

# **DIVISION 22 - PLUMBING**

## **22 00 00 PLUMBING**

### **PART 1 - GENERAL**

#### 1.01 SCOPE:

- A. This section applies to all plumbing and piping systems inside buildings or interfacing within five feet of buildings. The detailed requirements of Plumbing Pumps (22 06 10 13), Steam and Condensate (23 22 00), Central Chilled Water (33 60 00), and Deionized Water Process Piping (40 23 13) are addressed in separate sections.
- B. As part of the design process (no later than the 50% Design Development drawings), the Consultant shall submit a Process and Instrumentation Drawing (P&ID) for each major system, illustrating all subcomponents of that system, for review by the WSU Project Manager and Engineering Services.
  - 1. For renovation and renewal projects, the Process and Instrumentation Drawing (P&ID) shall illustrate all subcomponents of the existing systems, together with the connections and integration of all new work.

#### 1.02 GENERAL PLUMBING DESIGN REQUIREMENTS

- A. Coordinate plumbing runs with Mechanical and Electrical systems to maintain grade without offsets.
- B. Install each run with the minimum necessary joints and couplings, but with adequate and accessible unions for disassembly, maintenance, or replacement of valves and equipment.
- C. When piping installations or modifications require roof penetrations or horizontal runs across roofs or parapets, reference the standards in section 07 70 00 "Roof Specialties and Accessories."
- D. Provide drain valves at main shut-off valves, low points of piping, and apparatus.
- E. All equipment, fixtures, appliances, and valves shall be installed where accessible for maintenance, removal, and replacement.
  - 1. Install valves at each piece of equipment, fixture, or appliance so that supply and return services can be shut off to remove the item without draining the system.
  - 2. Install valves for proper isolation of piping and equipment, including valves in branch lines to isolate sections of piping.

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#### 1.03 STANDARD BATHROOM DESIGN REQUIREMENTS

##### A. Minimum Number of Fixtures:

1. Assume overall gender distribution to be 50% male; 50% female.
  - i. Single-user toilet facilities shall be identified for use by either sex and shall contribute toward the total number of required plumbing fixtures.
2. The ratio of women's toilets to men's toilets and urinals shall be no less than three (3) Women's to two (2) Men's.
3. Minimum one (1) single-user toilet facility within each building (new construction or renovation).
  - i. One single-user restroom per floor when applicable.
4. Lavatories
  - i. Where two or more toilet rooms are provide for each sex, the required number of lavatories shall be distributed proportionately to the required number of toilets/ urinals.

##### B. Wall-hung Toilets and Urinals:

1. Wall-hung toilets are the WSU standard. Specifying and installing floor-mounted toilets requires approval from WSU Engineering Services.
2. Wall-mounted single-toilet carriers shall be double-nutted above and below the anchor foot. When the anchor foot is more than 7 inches from the toilet-mounting wall, a wide pipe chase support shall also be required. [SEE STANDARD DRAWING]

##### C. Toilets and urinals shall be separated by partitions. See WSU Design Standard 10 21 13 "Toilet Compartments and Partitions".

##### D. Bathrooms to include touchless fixtures where possible (hardwired to building preferred).

##### E. Floors and Walls: Hard, smooth, water-resistant, easily cleanable (at least to five feet high).

1. Black or dark-colored tile, cove base, fixtures, toilet partitions, etc., are not permitted.

##### F. Lavatories: Where possible, use countertop installed, self-rimming lavatories. Wall hung installations shall be used where small vanity tops are impractical. Floor-standing lavatories are not acceptable.

##### G. Hose Bib: All restrooms shall be provided with a hose bib hidden from view but accessible, preferably under lavatories.

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1. Hose bib shall be operated by a removable key. Provide key to the WSU Project Manager upon project completion.

H. Floor Drains: See details under “Special Requirements” below.

I. Plumbing Chase(s): All plumbing chases shall be provided with a minimum of thirty (30) inches clear width, providing personnel access to all piping and valves behind toilets, urinals, sinks, and any other water-using devices. Chase size may increase to accommodate other piping as long as clear width and personnel access can be maintained.

1. Architect and Mechanical Engineer of Record are responsible to coordinate plumbing chase design.
2. Provide access via a locked access door, generally located in a hallway. Chase access shall not be through Custodial Closets. See sections 08 31 00 (Access Doors & Panels) and 08 70 00 (Hardware and Keying).
3. Plumbing chase shall include lights and a convenience receptacle.

