DIVISION 22 – PLUMBING

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22 00 50 Design Criteria

A. Refer to the DFCM website for the latest mechanical design requirements. USU design requirements include the DFCM design requirements.

B. Comply with the latest (Utah adopted) edition of the International Codes:
   - International Building Code (IBC)
   - International Mechanical Code (IMC)
   - International Plumbing Code (IPC)
   - International Fuel Gas Code (IFGC)
   - International Energy Conservation Code (IECC)
   - International Fire Code (IFC)
   - National Electric Code (NEC)
   - All state amendments.

C. Comply with all applicable local, state, and federal codes and regulations.

D. Provide waste and vent isometric riser diagrams for all multistory (more than one floor) buildings.

E. Submit plumbing basis of design with schematic design, design development, 100% review documents for all new buildings and major remodels. Submit design calculations for all major plumbing systems.

F. Avoid locating toilet rooms in basements where a sewage ejector pump is required.

G. Avoid locating floor drains in air handling units or plenum spaces where trap seals can dry-out or freeze.

H. Locate grease interceptors, chemical dilution tanks, etc. away from building air intakes. Locate grease interceptor where it can be properly maintained.

I. Avoid locating plumbing fixtures on exterior walls.

J. Food waste (garbage) disposal units are not allowed.

22 01 00 General Requirements

A. Test and inspect all plumbing installations with a representative of the university present prior to backfill or enclosing plumbing piping.
B. Schedule all utility shutdowns 7 days in advance. Submit written request to USU project manager.

22 05 00 Common Work Results

A. Provide USA made plumbing piping and fittings.

B. Refer to Division 23 for hangers & support, identification & tagging, meters & gages, vibration & seismic controls, operation & maintenance manuals, balancing, and other general piping requirements.

C. Route all plumbing piping to remain clear of transformer vaults, refrigerated spaces, switch rooms, elevator shafts, elevator equipment rooms, and other critical areas.

D. Do not install domestic water piping in or below concrete slabs (except for water service piping).

E. Plumbing piping is not permitted in exterior walls.

F. Where possible provide a freeze-type wall hydrant on the exterior at each side of the building. Locate wall hydrants where feasible in an accessible area within 15’ of the entrance to the building. Provide isolation valve(s) for the water main serving the wall hydrants. Locate piping serving wall hydrants in an interior wall. Slope piping to outside.

G. Coordinate saw cutting, core drilling, and other work within occupied buildings to avoid disruptions to the building occupants. Provide dust barriers, negative air flow, and sound barriers as required.

H. Provide appropriate method for removing cooling water where core drilling and saw cutting are performed to prevent staining of walls and floors.

I. Floor drains connected to the sanitary sewer shall be provided in all mechanical equipment rooms, restrooms and locker rooms.

J. Provide floor drains near all relief or drain down valves. Trench drains are preferred near all major equipment including boilers, chillers, pumps, etc.

K. Provide concrete curbs around perimeter of mechanical rooms where flooding could occur in adjacent occupied spaces.

L. Slope floors to floor drains, floor sinks, and trench drains.

M. Seal concrete floors water tight in all mechanical rooms.
N. Provide cleanouts for all plumbing fixtures, water closets, wash basins, urinals, water coolers or fountains, main sewer lines, lab benches, etc.

O. Provide fixtures designed for outside use for plumbing fixtures used in all weather installations.

P. Pipe bedding: Provide a sand bed with six (6") inches minimum coverage around pipes. Provide backfill free of boulders larger than two (2") inches. Compact and test all backfill according to ASTM compaction standards or provide pea gravel back fill.

Q. Provide accessible pipe chases with adequate space for repair and maintenance.

R. Provide access to all equipment, valves, controls, etc.

S. Avoid using adjustable wrenches on exposed chrome work.

T. Wall cleanouts are preferred over floor cleanouts.

22 06 00 General-Duty Valves

A. Provide all main piping with accessible shut-off valves for isolation purposes.

B. Provide all branch piping from main with shut-off valves.

C. Provide isolation valves at each toilet group and at each floor. Locate valves for easy access.

D. Provide valves that are listed and rated for intended use.

22 07 00 Insulation

A. Insulate all domestic water piping to conform to the latest energy code requirements (IECC).

B. Provide continuous insulation and jacketing through hangers and floor and wall penetrations.

C. Provide a valve stem extension to accommodate full insulation thickness at all valves.

D. Insulate all storm drainage piping and roof drain bowls with an impervious vapor barrier.
22 08 00 Commissioning

A. All plumbing systems shall be commissioned. Refer to project commissioning requirements.

22 10 00 PLUMBING PIPING AND PUMPS

22 11 00 Water Distribution

A. Connect new building water service to the campus culinary and irrigation water distribution systems where available.

B. Isolate the building water distribution system by providing two reduced pressure backflow preventers (sized at 50% flow each) mounted in parallel downstream of the PRV station located inside the building near adequate drainage.

