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Spring 5-1-2018

224000 - Plumbing

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Weatherbee, Stephanie L., "224000 - Plumbing" (2018). *Division 22 – Plumbing*. 6.
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SECTION 22 4000 – PLUMBING

1.1 SUMMARY

- A. The design of the plumbing work for all projects performed for the University shall be prepared in accordance with the latest University of New Hampshire Planning, Design, and Construction Guidelines.
- B. Design documents shall be prepared by an entity offering professional design services under a current Certificate of Authority issued by the State of New Hampshire Joint Board of Licensure and Certification.
- C. All plumbing documents shall be prepared under the supervision of an employee acting as the responsible engineer for the entity and eligible to be listed on the Certificate of Authority.
- D. All construction work shall be provided utilizing licensed plumbers in accordance with the International Plumbing Code for the State of New Hampshire.
- E. The University shall act as the Authority having Jurisdiction for the water supply to the project location.
- F. The Town of Durham shall be the Authority having Jurisdiction for all drainage systems.
- G. No construction work shall proceed without the required appropriate permits being obtained.
- H. Design documents shall conform to the most current International Plumbing Code for the State of New Hampshire.
- I. Natural gas piping and equipment installation shall conform with the State of New Hampshire Fire Code (NFPA 54).
- J. See Chapter 5, Division 01, Section 017700.1.1.B.1.i Closeout Procedures - Project Record Documents for equipment list requirements for all equipment provided in this section.

PART 2 - PRODUCTS

2.1 Underground Services to new construction or additions:

- A. Water supply from the main
 - 1. Pipe – ductile iron
 - 2. Valves – non- rising stem gate valves, bronze trim, flanged connections, OPEN LEFT, 150 PSI with curb box.

3. The water entry for the building shall be terminated a minimum of 6 inches above the service entry room floor with a flanged connection.
- B. Gas supply (Natural Gas)
1. Pipe - Schedule 80, Black Iron pipe, plastic jacket, welded joints.
 2. Pipe fittings – malleable.
 3. Valves - gas cock, 150 psi.
 4. Cathodic protection to be installed as necessary.
 5. Polyethylene Pipe - Plexo Yellowpipe PE 2406 for Gas Distribution (ASTM D 2513). Provide trace wire above all nonmetallic piping.
 6. Gas Meter –
- C. Utility Services inside building:
1. Water supply
 - a. Isolation valve at exterior wall, gate valve, bronze trim, flanged connections, OPEN LEFT, 150 psi.
 - b. Piping after the isolation valve shall - type "K" copper, lead-free-solder, or Viega Pro-Press fittings, compliant tools, and procedures.
 - c. Meter - flanged connections, sized to manufacturer's specs, provide a by-pass line around meter. Water meters shall be Badger Meter RCDL disc type with NPT connections or Badger Meter Recordall compound type. All meter housings shall be cast bronze. Water meter registers shall read in gallons. Water meters shall have a Badger RTR type head in order to provide both a local register reading and a dry contact pulse output. Compound meters shall have an RTR head on both the low and high sides (two RTRs per meter). Output wires from the RTR heads shall be run in conduit to a watertight gasketed 8x8x4 nonmetallic pullbox located on the building exterior.
 - d. Back-flow preventers - one on downstream side of meter and on by-pass. Provide a back flow prevention station immediately downstream of the water meter and its bypass line to contain and protect the water district piping system from any backflow from the building. All back flow preventer housings shall be cast bronze, copper, or stainless steel. The station shall include two RPBPs installed in parallel with each valve including isolation valves to allow testing of either valve without shutting down the water supply into the building. The supply of domestic water serving the main potable water distribution piping system shall be taken off downstream of the building containment backflow station. Each branch serving systems requiring protection must include an approved backflow prevention device to prevent backflow from a non potable system into the building systems potable water system. Laboratory water systems serving multiple laboratories shall also be protected with two RPBPs installed in parallel with each valve including isolation valves to allow testing of either valve without shutting down the water supply into the building. Each device serving individual system equipment shall be provided with a dedicated backflow device located within



