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SECTION 22 11 00 _DOMESTIC WATER PIPING SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. This standard includes the domestic water requirements for both hot and cold water for the Newark Campus of the University of Delaware.
- B. The intent of these standards are to provide input to the design team on the University's preference of manufacturers, design, equipment options and quality assurance to maintain the longevity of its assets.

1.2 Related Sections:

- A. Section 22 05 00– Common Work for Plumbing Systems
- B. Section 22 05 01 – Common Requirements for Plumbing Systems
- C. Section 22 07 00 – Plumbing Insulation.
- D. Section 22 32 00 – Domestic Water Filtration
- E. Section 22 35 00 – Domestic Water Heat Exchangers
- F. Section 22 40 00 – Plumbing Fixtures

1.3 DESIGN REQUIREMENTS

1.3.1 All vents, air release valves, balancing valves and drains shall be shown on drawings. Drain valves shall be included at main shut off valves, at the branch shut-off valves, low points, bases of vertical risers and at all terminal equipment. Manual and auto air vents shall be included at all high points in the piping systems. All drain valves shall be full port ball valves with hose end connection.

1.3.2 Risers shall have isolation valves between each floor and at each floor branch. All take offs from mains shall have isolation valves.

1.3.3 All domestic water service entrances shall have a revenue grade water meter. Contact the City of Newark Department of Water for meter manufacturer and model number and for special requirements.

1.3.4 The domestic water shall have a shut off valve outside the building at the service entrance as mandated by the City of Newark.

1.3.5 The domestic water meter shall be capable of generating a pulse output into the University of Delaware ION energy monitoring system.

1.3.6 Provide a full size bypass with a shut off valve at the domestic water meter.

1.3.7 All branch take offs from piping mains are required to have shut off valves at the take offs so that repairs can be performed on the branch piping without shutting down the system.

1.3.8 Provide shut off valves at each equipment connection.

1.3.8 Provide a backflow preventer at all cross connections into the domestic water system.

1.3.9 All buildings shall have at least one (1) hose bib capable of connecting to a standard garden hose. Space hose bibs so that they are no more than 100 feet apart.

1.3.10 All floor drains are required to have trap primers.

1.3.11 Route all domestic water piping in inside walls only. Consult the University Energy and Engineering Department if it is necessary to route domestic water in an exterior wall.

1.3.12 Do not use butterfly valves in domestic water piping systems.

1.3.11 Pipe routed exterior to the building and above grade shall be electrically heat traced with current monitoring through BAS.

1.3.14 All pipe, fittings and valves must comply with NSF 61.

1.4 Submittals

- A. Product Data:
 - 1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturer's catalog information.
 - 2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
 - 3. Hangers and Supports: Submit manufacturers catalog information including load capacity.
 - 4. Domestic Water Specialties: Submit manufacturers catalog information, component sizes, rough-in requirements, service sizes, and finishes.
 - 5. Pumps: Submit pump type, capacity, certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.
- B. Manufacturer's Installation Instructions: Submit installation instructions for pumps, valves and accessories.
- C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of valves and equipment.
- B. Operation and Maintenance Data: Submit spare parts list, exploded assembly views and recommended maintenance intervals.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves and equipment on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping, valves and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.8 EXTRA MATERIALS

- A. Furnish two packing kits for each size valve, two loose keys for outside hose bibs and hose end vacuum breakers for hose bibs and service kits for each pump.

PART 2 PRODUCTS

2.1 The University of Delaware will entertain all relevant materials for domestic water piping systems.

2.2 If copper tubing is used it must be ASTM B280, Type K hard drawn and seamless. All copper fittings shall be wrought copper and comply with ASME B16. All joints 2" and larger shall be brazed.

2.3 If steel pipe is used it must be ASTM A234, Schedule 40 or greater. All steel pipe less than 2" shall be schedule 80.

2.4 All steel fittings shall be threaded, socket weld or butt weld type and Conform to ASME B31.9. All joints larger than 2" diameter shall be welded.

2.5 PVC or CPVC are not acceptable pipe materials for domestic water piping.

2.6 GATE VALVES

- A. Use flanged gate valves as shut off valves in domestic water piping 4" and greater

B. Acceptable Manufacturers:

- 1. NIBCO, Inc.
- 2. Watts

2.7 GLOBE VALVES

- A. Use threaded globe valves in domestic water piping up to 4". Use flanged globe valves in domestic water piping 4" and greater

A. Acceptable Manufacturers:

- 1. NIBCO, Inc.
- 2. Watts

2.8 BALL VALVES

- A. Use soldered ball valves as shut off valves in domestic water pipe sizes up to 2":
 - 1. Bronze, two piece body, stainless steel ball and trim, full port, teflon seats, blow-out proof stem.
- B. Use flanged ball valves as shut off valves in domestic water pipe sizes 2-1/2" to 4"
 - 1. Three piece body, stainless steel ball, full port, teflon seats, blow-out proof stem, flanged ends.
- C. Acceptable Manufacturers:
 - 1. Apollo
 - 2. Milwaukee
 - 3. NIBCO, Inc.
 - 4. Watts

