UC Davis Health

Central Plant 1st Floor PO&M Emissions Urea Project
9557240

Project Manual

Construction Documents
Delta 2
Backcheck Response 02
October 27, 2023

UC DAVIS HEALTH BUILDING DEPARTMENT

APPROVED

REVIEWED FOR CODE COMPLIANCE
The set of plans and specifications must be kept on the job site at all times and it is unlawful to make any changes or alterations to the approved set without written permission from the Building Department.
The approval of this plan and specifications SHALL NOT be held to permit or approve the violation of any University Policy or State Building Code.

BY: Paul R Menard AIA, CBO DATE: 11/1/2023

PROJECT #: UCDH-2023-0181

UC Davis Health
Sacramento, CA 95817

This approval includes 301 pages.

HGA

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HGA Commission Number
1500-154-00

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SECTION 011000
SUMMARY OF WORK

PART 1 - GENERAL

1.1 PROJECT DESCRIPTON

A. Briefly, and without force and effect upon the contract documents, the work on the contract can be summarized as follows:

B. The Urea Conversion Project (Project) at the UC Davis Medical Center Central Plant (Plant) involves the following work as an overview.
   1. Removal of existing ammonia equipment inside the ammonia room
   2. Removal of existing ammonia supply piping from the ammonia room to the ammonia distribution grid at the HRSG
   3. Removal of existing ammonia distribution header and supports
   4. Removal of existing ammonia injection grid
   5. Temporary removal of building window, frame, and wall at the ammonia room to allow the removal of existing ammonia equipment and installation of the new urea equipment
   6. Installation of new urea equipment
   7. Restoration of the building window, frame, and wall at the ammonia room after the new urea equipment is placed inside the ammonia room
   8. Installation of new mechanical and electrical items, interconnections and supports
   9. Installation of new ammonia/air mixture supply piping and supports to the new ammonia distribution grid at the HRSG
   10. Installation of the new ammonia distribution header and supports
   11. Installation of the new ammonia injection grid and catalyst frame modifications inside the HRSG
   12. Evacuate and cleaning of the existing underground ammonia tank
   13. Application of epoxy coating to cover the internal of the underground ammonia tank .

C. Furnish labor, equipment, tools, and construction materials for construction of the project in full compliance with the design drawings and the specifications.

D. It is not the intent to specify herein all the details of the Contractors work scope. The Contractor shall bear the responsibility of ensuring that the work is in accordance with all applicable codes, standards, drawings, and specifications.

E. Contractor shall not proceed with any construction work which is "On Hold" until the "On Hold" is released for construction.

F. Contractor's price shall include an allowance of plus or minus 18 inches for final location of grounding grid pigtail stub ups, piping stub ups and electrical conduit stub ups.

G. Provide mechanical and electrical interconnection testing.

1.2 SUMMARY OF WORK

A. WORK TO BE PERFORMED BY THE OWNER
   1. The Owner shall be responsible for the following items.
      a. Clear storage and loose items inside the ammonia room
      b. Shutoff and isolate ammonia supply from underground tank to ammonia room
      c. Evacuation of residual ammonia between tank, ammonia room, and HRSG
      d. Air, nitrogen or water purge between tank, ammonia room, and HRSG

e. Draining non-potable water supply line
f. Depressurization of IA (instrument air) supply line at the ammonia room
g. Lockout/Tagout (LOTO)
    1) Ammonia supply, double block and bleed isolation or blind between tank and ammonia room
    2) IA supply to ammonia room
    3) Non-potable water supply to ammonia room
    4) Dilution air blowers 73-F-3071A and B
    5) Heater 73-HTR-3071
    6) LOTO MCC bucket. Remove and tag wires. Remove MCC bucket.MCC for new breaner installation
    7) Ammonia forwarding pumps
    8) Lift and tag wiring onAny low voltage systems for the devices inside the ammonia room as requested.
    A) TEMPORARY RELOCATION OF FIRE SPRINKLER PIPING IF NECESSARY
h. Temporarily Relocation of HVAC vent if necessary
i. Coordinate with UCDH Fire Prevention office to temporarily disable fire sprinkler system in Ammonia Room. Contractor to give a 5-business day notice to UCDH prior to removal of fire sprinkler piping. Contractor responsible for temporary removal and reinstallation of fire sprinkler piping if required.
j. Third-party inspection for California Building Code related testing and inspections including special inspections as required by the California Building Code. The Contractor shall coordinate with the Owner for scheduling the thirty-party testing and inspections with a minimum of one (1) week advance notice.
k. Porta-Johns
l. Construction power, water, and air
m. Construction trailer and personnel parking (Pending discussion)
n. Laydown area for removed equipment and new equipment
o. Disposal of flush water
p. Hot work and confined space permits
~~q. Confined space rescue team~~
~~r. Temporary fencing~~
s. Wiring terminations at the DCS cabinet just outside of the ammonia room (north side)

B. WORK TO BE PERFORMED BY THE CONTRACTOR

1. Refer to drawings T1.1 for a listing of engineer's design drawings that cover the work in this contract. The Contractor shall be aware that Owner furnished equipment vendor drawings are also included in the design package as the Contractor will also need to refer to the vendor drawings for a complete project.
2. The Contractor shall provide typical submittals required for performance of the work for Owner's review and approval, including but not limited to:
    a. Calculations/Engineering Data
    b. Product Data
    c. Vendor Drawings
    d. Samples
    e. Certificates
    f. Test Reports
    g. Catalog Data
    h. Demolition Plans and Procedures

3. The Contractor shall be aware that the FuelTech equipment is scheduled to be delivered to the Plant starting in (Pending date) 2023. The Owner has located an outdoor temporary location as the temporary laydown area for this equipment.

4. The Contractor shall be responsible for receiving and unloading all project equipment and materials (Owner will receive FuelTech equipment that arrives before job start) to the temporary laydown area. The Contractor shall be responsible for loading, transporting, and unloading of all equipment and materials from temporary laydown area to the construction area for erection and installation.
5. All necessary construction, lifting equipment, including adequate rigging equipment, shall be provided by the Contractor. The Contractor shall be liable for any damage (that is caused by the Contractor) to the equipment until the equipment is installed at the plant and turned over to the Owner.
6. To complete the temporary power distribution system, power distribution center with associated aboveground conduits, cables, and other necessary equipment shall be supplied and installed by the Contractor. The Contractor shall supply, install and connect all additional temporary conduit, 480V distribution cabling, etc. for a complete temporary power distribution system. (The temporary installations will be removed by the Contractor at the completion of the project.) (Pending discussion)
7. The Owner will provide 4 parking spaces inside the Central Plant Utility Yard for use by the contractor. For additional parking places on campus, the contractor will need utilize the parking kiosks. More details to be provided to the awarded contractor. The owner will also provide space for a contractor provided construction trailer with in the utility yard.
8. Demolition/removal of the following items.
    a. Removal of existing ammonia vaporizer skid, associated housekeeping pad and adjacent housekeeping pad (inside the ammonia room)
    b. Removal of existing ammonia expansion tank and housekeeping pad (inside the ammonia room)
    c. Removal of existing ammonia suction pump skid and housekeeping pad (inside the ammonia room)
    d. Removal of PA speaker and reinstallation of PA speaker above the ammonia room entrance door
    e. Instrumentations and associated conduits (inside the ammonia room)
    f. Wall mounted electrical pull boxes and disconnect switches
    g. Removal of ammonia leak detector and reinstallation of such detector near the NW corner of the ammonia room
    h. Controls and Instrumentation wiring and conduit from the ammonia room to the DCS cabinet located just outside the ammonia room (North side)
    i. Miscellaneous supports for the removed items
    j. Above ground cables and conduits as shown on the demolition drawings and illustrations.
    k. Cables located in existing underground conduit, which is being re-used, shall be fully removed to make the conduit available for new cables.
    l. Underground cables or wires which originate from the demo equipment shall be removed from the demo equipment to the next termination point, unless otherwise noted.
    m. Conduits rising from below ground which are no longer being used shall be capped flush with the finish grade with a male threaded fitting.
    n. Removal of interconnecting piping as necessary to allow removal of equipment
    o. Contractor shall pay special attention to protect and save the existing grounding pigtails/wires that are attached to the existing equipment that will be removed. All existing grounding pigtails/wires will be reused and extended for the installation of the new equipment.
    p. Other miscellaneous mechanical, electrical, and structural items surrounding and adjacent to the HRSG as shown in the demolition drawings.
    q. Overhead Lights. (Note: Overhead lighting circuit(s) to be extended to walls for new wall mounted lighting.)
    r. Remove the existing DENOX PLC and Display to allow room for the installation of the new FuelTech remote panel with power and ethernet cable to the FuelTech PLC in the ammonia room.
    s. Temporary relocation of fire sprinkler piping if necessary
    t. Temporarily Relocation of HVAC vent if necessary

9. During the demolition phase, some of the existing equipment/systems adjacent to the work area maybe in service. Contractor shall walkdown these equipment/systems to fully understand the locations and operating service boundary.
10. For the demolition of the existing equipment, Contractor shall verify equipment and work areas have been de-energized, disconnected, depressurized, drained, cleared, emptied, etc. prior to demolition.
11. Contractor shall work with the owner to investigate, save, and protect the piping and conduit that are remaining inside the ammonia room. These piping and conduit may remain active and energized during the entire construction period.
12. Cover and protect floor drain inside the ammonia room during the construction period.
13. Contractor shall minimize cutting of existing equipment skids (and other loose devices) and remove them as whole unit in case the equipment needs to be reused.
14. All removed items/equipment shall be stored at the laydown yard properly for a period of 1 month after the demolition is complete. After that, Contractor shall arrange and provide dumpsters and trucking for off-haul and disposal of all demolition items. Contractor shall coordinate with Owner regarding scheduling for transportation of the demolition items.
15. De-terminate electrical connections and interconnecting piping as necessary to allow removal of equipment.
16. Contractor shall include the following constraints in planning of the demolition and installation work:
    a. Total Cogeneration Unit Shutdown for this project will be 21 days or less. The installation phase by the Contractor shall be completed by the end of the 17th day. The Fueltech startup and commissioning team will begin the startup and commissioning process at the beginning of the 18th day.
    b. Contractor to stage all equipment prior to Cogeneration Unit Shutdown.
    c. Contractor to remove Ammonia Room Wall and Window prior to Cogeneration Unit Shutdown.
    d. Contractor to staff the job to meet the 21-day outage window including the use of 12-hour shifts, weekend work, and night shifts. Outage work to include demolition, installation, and offline commissioning of equipment. Outage work to also include cleaning, prepping, and coating the Underground Storage Tank.
    e. Online commissioning to take place immediately on the 22nd day after installation and offline commissioning.
    f. The Plant will be shutdown on (Pending date), 2023. Demolition work may only begin with Owner's approval and after the Plant completes LOTO, equipment isolation, selection of electrical determinations, and other clearances on (Pending date), 2023.
    g. It is expected that new installation work will begin after demolition is complete, unless otherwise approved by the Owner.
17. Furnish and install new concrete housekeeping foundations for the following equipment:
    a. Decomposition Chamber and Structure
    b. Metering and Heater Module
    c. Blower Module
    d. 4,500 gallon storage tank with seismic restraint system
18. Contractor shall remove the building wall, frame, and window to allow adequate room for the removal of existing equipment and the installation of the new equipment.
19. Once the new concrete housekeeping foundations are cured and up to design strength, Contractor can place the new equipment onto the new concrete housekeeping foundations.
20. After equipment is placed inside the ammonia room, Contractor shall re-install the building wall, frame, and window.
21. Installation of the following Owner furnished equipment (refer to detailed vendor drawings which show in greater detail the equipment installation work):
    a. Decomposition chamber and the associated structural support
    b. Metering and heater module
    c. Blower module
    d. 4,500 gallon urea storage tank

e. Manual and control valves (i.e., numbered valves indicated on P&ID's. The Contractor shall furnish and install all required valves not furnished by the vendor)
f. Vendor provided loose ship items including instrumentations, piping, tubing, enclosures, etc.
g. Relocation of the previously demolished Ammonia Leak Detector to the North wall.
h. Relocation of the previously demolished PA speaker to the West wall above the entrance doorway.
i. New FuelTech remote panel at the existing DENOX box, with power and ethernet cable to the FuelTech PLC at the ammonia room.

22. Installation of the following Contractor furnished equipment:
    a. Any necessary valves as indicated on the P&IDs not furnished by the vendor.
    b. Instrumentation tubing, fittings, manifolds, supports, and valves.
    c. Piping, fittings, other miscellaneous supports, and other piping components to complete the piping system.
    d. Piping and equipment system thermal insulation (including stainless steel insulation covers) for all piping and equipment with surface temperature equal to and above 140 °F.
    e. Two (2) 480V MCC Buckets equipped with breakers and door operators. 480V MCCs are located in the Plant Operations Building.
    f. Two (2) NEMA 4X pull boxes for power wiring.
    g. One (1) NEMA 4X interface terminal board enclosure for controls and instrumentation.
    h. One (1) 120V panelboard single pole breaker for controls power. Panelboard is located adjacent to the ammonia room.
    i. Four (4) new wall mounted LED lights. Two (2) new lights on the South wall and two (2) new lights on the North wall. Lights to be powered from existing lighting room lighting circuits.
    j. Cable trays, wireways and associated fittings, supports and hardware.
    k. Junction or pull boxes necessary for a complete electrical raceway system.
    l. Cables and wires for low voltage power, instrumentation, controls, and communication systems.
    m. Low voltage cable termination lugs and terminals.
    n. Wire labeling and cable marking devices. Labeling to include landing location and source location on each conductor.
    o. Ground bus extension(s) and ground tails.
    p. Any other miscellaneous electrical equipment or minor materials necessary for a complete system or as shown on the design drawings.
23. Furnish and install concrete-embedded anchor bolts with nuts and washers, and other embedded metal as shown on the drawings.
24. Furnish, install, pressure test, flush, clean, and leak test piping for the following piping systems:

25. Flush water
26. Instrument Air supply to blower valves
27. Air supply from blower module to metering and heater module
28. Ammonia/air mixture to ammonia injection grid
29. Heated air supply to decomposition chamber
30. Ammonia supply to injector
31. Atomizing air supply to injector
32. Instrument air supply to metering module
33. Urea solution supply to metering and heater module
34. Other piping system that comes with the Owner furnished equipment
35. Secondary urea fill connecting piping at the PG&E yard area

(NOTE: THE ABOVE PIPING SHALL BE FURNISHED, INSTALLED, AND TESTED IN ACCORDANCE WITH ASME B31.1 POWER PIPING CODE).

36. Furnish and install the new grounding pigtails to tie-in to existing grounding to all Owner furnished equipment.
37. Furnish and install drilled-in type anchor bolts
38. Furnish and install all grout materials.

39. Except where noted on the project drawings, the Contractor shall install, and terminate all cables.
40. Cable, Raceway and Termination Schedules: The cable and raceway schedules are furnished as an aid to the identification and installation of cables, conduits, and cable trays, etc. Not all project cables or raceways are reflected in the cable and raceway schedule. Some cables and raceways are shown on the project drawings in schematic or diagrammatic formats (e.g., communications, lighting, grounding). Except where noted on the project drawings, the Contractor shall be responsible for the supply and installation of these field-routed cables and raceways.
41. A computer-generated termination schedule in excel format will be furnished later as an aid to terminating wires and cables.
42. Receive and Maintain Electrical Equipment: Contractor shall be responsible for receiving, receipt inspection and testing (where required) of electrical components and equipment furnished by the Owner.
43. Where additional dress-out of equipment is required, (e.g., connection of shipping sections of switchgear and MCCs, etc.) the Contractor shall perform this work and perform it in accordance with the manufacturer's instructions.
44. Contractor shall be responsible for proper maintenance of this equipment during pre-installation storage and after installation until Owner's acceptance.
45. Provide electrical testing (megger, point-to-point, etc.) for newly installed items (Owner furnished or Contractor furnished) based on industry standards.
46. Grounding System: Contractor shall furnish and install all above ground cables, fittings, and devices to extend and complete the plant grounding and lightning protection systems. The locations of the ground taps to the grid are shown on the referenced grounding drawings.
47. Wherever above ground activities of the Contractor damage or cut the underground portion of the ground grid or taps to the ground grid, the Contractor shall repair, or replace, the damaged area in consultation with, and with the approval of, the Construction Manager.
48. Installation, point to point wire check, and instrument loop check of all instrumentation. The Contractor shall also assist the startup with all instrument calibration and commissioning.
49. Furnish, install, and/or repair site concrete slab-on-grade/surfacing as necessary around new foundation area.
50. Contractor shall furnish and perform final painting including but is not limited to all non-insulated steel piping, plastic piping, pipe, and conduit supports, vents, electrical panels, panel supports, equipment, touchup of shop applied coatings damaged during construction and miscellaneous items associated with construction. Contractor shall also apply touch-up painting (provided by Owner) to the Owner furnished equipment as necessary.
51. The Contractor shall provide flushing of all fluid pipelines to assure cleanliness of piping systems.
52. The Contractor shall provide the following work at the existing underground storage tank:
    a. Draining of residual ammonia
    b. Cleaning of tank walls
    c. Prep tank walls for coating per coating manufacturer instructions
    d. Coat tank per manufacturer instructions.
53. Contractor shall remove all Contractors' construction trailers and conduct final site cleanup.
54. Contractor shall provide the necessary safety essentials, including rescue team, to perform the scope of work described herein.
55. Contractor shall provide security, including temporary fencing with barb wire, temporary closure of building opening (with plywood or other adequate material) and/or security guards, to protect the plant during the construction period when the wall, frame, and window at the ammonia room are removed.

1.3 GENERAL INFORMATION

A. OWNER, ARCHITECH, AND ENGINEER DEFINED
1. Owner and Project Site Street Address:
   UCDMC CENTRAL PLANT

4840 2ND AVE
SACRAMENTO, CA 95817
PROJECT MANAGER: CASEY LUBAWY

(CALUBAWY@UCDAVIS.EDU)

2. Architect for Building Wall and Frame Removable/Restoration Details:
   HGA
   1200 R STREET
   SACRAMENTO, CA 95811

3. BOP Engineering Design:

   IEC CORPORATION
   8775 FOLSOM BLVD. SUITE 110
   SACRAMENTO, CA 95826
4. AIG and Ammonia Distribution Header Engineering Design and Material Supply:
   TBD

5. Third-Party Inspection Services: TBD

END OF SECTION

SECTION 011400
WORK RESTRICTIONS

PART 1 - GENERAL

1.1 WORK HOURS

Note to PM, INSTRUCTIONS for WORK HOURS:

Use Paragraph A for Projects with work hours restricted to 7 a.m. to 5 p.m. and delete Paragraph B.

Use Paragraph B for Projects that require an accelerated schedule to complete the work within the Contract Time, or for areas that require Early Occupancy.

If Paragraph B is used, delete text in Paragraph A and replace with text in Paragraph B.

Delete instructions after editing.

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.

Note to PM, INSTRUCTIONS for University Occupancy:

PM to edit and identify areas of the project that will be occupied during duration of the project and construction. This section can also be used to identify areas that will require early occupancy prior to Substantial Completion of the rest of the project.

1.2 SUBSTANTIAL COMPLETION

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

1.3 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.

1.4 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.

C. 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.

1.5 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.

1.6 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.

1.7 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 2 - PRODUCTS – NOT APPLICABLE TO THIS SECTION.

PART 3 - EXECUTION – NOT APPLICABLE TO THIS SECTION.

END OF SECTION

SECTION 012200

ALLOWANCES

PART I - GENERAL

1.1 GENERAL

A. The Contract Lump Sum Base Bid as entered in Article 4.0 of the Bid Form shall include the amounts for all Allowances required in this section and elsewhere in the Contract Documents. All Allowances shall be provided by the Contractor for the amounts indicated.

B. The following shall apply to the Allowances, unless otherwise indicated in the Contract Documents:
   1. Allowance amounts shall be for the full amount of compensation, both direct and indirect, and contain all overhead costs including but not limited to supervision, support, taxes, bonds, insurance, and profit.
   2. Allowances shall be for complete compensation to the **Contractor** for all materials and equipment delivered at the Project site, including all overhead, taxes, insurance, shipping, and handling.
   3. Allowances shall be for complete compensation to the **Contractor** for all labor amounts and shall include all overhead, supervision, support, tools and equipment to perform the work directed by the University's Representative.
   4. Allowances for tradesmen in labor amounts will be utilized and directed by the University's Representative. These amounts are for work not included in the scope of the contract documents and are solely for the use and direction by the University's Representative
   5. Upon project closeout, adjustments for any remaining quantities of the amounts included in the Allowances will be deleted from the contract sum on a per unit basis.

1.2 DESCRIPTION OF ALLOWANCES

A. TBD

PART 2 - PRODUCTS – NOT APPLICABLE TO THIS SECTION.

PART 3 - EXECUTION – NOT APPLICABLE TO THIS SECTION.

END OF SECTION

SECTION 012500

CLARIFICATION/INFORMATION PROCEDURES

PART 1 - GENERAL

1.1 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.

1.2 SECTION INCLUDES

1. RFI Administrative requirements
2. RFI Procedures
3. RFI Execution

1.3 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.

1.4 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.

1.5 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 2 - PRODUCTS – NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

3.1 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.

3.2 REFER TO THE FOLLOWING ATTACHMENT

A. Request for Information

END OF SECTION

3.1 REQUEST FOR INFORMATION

PROJECT #: _____ **PROJECT TITLE:** _____

RFI #: _____ **DATE:** _____ **HCAI #:** _____

UC DAVIS HEALTH FACILITIES DESIGN & CONSTRUCTION 4800 2ND AVENUE, SUITE 3010, SACRAMENTO, CA 95817 **ATTN.: PROJECT MANAGER** P: 916-734-#### C: ###-###-#### EMAIL: ########@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**

3.2

SECTION 012550

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 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

1.2 RELATED DOCUMENT SECTIONS

A. General Conditions of the Contract: Governing requirements for changes in the Work, in Contract Sum and Contract Time.

B. Section 012500 – CLARIFICATION/INFORMATION PROCEDURES

C. Section 012900 – MEASUREMENT AND PAYMENT: Applications for Payment.

D. Section 016100 – PRODUCT REQUIREMENTS: Product options, substitutions, omissions, and improper descriptions.

E. Section 017700 – CLOSEOUT PROCEDURES: Project record documents.

1.3 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.

1.4 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.

1.5 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

1.6 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.

1.7 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.

1.8 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.

1.9 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 2 - PRODUCTS – NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

3.1 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:
               (i) The COR is before the contractor would reasonably have the material on site to accomplish the COR.
               (ii) Recent, within last 6 months.
               (iii) 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.

3.2 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.

3.3 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

SECTION 012900
MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

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

B. Procedures for preparation and presentation of Schedule of Values.

1.2 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

E. PAYMENT APPLICATION FORM

1.3 PAYMENT APPLICATION FORM:

A. Prepare Applications for Payment using Exhibit 4 provided in the Contract.

1.4 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.

C. 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.

D. **Contractor's** General Conditions overhead and profit shall be a separate line item per month.

E. Allowances (if applicable). Show the line item value of allowances.

1.5 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.

1.6 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.

1.7 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 2 - PRODUCTS – NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION – NOT APPLICABLE TO THIS SECTION

END OF SECTION

SECTION 013100
COORDINATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Project Meetings

B. Submittals Requirements

C. General Contractor Coordination

D. Coordination of Subcontractor and Separate Contracts

E. University Criteria

1.2 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.

1.3 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][C/M 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 3~~2~~ 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.

1.4 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.
3. **Contractor** shall submit the following submittals to the University's Representative who will forward directly to the appropriate State Agencies for their review and approval:
   a. Fire Protection Drawings: Refer to Division 21
   b. Fire Alarm System: Refer to Division 28
   c. Additional HCAI Deferred Approvals: Refer to list of deferred approvals as shown on the Contract Documents.

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.

1.5 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.

1.6 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.

1.7 UNIVERSITY CRITERIA

A. 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.

B. 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.

C. 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** 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.

D. 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.

E. 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.

[ADD ADDITIONAL SPECIFIC WORK WHICH IS TO BE PERFORMED DURING NON-NORMAL TIME PERIODS.]

F. 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.

G. 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 (¼" 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 2 - PRODUCTS – NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

3.1 REFER TO THE FOLLOWING ATTACHMENTS

A. Request for Shutdown (RFS) Info/Impact Report

B. Dig Notification Form

END OF SECTION

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 2ND AVENUE, SUITE 3010** **SACRAMENTO, CA 95817** **P: 916-734-7024** **PROJECT MANAGER'S EMAIL ADDRESS:**	**FROM:**

REQUEST DATE: _____ **SHUTDOWN TARGET DATE:** _____

REQUESTED BY: _____ **REQUESTOR'S PHONE #:** _____

SHUTDOWN WORK (**UTILITY SPECIFIC**): _____

SCOPE (**BRIEF DESCRIPTION OF WORK**): _____

IMPACT (**AREAS & USERS**): _____

ADDITIONAL COMMENTS: _____

DIG NOTIFICATION FORM

PROJECT #: _____ **HCAI#:** _____ **DATE:** _____

TO: UC DAVIS HEALTH **FACILITIES DESIGN & CONSTRUCTION** **4800 2ND AVENUE, SUITE 3010** **SACRAMENTO, CA 95817** **P: 916-734-7024**	**FROM:**
PROJECT MANAGER'S EMAIL ADDRESS:	

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 013200

CONTRACT SCHEDULES

PART 1 - GENERAL

1.1 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.

1.2 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.

1.3 SUBMITTALS

A. Submit the following in accordance with Section 013300 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 2 - PRODUCTS

2.1 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 3 - EXECUTION

3.1 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).

3.2 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:
      1) Area of the project
      2) Identity of the party responsible for the activity (i.e., University, General **Contractor**, specific subcontractor…)
      3) Specification section applicable to activity
      4) Phase
      5) Sequence – The following sequences shall be identified:
         (a) Administrative
         (b) Submittal and Review
         (c) Fabrication
         (d) Construction: including phasing and sequencing as identified in 011400 Work Restrictions
         (e) 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 013300 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.

3.3 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.

3.4 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 *c*alendar 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.

3.5 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.

3.6 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.

3.7 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.

3.8 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

SECTION 013220

CONSTRUCTION PROGRESS REPORTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Requirements and procedures for documentation of construction progress using still photographs, videos, **[Webcam].**

B. Related sections include the following:
   1. Division 01, Section “Closeout Procedures” for general closeout procedures.
   2. Division 01, Section “Closeout Submittals.”

1.2 PROGRESS PHOTOS/VIDEOS

A. Maintain a [daily, weekly, monthly] 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.

1.3 AS-BUILT DOCUMENTATION

A. The Contractor shall be responsible for the maintenance and completion of As-Built PDF Drawings and Models 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 and in the record model by the Contractor. Such indications shall be neatly made and kept current. Where exact locations are critical, such as in the case of buried piping or conduit, such locations - both horizontal and vertical - shall be dimensioned back to an above ground, permanent fixed point.
   3. Properly note construction deviations or changes on the monthly As-Builts, prior to proceeding with any Work in those locations. Do not complete Work or request inspections if such Work has been installed in locations contrary to the Drawings.
   4. University's Representative may request to review the As-Builts, on a monthly basis and prior to each Application for Payment. If requested by University's Representative, provide access to the following:
      a. Approval of Application for Payment is contingent upon timely review of monthly changes on As-Builts Drawings and Record Models.
      b. PDF drawings and The Record Model must be available for review to the University's Representative of the sheets or areas on which changes have been noted during the preceding month.
   5. All As-Built and Record indications shall be clear and legible.
   6. At the completion of the Project, Refer to Section 017800 CLOSE OUT SUBMITTALS.

PART 2 - PRODUCTS – NOT APPLICABLE TO THIS SECTION.

PART 3 - EXECUTION

A. Contractor is required to maintain a [daily, weekly, monthly] 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.

END OF SECTION

SECTION 013300

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 - GENERAL

1.1 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

1.2 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.

1.3 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.

1.4 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.

1.5 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.

1.6 FIELD SAMPLES AND MOCK-UPS (IF APPLICABLE OR NOT USED)

A. Erect at the project site, at a location directed by University's Representative, mock-ups to a size as specified.
1. The following mock-ups are required for this project:
2. (**CONSULTANT TO LIST**)

B. Fabricate each Sample and mock-up to be complete and fully furnished. Unless otherwise agreed, full-size complete samples will be returned and may be incorporated into field mock-ups and Work.

C. Mock-ups shall be removed by the **Contractor** at conclusion of the Work at no additional cost to the University.

1.7 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**.

1.8 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 2 - PRODUCTS – NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION – NOT APPLICABLE TO THIS SECTION

END OF SECTION

SECTION 013400

CONTRACTOR(S) EMERGENCY PROCEDURES

PART 1 - GENERAL

A. The purpose of this specification is to outline, to the [contractor][cm/contractor][design-builder], the university's policy and procedures for effective project site management of an emergency situation during the construction of projects at UC Davis health.

B. This procedure applies to all contractors and their subcontractors who have contractual agreements with UC Davis health.

PART 2 - DEFINITIONS

A. 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.

B. 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.

C. Code Red – fire

D. Code White – hazardous material / chemical spill

E. 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.

F. Other emergency situations include the following systems failures as outlined in the UC Davis Emergency Response Plan.
   1. Water system failure
   2. Telephone system failure
   3. Fire
   4. Electrical system failure
   5. Security
   6. Chemical spill
   7. Evacuation

PART 3 - PROCEDURES

A. The Contractor will be issued a UC Davis Health Emergency Response Plan at the project

B. Pre-construction meeting. This plan must be posted at the project site at all times in a visible location known to all project contractors.

C. Contractor is directed to contact appropriate emergency personnel as outlined in the Emergency Response Plan information during an emergency.

D. 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

POLICE DISPATCH:	916-734-2555
PO&M DISPATCH (ELECTRICAL)	916-734-2763
PG&E (GAS)	800-743-5000
CITY OF SACRAMENTO WATER	3-1-1
HAZMAT SPILL	916-734-2740

END OF SECTION

SECTION 013500

SPECIAL PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Interim Life Safety Measures (ILSM)

B. Security Procedures

C. Hazardous Materials Procedures

1.2 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

1.3 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.

D. 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.

E. 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.

F. 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.

G. 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.

1.4 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.

1.5 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.

B. 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 2 - PRODUCTS – NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION – NOT APPLICABLE TO THIS SECTION

END OF SECTION 013500

I.L.S.M.

Interim Life Safety Measures Requirement Verification Card

Contractor	Inspector	Fire Marshal	Comments
Walk each area indicated by the ILSM and ensure measures are in place. Effective Dates	Review the progress and verify the responsible parties adhere to ILSM provisions. Effective Dates	Fire Marshal has visited the site and reviewed the program with the responsible parties	
Daily -Initial and Date	**Weekly – Initial and Date**	**Monthly – Initial and 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.	☐	☐
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.	☐	☐
The issue impairs the building fire alarms or sprinkler systems?	☐	☐
The activity includes significant ignition sources such as cutting, welding, or other operations using flame or producing sparks?	☐	☐
The activity includes large quantities of combustible materials, flammable materials, or generation of large amounts of dust and debris?	☐	☐
Access to fire or life safety equipment affected? If yes, what systems or equipment? (i.e.: fire watch, Fire Inspector, extinguisher, etc.)	☐	☐
Are construction barriers present / required?	☐	☐

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/

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 014100

REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 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

1.2 RELATED SECTIONS

A. Section 013500 – SPECIAL PROCEDURES

B. Section 014200 – REFERENCES

C. Section 014500 – QUALITY CONTROL

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

A. Authority: All codes, ordinances and standards referenced in Contract Documents shall have full force and effect as though printed in their entirety in the Contract Specifications.

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

1.4 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
      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) 2021 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)- CABO/ANSI A117-1-2017 (Accessibility)
      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.

5. 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.

1.5 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.

B. DEPARTMENT OF HEALTH CARE ACCESS AND INFORMATION PROJECTS (If applicable or NOT USED)

C. 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.

D. HCAI will approve an inspector for the Project who shall have full access to the Project at all times.

E. 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.

F. 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.

G. HCAI will require Change Order Approval submitted by University's Representative.

H. HCAI will require a Licensed Contractor's Declaration from the Contractor.

I. HCAI projects shall comply with the 2016 California Administration Code.

1.6 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 2 - PRODUCTS – NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION – NOT APPLICABLE TO THIS SECTION

END OF SECTION 014100

SECTION 014200

REFERENCES

PART 1 - GENERAL

1.1 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

1.2 RELATED SECTIONS

A. Section 014100 – Regulatory Requirements

1.3 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.

1.4 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.

1.5 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 2 - PRODUCTS – NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION – NOT APPLICABLE TO THIS SECTION

END OF SECTION 014200

SECTION 014500

QUALITY CONTROL

PART 1 - GENERAL

1.1 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

1.2 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.

1.3 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.

1.4 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.

1.5 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.

1.6 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.

1.7 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.

1.8 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.

1.9 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.

B. University will distribute one (1) PDF electronic copy of the reports to University's Consultants and Contractor.GEOTECHNICAL ENGINEER (If applicable or NOT USED)

C. 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 2 - PRODUCTS – NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION – NOT APPLICABLE TO THIS SECTION

END OF SECTION 014500

SECTION 014510

SEISMIC CONTROL – HCAI

PART 1 - GENERAL

1.1 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.

1.2 QUALITY ASSURANCE

A. ASTM standards

B. 2022 California Building Code, Title 24 (CBC)

1.3 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][CM/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][CM/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 2 - PRODUCTS

2.1 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.

2.2 SEISMIC RESTRAINT DESIGN

A. 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.
   1. All equipment/components including but not limited to: electrical, mechanical, plumbing, fire sprinkler and architectural.
   2. 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.
   3. Design and installation shall consider seismic relative displacement in accordance with ASCE 7-16-13.3.2.
   4. 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.
   5. Support and attachment requirements for fixed, interim, mobile, movable, other, and temporary equipment shall be in accordance with HCAI PIN 68.

B. Seismic restraint transverse and/or longitudinal spacing shall be in accordance with CBC and OPM and limited to the following:
   1. Seismic design forces equal to or less than the capacity of the building structure.
   2. 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).
   3. 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).
   4. 20’ feet transversely and/or 40’ feet longitudinally for bus ducts and cable trays, baskets, channels.

C. **[Contractor][CM/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.
   1. 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.
   2. 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.

D. 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.

E. Seismic restraint assembly connections shall not incorporate the use of break-off bolts or nuts and pneumatic fasteners unless referenced in the OPM document.

F. Ceiling system shall not be used as a seismic restraint, sway brace and/or safety restraint material.

G. Non-seismic and/or safety restraints sway bracing shall meet or exceed that required for the attachment of seismic restraints to the building structure.

H. 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.

I. 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.

J. 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.

K. Trapeze systems installed in a multi-layer configuration shall have seismic restraints designed and installed for each individual trapeze layer.