### **PART 2 - PRODUCTS**

#### **2.01 WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING**

A. Copper Tubing:

1. Copper Tubing: Type K, hard drawn.
2. Fittings: Wrought copper.

B. Galvanized steel pipe with malleable fittings

C. Joints (both copper tubing and galvanized steel):

1. Mechanical
2. Double wrap 20 mil polyethylene tape

#### **2.02 WATER PIPING, ABOVE GRADE**

A. Copper Tubing: Type L, hard drawn

B. Press Fit

C. Propress

D. Fittings:

1. Cast brass

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2. Wrought copper
- E. Joints:
1. Solder
  2. B cup Silver Braze
  3. Lead Free
- F. PEX: The following requirements shall be enforced:
1. Specify use of long barrel commercial-grade fittings with PEX.
  2. Pressure/temperature rating at 160 psi at 73°F.
  3. Pressure/temperature rating at 100 psi at 180°F.
  4. Pressure/temperature rating at 80 psi at 200°F.
  5. PEX design and installation shall be in accordance with the manufacturer's recommendations.
  6. All valves and isolation points shall be readily accessible, with no risk of cutting/shearing from trays or carriers.
  7. PEX horizontal mains shall be supported in one of three ways:
    - i. With hangers every 32"
    - ii. With a manufactured PEX support system installed per manufacturer's instructions
    - iii. In a manufactured pipe tray (no field-fabricated trays), if strapped every six feet
  8. Only piping shall be installed in trays. Any valves, joints, strainers or other devices shall be installed outside the tray – generally accomplished by installing these accessories in a gap between two trays. If trays are trimmed in the field, ensure there are no abrasive or sharp edges that can damage PEX tubing.
  9. Protect PEX tubing passing through masonry walls or metal studs with sleeves or grommets.
  10. Provide vertical support every 4 to 5 feet with a mid-story guide placed between floors.

#### **2.03 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING**

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- A. Cast Iron: No-hub couplings required; Husky 6000 with stainless steel multiple band clamps, or equivalent.

#### **2.04 SANITARY SEWER PIPING, BUILDING INTERIOR**

- A. Cast Iron: Specify no-hub couplings.

- 1. No-hub couplings shall be Husky 6000 with stainless steel multiple band clamps, or equivalent.

- B. PVC (solid core):

- 1. Cleanouts: Require cast iron pipe and fittings (including a brass plug) to the first piping change in direction for protection during cleaning.

- C. ABS (solid core)

- 1. Cleanouts: Require cast iron pipe and fittings (including a brass plug) to the first piping change in direction for protection during cleaning.

- D. A shielded transition coupling shall be required when joining dissimilar piping materials (i.e., PVC to cast iron transitions).

- 1. Pre-approved Manufacturer:

- i. ProFlex

#### **2.05 SANITARY SEWER VENT LINES**

- A. Cast iron: Cast iron soil pipe

- B. ABS (solid core)

#### **2.06 LABORATORY WASTE & VENT:**

- A. Rigid polypropylene with mechanical joints (above grade)

- 1. Fused polypropylene joints may be used where it can be demonstrated the joints are accessible for maintenance personnel and equipment. Use of these alternates must be approved by WSU Engineering Services.

- 2. Underslab use of polypropylene may be considered acceptable; must be approved by WSU Engineering Services.

- B. CPVC (manufacturer's designated products for Lab Waste only)

#### **2.07 DISTILLED / DEMINERALIZED WATER PIPING**

- A. Piping: Schedule 80 PVC

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B. Fittings: Schedule 80 PVC

#### 2.08 HYDRONIC PIPING

A. Schedule 40 black steel (mechanical joint fittings acceptable)

B. Type "L" hard drawn copper tube

C. PEX: The following requirements shall be enforced:

- i. Specify use of long barrel commercial-grade brass fittings with PEX.
- ii. Pressure/temperature rating at 160 psi at 73°F.
- iii. Pressure/temperature rating at 100 psi at 180°F.
- iv. Pressure/temperature rating at 80 psi at 200°F.
- v. All valves and isolation points shall be readily accessible, with no risk of cutting/shearing from trays or carriers.

