

DIVISION 22 – PLUMBING

SECTION 22 00 00 GENERAL PLUMBING REQUIREMENTS

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

1.2 DESIGN CRITERIA

- A. The A/E is responsible for developing, documenting, and promoting technical discussion of proposed systems early in the project design phase. Early submittals are to include narrative technical discussion of system types, materials, and controls, including options, advantages, disadvantages, relative costs, and architect/engineer recommendations.
- B. The A/E shall ensure that all major decisions regarding system types, materials, and controls are determined and agreed to by owner/user by the end of design development phase; and documented in the design development submittal. Costs are to be included in the A/E's design development estimate of construction cost.
- C. The A/E shall ensure that that careful consideration is demonstrated in the selection of equipment and fixtures. Equipment and fixtures selections must support ECU's and UNC System's commitment to sustainability by reducing our energy and water consumption.
- D. The A/E shall also ensure they fully understand the intention of the building occupants to operate, or potentially operate, portions of the building outside normal business hours and make provisions to serve those areas without running "Whole Building" systems.

22 01 10.16 VIDEO PIPING INSPECTIONS

Prior to reuse, existing underground sanitary sewer shall be video inspected to ensure condition is suitable per ECU Plumbing Department. All underground sanitary sewer (SS) shall be video inspected after backfilling but prior to installation of finished surfaces. Coordinate with ECU Plumbing Departments to determine if any above hard ceiling SS should be videoed. All videos shall be transmitted to ECU via flash drive or by secure ftp site.

22 01 10.51 PLUMBING PIPING CLEANING

All repaired or newly constructed potable water lines must be properly disinfected. The appropriate method shall be applied to all pipe on either side of any new piping or fittings and continuing to the nearest mechanical valves that can stop water flow so as to isolate the piping. The procedure shall follow ANSI/AWWA Standard C651, most recent edition and meet the bacteriological standards. The laboratory testing and analysis of the potable water system shall demonstrate that it meets EPA Primary and EPA LCR compliance standards.

22 01 60 OPERATION AND MAINTENANCE OF LABORATORY AND HEALTHCARE SYSTEMS

PART 1 – GENERAL (for Healthcare Facilities only)

1.1 GENERAL REQUIREMENTS

East Carolina University Construction Standards	Date of Issue: 3/1/2022 Supersedes: 9/24/2020	Division 22 Page: 1 of 11
--	--	------------------------------

- A. The purpose of these standards is to address the prevention of healthcare-associated *Legionella* Disease and other possible water borne pathogens from the Potable Water Distribution Systems in ECU buildings. Health care facilities are included in the types of buildings that have been associated with the transmission of Legionella to people. Cases of healthcare-associated LD (HCA LD) often arise from exposure to Legionella bacteria in potable water distribution systems.
- B. This section applies to all health care facilities at ECU whether they are new construction or a major renovation.

1.2 DESIGN CRITERIA

- A. The efficacy of biocides on suppressing or killing waterborne pathogens is dependent on multiple factors such as water quality, organic and inorganic contaminants, pH levels, disinfectant concentrations, and contact time. Design shall provide:
 - 1. Thermometer
 - 2. Grab sample port
 - 3. Pressure gauge
- B. Aerators are prohibited in order to reduce exposure to Legionella contaminated water
- C. Hot Water Distribution Systems: If a building uses domestic hot water storage tanks, water temperature of all such storage tanks must be maintained at a minimum of 140°F to prevent Legionella growth. The minimum discharge temperature for instantaneous and semi-instantaneous heat exchangers must be 130°F . Water in the potable hot water distribution system piping must be no lower than 124°F (prior to any temperature-reducing mixing valve or anti-scald device at the water outlet). NOTE: To limit the risk of scald injury, hot water in the distribution system piping should be maintained at the lowest temperature that will ensure the minimum of 124°F throughout.
- D. Cold Water Distribution Systems. Legionella can grow in the building’s cold water distribution system as water temperatures increase above 67°F. Cold water temperature throughout the system should be maintained at or below 67°F to the greatest extent practicable to inhibit growth. NOTE: Use of piping system insulation, automatic drain devices and recirculation can limit the rate and duration of increased temperatures within the cold water distribution system. Based on local conditions and validation testing, modifications, upgrades, supplemental cooling, or secondary water treatment of the cold water distribution system may be required.
- E. Water Temperature Monitoring. The water temperature in the hot and cold potable water distribution systems needs to be monitored continuously to determine if temperatures are within the established control limits. Temperature monitoring must be conducted, at a minimum, in the following types of areas: incoming water supply to the building, water storage tanks, hot water discharge at the hot water source equipment, hot water return proximal to the hot water source equipment, water at the return of circulation loops, and water supplied to representative outlets (e.g., loop or branch, hydraulic remoteness, flow).
- F. Water Temperature Control at the Outlet: to minimize the risk of scald injury to patients, staff and visitors. The use of mixing valves and anti-scald devices on all outlets where people access water from the potable hot water distribution system is required in order to prevent scald injury. The water temperature delivered from the outlet must not exceed

