DIVISION 22 – PLUMBING

Demarcation line for building versus steam line distribution:

Below is a chart that displays a separation line showing responsibilities for maintenance and billing purposes. Everything right of the demarcation line should be considered part of the steam distribution system; condensate pump, venting, check valve, condensate meter, etc. Everything before the condensate pump or left of the demarcation line will be the building responsibility and/or the steam customer responsibility.

Chart showing the demarcation line for steam condensate distribution

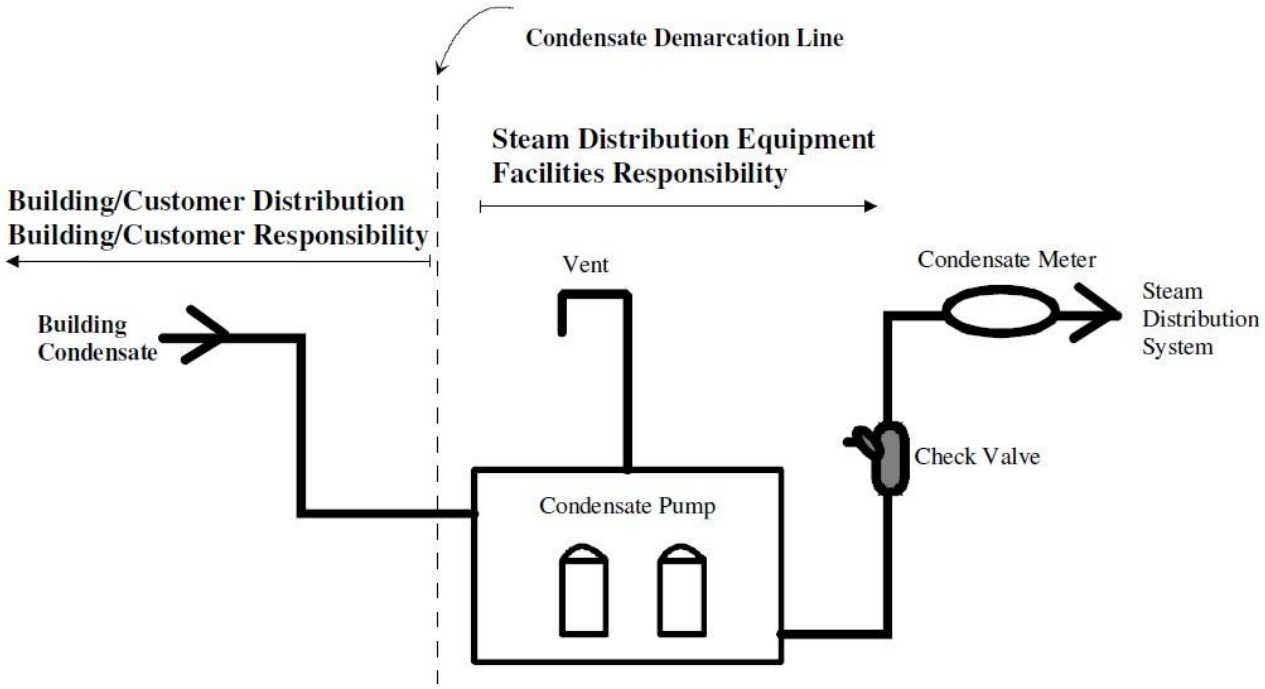
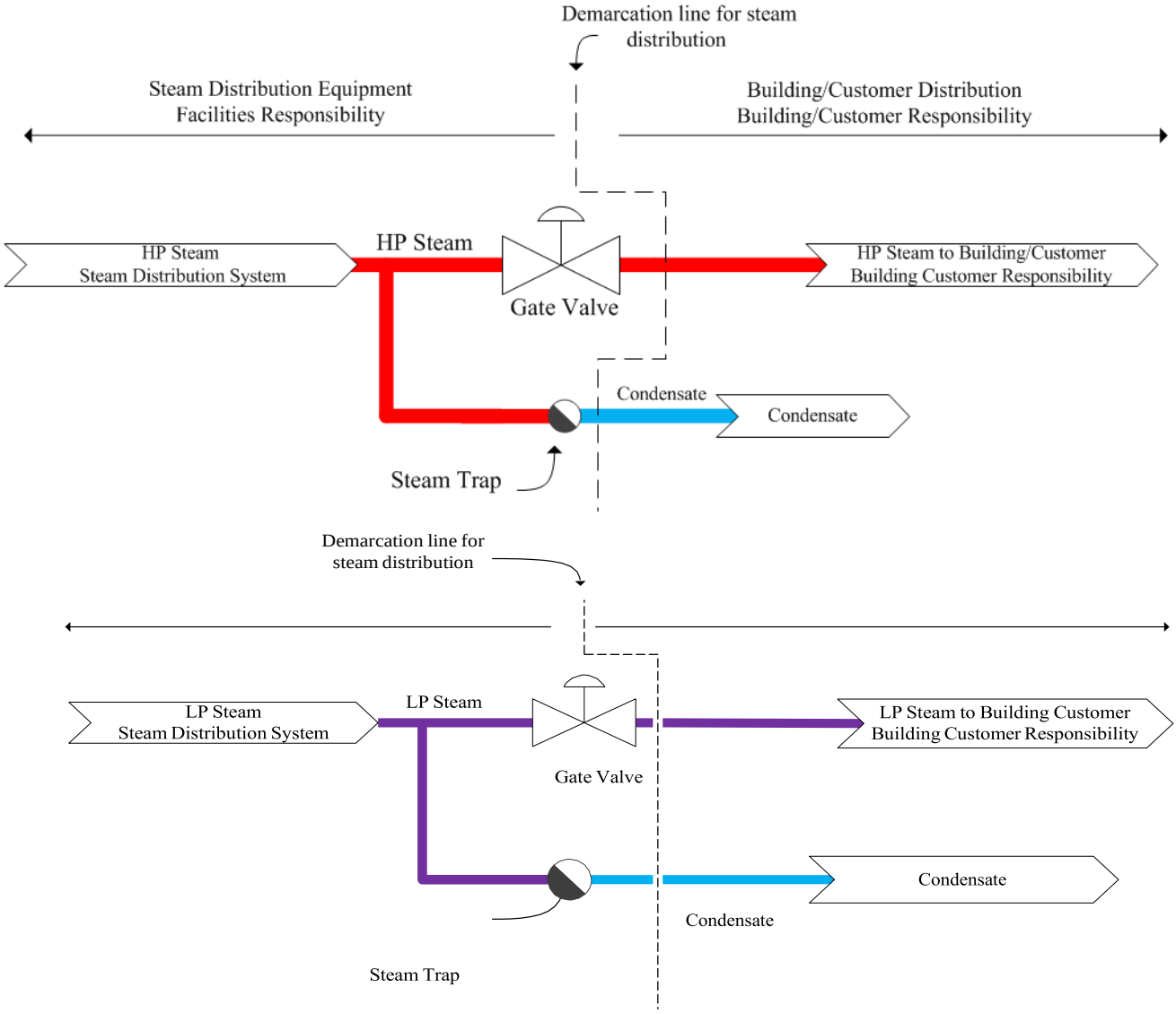