#### 2.09 INSULATION

A. Piping systems requiring insulation are:

1. Steam (see 23 22 00)
2. Condensate (see 23 22 00)
3. Domestic cold water
4. Domestic hot water
5. Domestic hot water return lines
6. Hydronic piping
7. Interior down spouts
8. Chilled water (see 33 60 00)
9. Refrigeration (see 23 61 00)
10. Heat recovery

B. Serviceable fittings for all the piping systems listed above shall require removable insulation jackets with Velcro ties, regardless of WA State Energy code requirements.

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- C. Piping and equipment subject to condensation shall be insulated and have support systems allowing full insulation thickness.
- D. Domestic hot and cold water lines and rainwater piping shall be insulated with WAC 51-11 compliant fiberglass with vapor barrier, thickness compliant with the latest Washington State Energy Code.

#### **2.10 NATURAL GAS PIPING, ABOVE GRADE**

##### **A. Steel Pipe:**

- 1. Schedule 40 black steel
- 2. Fittings:
  - i. Malleable iron
  - ii. Forged steel welding type
- 3. Interior valves to be WOG rated 150 psi.
- 4. Exterior valves must be greased or lubricated.
- 5. Joints: Screwed for pipe two inches and under
- 6. Buried gas lines downstream of the gas meter are not acceptable. All buried gas lines shall be the property and under control of Avista Utilities.

#### **2.11 VACUUM PIPING**

- A. Schedule 40 steel pipe
- B. Type "L" hard drawn copper tube
  - 1. Soldered joints
  - 2. ProPress System

#### **2.12 COMPRESSED AIR PIPING**

- A. Schedule 40 steel pipe
- B. Type "L" hard drawn copper tube
  - 1. Brazed joints
  - 2. ProPress System

#### **2.13 FLANGES, UNIONS, AND COUPLINGS**

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#### A. Pipe Size 2 Inches and under:

1. 250 psig malleable iron unions for threaded ferrous piping
2. Bronze unions for copper pipe

#### B. Pipe Size over 2 Inches:

1. 250 psig forged steel slip-on flanges for ferrous piping
2. Bronze flanges for copper piping
3. Neoprene gaskets for gas service; 1/16 inch thick preformed neoprene

#### C. Connections/Unions:

1. Brass unions and brass nipples.
  - i. ClearFlow dielectric nipples are an acceptable substitution.
  - ii. Dielectric unions are not acceptable.

### 2.14 GATE VALVES

#### A. Specifications:

1. Up to 2 Inches: Bronze body, non-rising stem and hand wheel, inside screw, single wedge or disc, threaded ends, 150 lb. body rating.
2. Over 2 Inches: Iron body, bronze trim, non-rising stem and hand wheel, flanged ends, 150 lb. body rating.

#### B. Acceptable Manufacturers:

1. Nibco
2. Kennedy
3. Milwaukee
4. Tyco

### 2.15 GLOBE VALVES

#### A. Specifications:

1. Up to 2 Inches: Bronze body, rising stem and hand wheel, inside screw, renewable composition disc, threaded ends, with back seating capacity, 600 lb. body rating.



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2. Over 2 Inches: Iron body, bronze trim, rising stem and hand wheel, OS&Y, plug- type disc, flanged ends, renewable seat & disc.
- B. Acceptable Manufacturers:
1. Nibco
  2. Kennedy
  3. Milwaukee
  4. Tyco

#### **2.16 BALL VALVES**

- A. Specifications:
1. Up to 2½ Inches: Bronze body, stainless steel ball; full port; Teflon seats and stuffing box ring; lever handle and balancing stops; threaded ends with union; 150 lb. body rating.
  2. 3 Inches or greater: Cast steel body, chrome plated steel ball; full port; Teflon seat and stuffing box seals; lever handle or gear drive hand wheel; flanged; 150 lb. body rating (or greater, as required by system pressure).
- B. Acceptable Manufacturers:
1. Apollo
  2. FNW
  3. Jenkins
  4. Kennedy
  5. Legend
  6. Milwaukee
  7. Nibco
  8. Pro Flow
  9. Victaulic

#### **2.17 BUTTERFLY VALVES**

- A. Butterfly Valves are not acceptable on the WSU domestic water system. Use Gate Valves or Ball Valves for isolation points.

