

# NC State University Design and Construction Guidelines

## Division 22 Plumbing

### 1.0 Purpose

- A. The following guidelines apply to the selection of piping, fixtures and accessories. It is the goal of NC State to utilize items that will provide a long service life, styles that allow for minimal maintenance, and operate efficiently.

### 2.0 General Requirements

- A. Specify ASME expansion tank with manual air/water bleed for all water heater tank systems.
- B. If available, provide steam to hot water converters for domestic hot water
- C. Caulk wall-mounted fixtures with 100% white silicone sealer.
- D. All fixtures shall be provided with maintenance accessible integral or separate I.P.S. stops.
- E. Specify chrome-plated cast brass one-piece, p-trap with cleanout, ground joint, threaded 1 1/2" outlet for lavatories, sinks, and water coolers.
- F. Specify chrome-plated cast brass escutcheons with set screws for exposed flush valves, water supplies, and p-traps.
- G. All exposed piping in restrooms & kitchens shall be chrome-plated brass.
- H. Specify hose bibs for all restrooms with floor drains, mechanical equipment rooms, cooling tower enclosures, packaged chillers, and roof top mounted AHU's. Specify loose key operated hose bibs for public restrooms.
- I. Specify all available vandal-proof features for plumbing fixtures located in student and public areas. Provide to Facilities Operations, a minimum of one set of special tools required to remove vandal-proof items.
- J. Specify wall mounted steel pipe carriers for all urinals, lavatories, toilets and water coolers.
- K. Use the same manufacturer for each grouping of faucets, valves, flush valves, etc. for the entire building.
- L. Specify shock absorbers with lockable access doors for domestic water systems with flush valves.

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- M. Specify interceptors and appropriate treatment for any waste that could be detrimental to the drainage system and/or the City of Raleigh waste treatment plant.
- N. Sump pumps and/or sewage lift stations are not allowed. Elevator sump pumps are acceptable.
- O. Insulate bottom side of roof drain pans and horizontal roof leader piping. Also, insulate bottom side of floor drains, p-traps and piping receiving condensate from a cooling coil or ice machine as required to prevent condensation.
- P. Cold and hot water piping is not permitted in exterior walls. Freeze proof wall hydrants with extended stems shall be supplied from interior partitions perpendicular to exterior walls.
- Q. Space exterior hose bibs a maximum of 200 feet apart.
- R. Provide isolation valves in accessible valve box located in corridor wall outside each laboratory space for each lab service.
- S. Provide primers for all floor drains.
- T. Provide floor drains for restrooms with two or more flushing fixtures.
- U. Provide “wet” columns to allow for ease of installation in future upfits for shell buildings.
- V. Specify “Energy Star” appliances and equipment where possible

### 3.0 Materials & Standards

- A. Valves- Gate valves or ball valves shall be installed, on all hot and cold water branch lines. Check valves shall be swing check type, rated for 125 psi. Specify extended stems for valves in insulated lines. Ball valves shall be 3-piece full port type.
- B. Cleanouts- All required cleanouts shall be shown on plans and riser diagrams. Wall cleanouts in corridors are preferred to floor cleanouts where possible. If clean outs are located in the ceiling, extend to floor above for access. Cleanouts shall be adjustable and equipped with an internal brass plug with countersunk brass screws holding the rim to the body and cover. Use tops with tile recess for floor coverings or terrazzo. Provide a permanent carpet indicator where cleanout is located under carpet. Yard cleanouts shall be brass recessed type in 24" x 24" x 6" concrete pad. Wall cleanouts shall have stainless steel round access covers, frame with anchor lugs and cover plate with screws.

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- C. Access Panels- Access panels shall be provided where shutoff valves, air chambers, or other equipment is located in chases or other concealed spaces. They shall be fire rated where required and equipped with full piano hinge. Access panels shall be a minimum of 24" x 24".
- D. Flush Valves- Flush valves shall be diaphragm type, typical of either Delaney "Flushboy" or Sloan "Royal" series.
- E. Faucets- Solid brass construction with vandal proof aerator, typical of "Chicago Faucet Co." or "T & S Brass". Provide all vandal proof options in student and public areas.
- F. Backflow Preventers- Locate backflow preventers for domestic and fire line services inside building for new buildings and inside if possible for existing buildings. Provide air gap device on reduced pressure assemblies and pipe full size to floor drain funnel. Backflow preventers and their installation shall meet City of Raleigh Public Utilities Department requirements. Provide parallel backflow preventers in central utility plants and other critical buildings as designated by the owner.
- G. Building shutoffs and shall be well marked, readily accessible, and readily visible. Newly installed building utility shutoffs should be reported to NC State for inclusion on emergency plans.