East Carolina University Construction Standards	Date of Issue: 3/1/2022 Supersedes: 9/24/2020	Division 22 Page: 2 of 11
--	--	------------------------------

110°F.

- G. Thermal Eradication. This procedure involves the temporary resetting of the temperature in the hot water distribution system(s) to 160 °F -170°F while continuously flushing each outlet in the system for at least 30 minutes. Consideration needs to be given as to the feasibility of implementing thermal eradication depending on the design of the mixing valves in place. NOTE: Since there is significant risk for scalding at the water temperatures used for thermal eradication, extreme care must be taken to protect end users of the water distribution system(s), as well as employees who are administering the measure.

22 05 00 COMMON WORK RESULTS FOR PLUMBING

22 05 05 SELECTIVE DEMOLITION FOR PLUMBING

- A. Provide for occupant protection during construction and renovation. Indicate construction barriers and procedures for protecting building occupants from objectionable odors, dust, noise, etc. during construction and renovation projects.
- B. Cap, plug or cover all exposed SS piping to remaining to prevent blockage by demolition material

22 05 17 SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

- A. Sleeves: Schedule 40 galvanized, welded steel pipe, ASTM A53, grade A. Sleeves shall be cast in the slab for new construction, or core drilled and set in epoxy grout for retrofits. Sleeves in floors shall extend 6" above the floor.
- B. Seals: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened. Seals shall match fire rating of wall system.

22 05 19 METERS AND GAGES FOR PLUMBING PIPING

- A. See ECU Metering standard in HVAC standard for Domestic water meters
- B. Gauges for pressure shall be selected so that normal operation pressure is mid-range of gauge. Gauges shall be 4" face glycerin filled. All gauges shall have ball type isolation valve. Gauges install in high ceiling area shall be installed to allow for reading from floor level.
- C. Thermometers shall be 8" liquid filled with white background, black notation and red fluid. Swivel base and brass thermowell.
- D. Coordinate with ECU Plumbing shop for attic stock.

22 05 23 GENERAL-DUTY VALVES FOR PLUMBING PIPING

- A. Isolation/service valves used throughout domestic water system shall be low lead valve for potable water, full port ball type. For valves ¼" – 2" use 600 WOG – 150 SWP class, forged

East Carolina University Construction Standards	Date of Issue: 3/1/2022 Supersedes: 9/24/2020	Division 22 Page: 3 of 11
--	--	------------------------------

brass, ball valves with threaded, solder, pressed fit ends. Provide stem extensions, as necessary, to accommodate piping insulation.

- B. Isolation/service valves used throughout domestic water system shall be full port ball type. For valves 3" and larger, operating below 125 psi, 125# class, epoxy coated cast iron flanged ball valves. Over 125 psi shall be 150# class, stainless steel, flanged ball valves suitable for potable water service.

22 05 33 HEAT TRACING FOR PLUMBING PIPING

- A. Piping should be installed to minimize heat tracing requirements. Heat trace shall be self-regulating thermostatically controlled. Coordinate with electrical designer to provide a dedicated power circuit. Indicator lights location shall be shown on drawings in readily accessible areas.