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#### 2.18 SWING CHECK VALVES

##### A. Specifications:

1. Up to 2 Inches:
  - i. Bronze 45 degree swing disc
  - ii. Solder ends
2. Over 2 Inches:
  - i. Iron body
  - ii. Bronze trim
  - iii. 45 degree swing disc
  - iv. Renewable disc and Teflon seat
  - v. Flanged ends

##### B. Acceptable Manufacturers:

1. Febco
2. Kennedy
3. Stockham
4. Watts
5. Powell
6. Crane
7. Ohio

#### 2.19 SILENT CHECK VALVES

##### A. Required where pressure gradient must be maintained during shutoff (i.e., downstream of pumps).

1. Silent checks shall not be used on steam lines downstream of traps.

##### B. Specifications:

1. Up to 2 Inches: Bronze body, 200 psi @ 250° F, threaded ends, resilient seats, center guided disk.

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2. Over 2 Inches: Iron body, bronze or stainless steel trim, class 125, 316 stainless steel spring, dual plate or tilting-disk type, resilient seat.

#### C. Acceptable Manufacturers:

1. Metra-Flex
2. Cla-Val
3. GA Industries
4. Nibco
5. Pentair
6. Victaulic (for grooved pipe systems)

#### 2.20 RELIEF VALVES

##### A. Specifications:

1. Bronze body
2. Teflon seat
3. Steel stem and springs
4. Automatic
5. Direct pressure actuated
6. Capacities ASME certified and labeled

##### B. Acceptable Manufacturers:

1. Grinnell, Bell & Gossett
2. Taco
3. Crane
4. Watts

#### 2.21 GRISWOLD VALVES

- A. Typically specified in the 1-14 psi range.
- B. Soldered connections are not acceptable; integral threaded unions are required on both sides.

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#### 2.22 EXPANSION TANKS

- A. Where expansion tanks are required on domestic water systems, specify diaphragm expansion tanks.
- B. Tank shall be clearly and visibly marked with set pressure.

#### 2.23 TOILETS:

- A. Shall be low-volume flush, 1.6 gallon toilets.
- B. Pre-Approved Manufacturers:
  - 1. Kohler Model 4330
  - 2. Eljer Signature Series
  - 3. American Standard
- C. Flush Valves: Sloan Royal Flush Valves; alternatives must be approved by WSU Engineering Services.

#### 2.24 METERS AND INSTRUMENTATION

##### A. Water Meters:

- 1. Standard water meter installation shall be a pulse water meter, networked through the campus standard SEL-735 electric meters, for reporting to the WSU Energy Management System SCADA and Historian.
  - i. Meters must be rated for potable water usage.
  - ii. Pre-Approved Manufacturers/Models:
    - 1) Hersey / Mueller
    - 2) Badger
- 2. Alternative network meters: Where required and approved by WSU Engineering Services, network meters may be installed for direct reporting to the WSU Energy Management System SCADA and Historian.
  - i. Siemens SITRANS FUS1010 clamp-on ultrasonic flowmeter
  - ii. ONICON F-3100 series electromagnetic in-line flowmeter

##### B. Thermometers:

- 1. Provide thermometers where equipment causes fluid temperature changes (except for finned radiation and convectors).

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2. Thermometers shall be installed in wells so they can be removed from the system and replaced without shutting the system down.
- C. Pressure Gauges:
1. Provide pressure gauges for all pumps (suction and discharge). Also see section 22 06 10 13 (Plumbing Pumps).
  2. Install a single pressure gauge with isolation valves across both supply and return lines to compare system pressure.
  3. Gauge selection shall typically center on design operating pressure and cover safe system operating range without damage.
  4. Provide isolation valves on both sides of gauges.
  5. Provide a throttle valve for each gauge to allow snubbing and isolation function.
  6. All gauges shall be installed where easily accessible and legible for Maintenance and Utilities personnel.

#### **2.25 SPECIAL REQUIREMENTS**

- A. Mechanical Rooms:
1. Above-ground mechanical room floor openings require curbs.
  2. Floor penetrations (piping, conduit, etc.) require pipe sleeves 2 inches above floor.
- B. Floor Drains: Floor drains are required in all mechanical rooms, bathrooms, kitchens, laundry rooms, shower drying areas, and service sink closets in addition to wet labs and for other building program needs.
1. Floors shall be sloped to ensure all spills and runoff flow to floor drains.
  2. Where located in close proximity to bathrooms, install trap primers on the tail piece of flush valves to maintain an air gap.
  3. Floor drains with potential for solids shall have basket strainers.
  4. Large capacity floor sinks or drains are preferable to trench drains in all cases.
  5. Floor drains and drain lines in Mechanical Rooms shall be sized to accommodate the maximum anticipated flow from equipment or piping in that space.