- the same room as equipment served. Where system operation is identified as critical, such as a laboratory water system, and not to be shutdown, dual station backflow prevention should be provided for that system.
- e. Water Meter Boxes - Cast-iron bronze body and cover for disc-type water meter, with lettering "WATER METER" on cover; and with slotted, open-bottom base section of length to fit over service piping.
 - f. Vacuum breakers for hose connections in laboratory areas shall not be less than 6 feet (1829 mm) above the floor.
 - g. The water pressure within the building shall be limited to a maximum pressure of 80 psig. Provide a pressure relief valve in the domestic water line when the available pressure into the building is determined to be too high.
 - h. Faucets with serrated outlets or fixtures with discharge hoses in laboratory areas shall include a vacuum breaker located a minimum of 6 feet above the floor.
 - i. Valves - all other valves downstream of meter to be of the ball type, 125 psi at branches and fixtures.
 - j. Ground rods to be connected before valve and meter (upstream).
 - k. Booster pumps – Where the water pressure is determined to be inadequate to provide adequate pressure to all the fixtures a booster pump shall be employed. The booster pump equipment shall generally be piped to provide the additionally required pressure in the domestic water system. Pressure requirements must consider pressure drops through backflow devices to non-potable branches served off the domestic water distribution system.
 - l. Emergency Water System – The emergency water system shall be sized to serve the anticipated simultaneously operating emergency fixtures but no case less than a minimum of two combination emergency shower/eyewash station. A minimum 30 psig pressure at each combination fixture must be provided.
 - m. Processed Water: Special systems, such as, reverse osmosis, deionized water or other purified water systems, shall to the extent possible, utilize skid mounted equipment. The base system shall employ, dedicated backflow protection, water softening, filtration, a reverse osmosis unit, storage tank, ultraviolet type sterilization chamber, automatic dye feed equipment, distribution pumps, and final distribution. The distribution piping may be PVC. Where central polishing may be required to acquire the determined system water quality the additional space required must be provided near the skid. Provide PP distribution piping serpentine loops with minimal dead legs for water systems designed to provide a resistivity above 1 ohm. System equipment shall be based on Siemens.
 - n. Trap priming devices shall be provided for all traps subject to evaporation. Trap primers shall be selected to supply water to traps on an adjustable interval through the trap primer device. The device shall include a shut off valve on the branch connection from the water main and the device shall include integral backflow protection and suitable manifold to serve the individual traps served through separate ½" piping to each trap served. Provide deep seal traps with ½" trap primer connection above the weir level.

Lines shall be routed to trap connection with no low points and be pitched to allow all water in the line to discharge into the trap.

2. Sanitary Drainage and Vents.

- a. All buried piping shall be ASTM A 74 Extra Heavy cast iron with hub and spigot joints with rubber gaskets.
- b. Above ground piping shall be ASTM A 888 or CISP 301 Hubless Cast Iron Heavy Duty shielded, stainless steel couplings with a minimum of 4 bands.
- c. Copper DWV, ASTM B 306, cast copper or ASTM B16.29 wrought copper with solder joint fittings.
- d. For above slab and interior of any buildings, except those with piping installed within interior walls of instructional space, or predominantly administrative offices the use of Schedule 40, PVC piping, for the purpose of drainage and venting. All PVC, piping, fittings, and couplings shall be properly cleaned and primed, with use of a dyed product, before the adhesion/glue.

3. Storm Drainage.

- a. All buried piping shall be ASTM A 74 Extra Heavy cast iron with hub and spigot joints with rubber gaskets.
- b. Above ground piping shall be ASTM A 888 or CISP 301 Hubless cast iron heavy duty shielded, stainless steel couplings with rubber sleeve and a minimum of 4 bands.
- c. Secondary Roof Drainage shall be provided where the structural design is found to be compromised should the primary roof drains be obstructed. Secondary Roof Drains shall have drainage piping be independent of the primary storm drainage system and shall terminate above grade at an easily observed location. Secondary drains shall have weir heights selected to reduce the chances of overflow when the roof drains are not obstructed during a typical design storm condition.
- d. For above slab and interior of any buildings, except those with piping installed within interior walls of instructional space, or predominantly administrative offices the use of Schedule 40, PVC piping, for the purpose of drainage and venting. All PVC, piping, fittings, and couplings shall be properly cleaned and primed, with use of a dyed product, before the adhesion/glue.