22 05 53 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

Piping System	Pipe Text	Pipe Label Color	Pipe Paint or Jacket Color
Fire Protection	FIRE	White on Red	Red
Fire Sprinkler	FIRE SPRINKLER	White on Red	Red
Domestic Cold Water	DOMESTIC COLD WATER	White on Green	Dark Green
Domestic Hot Water Supply	DOMESTIC HOT WATER SUPPLY	White on Green	Orange
Domestic Hot Water Return	DOMESTIC HOT WATER RECIRC	White on Green	Orange
Non Potable Water	NONPOTABLE WATER	White on Green	Light Green
Rainwater Reuse	REUSE WATER	White on Purple	Light Purple
Natural Gas	NATURAL GAS	Black on Yellow	Yellow
Sanitary Waste	SANITARY WASTE	White on Green	White
Sanitary Vent	SANITARY VENT	White on Green	White
Storm	STORM	White on Green	White
Grease Waste	GREASE WASTE	White on Green	Gray
Grease Vent	GREASE VENT	White on Green	Gray

Have contractor provide laminated pipe label identification chart along with plumbing valve schedule

22 05 76 FACILITY DRAINAGE PIPING CLEANOUTS

- A. Clean outs shall be line size.
- B. No clean outs in ceiling and shall be on the floor where fixtures are served.
- C. Wall clean outs shall be between 6" and 12" above finished floor.
- D. Exterior clean outs shall be two way.

22 06 60 SCHEDULES FOR LABORATORY AND HEALTHCARE SYSTEMS

- A. Combination eyewash/drench hose fixtures shall be used unless a risk assessment requires a standalone shower.
- B. Consult with EH&S on types and locations of fixtures.
- C. Consideration shall be given to how flow test shall be conducted on showers and eyewash stations.
- D. Exterior clean outs shall be two way.

22 07 00 PLUMBING INSULATION

- A. All domestic cold water piping (DCW), except as noted, shall be insulated with closed cell elastomeric foam insulation. Insulation on DCW piping shall begin where piping enters crawl space from exterior or through exterior foundation wall.
- B. All domestic hot water piping (DHW) to be insulated as follows:
 - 1. Pipe sizes 0 - 1.5", 1.0" thick, 3.0# density fiberglass
 - 2. Pipe sizes 2 - 4", 1.5" thick, 3.0# density fiberglass
 - 3. Pipe sizes above 4", 2.0" thick, 3.0# density fiberglass

22 08 00 Commissioning of Plumbing

22 09 00 INSTRUMENTATION AND CONTROL FOR PLUMBING

- A. Coordinate with ECU Plumbing which pieces of equipment are to be controlled remotely via web interface. Ensure the electrical designer indicates a data connection at the equipment.

22 10 00 PLUMBING PIPING

22 11 16 DOMESTIC WATER PIPING

- A. Domestic water piping below grade shall be type K soft copper with no joints, PP-RCT or PP-R.
- B. Above grade piping shall be type L hard copper. Evaluate PP-RCT or PP-R for use in place of copper.
- C. For copper pipe 1-1/2" and under shall be soft solder, 2" and larger shall be brazed. Press fittings are allowed and shall be specified where hot work is not allowed. Coordinate with ECU Plumbing shop
- D. No "Shark Bite" fittings shall be permitted
- E. Restroom suites shall have shutoff valves accessible without a ladder
- F. Press fit fittings shall not be permitted for new copper installations. New installations shall be soldered/brazed with press fittings allowed for maintenance and repairs.

East Carolina University Construction Standards	Date of Issue: 3/1/2022 Supersedes: 9/24/2020	Division 22 Page: 5 of 11
--	--	------------------------------