L. 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.

M. SMACNA details shall not be used without prior approval by Structural Engineer of Record (SEOR).

2.3 ACCEPTABLE MANUFACTURERS

A. HCAI Pre-approved Certified Manufacturer (OPM)

2.4 ANCHORS, INSERTS AND FASTENERS

A. 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.

B. Do not use any anchor or insert in concrete or metal decking with concrete fill, which does not have one of the following:
   1. ICC evaluation report
   2. HCAI pre-approval

C. 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.

D. 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.

E. 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.

F. 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.

2.5 FIELD QUALITY CONTROL

A. Inspection of seismic restraints by the Inspector of Record (IOR), and/or Authority Having Jurisdiction (AHJ).

B. Special inspection for special seismic certification per CBC 1705A.12.4.

PART 3 - EXECUTION

3.1 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.

3.2 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 014510

SECTION 014520

SEISMIC CONTROL – NON-HCAI

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide all required seismic restraints and calculations in order to ensure that the installation is in compliance with all applicable seismic codes, standards, and specific information listed herein.

1.2 QUALITY ASSURANCE

A. ASTM standards

B. 2022 California Building Code, Title 24 (CBC)

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of material listed in this Section, including shop drawings and other documentation to comply with the requirements of this Section.

PART 2 - PRODUCTS

2.1 SEISMIC RESTRAINT REQUIREMENTS

A. SUMMARY
   1. This section covers the seismic restraint requirements for suspended vibration and non-vibration isolated items, systems and/or related suspended equipment.
   2. The Design-Builder's, Design Professionals are the designers of record as referenced in this specification shall be the project architect, structural engineer and the appropriate system engineer (e.g., electrical etc.).
   3. Department of Health Care Access and Information (HCAI) pre-approved designs may be submitted as an alternate provided they meet or exceed all the requirements contained within these specifications, and provided they meet or exceed all of the HCAI pre-approved service loads, installation applications, engineering services, etc. Furthermore, said other HCAI pre-approved designs must be submitted to the designers of record for review and acceptance, and to the University as a deferred approval prior to installation, with all costs including but not limited to project delay costs, to be borne by the contractor.
   4. Channel framing materials, fittings and related accessories shall be as indicated 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.

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 California Building Code (CBC).
      a. All equipment/components including but not limited to: electrical, mechanical, plumbing, fire sprinklers and architectural.
      b. Attachment, supports, and seismic restraints that are not shown on the approved construction document 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 designers of record and the University for acceptance prior to installation. Cost to be borne by the contractor.
      c. c. Design shall consider seismic relative displacement in accordance with ASCE 7-16 – 13.3.2.
   2. Seismic restraint transverse and/or longitudinal spacing shall not exceed CBC requirements and the lesser of the following:
      a. That which develops seismic design forces equal to or less than the capacity of the building structure.
      b. That which develops seismic design forces that are equal to or less than the capacity of weakest part, component, anchorage, etc., contained within the seismic brace assembly.
      c. 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).
      d. 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).
      e. 20 feet transversely and/or 40 feet longitudinally for bus ducts and cable trays, baskets, channels.
   3. **[Contractor][CM/Contractor]** shall not adopt, use, or otherwise implement the omission of any seismic restraints without prior review and acceptance by the designers of record. Submittals for omission of seismic restraints shall be limited to piping, ducts, and conduits. All submittals for omission of seismic restraints must be signed and sealed by a licensed California Structural Engineer, approved by the University and include the following items:
      a. Project-specific cover letter clearly indicating that said engineer has (with respect to the attached submittal for omission of seismic restraints) completely review the project documents including these specifications, the items/systems designs individually and in coordination with all other trades, and that all code and/or project specified requirements for omission of restraints have been meet individually and in combination with each other, that (if the attached submittal for omission is approved) said engineer has been hired/retained by contractor to visit the project site without limit to review and inspect the installation of the items/systems which have been reviewed and approved for installation without seismic restraints.
      b. Engineered details and engineering for all vertical supports and their connections to the building structure to qualify, that top connections cannot develop moments, that lateral motion will not cause loss of item/system support, that lateral motion of the item/system will not cause damaging impact with other items/systems, that lateral motion of the item/system will not directly or indirectly impact any life safety, emergency services and/or hazardous items/systems or their supports.
   4. Seismic hardware brackets shall provide a (Captive) 360º 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.
   6. Seismic restraint cables shall be looped through the seismic hardware bracket and turned back onto itself at the point of assembly/connection. Cables shall not be installed or attached to the seismic hardware bracket in a straight through (non-turn back) method of assembly/connection.

7. Seismic hardware brackets, connectors and related components shall be constructed entirely of malleable iron or steel. Seismic assemblies shall not include the use of cast components.
8. Ceiling and other types of single strand wire shall not be used as a seismic restraint, sway brace and/or safety restraint material.
9. The connection to the building structure of non-seismic sway bracing and/or safety restraints shall meet or exceed that required for the attachment of seismic restraints to the building structure.
10. Seismic restraints shall be installed to provide a minimum of (2) transverse and (1) longitudinal braces per run. A “run” shall be defined as a length of 5 feet or more.
11. The accumulated load of multiple items to any given support (with or without seismic restraints) shall be limited so as not to overload the building structure and the support assembly.
12. Trapeze systems installed in a multi-layer configuration shall have seismic restraints designed and installed for each individual trapeze layer.
13. Vertical supports shall be designed and installed to account for vertical tension and compression loads including accumulated seismic component increases.
14. 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.
15. 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)

2.2 ANCHORS, INSERTS AND FASTENERS

A. 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.

B. Do not use any anchor or insert in concrete or metal decking with concrete fill, which does not have a signed structurally engineered design value based on its installed application and one of the following:
   1. ICC evaluation report
   2. HCAI pre-approved

C. Cast-in-place inserts used in concrete or metal decking with concrete fill, shall be constructed entirely of malleable iron or steel.

D. 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.

E. Cast-in-place inserts that allow for horizontal adjustment shall not be allowed unless an engineered solution is provided to assure positive captive positioning and securement of the attachment.

F. 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.

G. 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.

2.3 FIELD QUALITY CONTROL

A. Inspection of seismic restraints by the Inspector of Record (IOR), and/or (AHJ) Authority Having Jurisdiction.

PART 3 - EXECUTION

3.1 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 Title 24.

C. Lighting fixture supports:
   1. Provide independent seismic support system for all lighting fixtures.
   2. Minimum Clearance:
   3. Diagonal braces and hanger supports shall maintain 6-inch minimum clearance from unbraced ducts and conduits, and 1-inch minimum clearance from braced ducts and conduits.
      a. 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.

3.2 INSTALLATION AND TESTING OF MECHANICAL ANCHORS:

A. Where permitted in other Sections of this specification, 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, procedure, and acceptance criteria of post-installed anchors in concrete shall be in accordance with CBC 1901.3.4.

END OF SECTION 014520

SECTION 014550

INSPECTION AND TESTING OF WORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Project Inspections and Procedures

B. Scheduling Inspectors – Notification requirements

1.2 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

1.3 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

1.4 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.

1.5 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 2 - PRODUCTS – NOT APPLICABLE TO THIS SECTION.

PART 3 - 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.

3.1 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%.

3.2 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.

3.3 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).

3.4 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).

3.5 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).

3.6 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.

3.7 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).
      a. Skilled Nursing (Chapter 3, Section 314.2) [test to include humidity controls in required areas - Section 2102(a)].
   3. Hydronic balance completed and reviewed by Mechanical Engineer-of-Record.
   4. Air and Hydronic reports forwarded to Mechanical Engineer of Record.
   5. Fuel Gas line inspection (Part 4, Section 1406 and Appendix B, Chapter 16).
      a. 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).

3.8 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).

3.9 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).
6. Close-In Inspections
7. Check fire-blocking and draft stops in combustible construction.
8. Check gypsum board installation in accordance with approved design assembly description for rated assembly.
9. Check integrity of firewall construction where recessed cabinets, panels, excessive electrical/plumbing are installed.
10. 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.
11. Check for through-penetrations and fire-stop systems in all walls or floor/ceiling assemblies.
12. Check top of wall to structure fire stopping.
13. Check above ceiling areas and construction prior to installation of ceilings.
14. 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.

15. [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.
16. Check bracing, anchorage, fasteners and installation.
17. Final Construction Inspections
18. 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.)

A. Refer to the following attachments
   1. Inspection Request
   2. Non-conforming Work Notice

END OF SECTION 014550

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

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'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-

PROJECT FIELD RECORD OF CONSTRUCTION PROGRESS SUMMARY OF WORK IN PROGRESS (PART 1, CHAPTER 7, SECTION 7-
PROJECT PHASE (BUILDING FOUNDATION, STRUCTURAL, WALL FRAMING, ELECTRICAL ROUGH-IN, SPRINKLER ROUGH-IN, ETC.)
PROJECT PHASE PERCENTAGE COMPLETE (% OF THE PHASE COMPLETED): **OVERALL PROJECT PERCENTAGE COMPLETE:**

NON-CONFORMING WORK NOTICE

PROJECT #:_____ **HCAI #:**_____ **NOTICE #:**_____ **DATE:**_____

TO: [PROJECT MANAGER NAME/EMAIL]
[DESIGN PROFESSIONAL NAME/EMAIL]
[IF HCAI PROJECT, AREA COMPLIANCE OFFICER/EMAIL]

FROM: UC DAVIS HEALTH
IOR
FACILITIES DESIGN & CONSTRUCTION –
INSPECTION TRAILER 4430 V STREET, BUILDING 35-A

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, ADVICE UNIVERSITY'S REPRESENTATIVE IN ACCORDANCE WITH THE GENERAL CONDITIONS.

DESCRIPTION OF CORRECTIVE ACTION TAKEN: _____

ACCEPTED BY: _____ **DATE:**

CC:

SECTION 015100

TEMPORARY UTILITIES

PART 1 - GENERAL

1.1 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.

1.2 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

1.3 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.

1.4 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.

B. Distribution: **Contractor** shall provide distribution network for temporary electrical power.

C. Power Source: Arrange for service with University's Plant Operations and Maintenance Department, or local utility company.

D. Conformance: All temporary wiring and electrical facilities shall be in accordance with applicable provisions of Electrical Safety Orders of the State of California.

E. 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.

F. 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.

G. Security Lighting: **Contractor** shall provide security lighting during hours of low visibility.

H. 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.
4. 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.
   a. 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.
   b. **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.
   c. 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.
      1) Provide and maintain warning labels on energized equipment.
      2) Replace plates, electrical devices or similar existing items or components damaged as a result of temporary usage.

1.5 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 50ºF., 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.

1.6 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 ⅞" 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.

1.7 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.

1.8 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.
3. 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.
4. [WIFI coverage at the above internet speeds will be provided throughout the jobsite]

PART 2 - PRODUCTS

2.1 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 3 - EXECUTION

3.1 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.

B. 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.

C. 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.

3.2 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 015100

SECTION 015200

CONSTRUCTION FACILITIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Field Offices and Sheds

B. Temporary Facilities

C. Temporary Sanitary Facilities

1.2 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

1.3 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.

1.4 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.

1.5 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 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION – NOT APPLICABLE TO THIS SECTION

END OF SECTION 015200

SECTION 015500

VEHICULAR ACCESS AND PARKING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Construction Parking and Access Roads

B. Traffic Regulation

C. Project Informational Signs

1.2 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.

1.3 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.

C. 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.

D. Delivery of materials may be made to the job-site as required. Contractor shall coordinate with University's Representative.

E. Dumpsters shall be located in approved location as arranged by University's Representative.

F. 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.

G. Designated areas of existing parking facilities may be used by construction personnel. Do not allow heavy vehicles or construction equipment in parking areas.

H. Maintain traffic and parking areas in a sound condition, free of excavating material, construction equipment, products, mud, snow and ice.

I. 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.

J. Remove temporary materials and construction when permanent paving is usable.

1.4 TRAFFIC REGULATION

A. Schedule of Access Closing: [Contractor][CM/Contractor][Design-Builder] shall adopt all practical means to minimize interference to traffic. Access to other facilities in the area shall be maintained at all times. [Contractor][CM/Contractor][Design-Builder] 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][CM/Contractor][Design-Builder] 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.

I. PROJECT INFORMATIONAL SIGNS (If applicable or NOT USED)

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

K. Project Identification Sign: [Contractor][CM/Contractor][Design-Builder] shall provide one (1) project sign. Sign will consist of one (1) 8' x 4'x ¾" 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.

L. 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.

M. Maintain signs and supports: Clean, repair deterioration and damages.

N. Remove signs, framing, supports and foundations at completion of Project and restore the area.

PART 2 - PRODUCTS – NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION – NOT APPLICABLE TO THIS SECTION

END OF SECTION 015500

SECTION 015600

TEMPORARY BARRIERS, ENCLOSURES AND CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Barriers and Enclosures

B. Protected Walkways and Weather Closures

C. Tree and Plant Protection

D. Temporary Controls

1.2 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

1.3 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.

1.4 PARTITIONS AND CEILING ENCLOSURES:

A. 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 ⅝" thick Type-X rated gypsum wallboard fire taped, braced so to be self-supporting without fastening to existing finishes.
   1. Provide gaskets of closed cell neoprene, or strips of fiberglass insulation between barriers and existing finish.
   2. 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**.
   3. Provide temporary doors in corridors with twenty (20) minute fire-rated assemblies and locksets to limit use.
   4. Use of access doors and routes by workmen to be approved by University's Representative.

B. 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.

1. Joints shall be taped and sealed over framing studs.
2. Bracing shall be self-supporting without fastening to existing finishes.
3. Provide gaskets of closed cell neoprene, or strips of fiberglass insulation between barriers and existing finishes.
4. Provide non-staining taped seal to surrounding materials to insure seal.
5. 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.

1.5 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.

1.6 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.

1.7 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.

1.8 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 2 - PRODUCTS

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.

PART 3 - EXECUTION

3.1 INFECTION CONTROL RISK ASSESSMENT ICRA REQUIREMENTS:

****DELETE SECTION IF NON-PATIENT CARE SPACE*** NON-CLINICAL DUST CONTROL COVERED BY 1.03***

A. Refer to attached Infection Control Risk Assessment (ICRA) and UC Davis Health Construction Dust & Hazardous Materials Inspection Worksheet.
   1. These documents dictate minimum requirements for Class I and II containments and minimum requirements that must be completed to control dust during construction.
      a. 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.

B. 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.

C. 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.

3.2 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 015600

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]					
	FULL CONTAINMENT (POLY OVER ALL SURFACES NOT IN SOW) BARRIERS REQUIRED				☐ HARD
	ISOLATED ROOM – CRITICAL OPENINGS ONLY (SEAL DOORS, SUPPLY AND RETURN REGISTERS, ETC)				
	MINI CONTAINMENT CUBE (ONLY LARGE ENOUGH FOR 1-2 PEOPLE; AKA POP UP CUBE)				
	SHROUDED TOOL WITH HEPA FILTERED EXHAUST				
	GLOVE BOX CONTAINMENT WITH HEPA FILTERED EXHAUST				
	OTHER:				
NEGATIVE PRESSURE REQUIREMENTS [CHECK ALL THAT APPLY]					
	-0.020” WC AT ALL TIMES (24/7) AS DISPLAYED ON MOUNTED MANOMETER				
	-0.020” WC AT SETUP WITH SOME NEGATIVE PRESSURE THROUGHOUT PROJECT AS DISPLAYED ON MANOMETER				
	VISUAL VERIFICATION OF SOME NEGATIVE ROOM PRESSURE THROUGHOUT PROJECT				
	NO NEGATIVE ROOM PRESSURE REQUIRED				
	NEGATIVE PRESSURE IN LOCALIZED HEPA EXHAUSTED WORK AREA (E.G. SHROUDED TOOL, GLOVE BOX)				
	OTHER:				
NEGATIVE PRESSURE EQUIPMENT [CHECK ALL THAT APPLY]					
	ONSITE CHALLENGE TESTING (DOP OR PARTICLE COUNTING) PRIOR TO SETUP				
	CHALLENGE TESTED WITHIN LAST 6 MONTHS; EQUIPMENT HAS REMAINED ONSITE AT UNIVERSITY				
	SINGLE HEPA UNIT; EXHAUSTED TO: ☐OUTDOORS ☐ DIFFUSION BOX/CHAMBER				
	TWO HEPA UNITS IN PARALLEL; EXHAUSTED TO: ☐OUTDOORS ☐ DIFFUSION BOX/CHAMBER				
	OTHER:				
ADDITIONAL CONTAINMENT REQUIREMENTS [CHECK ALL THAT APPLY]					
	ANTE ROOM		MASONITE FLOOR PROTECTION		PROTECTIVE CLOTHING
	WALK OFF MATS		SHOE COVERS		AIR SCRUBBER
	OTHER:				

VERIFICATION OF WORK

TYPE(S) OF INSPECTION REQUIRED		RESPONSIBLE PARTY
	HEPA EQUIPMENT VERIFICATION	□ EH&S □ CONSULTANT □ OTHER:
	PRE-WORK APPROVAL INSPECTION	□ EH&S □ CONSULTANT □ OTHER:
	DAILY ONSITE OVERSIGHT	□ PM □ EH&S □ CONSULTANT □ IOR □ OTHER:
	AIR SAMPLING TYPE:_____	□ EH&S □ CONSULTANT □ OTHER:

	FREQUENCY:_____	
	DEMOLITION INSPECTION	□ PM □ EH&S □ CONSULTANT □ IOR □ OTHER:
	ICRA DOWNGRADE	□ PM □ EH&S □ CONSULTANT □ IOR □ OTHER:
	FINAL VISUAL APPROVAL INSPECTION	□ PM □ EH&S □ CONSULTANT □ IOR □ OTHER:

INITIAL INFORMATION AND BENCHMARK CONTAINMENT INSPECTIONS – APPENDIX B

ICRA #	LOCATION	SET UP DATE	ELECTRICAL SHOP INSPECTION	PRE-START INSPECTION (NAME, DATE, TIME)	POST-DEMO INSPECTION (NAME, DATE, TIME)	DOWNGRADE INSPECTION (NAME, DATE, TIME)	FINAL INSPECTION (NAME, DATE, TIME)	TAKE DOWN DATE

DAILY INSPECTION LOG (SHEET _____ OF _____)

DATE & TIME	PERFORMED BY(NAME)	PRESSURE READING (+/-)	ACCEPTABLE NEGATIVE PRESSURE? (Y/N)	ILSM CONDITIONS STILL MET? (Y/N/*N/A*)	TACK MAT USEABLE? (Y/N)	INTERIOR FREE OF DUST/DEBRIS? (Y/N)	CONTAINMENT INTEGRITY INTACT (NO HOLES OR BREACHES)? (Y/N)	ALL ICRA PERMIT CONDITIONS MET? (Y/N)	OTHER ISSUES? (EXPLAIN)	CORRECTIVE ACTIONS
EXAMPLE 7/4/16 – 0800	B. CLEAN	-0.025	Y	Y	Y	Y	Y	Y	N	CLOSED ENTRY DOOR

ENTRY WARNING SIGN WITH PROJECT MANAGER CONTACT INFORMATION – APPENDIX C

CONSTRUCTION DUST PRECAUTIONS IN USE DO NOT ENTER

FOR MORE INFORMATION CONTACT THE PROJECT MANAGER

_____

(NAME)

_____

PHONE NUMBER

(THIS SIGN MUST BE POSTED IN COLOR)

SECTION 015610

AIRBORNE CONTAMINANTS CONTROL

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 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 is required for each project. The risk assessment identifies patient groups at risk for infection due to construction dust. The dust mitigation plan is designed to contain dust within the construction zone.

C. If visible mold is found during construction, renovation, or repairs, any ICRA in-hand is invalid and risk assessment shall be performed to reevaluate ICRA levels and the work plan prior to restart of the work. Upon discovering, seal any openings, stop work and notify the University's Representative immediately. This includes projects that are already considered and operating under a Class IV.

1.3 RELATED SECTIONS:

A. Section 017300 – CUTTING AND PATCHING: Removal of debris may be outside of normal work hours and shall be in tightly covered containers.

B. Section 013500 – SPECIAL PROCEDURES: Perform work in accordance with requirements of this section.

C. Section 013900 - GREEN BUILDING POLICY IMPLEMENTATION

D. 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.

E. Section 015600 – TEMPORARY BARRIERS, ENCLOSURES AND CONTROLS: Extend barriers above ceilings as required to seal off and contain airborne contaminants.

F. Section 015600 – TEMPORARY CONTROLS: Contain waste materials during removal; bagging, wrapping, and transporting.

G. 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. Disinfect Containment and Protection Areas as directed by University's Representative

1.4 DUST MITIGATION REQUIREMENTS

A. 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.

B. UC Davis Health Construction Dust Infection Prevention Best Practice Standard
   1. 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.
   2. Refer to the UC Davis Health Construction Dust Infection Prevention Best Practice Standard per requirements for.
      a. Responsibilities
      b. Procedures
      c. Training And Certifications
      d. Containment Design & Construction
      e. Materials And Equipment
      f. Cleaning Procedures
      g. Documentation
      h. Containment Verification
      i. Inspection Criteria
      j. And other Dust Infection Prevention Measures

1.5 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 building including number of negative air units and sizes (cfm), and location of sealed blocked off areas of corridors. Any impacts to corridors will need to be approved via ILSM (see specification section 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: In order 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

1.6 QUALITY CONTROL

A. Pre-construction Meeting: Before any construction on site begins, Contractor's Superintendent is required to attend a mandatory pre-construction orientation session held by University's Representative for a review on precautions to be taken.

B. Review by PO&M HVAC staff for possibility to disconnect air supply and return into the project area. Negative air machines shall be connected to separate electrical circuits.

C. Notification: A minimum of fourteen (14) calendar days written notification to University's Representative of possible construction activity causing airborne contaminants in Protection Areas.

1.7 DEFINITIONS

A. Containment Areas: As determined by University's Representative and if shown. Includes all areas of construction activities, adjacent staging and storage areas, and passage areas for workers, supplies and waste. The containment area includes ceiling spaces above and adjacent to construction activities.

B. Critical Openings – Include all potential paths for air and contaminants to move from the project area to outside of the project area and include: supply registers, return registers, exhaust registers, doors, windows, and other openings within the area where contaminants can escape. Sealing the critical openings can be accomplished with tape, plastic, hard barriers and a combination of these materials to seal airtight the critical opening.

C. HEPA System DOP Testing – An ANSI / ASTM recognized method to test the integrity of a High Efficiency Particulate filter which filters out 99.97% of particles 0.3 micrometers or larger. DOP testing is performed by specialty 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 four precaution levels. The ICRA program is documented in Hospital P&P 2120. ICRAs apply to patient care areas and their adjoining contiguous areas. All ICRA evaluations are the sole responsibility of the Health System Infection Prevention Department based on an application by the Project Manager. ICRA Permits expire and can be extended subject to approval by the Infection Prevention Department.

1.8 PERFORMANCE REQUIREMENTS

1.9 UNIVERSITY'S REPRESENTATIVE'S RESPONSIBILITIES:

A. Determination of the Containment and Protection Areas, as well as, the standard of limitations of the **Contractor**'s responsibilities, required for the project.

B. 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.

C. Coordinate any testing and monitoring as necessary with EH&S or a third party.

1.10 **CONTRACTOR** RESPONSIBILITIES:

A. Provide specific means and methods of achieving and maintaining control of airborne contaminants during construction.

B. 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.**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.

C. **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.

D. 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 Permit Extension Form attached ~~provided~~ at the end of ~~in~~ this section.

PART 2 - PRODUCTS

2.1 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.

PART 3 - EXECUTION

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)

PM TO MODIFY THIS SECTION. ATTACH ICRA PERMITS, EH&S WORKSHEETS, OR ANY OTHER APPLICABLE DOCUMENTATION

THE BELOW LISTED CRITERIA ARE POSSIBLE STRATEGIES FOR CLASS 3 AND 4 CONTAINMENTS. NOT ALL OF THE STRAGEGIES 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.

3.1 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. 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.

3.2 FULL CONTAINMENT

A. 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.

B. Sealing of Openings: Use tape or other impenetrable sealant to seal barrier wall seams, cracks around window and door frames, exhaust system ductwork, pipes, joints and ducts. Use of spray glue is not acceptable to be used inside of the building.

C. **Contractor** must block off existing ventilation supply registers, return registers and exhaust registers in the construction area.

D. All polyethylene and other materials used for temporary enclosures shall be at least 6 mil thickness and fire-retardant type. Zip poles or other easily removable supports shall be used for projects extending beyond one work shift. Temporary walls with metal stud framing may be required for long term projects and must be approved by the Project Manager. All doors leading into the containment area shall utilize zippered doors for control of the air flow and closing the plastic doors.

3.3 CRITICAL SEAL OF AREAS

A. Use tape or other impenetrable sealant to seal barrier wall seams, cracks around window and door frames, exhaust system ductwork, pipes, joints and ducts. Use of spray glue is not acceptable to be used inside of the building.

3.4 CUBES

A. Mini-containments (pop-up cubes) which are designed to have at most 1-2 people are means of control to access attic spaces, wall spaces and subfloor spaces usually at defined entry points such as access hatches or above a drop-in ceiling system. Cubes are reviewed and approved by the University's Representative on a case by case basis.

3.5 GLOVE BOXES

A. 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.

3.6 SHROUDED TOOLS

A. 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.

3.7 NEGATIVE AIR CRITERIA

A. Under no circumstances shall the HEPA filtered air be discharged into existing HVAC returns, exhaust ducting or building plenum spaces.

B. When the air from the HEPA filtered negative air unit exhaust cannot be directed outside of the building due to no windows in the vicinity of the work or if impractical, all HEPA filtered negative air units shall be exhausted to a location agreeable to the PM. Each HEPA unit shall be plugged into a separate electrical circuit to provide temporary redundancy should one unit fail or due loss of electrical power. The PO&M Electrical shop shall inspect and test each circuit connected to the HEPA negative air unit prior to use.

C. When the air from the negative air units 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.

D. Negative air units shall be positioned as far from the entry ante room containment as possible for distribution of air flow throughout the project area. The number of negative air units shall be to provide sufficient negative pressure and for a minimum of at least four (4) air changes per hour of the volume of the entire work containment.

E. Dual HEPA Units operating in parallel may be required for redundancy in high-risk areas.

3.8 DOP TESTING OF HEPA EQUIPMENT

A. 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.

B. 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.

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

3.9 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. An Omniguard IV recording manometer is recommended as the standard instrument for containment pressure monitoring, but other electronic manufactured models with similar sensitivities at low pressures and recording capabilities are acceptable.

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

3.10 VISUAL VERIFICATION

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

3.11 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 existing the ante room from the containment area. The zippered doors are to remain closed or adjusted slightly open as necessary to allow negative pressure to be maintained at least -0.020 in-WC.
   2. The ante room shall have a sticky mat present which is intended to remove any debris from the bottom of work shoes before leaving the ante room into the public area. The sticky mat is not intended to clean debris from the bottom of disposable coveralls or from booties. The sticky mat layers shall be replaced many times during a work shift when work involves movement of many workers and supplies out of the containment area. The **Contractor** is responsible for removing a dirty sticky mat and replacing it with a clean one when it is necessary.
   3. Workers entering into the containment area will put on a full body disposable coverall with booties inside of the ante room before entering the containment area. Entry into the ante room requires one of the two zippered doors to be opened at one time to maintain the required negative pressure. After entering the ante room, the zipper shall be closed before leaving the ante room into the containment area.

3.12 AIR SCRUBBING

A. 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.

3.13 DISPOSABLE COVERALLS AND BOOTIES

A. 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.

B. 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.

3.14 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.

3.15 REMOVAL OF CONTAINMENT

A. Provide thorough cleaning of existing surfaces, which become exposed to dust, before leaving the containment area and before allowing staff and the public access to the project area.

B. Final cleaning of the containment area requires diligent HEPA vacuuming of all horizontal surfaces and wet wiping all surfaces. Clean towels, sponges, cloth rags or other means shall be used with clean water to effectively clean all surfaces within the containment area. Use of a measured solution of an EPA Listed Germicide is required as part of the final detail cleaning.

C. Additional HEPA filtered negative air units may be installed for scrubbing of particles (see 3.05 B).

D. Coordinate with the 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.

E. Particle count assessment may be made inside of the containment area by the University's Representative as part of the final visual inspection process in addition to the final visual inspection. Particle testing will include testing the airborne concentration of various particle sizes compared to the concentration outside of the containment area. If particle counts inside of the containment area are significantly greater than outside of the containment area, the **Contractor** shall continue to scrub the air inside of the project area with HEPA filtered negative air units and conduct additional surface cleaning until subsequent particle testing has demonstrated particle concentrations inside of the containment area are not significantly greater than particle concentrations immediately outside of the containment area.

3.16 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.

3.17 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.

3.18 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.

F. 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 015610

ICRA Permit Extension Request

Date		
ICRA Permit No.		
Original ICRA Permit Approval Date		
Approved Permit Classification	Class ___ Type C, Medium Risk (Example)	
Requested Permit Expiration Date		
Project Location (Building & Floor/ Room)		
Brief Description of Work		
Contact Information	Name:	
	Phone:	
	Email:	
Are there any current or planned changes in the project or work activities affecting the current ICRA Permit Classification? **Initial:** YES ____ NO ____		
Have any issues arisen during project activities affecting air quality requiring greater infection prevention controls or health safety measures not covered by the current ICRA Permit? **Initial:** YES ____ NO ____		
Project activities are occurring in accordance with the current ICRA Permit requirements. **Initial:** YES ____ NO ____		
Applicant Signature:		
Permit Extension Approved: (UCDH Infection Prevention)		**Date:**
Further Review Required *		**Date:**
* Please return to the ICRA Committee with the requested permit extension for further discussion and determination.		
NOTE: *Approved ICRA Documents required with Extension Request including –* Approved Project Risk Assessment and ICRA Permit, EH&S Worksheet, Project ICRA Plan(s)		

Procedure – ICRA Permit Extension

1. Submit Extension Request to UCDH Infection Prevention (IP):

   Colin McGlynn - ccmcglynn@ucdavis.edu

   Send email copies also to -

   James Dunbarr – jjdunbarr@ucdavis.edu
   Dave Daly – drdaly@ucdavis.edu

2. IP Review of Permit Extension –
   a. Request Approved – Go to Step 3;
   b. Refer to Applicant to re-submit to ICRA Committee for further review
3. Approved permit extension –
   a. ICRA Permit Log on One Drive updated and document uploaded to One Drive archive folder by IP
   b. Document emailed to Applicant

Infection Control Risk Assessment

ICRA Committee approval of an ICRA Permit is required for all Construction Activity

Fill-out form completely or indicate NA on individual items

Date: _____

Requested ICRA
(See Steps 1, 2 and 3)

Construction Type Type B
Risk Level Low Risk
Classification Class I

Submitted by: _____
Dept/ Firm: _____
Cell Phone: _____

Project Location/Address: _____
Building name, Floor, Suite/Room: _____

FD&C Project Number or Other Identifying Number: _____

Type of Patient Care within Area of Work: _____
Type of Patient Care in Adjacent Areas: _____

Project Scope Description:

Describe Work Plan:

Required Documents

- Infection Control Risk Assessment
- Infection Control Construction Permit form
- UCDH Construction Dust & Hazardous Materials Inspection Worksheet form
- ICRA/ Project Floor Plan (work area / floor plan, and path of travel plan)

Infection Control Risk Assessment

Matrix of Precautions for Construction & Renovation

STEP 1

Using the following table to *identify* the Construction Type A, B, C or D

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

Step 1 - Construction Type: Type B

STEP 2

Using the following table of **Patient Risk Groups,** identify the **Risk Level (Low, Medium, High, Highest)** posed by the project. Also provide further description of uses / risk groups as necessary that are not otherwise listed in the table. If more than one risk group will be affected, select the higher risk group:

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

Step 2 - Risk Level: Low Risk

STEP 3

Use the table below to determine the ICRA Classification.

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

	CONSTRUCTION PROJECT TYPE			
PATIENT RISK GROUP	**TYPE A**	**TYPE B**	**TYPE C**	**TYPE D**
LOW Risk Group	I	II	II	III / IV
MEDIUM Risk Group	I	II	III	IV
HIGH Risk Group	I	II	III / IV	IV
HIGHEST Risk Group	II	III / IV	III / IV	IV

Step 3 – Classification Determination: Class I

Infection Control Construction Permit (Post At Job Site)

ICRA Permit No:	ICRA Class:
Location of Construction:	Project Start Date:
Project Coordinator:	Estimated Duration:
Contractor Performing Work:	Permit Expiration Date:
Supervisor:	Telephone:

YES	NO	CONSTRUCTION ACTIVITY	YES	NO	INFECTION CONTROL RISK GROUP
		TYPE A: Inspection, non-invasive activity			GROUP 1: Low Risk
		TYPE B: Small scale, short duration, moderate to high			GROUP 2: Medium Risk
		TYPE C: Activity generates moderate to high levels of dust, requires greater 1 work shift for completion			GROUP 3: Medium/High Risk
		TYPE D: Major duration and construction activities requiring consecutive work shifts			GROUP 4: Highest Risk

CLASS I	1. Execute work by methods to minimize raising dust from construction operations. 2. Immediately replace any ceiling tile displaced for visual inspection. 3. Clean work area upon completion of task
CLASS II	1. Isolate HVAC system in area where work is being done to prevent contamination of the duct system. 2. Complete all critical barriers or implement control cube method before construction begins. 3. Place dust mat at entrance and exit of work area. 4. Water mist work surfaces to control dust while cutting. 5. Contain construction waste before transport in tightly covered containers 6. Wipe surfaces with cleaner/disinfectant. 7. Remove barrier materials carefully to minimize spreading of dirt and debris.
CLASS III **Date** _____ **Initial** _____	1. Isolate HVAC system in area where work is being done to prevent contamination of the duct system. 2. Complete all critical barriers or implement control cube method before construction begins. Seal holes, pipes, conduits, and punctures appropriately. 3. Place dust mat at entrance and exit of work area. 4. Maintain negative air pressure utilizing HEPA equipped air filtration units to control dust. 5. Vacuum work with HEPA filtered vacuums. 6. Wipe surfaces with cleaner/disinfectant. 7. Contain construction waste before transport in tightly covered containers. 8. Do not remove barriers from work area until complete project is clean and checked by Environmental Health and Safety or its representative. 9. Remove barrier materials carefully to minimize spreading of dirt and debris.
CLASS IV **Date** _____ **Initial** _____	1. Isolate HVAC system in area where work is being done to prevent contamination of the duct system. 2. Complete all critical barriers or implement control cube method before construction begins. Seal holes, pipes, conduits, and punctures appropriately. 3. Place dust mat at entrance and exit of work area. 4. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 5. Construct anteroom and require all personnel to pass through room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site, or personnel can wear cloth or paper coveralls that are removed each time they leave the work site. 6. All personnel entering work site are required to wear shoe covers. 7. Contain construction waste before transport in tightly covered containers. Utilize tape coverings. 8. Vacuum work area with HEPA filtered vacuums. 9. Wipe surfaces with cleaner/disinfectant. 10. Do not remove barriers from work area until complete project is clean and checked by Environmental Health and Safety or their representative. 11. Remove barrier materials carefully to minimize spreading of dirt and debris.