4. Acid Waste System.

- a. The University policy does not allow the introduction of acid or corrosive material into the drainage system.
- b. Laboratory drainage system shall conform to sanitary system construction unless specifically directed otherwise.

5. Gas (Natural)

- a. Isolation valve - Gas cock 150 psi.
 - b. Meter - threaded connections, reads in cubic ft., remote reading unit capability.
 - c. Piping - threaded joints, Schedule 40, malleable fittings, or Viega Mega-Press fittings, compliant tools, and procedures.
 - d. Reducing valves– Reducing valves shall be sized to accommodate equipment specifications. Provide a dedicated pressure reducing valve for elevated gas pressure piping.
 - e. Provide shut off valves for kitchen equipment and each laboratory or space with more than one gas outlet or connection and normally used by students.
6. Hot Water Systems.
- a. Electric - copper lined tanks, 460 VAC immersion heaters.
 - b. Exchanger - plate type.
 - c. Steam converter.
 - d. Natural gas fired units - Lochnivar preferred.
 - e. Piping - Type "L" copper above grade, Type "K" below grade, and lead free solder for soldered joints, or Viega Pro-Press fittings, compliant tools, and procedures.
 - f. Mixing valves - bronze, flanged connections, maintain 130 system temperature.
 - g. Captive air shock absorbers on all lines with solenoid valves, hot or cold.
 - h. Non potable hot water heaters shall all be piped from a protected source and isolated from other systems.
 - i. Tepid water for emergency water systems shall be sized to serve the anticipated simultaneously operating emergency fixtures but no case less than a minimum of one combination emergency shower/eyewash station.
7. Fixtures and Hardware
- a. General

Water closets and urinals shall have automatic flushometers. The University prefers hardwired over battery operated.
 - b. Water Closets:
 - 1) Basis-of-Design Product: Subject to compliance with requirements, provide Kohler Kingston Model# K-4330 or a comparable product by one of the following:
 - a) Kohler Co.
 - b) TOTO USA, Inc.
 - c) Zurn Plumbing Products Group.
 - 2) Description: Wall-mounting, back-outlet, vitreous-china fixture designed for flushometer valve operation.



- a) Style: Flushometer valve.
 - b) Bowl Type: Elongated with siphon-jet design.
 - c) Design Consumption: 1.6 gal./flush (6 L/flush).
 - d) Color: White.
 - e) Flushometer: F-W.
 - f) Toilet Seat: TS-1.
 - g) Fixture Support: Water-closet support combination carrier.
- 3) Water Closets, (Accessible): Same as basic water closet and approved and installed to comply with all ADA requirements including mounting height and valve location. Waterless water closets shall not be permitted except when directed by the University.
- c. Urinals:
- 1) Basis-of-Design Product: Subject to compliance with requirements, provide Kohler Bardon Superior Model# K-4960-ET or a comparable product by one of the following:
 - a) Kohler Co.
 - b) TOTO USA, Inc.
 - c) Zurn Plumbing Products Group.
 - 2) Description: Accessible, Wall-mounting, back-outlet, vitreous-china fixture designed for flushometer valve operation.
 - a) Type: Washout with extended shields.
 - b) Strainer or Trap way: Separate removable strainer with integral trap.
 - c) Design Consumption: 0.5 gal./flush (1.9 L/flush).
 - d) Color: White.
 - e) Supply Spud Size: NPS 3/4 (DN 20).
 - f) Outlet Size: NPS 2 (DN 50).
 - g) Flushometer: F-U.
 - h) Fixture Support: Urinal <US-1> chair carrier.
 - 3) Waterless Urinals will not be permitted except when directed by the University.
- d. Automatic Flushometers: Toto or Sloan.
- e. Lavatories:
- 1) Basis-of-Design Product: Subject to compliance with requirements, Architect to provide integral sink system or approved equal:
 - 2) Description: Integral sink system fixture.
 - a) Faucet: Lavatory.
 - b) Supplies: NPS 3/8 (DN 10) chrome-plated copper with stops.