22 11 19 DOMESTIC WATER PIPING SPECIALTIES

- A. Hose bibs: shall be provided at: 100 foot intervals along building perimeters minimum 1 per face, roof with mechanical equipment, mechanical rooms, and restrooms with floor drains. Hose bibs accessible to the public shall be recessed concealed with keyed door. Hose bibs in mechanical area and on roof will not require key. Hose bibs shall have accessible isolation valve. Exterior hose bibs shall be freeze proof.
- B. Equipment isolation (interior) Back Flow Preventer: BFPs shall be placed to protect building potable water from non-potable water systems. Reduced pressure principal type backflow preventers only. BFP's shall be located in mechanical equipment rooms. BFP shall be located three (3) to five (5) feet above finished floor. BFPs shall not be mounted above ceiling. All locations shall be coordinated with ECU Plumbing Dept. Locate BFP near floor drain. Pipe drip cup discharge to floor drain.
- C. No pressure reducing stations where pressure balancing shower valves are used
- D. Water hammer arresters shall be threaded with separate isolation valve

22 11 23 DOMESTIC WATER PUMPS

- A. Domestic water recirculation pumps shall be bronze body, bronze impeller. Pumps shall be constant volume, thermostatically (aquastat) controlled if required by code. B&G Series 100 basis of design. Domestic hot water piping and recirculation piping should be arranged so as not to require circuit setters. If the domestic hot water system requires multiple recirculation system each system shall have its own pump with aquastat in a common location.

22 11 23.13 DOMESTIC WATER PACKAGED BOOSTER PUMPS

- A. Water boosters shall be used only when building elevation exceeds Greenville Utilities ability to support pressure requirements
- B. Water boosters shall be duplex, variable speed. Basis of design HYFAB or QuantumFlo
- C. The water booster shall monitored via web interface.

22 12 00 FACILITY POTABLE WATER STORAGE TANKS

- A. Use only with pressure booster. Bladder type. Coordinate with ECU Plumbing Dept prior to designing into the system. Initial bladder pressure shall be calculated and included as a drawing note.

22 13 16 SANITARY WASTE AND VENT PIPING

- A. The A/E must make provisions for water saving plumbing fixtures in the designs of the sanitary sewer to ensure there is adequate water volume and velocity to ensure the movement of solid waste products through the system
- B. Waste and vent piping shall be:

East Carolina University Construction Standards	Date of Issue: 3/1/2022 Supersedes: 9/24/2020	Division 22 Page: 6 of 11
--	--	------------------------------

1. Above Grade: Hubless standard weight cast iron pipe. Medium duty No-Hub bands, Yellow Shield
2. Hubless extra heavy weight cast iron pipe for commercial kitchen service, Medium duty No-Hub bands, Yellow Shield
3. Below Grade: Use extra-heavy hub and spigot compression fittings.
4. No flexible couplings without consent from ECU Plumbing shop
5. All new building sanitary lines shall go to a manhole, coordinate with site civil design.
6. All underground building mains shall be tested and videoed after backfilling but prior to concrete installation.

22 13 19 SANITARY WASTE PIPING SPECIALTIES

- A. No trap primers. Provide floor drains with inline floor drain trap seal.
- B. All floor drains in mechanical rooms and other locations shall be connected to the sanitary sewer system.
- C. Provide sheet type waterproofing underfloor substrate for restrooms and commercial type kitchen areas above occupied spaces. Floor drains shall have retaining clamps and weep holes.
- D. Extend clean outs to accessible area or turn up to floor (no clean outs at or above ceiling).
- E. For laboratories include acid resistant piping.
- F. Drains lines containing corrosive or biohazard shall be labelled per type of hazard.
- G. Lab drains: coordinate with use groups as to any process that may discharge products into the sanitary drains that may be detrimental to system. Determine appropriate mitigation system in coordination with ECU Project Manager and Plumbing Dept.

22 13 29 SANITARY SEWERAGE PUMPS

- A. Avoid if possible. Coordinate design with ECU Plumbing Dept. Should be outside of building.

22 14 13 FACILITY STORM DRAINAGE PIPING

- A. Use service weight no hub cast iron joined with heavy duty “MD” (yellow shield) no-hub coupling.
- B. Insulate roof drain bowl below roof deck
- C. Insulate horizontal roof drainpipe.

22 14 29 SUMP PUMPS (Elevator and equipment room sumps)

- A. Sump pumps: Coordinate with ECU Plumbing Dept concerning type, controls, power source (normal or stand-by), alarms or BAS monitoring.