C. Verify that adequate water pressure is available for the building based on fire hydrant flow tests, if available. Provide booster pump or pressure reducing station as required. Provide a minimum of 30 psig to the furthest outlet.

D. Provide water distribution piping from the following:

   All sizes          Type L copper

E. Provide water service piping from the following:

   Underground Piping: 3" & smaller Type K copper
                        4" & larger Ductile iron
                        Polyethylene

F. Provide water service piping with no joints below slab. Extend water piping above floor as near the exterior wall as practical. Avoid extending water service piping to an interior room.

G. Provide backflow protection on all make-up water for heating, cooling, or process systems, water cooled equipment, fume hoods, hose bibs, etc.

H. Provide a hot water recirculation system to maintain outlet water temperature. Heat trace shall not be used.

I. Viega ProPress pipe fitting connections are allowed for domestic water systems for small projects, remolds, additions, and repairs.
22 13 00 Sanitary Sewerage

A. Connect the building sanitary waste system to the campus sanitary sewer system where available.

B. Provide sanitary sewerage piping from the following:

   Above Ground:  All sizes    Cast Iron
   Below Slab:     All sizes    Cast Iron
                    PVC (solid core – Sch. 40 (min.))
                    ABS (solid core)

C. Provide bell and spigot joints with compression gaskets or heavy duty no-hub joints approved for underground piping. Provide bell and spigot joints with compression gaskets or no-hub joints for above grade piping.

D. Provide vent piping from the following:

   Above Ground:  All sizes    Cast Iron
   Below Slab:     All sizes    Cast Iron
                    PVC (solid core – Sch. 40 (min.))
                    ABS (solid core)

E. Ejection Pumps: Buildings that require sanitary waste to be pumped shall have a sewage ejection system with duplex submersible pumps complete with high water alarms. The piping shall be flanged or screwed from the pump to the main sewer connection. Provide a forty-five (45) degree offset where the piping exits the holding tank through the check valves and shut-off valves. Provide another forty-five (45) degree offset up to the main connection. The pump control should be equipped with a hand-off-auto switch and manual test control. Controls shall be designed to alternate pump operation and provide a backup alarm. Connect a high level alarm to the building automation system.

22 14 00 Storm Drainage

A. Connect the building storm drainage system to storm water retention sumps located near each building on the central campus.

B. Connect all roof and surface water to the storm drainage system. No storm water shall be connected to the sanitary sewer system. Do not connect building floor drains to the storm drainage system.
C. Provide storm drainage piping from the following:

   Above Ground: All sizes Cast Iron
   Below Slab:   All sizes Cast Iron
               PVC (solid core)
               ABS (solid core)

F. Provide bell and spigot joints with compression gaskets or heavy duty no-hub joints approved for underground piping. Provide bell and spigot joints with compression gaskets or no-hub joints for above grade piping.

22 15 00 Compressed-Air Systems

A. Provide compressed air piping from the following:

   Above Ground: All sizes Type L copper

22 30 00 PLUMBING EQUIPMENT

22 33 00 Domestic Water Heaters

A. Steam is the preferred heat source for all domestic hot water systems. Availability of existing hot water source and cost effectiveness of its use should be investigated while designing a domestic hot water system for the specific project.

B. Provide a water softener system where a heat exchanger is used for the domestic water system. Provide pipe ports for cleaning.