Additional Requirements:	
Permit Requested By:	Permit Authorized By:
Date:	Date:

UCDH Construction Dust & Hazardous Materials Inspection Worksheet

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

ACKNOWLEDGEMENT OF HAZARDOUS MATERIALS

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

CONTAINMENT STRATEGIES

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

VERIFICATION OF WORK

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

SECTION 015620

REQUIREMENTS FOR CEILING ACCESS TO SPACES CONTAINING ASBESTOS

PART 1 - GENERAL

1.1 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 2 - PRODUCTS - NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

3.1 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).

3.2 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.

3.3 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.

3.4 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.

3.5 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.

3.6 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.

B. 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).

C. 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:
   1. dry sweeping is not permitted
   2. employees must not walk on, crawl on or otherwise crush visible suspect asbestos containing debris
   3. the control method must not result in a release of airborne fibers.

D. 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.

3.7 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.

3.8 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.

3.9 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][CM/Contractor][Design-Builder] 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 015620

SECTION 016100
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Product Options

B. Product Substitutions

C. Product Transportation and Handling Requirements

D. Product Storage and Protection

E. Product System Completeness

1.2 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

1.3 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.

1.4 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.

1.5 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 Deign 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.

1.6 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.

1.7 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.

1.8 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 2 - PRODUCTS – NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

3.1 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.

C. Refer to the following Attachment:
   1. Request for Substitution Form.

END OF SECTION 016100

REQUEST FOR SUBSTITUTION

SUBSTITUTION #: _____ **SUBMITTAL #:** _____ **DATE:** _____

PROJECT#: _____ **HCAI#:** _____

PROJECT NAME: _____

TO: UC DAVIS HEALTH **FACILITIES DESIGN & CONSTRUCTION** **4800 2ND AVENUE, SUITE 3010** **SACRAMENTO, CA95817** **P: 916-734-7024** **ATTN.: (PROJECT MANAGER'S EMAIL ADDRESS)**	**FROM:** _____

NAME OF PARTY SUBMITTING REQUEST FOR SUBSTITUTION: _____

REASON FOR SUBMITTING REQUEST FOR SUBMISSION: _____

SPECIFICATION SECTION AND PARAGRAPH #: _____

SUBSTITUTION MANUFACTURER NAME AND ADDRESS: _____

PROPOSED SUBSTITUTION (TRADE NAME OF PRODUCT, MODEL OR CATALOG #): _____

FABRICATORS AND SUPPLIERS (AS APPROPRIATE): _____

PRODUCT DATA:
ATTACH PRODUCT DATA AS SPECIFIED IN SPECIFICATION SECTION 013300 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

SIMILAR PROJECTS USING PRODUCT (LIST DATES OF INSTALLATION AND NAMES/PHONE NUMBERS OF OWNERS):

SIMILAR COMPARISON OF PROPOSED SUBSTITUTION WITH SPECIFIED PRODUCT (INDICATE VARIATION(S), AND REFERENCE EACH VARIATION TO APPROPRIATE SPECIFICATION SECTION PARAGRAPHS):

-ATTACH COMPARISON SUMMARY-

(SUBSTITUTION REQUEST CONTINUES)

QUALITY AND PERFORMANCE COMPARISON BETWEEN PROPOSED SUBSTITUTION AND SPECIFIED PRODUCT:

AVAILABILITY OF MAINTENANCE SERVICES AND REPLACEMENT MATERIALS:

EFFECT OF PROPOSED SUBSTITUTION ON CONSTRUCTION SCHEDULE:

EFFECT OF PROPOSED SUBSTITUTION ON OTHER WORK OR PRODUCTS:

SECTION 017200
PREPARATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Surveying and Field Engineering Services

1.2 RELATED SECTIONS

A. Section 014500 – QUALITY CONTROL

B. Section 017800- CLOSEOUT SUBMITTALS

1.3 REGISTRATION REQUIREMENT

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

1.4 LINE AND GRADES

A. [Contractor][CM/Contractor][Design-Builder] 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][CM/Contractor][Design-Builder] shall verify final configuration of project during demolition work. Minor adjustments of work to accommodate existing field conditions shall be responsibility of [Contractor][CM/Contractor][Design-Builder].

C. For work that connects to existing structures with new floors or roofs that align with existing conditions; [Contractor][CM/Contractor][Design-Builder] 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 2 - PRODUCTS – NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

3.1 INSPECTION

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

3.2 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.

3.3 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.

3.4 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 017800.

END OF SECTION 017200

SECTION 017300

CUTTING AND PATCHING

1.1 GENERAL

1.2 SECTION INCLUDES

1.3 REQUIREMENTS AND LIMITATIONS FOR CUTTING AND PATCHING WORK.

1.4 HAZARDOUS CONDITIONS PERMIT REQUIREMENTS FOR BRAZING, WELDING AND OTHER HOT WORK.

1.5 RELATED SECTIONS

1.6 SECTION 011100 – SUMMARY OF THE WORK

1.7 SECTION 013100 – COORDINATION

1.8 SECTION 013300 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

1.9 SECTION 015610 – AIRBORNE CONTAMINANTS CONTROL

1.10 SECTION 016100 – PRODUCT REQUIREMENTS

1.11 INDIVIDUAL SPECIFICATIONS SECTIONS.

A. Cutting and patching incidental to Work specified in this Section.

B. Coordination with work in other Sections for openings required to accommodate Work specified in those other Sections.

1.12 SUBMITTALS

1.13 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.

A. Structural integrity of any element of Project.

B. Integrity of weather-exposed or moisture-resistant element.

C. Efficiency, maintenance, or safety of any operational element.

D. Visual qualities of sight-exposed elements.

E. Work of University.

F. Utility supply, drains, fire alarm, communication.

1.14 INCLUDE IN REQUEST:

A. Identification of Project, including University's Project Name and Project Number.

B. Location and description of affected Work.

C. Necessity for cutting and patching.

D. Description of proposed work, and products to be used.

E. Alternatives to cutting and patching.

F. Effect on work of University.

G. Written permission of University.

H. Date and time work will be executed.

1.15 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.

B. 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.

C. **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.

D. 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.

E. **Contractor** shall then follow any and all instructions as indicated by University's Representative.

PART 2 - PRODUCTS

2.1 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 3 - EXECUTION

3.1 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.

3.2 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 form the Fire Marshal.

3.3 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.

H. PERFORMANCE

I. Execute cutting and patching by methods to avoid damage to adjoining Work, and that will provide appropriate surfaces to receive final finishing.

J. Execute cutting and patching of weather-exposed, moisture-resistant and sight-exposed surfaces by methods to preserve weather, moisture and visual integrity.

K. Restore work with new Products as specified in individual Sections of Contract Documents.

L. 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.

M. 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.

N. 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.

O. 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.

P. 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.

Q. 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

R. Refer to the Following Attachment

S. Coring/Sawcutting Notification

END OF SECTION 017300

CORING/SAWCUTTING NOTIFICATION

LOCATION: _____ PROJECT#: _____
TITLE: _____

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
(PROJECT MANAGER'S EMAIL ADDRESS)

FROM:

SCOPE:

HAS USA BEEN NOTIFIED? 3.1 ☐ *YES* ☐ 3.2 *WH* 3.3

ARE ALL KNOWN UTILITIES MARKED? 3.4 ☐ *YES* ☐ *BY WHOM?* _____

LOCATION OF WORK SHOWN ON ATTACHED SITE PLANS? 3.5 ☐ *YES* ☐ *PURPOSE:* _____

DATE(S) CORING OR SAWCUTTING WILL TAKE PLACE: SIGNED: _____

3.6 UC DAVIS HEALTH USE ONLY

DATE RECEIVED:

WHO FROM UNIVERSITY WILL AUTHORIZE, SUPERVISE AND VERIFY?
PHONE:

UTILITIES VERIFIED BY IOR? ☐ *YES* ☐ *NO*

ACTIVITIES COORDINATED WITH: ☐ PO&M ☐ FIRE ☐ TELECOM ☐ OCC. SAFETY ☐ OTHER (ITEMIZE):

COMMENTS:

DATE AUTHORIZED: _____ SIGNED: _____
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 017400
CLEANING

PART 1 - GENERAL

1.1 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.

1.2 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 2 - PRODUCTS

2.1 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.

D. EQUIPMENT

E. Provide covered containers for deposit of waste materials, debris, and rubbish.

F. 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 3 - EXECUTION

3.1 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.

B. Maintain areas under Contractor's control free of waste materials, debris and rubbish. Maintain site in a clean and orderly condition.

C. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to closing such spaces.
   1. All horizontal surfaces above ceilings shall be cleaned prior to ceiling closer.

D. After every concrete placement clean all wet concrete from all surfaces.
   1. Interior and exterior

E. 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.

F. Broom clean with sweeping compound or HEPA Vacuum interior areas prior to start of surface finishing, and continue cleaning on an as needed basis.

G. Control cleaning operations so that dust and other particles will not adhere to wet or newly coated surfaces.

H. Provide a mat, as specified above, for project entrances and exits. Item to be of sufficient size to allow personnel exiting project site to clean debris and dust from shoes. Tracking dust and debris through working areas of hospital and/or related buildings is not acceptable.

I. 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 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.

J. Conduct cleaning and disposal operations in compliance with Waste Management Program per 013900 and all applicable codes, ordinances, regulations, including anti-pollution laws.

3.2 SUBSTANTIAL COMPLETION CLEANING

A. Execute a thorough cleaning prior to Substantial Completion review by University's Representative.

C. 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.

D. Clean walkways, driveways and streets by thorough brooming and wash-down.

E. Clear debris from storm drainage lines and ways, leaving site ready for stormy weather.

F. Rake landscaped areas clean.

G. Remove waste and surplus materials, rubbish and temporary construction facilities, utilities and controls.

H. Disinfect containment and protection areas as directed by University Representative.

I. 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.

3.3 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.

3.4 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.

3.5 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.

3.6 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 017400

SECTION 017500
STARTING AND ADJUSTING SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Procedures for Starting Systems

1.2 REALATED 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

1.3 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.

B. Start up, testing and Commissioning of equipment shall be integrated and coordinated with the contract schedule.
   1. Adjustments will be made as project progresses, but the sequencing will be maintained.

C. Submit manufacturer's representative reports within one (1) week after start-up, listing satisfactory start-up dates.

D. 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.

E. Maintain log with dates and results of Starting and Adjustments, and provide electronic copy to University’s Representative.

1.4 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 2 - PRODUCTS – NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify Project conditions comply with requirements for start-up.

B. Verify status of Work meets requirements for starting equipment and systems.

3.2 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][CM/Contractor][Design-Builder] 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.

D. Coordinate all start-up with the Commissioning Agent for the project.

E. Information on hand: Have Contract Documents, shop drawings, product data, and operation and maintenance data at hand during entire start-up process.

F. Verify each piece of equipment is anchored correctly per the manufacturer's requirements and the Contract Documents prior to energizing or starting.

G. 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.

H. 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.

I. Verify control systems are fully operational in automatic mode.

J. Manufacturer's Criteria: Verify tests, meter readings and specific electrical characteristics agree with electrical equipment manufacturers' criteria.

K. Bearings: Inspect for cleanliness: clean and remove foreign matter, verify alignment. Take corrective action as required.

L. 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.

M. 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.

3.3 STARTING SYSTEMS

A. Execute start-up under supervision of responsible [Contractor][CM/Contractor][Design-Builder] 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 017500

SECTION 017600

PROTECTION OF EXISTING AND INSTALLED CONSTRUCTION

PART 1 - GENERAL

1.1 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.

1.2 RELATED SECTIONS

A. Section 013100 – COORDINATION

B. Section 013900 – GREEN BUILDING POLICY IMPLEMENTATION

C. Section 015100 – TEMPORARY UTILITIES

1.3 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.

E. 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.

F. 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.

G. 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.

H. 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 2 - PRODUCTS – NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

3.1 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.

3.2 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 017600

SECTION 017700

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Project Closeout Procedures

B. Contract Closeout Procedures

C. Punch List of Incomplete Work or Corrections

1.2 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

1.3 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.

1.4 SUBSTANTIAL COMPLETION REVIEW

1.5 PRELIMINARY PUNCH LIST REVIEW:

A. **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.

B. Organize the List per Item 1.04, C.

C. 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).

D. Segregate architectural, plumbing, HVAC and electrical Work on separate lists.

E. University's Representative and **Contractor** shall conduct a brief walk-through of Project to review scope and adequacy of list.

1.6 **CONTRACTOR** THAT WORK IS SUBSTANTIALLY COMPLETE, **CONTRACTOR** SHALL NOTIFY UNIVERSITY'S CONSULTANT AND UNIVERSITY'S REPRESENTATIVE.

A. Submit to University's Representative written certification that:
   1. Contract Documents have been reviewed.
   2. All portions of Work have been carefully inspected.
   3. Work is complete in accordance with Contract Documents.
   4. Equipment and systems have been commissioned, tested, adjusted and balanced and are fully operational.
   5. Indicate Operation of systems that have been demonstrated to University personnel and which systems have not been demonstrated to University personal.
   6. Work is ready for University's Consultant's Substantial Completion review.

B. Provide minimum fourteen (14) calendar days’ notice to University's Representative prior to desired date for Punch List review.

1.7 ORGANIZATION OF LIST (PUNCH LIST):

A. 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.

B. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

C. Format Requirements: Provide the following:
   1. Organized electronic file that is able to be filtered or queried by the following categories:
      a. Contractor or Subcontractor
      b. Building Area/Floor if applicable
      c. Room Number or specific interior or exterior area.
      d. Photo Number if applicable
      e. Open or Closed
      f. Columns for use by University's Representative
         1) Responsible Design Consultant
      g. Comments
   2. Other Punchlist Software may be used if approved by the University's Representative.
   3. Include the following information at the top of each page:
      a. Project name and Number.
      b. Date.
      c. Name of University's Representative.
      d. Name of Contractor.
      e. 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.

E. **Contractor** shall prepare list and record additional items as University's Representative may determine require completion and correction from walk-through.
   1. If deficiencies are noted University's Representative and University's Consultant shall promptly notify **Contractor** in writing, listing observed deficiencies.
   2. If no deficiencies are noted, or when noted deficiencies are removed from the Punch List, University's Representative shall promptly notify **Contractor**.

F. **Contractor** shall edit the electronic file and distribute list with University's Representative and University's Consultant's additions.

G. **Contractor** shall remedy deficiencies.

H. Costs of additional visits to site by University's Consultants to review completion and correction of Work shall be deducted from the Contract Sum.

I. Uncorrected Work: Refer to requirements specified in SECTION 014500 – QUALITY CONTROL regarding Contract adjustments for non-conforming work.

J. 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

K. 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.

L. Complete materials tests and inspections.

M. Complete commissioning, testing, inspection, balancing, sterilization and cleaning of plumbing and HVAC systems.

N. Complete commissioning, testing and inspection of electrical system.

O. Complete commissioning and operational tests of equipment.

P. 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.

Q. 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.

S. FINAL COMPLETION SUBMITALS (See 017800 CLOSEOUT SUBMITTALS)

T. STATEMENT OF ADJUSTMENT OF ACCOUNTS
   1. Submit final statement reflecting adjustments to Contract Sum indicating:
   2. Original Contract Sum
   3. Previous Change Orders
   4. Changes under allowances (Mark as NOT USED if not project applicable.)
   5. Changes under unit prices (Mark as NOT USED if not project applicable.)
   6. Deductions for uncorrected work
   7. Penalties
   8. Deductions for liquidated damages
   9. Deductions for re-inspection fees
   10. Other adjustments to Contract Sum
   11. Total Contract Sum as adjusted
   12. Previous payments
   13. Sum remaining due

U. University will issue a final Change Order reflecting approved adjustments to Contract Sum not previously made by Change Order.

1.8 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 2 - PRODUCTS – NOT APPLICABLE TO THIS SECTION

PART 3 - PART III - EXECUTION

3.1 REPAIR OF THE WORK

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

C. 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.

3.2 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).

B. 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 017700

SECTION 017800

CLOSEOUT SUBMITTALS

PART 1 - GENERAL

1.1 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 Record Documents

1.2 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 016100 – PRODUCT REQUIREMENTS

G. Section 017700 – CLOSEOUT PROCEDURES

1.3 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

1.4 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.

1.5 MANUAL FOR MATERIALS AND FINISHES:

A. 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.

B. 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.

C. 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.

D. Additional Requirements: As specified in individual Specification Sections.

~~E.~~ Table of Contents: Provide PDF electronic file with links to individual sections.

1.6 MANUAL FOR EQUIPMENT AND SYSTEMS

A. 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.

B. O & M Instructions: Provide and install, where directed, printed sheet under clear plastic cover, giving concise operating and maintenance instruction for equipment.

C. 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.

D. Panelboard Circuit Directories: Provide electrical service characteristics, controls and communications.

E. Wiring Diagrams: Include color-coded wiring diagrams as installed.

F. 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.

G. 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.

H. Instructions: Include manufacturer's printed operation and maintenance instructions. Include sequence of operation by controls manufacturer.

I. 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.

J. Control Data: Provide as installed control diagrams by controls manufacturer.

K. 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.

L. Design Data: Provide a listing in table of Contents for design data, with tabbed binder divider page and space for insertion of data.

M. Reports: Include test and balancing reports as specified.

N. Additional Requirements: As specified in individual Specification Sections.

O. 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.

1.7 EQUIPMENT DATA AND OPERATION AND MAINTENANCE INSTRUCTIONS SUBMITTALS:

A. Submittals: Comply with administrative requirements specified in SECTION 013300 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

B. 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.
   1. The comments or corrections shall be incorporated into the Final O&M submittal.
   2. 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.
   3. University’s Representative will notify the **Contractor** when the edits have been accepted for incorporation into the final O&M submittal.

C. 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.

~~D.~~ 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.
   1. Submit electronic copies of each manual prior to requesting training.

1.8 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.

1.9 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.

B. 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."

C. This Directory shall be submitted to the University's Representative for review and acceptance.

1.10 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.

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

1.11 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.

1.12 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.

B. Standard Product Warranties: Preprinted written warranties published by individual manufacturers for particular products and specifically endorsed by manufacturer to University.

C. 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.

D. Provisions for Special Warranties: Refer to General Conditions of the Contract for terms of **Contractor**'s special warranty of workmanship and materials.

E. Specific Warranty Requirements: requirements are included in the individual Sections of Division 2 through 49 of the Contract Specifications, including content and limitations.

F. 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**.

G. 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.

H. 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.

I. 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.

J. 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.

K. 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.

L. 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.

M. 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.

N. Submit written guarantees, in the form contained at end of this Section.

O. 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.

1.13 SUBMISSION REQUIREMENTS:

A. **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.

~~B.~~ Table of Contents: Provide PDF electric file with links to individual warranty sections. Include the following information.
1. Product or Work item.
2. Product or work suppliers firm name, address, telephone number and name of principal.
3. Scope of guarantee, bond, service or maintenance agreement.
4. Date of beginning of guarantee, bond, service or maintenance contract.
5. Duration of guarantee, bond, service or maintenance contract.
6. **Contractor**'s name, address, telephone number and name of principal.
7. Provide information for University personnel:
    a. Proper procedure in case of failure.
    b. Circumstances that might affect validity of guarantee or bond.

1.14 WARRANTY SUBMITTAL

A. Provide all warranties in PDF composite electronically indexed files.
1. Submit individual files for each warranty with a directory assembled by CSI division.

a. Combine all project warranties including the directory into one PDF for record
b. Files will be formatted for printing with a footer identifying the CSI Number and UC Davis Health Project Number.
c. 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.
d. Coordinate copies of each warranty to be included in operation and maintenance manuals.
e. Final Submittal shall be incorporated into one PDF, bookmarked and searchable document.

B. 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.

1.15 PROJECT AS-BUILT RECORD DOCUMENTS

A. Maintenance of As-Built Documents and Samples:
1. Provide complete set of As-Built Drawings and Specifications, showing every change from original Contract set, including all Addenda, Change Order, job decisions, etc. PDFs for this purpose may be obtained from University's Representative.
2. Refer to Section 017700 CLOSEOUT PROCEDURES for additional requirements for As-Built Documents.
3. When work is complete and prior to final payment, submit one (1) complete set of all As-Built documents, marked to show any deviation from the original Contract set. These documents are to be an accurate description of all work as constructed.
4. As-Built Schedule: **Contractor** shall provide As-Built Schedule of construction activities. Schedule shall be in same format as specified in SECTION 013200 – CONTRACT SCHEDULES.

B. As-Built Drawings: Comply with the following:
1. Number of Copies: Submit one PDF file bookmarked and searchable of marked-up As-Builts.
a. Initial Submittal:
1) Submit PDF As-Built digital data files.
2) Submit digital data files per UC Davis Health Campus Design Guidelines.
3) University's Representative will indicate whether general scope of changes, additional information recorded, and quality of document are acceptable.
b. Final Submittal:
1) Submit PDF electronic files of digital As-Built.
2) Submit digital data files per UC Davis Health Campus Design Guidelines.
3) Final submittals of all formats will include all documents whether changes were made or not.

C. As-Built Specifications: Submit one annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

D. As-Built Product Data: Submit annotated PDF electronic files and directories of each submittal.
1. When As-Built Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

E. Miscellaneous As-Built Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

F. Submittals: At Contract closeout, deliver Record Documents and samples as required by SECTION 017700 – CLOSEOUT PROCEDURES.
1. Transmit with cover letter listing:

a. Date.
b. Project title and Project number.
c. **Contractor**'s name, address and telephone number.
d. Number and title of each Record Document.
e. Signature of **Contractor** or authorized representative.

1.16 AS-BUILT SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

B. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

C. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

D. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

E. Note related Change Orders, As-Built Product Data, and As-Built Drawings where applicable.

F. Format: Submit As-Built Specifications as annotated PDF electronic file.

1.17 AS-BUILT PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

B. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

C. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.

D. Note related Change Orders, As-Built Specifications, and As-Built Drawings where applicable.

E. Format: Submit As-Built 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.

1.18 AS-BUILT SAMPLES

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.

B. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.

C. Note related Change Orders, As-Built Specifications, and As-Built Drawings where applicable.

D. 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.

E. Each Sample will be labeled with Manufacturer, Model, Product Number, CSI Section and UC Davis Health Project Name and Number.

1.19 MISCELLANEOUS AS-BUILT SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work.

B. Format: Submit miscellaneous As-Built submittals as PDF electronic file Include miscellaneous As-Built submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous As-Built submittals.

1.20 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.

1.21 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 2 - PRODUCTS – NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

3.1 REFER TO THE FOLLOWING ATTACHMENTS

A. Guarantee

B. Report of Work Required by Warranty

END OF SECTION 017800

3.1 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: _____

REPORT OF WORK REQUIRED BY WARRANTY

TO:	(PM'S NAME), UNIVERSITY REPRESENTATIVE
FROM:	

ON THE DATE NOTED, THE UNIVERSITY IDENTIFIED THE FOLLOWING WORK REQUIRED UNDER WARRANTY:

PREPARED BY: _____ _____ _____

(PRINT NAME) SIGNATURE DATE

IN ACCORDANCE WITH THE TERMS AND CONDITIONS OF THE CONTRACT, THE **CONTRACTOR** HAS AGREED THAT, IF AT ANY TIME WITHIN _____ MONTHS AFTER THE DATE OF THE GUARANTEE THE **CONTRACTOR** RECEIVES NOTICE FROM UNIVERSITY THAT THE AFORESAID PORTION OF THE WORK IS UNSATISFACTORY, FAULTY, DEFICIENT, INCOMPLETE, OR NOT IN CONFORMANCE WITH THE REQUIREMENTS OF THE CONTRACT, THE **CONTRACTOR** WILL, WITHIN 10 DAYS AFTER RECEIPT OF SUCH NOTICE, CORRECT, REPAIR, OR REPLACE SUCH PORTION OF THE WORK, TOGETHER WITH ANY OTHER PARTS OF THE WORK AND ANY OTHER PROPERTY WHICH IS DAMAGED OR DESTROYED AS A RESULT OF SUCH DEFECTIVE PORTION OF THE WORK OR THE CORRECTION, REPAIR, OR REPLACEMENT THEREOF; AND THAT IT SHALL DILIGENTLY AND CONTINUOUSLY PROSECUTE SUCH CORRECTION, REPAIR, OR REPLACEMENT TO COMPLETION.

PROMPT NOTIFICATION TO BE PROVIDED BY THE UNIVERSITY REPRESENTATIVE TO THE APPROPRIATE **CONTRACTOR**.

SECTION 018200

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SECTION INCLUDES

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

1.2 RELATED SECTIONS

A. Section 017800 – CLOSEOUT SUBMITTALS

B. Section 018100 – PLUMBING/HVAC TESTING PROCEDURES

1.3 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.

1.4 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 2 - PRODUCTS – NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

3.1 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.

3.2 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 018200

SECTION 019100
COMMISSIONING

PART 1 - GENERAL

1.1 SUMMARY

A. Commissioning (Cx) is the process of ensuring that all building systems are installed and perform interactively according to the design intent; those systems are efficient, cost effective and meet the University's Project Requirements and operational needs; that the installation is adequately documented; and that the operations staff are adequately trained. This is achieved by a full understanding of all building systems through construction, acceptance and warranty period with actual verification of performance. It also establishes testing and communication protocols in an effort to advance the building systems from installation to full dynamic operation and optimization.

B. The Commissioning process does not relieve responsibility of the **Contractor** to provide a finished and fully functioning Project. The **Contractor** and Subcontractors provide the quality control for installation and start-up of the building systems.

C. The specified commissioning activities shall demonstrate compliance with the University, LEED and California Code Commissioning requirements.

D. Commissioning is a condition of the Contract and shall not be excluded from the base bid.

E. Commissioning requirements extend to all alternates and change orders, as well as all subcontracts and purchase orders for work under the **Contractor**'s control.

1.2 RELATED DOCUMENTS:

A. Division 00 Procurement and Contracting Requirements, apply to this Section.

B. Drawings and general provisions of Contract, and other Division 01 Specification Sections, apply to this Section.

C. Technical Divisions of the Specifications apply to this Section.

1.3 DEFINITIONS

A. Acceptance Phase: This is the phase of the project when the facility and its systems and equipment are inspected, tested, verified, and documented, and when most of the Functional Performance Testing (FPT) and final training occurs. This will generally occur after the Construction Phase is complete (i.e., start-up and checks have been accomplished). The Acceptance Phase typically begins with certification by the **Contractor** that the systems have been started in accordance with the approved protocols and the submission of the documentation of that start-up. The Acceptance Phase ends with the successful completion of all FPT and sign-off by the CA and the University.

B. Action Item: Any issue that requires a response, completion, corrective or additional work, or any other action. Examples include a Request for Information (RFI), a work directive, a clarification request, a to-do item, an identified deficiency, or any other like item. Actions Items must be categorized as appropriate.

C. Action List: This is a list that is maintained and updated by the CxA that includes all Action Items that relate to Cx activities.

D. Commissioning (Cx): The process of ensuring that all building systems perform interactively according to the design intent and that the system operations are efficient and cost effective and meet the University's functional needs.

E. Commissioning Agent (CxA): The individual retained by the University who will oversee the Cx process, develop and stipulate many of the Cx requirements (including FPTs), manage the Cx process, and ensure and verify that systems and equipment are installed, and tested to meet the University's requirements.

F. Commissioning Coordinator (CC): The **Contractor** shall provide a Commissioning Coordinator. The CxA, the University's Representative and the CC will comprise a commissioning management team. While the CxA leads the overall commissioning process, the CC is responsible for managing contractors in their day-to-day performance of the specified commissioning work. The CC is an employee of the **Contractor** who is regularly and frequently on site. Qualifications for the Commissioning Coordinator include experience and excellent abilities to schedule, coordinate and manage subcontractors. The following tasks are some of the critical items included in the CC's scope of work:
   1. Integrating the specified commissioning activities into the overall contract construction schedule, updating the schedule and providing three-week look-ahead schedules showing the upcoming commissioning related activities.
   2. Providing all commissioning submittals to the University's Representative and CxA.
      a.O&M Manuals per Division 017700 Close-out Procedures and 017800 Close-out Submittals
   3. Coordinating University training and ensuring that training is provided in accordance with the Division 017700 Close-out Procedures and the technical specifications.
   4. Ensuring that subcontractor and supplier review and complete the CxA provided FPT procedures and forms then submitted in accordance with the specifications. This includes providing written comments (even if no exception is taken) regarding issues pertaining to safety, equipment protection/warranty and appropriateness of the procedure for the systems as provided from all required FPT participants for each FPT.
   5. Coordinating development and submittal of specified flushing, cleaning and start-up procedures and ensuring that these procedures are completed, and documentation is submitted.
      1) Providing test reports and progress reports in accordance with the 017800 Close-out Submittals, commissioning, and technical specifications.
   6. Managing the **Contractor** participation in the FTP process in accordance with the commissioning specifications.
   7. Managing the **Contractor** participation in resolution of issues identified during pre-commissioning meetings and during the commissioning process.

8. Ensuring that subcontractors perform preliminary testing to verify readiness for final FPT demonstrations, submitting documented verification that systems will pass functional tests with acceptable results as documented in the FPTs and coordinating the demonstration of the FPTs to the University and the CxA.
9. Coordinating repeat FPTs that fail due to contract deficiencies until acceptable results are achieved and managing the reimbursement of the University's costs for repeated tests in accordance with the commissioning specifications.

G. Commissioning Plan: This is a detailed document prepared and maintained by the CxA that describes the entire commissioning process.

H. Commissioning Specifications (Cx specs): Includes the Cx specification section and Cx-related subsections of other specifications. All **Contractor** requirements relating to Cx.

I. Commissioning Team: The parties involved in the commissioning process for any given system. The Cx Team will include a core group involved with all systems. This core group will typically include the CxA, the University's Cx coordinator, and **Contractor** CC and/or MEP Coordinator. At any given point the team may include the project manager, members of the design team, the project inspector, product representatives, and operation and maintenance personnel.

J. **Contractor**: As used herein, **Contractor** is a general reference to the installing parties and can therefore refer to the **Contractor**, the subcontractors, or vendors as inferred by its usage.

K. Construction Phase: Phase of the project during which the facility is constructed and/or systems and equipment are installed and started. **Contractor** and subcontractors complete the installation complete start-up documentation, submit O&M information, establish trends, and perform other applicable requirements to get the systems started. The Construction Phase will generally end upon completed start-up and TAB of systems and equipment.

L. Contract Documents: The documents governing the responsibilities and relationships between the parties involved in the construction of the project including, but not necessarily limited to, the agreement/contract, construction plans and drawings, specifications, addenda, and change orders.

M. Deficiency: A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents.

N. Functional Completion: A milestone that marks the completion of the Acceptance Phase and successful documentation of the FPTs by the CxA.

O. Functional Performance Testing (FPT): This process verifies that the systems within the commissioning scope function in accordance with the Contract Documents, the University's design intent and the Design Team's Basis of Design. The process includes the documented testing of the systems under actual and simulated operating conditions. Functional Performance Test (FTP) procedures are detailed instructions that allow experienced system technicians to perform the FPTs with repeatable results. The repeatability of the procedures and results validate the tests. Final performance testing of systems will begin only after the **Contractor** certifies that such systems are completely installed and ready for functional testing and after the CxA has completed the subsequent installation verification process for the systems to be tested.

P. Installation Verification Process: This process includes the on-site review of related system components for conformance to the Contract Documents. Upon receipt of the completed **Contractor**'s System Readiness Manual, the CxA will conduct this review and verify system readiness for final functional testing procedures. The CxA will document issues identified during this process and assign them to the appropriate party for resolution.

Q. MEP Coordinator: **Contractor**'s staff member who is responsible for all MEP equipment and system installation, coordination, and start-up is the primary contact for the Cx Agent and shall be responsible to organize and lead the start-up and commissioning meetings, tracks response to Action Items from Cx Agent and generate minutes.

R. Ready to Commission statement: The subcontractor's written statement, through the System Readiness Checklist (SRC),that the equipment or system described has been completely installed, started, and tested to ensure that it has met all the requirements of the contract documents and is ready for commissioning.

S. Start-up: Refers to the quality control process whereby the **Contractor** verifies the proper installation of a device or piece of equipment, executes the manufacturer's starting procedures, completes the start-up checklists, energizes the device, verifies it is in proper working order and ready for dynamic testing, and completes the start-up tests.

T. System Readiness Checklists (SRCs): These checklists are provided by the CxA and include equipment installation and start-up items specified to be performed and verified by the **Contractor**. These checklists shall be compiled along with associated start-up forms by the **Contractor** to create the **Contractor**'s System Readiness Plan. They shall be completed during installation and returned to the CxA as components of the **Contractor**'s System Readiness Manual prior to the final CxA installation verification and functional performance testing process.

U. System Readiness Manual: This document includes, for each system within the commissioning scope of work, completed and signed versions of each form submitted by the **Contractor**'s .

V. System Readiness Plan: This document shall be completed by the **Contractor** and submitted to the CxA prior to the final installation verification and functional performance testing process. By submitting these completed forms, the **Contractor** signals that the relevant systems are installed, operational and will meet functional testing acceptance criteria. The System Readiness Plan is compiled by the **Contractor** and includes, for each system within the commissioning scope of work, the System Readiness Checklists provided by the CxA, followed by the associated **Contractor**'s Start-up and Test Forms. The **Contractor** System Readiness Plan shall be submitted to the CxA for review and approval prior to installation of the systems.

1.4 REFERENCES

A. American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE):
1. ASHRAE Guideline 0-2013, The Commissioning Process
2. ASHRAE Guideline 1.1-2007, HVAC&R Technical Requirements for The Commissioning Process.
3. ASHRAE Standard 202-2013, Commissioning Process for Buildings and Systems

B. US Green Building Counsel (USGBC), Leadership in Energy and Engineering Design (LEED):
1. Reference Guide for the version of LEED pursued by project

C. California Building Standards Code (California Code of Regulations, Title 24):
1. Part 6, Building Energy Efficiency Standards for Residential and Nonresidential Buildings
2. Part 11, CALGreen

1.5 SYSTEMS TO BE COMMISSIONED

A. All systems and equipment identified in the contract documents as having quality assurance or acceptance testing requirements are included in SYSTEMS TO BE COMMISSIONED by reference.

B. All systems and equipment identified in the contract documents as requiring startup are included in SYSTEMS TO BE COMMISSIONED by reference.

C. All systems and equipment identified in the contract documents requiring training are included in SYSTEMS TO BE COMMISSIONED by reference.

D. Commissioning shall be system based.
   1. Equipment and sub-assemblies are to be installed, started and tested as components of each respective system rather than as a category of equipment or by specification section.

E. The systems to be commissioned shall include but are not limited to the following:
   1. Air Handling Units
   2. Exhaust Fans
   3. HTHW Heat Exchangers
   4. Pumps
   5. Fan Coils
   6. Terminal Devices (VAV boxes)
   7. Sump Pumps
   8. Air Transfer Fans
   9. Hot Water Heaters
   10. Building Control System - Direct Digital Control System
   11. Energy Management System
   12. Workshop Airflow Control System
   13. Hydronic Systems
   14. Heat Exchangers
   15. Automated Lighting control systems
   16. Emergency generators
   17. Transfer switches
   18. Environmental Rooms (hot or cold)
   19. Utility Meters and sub-metering system
   20. VFDs
   21. Power to Mechanical Systems
   22. Lighting Inverter
   23. Irrigation Systems
   24. Window Switches related to natural ventilation control
   25. Solar Photovoltaic Power Systems
   26. Solar Domestic Hot Water Systems
   27. Water Reuse Systems
   28. VRF Systems
   29. Radiant Heaters
   30. Heat Recovery boxes
   31. Stair Pressurization Fans
   32. Irrigation systems
   33. Anaerobic Digester
   34. Renewable Energy Systems
   35. Fire alarm / Fire Detection System.
   36. Data Systems.
   37. Audio/Visual Systems.
   38. Intercom / Telecom Systems.
   39. Miscellaneous Low Voltage Systems.