Chart showing the demarcation line for steam distribution

GENERIC SPECIFICATION FOR HIGH PERFORMANCE POWER MONITORING, REVENUE METERING, POWER QUALITY RECORDING, AND RTU FUNCTIONALITY



22 0533 HEAT TRACING FOR PLUMBING PIPING

A. SELF-REGULATING, PARALLEL-RESISTANCE HEATING CABLES

1. Comply with IEEE 515.1.
2. Heating Element: Pair of parallel No. 16 or No. 18 AWG, tinned, nickel-coated, stranded copper bus wires embedded in cross-linked conductive polymer core, which varies heat output in response to temperature along its length. Terminate with waterproof, factory-assembled, non-heating leads with connectors at one end, and seal the opposite end watertight. Cable shall be capable of crossing over itself once without overheating.

B. CONSTANT-WATTAGE HEATING CABLES

1. Retain this article for snow and ice melting on roofs and in gutters and downspouts.
2. Comply with IEEE 515.1.

C. CONTROLS

1. Pipe-Mounted Thermostats for Freeze Protection:
2. Precipitation and Temperature Sensor for Snow Melting on Roofs and in Gutters

22 0548 VIBRATION AND SEISMIC CONTROL FOR PLUMBING

22 0553 IDENTIFICATION FOR PLUMBING AND EQUIPMENT

A. Valves shall be identified with a brass tag with brass ball-chain affixed to each valve indicating its enumeration and marked on the “As Built” as a legend which indicates what each numeral value serves accordingly. The legend will be provided to UND’s Preventative Maintenance Coordinator.

B. Valves that are hidden from view behind ceiling tiles/access panels shall be indicated with color coded round stickers placed as near to the valve location as possible on the ceiling grid/access panels. These stickers can be provided to you from the UND plumbing Supervisor or Lead. Color codes shall be as Follows:

1. Dom Cold water: Blue dot
2. Dom Hot water: Red dot
3. Dom Hot recirc: Red dot
4. Natural Gas: Yellow dot
5. Compressed air: Black dot
6. Hot water heat: Orange dot
7. Steam/Condensate: Gray or Silver dot
8. Medical Air/Gas: Green dot
9. Chilled water: Purple dot

C. Piping Identification:

1. Contents and direction of flow on all piping (steam, gas, water, condensate, etc.) shall be identified by labeling.
   a. Labels on piping up to 1-1/4" size shall be a minimum 1/2" high.
   b. Labels on piping larger than 1-1/4" size or pipe covering shall be a minimum of 1" high.

Labels shall be applied at all points where pipes pass through walls, at each change of direction and on each 20 feet of straight lengths.

2. Pipe identification shall be as follows:

Item	ABBRV.	Pipe Color	Lettering Color
Cold Water (Domestic)	DCW	Green	White
Hot Water (Domestic)	DHW	Green	White
Hot Water Return (Domestic)	DHWR	Green	White
Reverse Osmosis	RO	Green	White
Tempered Water (Domestic)	DTW	Green	White
Storm Drain	STORM	Gray	White
Sanitary Drain	SAN	Gray	White
Vacuum	VAC	Blue	White
Compressed Air	COMP AIR	Blue	White
Natural Gas	GAS	Black	White
115 PSIG Steam	STM-115	Black	White
60 PSIG Steam	STM-60	Black	White
15 PSIG Steam	STM-15	Black	White
Low Pressure Condensate	LP COND	Black	White
High Pressure Condensate	HP COND	Black	White
Pumped Condensate	PCOND	Black	White
Condenser Water Supply	CONDWS	Green	White
Condenser Water Return	CONDWR	Green	White
Chilled Water Supply	CHWS	Green	White
Chilled Water Return	CHWR	Green	White
Chilled Water Glycol Supply	CWGLS	Green	White
Chilled Water Glycol Return	CWGLR	Green	White

Heating Water Glycol Supply	HWGLS	Green	White
Heating Water Glycol Return	HWGLR	Green	White
Heating Water Supply	HWS	Green	White
Heating Water Return	HWR	Green	White
Fire Sprinkler Piping	FIRE SPRINKLER	Red	White
Radioactive	Radioactive	Orange	Black
Toxic	Toxic	Orange	Black
Foam	Foam	Red	White
Carbon Dioxide (Co^2)	Carbon Dioxide	Red	White

Halon	Halon	Red	White

22 0716 PLUMBING EQUIPMENT INSULATION

A. Steam and condensate piping in areas prone to flooding, such as steam vaults, shall be piped using “Foam Glass” wrapped in a metal jacket.

B. For High Temperature Equipment Insulation for equipment inside the building in conventional equipment rooms the following shall apply:

a. All steam valves including control valves, expansion joints and the access end of strainers shall be covered with a custom fabricated insulation jacket secured around the fitting. Insulation Systems will be custom designed and engineered for each individual item which is not a standard product based on type of application, operating temperature, and environment. A close contour fit is essential for proper thermal performance and neat appearance.

b. Insulation Jacket shall be constructed of Teflon Impregnated Fiberglass Cloth with a minimum temperature rating to 500F and Dark Grey in color. Insulation shall be a minimum of one (1”) Inch Thick.

c. Insulation jacket shall be secured to the fitting with stainless steel buckle and strap assembly, Grey color, Maximum Temperature Resistance 250°. Insulation Seams which do not tightly butt one another are Not Acceptable.

d. All reusable insulation blanket assemblies shall be labeled with laser label. The tagging systems will facilitate installation and reinstallation of all blankets and enable the manufacturer to provide replacements upon request by number assigned as imprinted on the label.