2.9 CHECK VALVES

- A. Use soldered check valves in domestic water piping up to 2". Use flanged check valves in domestic water piping 2" and greater
- B. Horizontal Check and Spring Loaded Check Valves:
 - 1. Manufacturers:
 - a. NIBCO, Inc.
 - b. Watts

2.10 PRESSURE GAGES

- A. Pressure gages shall be accurate to within plus or minus one percent of range span, stainless steel bourdon-tube system, bronze movement, a dial diameter of 4 to 5" is acceptable when installed 8 feet or less above finished floor, 8" dial diameter when installed higher than 8 feet above finished floor. Each gage connection shall have a full port ball valve for isolation. Pressure gages shall be liquid filled.

2.11 THERMOMETERS

- A. Local temperature gauges to be liquid filled thermometer type, 90 degree angle.

2.12 WATER PRESSURE REDUCING VALVES

- A. Acceptable Manufacturers:
 - 1. Watts

2.13 RELIEF VALVES

- A. Acceptable Manufacturers:
 - 1. Watts

2.14 STRAINERS

- A. Manufacturers:
 - 1. Watts

2.15 HOSE BIBS

- A. Manufacturers:
 - 1. Watts
 - 2. Woodford

2.16 WATER METERS

- A. Acceptable Manufacturers:
 - 1. DLJ
 - 2. Seametrics
 - 3. Sensus (Revenue Grade for use in domestic water entrance into buildings. Contact city of Newark Water Department for model number.)

2.17 HYDRANTS

- A. Manufacturers:
 - 1. Watts
 - 2. Woodford
- B. Wall Hydrant: ASSE 1019; non-freeze, self-draining type hose thread spout, locks shield and removable key, and integral vacuum breaker.
- C. Floor Hydrant: ASSE 1019; lockable recessed box, hose thread spout, lock shield and removable key, and vacuum breaker.

2.18 BACKFLOW PREVENTERS

- A. Manufacturers:
 - 1. Watts

- B. Reduced Pressure Backflow Preventers:
 - 1. Comply with ASSE 1013.
 - 2. Bronze body, with bronze internal parts and stainless steel springs.
 - 3. Two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve opening under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.
- C. Double Check Valve Assemblies: Comply with ASSE 1012; Bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

2.19 WATER HAMMER ARRESTORS

- A. Manufacturers:
 - 1. Watts
- B. stainless steel construction, piston type sized in accordance with PDI WH-201.
- C. Pre-charged suitable for operation in temperature range 34 to 250 degrees F and maximum 150 psi working pressure.

2.20 THERMOSTATIC MIXING VALVES

- A. Manufacturers:
 - 1. Powers
 - 2. Lawler
 - 3. Leonard
- B. Accessories:
 - 1. Check valve on inlets.
 - 2. Volume control shut-off valve on outlet.
 - 3. Stem thermometer on outlet.
 - 4. Strainer stop checks on inlets.
- C. Cabinet: 16 gage stainless steel, with keyed lock.

2.21 IN-LINE CIRCULATOR PUMPS

- A. Acceptable Manufacturers:
 - 1. Bell and Gossett
- B. Casing: Bronze rated for 125 psig working
- C. Impeller: Bronze.

- D. Shaft: Alloy steel with integral thrust collar and two, oil lubricated bronze sleeve bearings.
- E. Seal: Carbon rotating against stationary ceramic seat.
- F. Drive: Flexible coupling.

2.22 CLOSE COUPLED PUMPS

- A. Acceptable Manufacturers:
 - 1. Bell and Gossett
- B. Type: Horizontal shaft, single stage, close coupled, radial split casing, for 250 psig maximum working pressure.
- C. Casing: Cast iron, with suction and discharge gage ports, renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction and discharge.
- D. Impeller: Bronze, fully enclosed, keyed to motor shaft extension.
- E. Shaft: Stainless steel.
- F. Seal: Carbon rotating against stationary ceramic seat, 225degrees F maximum continuous operating temperature.

2.23 BASE MOUNTED PUMPS

- A. Acceptable Manufacturers:
 - 1. Bell and Gossett
- B. Type: Horizontal shaft, single stage, direct connected, horizontal split casing, 250 psig maximum working pressure.
- C. Casing: Cast iron, with suction and discharge gage ports, renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction and discharge.
- D. Impeller: Bronze, fully enclosed, keyed to shaft.
- E. Bearings: Permanently lubricated roller or ball bearings.
- F. Shaft: Alloy steel with copper, bronze, or stainless steel shaft sleeve.