### 4.0 Fixtures

- A. Water Closet- Use white vitreous china, elongated bowl wall-mounted, siphon jet or blowout, white open-front heavy-duty plastic seat with stainless steel self-sustaining check hinge, water conserving diaphragm type lever-operated flush valve with solid ring support, 24" above fixture rim, cast iron chair carrier.
- B. Urinal- Use white vitreous china, integral trap, 2" outlet, wall-mounted with steel pipe carrier, water conserving diaphragm type lever-operated flush valve with solid ring support.
- C. Lavatory- Use white acid-resisting, enameled cast iron, wall-mounted with steel pipe carrier, 4" high back, single-lever centerset commercial faucet, grid drain, wheel handle I.P.S. stops. Use vitreous china in countertop applications.
- D. Sink- Counter-mounted self-rimming 18 gauge type 302 or 304, 18-8 stainless steel with faucet ledge, and commercial two-handle faucet with gooseneck spout, 1 3/4" radius corners, undercoated and sound deadener. Use 316 stainless steel for darkroom sinks.
- E. Electric Water Cooler- Specify only dual level A.D.A. accessible type electric water coolers with electric push button or push bar, wall mounted with steel pipe carrier, all

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stainless steel exterior including skirt. Recess water cooler or provide cane detection as needed. Conceal all services including water supply, waste, and receptacle behind water cooler skirt. Use prison type vandal proof water cooler with remote chiller for locker room and gym areas.

- F. Mop Receptor- Built-up of ceramic tile if other tile work on project, otherwise use pre-cast terrazzo 24" x 36" with stainless steel rim and stainless steel wall splash protectors. Provide a 3-tool mop hanger and hose end holder.
- G. Floor Drains-Mechanical Rooms: Galvanized cast iron parts with sediment bucket that supports round strainer. Strainer to suit application. Do not locate inside built-up air handling units. Provide primer connection. Use deep seal p-traps.
- H. Other Locations: Coated cast iron body with chrome nickel alloy strainer to suit application. Use square tops where floor finish has a straight grid pattern. Use funnel drains for indirect waste. Provide primer connection. Provide clamping collar in waterproof floors.
- I. Exterior stairwell drains shall be a minimum of 12" x 12" x 6" drain sump with 4" outlet and grate cover.
- J. Floor drains located in animal quarters shall have the strainers secured with vandal proof screws with "thread locker" to prevent strainers from coming loose.
- K. Domestic Water Heater- Use semi-instantaneous type, factory assembled and packaged, skid mounted steam heated hot water generator for applications where the HW draw is mostly constant. Specify ASME Code 316 stainless steel tank (45 or 60 gallon), copper u-bend heating coil, full steam package including pressure reducing valve, integral bronze circulator. Reference: Cemline SSH series.
- L. Add separate hydraulic cement lined steel tanks where storage is required such as dormitories, gym showers, and kitchens.
- M. Electric water heaters are not allowed except:
  - 1. Where the life cycle costs show electric the best overall choice.
  - 2. The usage is low such as hand washing in restrooms.
- N. Shower valve- Single lever operated pressure balance anti-scald valve with integral stops and tamperproof water saver showerhead. Use thermostatic mixing valve in lockable enclosure for hot water supply to gang showers.

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- O. Wall Hydrant- Wall mounted concealed cast brass box type, non-freeze, automatic draining, and polished brass or stainless steel face with loose key lock.
- P. Eye Wash Stations- Connect drain from free standing/ wall mounted eye wash to building drainage system.
- Q. Safety Showers- Safety showers shall be installed in areas where bodily exposure to hazardous chemicals could occur. i.e. mechanical rooms, labs, etc.

### 5.0 Piping

- A. Domestic Water
  - 1. Above ground 2-1/2" and smaller - Type "L" hard drawn copper tubing. Specify 95-5 solder for 1-1/4" and smaller; Specify silver brazing for 1-1/2" – 2-1/2".
  - 2. Above ground 3" and larger – Cement lined ductile iron with flanged joints.
  - 3. Below ground – 3" and smaller - Type "K" soft copper tubing with silver brazed joints. No joints allowed under building slab. Stub above slab on grade near exterior wall.
  - 4. Below ground – 4" and larger - Cement lined ductile iron with push-on joints except use mechanical joints at all elbows.
- B. Drainage and Vent Systems
  - 1. Fixture arms – Schedule 40 galvanized steel pipe with threaded fittings.
  - 2. Above ground – Cast iron no-hub pipe with heavy-duty couplings such as "MG" or "Clamp-all".
  - 3. Below ground – Cast iron hub and spigot pipe with rubber gaskets.
- C. Acid Waste- Above ground - Flame retardant schedule 40 polypropylene with socket fusion fittings. Mechanical joints allowed only under lab benches inside accessible cabinets (not in cabinet pipe chase). Below ground - Schedule 80 polypropylene with socket fusion fittings.
- D. Compressed Air and Vacuum- Type "L" hard drawn copper tubing. Specify silver brazed joints and stainless steel flexible connections at equipment.
- E. Natural Gas- Schedule 40 black steel pipe with threaded malleable iron fittings.