22 0719 PLUMBING PIPING INSULATION

C. All heating and chilled water pipes shall have adequate insulation.

D. Roof drain sumps shall be insulated as specified for fittings.

E. On domestic water, a pipe insulation protection saddle of 22 gauge galvanized sheet metal for piping 3" diameter and smaller, and 18 gauge for piping larger than 3" diameter, shall be provided at every pipe hanger or support. The saddle shall be at minimum length of 10 inches

1. All domestic piping smaller than 2”, no saddle required below the insulation

2. Both inserts and saddles shall be provided for all piping 2" and larger.

F. Hot and Cold Line Insulation

1. All water piping in tunnels and within the building as well as all rain leaders, including those concealed and in furred spaces or pipe chases, shall be insulated with glass fiber pipe insulation in one piece molded sections, 4 lb. nominal density, and of the following thickness:

Application	Pipe Size	Insulation Thickness
Cold water lines	1-1/2'' and less	½''
Rain Leaders	2'' and larger	1''
	1'' and less	1''
Hot water lines	1-1/4'' to 4''	1-1/2''
120°F - 200°F	5'' to 6''	2''
	8'' and over	2-1/2''
	1'' and less	1''
Hot water lines	1-1/4'' to 2''	1-1/2''
201°F - 250°F	2-1/2'' to 4''	2''

2. Insulate floor drain sumps and all horizontal sanitary waste pipe and fittings for all floor drains above grade receiving cooling coil condensate.
   a. Insulate horizontal sanitary waste line from floor drain to nearest vertical sanitary riser.
   b. Insulation shall be 1/2" thick glass fiber pipe insulation, 4 lb. density.

G. Unless specified, the application of all insulation shall be in accordance with the manufactures published recommendations.

H. Insulation shall be installed full thickness through all wall and floor penetrations.

I. Insulation shall be installed at full thickness through oversized pipe hangers and supports with appropriate ridged inserts and protection saddles.

J. All insulation work under contract shall be done by skilled, competent workmen familiar with this type of work. All insulation work shall present a neat, finished and workman like appearance.

K. Insulation shall be applied over dry clean surfaces, butting adjoining sections firmly together.

L. All insulation, jackets and PVC coverings shall have a flame spread rating of 25 percent or less and a smoke developed rating of 50% or less.

M. Exterior or Exposed Piping

1. Apply metal or PVC jacket with 2" overlap at seams and joints.
   a. Seal seams and joints weather tight with manufacturers recommended sealant.
   b. Apply the jacket such that the longitudinal seam is on the bottom of pipe.
1. When using metal jacket, secure jacket with stainless steel bands every 12" at end joints.

22 1005 PLUMBING PIPING

A. Plumbing piping material shall be soldered, crimped, pressed, threaded, glued, no hub or welded. All parts and materials must be lead free. Victaulic piping may be accepted where it is applicable, and code allows. If Victaulic piping is used the system needs to be rated for failure temperatures, not just normal operating temperatures. The engineer of record must provide the failure temperatures for each system and provide a 15-year warranty from the vendor at the failure ratings.

1. Sanitary System Type: Standard cast iron pipe system or schedule 40 PVC | ABS. If copper is used for drain lines, use only Type "L" hard copper tubing, not DWV weight copper.
2. Cold & Hot Water System Type: Copper pipe system with all lead-free components. PEX-A may also be used up to 2".

B. Service isolation valves should be provided for plumbing systems to prevent shutting down an entire building to work on a bathroom, drinking fountain, etc. All bathroom groups should have isolation valves, all floors should have the ability to be isolated independently and where capable wings of floors should have isolation valves. All isolation valves shall be accessible in ceilings or access panels. Final valve locations are to be clearly identified on mechanical drawings provided to Facilities Management

C. Pipes penetrating exterior walls must be installed to prevent breakage when building settles or go through expansion and contraction due to temperature changes. Use metallic pipe for five-foot minimum distance outside building perimeter. Prefer spools cast in walls with hubs on either sides, or packed sleeves.

