



Section 220500

Common Work Results for

Plumbing

DESIGN GUIDE

1 General

1.1 General

- A. All plumbing systems chosen for use on the University campus shall consider long-term ownership, and their operation and maintenance needs.
- B. Provide facility piping diagrams for all pressurized plumbing systems showing utility service, major equipment and overall distribution or mains by floor.
- C. Systems and construction methods shall be chosen based on a useful life of 25 to 30 years.
- D. Engineers shall visit the campus at the end of each major design phase unless previously arranged to have a virtual meeting to present the design and system approach and review documents with the MHM and MPM. This includes, but is not limited to, serviceability as discussed elsewhere in this document.

1.2 Permitting

- A. In addition to submission of normal permitting to the AHJ for mechanical/plumbing and fire protection review, the design engineer is advised that all regulated emission sources are required to be permitted by the Department of Ecology. The design engineer is responsible for permitting of air emissions with the Department of Ecology. This includes new fuel fired equipment, spray paint booths



and other emission sources. This includes even small loads such as small gas fired water heaters.

- B. The campus operates under a single permit and each project with emissions, requires a notice of construction that is filed with the Department of Ecology complete with emissions calculations and a best available control technology analysis. The consultant fees shall include the permitting costs associated with Department of Ecology.
- C. The Department of Ecology requires that in addition to the project being permitted that the application include all source emissions permitted by CWU in the three-year period leading up to the required permit. Landau and Associates has assisted with many of the campus emission permits.
- D. CWU contact for the campus Department of Ecology permit is the Campus Building Energy Engineer.

1.3 Life Cycle Costs Analysis

- A. In accordance with RCW 39.35, for facilities greater than 20,000 square feet, perform a Life Cycle Cost Analysis (LCCA) in conjunction with the Architect, Mechanical Engineer and Electrical Engineer.
- B. Prior to commencement of the LCCA, the work plan identifying options for study for the LCCA shall be reviewed and approved by the Capital Planning Project Manager (CPPM) and the Mechanical Plumbing Manager (MPM).
- C. Utilize the Life Cycle Cost Model (LCCM) developed by the Washington Office of Fiscal Management (OFM) and prepare model in accordance with <https://ofm.wa.gov/facilities/facility-life-cycle-cost-model> .
- D. This comprehensive analysis encompasses the total building construction and operating costs and is performed in the pre-design and the design phase.

1.4 Codes and Standards

- A. Codes shall be most recent addition, adopted by the State of Washington or these adopted by the LEED version being pursued for certification.



- B. Facility design and installation shall conform to the following codes and standards.
 - 1. American Disabilities Act
 - 2. American Society of Civil Engineers Minimum Design Loads for Buildings and Other Structures ASCE 7 (seismic)
 - 3. American Water Works Association (backflow prevention)
 - 4. National Electrical Code
 - 5. Uniform Plumbing Code
 - 6. Washington State Energy Code
 - 7. Washington State Boiler and Unfired Pressure Vessel Code
 - 8. Applicable state and local ordinances and regulatory agencies
- C. All mechanical equipment with electrical connections shall be listed by UL or other nationally recognized testing laboratory (NRTL). Where required by Division 26, indicate the required short-circuit current rating (SCCR) for the equipment on the equipment schedules.

1.5 LEED

- A. Major facility projects receiving funding from the state capital budget or through a financing contract as defined in RCW 39.94.020 shall be certified at the level of Silver or higher. CWU has goals of reaching certification levels of Gold or higher when practical.
- B. Major facilities include major new construction and renovation projects over 5,000 GSF where the renovation costs exceed 50% of the building assessed value.

1.6 Efficiency

- A. All selected HVAC units shall be of the highest energy efficiency possible.



1.7 Mechanical Rooms

- A. The campus has very high seasonal groundwater due to irrigation water in the canal that passes through campus.
- B. Basement mechanical spaces shall be avoided unless specific permission is granted by the CPPM. The design team shall demonstrate precautions to prevent ground water intrusion into the mechanical room.
- C. Access panels or doors must be large enough to allow the removal of any and all mechanical system components located within.
- D. It is preferred that plumbing equipment rooms be fully enclosed and roofed. This will frequently require double doors for removal of larger pieces of equipment.
- E. Where major equipment is in a penthouse or on the roof, service access shall be provided by:
 - 1. Elevators are preferred.
 - 2. Regular stair-not preferred. Review equipment service and replacement with the mechanical plumbing manger and mechanical HVAC manager. Provide hoist and beam at top of stair to allowing removal and reinstallation of major equipment.
 - 3. Ships ladder or alternating tread stair are permitted only when approved by the Capital Planning Project Manager.
 - 4. If/when ladders/stairs are provided, provide hoist and beam or lifting crane at top of stair to allowing removal and reinstallation of major equipment.
- F. Rooms located above grade:
 - 1. Coordinate construction with the project architect as it relates to water proofing of elevated equipment rooms (excluding slab on grade areas).
 - 2. Best practices include:
 - a. Floor drains as indicated above with sloping of floor to area drains



- b. Epoxy coating on floor
- c. Concrete 6" curbs around perimeter of room, around pipe shafts and duct shafts.
- d. Isolated pipe and conduit penetrations may utilize an oversized sleeve with a 2" water stop poured in place in the slab that terminates a minimum of 4" above the floor or a mechanical rubber pipe seal such as "Link-Seal". When floor is part of a fire rated assembly, the penetrations shall be approved with UL as part of the fire rating.