East Carolina University Construction Standards	Date of Issue: 3/1/2022 Supersedes: 9/24/2020	Division 22 Page: 7 of 11
--	--	------------------------------

- B. Use oil sensing system controller for hydraulic elevator sumps only.
- C. Use 200 degree capable pumps in steam entry pits in buildings.
- D. Install shut off or check valves and couplings arranged to allow for changing pump(s).

22 15 13 GENERAL-SERVICES COMPRESSED AIR PIPING

- A. All lab and Medical gas piping shall be per ASSE 6010. Certification of installer shall be submitted and reviewed prior to start of installation.

22 15 16 GENERAL SERVICE COMPRESSED AIR VALVES

RESERVED

22 15 19 GENERAL SERVICE PACKAGED AIR COMPRESSORS AND RECEIVERS

RESERVED

22 32 00 DOMESTIC WATER FILTRATION EQUIPMENT

- A. Coordinate between ECU Plumbing shop and User group concerning laboratories requiring high quality water

22 33 00 ELECTRIC DOMESTIC WATER HEATERS

- A. Electric water heaters are permitted as an alternative to direct or indirect-fired water heaters to serve local low flow hot water requirements. Provide thermowell, thermometer and pressure gauges on discharge and recirculation lines. Electric water heaters shall be as manufactured by A.O. Smith or approved equal.

22 34 00 FUEL-FIRED DOMESTIC WATER HEATERS

- A. Natural gas fired water heaters may be required where significant hot water requirements must be met, and steam is not available. Use instantaneous or semi-instantaneous depending on water requirements. A recirculation system shall be used. Provide thermowell, thermometer and pressure gauges on discharge and recirculation lines. Burners and heat exchangers shall be of high grade stainless providing a minimum of 10 year warranty

22 35 00 DOMESTIC WATER HEAT EXCHANGERS

- A. Domestic water heater shall be steam fired, semi-instantaneous having service water in the shell and steam in the coils, condensate sub-cooling, and electronic controls. Provide thermowell, thermometer and pressure gauges on discharge and recirculation lines. Basis of design is Aerco Water Wizard II B+. Control panels must be 3rd party (UL) certified. All heat exchangers shall comply with ASME Boiler and Pressure Vessel Code and shall be stamped with appropriate code symbols. These Standards are not intended to re-state requirements set forth in applicable Codes.

East Carolina University Construction Standards	Date of Issue: 3/1/2022 Supersedes: 9/24/2020	Division 22 Page: 8 of 11
--	--	------------------------------

22 40 00 PLUMBING FIXTURES

- A. Automatic “hands free” fixtures are preferred for lavatories and are required for all ADA water closets, urinals, sinks and hand dryers. All “hands free” fixtures shall be equipped with manual override. For lavatories, hard-wired automatic fixtures are preferred to battery operated.
- B. Toilets: Wall-hung, vitreous china, maximum 1.6 GPF as manufactured by Sloan, Kohler, or American Standard. Coordinate with architect for access to carriers. Coordinate with architect so that wall hung water closets have plumbing chase min 30”, indicate piping and carriers shall be arranged to allow access the entire length of the chase. Carriers shall be rated for a minimum of 500lbs, but designers shall confirm if higher level ratings may be required for certain installations such patient care areas.
- C. Urinals: Wall-hung, vitreous china, side mount heavy duty diaphragm type, maximum .125 GPF as manufactured by Sloan, Kohler, or American Standard.
- D. Toilet Flush Valves: side mount, manual, dual flush, heavy duty diaphragm type, maximum 1.6 GPF, as manufactured by Sloan, Kohler, or American Standard. Preferred brand is Sloan. For areas where automatic flush valves are required, side mount battery powered flush valves are preferred.
- E. Lavatories: Wall-hung or under-mount, vitreous china, maximum 0.5 GPM as manufactured by Sloan, Kohler, or American Standard. Automatic faucets shall be equipped with above deck mixing valve where required to ensure access to serviceable faucet components.
- F. Kitchen Sinks (Office Kitchen Areas): Drop-in, self-rimming, single compartment, stainless steel, as manufactured by American Standard, Just, or Kohler. Faucets for Kitchen sinks to be manual, single lever type with ceramic disc valving, as manufactured by Moen, Kohler or American Standard.
- G. Water Coolers: Shall be wall mounted electric with evaporator/chiller installed in the cabinet, with pre-cooler, temperature control, valve/stem regulator, one piece chrome plated bubbler with mouth guard, anti-splash stainless steel top and heavy gauge steel cabinet. Some portion of water cooler shall have bottle fillers. Secondary water filtration is not considered necessary and therefore watercoolers should not have filters that would require periodic replacement. Basis of design: Elkay. Exterior cabinet finish shall be coordinated with Architect.
- H. Shower control valves shall be pressure balance type, solid brass construction preferred. Symons Temptrol or equal. Handicap showers shall have wand only with no diverter valve. Shower head rough in shall be based on finished shower stall height. Arrange valve and head to discharge toward stall wall not door or curtain.
- I. Floor drains in areas that traps may become “dry” shall have trap sealers similar to SureSeal. All floor drains installed in membrane protected floors shall have membrane lock collars and weep holes.
- J. Plumbing fixtures for janitor’s closets
- K. Mop Sinks: Terrazzo floor mounted with tile flange. Faucets for mop sinks shall have integral checks or inline check valves as manufactured by T & S Brass and Bronze Works, Inc. or equal.
- L. Service Sinks: Wall-hung, enameled cast iron as manufactured by American Standard or Kohler.