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6. PVC or other plastic fixtures are not acceptable in any applications.
7. Cast iron drains need to be protected with a factory-applied corrosion-resistant coating.

#### **C. Water Fountains**

1. WSU has generally standardized upon filtered water cooler and bottle-filling stations. Variations require approval from WSU Engineering Services.
2. Pre-Approved Products: Elkay Filtered EZH2O Bottle Filling Station with Single ADA Cooler

#### **D. Grease Traps**

1. Grease traps shall only be installed where determined necessary by the local Authority Having Jurisdiction. Grease trap design and installation requires approval from WSU Engineering Services. Maintenance and renewal of grease traps shall be an end user responsibility.
2. Specifications:
  - i. Fabricated steel with acid-resistant coating inside and outside
  - ii. Flow control fitting
  - iii. Removable baffles
  - iv. Threaded inlet and outlet
  - v. Internal air relief
  - vi. Double-wall trap without cleanout and gasket scoriated cover
3. Acceptable Manufacturers:
  - i. Wade
  - ii. Zurn
  - iii. Josam
  - iv. J.R. Smith

#### **E. Solids Separation and Collection**

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1. Facilities and applications with large quantities of biodegradable waste shall be collected and composted at the WSU Compost Facility, with appropriate collection methods to prevent disposal in Sanitary Sewer.
2. Sink-mounted garbage disposals are not acceptable at WSU.

### **PART 3 - EXECUTION**

#### **3.01 CONNECTION**

- A. Any connection to the WSU domestic water system – including temporary construction connections – shall require approval and observation by the WSU Cross-Connection Control Specialist. Coordinate through the WSU Construction Manager.

#### **3.01 DISINFECTION**

- A. New or repaired public drinking water systems shall be disinfected prior to connection, in accordance with the standards of the most current Uniform Plumbing Code as modified by Chapter 51-56 WAC, and in accordance with the most current version of ANSI/AWWA C651, “Disinfecting Water Mains.”
- B. For installation of new lines and systems, the Contractor is responsible to ensure all chlorination is performed according to the most current version of ANSI/AWWA C651, and that adequate bacteriological sampling results are obtained from a WA State approved laboratory (results require a 24-hour turnaround).
- C. Submit written documentation of chlorination and bacteriological sampling to the WSU Construction Manager, for review and approval by WSU Cross-Connection Control Specialist, before placing new lines in service.

#### **3.02 TESTING**

- A. Conduct pressure testing as required by the relevant codes. The Contractor shall notify the WSU Construction Manager in writing 48 hours prior to testing. The WSU Construction Manager shall notify the following personnel of pressure testing date and time:
  1. WSU Water Distribution Manager
  2. WSU Environmental Health and Safety
  3. City of Pullman Department of Public Works
- B. No testing water or chlorinated water may be discharged into the sanitary or storm sewer system in accordance with the most current and adopted version of Washington Administrative Code (WAC) 173-201A. All chlorinated water

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shall either be treated to remove chlorine prior to discharge into sewers, or discharged into an area which does not impact storm drains or surface waters. If soil is the only contaminant, the wastewater may be discharged into the storm sewer catch basins provided they are protected using Best Management Practices (BMPs), per the requirements of WSU section 33 40 00 (Storm Drainage Utilities).

**PART 4 - QUALITY (NOT APPLICABLE)**

**PART 5 - WARRANTY (NOT APPLICABLE)**

**PART 6 - TRAINING REQUIREMENTS (NOT APPLICABLE)**

**PART 7 - STOCK AND SPARE PARTS (NOT APPLICABLE)**

**PART 8 - PRE-INSTALL REQUIREMENTS (NOT APPLICABLE)**

**PART 9 - SPECIAL INSPECTIONS (NOT APPLICABLE)**

**PART 10 - SHOP DRAWINGS (NOT APPLICABLE)**

**PART 11 - SPECIAL INSTRUCTIONS OR PROVISIONS (NOT APPLICABLE)**

**END OF SECTION**