2.24 PRESSURE BOOSTER SYSTEMS

- A. Acceptable Manufacturers:
 - 1. Bell and Gossett
 - 2. Tiger Flow - VSD
- B. System: Packaged with two pumps, factory assembled, tested, and adjusted; shipped to site as integral unit; consisting of pumps, valves, and galvanized piping, with control panel assembled on fabricated steel base with structural steel framework.
- C. Controls and Instruments: Locate in NEMA 250 Type 1, general-purpose enclosure with main disconnecting switch interlocked with door.
 - 1. Furnish for each motor, fused circuit, magnetic starter with three overloads, control circuit transformer with fuse protection and selector switch for each pump.
 - 2. Furnish low limit pressure switch, low pressure alarm indicator, running indicator, current sensing devices, minimum run timers, manual alternation, and suction and discharge pressure gages.
- D. Lead Pump: Operate continuously with lag [pump] [pumps] operating on system demand. When lead pump fails to operate, start next pump in sequence automatically.
- E. Time Delay Relay: Prevent lag pump short cycling on fluctuating demands.
- F. Thermal Bleed Circuit with Solenoid Valve: Prevent overheating during low demand.
- G. Low Pressure Control: Stop pump operation when incoming water pressure drops to atmospheric.
- H. Pump Switch: Permit manual or automatic operation.
- I. Valves: Each pump outlet, combination pressure reducing and check valve to maintain constant system pressure. Furnish gate on suction and discharge of each pump. Furnish check valve on each pump discharge.
- J. Time Clock for Automatic Day-Night Changeover:
 - 1. Day cycle: Operate system continuously with pressure to fixtures maintained by pressure reducing valves.
 - 2. Night Cycle: Operate pumps intermittently on pressure switch located near pressure tank operating pump for pre-determined adjustable time period.
- K. Pressure booster systems shall have a maintenance bypass built into the system.

PART 3 EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. [Bevel plain end ferrous pipe.]
- B. Remove scale and dirt, on inside and outside, before assembly.

3.2 INSTALLATION - METERS

- A. Install water meters in accordance with AWWA M6, with isolating valves on inlet and outlet. Provide full line size bypass with globe valve.

3.3 INSTALLATION - THERMOMETERS AND GAGES

- A. Install one pressure gage for each pump, locate taps before strainers and on suction and discharge of pump; pipe to gage.
- B. Install gage taps in piping.
- C. Install pressure gages with pulsation dampers. Provide ball valve to isolate each gage.
- D. Install thermometers in piping systems in sockets in short couplings. Allow clearance from insulation.
- E. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- F. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- G. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.4 INSTALLATION

- A. Install non-conducting dielectric couplings or nipples wherever jointing dissimilar metals. Dielectric unions are not allowed on the University of Delaware Newark Campus.
- B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- C. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.

- D. Group piping whenever practical at common elevations.
- E. Slope piping and arrange systems to drain at low points.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings
- H. Provide access doors where valves and fittings are not accessible.
- I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- J. Provide support for utility meters in accordance with requirements of utility companies.
- K. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
- L. Install domestic water piping in accordance with ASME B31.9.
- M. Sleeve pipes passing through partitions, walls and floors.
- N. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping.
- O. Install unions downstream of valves and at equipment or apparatus connections.
- P. Install valves with stems upright or horizontal, not inverted.
- Q. Provide spring loaded check valves on discharge of water pumps.
- R. Install potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibs.
- S. Pipe relief from valves, back-flow preventers and drains to nearest floor drain.
- T. Test backflow preventers in accordance with ASSE.
- U. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories, sinks and washing machine outlets.

- V. Provide a full pipe size bypass around the thermostatic mixing valve for service.

3.5 INSTALLATION - PUMPS

- A. Provide pumps to operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
- B. Install long radius reducing elbows or reducers between pump and piping. Support piping adjacent to pump so no weight is carried on pump casings. For close coupled or base mounted pumps, install supports under elbows on pump suction and discharge line sizes 4 inches and over.
- C. Install pumps on vibration isolators.
- D. Install flexible connectors at pumps where piping configuration does not absorb vibration.
- E. Provide line sized shut-off valve and strainer on pump suction, and line sized check valve and shut-off valve.
- F. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump so no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4 inches and larger.
- G. Provide air cock and drain connection on horizontal pump casings.
- H. Provide drains for bases and seals.
- I. Check, align, and certify alignment of base mounted pumps prior to start-up.
- J. Install close coupled and base mounted pumps on concrete housekeeping base, with anchor bolts, set and level, and grout in place.
- K. Lubricate pumps before start-up.

3.6 INSTALLATION - SERVICE CONNECTIONS

- A. Provide new water service complete with back-flow preventer and water meter with bypass valves and strainer.
- B. Provide sleeve in wall for service main and support at wall. Provide Link Seal in sleeve and make watertight with pliable material.

3.7 FIELD QUALITY CONTROL

- A. Test domestic water piping system in accordance with City of Newark Water Department requirements.

3.8 CLEANING

- A. Prior to starting work, verify system is complete and properly flushed.

END OF SECTION