D. Any floor drain or sump pit and associated piping that could potentially be used to dump hot liquids such as condensate for a temporary amount of time will be of a metallic material as to not damage the drain, pump or piping. A minimum of 15 feet of metal pipe is to be used. Pump must be rated for high temperature. UND Plumbing Shop is to approve the drains; Engineer is to design.

E. At every point where piping and duct work penetrate a floor slab, except slabs on grades, a cast-in sleeve or other curbing at least 1" high must be provided so that any

leakage of water or liquids must be at least 1" deep in order to spill through floor penetrations.

F. Sump drains shall be piped to the storm sewer, unless prior approval is given by UND Mechanical Ops Coordinator. If piped outside, the water should not run over any existing pedestrian walks or driveways. Provide proper slope away from the building for drainage.

G. For future use, main runs of piping shall utilize plugged tees instead of elbows. All plugs must be anchored, secured, and leak proof but must be available for future use.

H. Valves need to be of quality design and materials to ensure they move freely and seal tightly after sitting for more than a year and to be of adequate quality in order to maintain that performance after 20 years. Valves should be constructed of proper materials to prevent corrosion or rusting, especially with valves exposed to moisture or condensation. All valve components are to be lead free. Lead free valves with packing nut are required and a minimum rating of 300 WOG. Provide full-port ball valves at all water lines up to 3 inches in diameter whenever possible. Over 3" can be of the gate or globe style valves. Butterfly valves will not be acceptable unless approved by UND Mechanical Operations Coordinator beforehand.

I. Each restroom plumbing fixture supply and drain line tree shall be easily accessible within a chase with access to the chase through a full height door. Install the chase with a minimum width of three (3) feet.

J. All pipes should be accessible to work on by use of tunnels, chases, crawl spaces, accessible ceilings, etc.

K. All floors susceptible to water shall drain to floor drains. Indicate the floor pitch on the drawings.

L. All building sanitary drainage systems with fixtures below grade shall incorporate backflow prevention strategies, e.g. backwater valves, knife gate valves or sewage ejectors.

22 1006 PLUMBING SPECIALTIES

A. No roof drains shall be placed over joints.

B. All roof drains shall be run internally.

C. The base of all storm and sanitary sewer stacks shall have a clean-out. Clean-out plugs should be set with a suitable lubricant to facilitate removal.

D. Hose bibs should be provided at 100 ft. intervals for exterior use (frost-proof type). All bibs should be key operated with inside valve control. All cooling towers and air cooled chillers must have a hose bib within 10 feet of its location. This must be approved by the HVAC Systems supervisor.

E. Floor drain design shall include enough slope to provide for proper drainage. This is especially important if ceramic floor tile is to be installed.

F. Refer to Part 1 of the Grand Forks City Code: Chapter XV Waterworks & Sewage Systems: Article 8 Fats, Oils, and Grease (FOG) Control. Any additional changes need to be approved by UND Facilities Management. Check for updated versions at the Grand Forks website.

G. All food service establishments possessing cook sinks, floor troughs, floor sinks, pulpers, extractors (excluding hand sinks), are required to install grease interceptors to prevent the discharge of FOG to the public sewer system. Grease interceptors shall be approved at the time of design. Grease interceptors shall be installed to receive the drainage from plumbing fixtures and equipment with grease-laden wastewater located in food service establishments.

H. Schier and Highland Tank are acceptable grease interceptor brands to use on campus
1. When a Highland Tank grease interceptor is used, a hot water hose faucet is required to clean out the tank.

I. Grease interceptors are not required for residential users.

J. All food service establishments shall implement and adhere to the best management practices that are part of the city's FOG control program.

K. Except as provided herein, food waste disposal units shall be removed from all existing food service establishments.
1. However, a food service establishment may continue to operate a food waste disposal unit provided that it is operated with the use of a screen.
2. All food waste disposal units are required to have an Insinkerator Mini-Waste Xpress System.
3. Failure to utilize a screen shall be basis for an order requiring the removal of the food waste disposal unit at the expense of the food service establishment.

L. Food waste disposal units, including grinders, garbage grinders, or garbage disposals, shall not be allowed in any newly constructed food service establishment.