- c) Drain: Grid:
 - d) Drain Piping: NPS 1-1/4 by NPS 1-1/2 (DN 32 by DN 40) chrome-plated, cast-brass P-trap; NPS 1-1/2 (DN 40), 0.032-inch- (0.8-mm-) thick tubular brass waste to wall; and wall escutcheon.
 - e) Hair Interceptor: Not required.
 - f) Protective Shielding Guard(s).
 - g) Fixture Support: Lavatory.
- f. Lavatories, (Accessible):
- 1) Basis-of-Design Product: Subject to compliance with requirements, Architect to provide integral sink system or approved equal:
 - 2) Description: Accessible, Integral sink system fixture.
 - a) Faucet.
 - b) Supplies: NPS 3/8 (DN 10) chrome-plated copper with stops.
 - c) Drain: Grid.
 - d) Drain Piping: NPS 1-1/4 by NPS 1-1/2 (DN 32 by DN 40) chrome-plated, cast-brass P-trap; NPS 1-1/2 (DN 40), 0.032-inch- (0.8-mm-) thick tubular brass waste to wall; and wall escutcheon.
 - e) Hair Interceptor: Not required.
 - f) Protective Shielding Guard(s).
 - g) Fixture Support.
- g. Individual Showers:
- 1) Basis-of-Design Product: Subject to compliance with requirements, provide Crane Plumbing ADA Compliant Model# A3636.09F or a comparable product by one of the following:
 - a) Acryline USA, Inc.
 - b) Aker Plastics Co., Inc.
 - c) Aqua Bath Company, Inc.
 - d) Aqua Glass Corporation.
 - e) Aquatic Industries, Inc.
 - f) Clarion Bathware.
 - g) Crane Plumbing, L.L.C./Fiat Products.
 - h) Jacuzzi, Inc.
 - i) Kohler Co.
 - j) LASCO Bathware.
 - k) Praxis Industries, Inc.; Aquarius Products.
 - l) Simmons
 - 2) Description: Accessible, PMMA shower enclosure with slip-resistant bathing surface and shower rod with curtain.



- a) Size: 36 by 36 inches (915 by 915 mm).
 - b) Surround: One piece.
 - c) Color: White.
 - d) Drain Location: Center.
 - e) Accessibility Options: Include (2) grab bars and fold-up bench.
 - f) Faucet.
 - g) Drain: Grid, NPS 2 (DN 50).
 - h) Misc.: Stainless steel curtain rod and wood blocking for shower head hooks.
- h. Individual Showers:
- 1) Description: Components for built-up shower.
 - a) Faucet.
 - b) Receptor: Not Required.
 - c) Drain: Trench Drain.
 - d) Misc.: Stainless steel curtain rod and wood blocking for shower head hooks.
- i. Kitchen Sinks:
- 1) Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a) Elkay Manufacturing Co.
 - b) Just Manufacturing Company.
 - c) Kohler Co.
 - d) Moen, Inc.
 - e) Sterling Plumbing Group, Inc.
 - f) Teka USA.
 - 2) Description: One-bowl, residential, counter-mounting, stainless-steel kitchen sink.
 - a) Overall Dimensions: 22 by 19 inch (559 by 483 mm).
 - b) Metal Thickness: #18 gauge.
 - c) Bowl:
 - d) Dimensions: 6 inch (152 mm) deep.
 - e) Drain: 3-1/2-inch (89 mm) grid with offset waste.
 - f) Location: Near back of bowl.
 - g) Sink Faucet:
 - h) Supplies: NPS 1/2 (DN 15) chrome-plated copper with stops.
 - i) Drain Piping: NPS 1-1/2 (DN 40) chrome-plated, cast-brass P-trap; 0.045-inch- (1.1-mm-) thick tubular brass waste to wall; continuous waste; and wall escutcheon(s).
 - j) Disposer: Not required.
 - k) Dishwasher Air-Gap Fitting: Required.