40. Pneumatic Tube System.
41. Building Envelope.
42. Other Systems as Specified.

1.6 CONSTRUCTION AND ACCEPTANCE PHASE COMMISSIONING

A. The **Contractor**will be an active participant in the construction and acceptance phase commissioning activities. The commissioning tasks and responsibilities include following:
   1. Respond to requests from the CxA for interpretation/clarification of equipment selection and sequence of operation during functional performance test development.
   2. Review, and provide direction as necessary on, the functional performance tests developed by the CxA for conformance with the design intent, within an agreed time interval.
   3. Supporting the commissioning process by diligently executing the contract requirements to provide a fully functional facility ready for testing and working closely with the commissioning team to integrate the commissioning process into the project delivery schedule.
   4. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
   5. Cooperate with the CxA for resolution of issues recorded during the commissioning process.
   6. Schedule and attend commissioning kick-off meeting and commissioning coordination meetings.
   7. Integrate and coordinate commissioning process activities with construction schedule.
   8. Develop quality assurance process to verify and document proper installation, access, startup, adjusting, check out and maintenance of commissioned systems.

B. The CxA will develop the System Readiness Checklist (SRC) forms for each system within the commissioning scope of work. These forms summarize specific aspects of the installation of each system that the Contractor must verify prior to conducting functional performance testing. The SRC forms will be submitted to the Contractor and subcontractors for review and comments and subsequently compiled into the System Readiness Plan.

C. As part of the commissioning submittals, the Contractor shall submit a System Readiness Plan to the CxA. This document is typically a binder organized into sections with one section per system, each of which includes the SRC for that system followed by Manufacturer – or installation subcontractor-provided installation checklists, detailed start-up procedures, blank TAB forms and other project specific test forms. The CxA will review the System Readiness Plan and document any missing or erroneous forms. After the Contractor provides the correct forms, the CxA will provide final approval and acceptance of the System Readiness Plan for use by the Contractor and/or installation subcontractors. Once approved, the System Readiness Plan is subsequently referred to as the System Readiness Manual.

D. Review and accept commissioning functional performance test procedures provided by the CxA.

E. Ensure cooperation and participation of specialty subcontractors.

F. Provide to CxA a completed Functional Verification Checklist certifying that for all (listed) systems and equipment to be commissioned, that all systems, subsystems, equipment, and controls are ready for testing.

G. Ensure participation of major equipment manufacturers in appropriate training and testing activities.

H. Execution of the Functional Performance Test protocols for CxA to witness.

I. Manage every aspect of the training program including being responsible for all training requirements. An outline of the training requirements shall be developed with the University and CxA.

J. Responsible for developing and implementing a formal equipment maintenance program to ensure that all equipment specified to be installed on the project is received and maintained in good working order until accepted by the University.

1.7 SUBMITTALS

A. The **Contractor** shall provide the CxA a list of required equipment/system submittals to the CxA. The CxA will identify submittals to be submitted to the CxA concurrent with submission to the University's Representative for review.

B. The **Contractor** shall provide the CxA the requested submittals for the CxA concurrent review, with submission to the University for review

C. One set of searchable and bookmarked electronic file of coordination drawings which includes all commissioned systems e.g., mechanical, electrical, fire protection, plumbing, and telecom.

D. Names of **Contractor** and subcontractor's personnel who will be responsible for the start-up and commissioning of the facility. To include names, email, and telephone contact information.

E. Start-up and commissioning schedule. To include detailed plan of the sequence of construction with start and completion dates for each phase.

F. Start-up forms for equipment and systems installed in the building. Documents to be used by sub-contractors to ensure that the building complies with the requirements of the contract documents.

G. All Subs, through the **Contractor**, shall submit required installation, start-up, and preventive maintenance equipment data sheets to the CxA within 45 calendar days of equipment acceptance by the University.

H. All Subs, through the **Contractor**, shall submit initial O&M data for system and equipment being commissioned under this specification. Initial O&M data shall be submitted within 45 calendar days of equipment acceptance by the University, but no less than 8 weeks prior to the beginning of functional testing.

I. The **Contractor** shall submit an electronic copy of the construction meeting minutes, updated construction schedule, RFI log, and Bulletin log to the CxA within seven (7) calendar days of each meeting or update.

J. **Contractor** shall submit an electronic copy of training plan and training materials to the CxA for review and approval prior to providing training.

K. Consolidated close out list with all training, Final O&M manuals, As-Built documentation and surplus stock listed by spec section. Information to be compiled from the specifications.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. The **Contractor s**hall supply all personnel and equipment for the demonstration and testing, including, but not limited to, tools, instruments, ladders, lifts, computers, software, cables, etc. **Contractor** supplied personnel must be competent with and knowledgeable of all project-specific systems, and automation hardware and software. All training documentation, O&Ms, and submittals shall be at the job site before functional testing commences.

B. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the division contractor for the equipment being tested. For example, the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC system and control systems in Division 23.

C. Special equipment, tools and instruments (only available from vendor/Subs, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be provided by the **Contractor** and left on site, for the CxA to use during functional testing, seasonal testing, and deferred testing. The equipment, tools, and instruments will be returned to the vendor/Subs after successful conclusion of the commissioning effort.

D. The controls contractor shall provide the CxA with temporary software license to be loaded on the CxA's computer, and any necessary network connection cables, for accessing the direct digital control system field panels for system testing. The controls contractor shall also provide a palm device (if applicable) with attachments, software, and cables, to check setpoint values of terminal device controllers. The controls contractor shall provide the CxA with log on ID, password, and LAN IP connection criteria for remote connection to direct digital control system. All the software, cables, and modems provided to the CxA will be returned at the successful conclusion of the commissioning effort.

E. All testing equipment used by the contractors shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Contract Document Specifications (Project Manual). If not otherwise noted, the following minimum requirements apply to test and measurement equipment: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.1°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals. Calibration tags shall be affixed or certificates readily available.

PART 3 - EXECUTION

3.1 AFTER AWARD OF CONTRACT

A. The Contractor shall identify the person on their staff who will serve as the Commissioning Coordinator (CC). This person shall be responsible for all startup and commissioning issues on the project. Specific duties are identified in Part 1 of this Section.

B. Within the first 30 calendar days of the project the **Contractor** shall meet with the University and the commissioning agent to discuss the process to be used on the project for managing communication to and from the Cx agent. This is to include the means for communication issues, commissioning reviews, processing submittals, RFIs, change orders, etc., meeting minutes, schedule information, Cx agent observations, and the action item lists. If a mutually agreeable process cannot be agreed upon, the Cx agent's process and software tools will be utilized.

C. Within the first 60 days of the project there will be a meeting of the GC, the Cx agent and the key subcontractor's personnel to review how the Cx process will be implemented on the project and how the communication and documentation requirements will be met. The subcontractors are expected to send the staff that will be participating in the start-up and commissioning meetings.

D. The **Contractor** will submit a schedule listing the key startup and Cx activities. The initial schedule can be general in nature. As the project progresses, the details on the schedule must be sufficient to list the activities of each **Contractor** for each phase of the project and what work must be accomplished before each listed task.

E. The **Contractor** is to identify the team members from each subcontractor who will be participating in the start-up and commissioning meetings. This list is to include the name and contact information for the subcontractor's commissioning coordinator.

F. The **Contractor** is to compile a listing of all factory tests that will take place prior to the start of the start-up and commissioning meetings. The consolidated list, along with an approximation of when they are expected to take place, shall be forwarded to the Cx agent.

3.2 CX MEETINGS

A. Eight weeks prior to supplying potable water to the building or the permanent power, the Commissioning Coordinator (CC) will schedule the first start-up and commissioning meeting. The meetings will not be concurrent with the **Contractor's** MEP coordination meeting and are to be scheduled at a mutually agreeable time between the **Contractor**, the Cx agent, and the University.

B. The meetings will initially be held every second or third week as appropriate, and then increase in frequency to weekly as the bulk of the start-up and commissioning work is taking place.

C. During each meeting an updated start-up and commissioning schedule will be distributed. In addition to the hard copies distributed at the meeting, electronic versions shall be forwarded to the Cx agent and the University.

D. During the meetings a consolidated training, O&M, and attic stock list drawn from the contract document requirements will be distributed. Decisions on the O&M review, when the training will take place, and how the stock will be turned over the University will be made based on this document. In addition to the hard copies distributed at the meeting, an electronic version shall be forwarded to the Cx agent and the University.

E. Minutes of the start-up and commissioning meetings will be generated and distributed by the Commissioning Coordinator (CC). The minutes are to incorporate findings from the Cx agent. In addition to the hard copies distributed at the meeting, electronic versions shall be forwarded to the Cx agent and the University.

F. The updated FPTs will be provided to the **Contractor** by the Cx agent.

G. The **Contractor** and the subcontractors will be required to coordinate their activities, and work collaboratively, with the test and balance contractor hired by the University.

H. The **Contractor** will coordinate the schedules for two review meetings to be led by the Cx agent. The first will be a comprehensive test and balance review and needs to include the mechanical subcontractor's wet and dry side foreman. The second meeting will be a controls review. This meeting is to be attended by the controls subcontractor's lead on the project and the programmer. Each meeting is to last at least two hours.

3.3 FIELD START-UP AND TESTING

A. The dates for all field start-up activities shall be listed on the start-up and commissioning schedule.

B. The CxA works with the Subs in developing startup plans and startup documentation formats, including providing the Subs with pre-functional checklists to be completed, during the startup process.

C. The TAB contractor submits their TAB plan, along with the TAB Plan Review Checklist, for approval by the CxA prior to starting TAB work.

D. In general, the checkout and performance verification proceeds from simple to complex, from component level to equipment to systems and intersystem levels with pre-functional checklists being completed before functional testing.

E. The CxA shall review shop drawings and material certifications, review of reports from independent testing agencies, independent on-site periodic construction observation and attendance of selected quality control-related meetings (e. g., Pre-installation Conferences).

3.4 PRE-FUNCTIONAL TEST PHASE:

A. The **Contractor** shall prepare the equipment and systems for start-up in accordance with the Contract Documents, industry standard guidelines and the guidelines of the equipment and systems manufacturers. Start-up shall be performed by the **Contractor**'s and/or manufacturer's start-up technicians in accordance with the Contract Documents, industry standard guidelines and the guidelines of the equipment and systems manufacturers. The **Contractor** shall test the systems to verify that they perform in accordance with the Contract Documents, including the commissioning FPT procedures.

B. The CxA will witness equipment start up and testing. The **Contractor** shall notify the CxA in writing at least fourteen (14) calendar days in advance of the start-up and testing dates so that the CxA can schedule attendance. If the CxA is not notified in advance of a scheduled start-up or testing activity, the start-up or testing shall be rescheduled and repeated to the satisfaction of the CxA. When scheduled start-up activities are not executed because of lack of preparation or coordination by the **Contractor**, the **Contractor** will be subject to back-charges in accordance with the Contract Documents.

C. The **Contractor** shall complete and compile all start-up forms, test forms and SRCs for the System Readiness Manual and submit to the CxA.

D. Upon receipt of the completed System Readiness Manual forms, the CxA will perform an Installation Verification by providing various inspections and back-checks of the completed System Readiness Manual forms. Issues notes during this process will be documented by the CxA in the Commissioning Issues Log.

E. Upon acceptance of the System Readiness Manual, which includes the draft TAB report, functional performance testing shall be scheduled. Functional performance testing shall not commence until all critical issues identified during the Installation Verification process are resolved.

F. Upon completion of the start-up and contractually required work, the **Contractor** shall submit a 'Ready to Commission' document to the University for the Specific Equipment and/or system that is complete. It is only after this document is received that the FPTs will commence.

3.5 FUNCTIONAL PERFORMANCE TESTING:

A. Functional Performance Testing of commissioned systems shall begin after all critical issues discovered during the installation verification process have been corrected.

B. The procedure for developing and performing the FPTs shall be as follows:
   1. The **Contractor** shall provide the equipment and commissioning submittals as specified in the Contract Documents.
   2. The Commissioning Authority will draft the FPT procedures based on the **Contractor**'s submittals as approved by the Design Team. The draft procedures will be submitted to the Commissioning Team for review.
   3. Each **Contractor** and equipment supplier that is specified as an FPT participant in the FPT Summary Tables in the specifications shall participate in the development and performance of the associated FPTs. Each FPT participant shall provide written comments on the associated FPT procedures regarding each of the following issues:
      a. Verify that the procedures can be performed without compromising the safety of the participants
      b. Verify that the procedures can be performed without compromising the warranties of equipment, components, and systems
      c. Verify that the procedures are appropriate for the equipment, components and systems as provided

C. The CxA will complete the working drafts of the FPT procedures.

D. Subcontractors and suppliers shall provide the personnel, expertise and test equipment to operate and maintain the systems during testing.

E. The Contractor shall test all systems within the commissioning scope of work, using the FPT procedures until the acceptable results specified in the FPT procedure are verified and documented. If necessary to obtain acceptable results, the Contractor may consult with the CxA to acquire clarification and resolve issues. The CxA will be available for on-site assistance of this nature.

F. The Contractor shall submit documentation that verifies that the acceptable results specified in the FPT procedures have been verified and that they are ready to demonstrate the FPTs with acceptable results. Acceptable documentation consists of completed FPT record forms which document acceptable FPT results or indication on the Systems Readiness Checklists that the Contractor's pre-functional testing has verified that functional performance testing of the equipment and associated system demonstrate the acceptable results as specified.

G. After the CxA has accepted the Contractor's documentation of acceptable results, the FPT shall be conducted and demonstrated to the CxA. If acceptable results are not demonstrated for an FPT, the Contractor shall resolve the issue(s) and the demonstration shall be repeated.

H. The Contractor shall verify and document acceptable FPT results for all equipment components and systems. The FPTs may be demonstrated for a sample of the systems that comply with all of the following criteria. This process is referred to in this document as “demonstration sampling”.
   1. There shall be many of the systems with similar components that have identical sequences of operation which are implemented using identical control software programming.
   2. The components and systems to be included in the Demonstration Samples will be chosen by the CxA at the time of demonstration.
   3. The sample size will be in accordance with the Functional Performance Test (FPT) Demonstration Sampling Tables in the specifications.
   4. Acceptable results must be demonstrated for the entire sample. If the FPT results are not acceptable due to a lack of preparation or coordination by the **Contractor** for any system or component sampled, the FPT shall be demonstrated for all the systems and components for which it was written. Whenever the demonstrated results are not acceptable, the **Contractor** shall make corrections and the FPT shall be demonstrated again. The cost of back-checking FPTs with unacceptable results is not included in the Commissioning Authority’s scope of work. Back-charging applies to additional back-checking required due to lack of preparation by **Contractor**.

I. The CC is responsible for scheduling and coordinating functional testing activities. The Contractor shall demonstrate the FPTs after they have verified that performing the FPTs will yield the documented acceptable results. The Contractor is subject to back-charging, as specified herein, if acceptable results are not demonstrated because of work that should have been verified during pre-demonstration testing prior to the submittal of the System Readiness Manual. Acceptable results must be obtained during a single demonstration. No more than two delays of less than 15 minutes each are acceptable for each test.
   1. In addition to conducting the functional tests developed by the CxA, the **Contractor** shall be required to complete all start-up and testing procedures as specified elsewhere in the Contract Documents.
   2. Where the CxA requires BMS trending, the CxA will provide a points list within the FPT form that may include both hardware (input/output) and software (virtual) points and appropriate trending intervals.

J. The Contractor shall provide trend data to the CxA in electronic format. As a University approved alternative, the Contractor can provide the CxA remote access to the BMS and provide training that will allow the CxA to directly download trend data.

K. The CxA will analyze and review the trend data and associated system performance.

3.6 CX AGENT FUNCTIONAL PERFORMANCE TESTING (FPT)

A. Upon receipt of the Ready to Cx statement, the Cx Agent will coordinate a time with the **Contractor** to witness the FPTs.

B. The CxA develops specific equipment and system functional performance test procedures. The **Contractor** and manufacturer review the procedures to make sure the tests are safe for the equipment provided.

C. The functional test procedures are executed by the **Contractor**s, under the direction of, and documented by the CxA.

D. The CxA will direct a TAB verification, with support from the TAB **Contractor**, to verify the values reported in the final TAB report.

E. Items of non-compliance in material, installation or setup are corrected at the Sub's expense and the system retested.

F. All deficiencies noted will be tracked via the CxA issues log. The **Contractor** will be responsible for obtaining sign-off of corrected items.

G. The **Contractor** is responsible for scheduling and coordinating commissioning activities. The **Contractor** shall reimburse the University for the cost of commissioning activities that must be repeated because of a lack of preparation or coordination by the **Contractor**. Reimbursable costs include CxA fees for services billed at the CxA's standard hourly rate. Activities subject to back-charging include: Repeated back-checking: Commissioning issues are documented in the Commissioning Issues Log. The **Contractor** shall submit a brief written statement describing when and how each issue has been resolved, which shall be added to the Issues Log maintained by the CxA. The CxA will back-check these issues on a one-time-per-issue basis to verify they have been resolved. If the back-checked issues that have not been resolved as reported, the associated cost of the unsuccessful back-check shall be subject to back-charging.

H. Repeated installation verification: Once the **Contractor** has submitted the completed System Readiness Manual forms, the CxA will perform final installation verifications on selected systems. Discrepancies discovered will be reported in the Commissioning Issues Log. Back-checking the correction of these discrepancies shall be subject to back-charging.

I. Repeated witnessing of FPT demonstrations: As specified in this section, the **Contractor** demonstrates the functional performance tests after they have verified that performing the FPTs will yield the documented acceptable results. The cost of witnessing demonstrations that do not demonstrate specified acceptance criteria shall be subject to back-charging.

3.7 SAMPLING

A. As noted in the specifications, multiple identical pieces of non-life-safety or otherwise non-critical equipment will be functionally tested using a sampling strategy. Significant application differences and significant sequence of operation differences in otherwise identical equipment invalidates their common identity. A small size or capacity difference, alone, does not constitute a difference. It is noted that no sampling by Subs is allowed in pre-functional checklist execution.

B. Sampling strategy referenced in the Specifications as the "xx% Sampling—yy% Failure Rule" is defined by the following example:
   1. xx = the percent of the group of identical equipment to be included in each sample.
   2. yy = the percent of the sample that if failing, will require another sample to be tested.

C. The example below describes a 20% Sampling—10% Failure Rule.
   1. Randomly test at least 20% (xx) of each group of identical equipment. In no case test less than three units in each group. This 20%, or three, constitute the "first sample." If 10% (yy) of the units in the first sample fail the functional performance tests, test another 20% of the group (the second sample).
   2. If 10% of the units in the second sample fail, test all remaining units in the whole group. If at any point, frequent failures are occurring, and testing is becoming more troubleshooting than verification, the CxA may stop the testing and require the responsible Sub to perform and document a checkout of the remaining units, prior to continuing with functionally testing the remaining units.

3.8 FAILURE DUE TO MANUFACTURER DEFECT:

A. If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the **Contractor,** the University, the A/E, or the CxA. In such case, the **Contractor** shall provide the University with the following:

B. Within one week of notification **Contractor** or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the University within two weeks of the original notice.

C. Within two weeks of the original notification, the Contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation. The University will determine whether a replacement of all identical units or a repair is acceptable.

D. Two examples of the proposed solution will be installed by the Contractor and the PM will be allowed to test the installations for up to one week, upon which the University will decide whether to accept the solution. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

3.9 DEFERRED TESTING

A. Unforeseen Deferred Tests: If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the University, A/E, and CxA. These tests will be conducted in the same manner as the seasonal tests as soon as possible.

B. Seasonal Testing: During the warranty period, seasonal testing shall be completed as part of this contract. Seasonal testing is intended to test the performance of systems under full load conditions that cannot be simulated during the functional testing period. For example, it is impossible to test the heating system under full load conditions in July, so the heating system would be full load tested during the winter months. The CxA shall coordinate this activity. Tests will be executed, documented, and deficiencies corrected by the appropriate Subs, with facilities staff and the CxA witnessing. Any final adjustments to the O&M manuals and As-Builts due to the testing will be made by the **Contractor**

3.10 TRAINING OF UNIVERSITY PERSONNEL

A. The Contractor shall be responsible for training coordination and scheduling and ultimately for ensuring that training is complete. The CxA will be responsible for overseeing and approving the adequacy of the training of University personnel for commissioned equipment.

B. Instructor capabilities shall be commensurate with level of instruction required. Instructor qualifications shall be submitted to University and CxA for review prior to training.

C. The specific training requirements of University personnel by Subs and vendors as directed within the specifications.

D. Each Sub and vendor responsible for training shall submit a written training plan to the CxA for review and approval prior to training. The plan shall include the following elements:
   1. Equipment (included in training)
   2. Intended audience
   3. Location of training
   4. Objectives
   5. Subjects covered (description, duration of discussion, special methods, etc.)
   6. Duration of training on each subject
   7. Instructor name and qualifications for each subject
   8. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)

E. The CxA develops criteria for determining that the training was satisfactorily completed, including attending some of the training, etc. The CxA recommends approval of the training to the University.

3.11 COMMISSIONING ISSUES LOG:

A. Issues identified during the commissioning process, including during site observations, pre-functional testing verification and functional testing, will be logged in the commissioning issues log. The CxA will maintain the master log. For each issue, the CxA will make a recommendation regarding who they believe is in the best position to provide the resolution. However, it is the **Contractor'**s responsibility to manage issue resolution, including the determination of how the issue will be resolved and who will do the work.

B. Each issue on the list will be classified with a "status" of either "resolved", "unresolved", or "resolved-unverified". "Resolved" issues are closed, having either been addressed by the **Contractor** and verified as corrected by the CxA or having been accepted by the University. "Resolved-unverified" issues have been reported as resolved by the **Contractor** but are not yet verified by the CxA as resolved. "Unresolved" issues have not been reported as addressed by the **Contractor**. Updated unresolved issues lists will be distributed to team in MS Word/Excel format.

C. Material and method issues discovered during commissioning, but that pertain to **Contractor** construction shall be promptly reported to the A/E, CxA and the University's Representative.

D. When a commissioning issue is resolved, the **Contractor** shall submit an updated list with a written response describing when and how the issue is resolved. The CxA or an applicable member of the Design Team shall then back-check the resolution of said issue. The CxA scope of work includes one back-check of issues that the **Contractor** reports as resolved. Back-charging applies to back-checking required due to lack of preparation of **Contractor**.

3.12 OPERATION AND MAINTENANCE MANUALS:

A. The specific content and format requirements for the standard O&M manuals are detailed in Section 017800 Closeout Submittals. Special requirements for TAB contractor in appropriate Division 23 Sections and for the Controls contractor are found in appropriate Division 23 Sections. Electrical requirements are located in the appropriate Division 26 Sections. Refer to the specifications for additional O&M requirements.

B. System Narrative. The Contractor.shall include in the beginning of the O&M manuals a separate section describing the systems including:
   1. A system narrative describing the type and function of the system.
   2. Site information, including facility description and current requirements
   3. Simplified professionally drawn single line system diagrams on 8 ½" x 11" or 11" x 17" sheets. These shall include chilled water distribution system, water system, condenser water system, heating system, supply air systems, and exhaust systems and others as designated. These shall show major pieces of equipment such as pumps, heat exchangers, humidifiers, control valves, expansion tanks, coils, service valves, etc.

C. CxA Review and Approval. Prior to material completion, the CxA shall review the O&M manuals, documentation and redline As-Builts for systems that were commissioned and list other systems documentation that the CxA should review to verify compliance with the Specifications. The CxA will communicate deficiencies in the manuals to the University or A/E, as requested. Upon a successful review of the corrections, the CxA recommends approval and acceptance of these sections of the O&M manuals to the University or A/E. The CxA also reviews each equipment warranty and verifies that all requirements to keep the warranty valid are clearly stated. This work does not supersede the A/E's review of the O&M manuals according to the A/E's contract.

3.13 CLOSE-OUT PROCESS

A. All start-up documentation generated by the subcontractors shall be submitted to the Cx agent and the University in an electronic format.

B. The sign-in sheets for all training sessions shall be submitted to the Cx agent and the University in electronic format.

C. All training activities will be scheduled at mutually agreeable times between the **Contractor**, the University, and the Cx agent.

END OF SECTION 019100

SECTION 024120

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.3 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.4 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.
   1. Inspect and discuss condition of construction to be selectively demolished.
   2. Review structural load limitations of existing structure.
   3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
   5. Review areas where existing construction is to remain and requires protection.

1.5 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

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

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

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. Hazardous materials will be removed by Owner before start of the Work.
   2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.

1.6 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

D. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs or video.
   1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
   2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
      a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
      b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
      c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
      d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
      e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
      f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
      g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.3 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
   1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
   2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
   3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
   4. Cover and protect furniture, furnishings, and equipment that have not been removed.
   5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015600 Construction Facilities.

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
   1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.

2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least one hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

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

D. Removed and Reinstalled Items:
1. Clean items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

EDIT NOTE:RETAIN ONE OF TWO "CONCRETE" PARAGRAPHS BELOW. SECOND PARAGRAPH WILL PROVIDE NEATER OPENINGS WITH LESS RISK OF DAMAGE TO REMAINING CONCRETE, BUT MAY COST MORE.

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

3.6 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

SECTION 031000

CONCRETE FORMWORK

PART 1 - GENERAL

1.1 DESCRIPTION

1.0.1 THIS SECTION SPECIFIES REQUIREMENTS FOR CONCRETE FORMWORK AS SHOWN ON THE DRAWINGS AND AS SPECIFIED HEREIN.

1.0.2 USE FORMS, WHEREVER NECESSARY, TO CONFINE THE CONCRETE AND SHAPE IT TO THE REQUIRED LINES, AND TO PROVIDE THE SPECIFIED FINISHES. CONSTRUCT FORMS WITH SUFFICIENT STRENGTH TO STRUCTURALLY SUPPORT THE WORK AND WITHSTAND THE PRESSURE RESULTING FROM PLACEMENT AND VIBRATION OF THE CONCRETE AND MAINTAIN THEM RIGIDLY IN POSITION. CONSTRUCT FORMS SUFFICIENTLY TIGHT TO PREVENT LOSS OF MORTAR FROM THE CONCRETE.

1.2 RELATED SECTIONS

A) SECTION 03300: CAST-IN-PLACE CONCRETE

1.3 REFERENCES

1.0.3 WHERE THE LANGUAGE IN ANY OF THE DOCUMENTS REFERRED TO HEREIN IS IN THE FORM OF A RECOMMENDATION OR SUGGESTION, SUCH RECOMMENDATIONS OR SUGGESTIONS SHALL BE DEEMED TO BE MANDATORY FOR THIS SECTION.

A) AMERICAN CONCRETE INSTITUTE (ACI):

ACI 347 RECOMMENDED PRACTICE FOR CONCRETE FORMWORK

1.4 DESIGN REQUIREMENTS

1.0.4 DESIGN FORMWORK IN ACCORDANCE WITH THE REQUIREMENTS OF ACI 347, AND AS SPECIFIED HEREIN.

1.1 QUALITY ASSURANCE

1.0.5 TOLERANCES:

A) PERMISSIBLE SURFACE IRREGULARITIES FOR THE VARIOUS CLASSES OF CONCRETE SURFACE FINISH AS SPECIFIED IN SECTION 03300 ARE DEFINED AS "FINISHES"; AND ARE TO BE DISTINGUISHED FROM TOLERANCES AS SPECIFIED HEREIN. DEVIATIONS FROM THE ESTABLISHED LINES, GRADES AND DIMENSIONS WILL BE PERMITTED TO THE EXTENT SET FORTH HEREIN.

B) THE TOLERANCE LIMITS SPECIFIED IN THIS SECTION AND THE SURFACE FINISH IRREGULARITIES PERMITTED IN SECTION 03300 ARE NOT THE LIMITS TO WHICH FORMS MAY BE BUILT OR WHICH DAMAGED FORM MAY USE SHEATHING. THESE LIMITS ARE PROVIDED ONLY FOR THE OCCASIONAL SLIGHT MISALIGNMENT OR IRREGULARITY OF SURFACE, WHICH MAY OCCUR DESPITE A SERIOUS EFFORT TO BUILD AND MAINTAIN THE FORMS ACCURATELY AND SECURELY WITH AN EVEN SURFACE. THESE LIMITS WILL BE ALLOWED ONLY FOR INADVERTENT OR RELATIVELY INFREQUENT IRREGULARITIES OF THE DEGREE MENTIONED, BUT PRACTICES AND FORM MATERIALS WILL BE PROHIBITED WHICH WITHOUT DOUBT WILL RESULT IN THE CREATION OF ADDITIONAL IRREGULARITIES, EVEN THOUGH THESE WOULD BE WITHIN THE LIMITS SPECIFIED.

C) WHERE SPECIFIC TOLERANCES ARE NOT STATED HEREIN OR SHOWN ON THE DRAWINGS FOR A STRUCTURE, PORTION OF A STRUCTURE, OR OTHER FEATURE OF THE WORK, PERMISSIBLE DEVIATIONS WILL BE INTERPRETED CONFORMING TO THE TOLERANCES STATED HEREIN FOR SIMILAR CONSTRUCTION. SPECIFIC MAXIMUM OR MINIMUM TOLERANCES AS SHOWN ON THE DRAWINGS IN CONNECTION WITH ANY DIMENSION SHALL BE CONSIDERED AS SUPPLEMENTAL TO THE TOLERANCES SPECIFIED HEREIN AND SHALL GOVERN. CONCRETE FORMS SHALL BE SET AND MAINTAINED WITHIN THE TOLERANCE LIMITS NECESSARY TO ENSURE THAT THE COMPLETED WORK WILL BE WITHIN THE TOLERANCES SPECIFIED. CONCRETE CONSTRUCTION THAT EXCEEDS THE TOLERANCE LIMITS AS SPECIFIED OR AS SHOWN ON THE DRAWINGS SHALL BE REMEDIED OR REMOVED AND REPLACED.

D) TOLERANCES SHALL BE AS SPECIFIED IN ACI 347 FOR REINFORCED CONCRETE BUILDINGS.

PART 2 - PRODUCTS

2.1 MATERIALS

1.0.1 FORMS: CONSTRUCT FORMWORK FOR EXPOSED CONCRETE SURFACES WITH SMOOTH FACED UNDAMAGED PLYWOOD OR OTHER PANEL-TYPE FACING MATERIALS TO PROVIDE CONTINUOUS, STRAIGHT, SMOOTH AS-CAST SURFACES, AND PRODUCE A UNIFORM AND CONSISTENT TEXTURE AND PATTERN ON THE SURFACES. METAL PATCHES ON FORMS FOR THESE SURFACES WILL NOT BE PERMITTED.

1.0.2 FORM TIES:

A) PROVIDE FACTORY-FABRICATED, ADJUSTABLE-LENGTH, REMOVABLE OR SNAP-OFF METAL FORM TIES, DESIGNED TO PREVENT FORM DEFLECTION AND TO PREVENT SPALLING CONCRETE SURFACES UPON REMOVAL.

B) PROVIDE TIES SO THAT PORTION REMAINING WITHIN CONCRETE AFTER REMOVAL OF EXTERIOR PARTS IS AT LEAST 1-1/2 INCH FROM THE OUTER CONCRETE SURFACE. PROVIDE FORM TIES, WHICH WILL NOT LEAVE A HOLE LARGER THAN ONE-INCH DIAMETER IN THE CONCRETE SURFACE. FILL RESULTING RECESSES AS SPECIFIED IN SECTION 03300.

1.0.2 FORM COATINGS: PROVIDE COMMERCIAL FORMULATION FORM-COATING COMPOUNDS THAT WILL NOT BOND WITH, STAIN, NOR ADVERSELY AFFECT CONCRETE SURFACES REQUIRING BOND OR ADHESION, NOR IMPEDE THE WETTING OF SURFACES TO BE CURED WITH WATER OR CURING COMPOUNDS.

PART 3 - EXECUTION

3.1 INSTALLATION

1.0.1 EXAMINE THE SUBSTRATE AND CONDITIONS UNDER WHICH WORK OF THIS SECTION IS TO BE PERFORMED, AND CORRECT UNSATISFACTORY CONDITIONS, WHICH WOULD PREVENT PROPER AND TIMELY COMPLETION OF THE WORK. DO NOT PROCEED UNTIL UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.

3.2 PLACING AGAINST EXCAVATED SURFACES

1.0.2 SIDE FORMS OF FOOTINGS MAY BE OMITTED AND CONCRETE PLACED DIRECTLY AGAINST EXCAVATED SURFACES ONLY WHEN APPROVED BY THE OWNER. WHEN OMISSION OF FORMS IS APPROVED, PROVIDE A TWO-INCH-THICK MUD PAD, SLOPED AT TWO FOOT HORIZONTAL AND ONE FOOT VERTICAL, ON EACH SIDE OF THE MINIMUM DESIGN PROFILES AND DIMENSIONS SHOWN.

3.3 FORM CONSTRUCTION

1.0.3 GENERAL:

A) CONSTRUCT FORMS COMPLYING WITH ACI 347, TO THE EXACT SIZES, SHAPES, LINES, AND DIMENSIONS SHOWN, AND AS REQUIRED TO OBTAIN ACCURATE ALIGNMENT, LOCATION, GRADES, LEVEL, AND PLUMB WORK IN FINISHED STRUCTURES.

B) PROVIDE FOR OPENINGS, OFFSETS, KEYWAYS, RECESSES, MOLDINGS, CHAMFERS, BLOCKING, SCREEDS, BULKHEADS, ANCHORAGES, INSERTS, AND OTHER FEATURES REQUIRED. USE SELECTED MATERIALS TO OBTAIN REQUIRED FINISHES.

C) FORMS FOR CONCRETE WHICH ACCOMMODATE WORK OF OTHER TRADES, FABRICATED BEFORE THE OPPORTUNITY EXISTS TO VERIFY THE MEASUREMENTS OF ADJACENT CONSTRUCTION, SHALL BE ACCURATELY SIZED AND LOCATED AS DIMENSIONED ON THE DRAWINGS. IN THE EVENT THAT DEVIATION FROM THE DRAWING DIMENSIONS RESULTS IN PROBLEMS IN THE FIELD, THE CONTRACTOR SHALL BE RESPONSIBLE FOR RESOLUTION OF THE CONDITIONS.

1.0.4 FABRICATION:

A) FABRICATE FORMS FOR EASY REMOVAL WITHOUT HAMMERING OR PRYING AGAINST CONCRETE SURFACES. PROVIDE CRUSH PLATES OR WRECKING PLATES WHERE STRIPPING MAY DAMAGE CONCRETE SURFACES.