East Carolina University Construction Standards	Date of Issue: 3/1/2022 Supersedes: 9/24/2020	Division 22 Page: 9 of 11
--	--	------------------------------

- L. All plumbing fixtures must be tight fitting to walls and be neatly sealed at joint with silicone sealant.
- M. All piping penetrating walls shall be covered with escutcheon plates.
- N. Plumbing fixtures and fittings for laboratory furniture shall be provided by the laboratory furniture manufacturer.
- O. Wall hydrants recessed concealed freeze-less on exteriors of new buildings. A minimum of one centrally located wall hydrant shall be provided for each building exposure. Model 68 series as made by Woodford Manufacturing, Inc. or approved equal.
- P. Provide vacuum breakers for all plumbing fixtures as required by Code and as required to prevent back-siphonage to domestic water supply.
- Q. All fixtures shall be provided with ¼ turn stop valves (ball valves).

22 45 00 EMERGENCY PLUMBING FIXTURES

- A. Emergency eye wash or safety showers shall be coordinated between ECU Plumbing Shop and ECU Environmental Health and Safety
- B. Combination eyewash/drench hose fixtures shall be used unless a risk assessment requires a standalone shower.
- C. Consult with EH&S on types and locations of fixtures.
- D. Consideration shall be given to how flow test shall be conducted on showers and eyewash stations.

22 47 00 DRINKING FOUNTAINS AND WATER COOLERS

- A. Coordinate water cooler location between building owner and ECU Plumbing shop. Coordinate with electrical designer to provide dedicated GFCI breaker in panel and receptacle outside of the water cooler enclosure. Provide “lead free” materials certification from drinking fountain manufacturer prior to installation.
- B. Drinking fountains and water coolers shall be as manufactured by Elkay or approved equal and shall incorporate a bottle-filler without filter feature.

22 60 00 GAS AND VACUUM SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

- A. Manufacturer Qualifications: A qualified manufacturer: Maintains, within 150 miles of ECU, a service center capable of providing training, parts, scheduled maintenance, and emergency maintenance repairs for all equipment provided.

East Carolina University Construction Standards	Date of Issue: 3/1/2022 Supersedes: 9/24/2020	Division 22 Page: 10 of 11
--	--	-------------------------------

22 66 00 SANITARY SEWER DISCHARGE

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

- A. Designer shall coordinate with user group to determine chemical or grease waste that may discharge to the local utility system that may require mitigation devices. Chemical dilution tanks or grease traps shall meet local utility requirements. Location and access shall be coordinated with ECU Project Manager and Plumbing Department.

END DIVISION 22 – PLUMBING

East Carolina University Construction Standards	Date of Issue: 3/1/2022 Supersedes: 9/24/2020	Division 22 Page: 11 of 11
--	--	-------------------------------