- d) Filter: One or more water filters complying with NSF 42 and NSF 53 for cyst and lead reduction to below EPA standards; with capacity sized for unit peak flow rate.
 - e) Drain(s): Grid with NPS 1-1/4 (DN 32) minimum horizontal waste and trap complying with ASME A112.18.1.
 - f) Cooling System, if included: Electric, with hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.
 - g) Capacity: 8 gph (0.0084 L/s) of 50 deg F (10 deg C) cooled water from 80 deg F (27 deg C) inlet water and 90 deg F (32 deg C) ambient air temperature.
 - h) Electrical Characteristics: 370 watts; 120-V ac; single phase; 60 Hz.
 - i) Support: Type II, water cooler carrier. Refer to "Fixture Supports" Article.
 - j) Bottle filler: Sensor-activated. Quick fill rate should be at least 1 gallon per minute. Laminar flow provides a clean fill with minimal splash and easy maintenance. Equipped with an automatic 20 second shut off timer.
- 4) Type I: Hanger-type carrier with two vertical uprights.
 - 5) Type II: Bi-level, hanger-type carrier with three vertical uprights.
 - 6) Supports for Accessible Fixtures: Include rectangular, vertical, steel uprights instead of steel pipe uprights.
- I. Laboratory Sinks and trim
- 1) Epoxy sink and trim by other. Provide Water Saver deck mounted chrome plated gooseneck faucet with wrist blade handles, acid resistant grid drain with 1 1/2"-inch tailpiece, acid resistant "P-trap". Include 1/2" flexible supply risers, angle stops, set screw and escutcheons for hot and laboratory water supply. Provide CPVC mixing faucet with vacuum breaker, compression control, deck mounted self-closing faucet with 1/2" flexible supply risers and angle stops set screw and escutcheons, for RO water supply connection.
 - a) Provide non-potable labels in compliance with International Plumbing Code typical at all lab type sinks.
 - m. Cup Sinks: Single epoxy resin with strainer and tailpiece. Supply fitting Water Saver, gooseneck with wrist blade handle, serrated end, polypropylene "P" trap and flexible riser with angle stop.
 - n. FUME HOODS: Hoods shall not be provided with cup sinks. Confirm hoods are pre-piped for service connection from a single valved off line provided under the plumbing scope.
 - o. Lab Stainless Steel Sinks:

- 1) Description: Reuse existing One-bowl, commercial, floor-mounting, stainless-steel sink.
 - a) Sink Faucet.
 - b) Supplies: NPS 1/2 (DN 15) chrome-plated copper with stops.
 - c) Drain Piping: NPS 1-1/2 (DN 40) chrome-plated, pipe to below sink; 0.045-inch- (1.1-mm-) thick tubular brass waste to wall; continuous waste; and wall escutcheon(s).

- p. Lab Outlets
 - 1) Refer to architectural lab trim and fixture schedule for orientation, quantity and laboratory furnishing, drawings for type and locations.
 - 2) Provide turret for deck mounted locations and wall flange for wall mounted locations.
 - 3) Natural gas, vacuum, compressed air outlet shall be water saver type with serrated hose end, ball valve, lever handle with index.
 - 4) Specialty gas outlet shall be Water Saver L4200-FH with Water Saver BO-188 1/4"NPT Quick Connect fitting, ball valve, lever handle with index.
 - 5) Individual air, gas, vacuum and specialty gas outlets installed at exposed piping with backing board shall include outlets with integral check valve.

- q. Miscellaneous Supply Fixtures
 - 1) Ice maker connection
 - a) General: recessed-mounting outlet boxes with fittings complying with ASME A112.18.1M. Include stainless steel box with faceplate, services indicated for equipment connections, and reinforcement to wall supports.
 - b) Ice maker outlet boxes: With hose connection and the following:
 - c) Box and faceplate: stainless steel.
 - d) Supply fitting: 3/8-inch NPS globe or ball valve and 3/8-inch NPS copper, water tubing.
 - e) Supply ice maker from valved off branch piping from domestic water line and include backflow protection.