B) PROVIDE TEMPORARY OPENINGS WHERE INTERIOR AREA OF FORMWORK IS INACCESSIBLE FOR CLEANOUT, FOR INSPECTION BEFORE CONCRETE PLACEMENT, AND FOR PLACEMENT OF CONCRETE. BRACE TEMPORARY CLOSURES AND SET TIGHTLY TO TEMPORARY OPENINGS ON FORMS IN AS MANY INCONSPICUOUS LOCATIONS AS POSSIBLE, COMMENSURATE WITH DESIGN REQUIREMENTS. FORM INTERSECTING PLANES TO PROVIDE TRUE, CLEAN-CUT CORNERS.

1.0.2 FALSEWORK:

A) ERECT FALSEWORK AND SUPPORT, BRACE AND MAINTAIN IT TO SAFELY SUPPORT VERTICAL, LATERAL, AND ASYMMETRICAL LOADS APPLIED UNTIL SUCH LOADS CAN BE SUPPORTED BY IN-PLACE CONSTRUCTION. CONSTRUCT FALSEWORK SO THAT ADJUSTMENTS CAN BE MADE FOR TAKE-UP AND SETTLEMENT, AND ACCESS IS PROVIDED FOR INSPECTION.

B) PROVIDE WEDGES, JACKS, OR CHAMFER STRIPS TO FACILITATE VERTICAL ADJUSTMENTS. CAREFULLY INSPECT FALSEWORK AND FORMWORK DURING AND AFTER CONCRETE PLACEMENT OPERATIONS TO DETERMINE ABNORMAL DEFLECTION OR SIGNS OF FAILURE; MAKE NECESSARY ADJUSTMENTS TO PRODUCE WORK OF REQUIRED DIMENSIONS.

1.0.3 FORMS FOR EXPOSED CONCRETE:

A) DRILL FORMS TO SUIT TIES USED AND TO PREVENT LEAKAGE OF CONCRETE MORTAR AROUND TIE HOLES. DO NOT SPLINTER FORMS BY DRIVING TIES THROUGH IMPROPERLY PREPARED HOLES.

B) PROVIDE SHARP CLEAN CORNERS AT INTERSECTING PLANES, WITHOUT VISIBLE EDGES OR OFFSETS. BACK JOINTS WITH EXTRA STUDS OR GIRTS TO MAINTAIN TRUE, SQUARE INTERSECTIONS.

C) USE EXTRA STUDS, WALERS, AND BRACING TO PREVENT OBJECTIONABLE BOWING OF FORMS BETWEEN STUDS AND TO AVOID BOWED APPEARANCE IN CONCRETE. DO NOT USE NARROW STRIPS OF FORM MATERIAL, WHICH WILL PRODUCE BOW.

1.0.4 CORNER TREATMENT: UNLESS SHOWN OTHERWISE, FORM CHAMFERS WITH 3/4-INCH BY
3/4-INCH STRIPS, ACCURATELY FORMED AND SURFACED TO PRODUCE UNIFORMLY STRAIGHT LINES AND TIGHT EDGE JOINTS ON EXPOSED CONCRETE. EXTEND TERMINAL EDGES TO REQUIRED LIMIT AND MITER CHAMFER STRIPS AT CHANGES IN DIRECTION.

1.0.5 CONTROL JOINTS: LOCATE AS INDICATED ON THE DRAWINGS.

1.0.6 PROVISION FOR OTHER TRADES: PROVIDE OPENINGS IN CONCRETE FORMWORK TO ACCOMMODATE WORK OF OTHER TRADES. VERIFY SIZE AND LOCATION OF OPENINGS, RECESSES AND CHASES WITH THE TRADE REQUIRING SUCH ITEMS. ACCURATELY PLACE AND SECURELY SUPPORT ITEMS TO BE BUILT INTO FORMS.

1.0.7 CLEANING AND TIGHTENING: THOROUGHLY CLEAN FORMS AND ADJACENT SURFACES TO RECEIVE CONCRETE. REMOVE ENCRUSTED MORTAR AND GROUT, CHIPS, WOOD, SAWDUST, DIRT, AND OTHER DEBRIS JUST BEFORE CONCRETE IS PLACED. RETIGHTEN FORMS IMMEDIATELY AFTER CONCRETE PLACEMENT AS REQUIRED TO ELIMINATE MORTAR LEAKS.

3.4 FORM COATINGS

1.0.1 COAT FORM CONTACT SURFACES WITH FORM COATING COMPOUND BEFORE REINFORCEMENT IS PLACED. DO NOT ALLOW EXCESS FORM COATING MATERIAL TO ACCUMULATE IN THE FORMS OR TO COME INTO CONTACT WITH SURFACES, WHICH WILL BE BONDED, TO FRESH CONCRETE. APPLY IN COMPLIANCE WITH MANUFACTURER'S INSTRUCTIONS.

3.5 INSTALLATION OF EMBEDDED ITEMS

1.0.2 SET AND BUILD INTO THE FORMS, ANCHORAGE DEVICES AND OTHER EMBEDDED ITEMS REQUIRED FOR OTHER WORK THAT IS ATTACHED TO, OR SUPPORTED BY, CAST-IN-PLACE CONCRETE. USE CERTIFIED DRAWINGS, DIAGRAMS, INSTRUCTIONS, AND DIRECTIONS PROVIDED BY SUPPLIERS OF THE ITEMS ATTACHED THERETO.

1.0.3 SET EDGE FORMS OR BULKHEADS AND INTERMEDIATE SCREED STRIPS FOR SLABS, TO OBTAIN REQUIRED ELEVATIONS AND CONTOURS IN THE FINISHED SLAB SURFACE. PROVIDE AND SECURE UNITS TO SUPPORT TYPES OF SCREEDS REQUIRED.

3.6 REMOVAL OF FORMS

1.0.4 FORMWORK NOT SUPPORTING CONCRETE, SUCH AS SIDES OF BEAMS, WALLS, COLUMNS, AND SIMILAR PARTS OF THE WORK, MAY BE REMOVED AFTER CUMULATIVELY CURING AT NOT LESS THAN

50 DEGREES F FOR 24 HOURS AFTER PLACING CONCRETE, PROVIDED CONCRETE IS SUFFICIENTLY HARD TO NOT BE DAMAGED BY FORM REMOVAL OPERATION, AND PROVIDED THAT CURING AND PROTECTION OPERATIONS ARE MAINTAINED.

1.0.5 FORMWORK SUPPORTING WEIGHT OF CONCRETE, SUCH AS BEAM SOFFITS, JOISTS, SLABS, AND OTHER STRUCTURAL ELEMENTS, MAY NOT BE REMOVED IN LESS THAN 14 DAYS, AND NOT UNTIL CONCRETE HAS ATTAINED DESIGN MINIMUM 28-DAY COMPRESSIVE STRENGTH. DETERMINE POTENTIAL COMPRESSIVE STRENGTH OF IN-PLACE CONCRETE BY TESTING FIELD-CURED SPECIMENS' REPRESENTATIVE OF THE CONCRETE LOCATION OR MEMBERS, AS SPECIFIED IN SECTION 03300.

1.0.6 FORM FACING MATERIAL MAY BE REMOVED FOUR DAYS AFTER PLACEMENT, ONLY IF SHORES AND OTHER VERTICAL SUPPORTS HAVE BEEN ARRANGED TO PERMIT REMOVAL OF FORM FACING MATERIAL WITHOUT LOOSENING OR DISTURBING SHORES AND SUPPORT.

3.1 REUSE OF FORMS

1.0.7 CLEAN AND REPAIR SURFACES OF FORMS TO BE REUSED IN THE WORK. SPLIT, FRAYED, DE- LAMINATED OR OTHERWISE DAMAGED FORM FACING MATERIAL IS NOT ACCEPTABLE. WHEN FORMS ARE REUSED FOR SUCCESSIVE CONCRETE PLACEMENT, THOROUGHLY CLEAN SURFACES, REMOVE FINS AND LAITANCE, AND TIGHTEN FORMS TO CLOSE ALL JOINTS. ALIGN AND SECURE JOINTS TO AVOID OFFSETS.

END OF SECTION

SECTION 032000

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 DESCRIPTION

1.0.1 THIS SECTION SPECIFIES REQUIREMENTS FOR CONCRETE REINFORCEMENT AS SHOWN ON THE DRAWINGS AND AS SPECIFIED HEREIN.

1.2 REFERENCES

1.0.2 AMERICAN CONCRETE INSTITUTE (ACI):

ACI 315	DETAILS AND DETAILING OF CONCRETE REINFORCEMENT
ACI 315R	MANUAL OF ENGINEERING AND PLACING DRAWINGS FOR REINFORCED CONCRETE STRUCTURES
ACI 318	BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE AND COMMENTARY

1.0.3 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

A 185	SPECIFICATION FOR STEEL WELDED WIRE, FABRIC, PLAIN, FOR CONCRETE REINFORCEMENT
A 615	SPECIFICATION FOR DEFORMED AND PLAIN BILLET-STEEL BARS FOR CONCRETE REINFORCEMENT

1.3 DELIVERY, STORAGE, AND HANDLING OF MATERIALS

1.0.4 DELIVERY: DELIVER REINFORCEMENT TO THE JOB SITE BUNDLED, TAGGED, AND MARKED. USE METAL TAGS INDICATING BAR SIZE, LENGTHS, AND OTHER INFORMATION CORRESPONDING TO MARKINGS SHOWN ON SHOP DRAWINGS.

1.0.5 STORAGE: STORE REINFORCEMENT AT THE JOB SITE IN A MANNER TO PREVENT DAMAGE AND ACCUMULATION OF DIRT AND EXCESSIVE RUST.

PART 2 - PRODUCTS

2.1 MATERIALS

2.0.1 REINFORCING BARS SHALL BE DEFORMED BARS CONFORMING TO ASTM A 615, GRADE 60, WITH A MINIMUM ULTIMATE TENSILE STRENGTH OF 60,000 DEFORMED.

2.0.2 WELDED WIRE FABRIC SHALL CONFORM TO ASTM A497, WITH A MINIMUM ULTIMATE TENSILE STRENGTH OF 70,000 PSI DEFORMED.

2.0.3 BAR SUPPORT AND ACCESSORIES SHALL BE GALVANIZED, PLASTIC COATED, OR RUBBER TIPPED AND SHALL CONFORM TO ACI 315.

2.0.4 WIRE FOR TYING REINFORCEMENT IN PLACE SHALL BE NO. 16 AWG OR HEAVIER BLACK SOFT-ANNEALED WIRE.

2.2 FABRICATION

2.0.5 FABRICATE REINFORCEMENT ONLY AFTER SHOP DRAWINGS HAVE BEEN RETURNED MARKED "REVIEWED".

2.0.6 BEND REINFORCING STEEL COLD, AND DO NOT STRAIGHTEN OR REBEND IN A MANNER, WHICH WILL DAMAGE THE MATERIAL.

2.0.7 SPLICES:

A) PROVIDE STANDARD REINFORCEMENT SPLICES BY LAPPING ENDS, PLACING BARS IN CONTACT, AND TIGHTLY WIRE TYING FOR THE FULL LENGTH OF THE SPLICE.

B) ADJACENT SPLICES SHALL BE STAGGERED WHENEVER POSSIBLE.

C) MECHANICAL SPLICES SHALL DEVELOP 125 PERCENT OF THE SPECIFIED YIELD STRENGTH OF THE REINFORCING STEEL.

END OF SECTION

SECTION 032500

READY-MIXED CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

1.0.1 THIS SECTION SPECIFIES REQUIREMENTS FOR PROCUREMENT AND DELIVERY OF READY-MIXED CONCRETE AS SHOWN ON THE DRAWINGS AND AS SPECIFIED HEREIN.

1.2 REFERENCES

1.0.2 WHERE THE LANGUAGE IN ANY OF THE DOCUMENTS REFERRED TO HEREIN IS IN THE FORM OF A RECOMMENDATION OR SUGGESTION, SUCH RECOMMENDATIONS OR SUGGESTIONS SHALL BE DEEMED TO BE MANDATORY FOR THIS SECTION.

1.0.3 AMERICAN CONCRETE INSTITUTE (ACI):

ACI 211.1	STANDARD PRACTICE FOR SELECTING PROPORTIONS FOR NORMAL, HEAVYWEIGHT, AND MASS CONCRETE
ACI 214	RECOMMENDED PRACTICE FOR EVALUATION OF STRENGTH TEST RESULTS OF CONCRETE
ACI 301	SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS
ACI 304R	GUIDE FOR MEASURING, MIXING, TRANSPORTING, AND PLACING CONCRETE
ACI 305R	HOT WEATHER
CONCRETING ACI 306R	COLD WEATHER
CONCRETING	
ACI 318	BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE

1.0.4 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

C31	TEST METHOD OF MAKING AND CURING CONCRETE TEST SPECIMENS IN THE FIELD
C33	SPECIFICATION FOR CONCRETE AGGREGATES

C39	TEST METHOD FOR COMPRESSIVE STRENGTH OF CYLINDRICAL CONCRETE SPECIMENS
C42	TEST METHOD FOR OBTAINING AND TESTING DRILLED CORES AND SAWED BEAMS OF CONCRETE
C 94	SPECIFICATIONS FOR READY-MIXED CONCRETE
C138	TEST METHOD FOR UNIT WEIGHT, YIELD, AND AIR CONTENT (GRAVIMETRIC) OF CONCRETE
C143	TEST METHOD FOR SLUMP OF HYDRAULIC CEMENT
CONCRETE C150	SPECIFICATION FOR PORTLAND CEMENT
C172	PRACTICE FOR SAMPLING FRESHLY MIXED CONCRETE
C231	TEST METHOD FOR AIR CONTENT OF FRESHLY MIXED CONCRETE BY THE PRESSURE METHOD
C260	SPECIFICATION FOR AIR-ENTRAINING ADMIXTURES FOR
CONCRETE C289	TEST METHOD FOR POTENTIAL REACTIVITY OF
AGGREGATES (CHEMICAL	METHOD)
C494	SPECIFICATION FOR CHEMICAL ADMIXTURES FOR CONCRETE

1.0.5 CALIFORNIA BUILDING CODE (CBC)

PART 1 - PRODUCTS

1.1 MATERIALS

1.0.1 USE ONLY APPROVED MATERIALS CONFORMING TO THE REQUIREMENTS OF THE DRAWINGS AND THIS SECTION IN THE WORK. THEY MAY BE SUBJECT TO INSPECTION AND TESTS AT ANY TIME DURING THE PROGRESS OF THEIR PREPARATION OR USE. REPRESENTATIVE PRELIMINARY SAMPLES OF THE MATERIALS SHALL BE SUBMITTED WHEN REQUIRED FOR EXAMINATION AND TEST. MATERIALS SHALL BE STORED AND HANDLED TO ENSURE THE PRESERVATION OF THEIR QUALITY AND FITNESS FOR USE AND SHALL BE LOCATED TO FACILITATE PROMPT INSPECTION. ALL EQUIPMENT FOR HANDLING AND TRANSPORTING MATERIALS AND CONCRETE SHALL BE CLEAN BEFORE ANY MATERIAL OR CONCRETE IS PLACED THEREIN.

1.0.2 AGGREGATES:

A) GENERAL: USE AGGREGATES CONFORMING TO THE REQUIREMENTS OF ASTM C33. COARSE AGGREGATES FOR CONCRETE SHALL BE UNIFORMLY GRADED WITHIN THE NOMINAL SIZES SPECIFIED. COARSE AGGREGATES SHALL TEST INNOCUOUS FOR POTENTIAL REACTIVITY, IN ACCORDANCE WITH ASTM C289.

B) AGGREGATE SIZES:

1) USE MAXIMUM SIZE COARSE AGGREGATE SPECIFIED HEREINAFTER, BUT NOT LARGER THAN ONE-FIFTH OF THE NARROWEST DIMENSION BETWEEN SIDES OF FORMS, ONE-THIRD OF THE DEPTH OF NEITHER SLABS, NOR THREE-FOURTHS OF THE MINIMUM CLEAR SPACING BETWEEN INDIVIDUAL REINFORCING BARS OR BUNDLES OF BARS.

2) PEA GRAVEL MAY BE USED AS COARSE AGGREGATE IN AREAS OF REINFORCEMENT CONGESTION UPON PRIOR APPROVAL OF THE OWNER.

C) STORAGE: STOCKPILE THE AGGREGATES IN A MANNER TO PROTECT FROM CONTAMINATION.

1.0.3 CEMENT: USE PORTLAND CEMENT CONFORMING TO THE REQUIREMENTS OF ASTM C150 TYPE II.

1.0.4 WATER: USE POTABLE WATER FOR MIXING CONCRETE.

1.0.5 ADMIXTURES:

A) USE AN AIR-ENTRAINING AGENT IN ALL CONCRETE, CONFORMING TO ASTM C260.

B) USE OTHER ADMIXTURES CONFORMING TO ASTM C494.

C) DO NOT USE ADMIXTURES CONTAINING CALCIUM CHLORIDE.

1.2 BATCHING, MIXING, AND DELIVERY

1.0.6 PROPORTIONING AND MIXING:

A) GENERAL: PROPORTION AND MIX CONCRETE MATERIALS FOR THE SPECIFIED STRENGTH IN CONFORMANCE WITH ACI 211.1 AND ACI 318, UNLESS OTHERWISE SPECIFIED HEREIN.

A) CONCRETE MIX:

1) PROVIDE READY-MIXED CONCRETE CONFORMING TO ASTM C 94, THE REQUIREMENTS SHOWN ON THE DRAWINGS, AND AS SPECIFIED HEREIN.

2) MAXIMUM SIZE COARSE AGGREGATE AND MAXIMUM SLUMP, SHALL BE AS FOLLOWS:

TYPE	CONCRETE ELEMENT	MAX. SIZE COARSE AGGREGATE (INCH)	STRENGTH FC' (PSI)	MAX. SLUMP (INCH)
A	LEAN CONCRETE FILL	1-1/2	2,000	5
B1	COLUMNS, BEAMS AND WALLS	3/4	4,000	4
B2	FOOTINGS AND SLAB- ON-GRADE	½" TO ¾"	3,000	3-1/2"

B) PROPORTIONS AND MIXTURES:

1) PROPORTIONING MIXTURES AND PRODUCTION OF CONCRETE SHALL BE IN ACCORDANCE WITH ACI 211.1 AND ACI 301 AND SHALL BE IN ACCORDANCE WITH MIX DESIGNS SUBMITTED BY AN ACCREDITED LABORATORY.

C) CONCRETE SHALL HAVE 4.5 PERCENT PLUS OR MINUS ONE PERCENT AIR ENTRAINMENT.

1.0.2 CONSISTENCY: THE CONSISTENCY SHALL BE UNIFORMLY MAINTAINED WITHIN THE ALLOWABLE RANGE OF SLUMP FOR THE JOB MATERIALS.

1.0.3 MIXING AND DELIVERY:

A) CONCRETE SHALL BE PLANTED MIXED AND DELIVERED IN ACCORDANCE WITH THE REQUIREMENTS OF ASTM C94. MIXING TIME REQUIREMENTS IN THE ASTM C94 SHALL BE OBSERVED.

B) READY-MIXED CONCRETE SHALL BE TRANSPORTED TO THE SITE IN WATERTIGHT AGITATOR OR MIXER TRUCKS LOADED NOT IN EXCESS OF RATED CAPACITIES. DISCHARGE AT THE SITE SHALL BE WITHIN 1-1/2 HOURS AFTER CEMENT WAS FIRST INTRODUCED INTO THE MIX. CENTRAL MIXED CONCRETE SHALL BE PLANT MIXED A MINIMUM OF FIVE MINUTES. AGITATION SHALL BEGIN IMMEDIATELY AFTER THE PREMIXED CONCRETE IS PLACED IN THE TRUCK AND SHALL CONTINUE WITHOUT INTERRUPTION UNTIL DISCHARGED.

1.0.4 MIXING CONDITIONS:

A) CONCRETE SHALL NOT BE MIXED WHILE THE AIR TEMPERATURE IS BELOW 40 DEGREES F, WITHOUT PERMISSION OF THE OWNER. IF PERMISSION IS GRANTED FOR MIXING UNDER SUCH CONDITIONS, AGGREGATES OR WATER, OR BOTH, SHALL BE HEATED AND THE CONCRETE SHALL BE PLACED AT A TEMPERATURE NOT LESS THAN 50 DEGREES NORMORE THAN 90 DEGREES FAHRENHEIT. CRUSHED ICE CAN BE USED AS PART OR ALL OF THE ADDED MIXING WATER IN HOT WEATHER CONDITION (AS DEFINED IN ACI 305R).
IN HOT OR COLD WEATHER, MIXING SHALL COMPLY WITH THE RECOMMENDATIONS OF ACI 305R OR ACI 306R. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ANY DEFECTIVE WORK, RESULTING FROM FREEZING OR INJURY IN ANY MANNER DURING MIXING, AND SHALL REPLACE SUCH DEFECTIVE WORK.

B) RETEMPERING OF CONCRETE BY ADDING WATER OR ANY OTHER MATERIAL SHALL NOT BE PERMITTED.

A) THE DELIVERY OF CONCRETE TO THE JOBSITE SHALL BE IN SUCH A MANNER THAT BATCHES OF CONCRETE WILL BE DEPOSITED AT UNINTERRUPTED INTERVALS.

PART 2 - EXECUTION

2.1 INSPECTION AT THE CONCRETE PLANT

1.0.1 ROUTINE INSPECTION AND TESTS WILL BE PERFORMED BY OTHERS AS DEEMED NECESSARY, DURING THE COURSE OF PERFORMANCE OF THE WORK COVERED BY THIS SECTION, ON THE PRODUCTION FACILITIES, EQUIPMENT, PROPOSED MATERIALS, MIX DESIGNS, AND THE RESULTING CONCRETE, TO EVALUATE THEIR COMPLIANCE WITH THIS SECTION.

1.0.2 INSPECTION OF PRODUCTION FACILITIES AND EQUIPMENT, AND TESTING AND EVALUATION OF MATERIALS AND MIX DESIGNS, WILL BE IN ACCORDANCE WITH THE APPLICABLE STANDARDS REFERENCED HEREIN.

1.0.3 PRODUCTION FACILITIES, EQUIPMENT, MATERIALS, AND MIX DESIGNS, WHICH FAIL TO MEET THE REQUIREMENTS OF THIS SECTION, SHALL NOT BE USED.

1.0.4 APPROVAL OF PRODUCTION FACILITIES, EQUIPMENT, MATERIALS, AND MIX DESIGNS SHALL NOT PROVIDE RELIEF FROM THE REQUIREMENT TO FURNISH AND DELIVER READY-MIXED CONCRETE OF THE REQUIRED STRENGTHS IN ACCORDANCE WITH THIS SECTION.

2.2 FIELD QUALITY CONTROL

1.0.5 GENERAL: CONCRETE SHALL BE SAMPLED IN ACCORDANCE WITH ASTM C172.

1.0.6 AIR CONTENT: AIR CONTENT SHALL BE DETERMINED ONCE FOR EVERY 30 CUBIC YARDS OF CONCRETE PLACED, BUT NOT LESS THAN ONCE PER DAY, IN ACCORDANCE WITH ASTM C231.

1.0.7 SLUMP: SLUMP SHALL BE DETERMINED ONCE FOR EVERY 30 CUBIC YARDS OF CONCRETE PLACED, BUT NOT LESS THAN ONCE PER DAY, IN ACCORDANCE WITH ASTM C143.

1.0.8 STRENGTH TESTS:

A) GENERAL: THE STRENGTHS SPECIFIED, AND THE DESIGN MIX WILL BE VERIFIED BY THE TESTING LABORATORY SELECTED BY THE CONTRACTOR, DURING PLACEMENT OF CONCRETE, BY TESTING STANDARD CYLINDERS OF SAMPLES TAKEN AT THE JOB SITE. THE CONTRACTOR SHALL FURNISH THE NECESSARY LABOR, MATERIALS, AND FACILITIES FOR

MOLDING THE SAMPLES, HANDLING, AND STORING THE CYLINDERS AT THE SITE OF THE WORK IN ACCORDANCE WITH CBC SECTION 1905.6. FOR THE FIRST 24 HOURS AFTER MOLDING, THE CYLINDERS SHALL BE KEPT MOIST IN A STORAGE BOX, CONSTRUCTED AND LOCATED SO THAT ITS INTERIOR AIR TEMPERATURE WILL BE BETWEEN 60 DEGREES F AND 80 DEGREES F. THE INSPECTOR SHALL TRANSPORT THE CYLINDERS AT THE END OF 24 HOURS TO THE LABORATORY.

B) TESTS: SPECIMENS WILL BE TESTED FOR COMPRESSIVE STRENGTH IN ACCORDANCE WITH CBC SECTION 1905.6.

A) TEST RESULTS: THE 28-DAY TEST RESULTS WILL BE EVALUATED IN ACCORDANCE WITH ACI 214. THE AVERAGE OF THREE CONSECUTIVE STRENGTH TEST RESULTS SHALL BE EQUAL TO OR EXCEED THE SPECIFIED STRENGTH, AND NO INDIVIDUAL STRENGTH TEST RESULT SHALL BE LESS THAN THE SPECIFIED STRENGTH BY MORE THAN 500 PSI. THE LABORATORY WILL TABULATE ALL TEST RESULTS AND SUBMIT AN INSPECTION REPORT TO THE OWNER. IF THE FOREGOING CRITERIA ARE NOT MET, CORE SAMPLES SHALL BE TAKEN AND TESTED. IN SUCH AN EVENT, THREE CORE SAMPLES FOR EACH CYLINDER TEST INDICATING DEFECTIVE CONCRETE SHALL BE TAKEN FOR FURTHER TESTING. SAMPLING, TESTING, AND EVALUATION OF DRILLED CORES SHALL BE IN ACCORDANCE WITH CBC SECTION 1905.6.4. CONCRETE WHICH IS DETERMINED TO BE DEFECTIVE BASED ON THE STRENGTH ACCEPTANCE CRITERIA THEREIN SHALL BE REMOVED AND REPLACED WITH ACCEPTABLE CONCRETE.

END OF SECTION

SECTION 032700

ANCHORS AND EMBEDDED METALS

PART 1 - GENERAL

1.1 DESCRIPTION

1.0.1 THE WORK INCLUDES FURNISHING AND INSTALLING ALL ANCHORS COMPLETE WITH WASHERS AND NUTS, EMBEDDED METAL AND ASSOCIATED ITEMS REQUIRED AND/OR INDICATED ON THE DRAWINGS. THE WORK ALSO INCLUDES INSTALLING REINFORCING STEEL INTO EXISTING CONCRETE.

1.2 RELATED SECTIONS

A) SECTION 03100: CONCRETE FORMWORK

B) SECTION 03200: CONCRETE REINFORCEMENT

C) SECTION 03300: CAST-IN-PLACE CONCRETE

D) SECTION 03600: GROUT

1.3 QUALITY ASSURANCE

1.0.2 THE CONTRACTOR SHALL ESTABLISH AND MAINTAIN AN EFFECTIVE QUALITY ASSURANCE PROGRAM, QUALITY ASSURANCE RECORDS AND VERIFICATION DOCUMENTS TO ASSURE THAT ALL MATERIALS AND WORKMANSHIP FURNISHED HEREUNDER SHALL BE IN COMPLIANCE WITH THE FOLLOWING REQUIREMENTS:

1.0.3 QUALIFICATIONS OF CONTRACTOR: THE CONTRACTOR SHALL BE FAMILIAR WITH MATERIALS AND METHODS REGARDING ANCHORS AND EMBEDDED METALS AND SHALL PERFORM ALL WORK IN A MANNER THAT WILL BEST INCORPORATE THE MOST MODERN MATERIALS AND METHODS.

1.0.4 QUALIFICATIONS OF WORKMEN: THE CONTRACTOR SHALL 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 FAMILIAR WITH ANCHORS AND EMBEDDED METALS AND THE REQUIREMENTS THEREOF, AND WHO SHALL DIRECT ALL WORK PERFORMED UNDER THIS SECTION. ALL WORKERS EMPLOYED BY THE CONTRACTOR SHALL BE SKILLED IN PERFORMING TASKS RELATED TO ANCHOR BOLTS AND EMBEDDED METALS.

1.0.5 IN ADDITION TO COMPLYING WITH ALL PERTINENT LOCAL CODES AND REGULATIONS, COMPLY WITH ALL PERTINENT RECOMMENDATIONS CONTAINED IN THE MOST CURRENT EDITION OF THE FOLLOWING PUBLICATIONS:

A) AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI):

1) B1.1 - STANDARDS FOR UNIFIED INCH SCREW THREADS

2) B27.2 - MILD STEEL FLAT WASHERS

B) AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) INCLUDING, BUT NOT LIMITED TO:

1) A 36 - SPECIFICATION FOR STRUCTURAL STEEL

2) A 108- - SPECIFICATION FOR STEEL BARS, CARBON, COLD-FINISHED, STANDARD QUALITY

3) A 123 - SPECIFICATION FOR ZINC (HOT-DIPPED GALVANIZED) COATINGS ON IRON AND STEEL PRODUCTS

4) A 153 - SPECIFICATION FOR ZINC COATING (HOT DIP) ON IRON AND STEEL HARDWARE

5) A 307 - SPECIFICATION FOR CARBON STEEL BOLTS AND STUDS, 60,000 PSI TENSILE STRENGTH

6) A 325 - SPECIFICATION FOR STRUCTURAL BOLTS, STEEL, HEAT TREATED, 120/105 KSI MINIMUM TENSILE STRENGTH

7) A 563 - SPECIFICATION FOR CARBON AND STEEL ALLOY NUTS

8) B 633 – SPECIFICATION FOR ELECTRODEPOSITED COATINGS OF ZINC ON IRON AND STEEL

C) AMERICAN WELDING SOCIETY (AWS):

1) D1.1 - STRUCTURAL WELDING CODE, STEEL

D) CALIFORNIA BUILDING CODE (CBC)

E) INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO)

F) WHERE THE PROVISIONS OF PERTINENT CODES AND STANDARDS CONFLICT WITH THIS SECTION, THE MORE STRINGENT PROVISIONS, AS DETERMINED BY THE OWNER, SHALL APPLY.

1.0.2 INSPECTIONS AND TESTS: THE OWNER WILL EMPLOY A TESTING LABORATORY TO PERFORM INSPECTIONS AND TESTS ON ALL ADHESIVE AND EXPANSION ANCHORS TO ENSURE THAT ALL SPECIFIED REQUIREMENTS HAVE BEEN FULFILLED.

IF ANY OF THE TESTED ANCHORS ARE PULLED OUT, OR GROUT YIELDS, OR CRACKS ARE NOTICED NEAR CONCRETE SURROUNDING THE ANCHOR, THE OWNER WILL RANDOMLY SELECT 10 ADDITIONAL ANCHORS TO BE TESTED TO THE SAME CRITERIA AS THE ORIGINAL 10 TEST ANCHORS. IF ANY OF THESE ADDITIONAL TESTED ANCHORS ARE PULLED OUT, OR GROUT YIELDS OR CRACKS ARE NOTICED NEAR THE CONCRETE SURROUNDING THE ANCHOR, ALL ANCHORS ON THE PROJECT WILL BE SUBJECTED TO THE SAME TEST PROGRAMS AS THE TEST ANCHORS. THE COST FOR THIS ADDITIONAL TESTING AND FOR REPLACING ANY FAILED ANCHORS SHALL BE INCURRED BY THE CONTRACTOR.

1.1 SUBSTITUTIONS

1.0.3 SUBSTITUTIONS IN MATERIALS, EQUIPMENT OR METHODS SHALL NOT BE MADE UNLESS SUCH SUBSTITUTIONS HAVE BEEN SPECIFICALLY APPROVED IN WRITING BY THE OWNER.

1.0.4 REQUESTS FOR SUBSTITUTIONS SHALL BE ACCOMPANIED BY PERTINENT DATA, INCLUDING COST AND DELIVERY INFORMATION. NO SUBSTITUTIONS WILL BE APPROVED UNLESS DOCUMENTATION IS PROVIDED VERIFYING THAT THE PROPOSED CHANGE IS EQUAL OR BETTER IN ALL RESPECTS TO THE ITEM OR METHOD SPECIFIED.

1.2 PRODUCT HANDLING

1.0.5 PROTECTION: THE CONTRACTOR SHALL USE ALL MEANS NECESSARY TO PROTECT ANCHORS AND EMBEDDED METALS BEFORE, DURING AND AFTER INSTALLATION AND TO PROTECT THE INSTALLED WORK AND MATERIALS OF ALL OTHER TRADES.

1.0.6 STORAGE: THE CONTRACTOR SHALL STORE THE MATERIALS OF THIS SECTION IN A MANNER TO PREVENT EXCESSIVE RUSTING AND FOULING OF DIRT, GREASE AND OTHER BOND-BREAKING COATINGS.

PART 2 - PRODUCTS

2.1 ANCHOR BOLTS

1.0.1 ALL ANCHOR BOLTS SHALL BE NEW, FREE FROM RUST AND SHALL COMPLY WITH ASTM A 325, TYPE 3, OR ASTM A 307 UNLESS NOTED OTHERWISE ON THE DRAWINGS.

1.0.2 ANCHOR BOLTS, NUTS AND WASHERS SHALL BE HOT-DIPPED GALVANIZED. GALVANIZING SHALL BE DONE AFTER BENDING AND SHALL CONFORM TO ASTM A 153, CLASS C.

1.0.3 ANCHOR BOLTS SHALL BE SUPPLIED WITH COARSE, UNC THREADS ACCORDING TO ANSI B1.1. ANCHOR BOLTS SHALL BE SHIPPED WITH NUTS AND WASHERS INSTALLED.

1.0.1 NUTS FOR ANCHOR BOLTS SHALL BE HEAVY HEX GRADE A CONFORMING TO ASTM A 563. NUTS SHALL BE OVER TAPPED TO CLASS 2A FIT BEFORE GALVANIZING.

1.0.2 WASHERS SHALL BE MILD STEEL FLAT WASHERS CONFORMING TO ANSI B-27.2 OR PLAIN HARDENED WASHERS CONFORMING TO ASTM F436, GALVANIZED.

2.2 EMBEDDED METAL

1.0.3 ALL EMBEDDED METALS SHALL BE NEW, FREE FROM RUST AND SHALL COMPLY WITH ASTM
A 36, UNLESS OTHERWISE NOTED. GALVANIZED WHEN EXPOSED TO WEATHER. BLOCK OUT GALVANIZING WHERE FIELD WELDING IS TO OCCUR.

1.0.4 WELDED CONCRETE ANCHORS AND SHEAR STUDS SHALL COMPLY WITH SECTION 7.2 IN AWS D1.1, USING MATERIAL IN ACCORDANCE WITH ASTM A 108, GRADE 1010 OR 1020, SEMI-KILLED OR FULLY KILLED DEOXIDIZATION.

1.0.5 EMBEDDED METAL, NOT EXPOSED, NEED NOT BE PAINTED OR GALVANIZED.

1.0.6 EXPOSED EMBEDDED METAL, EXCEPT CAST IRON AND NON-FERROUS MATERIALS, SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A 123.