22 40 00 PLUMBING FIXTURES

22 42 00 Plumbing Fixtures

A. Provide water closets, urinals, and lavatories with water flow control devices of the water conserving type.

B. Waterless urinals are not permitted due to costly maintenance, odors, and waste piping blockage.

C. Wall hung fixtures are preferred in all public restrooms. Provide adequate space for carriers.

D. Water closet and urinal flush valves shall be battery operated sensor type. Preferred flush valve manufacturers: Sloan, Zurn, Moen.
E. Lavatory faucets shall be battery operated sensor type. Commercial freehand type faucet with thermostatic mixing valve, single hole, AA batteries, components above counter, and thermal or proximity sensor. Preferred manufacturers: Moen, Symmons, Zurn, Sloan

F. Provide one or more of the following trap primer methods for each room type:

- **Toilet Rooms:** Hose bibb, Deep seal trap
- **Custodial Rooms:** Deep seal trap, Barrier type floor drain trap seal protection device (Trap Guard or Sure Seal)
- **Mechanical Rooms:** Hose bib, Deep seal trap, Trap seal primer (solenoid valve with timer)
- **Emergency Showers:** Deep seal trap, Barrier type floor drain trap seal protection device (Trap Guard or Sure Seal)

G. Drain line connection and pressure type trap seal primers are not permitted.

22 45 00 Emergency Plumbing Fixtures

A. Provide floor drains with emergency showers. Connect floor drains serving emergency showers to the chemical waste system.

B. Provide tempered water to emergency shower/eyewash stations.

22 47 00 Drinking Fountains and Water Coolers

A. Provide one electric water cooler with a non-filtered bottle filler (minimum) on each building level.

B. Preferred manufacturers: Elkay, Halsey Taylor

22 60 00 LABORATORY GAS & VACUUM SYSTEMS

22 61 00 Laboratory Compressed-Air Systems

A. Laboratory compressed air system piping shall be Type L, ACR copper with wrought copper fittings and soldered or brazed joints.
B. The system shall be designed to supply 1 scfm of air to each lab outlet @ 100 psig with a diversity factor based on the number of outlets. Laboratory compressed air system distribution piping shall be sized so that the uniform friction loss does not exceed 10% of the delivered pressure and the velocity is less than 4,000 fpm.

C. Provide 50% redundant capacity for all air compressors.

D. Preferred air compressor manufacturers are: Ingersoll Rand, Becker, Curtis, Quincy, Kobelco, Atlas Copco

22 62 00 Laboratory Vacuum Systems

A. Laboratory vacuum system piping shall be Type L copper with wrought solder joints and wrought copper fittings.

B. The system shall be designed to extract 0.5 scfm of air from each lab inlet @ 20" of vacuum with a diversity factor based on the number of inlets. Laboratory vacuum system distribution piping shall be sized to 2" Hg total uniform friction loss and a velocity less than 6,000 fpm.

C. Equipment vacuum piping larger than 3" shall have drainage fittings.

D. Provide 50% redundant capacity for all vacuum pumps.

E. Use dry reciprocating type vacuum pumps. Do not use water vortex type.

F. Preferred vacuum pump manufacturers are: Busch, Reitschle, Dekker, Becker

22 63 00 Laboratory Special Gas Systems

A. Special gas system piping shall be Type L copper, ACR tubing with capped fittings and silver solder brazed joints.

B. Provide local gas cylinder stations in designated closets adjacent to the laboratories. Provide multi-station manifolds with regulators and wall brackets.

C. Provide space for space cylinders at each cylinder station.

22 63 00 Laboratory Natural Gas Systems

A. Natural gas system piping shall be schedule 40 black steel.

B. Where a central natural gas system is available, provide a lab shut-off valve in corridor outside of laboratory.
C. Provide space for space cylinders at each cylinder station.

22 66 00 Laboratory Chemical-Waste Systems

A. Laboratory chemical waste piping shall be flame retardant corrosion resistant schedule 40 polypropylene with fusion welded or mechanical joints for above ground, schedule 80 polypropylene with fusion welded joints for below ground.

B. Use polyvinylflouride (PVDF) plenum rating piping in ceiling or other plenums.

C. Provide Duriron or glass piping with cast iron couplings for discharge piping (25 feet) from Autoclaves, sterilizers, glasswashers, and other heat producing equipment.

D. Provide an active neutralization system consisting of packaged flow through type system with caustic and acid injection. Provide a sampling test location prior to connecting to the building sanitary waste system.

Revision Log:

7/7/14: No Garbage disposals, wall cleanouts preferred, automatic seismic gas shut-off valves, Viega Pro Press piping, water softeners, metered faucets, bottle fillers, air compressors, and vacuum pumps.