1.8 Roof Mounted Equipment

- A. All roof-mounted equipment must consider re-roofing and roofing maintenance and/or repair operations.

1.9 Backup Power

- A. Coordinate with Division 26 to have back-up power provided to the following systems
 - 1. Life Safety Systems
 - 2. Code Required elements
 - 3. Domestic booster pumps and electronic faucets and flush valves (residential facilities)
 - 4. Sump pumps, grey water/foundation pumps when serving systems that are operational in a power outage
 - 5. Sewage ejectors
 - 6. Heat trace for pipe subject to freezing
 - 7. As required for facility program.
- B. The following equipment shall have back-up power when determined necessary by the mechanical piping manager
 - 1. Domestic booster pumps and associated electronic faucets and flush valves.



1.10 BIM modeling

- A. Contractors shall participate with the BIM modeling if required in Division 1.

1.11 Serviceability

- A. Install systems (piping, ductwork, equipment, accessories) to facilitate maintenance and repair or replacement.
- B. Design and construction shall provide easy access to serviceable components in the plumbing systems.
 - 1. Engineer shall demonstrate access in building BIM model to the Mechanical Plumbing Manager during the design phase.
 - 2. Serviceability shall consider height above ceiling. Valves and equipment to be installed to allow reasonable access from ladder with a normal reach.
 - 3. Contractor shall demonstrate service prior to project substantial completion after ceilings are installed. A preliminary walkthrough prior to the ceiling tiles being installed is highly recommended.
- C. For equipment located above ceilings, access shall consider other systems above the ceiling as well as devices in the ceiling system that may impede access such as sprinkler heads, occupancy sensors, lights, smoke detectors, etc.
- D. Allow for coil removal and replacement in mechanical rooms. Provide access to all DDC system controllers, fans, filters, balancing dampers and other equipment requiring service.
- E. Access panels need to be a minimum of 18x18 for hand reach, 24 x 24 for person access (shoulders through). Access panels-location and size shall be coordinated with Division 8. Excessively heavy panels or unusually large ceiling panels shall be hinged.
- F. Allow a minimum of 24-36" clearance for operator's access to all equipment. This clearance may need to be increased to allow for the removal and/or replacement of any and all items within the units which may need to be removed for servicing and/or repair operations.



- G. Clearances around base mounted pump motors. For large motors: maintain 30” minimum on one side for motor removal and minimum 18” between back-to-back pumps.

1.12 Telecom Rooms (MDF/IDF)

- A. No piping may be run over telecom rooms except for the branch piping servicing the cooling units. Main piping shall be routed around telecom rooms.

1.13 Custodial Rooms

- A. Do not locate utility panels, pipe chases, mechanical equipment or roof hatches within the closet.

1.14 Drawings

- A. As part of the construction documents, the engineer shall prepare one-line diagrams of the following systems. One-line diagrams are intended to be high level schematic plans that quickly indicate major equipment and arrangement as well as areas of building serviced
 1. Domestic and Non-Potable Cold Water
 2. Domestic and Non-Potable Hot Water.
 3. Pure water
 4. Lab gases

1.15 Training

- A. Provide training on all systems and equipment prior to project completion. Training shall be recorded by video and shall be a combination of classroom training and site walk-through.
- B. Provide a second training session and facility walkthrough one month before expiration of the one-year warranty.



- C. When equipment is indicated to have start-up by factory trained technicians, training shall be performed at the time of start up by the factory trained technicians.

1.16 Factory Start-Up

- A. Provide as indicated throughout specifications.

1.17 Project Closeout

- A. Refer to Division 1 for supplemental requirements
- B. Project Record Drawings
 1. Contractor shall maintain a single set of neatly annotated mark ups (digital or hard copy) in the field that include as installed deviations from the contract engineered drawings.
 2. The Owner's representative and the contractor shall review these monthly at the time of pay application.
 3. The contractor's fabrication drawings or BIM coordination documents, while helpful, are not acceptable as record drawings as they do not typically include the same content (annotation, sizing etc.) as the contract engineered drawings and they do not typically clearly indicate where deviations are made to the contract engineered drawings.
 4. At project closeout, submit annotated record drawings to the Owner's representative as part of the closeout materials.
 5. The Architect/Engineer will be responsible for drafting the contractor's record drawings into electronic record files. Deliverables to the Owner include:
 - a. Original BIM Model (if utilized)
 - b. Exports of each plan into Auto-CAD DWG files with each piping or duct type on a separate layer.
 - c. Fire dampers and smoke dampers shall additionally be separated on a separate layer for the owner's preventative maintenance program to facilitate annual inspections.



1.18 Acoustics

- A. Systems shall be designed and installed to meet the maximum noise criteria (NC) established for each space.

1.19 Vibration and Seismic Controls

- A. Provide in accordance with 230548

1.20 Commissioning

- A. Division 22 systems shall be commissioned in accordance with requirements of 230800.