2.3 EXPANSION ANCHORS

1.0.7 UNLESS OTHERWISE INDICATED ON THE DRAWINGS, EXPANSION ANCHORS SHALL BE HILTI PRODUCT AS MANUFACTURED BY HILTI CORP. TULSA, OKLAHOMA OR ICBO APPROVED EQUIVALENT ACCEPTABLE TO THE OWNER. EXPANSION ANCHORS SHALL BE FURNISHED COMPLETE WITH NUTS AND WASHERS AND SHALL BE ZINC PLATED IN ACCORDANCE WITH ASTM B633.

2.4 OTHER MATERIALS

1.0.8 ALL OTHER MATERIALS, NOT SPECIFICALLY DESCRIBED, BUT REQUIRED FOR A COMPLETE AND PROPER INSTALLATION OF ANCHOR BOLTS AND EMBEDDED METALS, SHALL BE AS SELECTED BY THE CONTRACTOR SUBJECT TO ACCEPTANCE OF THE OWNER.

PART 3 - EXECUTION

3.1 JOB CONDITIONS

1.0.1 INSPECTIONS

A) PRIOR TO ALL WORK OF THIS SECTION, THE CONTRACTOR SHALL CAREFULLY INSPECT THE INSTALLED WORK OF ALL OTHER TRADES AND VERIFY THAT ALL SUCH WORK IS COMPLETE TO THE POINT WHERE THIS WORK MAY PROPERLY COMMENCE.

B) THE CONTRACTOR SHALL VERIFY THAT ANCHORS AND EMBEDDED METALS SHALL BE INSTALLED IN STRICT CONFORMANCE WITH ALL PERTINENT CODES AND REGULATIONS, THE REVIEWED SHOP DRAWINGS, AND THE ORIGINAL DESIGN.

A) PRIOR TO PLACING CONCRETE AND AFTER ALL ANCHOR BOLTS AND EMBEDDED METALS ARE INSTALLED, THE CONTRACTOR SHALL REVIEW FINAL PLACEMENT WITH THE OWNER. THIS DOES NOT RELIEVE THE CONTRACTOR OF HIS RESPONSIBILITY TO INSTALL ALL ANCHORS AND EMBEDDED METALS PER DESIGN DRAWINGS AND SPECIFICATIONS.

1.0.2 DISCREPANCIES

A) IN THE EVENT OF DISCREPANCY, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE OWNER.

B) THE CONTRACTOR SHALL NOT PROCEED WITH THIS WORK IN AREAS OF DISCREPANCY UNTIL ALL SUCH DISCREPANCIES HAVE BEEN FULLY RESOLVED.

3.2 ANCHOR BOLTS

1.0.3 THE CONTRACTOR SHALL ACCURATELY PLACE ANCHOR BOLTS TO THE DIMENSIONS SHOWN ON THE DRAWINGS. ANCHOR BOLTS SHALL BE POSITIVELY SECURED AND SUPPORTED PRIOR TO PLACING CONCRETE. WELDING WILL NOT BE PERMITTED.

1.0.4 BEFORE PLACING CONCRETE, THE CONTRACTOR SHALL GREASE THE THREADED PORTIONS OF BOLTS THAT PROJECT ABOVE THE CONCRETE SURFACE.

1.0.5 BEFORE PLACING CONCRETE, THE CONTRACTOR SHALL ENSURE THAT THE EMBEDDED PORTIONS OF ANCHOR BOLTS ARE FREE FROM GREASE, OIL OR OTHER MATERIALS THAT WOULD ADVERSELY AFFECT THE BOND WITH CONCRETE.

1.0.6 DURING COLD WEATHER, THE CONTRACTOR SHALL PROVIDE PROTECTION AGAINST TRAPPED WATER FREEZING IN ANCHOR BOLT SLEEVES.

3.3 EMBEDDED METAL

1.0.7 EMBEDDED METALS SHALL BE SHOP-FABRICATED TO THE GREATEST EXTENT POSSIBLE.

1.0.8 ALL CONCRETE ANCHORS AND SHEAR STUDS SHALL BE FULL PENETRATION WELDED IN ACCORDANCE WITH AWS D1.1.

1.0.9 THE CONTRACTOR SHALL SECURE AND INSTALL ALL EMBEDDED METALS IN PROPER LOCATIONS BEFORE CONCRETE IS PLACED.

3.4 DEFECTIVE WORK

1.0.10 ANCHOR BOLTS INSTALLED INCORRECTLY MUST BE REPORTED TO THE OWNER IMMEDIATELY AFTER THE ERROR IS DISCOVERED. RESOLUTION OF THE DISCREPANCY SHALL BE AS DIRECTED BY THE OWNER.

1.0.11 ANCHORS AND EMBEDDED METALS INSTALLED BY THE CONTRACTOR WHICH ARE NOT LOCATED AND COORDINATED WITH THE NEXT TRADES WORK OR ARE OUT OF ALIGNMENT SHALL BE REMOVED FROM THE WORK AND REPLACED BY THE CONTRACTOR.

END OF SECTION

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

1.0.1 THIS SECTION SPECIFIES REQUIREMENTS FOR PLACEMENT AND CURING OF REINFORCED CONCRETE AS SHOWN ON THE DRAWINGS AND AS SPECIFIED HEREIN.

1.2 RELATED SECTIONS

A) SECTION 03100: CONCRETE FORMWORK

B) SECTION 03200: CONCRETE REINFORCEMENT

C) SECTION 03250: READY-MIXED CONCRETE

D) SECTION 03270: ANCHORS AND EMBEDDED METALS

E) SECTION 03600: GROUT

1.3 REFERENCES

1.0.2 WHERE THE LANGUAGE IN ANY OF THE DOCUMENTS REFERRED TO HEREIN IS IN THE FORM OF A RECOMMENDATION OR SUGGESTION, SUCH RECOMMENDATIONS OR SUGGESTIONS SHALL BE DEEMED TO BE MANDATORY FOR THIS SECTION.

1.0.3 AMERICAN CONCRETE INSTITUTE (ACI):

ACI 117 STANDARD TOLERANCES FOR CONCRETE CONSTRUCTION

AND MATERIALS ACI 301 SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR

BUILDINGS

ACI 304R GUIDE FOR MEASURING, MIXING, TRANSPORTING, AND PLACING CONCRETE

ACI 305R HOT WEATHER

CONCRETING ACI 306R COLD WEATHER

CONCRETING

ACI 308 STANDARD PRACTICE FOR CURING CONCRETE

ACI 318 BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE

1.3.3 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

	SPECIFICATION FOR READY-MIXED CONCRETE
C94	SPECIFICATION FOR SHEET MATERIALS FOR
C171	CURING CONCRETE
C309	SPECIFICATION FOR LIQUID MEMBRANE-FORMING COMPOUNDS FOR CURING CONCRETE
D1751	SPECIFICATION FOR PREFORMED EXPANSION JOINT FILLERS FOR CONCRETE PAVING AND STRUCTURAL CONSTRUCTION (NONEXTRUDING AND RESILIENT BITUMINOUS TYPES)

1.3.4 FEDERAL SPECIFICATIONS (FED.SPEC.):

TT-S-00230	SEALING COMPOUND: ELASTOMERIC TYPE, SINGLE COMPONENT (FOR CAULKING, SEALING, AND GLAZING IN BUILDINGS AND OTHER STRUCTURES)

1.3.5 CALIFORNIA BUILDING CODE (CBC)

PART 2 - PRODUCTS

2.1 MATERIALS

2.0.1 USE ONLY APPROVED MATERIALS CONFORMING TO THE REQUIREMENTS OF THE DRAWINGS AND THIS SECTION IN THE WORK. THEY MAY BE SUBJECT TO INSPECTION AND TESTS AT ANY TIME DURING THE PROGRESS OF THEIR PREPARATION OR USE. REPRESENTATIVE PRELIMINARY SAMPLES OF THE MATERIALS SHALL BE SUBMITTED WHEN REQUIRED FOR EXAMINATION AND TEST. MATERIALS SHALL BE STORED AND HANDLED TO ENSURE THE PRESERVATION OF THEIR QUALITY AND FITNESS FOR USE AND SHALL BE LOCATED TO FACILITATE PROMPT INSPECTION. ALL EQUIPMENT FOR HANDLING AND TRANSPORTING MATERIALS AND CONCRETE SHALL BE CLEAN BEFORE ANY MATERIAL OR CONCRETE IS PLACED THEREIN.

2.0.2 CURING MATERIALS:

A) USE CURING MATERIALS CONFORMING TO ONE OF THE FOLLOWING SPECIFICATIONS:

1) SHEET MATERIALS FOR CURING CONCRETE, ASTM C171.

2) CURING MEMBRANES: ASTM C309, TYPE 1, W.R. MEADOWS "CS-309", SIKA "SIKAGARD CURE-SEAL", TOCH BROS. "ACRI-SEAL", OR APPROVED EQUAL.

2.0.3 COMPRESSIBLE FILLER: ALL OPEN JOINTS BETWEEN ABUTTING CONCRETE SURFACES SHALL BE FILLED WITH PREFORMED EXPANSION JOINT FILLER CONFORMING TO ASTM D1751.

2.0.4 JOINT SEALANT: SEALING COMPOUND SHALL BE ONE-PART, GUN-GRADE, NON-SAG POLYURETHANE. SEALING COMPOUND SHALL CONFORM TO FED. SPEC. TT-S-00230, TYPE II, CLASS A. USE VULKEM 116, SIKAFLEX-LA, SONOELASTIC NP-L, OR APPROVED EQUAL.

WATERSTOP AT ENGINEERED CONSTRUCTION JOINT SHALL BE VOLCLAY WATERSTOP - RX101 BY AMERICAN COLLOID COMPANY, OR APPROVED EQUAL.

2.0.5 PREMIXED GROUT: PRE-MIXED GROUT SHALL BE FURNISHED AND INSTALLED IN ACCORDANCE WITH SECTION 03600.

2.0.6 STEEL REINFORCEMENT: STEEL REINFORCEMENT, WELDED WIRE FABRIC, WIRE FOR TYING REINFORCEMENT, AND BAR SUPPORT AND ACCESSORIES SHALL BE FURNISHED AS SPECIFIED IN SECTION 03200.

2.0.7 READY-MIXED CONCRETE: CONCRETE SHALL BE FURNISHED AS SPECIFIED IN SECTION 03250.

2.2 EXECUTION

2.3 INSPECTION

1.0.1 INSPECT AREAS IN WHICH REINFORCING MATERIALS ARE TO BE PLACED FOR DEFECTS THAT WOULD PROHIBIT THEIR SATISFACTORY INSTALLATION AND PERFORMANCE. CORRECT SUCH DEFECTS, PRIOR TO COMMENCING INSTALLATION OF REINFORCING MATERIALS.

2.1 PLACING STEEL REINFORCEMENT

1.0.2 GENERAL:

A) COMPLY WITH THE SPECIFIED STANDARDS FOR DETAILS AND METHODS OF REINFORCEMENT PLACEMENT AND SUPPORTS, AND AS HEREIN SPECIFIED. COMPLY WITH CONCRETE PROTECTIVE COVER REQUIREMENTS INDICATED ON THE DRAWINGS.

B) CLEAN REINFORCEMENT TO REMOVE LOOSE RUST AND MILL SCALE, EARTH, AND OTHER MATERIALS, WHICH WOULD REDUCE OR DESTROY BOND WITH CONCRETE.

C) POSITION, SUPPORT, AND SECURE REINFORCEMENT AGAINST DISPLACEMENT BY FORMWORK, CONSTRUCTION, OR CONCRETE PLACEMENT OPERATIONS. LOCATE AND SUPPORT REINFORCING BY METAL CHAIRS, RUNNERS, BOLSTERS, SPACERS, AND HANGERS, AS REQUIRED.

D) PLACE REINFORCEMENT TO OBTAIN THE SPECIFIED COVERAGE FOR CONCRETE PROTECTION. ARRANGE, SPACE, AND SECURELY TIE BARS AND BAR SUPPORTS TOGETHER WITH WIRE, TO HOLD REINFORCEMENT ACCURATELY IN POSITION DURING CONCRETE PLACEMENT OPERATION. SET WIRE TIES SO THAT TWISTED ENDS ARE DIRECTED AWAY FROM EXPOSED CONCRETE SURFACES.

E) INSTALL WELDED WIRE FABRIC IN AS LONG LENGTHS AS PRACTICABLE. LAP ADJOINING PIECES AT LEAST ONE FULL MESH.

F) PROVIDE SUPPORTS OF SUFFICIENT NUMBERS AND STRENGTHS TO CARRY REINFORCEMENT. DO NOT PLACE REINFORCING BARS MORE THAN 2 INCHES BEYOND THE LAST LEG OF ANY CONTINUOUS BAR SUPPORT. DO NOT USE SUPPORTS AS BASES FOR RUNWAYS FOR CONCRETE CONVEYING EQUIPMENT AND SIMILAR CONSTRUCTION LOADS.

2.2 PLACING CONCRETE

1.0.3 GENERAL:

A) CONCRETE FORMWORK SHALL SATISFY THE REQUIREMENTS AS SPECIFIED IN SECTION 03100. DO NOT PLACE CONCRETE UNTIL THE DEPTH, CHARACTER AND ADEQUACY OF FORMS, FALSEWORK, EMBEDMENTS, AND THE PLACING OF THE STEEL REINFORCEMENT HAVE BEEN CHECKED. THE METHOD AND MANNER OF PLACING THE CONCRETE SHALL BE SUCH AS TO AVOID SEGREGATION OF AGGREGATE AND DISPLACEMENT OF THE REINFORCEMENT. TROUGHS, PIPES, AND CHUTES MAY BE USED AS AIDS IN PLACING CONCRETE WHEN NECESSARY. DROPPING THE CONCRETE, MORE THAN FIVE FEET, OR DEPOSITING A LARGE QUANTITY AT ONE POINT, WILL NOT BE PERMITTED. CONCRETE SHALL BE PLACED UPON CLEAN, DAMP SURFACES, FREE FROM RUNNING WATER, OR UPON PROPERLY CONSOLIDATED SOIL.

B) RETEMPERING OF CONCRETE BY ADDING WATER OR ANY OTHER MATERIAL SHALL NOT BE PERMITTED.

C) CONCRETE PLACEMENT, FINISHING AND CURING, AND ALL OTHER PERTINENT CONSTRUCTION PRACTICES SHALL BE IN ACCORDANCE WITH ACI 301. IN ADDITION TO THE REQUIREMENTS OF ACI 301, THE FOLLOWING SHALL APPLY:

1) CONCRETE SHALL BE PLACED SO THAT A UNIFORM APPEARANCE OF SURFACES WILL BE OBTAINED.

2) CONCRETE SHALL BE PLACED AND CONSOLIDATED FREE OF ROCK POCKETS, HONEYCOMBS, AND VOIDS.

3) CONCRETE SHALL BE DEPOSITED AS NEARLY AS PRACTICABLE IN ITS FINAL POSITION, TO AVOID SEGREGATION DUE TO REHANDLING OR FLOWING, AND SHALL NOT BE SUBJECTED TO ANY PROCEDURE, WHICH WILL CAUSE SEGREGATION.

4) CONCRETE SHALL BE PLACED AND CONSOLIDATED IN WALLS IN APPROXIMATELY 18-INCH LAYERS, PROCEEDING AT A UNIFORM RATE.

5) SUBGRADE SHALL BE SLIGHTLY MOIST WHEN THE CONCRETE IS PLACED FOR FLOOR SLABS, TO PREVENT EXCESSIVE LOSS OF WATER FROM THE CONCRETE MIX.

B) PRIOR TO PLACEMENT OF CONCRETE, THE CONTRACTOR AND OWNER SHALL VERIFY WHERE ALL ANCHOR BOLTS AND EMBEDDED ITEMS SHALL BE PLACED, AND THEIR LOCATIONS VERIFIED WITH THE ENGINEERING DRAWINGS AND/OR THE CERTIFIED DRAWINGS PROVIDED BY THE EQUIPMENT MANUFACTURER. THE CONTRACTOR HAS FULL RESPONSIBILITY FOR THE PLACEMENT OF ANCHORS AND EMBEDDED METALS.

1.0.2 CONSOLIDATING:

A) CONSOLIDATE CONCRETE WITH SUITABLE MECHANICAL VIBRATORS OPERATING WITHIN CONCRETE. WHEN NECESSARY, VIBRATING SHALL BE SUPPLEMENTED BY HAND SPADING WITH SUITABLE TOOLS TO ASSURE PROPER AND ADEQUATE CONSOLIDATION. VIBRATORS SHALL BE MANIPULATED SO AS TO WORK THE CONCRETE THOROUGHLY AROUND THE REINFORCEMENT AND EMBEDDED FIXTURES AND INTO CORNERS AND ANGLES OF THE FORMS. THE VIBRATION AT ANY JOINT SHALL BE OF SUFFICIENT DURATION TO ACCOMPLISH CONSOLIDATION BUT SHALL NOT BE PROLONGED TO THE POINT WHERE SEGREGATION OCCURS.

B) EMPLOY AS MANY VIBRATORS AND TAMPERS AS NECESSARY TO SECURE THE DESIRED RESULTS. FOR EVERY TWO VIBRATORS REQUIRED FOR THE JOB, AN ADDITIONAL STANDBY VIBRATOR MUST BE KEPT ON THE SITE. DO NOT PLACE SUBSEQUENT LAYERS OF CONCRETE UNTIL THE PREVIOUS LAYER HAS BEEN CONSOLIDATED AS SPECIFIED. INTERNAL VIBRATORS SHALL HAVE A MINIMUM FREQUENCY OF 8000 VIBRATIONS PER MINUTE WHEN IMMERSED IN CONCRETE AND SHALL HAVE SUFFICIENT AMPLITUDE TO EFFECTIVELY CONSOLIDATE THE CONCRETE.

C) PREVENT THE FOLLOWING PRACTICES:

1) PUSHING OF CONCRETE WITH VIBRATOR.

2) EXTERNAL VIBRATION OF FORMS.

3) ALLOWING VIBRATOR TO VIBRATE AGAINST REINFORCING STEEL WHERE STEEL PROJECTS INTO GREEN CONCRETE.

4) ALLOWING VIBRATOR TO VIBRATE AGAINST THE CONTACT FACES OF FORMS.

1.0.1 COLD WEATHER: DO NOT PLACE CONCRETE WHEN THE AMBIENT TEMPERATURE IS BELOW 40 DEGREES FAHRENHEIT, UNLESS SPECIFICALLY AUTHORIZED BY THE OWNER. CONFORM TO THE REQUIREMENTS OF ACI 306R DURING COLD WEATHER.

1.0.2 HOT WEATHER: DO NOT PLACE CONCRETE WITH A MIX TEMPERATURE EXCEEDING
90 DEGREES F, UNLESS SPECIFICALLY AUTHORIZED BY THE OWNER. CONFORM TO THE REQUIREMENTS OF ACI 305R DURING HOT WEATHER.

1.0.3 CONSTRUCTION JOINTS:

A) WHEN THE PLACING OF CONCRETE IS SUSPENDED, NECESSARY PROVISIONS SHALL BE MADE FOR JOINING FUTURE WORK BEFORE THE PLACED CONCRETE TAKES ITS INITIAL SET. FOR THE PROPER BONDING OF OLD AND NEW CONCRETE, SUCH PROVISIONS SHALL BE MADE FOR GROOVES, STEPS, KEYS, DOVETAILS, REINFORCING BARS OR OTHER DEVICES AS MAY BE PRESCRIBED. BEFORE DEPOSITING NEW CONCRETE AGAINST CONCRETE, WHICH HAS HARDENED, THE SURFACE OF THE HARDENED CONCRETE SHALL BE CLEANED BY A HEAVY STEEL BROOM, ROUGHENED SLIGHTLY, WETTED, AND COVERED WITH A NEAT COATING OF CEMENT PASTE OR GROUT. INSTALL JOINT SEALANT WHERE SHOWN ON THE DRAWINGS, IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

B) JOINTS SHALL BE PERPENDICULAR TO THE MAIN REINFORCEMENT.

C) CONSTRUCTION JOINTS IN FLOORS SHALL BE LOCATED WITHIN THE MIDDLE THIRD OF SPANS OF SLABS, BEAMS, AND GIRDERS.

1.0.4 EXPANSION AND CONTROL JOINTS: EXPANSION AND CONTROL JOINTS SHALL BE CONSTRUCTED IN THE LOCATIONS AND TO THE DIMENSIONS AND DETAILS SHOWN ON THE DRAWINGS.

1.0.5 DEFECTIVE WORK:

A) ALL DEFECTIVE WORK DISCLOSED AFTER THE FORMS HAVE BEEN REMOVED SHALL BE IMMEDIATELY REMOVED AND REPLACED. IF DIMENSIONS ARE DEFICIENT, OR IF THE SURFACE OF THE CONCRETE IS BULGED, UNEVEN, OR SHOWS HONEYCOMB, WHICH IN THE OPINION OF THE OWNER CANNOT BE REPAIRED SATISFACTORILY, THE ENTIRE SECTION SHALL BE REMOVED AND REPLACED. OTHER WORK CONSIDERED TO BE DEFECTIVE INCLUDES, BUT IS NOT LIMITED TO, THE FOLLOWING:

B) CONCRETE IN WHICH DEFECTIVE OR INADEQUATE STEEL REINFORCEMENT HAS BEEN PLACED.

C) CONCRETE INCORRECTLY FORMED, OR NOT CONFORMING TO DETAILS AND DIMENSIONS ON THE DRAWINGS OR WITH THE INTENT OF THESE DOCUMENTS, OR THE CONCRETE SURFACES OF WHICH ARE OUT OF PLUMB OR LEVEL BEYOND SPECIFIED TOLERANCES.

D) CONCRETE BELOW SPECIFIED STRENGTH.

E) CONCRETE CONTAINING WOOD, CLOTH, OR OTHER FOREIGN MATTER, ROCK POCKETS, VOIDS, HONEYCOMBS, CRACKS, OR COLD JOINTS NOT SCHEDULED OR INDICATED ON THE DRAWINGS.

2.3 CONCRETE FINISHING

1.0.1 EXPOSED CONCRETE SURFACES SHALL BE TRUE, SMOOTH, AND FREE FROM OPEN OR ROUGH SPACES, DEPRESSIONS, OR PROJECTIONS. THE CONCRETE IN HORIZONTAL PLANE SURFACES SHALL BE BROUGHT FLUSH WITH THE FINISHED TOP SURFACE AT THE PROPER ELEVATION AND SHALL BE STRUCK OFF WITH A STRAIGHT-EDGE AND FLOATED. MORTAR FINISHING WILL NOT BE PERMITTED, NOR SHALL DRY CEMENT OR SAND-CEMENT MORTAR BE SPREAD OVER THE CONCRETE DURING THE FINISHING OF HORIZONTAL PLANE SURFACES.

1.0.2 FOLLOWING PLACEMENT OF CONCRETE FOR SLABS AND FLOORS, TAMP TO FORCE COARSE AGGREGATE AWAY FROM SURFACE, BULL FLOAT, AND STEEL TROWEL. FLOOR AREAS DESIGNATED TO RECEIVE EPOXY FLOOR COATING SHALL RECEIVE WOOD FLOAT FINISH.

1.0.3 THE FOLLOWING REQUIREMENTS SHALL GOVERN CONCRETE FINISHES SO INDICATED ON THE DRAWINGS.

A) FLOAT FINISH: FORCE COARSE AGGREGATE AWAY FROM SURFACE; FLOAT TO A SMOOTH AND EVEN SURFACE.

B) TROWEL FINISH:

1) AFTER FLOATING, BEGIN THE FIRST TROWEL FINISH OPERATION USING A
POWER-DRIVEN TROWEL: BEGIN FINAL TROWELING WHEN THE SURFACE PRODUCES A RINGING SOUND AS THE TROWEL IS MOVED OVER THE SURFACE.

2) CONSOLIDATE THE CONCRETE SURFACE BY THE FINAL HAND TROWELING OPERATION, FREE FROM TROWEL MARKS, UNIFORM IN TEXTURE AND APPEARANCE, AND WITH A SURFACE PLANE TOLERANCE NOT EXCEEDING 1/8" IN 10'-0" WHEN TESTED WITH A 10'-0" STRAIGHT-EDGE.

C) BROOM FINISH:

1) APPLY NONSLIP BROOM FINISH TO EXTERIOR CONCRETE AS SPECIFIED IMMEDIATELY AFTER TROWEL FINISHING; ROUGHEN THE CONCRETE SURFACE BY BROOMING IN THE DIRECTION PERPENDICULAR TO THE MAIN TRAFFIC ROUTE.

I) USE A FIBER BRISTLE BROOM.

II) FREQUENTLY CLEAN BROOM TO AVOID DEEP BROOMING.

D) AS-CAST FINISH:

1) ROUGH FORM FINISH: TIE HOLES AND DEFECTS SHALL BE PATCHED.

I) FINS EXCEEDING 1/4 INCH IN HEIGHT SHALL BE CHIPPED OFF OR RUBBED OFF.

II) OTHERWISE, SURFACES SHALL BE LEFT WITH THE TEXTURE IMPARTED BY THE FORMS.

1) SMOOTH FORM FINISH: THE FORM FACING MATERIAL SHALL PRODUCE A SMOOTH, HARD, UNIFORM TEXTURE ON CONCRETE.

I) THE ARRANGEMENT OF THE FACING MATERIAL SHALL BE ORDERLY AND SYMMETRICAL, AND THE NUMBER OF SEAMS KEPT TO THE PRACTICAL MINIMUM.

II) FORMS SHALL BE SUPPORTED BY STUDS OR OTHER BACKING CAPABLE OF PREVENTING EXCESSIVE DEFLECTION.

III) FORM-FACING MATERIAL WITH RAISED GRAIN, TORN SURFACES, WORN EDGES, PATCHES, DENTS, OR OTHER DEFECTS, WHICH WILL IMPAIR THE TEXTURE OF THE CONCRETE SURFACE, SHALL NOT BE USED.

2.4 CURING AND PROTECTION

1.0.2 INITIAL CURING: ALL CONCRETE SHALL BE PROPERLY CURED AND PROTECTED. MAINTAIN CONCRETE ABOVE 50 DEGREES F DURING FIRST SEVEN DAYS AFTER PLACING. THE WORK SHALL BE PROTECTED FROM THE ELEMENTS, FLOWING WATER, AND FROM DEFACEMENT OF ANY NATURE, DURING CONSTRUCTION. THE CONCRETE SHALL BE CURED AS SOON AS IT HAS SUFFICIENTLY HARDENED, BY COVERING WITH AN APPROVED MATERIAL. WATER-ABSORPTIVE COVERINGS SHALL BE THOROUGHLY SATURATED WHEN PLACED, AND KEPT SATURATED FOR A PERIOD OF AT LEAST SEVEN DAYS. CURING MATS OR BLANKETS SHALL BE SUFFICIENTLY WEIGHTED OR TIED DOWN TO KEEP THE CONCRETE SURFACE COVERED AND TO PREVENT THE SURFACE FROM BEING EXPOSED TO AIR CURRENTS. WHERE WOODEN FORMS ARE USED, THEY SHALL BE KEPT WET AT ALL TIMES UNTIL REMOVED, TO PREVENT THE OPENING OF JOINTS AND DRYING OUT OF THE CONCRETE. TRAFFIC SHALL NOT BE ALLOWED ON CONCRETE SURFACES UNTIL INITIAL CURING IS COMPLETED. MEMBRANE CURING COMPOUNDS SHALL NOT BE USED ON SURFACES TO BE PAINTED, COVERED WITH PLASTER, COVERED WITH SEALER, AND OTHER SURFACES WHICH CURING COMPOUND WOULD ADVERSELY AFFECT SUBSEQUENT CONSTRUCTION.

1.0.3 DURATION OF CURING: THE FINAL CURING SHALL CONTINUE UNTIL THE CUMULATIVE NUMBER OF DAYS OR FRACTIONS THEREOF, NOT NECESSARILY CONSECUTIVE, DURING WHICH THE TEMPERATURE OF THE AIR IN CONTACT WITH THE CONCRETE IS ABOVE 50°F, HAS TOTALED 7 DAYS BEYOND THE INITIAL CURING PERIOD.

A) IF HIGH-EARLY-STRENGTH CONCRETE HAS BEEN USED, THE FINAL CURING SHALL CONTINUE FOR A TOTAL OF 3 DAYS BEYOND THE INITIAL CURING PERIOD.

B) RAPID DRYING AT THE END OF THE CURING PERIOD SHALL BE PREVENTED.

1.0.4 FORMED SURFACES: STEEL FORMS HEATED BY THE SUN AND ALL WOOD FORMS IN CONTACT WITH THE CONCRETE DURING THE CURING PERIOD SHALL BE KEPT WET.

A) IF FORMS ARE TO BE REMOVED DURING THE CURING PERIOD, ONE OF THE ABOVE CURING MATERIALS OR METHODS SHALL BE EMPLOYED IMMEDIATELY.

B) SUCH CURING SHALL BE CONTINUED FOR THE REMAINDER OF THE CURING PERIOD.

2.1 CUTTING AND PATCHING

1.0.5 PERFORM ALL CUTTING, PATCHING, AND DRILLING AS REQUIRED BY THE WORK. PATCHING IN EXPOSED WORK SHALL MATCH THE COLOR OF THE PARENT CONCRETE. CONCRETE WORK CONTAINING ROCK POCKETS, VOIDS, HONEYCOMBS, CRACKS, OR COLD JOINTS NOT SCHEDULED OR INDICATED ON THE DRAWINGS OR REVIEWED SHOP DRAWINGS, SHALL BE CHIPPED OFF UNTIL ALL UNCONSOLIDATED MATERIAL IS REMOVED.

1.0.6 NO EXCESSIVE CUTTING WILL BE PERMITTED NOR SHALL ANY STRUCTURAL MEMBERS OR REINFORCEMENT BE CUT WITHOUT THE ADVANCE, WRITTEN APPROVAL OF THE OWNER.

END OF SECTION

SECTION 036000

GROUT

PART 1 - GENERAL

1.1 DESCRIPTION

1.0.1 THIS SECTION SPECIFICATION PROVIDES THE REQUIREMENTS FOR GROUTING ALL STRUCTURAL STEEL BASE PLATES, SOLE PLATES, MECHANICAL EQUIPMENT AND ANCHOR BOLTS.

1.2 RELATED SECTIONS

A) SECTION 03270: ANCHORS AND EMBEDDED METALS

B) SECTION 03300: CAST-IN-PLACE CONCRETE

1.3 QUALITY ASSURANCE

1.0.2 THE CONTRACTOR SHALL ESTABLISH AND MAINTAIN AN EFFECTIVE QUALITY ASSURANCE PROGRAM, QUALITY ASSURANCE RECORDS AND VERIFICATION DOCUMENTS TO ASSURE THAT ALL MATERIALS AND WORKMANSHIP FURNISHED HEREUNDER SHALL BE IN COMPLIANCE WITH THE FOLLOWING REQUIREMENTS:

A) QUALIFICATIONS OF CONTRACTOR: THE CONTRACTOR SHALL BE FAMILIAR WITH MODERN MATERIALS AND METHODS REGARDING GROUT AND SHALL BE REQUIRED TO PERFORM ALL WORK IN A MANNER THAT WILL BEST INCORPORATE THE MOST MODERN MATERIALS AND METHODS.

B) QUALIFICATIONS OF WORKMEN: THE CONTRACTOR SHALL 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 FAMILIAR WITH GROUT AND THE REQUIREMENTS THEREOF, AND WHO SHALL DIRECT ALL WORK PERFORMED UNDER THIS SECTION. ALL WORKERS EMPLOYED BY THE CONTRACTOR SHALL BE SKILLED IN PERFORMING TASKS RELATED TO GROUT.

1.4 SUBSTITUTIONS

1.0.3 SUBSTITUTIONS IN MATERIALS, EQUIPMENT OR METHODS SHALL NOT BE MADE UNLESS, SUCH SUBSTITUTIONS HAVE BEEN SPECIFICALLY APPROVED IN WRITING BY THE OWNER.

1.0.4 REQUESTS FOR SUBSTITUTIONS SHALL BE ACCOMPANIED BY PERTINENT DATA, INCLUDING COST AND DELIVERY INFORMATION. NO SUBSTITUTIONS WILL BE APPROVED UNLESS DOCUMENTATION IS PROVIDED VERIFYING THAT THE PROPOSED CHANGE IS EQUAL OR BETTER IN ALL RESPECTS TO THE ITEM OR METHOD SPECIFIED.

1.1 SUBMITTALS

1.0.5 SUBMIT PRODUCT DATA FOR GROUT IN ACCORDANCE WITH THE REQUIREMENTS OF SECTION 01300, SUBMITTALS.

1.2 PRODUCT HANDLING

1.0.6 STORAGE: AFTER DELIVERY TO THE JOB SITE, GROUT SHALL BE STORED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

1.0.7 REPLACEMENTS: THE CONTRACTOR SHALL IMMEDIATELY, AND AT NO ADDITIONAL COST TO THE OWNER, REMOVE FROM THE JOB SITE AND REPLACE ANY MATERIAL, WHICH BECOMES DAMP OR OTHERWISE DEFECTIVE.

PART 2 - PRODUCTS

2.1 FURNISH THE FOLLOWING GROUT PRODUCTS

2.0.1 CEMENTITIOUS GROUT: CEMENT-BASED, NONMETALLIC, NON-SHRINK GROUT WITH MINIMUM COMPRESSIVE STRENGTH OF 8000 PSI.

PART 3 - EXECUTION

3.1 GENERAL

3.0.1 ALL GROUTING AT STRUCTURAL AND MACHINE BASE PLATES AND SLEEVE TYPE ANCHOR BOLTS SHALL BE PERFORMED WITH CEMENTITIOUS GROUT UNLESS ANOTHER TYPE OF GROUT IS SPECIFIED BY THE EQUIPMENT VENDOR OR INDICATED ON DRAWINGS. ALL GROUT MIXING, INSTALLATION, TRIMMING, FINISHING, AND CURING SHALL BE IN STRICT COMPLIANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

3.0.2 NOT USED

3.0.3 ALL FORMS SHALL BE BUILT OF MATERIALS OF ADEQUATE STRENGTH, SECURELY ANCHORED, AND SHORED TO WITHSTAND THE FORCES DEVELOPED BY PLUNGING THE GROUT INTO PLACE. FORMS SHALL BE TIGHT AGAINST ALL SURFACES WITH JOINTS SEALED BY TAPE OR OTHER SUITABLE SEALANT. FORM OIL, HEAVY WAX OR OTHER SUITABLE RELEASE AGENT SHALL BE USED TO FACILITATE FORM REMOVAL.

3.0.4 EQUIPMENT PLATES, BASE PLATES, AND ALL OTHER GROUTED PLATES WITH A SKIRT AROUND THE PERIMETER SHALL HAVE 1/8-INCH MINIMUM DIAMETER RELIEF HOLES IN EACH CORNER. RELIEF HOLES SHALL ALSO BE PROVIDED AT EACH CORNER PRODUCED BY INTERSECTING STIFFENING MEMBERS.

3.1 SURFACE PREPARATION

3.0.5 CONCRETE:

A) THE CONCRETE ON WHICH THE GROUT WILL BEAR SHALL HAVE ATTAINED ITS DESIGN STRENGTH BEFORE GROUT IS PLACED.