- r. Combination Emergency Shower/Eyewash Units (Recessed):
 - 1) Basis-of-Design Product: Subject to compliance with requirements, provide Guardian Equipment Recessed Laboratory Units Model # GBF2170 or a comparable product by one of the following:
 - a) Guardian Equipment Co.
 - b) Haws Corporation.
 - c) Encon Safety Products.

- 2) Description: Plumbed, accessible, recessed in wall, with local full port ball valves for isolation.
 - 3) Piping: stainless steel.
 - a) Unit Supply: NPS 1-1/4 (DN 32) minimum from top.
 - b) Unit Drain: NPS 2 (DN 50) Outlet at bottom.
 - c) Shower Supply: NPS 1 (DN 25) with flow regulator and stay-open control valve.
 - d) Eye/Face Wash Supply: NPS 1/2 (DN 15) with flow regulator and stay-open control valve.
 - 4) Shower Capacity: Deliver potable water at rate not less than 20 gpm (76 L/min.) for at least 15 minutes.
 - a) Control-Valve Actuator: Pull rod.
 - b) Shower Head: 10-inch (250-mm) minimum diameter, stainless steel.
 - 5) Eye/Face Wash Equipment: With capacity to deliver potable water at rate not less than 3.0 gpm (11.4 L/min.) for at least 15 minutes. Third party testing is required prior to acceptance by the University.
 - a) Control-Valve Actuator: Handle.
 - b) Receptor: stainless-steel bowl.
- s. Combination Emergency Shower/Eyewash Units (Freestanding):
- 1) Basis-of-Design Product: Subject to compliance with requirements, provide Guardian Equipment Safety Station Model # G1950P or a comparable product by one of the following:
 - a) Guardian Equipment Co.
 - b) Haws Corporation.
 - c) Encon Safety Products.
 - 2) Description: Plumbed, accessible, freestanding, with emergency shower and eye/face wash equipment.
 - 3) Piping: stainless steel.
 - a) Unit Supply: NPS 1-1/4 (DN 32) minimum from top.
 - b) Unit Drain: Outlet at side near bottom.
 - c) Shower Supply: NPS 1 (DN 25) with flow regulator and stay-open control valve.
 - d) Eye/Face Wash Supply: NPS 1/2 (DN 15) with flow regulator and stay-open control valve.

- 4) Shower Capacity: Deliver potable water at rate not less than 20 gpm (76 L/min.) for at least 15 minutes. Third party testing is required prior to acceptance by the University.
 - a) Control-Valve Actuator: Pull rod.
 - b) Shower Head: 10-inch (250-mm) minimum diameter, ABC Plastic.
- 5) Solids Interceptors: Shall be installed at all sinks where solids may enter the sanitary waste system.
 - a) Zurn Plumbing, Tyler Pipe, Josam Company
- 6) Eye/Face Wash Equipment: With capacity to deliver potable water at rate not less than 3.0 gpm (11.4 L/min.) for at least 15 minutes. Third party testing is required prior to acceptance by the University.
 - a) Control-Valve Actuator: Handle.
 - b) Receptor: ABC Plastic.

PART 3 - EXECUTION

- 3.1 Excavation shall be in accordance with Chapter 5, Division 31.
- 3.2 Installation of all materials shall be in accordance with applicable codes, standards, and manufacturer's installation instructions.
- 3.3 Provide a swing check valve and isolation valve in each pump discharge.
- 3.4 Provide a backwater valve in piping subject to backflow.
- 3.5 Installation of all fixtures shall be in accordance with manufacturer's installation instructions.
- 3.6 Lavatory hot water supply and drainage piping including architectural millwork and/or other protective systems designed to protect against scalding by exposed piping shall

provide knee and toe clearances to the first obstruction as provided for by applicable regulation except that knee clearances shall be increased to no less than 9”.

- 3.7 ADA compliant trap and water line insulation shall be provided for all exposed piping indicated to be accessible.
- 3.8 Water distribution system shall be sized to accommodate future expansion and provide each fixture’s specified minimum input pressure at design fl
- 3.9 Provide hangers and supports and include seismic restraints for all systems determined by code to require them.

END OF SECTION 22 4000