B) CONCRETE SHALL BE SOUND AND ALL SURFACES TO BE IN CONTACT WITH THE GROUT SHALL BE ENTIRELY FREE OF OIL, GREASE, PAINT, LAITANCE, CURING COMPOUNDS AND OTHER DELETERIOUS SUBSTANCES.

C) THE SURFACES, IF NOT ROUGHENED DURING CASTING, SHALL BE ROUGHENED BY CHIPPING, OR BLASTING TO ENSURE BOND OF THE GROUT TO THE EXISTING CONCRETE. OTHER MEANS TO ROUGHEN SURFACES MAY BE USED UPON ACCEPTANCE BY THE OWNER.

D) PRIOR TO PLACEMENT OF CEMENT-BASED GROUT, ALL CONCRETE SURFACES SHALL BE WASHED CLEAN AND THEN SATURATED WITH WATER FOR 24 HOURS.

E) ALL FREE WATER SHALL BE REMOVED FROM CONCRETE AND BOLT HOLES IMMEDIATELY PRIOR TO GROUTING. ANY COMPRESSOR USED TO BLOW WATER OR OTHER SUBSTANCES FROM SURFACES SHALL BE EQUIPPED WITH A WORKING OIL TRAP IN THE AIRLINE TO PREVENT OIL BEING BLOWN ONTO THE SURFACE.

3.0.6 METAL:

A) ALL METAL SURFACES TO BE IN DIRECT CONTACT WITH THE GROUT SHALL BE THOROUGHLY CLEANED IMMEDIATELY BEFORE GROUTING.

3.0.7 WHEN THE MANUFACTURER'S INSTRUCTIONS ARE MORE STRINGENT OR DIFFER SUBSTANTIALLY FROM THE ABOVE SURFACE PREPARATION SPECIFICATIONS, THE MANUFACTURER'S INSTRUCTIONS SHALL BE FOLLOWED.

3.2 PLACING PREPARATION

3.0.8 STRUCTURAL STEEL: BEFORE PLACING GROUT, THE CONTRACTOR SHALL LEVEL BOTTOM OF STEEL TO ELEVATIONS SHOWN ON THE DRAWINGS AND "HARD SHIM" BASE PLATES UTILIZING LEVELING SCREWS OR ANCHOR BOLTS.

3.0.9 MECHANICAL EQUIPMENT: THE CONTRACTOR SHALL LEVEL EQUIPMENT OR MOUNTING RAILS TO ELEVATIONS SHOWN ON THE DRAWINGS AND HARD SHIM BEFORE GROUTING IN ACCORDANCE WITH THE EQUIPMENT MANUFACTURER'S RECOMMENDATIONS.

3.0.10 ANCHOR BOLTS: TO AVOID WATER COLLECTING IN THE SLEEVE, ANCHOR BOLT SLEEVES SHALL BE GROUTED BEFORE THE CONCRETE IS SATURATED WITH WATER.

3.1 PLACING REQUIREMENTS

3.0.11 VOIDS: GROUT PLACEMENT SHALL PROCEED IN A MANNER THAT ASSURES FILLING OF ALL SPACES AND FULL CONTACT OF THE GROUT WITH PREPARED SURFACES.

3.0.12 CONTINUOUS GROUTING: THE PLACEMENT OF THE GROUT SHALL BE RAPID AND CONTINUOUS SO AS TO AVOID COLD JOINTS. ALL GROUTING SHALL PROCEED FROM ONE SIDE TO THE OTHER OR FROM BOTTOM TO TOP TO AVOID TRAPPING AIR. CEMENT BASED GROUTS SHALL NOT BE PLACED IN LAYERS.

3.0.13 PLACEMENT HOLES: WHEN GROUT PLACEMENT HOLES OR STANDPIPES ARE UTILIZED, THE GROUT SHALL BE PLACED FROM ONE HOLE OR PIPE CONTINUOUSLY UNTIL THE GROUT HAS PASSED THE SECOND HOLE OR PIPE. GROUTING MAY THEN CONTINUE IN SIMILAR FASHION FROM THE SECOND HOLE OR PIPE.

3.0.14 WHEN THE MANUFACTURER'S INSTRUCTIONS ARE MORE STRINGENT OR DIFFER SUBSTANTIALLY FROM THE ABOVE PLACEMENT SPECIFICATIONS, THE MANUFACTURER'S INSTRUCTIONS, SUPERVISED BY A MANUFACTURER APPROVED FIELD REPRESENTATIVE, SHALL BE USED.

3.0.15 EQUIPMENT GROUTING: EQUIPMENT, SUCH AS PUMPS, SHALL BE GROUTED IN PLACE BY COMPLETELY FILLING ALL INTERIOR SPACES OF CAST IRON OR FABRICATED CHANNEL BEDPLATES. MOTOR RISERS SHALL NOT BE FILLED.

END OF SECTION

SECTION 054000

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Load-bearing wall framing.
   2. Exterior non-load-bearing wall framing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings:
   1. Include layout, spacing, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
   2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
   3. Manufacturers' Instructions: Erection instructions containing sequence of operations and requirements for temporary bracing.

Confirm the following with structural engineer

Confirm the following with structural engineer

1.3 INFORMATIONAL SUBMITTALS

A. Research Reports: For non-standard cold-formed steel framing, post-installed anchors and power-actuated fasteners, from ICC-ES.

1.4 QUALITY ASSURANCE

Engineer qualifications moved to Division 01, 013300.

A. Installer Qualifications: An experienced installer who has completed cold-formed metal framing 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. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code - Steel."
   2. AWS D1.3, "Structural Welding Code - Sheet Steel."

Retain "Testing Agency Qualifications" Paragraph below if Contractor or manufacturer selects testing agency or if Contractor is required to provide services of a qualified testing agency in "Field Quality Control" Article. Qualification requirements are in addition to those specified in Section 014000 "Quality Requirements," which also defines "NRTL" (nationally recognized testing laboratory).

C. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

Usually retain mill certifications or test reports from a qualified testing agency below. Insert option of test reports from in-house testing with calibrated test equipment if permitted. Insert option for testing ductility if required. See "Mill Certification" Paragraph in "Materials" Article in the Evaluations for more information.

D. Inspection and Quality Control: Steel framing manufacturer shall provide qualified representative for periodic on-site review of fabrication and installation in accordance with manufacturer's recommendations.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

Confirm the following with structural engineer

Retain paragraph below for both delegated design and prescriptive specification.

AISI S100 - North American Specification For The Design Of Cold-Formed Steel Structural Members

AISI S200 - North American Standard For Cold-Formed Steel Framing – General Provisions

A. Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200 Series.

Omit Structural Design Criteria if designed by HGA/project engineer.

2.2 COLD-FORMED STEEL FRAMING

The following applies to studs, stud joists, furring and tracks for walls, soffits, ceilings and floors.

Specify G90 coating for all studs, interior and exterior. (G60 is typical minimal standard, but HGA uses G90 at exterior backup walls. BIA recommends G90 for brick veneer backup.)

0.0329 inch = S20 gage

0.0428 inch = 18 gage

0.0538 inch = 16 gage

A. Steel Sheet for Framing Components: ASTM A 1003, Structural Grade, Type H; with G90 protective zinc coating, and as follows:
   1. Grade: ST33H, unless indicated otherwise.
   2. Minimum Base-Metal Thickness: As indicated below.

B. Structural Steel Studs: ASTM C 955, C-shaped stud, punched, with stiffened flanges.
   1. Minimum Base-Metal Thickness: 0.0451 inch.
   2. Web Depth: As indicated, and not less than 6 inches.
   3. Flange Width: As indicated, and not less than 1-5/8 inches.

C. Hat-Shaped Steel Furring Channels: ASTM C 955.
   1. Minimum Base-Metal Thickness: 0.0428 inch.
   2. Depth: As shown.

D. Z-Shaped Steel Furring: ASTM C 955.
   1. Minimum Base-Metal Thickness: 0.0566 inch.
   2. Depth: As shown.

E. Steel Track: ASTM C 955, U-shaped track, unpunched, with straight flanges, complying with , and as follows.
   1. Minimum Base-Metal Thickness: 0.0451 inch.
   2. Web Depth: As indicated, and not less than 6 inches.
   3. Flange Width: As indicated, and not less than 1-1/4 inches.

Delete if deflection track is not indicated. Usually not required for studs attached to face of floor slab.

F. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads, and as follows.
   1. Minimum Uncoated-Steel Thickness: 0.0566 inch, unless otherwise indicated or necessary for engineering.
   2. Flange Width: Minimum of 2 inches vertical deflection of 1/2 inch. Provide greater width for greater deflections or use double deflection track.

G. Framing Accessories: Fabricate steel-framing accessories from steel sheet, ASTM A 1003, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
   1. Supplementary framing.
   2. Bracing, bridging, and solid blocking.
   3. Web stiffeners.
   4. Anchor clips.
   5. End clips.
   6. Foundation clips.
   7. Stud kickers, knee braces, and girts.
   8. Backer plates.

2.3 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A36, zinc coated by hot-dip process according to ASTM A123.

B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel hex-headed, headless, hooked, bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153, Class C.

Retain "Expansion Anchors" Paragraph below if expansion anchors are acceptable. Verify safety factor with Project's structural engineer. Revise as required or insert specific load requirements and names of acceptable products.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

E. Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws. Provide with low-profile head beneath sheathing, and manufacturer's standard type at other locations.

F. Welding Electrodes: Comply with AWS standards.

The following Vertical Deflection Clip paragraph was in our HGA master. Is this something that's already covered in the framing accessories in the Article above?.

G. Vertical Deflection Clips (Drift Clips): Manufacturer's standard bypass clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

2.4 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A780.

B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C1107, with fluid consistency and 30-minute working time.

2.5 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
   1. Fabricate framing assemblies using jigs or templates.
   2. Cut framing members by sawing or shearing; do not torch cut.
   3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
   4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
   2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete or masonry construction.

B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

C. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

D. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop- or field-fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to ASTM C1007 and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
   1. Bolt or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
   1. Cut framing members by sawing or shearing; do not torch cut.
   2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

I. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 FRAMING INSTALLATION

A. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
   1. Install single deep-leg deflection tracks and anchor to building structure.
   2. Install vertical deflection clips to structure and to studs, one per stud at each floor and roof level.
   3. Install continuous top and bottom tracks sized to match studs.
   4. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
   5. Anchor Spacing: As shown on Shop Drawings.

B. Squarely seat studs against webs of top and bottom tracks. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
   1. Stud Spacing: As required to meeting loading requirements but not over 16 inches on center.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where wall-framing continuity is interrupted by floor framing. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

F. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
   1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings.
   2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

G. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
   1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

H. Install horizontal bridging in stud system, spaced apart at dimension indicated on Shop Drawings. Fasten at each stud intersection.
   1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle.

I. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

J. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 FIELD QUALITY CONTROL

A. Testing and Inspection: Owner will engage qualified special inspectors in accordance with Section 014500.

B. Cold Formed Metal Framing Welds: Visually inspect 100% of welds for specified length, size and continuity in accordance with AWS D1.3 for metal less than 1/8 inch in thickness, for work designed as a structural element.

C. Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.

D. Provide access for testing agency to places where cold formed metal framing work is being fabricated or produced so that inspection and testing can be accomplished.

E. Testing agency may inspect cold formed metal framing before shipment; however, Owner's Representative reserves right at any time before final acceptance, to reject material not complying with requirements.

F. Correct deficiencies in work which inspections and test reports have indicated to be not in compliance with requirements when directed in writing by Architect or Owner.

3.6 INSTALLED WORK

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Protection: Provide protection of installed Work and maintain conditions in a manner acceptable to Manufacturer and Installer, such that installed Work is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 071326

SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Self-adhering modified bituminous sheet waterproofing system (WP-6), including protection course and drainage panels.
   2. Blindside, self-adhering, integrally-bonded synthetic sheet waterproofing system (WP-7).

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
   2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

1.3 INFORMATIONAL SUBMITTAL

A. Qualification Data: For Installer.

B. Field quality-control reports.

C. Sample Warranty: Copy of special waterproofing manufacturer's and Installer's warranty stating obligations, remedies, limitations, and exclusions before starting waterproofing.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who is authorized, approved, or licensed by waterproofing manufacturer to install manufacturer's products.

B. Pre-Installation Conference: Conduct conference at Project site to comply with requirements in Section 013100 - Project Management & Coordination. Review requirements for waterproofing, including surface preparation specified under other Sections, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs

C. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for installation.
   1. Build for each typical waterproofing installation including accessories to demonstrate surface preparation, crack and joint treatment, corner treatment, and protection.
      a. Size: 100 sq. ft. in area.
      b. Description: Each type of wall and plaza installation.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.

C. Remove and replace materials that cannot be applied within their stated shelf life.

D. Store rolls according to manufacturer's written instructions.

E. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
   1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

C. Weather: Proceed with waterproofing and associated work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.

1.7 WARRANTY

A. Special Manufacturer's Warranty: Written warranty, signed by waterproofing manufacturer agreeing to replace waterproofing material that does not comply with requirements or that does not remain watertight during specified warranty period.
   1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 inch in width.
   2. Warranty Period: Five years after date of Substantial Completion.

B. Special Installer's Warranty: Written waterproofing Installer's warranty, signed by Installer, covering Work of this Section, for warranty period of two years.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Provide complete waterproofing system in accordance with waterproofing Manufacturer’s written recommendations and requirements for warranty.

B. Source Limitations: Provide waterproofing system components from single source from single manufacturer. Provide accessory products including drainage panel and protection course from sources as recommended in writing by waterproofing manufacturer.

C. Material Compatibility: Waterproofing materials shall be compatible with one another and with adjacent work under conditions of service and application required, and as demonstrated by waterproofing manufacturer based on testing and field experience.

D. Performance Requirements: Installed waterproofing system shall withstand thermally induced movement and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Waterproofing system shall remain watertight.

2.2 MODIFIED BITUMINOUS SHEET MEMBRANE WATERPROOFING

A. (WP-6) Modified Bituminous Sheet Membrane: 60 mils thick, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated to a 4 mils polyethylene-film reinforcement, with release liner on adhesive side; formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.
   1. Products and Manufacturers
      a. CCW Miradri 860/861 by Carlisle Coatings and Waterproofing.
      b. Bituthene 3000 by GCP Advanced Technologies Construction Products.
      c. Blueskin WP 200 by Henry Company.
      d. 650 Membrane by Polyguard Products, Inc..
      e. Sealtight MEL-ROL by W. R. Meadows.
   2. Physical Properties:
      a. Membrane Tensile Strength; ASTM D 412, Die C, modified: 250 psi minimum.
      b. Ultimate Elongation; ASTM D 412, Die C, modified: 300 percent minimum.
      c. Low-Temperature Flexibility; ASTM D 1970, at minus 20 deg F: Pass.
      d. Crack Cycling; ASTM C 836, after 100 cycles of 1/8-inch movement: Unaffected.
      e. Puncture Resistance; ASTM E 154: 40 lbf minimum.
      f. Water Absorption; ASTM D 570, after 48-hour immersion at 70 deg F: 0.2 percent weight-gain maximum.
      g. Water Vapor Permeance; ASTM E 96, Water Method: 0.05 perms maximum.
      h. Hydrostatic-Head Resistance; ASTM D 5385: 200 feet, minimum.

2.3 PRE-APPLIED NON-BITUMINOUS SHEET MEMBRANE WATERPROOFING

A. (WP-7) Pre-Applied Synthetic Sheet Membrane: Self-adhering, non-bituminous sheet membrane for installation on existing surface or on permanent concrete formwork; nominal 1.2 mm thick composite sheet membrane comprising 0.8 mm high density polyethylene film, and layers of specially formulated synthetic adhesive layers. The membrane shall form an integral and permanent bond to poured concrete to prevent water migration at the interface of the membrane and structural concrete.
   1. Basis of Design: Preprufe 300R Membrane by GCP Advanced Technologies Construction Products.

B. Mastic, Adhesives, and Detail Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

2.4 AUXILIARY MATERIALS

A. Provide auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

B. Concealed Strip Flashing: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

C. Primer: Liquid waterborne or VOC compliant solvent borne primer recommended for substrate by manufacturer of sheet waterproofing material.

D. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by manufacturer of sheet waterproofing material.

E. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, trowel grade or low viscosity.

F. Substrate Patching Membrane: Low-viscosity, two-component, asphalt-modified coating.

G. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

H. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch thick, predrilled at 9-inch centers.

2.5 PROTECTION COURSE

EDIT NOTE: DELETE PROTECTION COURSE BELOW IF FOUNDATION INSULATION IS USED AS PROTECTION COURSE.

A. Protection Course: Semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:
   1. Thickness: 1/4 inch, nominal, for vertical applications; 1/4 inch, nominal, elsewhere.
   2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for type of protection course.

B. Protection Course: Perimeter insulation (INSUL-1), refer to Section 072100 - Thermal Insulation.

2.6 MOLDED-SHEET DRAINAGE PANELS

EDIT NOTE: DELETE ARTICLE IF NOT REQUIRE. REVIEW AND COORDINATE WITH CIVIL. VERIFY IF PROJECT HAS FOUNDATION DRAIN SYSTEM; IF SO, USE DRAINAGE PANELS. TYPICAL FLOW RATE IS 9 TO 21.

BASIS OF DESIGN FOR PARAGRAPH BELOW IS: MIRADRAIN 6200

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panel consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 40 sieve laminated to one side of the core and a polymeric film bonded to the other side; and with a minimum vertical flow rate of 9 gpm per ft..

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
   1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
   2. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.
   3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D4258.
   1. Install sheet strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.

EDIT NOTE: TREATMENT AT EXPANSION JOINTS, ISOLATION JOINTS, AND OTHER DISCONTINUOUS JOINTS VARIES. DESCRIPTION BELOW IS BASED ON W. R. GRACE'S DETAILS. IN ADDITION TO A PRIMARY BUILDING EXPANSION JOINT, BUILDING EXPANSION JOINTS MAY NEED A CONTINUOUS SHEET WATERPROOFING COVERING. COORDINATE EXPANSION-JOINT TREATMENT WITH DIVISION 5 SECTION "EXPANSION JOINT SYSTEMS."

F. Bridge and cover isolation joints, expansion joints, and discontinuous deck-to-wall joints with overlapping sheet strips.
   1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.

G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
   1. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:
      a. At footing-to-wall intersections, extend liquid membrane each direction from corner or install membrane strip centered over corner.

H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.3 INSTALLATION

A. Install self-adhering sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D6135.

B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.

EDIT NOTE: RETAIN SUBPARAGRAPH BELOW FOR RUBBERIZED-ASPHALT SHEETS, IF APPLICABLE. VERIFY THAT SELECTED MANUFACTURERS PRODUCE LOW-TEMPERATURE PRODUCTS. AN UPPER-LIMIT TEMPERATURE MAY BE RECOMMENDED BY SHEET MANUFACTURER TO REDUCE WORKMANSHIP PROBLEMS WITH MORE AGGRESSIVE ADHESION.

1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, rubberized-asphalt sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.

D. Apply continuous sheets over sheet strips bridging substrate cracks, construction, and contraction joints.

E. Seal exposed edges of sheets at terminations not concealed by metal counterflashings or ending in reglets with mastic or sealant.

EDIT NOTE: TYPICAL?

F. Termination Bars: Securely fasten top termination of membrane with continuous metal termination bar anchored into substrate and cover with detailing tape.
   1. Install termination bar 2” below finish grade, coordinate with precast exterior finish transition locations.
   2. Apply compatible sealant at top edge of termination bar. Refer to section 079200 - Joint Sealants.

EDIT NOTE: DELETE PARAGRAPH BELOW IF NOT TERMINATING INTO OTHER WATERPROOFING.

G. Install sheet waterproofing and auxiliary materials to tie into adjacent waterproofing.

H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheets extending 6 inches beyond repaired areas in all directions.

I. Correct deficiencies in or remove sheet waterproofing that does not comply with requirements, repair substrates, reapply waterproofing, and repair sheet flashings.

3.4 INSTALLATION OF BLINDSIDE SHEET WATERPROOFING

EDIT NOTE:RETAIN THIS ARTICLE WHEN MEMBRANE IS APPLIED VERTICALLY AS BLIND-SIDE WATERPROOFING AGAINST TIMBER LAGGING, SHOTCRETE, OR SIMILAR SOIL-RETAINING CONSTRUCTION, OR IS APPLIED HORIZONTALLY FOR BELOW-GRADE, SPLIT-SLAB APPLICATIONS OR NEAR-HORIZONTAL, UNDER-SLAB APPLICATIONS AGAINST COMPACTED SUBSTRATES.

A. Install blindside sheet waterproofing according to manufacturer's written instructions.

EDIT NOTE:RETAIN FIRST PARAGRAPH BELOW IF REQUIRED. MOLDED-SHEET DRAINAGE PANELS MAY BE USED FOR HORIZONTAL OR VERTICAL DRAINAGE OR, IN VERTICAL APPLICATIONS, TO PROVIDE A SMOOTH SURFACE OVER SHOTCRETE OR TIMBER LAGGING.

B. Place and secure molded-sheet drainage panels over substrate. Lap edges and ends of geotextile to maintain continuity.

EDIT NOTE:RETAIN "VERTICAL APPLICATIONS" PARAGRAPH BELOW FOR WALL OR NEAR-VERTICAL APPLICATIONS.

C. Vertical Applications: Install sheet with face against substrate. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by membrane manufacturer. Overlap and seal seams, and stagger and tape end laps to ensure watertight installation. Mechanically fasten to substrate.

1. Securely fasten top termination of membrane with continuous metal termination bar anchored into substrate and cover with detail tape.

EDIT NOTE:RETAIN "HORIZONTAL APPLICATIONS" PARAGRAPH BELOW FOR HORIZONTAL OR NEAR-HORIZONTAL APPLICATIONS.

D. Horizontal Applications: Install sheet with face against substrate. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by membrane manufacturer. Overlap and seal seams, and stagger and tape end laps to ensure watertight installation.

E. Corners: Seal lapped terminations and cut edges of sheet waterproofing at inside and outside corners with detail tape.

F. Seal penetrations through sheet waterproofing to provide watertight seal with detail tape patches or wraps and a liquid-membrane troweling.

G. Install sheet-waterproofing and auxiliary materials to produce a continuous watertight tie into adjacent waterproofing.

H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Tape perimeter of damaged or nonconforming area extending 6 inches (150 mm) beyond repaired areas in all directions. Apply a patch of sheet waterproofing and firmly secure with detail tape.

3.5 INSTALLATION OF PROTECTION COURSE, DRAINAGE PANELS AND INSULATION

A. Protection Course: Install protection course with butted joints before installing drainage panels.

B. Drainage Panel: Place and secure molded-sheet drainage panels according to manufacturer's written instructions. Use adhesives that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Ensure that drainage channels are aligned and free of obstructions. Protect installed molded-sheet drainage panels during subsequent construction.

C. Foundation Wall Insulation: Install insulation over drainage panels in compliance with Section 072100 - Thermal Insulation.

3.6 PROTECTION AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 072100
THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Extruded polystyrene foam-plastic board insulation.
   2. Glass-fiber blanket insulation.
   3. Glass-fiber board insulation.
   4. Mineral-wool board insulation.
   5. Closed-cell spray polyurethane foam.

B. Related Requirements:
   1. Section 092900 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

1.3 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for each type of insulation and accessory.

1.4 INFORMATIONAL SUBMITTALS

A. Installer's Certification: Listing type, manufacturer, and R-value of insulation installed in each element of the building thermal envelope.
   1. For blown-in or sprayed fiberglass and cellulosic-fiber loose-fill insulation, indicate initial installed thickness, settled thickness, settled R-value, installed density, coverage area, and number of bags installed.
   2. Sign, date, and post the certification in a conspicuous location on Project site.

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

1.5 DELIVERY, STORAGE, AND HANDLING

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

B. Protect foam-plastic board insulation as follows:
   1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
   3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Acceptable Products and Manufacturers:
   1. Listed products below and on Drawing Sheet “Material ID” establish a standard of quality.
   2. Equivalent products by other manufacturers may be acceptable provided they comply with requirements of the Contract Documents.

2.2 GENERAL

A. Locations specified below are solely for Design/Builder's general information and shall not limit locations of each insulation type. Provide insulation at locations specified below, and at additional locations indicated on Drawings whether or not such additional locations are specified below.

2.3 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION

A. Extruded polystyrene boards in this article are also called "XPS boards." Roman numeral designators in ASTM C 578 are assigned in a fixed random sequence, and their numeric order does not reflect increasing strength or other characteristics.

B. Extruded Polystyrene Board, Type IV (INSUL-1): ASTM C 578, Type IV, 25-psi (173-kPa) minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
   1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
   2. Acceptable Products and Manufacturers:
      a. Styrofoam SE by Dow Chemical.
      b. Foamular 250 by Owens Corning.
      c. Certifoam by DiversiFoam Products.
      d. GreenGuard CM by Kingspan.

C. Extruded Polystyrene Board, Type IV (INSUL-2): ASTM C 578, Type IV, 25-psi (173-kPa) minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
   1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
   2. Acceptable Products and Manufacturers:
      a. Cavitymate Plus by Dow Chemical.
      b. Foamular 250 by Owens Corning.
      c. Certifoam by DiversiFoam Products.
      d. GreenGuard CMX by Kingspan.

D. Extruded Polystyrene Board Insulation, Type VI (INSUL-4): ASTM C578, Type VI, 40-psi (276-kPa) minimum compressive strength.
   1. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
   2. Smoke-Developed Index: Not more than 450 when tested in accordance with ASTM E84.
   3. Acceptable Products and Manufacturers:
      a. Styrofoam Brand Hyload 40 XPS by Dupont.
      b. Foamular 400 by Owens Corning.
      c. CertiFoam 40 by Diversifoam.

2.4 GLASS-FIBER BLANKET INSULATION

A. Glass-Fiber Blanket Insulation, Unfaced (INSUL-20): ASTM C665, Type I.
   1. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
   2. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
   3. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches (305 mm) and wider in width.
   4. Acceptable Products and Manufacturers:
      a. CertaPro Unfaced Insulation by Certainteed.
      b. Unfaced Insulation by Johns Manville.
      c. Unfaced Thermal Batt Insulation by Owens Corning.

2.5 MINERAL-WOOL BOARD INSULATION

A. Mineral-Wool Board Insulation, Types IA and IB, II, III, and IVA, Unfaced (INSUL-26): ASTM C612, Types IA and IB; passing ASTM E136 for combustion characteristics.
   1. Nominal Density: 4 lb/cu. ft. (64 kg/cu. m).
   2. Flame-Spread Index: Not more than 15 when tested in accordance with ASTM E84.
   3. Smoke-Developed Index: Not more than zero when tested in accordance with ASTM E84.
   4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches (305 mm) and wider in width.
   5. Acceptable product and manufacturer: Equivalent to Cavityrock by Rockwool International.

B. Mineral-Wool Board Insulation, Type IA, IB, II, III, IVA, Faced, Class A, Category 1 (INSUL-25): ASTM C612, Type III; faced on one side with foil-scrim or foil-scrim-polyethylene vapor retarder.
   1. Nominal Density: 4 lb/cu. ft. (64 kg/cu. m).
   2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
   3. Smoke-Developed Index: Not more than zero when tested in accordance with ASTM E84.
   4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches (305 mm) and wider in width.
   5. Acceptable product and manufacturer: FireSpan 40, by Thermafiber, Inc.

2.6 CLOSED-CELL POYURETHANE FOAM

A. Closed-Cell Spray Polyurethane Foam: ASTM C 1029, Type II, minimum density of 1.5 lb/cu. ft. (24 kg/cu. m) Insert density and minimum aged R-value at 1-inch (25.4-mm) thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F (43 K x sq. m/W at 24 deg C).
   1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
      a. Flame-Spread Index: 75 or less.
      b. Smoke-Developed Index: 450 or less.
   2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.7 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
   1. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
   2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation.

B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41 mm) thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.

1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
   a.Ceiling plenums.

C. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 1 inch (25 mm)2 inches (50 mm)3 inches (76 mm) dimensions indicated between face of insulation and substrate to which anchor is attached.
   1. Acceptable Product and Manufacturer: Equivalent to Clutch Clip by Gemco.

D. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

2.8 ACCESSORIES

A. Insulation for Miscellaneous Voids:
   1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
   2. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.

B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.
   1. Verify adhesives have a VOC content of 70 g/L or less.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Install insulation with manufacturer's R-value label exposed after insulation is installed.

D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
   1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
   2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
   4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
   1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
   2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.4 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 076200

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Low-slope roof sheet metal fabrications.
   2. Wall sheet metal fabrications.

1.2 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
   3. Review requirements for insurance and certificates if applicable.
   4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following
   1. Underlayment materials.
   2. Elastomeric sealant.
   3. Butyl sealant.

B. Shop Drawings: For sheet metal flashing and trim.
   1. Include plans, elevations, sections, and attachment details.
   2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
   3. Include identification of material, thickness, weight, and finish for each item and location in Project.
   4. Include details for forming, including profiles, shapes, seams, and dimensions.
   5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
   6. Include details of termination points and assemblies.
   7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
   8. Include details of roof-penetration flashing.
   9. Include details of edge conditions, including copings, counterflashings, drip edges, perforated gravel stops, gutters and downspouts.
   10. Include details of special conditions.
   11. Include details of connections to adjoining work.

12. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches.

C. Samples: For each type of exposed finish.
   1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
   2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
   3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of coping and roof edge flashing that is ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved.

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

D. Evaluation Reports: For copings and roof edge flashing, from an agency acceptable to authority having jurisdiction or ICC-ES showing compliance with ANSI/SPRI/FM 4435/ES-1.

E. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

B. Special warranty.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
   1. For copings and roof edge flashings that are ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
   1. Build mockups of typical Upper Roof drainage edge and parapet coping/ fascia, approximately 10 feet long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.
   1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
   2. Protect stored sheet metal flashing and trim from contact with water.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.9 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
      b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. SPRI Wind Design Standard: Manufacture and install copings and other roof edge flashings tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressure:
   1. Design Pressure: As indicated on Drawings.

D. FM Approvals Listing: Manufacture and install copings and other roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with name of fabricator and design approved by FM Approvals.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
   1. Exposed Coil-Coated Finish:

a. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Color: As selected by Architect from manufacturer's full range.
3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

C. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet in accordance with ASTM A653/A653M, G90 coating designation; prepainted by coil-coating process to comply with ASTM A755/A755M.
1. Surface: Smooth, flat.

D. Stainless Steel Sheet (SMF-4): ASTM A240/A240M, Type 304 or 316, dead soft, fully annealed; with smooth, flat surface.
1. Finish: ASTM A480/A480M, No. 2D (dull, cold rolled).
a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
b. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
1) Run grain of directional finishes with long dimension of each piece.
2) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.3 MANUFACTURED ROOF COPINGS

A. (SMF-1) Manufactured Aluminum Copings: Manufactured coping system consisting of snap-on coping cap, concealed anchorage; factory-mitered and continuously-welded corners and end cap, and concealed splice plates with same finish as coping caps.
1. Basis-of-Design Product: Perma-Tite Coping by Metal-Era, Inc.
2. Coping-Cap: Extruded aluminum, 0.125-inch thick, ASTM B 221, alloy and temper recommended by manufacturer for type of use and finish indicated.
3. Anchor Support Cleat: Concealed, 20 gauge galvanized-steel sheet, 12 inches wide, with stainless steel spring mechanically locked to cleat.

2.4 UNDERLAYMENT MATERIALS

A. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.

B. (UNDL-1) Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Carlisle WIP Products; a brand of Carlisle Construction Materials; CCW WIP 300HT.
b. GCP Applied Technologies Inc.; Ultra.
c. Henry Company; Blueskin PE200 HT.
2. Source Limitations: Obtain underlayment from single source from single manufacturer.
3. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F or lower.

C. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

2.5 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
   1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
      a. Exposed Fasteners: Stainless steel. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
      b. Blind Fasteners: High-strength stainless steel rivets.
   2. Fasteners for Aluminum and Stainless Steel Sheets: Series 300 stainless steel.

C. Solder:
   1. For Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless steel sheet manufacturer.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2-inch wide and 1/8-inch thick.

E. Elastomeric Sealant: ASTM C920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.

2.6 FABRICATION, GENERAL

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
   1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
   2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
   3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
   4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
   5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:
   1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
   2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

G. Seams:
1. Stainless Steel: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
2. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

H. Do not use graphite pencils to mark metal surfaces.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Drip Edge): Fabricate in minimum 96-inch-long, but not exceeding 12--oot-long sections. Furnish with 6-inch-wide, joint cover plates. Shop fabricate interior and exterior corners.
1. Joint Style: Lapped and soldered.
2. Fabricate from the following materials:
a. Stainless Steel: 0.0188 inch thick.

B. Copings and Fascia: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, fasten and seal watertight. Shop fabricate interior and exterior corners.
1. Joint Style: Butted with expansion space and 12-inch-wide, concealed backup plate, and 6-inch-wide cover plate.
2. Fabricate from the following materials:
a. Aluminum: 0.060 inch thick.

C. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
1. Stainless Steel: 0.0188 inch thick.

D. Flashing Receivers: Fabricate from the following materials:
1. Stainless Steel: 0.0188 inch thick.

E. Roof-Penetration Flashing: Fabricate from the following materials:

2.8 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch-long, but not exceeding 12-foot-long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch-high, end dams. Fabricate from the following materials:
1. Stainless Steel: 0.0156 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
   3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim.
   1. Install in shingle fashion to shed water.
   2. Lap joints not less than 2 inches.

B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, in accordance with manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.
   1. Lap horizontal joints not less than 4 inches.
   2. Lap end joints not less than 12 inches.

C. Self-Adhering, High-Temperature Sheet Underlayment:
   1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
   2. Prime substrate if recommended by underlayment manufacturer.
   3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
   4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses.
   5. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller.
   6. Roll laps and edges with roller.
   7. Cover underlayment within 14 days.

D. Install slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.
   1. Install in shingle fashion to shed water.
   2. Lapp joints not less than 4 inches.

3.3 INSTALLATION, GENERAL

A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
   1. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder and sealant.
   3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
   4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
   5. Install continuous cleats with fasteners spaced not more than 16 inches on center.

6. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
7. Do not field cut sheet metal flashing and trim by torch.
8. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
3. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated.
   a. Embed hooked flanges of joint members not less than 1 inch into sealant.
   b. Form joints to completely conceal sealant.
   c. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way.
   d. Adjust setting proportionately for installation at higher ambient temperatures.
      1) Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.
1. Pretin edges of sheets with solder to width of 1-1/2 inches; however, reduce pretinning where pretinned surface would show in completed Work.
2. Do not solder aluminum sheet.
3. Do not use torches for soldering.
4. Heat surfaces to receive solder, and flow solder into joint.
   a. Fill joint completely.
   b. Completely remove flux and spatter from exposed surfaces.
5. Stainless Steel Soldering:
   a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
   b. Promptly remove acid-flux residue from metal after tinning and soldering.
   c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

H. Rivets: Rivet joints in where necessary for strength.

3.4 INSTALLATION OF ROOF FLASHINGS

A. Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard.
   1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
   2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge (Drip Edge) Flashing:
   1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
   2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
   3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

C. Copings and Fascia:
   1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
   2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated.
      a. Interlock exterior bottom edge of coping and fascia with continuous cleat anchored to substrate at 16-inch centers.
      b. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.
   3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.

D. Pipe or Post Rain Shield: Install rain shield with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless steel draw band and tighten.

E. Surface-Mounted Counterflashing: Coordinate installation of counterflashing extensions with installation of base flashing.
   1. Secure counterflashing with drive-pin anchors. Fit tightly to base flashing.
   2. Extend counterflashing extensions 4 inches over base flashing.
   3. Lap counterflashing extension joints minimum of 4 inches and seal with sealant within lap.
   4. Seal top of counterflashing with sealant.

3.5 INSTALLATION OF WALL FLASHINGS

A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.6 INSTALLATION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 CLEANING

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

3.8 PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

C. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION

SECTION 079200
JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Silicone joint sealants.
   2. Nonstaining silicone joint sealants.
   3. Latex joint sealants.
   4. Expanding foam sealants (EXP JT-2), (EXP JT-21).

B. Related Requirements:
   1. See Section 092900 “Gypsum Board” for additional installation requirements for acoustical sealant.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Sustainable Design Submittals:
   1. Product Data: For sealants, indicating VOC content.
   2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Samples: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch (13-mm-) wide joints formed between two 6-inch (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.
   3. Joint-sealant formulation.
   4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.

C. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:
   1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
   2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.

D. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.
   1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.6 MOCKUPS

A. Prior to commencing Work and after acceptance of Product Data, Shop Drawings, and Samples, provide joint sealants for incorporation into integrated exterior mockup. See Section 034500 “Precast Architectural Concrete” for additional requirements related to integrated mockup.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
   1. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
   2. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
   3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
   5. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

1.8 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.9 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: One year from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
   1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   2. Disintegration of joint substrates from causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 ACCEPTABLE PRODUCTS AND MANUFACTURERS

A. Acceptable Products and Manufacturers:
   1. Identified products are to establish a standard of quality.
   2. Equivalent products by other manufacturers may be acceptable provided they comply with requirements of the Contract Documents.

2.2 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants:
   1. Custom colors: Up to three custom colors of joint sealant may be required.
   2. Typical colors: As selected by Architect from manufacturer's full range.

2.3 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
   1. Acceptable products and manufacturers:
      a. 791 Silicone Building Sealant by Dow Corning Corp.
      b. Silpruf SCS2000 by Momentive Performance Materials, Inc.
      c. 864 by Pecora Corp.
      d. Spectrem 3 by Tremco, Inc.
   2. Locations: Typical exterior joints in vertical surfaces and in horizontal non-traffic surfaces.

2.4 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.

B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
   1. Acceptable products and manufacturers:
      a. 791 Silicone Building Sealant by Dow Corning Corp.
      b. Silpruf SCS2000 by Momentive Performance Materials, Inc.
      c. 864 by Pecora Corp.
      d. Spectrem 3 by Tremco, Inc.
   2. Locations: Joints at precast panels.

2.5 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
   1. Acceptable products and manufacturers:
      a. AC20 Acrylic Latex by Pecora Corp.
      b. Sonolac by Sonneborn Building Products Div., BASF.
      c. Tremflex 834 by Tremco, Inc.
   2. Locations: Typical interior joints in vertical surfaces and in horizontal non-traffic surfaces, except as otherwise indicated.

2.6 EXPANDING FOAM SEALERS

A. Colored Expanding Foam Sealer (EXP JT-2):
   1. Factory laminated binary seal:
      a. Colored facing:
         1) Cured silicone sealant facing, approximately 1/8 inch thick, in bellows- configuration; color to be selected by Architect from manufacturer's full color range.
         2) Puncturing of colored facing shall not affect weather integrity of seal.
      b. Backing seal: Preformed, precompressed, open-cell urethane foam, impregnated with a water-based polymer-modified acrylic emulsion; factory-produced in precompressed sizes and in roll or stick form to fit joint widths indicated, depth as recommended by manufacturer for size of joint.
   2. Properties: Permanently elastic, mildew-resistant, nonmigratory, nonstaining and compatible with joint substrates and other joint sealers.
      a. Minimum 50% movement capability (+25%, -25%).
      b. Temperature stability, when tested in accordance with ASTM C711: -40 deg F to +185 deg F (-40 deg C to +85 deg C).
      c. Staining, when tested in accordance with ASTM C510: None.
      d. Tensile strength, when tested in accordance with ASTM D3574: 21 psi (145 kPa).
      e. Hardness of silicone coating, when tested in accordance with ASTM D2240: Shore A (15 points).
      f. Weathering, when tested in accordance with ASTM G155:
         1) Xenon arc weatherometer: No visible deterioration after 2000 hours.
         2) Primary surface weathering, Atlas weatherometer: Minimal hardness change after 6000 hours.
      g. Dimension: As indicated on Drawings.
   3. Provide with expanding foam sealer manufacturer's recommended non-sag, neutral cure silicone sealant; complying with ASTM C920, Type S, Grade NS, Class 50; compatibile with expanding foam sealer; match color of colored facing of expanding foam sealer.
   4. Acceptable product and manufacturer: Equivalent to Colorseal by Emseal Joint Systems Ltd.
   5. Locations: Exterior vertical and horizontal expansion joints, where indicated.

B. Expanding Foam Sealer (EXP JT-21): Two water-repellent silicone sealing surfaces adhered to fire-retardant impregnated foam backing.
   1. Properties: Permanently elastic, mildew-resistant, nonmigratory, nonstaining and compatible with joint substrates and other joint sealers.
      a. Minimum 50% movement capability (+25%, -25%).
      b. Dimension: As indicated on Drawings.
   2. Acceptable product and manufacturer: Equivalent to Emshield WFR1 System by Emseal Joint Systems Ltd.
   3. Locations: Interior expansion joints, where indicated.

2.7 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
      a. Concrete.
      b. Masonry.
      c. Unglazed surfaces of ceramic tile.
   3. Remove laitance and form-release agents from concrete.
   4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
      a. Metal.

b. Glass.
c. Porcelain enamel.
d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

A. Sealant Compatibility Requirements:
1. Verify adhesion qualities of intended finishes and coatings with sealants through field adhesion and peel testing.

2. Use test methods standard with manufacturer to determine if priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
3. Perform tests under normal environmental conditions that will exist indicating actual installation.

3.5 CLEANING

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

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

SECTION 099717
TANK LINER COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Epoxy coatings for lining steel tanks.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field Quality Control Test Reports.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials in accordance with Manufacturer's instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Material Compatibility: Materials for use within coating system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

B. Tank Liner Coating: Reinforced, 100-percent solids, novolac epoxy coating manufactured for immersed applications as liner in steel tanks containing chemicals.
   1. Basis of Design: Plasite 4550 by Carboline, Inc.
   2. Coating Thickness: As recommended by Manufacturer for Project, but not less than 30 mils (wet).
   3. VOC Content: 0 g/l.

2.2 MIXING

A. Mix each component separately to a smooth, uniform consistency. Any settling in the container must be thoroughly scraped and re-dispersed. Use a Jiffy type mixer and avoid plunging it up and down in the bucket, which can fold air into the resin causing bubbles to form in the coating after it has been applied.
   1. Do not thin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with manufacturer's requirements for maximum moisture content, alkalinity, and other conditions affecting performance of work.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

A. Comply with manufacturer's written instructions applicable to substrates and coating systems indicated.

B. Steel Substrate, Immersed Application: Prepare by abrasive blasting to a minimum near White Metal Finish (NACE NO 2, SSPC-SP10) with a minimum 3 mil (75 micron) dense, sharp anchor profile.

C. Stainless Steel Substrate, Immersed Application: Prepare by abrasive blasting to SSPC SP-17 Thorough Abrasive Blast to a minimum of 3 mils (75 microns) dense angular anchor profile.

D. Clean substrates of substances that could impair bond of coatings, including dirt, oil, grease, and incompatible encapsulants. Perform cleaning and coating application so dust and other contaminants from cleaning process will not fall on wet, newly coated surfaces.

3.3 APPLICATION

A. Apply coatings according to manufacturer's written instructions.
   1. Use equipment and techniques best suited for substrate and type of material being applied.
   2. Apply each coat separately according to manufacturer's written instructions.

B. Apply coatings to prepared surfaces as soon as practicable after preparation and before subsequent surface soiling or deterioration.

C. Spray Application: Use spray equipment for application only when permitted by authorities having jurisdiction. Wherever spray application is used, do not double back with spray equipment to build up film thickness of two coats in one pass.

3.4 FIELD QUALITY CONTROL

A. Testing: Owner reserves the right to invoke the following testing procedures:
   1. Owner will engage the services of a qualified testing agency to sample materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
   2. Testing agency will perform tests for compliance of materials with product requirements.
   3. Owner may direct Contractor to stop coating application if test results show materials being used do not comply with requirements. Remove noncomplying materials from Project site, pay for testing, and recoat surfaces that were coated with rejected materials. Remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

B. Field Testing and Inspection: Owner reserves the right to engage the services of a qualified testing agency to verify installed thickness of elastomeric coatings.

END OF SECTION

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UC Davis Medical Center

Central Energy Plant

Document Title: Specification/Procedure

Ammonia-Urea Tank Cleaning

REVISION	ISSUE OR REVISION DESCRIPTION	CHKD BY	DATE	APPD BY	DATE
01	Initial Procedure	C. Arechiga	7/19/23	Russell Smith and Patrick Dackins	--
02	Revised	C. Arechiga	8/18/23	Russell Smith and Patrick Dackins	9/21/23

1.0 PURPOSE

To define a procedure and the specifications to safely remove aqueous ammonia from the Underground Storage Tank (UST) at UC Davis Medical Center (UCDMC) Central Energy Plant (CEP) and prepare the UST for the introduction of urea into the UST for the CEP.

2.0 SCOPE

This document describes the procedure and essential specifications for removing remaining material from the UST as well as for cleaning and preparing the UST surface for the urea coating. This procedure contains the necessary steps to complete the UST cleaning and surface preparation, along with technical guidance. The health and safety of UCDMC personnel, contractor personnel, and the surrounding community were the first consideration in preparation of this document. Expectations and requirements of UCDMC personnel and the contractor for securing the safety and health of personnel and the community are included in the specifications.

UCDMC personnel responsibilities include contractor selection, management, and oversight during all required tasks for this project. Contractor personnel responsibilities include adherence to this specification for all tasks described herein for this project. A detailed risk assessment table needs to be developed by the contractor in their Health and Safety (H&S) Plan that considers every task and subtask which identifies possible hazards in each task and a mitigation plan.

All parties are responsible for safety and communicating any concerns throughout the project.

3.0 FACILITY INFORMATION

Below is a list of UCDMC CEP site specific facility information/specifications:

- The UST is in a pea gravel base.
- The UST is 150 degrees Fahrenheit design temperature.
- The UST is 111.5 inches ID (Inner Diameter).
- The UST is approximately 48 inches below ground level.
- 2-Inch camlocks on both liquid fill and vapor recovery.
- Aqua is at 29% ammonia, boiling point 85 degrees Fahrenheit.
- The UST is zero pounds per square inch gauge (PSIG) design pressure when above ground due to flat heads.
- Approximately 1,200 gallons remain in the UST after usable material is extracted.
- Approximately 160-inch column lift is needed (5.9 PSIG suction needed to overcome static head).
- Boiling point of 29% aqua ammonia is approximately 85 degrees Fahrenheit.

4.0 CONTRACTOR HEALTH AND SAFETY REQURIEMENTS

The Contractor will be responsible for the following items:

1. Written Hazard Communication Plan

The Contractor will have a written Hazard Communication Plan as required in Title 8 of the California Code of Regulations (CCR), section 5194.

An additional hazard communication plan specific to the project will include how the Contractor will inform their employees on:

- Hazards associated with aqueous ammonia and other chemicals to be used, and
- Location and access to safety data sheets

UCDMC will provide the Contractor access to safety data sheets for chemicals present onsite.

The Contractor shall provide training to their employees on specific hazards on aqueous ammonia and other chemicals used on the project as outlined in 8 CCR 5194.

2. Contractor Health and Safety Program

The Contractor must have a Health and Safety Program that meets the requirements in 8 CCR 5192(b). Elements of this program shall include, but not limited to:

- Program Organizational Structure
- A Site Specific H&S Plan
- Health and Safety training program
- Medical Surveillance
- Project specific activities and procedures referencing the Health and Safety program
- Workplan

3. Contractor Site Specific H&S Plan

The Contractor shall prepare a site specific H&S Plan. The site specific H&S Plan will include these elements that address the project activities:

- Organization and Responsibilities
- Risk based assessment for each task and subtask. The risk assessment shall include physical and health hazards for each task.
- Personal Protective Equipment (PPE)
- Pre-activity safety briefings
- Decontamination
- Emergency Response Plan

UCDMC requires the Contractor's Site Health and Safety Supervisor to conduct regular inspections during all on site contractor activities.

5.0 EMERGENCY RESPONSE CONSIDERATIONS

1. Ammonia Liquid Spill - An ammonia liquid spill could occur due to a ruptured hose, broken fitting, improperly secured fitting, and/or not ensuring that the hose is properly drained prior to disconnecting it. To help mitigate any release, a CEP staff member will always be monitoring the cleaning operation. If a leak is detected, all cleaning operations will be stopped and equipment will be shut down to minimize the release. A drain-blocker pad will always be in place over the storm drain by the maintenance yard gate to prevent spills from migrating to the storm drain system. A chemical spill kit, absorbent pads, booms, and oil dry are available to help contain any spills. These abatement materials are located on the shelves in front of auxiliary boiler #2 and on the racks (oil dry) north of the gas turbine generator. Reasonable efforts should be made to keep an ammonia spill from migrating outside of the CEP utility yard. If a spill does migrate outside the utility yard, emergency response procedures and notifications should be made as detailed in the Hazardous Material Business Plan, CalARP Risk Management Plan (RMP), and UCDH policy 1612 – Response to Hazardous Substance Spills. If an ammonia spill gets into the storm drains or street gutter, CEP policy #507 - Sacramento County Wastewater System Slug Control Plan will also need to be implemented.

2. Ammonia Vapor Release - An ammonia vapor release could occur due to a ruptured hose, broken fitting, or an improperly secured fitting. To help mitigate any vapor release a CEP staff member will always be monitoring the cleaning operations. The staff member will be carrying an ammonia gas detector. Wind direction can be determined by the 3 local windsocks placed around the CEP utility yard. If the ammonia gas detector reaches 35 ppm outside the exclusion zone work area all personnel will be evacuated from the UST and operations will stop until the cause of the vapor release can be identified. If the cause of the vapor cannot be remedied, the ammonia UST manhole cover should be reinstalled.

6.0 SITE PREPARATION ACTIVITIES (PREREQUISITIES)

1. A pre-job safety conference will be held between CEP personnel and the Contractor before the project begins to review the Site-Specific H&S Plan.
2. CEP personnel will confirm that the UST level probe has been removed and a cover has been installed over the opening and ensure an appropriate seal to prevent escape of ammonia vapors.
3. As required in the UCDMC Health and Safety plan, CEP personnel will follow UCDMC health and safety procedures and wear PPE and respirators when required by UCDMC procedures.
4. The CEP staff member monitoring the UST cleaning will be trained on the shutdown of equipment and emergency response procedures in case of a chemical release.
5. CEP staff shall set up a 25-foot caution-taped zone around the UST entry point and equipment holding ammonia waste until the cleaning operation is complete and the manhole cover has been reinstalled.
6. CEP staff will place the “drain-blocker” drain cover over the storm drain inlet near the maintenance yard gate prior to the start of the cleaning process. The drain cover is stored in the safety equipment locker, mounted on the wall, above the storm drain inlet.
7. The Contractor shall set up chemical containment booms to surround all trucks and storage tanks.
8. CEP staff will verify that all roll up doors and exterior outer doors to the CEP are closed before cleaning begins.
9. The Control Room Operator will ensure that all economizers for the CEP are closed and that the break room and personnel space air handler are shut off during the UST cleaning.
10. The Control Room Operator will ensure that security camera #1, labeled “Back Yard” is monitoring operations for the entire duration of the process.
11. All CEP personnel within the 25-foot exclusion zone must don their respirator before entering this zone during cleaning operations.
12. During the cleaning operations a CEP staff member will be present to monitor the Contractor outside the 25-foot exclusion zone. This operator will use a portable ammonia gas detector to monitor for ammonia vapors.
13. The CEP staff member monitoring the Contractor will establish communications with the Control Room Operator.
14. All reasonable accommodations should be made to ensure that UST cleaning operations take place after business hours (Weekends or between the hours of 5:00 PM to 6:00 AM)

7.0 TASK 1 DRAIN THE UST, 73-T-3061

7.1 Task Description

UCDMC CEP personnel will ensure that the UST operations are set up and isolated prior to conducting UST draining activities. The Contractor shall implement pre-draining activities such as

equipment set up and conduct a pre-check of the supplied air equipment. Any perimeter controls will be put in place for gates, walkways, etc. Contractor pumps ammonia out of UST.

7.2 Critical Steps

1. CEP staff will verify ammonia system is shut down.
2. CEP staff will apply Lockout/Tagout ("LOTO") to the ammonia system. LOTO must include ammonia pump disconnect, two valves after pre filter in the ammonia room, and the expansion tank discharge valve.
3. CEP staff will close ammonia pump discharge valve and open recirculation line to UST manhole cover.
4. CEP staff will connect diaphragm pump discharge to pre-filter housing in the ammonia room and diaphragm pump suction to two 55-gallon drums of demineralized water.
5. CEP staff will slowly open air to diaphragm pump allowing water to flow into the ammonia pipe system from the pre-filter housing back to the tank until all water is used.
6. CEP staff will close air to the pump and close inlet valve to pre-filter housing.
7. CEP staff will disconnect pump hose from pre-filter housing.
8. CEP staff will unwire ammonia pump.
9. CEP staff will remove ammonia pump recirculation and discharge piping from the manhole cover and install cap on the line leading to the building.
10. CEP staff will disconnect vapor piping from manhole cover.
11. Contractor shall implement an air-tight connection during the pumping process to contain aqueous ammonia vapors. This connection will be using either a camlock fitting or some other type of air-tight connection.
12. Contractor will provide a 2-inch schedule 40 pipe, as a closed system, and connect it to the existing 2-inch camlock with ball valve on the vapor recovery line.
13. Contractor shall connect all hoses to truck.
14. Contractor shall verify all chemical contaminants, drain-blockers, booms, spill kits, and windsocks are in place.
15. Contractor must obtain clearance from the CEP Superintendent before pumping begins.
16. CEP staff will initiate and/or pump to minimal operations level or until the ammonia level is below the intake (approximately 1,200 gallons will remain at the bottom of the UST), and then will be locked out.
    a. Note: Existing state conditions creates 160 plus inches of lift to remove existing materials from the bottom of the UST.
17. Contractor shall pump ammonia out of UST.
    a. Contractor shall pump out residual aqueous ammonia using centrifugal pump. Use a centrifugal pump along with a 160-inch-long, 1-1/2-inch schedule 40 pipe stinger with built in venturi/ejector with food valve and inlet screen, connected to a jet pump and primed with water. This eliminates the need to pressurize the UST and allows a standard 2-inch chemical hose to complete the closed system vapor recovery. A vacuum breaker shall be installed to ensure pumping operations do not apply a negative pressure to the UST.
    b. Contractor shall use a centrifugal pump with a standard 1-1/2-inch stinger and a 5.0 PSIG nitrogen or carbon dioxide gas blanket to pressurize the UST and effectively force the ammonium hydroxide to ground level and use standard liquid pumping operations.
    c. Note: the cargo tank/Intermediate Bulk Container (IBC) vapor lines with need to be vented back to the UST to provide a closed system.

7.3 Equipment Requirements

Contractor shall provide the following equipment:

1. Tank pressure gauges (both vacuum and pressure) and temperature gauges need to be supplied by the Contractor to ensure the UST is neither under or over pressurized or operational temperature limits are not exceeded.
2. The Contractor and any UCDMC personnel will be required to wear PPE for each person which may include goggles, air purifying respirator (APR), and/or self-contained breathing apparatus (SCBA) while operating in the exclusion zone. PPE specifications for each task will be identified in the contractor H&S plan.
3. If entering the UST, the Contractor must provide all confined space and recovery equipment and training for all personnel involved with the confined space operation.
4. Backup generator capable of powering all Contractor-supplied equipment.
5. High-volume ventilation fan as back up to dilute ammonia vapors.
6. All pumping equipment (pumps, hoses, stinger, etc.) required to handle all liquid transfer and vapor recovery systems to complete a closed loop transfer operation. Existing UST outlets are 2-inch male camlock fittings.
7. Safety cones and spill containment (booms or basin).
8. All required power or hand tools to complete all installation and teardown operations.
9. 1,500-gallon or larger capacity cargo tank compatible with 29% ammonia hydroxide or IBCs with an aggregate capacity of at least 1,500 gallons.
10. Forklift, if IBCs are used for loading or unloading from the transport vehicle.
11. All pumping and stingers to access the bottom of the UST.
12. At least 100 gallons of citric acid (other alternatives are hydrogen peroxide, baking soda, or acetic acid/non-distilled vinegar) to be used for neutralizing and treating any spilled ammonium hydroxide solution.
13. Four hand held ammonia gas detection monitors with alarms. The monitors shall be capable of detecting up to at least 200 ppm.
14. Hazard materials identification and shipping papers.
    a. Contractor is responsible to prepare all shipping papers to comply with U.S. Department of Transportation (DOT) shipping requirements.

7.4 Safety Precautions

1. NO VACUUM PUMP OR COMPRESSOR WILL BE USED. Pulling any amount of vacuum on the product will easily boil off releasing ammonia gas. This was previously demonstrated when a Contractor used a vacuum tanker with carbon filters to scrub the vacuum pump exhaust and immediately saturated the filters and released ammonia gas.

8.0 TASK 2 DILUTE RESIDUAL AQUA AMMONIA AND DRAIN

8.1 Task Description

UCDMC CEP personnel will ensure that the UST operations are set up and isolated prior to conducting UST diluting and draining activities. The contractor shall implement pre-draining activities such as equipment set up and conduct a pre-check of the supplied air equipment. Any perimeter controls will be put in place for gates, walkways, etc. Contractor shall dilute and pump ammonia out of UST.

8.2 Critical Steps

1. Once the ammonium hydroxide level in the UST is below the existing submersible pump (73-P-3066) inlet, CEP staff will refill the UST with water to fill the UST.
2. CEP will confirm diluted residuals of aqueous ammonia to be at or below 3% ammonium hydroxide solution by using an ammonia single gas detector, then discharge the collected dilution to the CEP wastewater treatment system. If further dilution is needed, additional water will be injected into the pump discharge to further dilute the discharge to wastewater system acceptable limits.
3. Once the liquid pumping is completed by the Contractor, either low temperature steam (around 130-150 degrees Fahrenheit) or a water mist shall be introduced to the UST to condense and dilute the ammonia vapor pressure to zero PSIG before any lines are disconnected. Please note that the vacuum breaker shall be installed and still in the system to eliminate implosion of the UST.
4. Contractor shall provide a DOT Specification cargo tank with a capacity of at least 1,500 gallons and a design pressure of 25 PSIG or greater, or multiple IBCs UN Specification with at least a 10 PSIG working pressure and means of providing a closed loop vapor return to the UST with a total aggregate capacity of at least 1,200 gallons plus 5% outage, for removing/transferring ammonia from the UST.
    a. Note: IBCs will be designed to keep all tanks under pressure to minimize the amount of ammonia that volatilizes and keep the system closed so that fugitive vapors are controlled.
5. Contractor shall install secondary containment (e.g., bermed area) for both the cargo tank or IBCs, and a portable generator (as backup power for the ventilation fans and transfer pump if needed). Facility will provide electrical power, but Contractor is responsible for power cords and emergency shutdown capabilities.
6. Contractor will use and install a cast iron or steel jet pump configuration with venturi and foot valve inside of the UST. (All plumbing materials, hoses, pipes, and fitting shall all be appropriate for aqua ammonia service, i.e., no brass, copper, galvanized materials). Hoses will be installed from UST to pump, pump to cargo tank (or IBCs), then vapor return to form a closed system while transferring product.
7. The drop piping venturi/foot valve should be plastic, steel, or other material compatible with the aqueous ammonia. The need for essentially no suction lift has been demonstrated by the existing tank system design where a submersible pump is used for normal operations to eliminate pump cavitation created by the vapor pressure of the product. The jet pump setup would be to build a coaxial venturi and foot valve assembly that will fit into a 2-inch schedule 40 pipe as a closed system and will enter via the 2-inch camlock with ball valve from the existing vapor recovery line.
8. During all pumping and cleaning operations, the UST tank pressure and temperatures needs to be monitored by the Contractor to ensure operations do not over pressurize or collapse the UST.
9. Contractor shall implement an air-tight connection during the pumping process to contain aqueous ammonia vapors. This connection will be using either a camlock fitting or some other type of air-tight connection.
10. Contractor will provide a 2-inch schedule 40 pipe, as a closed system, and connect it to the existing 2-inch camlock with ball valve on the vapor recovery line.
11. Contractor shall prime the cast iron or steel jet pump before the evacuation. Residual aqueous ammonia will be pumped out as much as possible via the stainless-steel dual diaphragm pump and into the stainless-steel IBCs.
12. As a general practice, the Contractor will extract the remaining recoverable product and complete a vapor test for the remaining vapors in the UST.

8..3 Equipment Requirements

1. Tank pressure gauges (both vacuum and pressure) and temperature gauges need to be supplied by the contractor to ensure the UST is neither under or over pressurized or operational temperature limits are not exceeded.
2. The Contractor and any UCDMC personnel will be required to wear PPE for each person which may include goggles, air purifying respirator (APR), and/or self-contained breathing apparatus (SCBA) while operating in the exclusion zone. PPE specifications for each task will be identified in the contractor health and safety plan.
3. If entering the UST, the Contractor must provide all confined space and recovery equipment and training for all personnel involved with the confined space operation.
4. Backup generator capable of powering all Contractor-supplied equipment.
5. High-volume ventilation fan as back up to dilute ammonia vapors.
6. All pumping equipment (pumps, hoses, stinger, etc.) required to handle all liquid transfer and vapor recovery systems to complete a closed loop transfer operation. Existing UST outlets are 2-inch male camlock fittings.
7. Safety cones and spill containment (booms or basin).
8. All required power or hand tools to complete all installation and teardown operations.
9. 1,500-gallon or larger capacity cargo tank compatible with 29% ammonia hydroxide or IBCs with an aggregate capacity of at least 1,500 gallons.
10. Forklift, if IBCs are used for loading or unloading from the transport vehicle.
11. All pumping and stingers to access the bottom of the UST.
12. At least 100 gallons of citric acid (other alternatives are hydrogen peroxide, baking soda, or acetic acid/non-distilled vinegar) to be used for neutralizing and treat any spilled ammonium hydroxide solution.
13. Four hand held ammonia gas detection monitors with alarms.
14. Hazard materials identification and shipping papers.
    a. Contractor is responsible to prepare all shipping papers to comply with U.S. Department of Transportation (DOT) shipping requirements.

8.4 Safety Precautions

1. **NO VACUUM PUMP OR COMPRESSOR WILL BE USED**. Pulling any amount of vacuum on the product will easily boil off releasing ammonia gas. This was previously demonstrated when a contractor used a vacuum tanker with carbon filters to scrub the vacuum pump exhaust and immediately saturated the filters and released ammonia gas.

9.0 TASK 3 CLEAN AND PREPARE THE UST FOR A UREA COATING

9.1 Task Description

Contractor will clean and prepare the UST in preparation for the Urea coating.

9.2 Critical Steps

1. Manway interferences will be displaced and manways will remain sealed with four bolts in preparation for confined space entry operations.
2. Ensure UST will be isolated from the vapor recovery line and/or pump discharge to ensure proper Lock-out/Tag-out.

3. Confined space entry primary and secondary teams will be staged and entry and egress will be designated based on site conditions and weather pattern.
4. Contractor will provide potential plume modeling and movement based on the current weather station data.
5. In preparation for confined space entry, initial atmospheric testing of the UST interior for aqueous ammonia vapors and oxygen levels will be taken, and measurements will be continued at specified frequency.
6. The primary team will unbolt the last of the manway access and the opening will be dusted with water from a pressure washer aerosol system to begin vapor laydown.
7. As a backup option and if needed, the UST will be flooded with dilute citric acid solution to react with the ammonia remaining in the UST. This process will generate a low heat condition.
8. The Contractor will use a remote multi directional spray ball cleaner to clean the inside walls of the UST to remove residual aqueous ammonia.
9. A vacuum truck will be used to recover rinse water and any recoverable solutions from the low end of the UST.
10. Vacuum pump needs to be pulled to complete vacuum (zero pounds per square inch absolute [PSIA]), and then vacuum pump is shut down and will remain off before starting evacuation procedure and during any evacuation.
11. Monitoring of the UST will be conducted to ensure no vacuum is imposed on the UST that could collapse the UST. Any air entering the UST should be saturated with steam or water mist to avoid explosive mixture and escape of ammonia vapor.
12. It is recommended to water purge at least two complete fillings and pump off the rinse water, and to conduct a live steam, low-pressure four-hour purge. This will force the ammonia out of the carbon steel and collapse any remaining ammonia vapor. Note: Monitor temperature to make sure the 150 degrees Fahrenheit tank design temperature is not exceeded, along with the design pressure and vacuum.
13. The remaining pH and ammonia levels will be checked prior to removal of the manway. Use of misting fans with vinegar or other neutralizing media can be used to minimize/eliminate ammonia vapors.
14. The Contractor will advance cleaning the interior as they proceed to remove the bulk of source materials.
15. The cleaning process will continue to remove the residual from the UST in preparation for tank re-use.
16. Rinse water will be recovered and staged in 275-gallon totes for sampling and disposal coordination.
17. Cleaning activities of the UST will be monitored at all times by CEP staff.
18. Any additional effluent generated will be evaluated by UCDMC Environmental health and Safety (EH&S) for metals and pH will not be discharged to the Publicly Owned Treatment Works (POTW). Water will only be discharged upon approval of EH&S.
19. Contractor completes cleaning of ammonia UST.
20. Contractor disconnects hoses from truck.
21. Contractor verifies all solid ammonia waste is properly stored in containers and ready to be transported to UCDMC hazardous waste yard.

22. Contractor to reinstall manhole cover using portable hoist (cherry picker) and chain fall. Contractor to ensure new gasket is correctly installed
23. CEP Staff will connect vapor piping to manhole cover.
24. Contractor shall move truck off site.
25. CEP staff will install recirculation and discharge piping on manhole cover.
26. CEP staff will confirm air monitor reads less than 10 PPM above manhole cover area.
27. CEP staff will wire ammonia pump.
28. CEP staff will release LOTO on ammonia system if not required by other work activities.

9..3 Equipment Requirements

Contractor shall provide the following equipment:

1. Tank pressure gauges (both vacuum and pressure) and temperature gauges will be supplied by the contractor to ensure the UST is neither under or over pressurized or operational temperature limits are not exceeded.
2. PPE for each person including goggles, APR, and/or SCBA while operating in the exclusion zone.
3. If entering the UST, the Contractor must provide all confined space and recovery equipment and training for all personnel involved with the confined space operation.
4. Backup generator capable of powering all Contractor supplied equipment.
5. High volume ventilation fan as back up to dilute ammonia vapors.
6. All pumping equipment (pumps, hoses, stinger, etc.) required to handle all liquid transfer and vapor recovery systems to complete a closed loop transfer operation. Existing UST outlets are 2-inch male camlock fittings.
7. Safety cones and spill containment (booms or basin).
8. All required power or hand tools to complete all installation and teardown operations.
9. 1,500 gallon or larger capacity cargo tank compatible with 29% ammonia hydroxide or IBCs with an aggregate capacity of at least 1,500 gallons.
10. Forklift, if IBCs are used and need to be loaded or unloaded from the transport vehicle.
11. All pumping and stingers to access the bottom of the UST.
12. At least 100 gallons of citric acid (other alternatives would be hydrogen peroxide, baking soda or acetic acid non-distilled vinegar) to be used for neutralizing and treat any spilled ammonium hydroxide solution.
13. Four Ammonia gas detection monitors with alarms.

9.4 Safety Precautions

1. The liquid pump used to transfer the aqua can be electric, gasoline powered, or a truck PTO (power take-off) shaft driving the liquid pump. When using a pump, it should be kept in mind that the vapor pressure of the aqua ammonia is about equal to atmospheric pressure and that any suction pressure will cause the ammonia vapor to come out of solution and vapor lock will occur. System should be designed so that the pump is as near to the hose connection as possible and that the hose length required will be as short as possible, twenty feet or less.

10.0 TASK 4 CONFIRM UST READINESS AND PROJECT CLOSEOUT

10.1 Task Description

Contractor will apply the Urea coating and confirm UST is mechanically set up to accept product for future operations.

10.2 Critical Steps

1. Immediately before applying spray coat, a stripe coat will be added to all welds and edges to assure adequate protection of these areas.
2. Coating will be applied to specified thickness.
3. The ventilation system shall be capable of preventing the solvent vapor concentration from reaching the lower explosion limit for the solvents used. User should test and monitor exposure levels to ensure all personnel are below guidelines.
4. Precautionary measures for potential fire and explosion hazards will be implemented. The product contains less than 1% volatile components; however, vapors are heavier than air and can travel long distances, ignite, and flash back.

10. 3 Equipment Requirements

1. UST pressure gauges (both vacuum and pressure) and temperature gauges shall be supplied by the Contractor to ensure the UST is neither under or over pressurized or operational temperature limits are not exceeded.
2. PPE for each person including goggles, APR, and/or SCBA while operating in the exclusion zone.
3. If entering the UST, the Contractor shall provide all confined space and recovery equipment and training for all personnel involved with the confined space operation.
4. Backup generator capable of powering all Contractor supplied equipment.
5. Safety cones and spill containment (booms or basin).
6. All required power or hand tools to complete all installation and teardown operations.
7. Four ammonia gas detection monitors with alarms.

10.4 Safety Precautions

1. Eliminate all ignition sources. Keep away from sparks and open flames. All electrical equipment and installations should be made and grounded in accordance with the National Electric Code. In areas where explosion hazards exist, workers should be required to use non-ferrous tools and wear conductive and non-sparking shoes.

11.0 REFERENCES

11.1 Process & Instrumentation Drawings (P&IDs)

- M73320, M320 – Central Plant
- Ammonia UST, 73-T-3061

11.2 Equipment Manuals

- Submersible Pump, 73-P-3066
- Ammonia UST, 73-T-3061

11.3 Operation Manual UCDH Central Energy Plant Procedures

- UCDH P&P #1612 – Response to Hazardous Substances Spills
- CP P&P #1612 - Sacramento County Wastewater System Slug Control Plan
- UCDH P&P #1626 – Confined Space Program
- CP P&P #502 – Equipment Safety/Best Safe Work Practices
- CP P&P #207 – Ammonia Maintenance Training
- California Accidental Release Prevention Risk Management Plan (CalARP RMP)

12.0 APPENDICES

APPENDIX A (*include any necessary UCDMC procedures that would be needed for the bid package)*

END OF SPECIFICATION