M. To minimize the discharge of FOG into the sanitary sewer system, best management practices shall be implemented by all food service establishments. This includes kitchen practices and employee training that are essential in minimizing FOG discharges. These best management practices are listed in the city's FOG control program. Food service establishments are required to maintain all grease removal devices in accordance with the language of this article.

N. All new food service establishments shall install grease interceptors in accordance with the Uniform Plumbing Code (UPC).

O. All food service establishments are required to submit the drainage plumbing plans to the environmental specialist or designated representative for approval prior to construction. Failure to submit plans or construct on accordance with approved plans is a violation of this article.

P. New facilities are required to maintain a grease interceptor by this, or other applicable ordinances. The new facilities shall install such a unit prior to commencement of discharge into the sanitary sewer.

Q. If a new food service establishment has no dishwasher but has a triple compartment sink, a mop sink, and hand sinks, the city may waive the necessity of installing an interceptor. The city will determine whether a facility, based upon its operations and kitchen fixtures, shall be required to install an interceptor.

R. The city may also determine whether plumbing fixtures may be connected to the sanitary sewer line separate from the domestic sanitary sewer line. In such Instances:

1. The separate sanitary sewer line shall be equipped with a cleanout located outside of the building to allow access for sampling.
2. The city may determine through sampling that the facility's discharge exceeds the city's limit for fat's oils, and grease, whether emulsified or not, of one hundred (100) mg/l. In such instances:
    a. The user shall be required to install an appropriately sized interceptor. The separate sanitary sewer line is to allow easier installation of an interceptor should one be required if there is a significant amount of oil and grease present in the discharge.
    b. This line may be combined with the domestic sanitary sewer at a point after this cleanout.

S. Existing food service establishments not equipped with a grease interceptor shall install an adequately sized grease interceptor when the kitchen is remodeled involving

structural renovations in their food preparation area including the sewer system or if the discharge causes excessive grease accumulation in the sanitary sewer.

1. An existing food service establishment changing from one class of facility to another shall be required to install an approved grease interceptor.

T. All grease interceptors shall be constructed in accordance with chapter 4-02 of the Uniform Plumbing Code.

1. There shall be a minimum of one manhole per ten feet of interceptor length to provide access for cleaning.
2. Manhole covers shall be gas-tight in construction and have a minimum opening dimension of 24". Concrete covers are not acceptable.
3. In areas where traffic may exist, the interceptor shall be designed for the appropriate traffic load.
4. The access manholes shall extend at least to finished grade and be designed and maintained to prevent surface and ground water from entering the grease interceptor.
5. The size, type, and location of each grease interceptor shall be approved by the environmental specialist or authorized representative before each installation although interceptors are usually located outside the facilities.
6. The city is authorized to make determinations of grease interceptor adequacy and need, based upon review of relevant information regarding grease interceptor performance, maintenance, and facility site and building plan review and to require repairs to and modification or replacement of such interceptors.
7. The minimum approved grease interceptor size is 750 gallons and the maximum approved size is 2,000 gallons, working capacity.

U. Grease traps shall be sized according to fixture volume to allow for proper FOG removal.

V. In the event that an outside grease interceptor is not practical in the new construction, a grease trap(s) shall be required on waste lines leading from kitchen floor drains, mop sinks, food preparation and washing sinks, and other fixtures or equipment where grease may be introduced into the sewer system.

W. Food service establishments that have grease traps or that are required to install them are subject to the requirements below:

1. The grease trap may be set on the floor or partially or fully recessed in the floor to suit piping and structural conditions. Baffle systems and all other internal

pieces shall be removable to facilitate cleaning and replacement but must be in place at all other times.

2. All grease traps, flow control, air intake, and interceptors shall be installed to manufacturer's specifications and shall be provided with proper venting. In addition, the grease traps shall be installed with sufficient clearance for the removal of trap cover for cleaning.

22 1500 GENERAL SERVICE COMPRESSED AIR SYSTEMS

22 3000 PLUMBING EQUIPMENT

A. Domestic water heaters should be located in a heated area as close as possible to the larger demand sources.

1. Each domestic water heater shall have a service area of 4'-0" by 4'-0" in front of the unit clear of obstructions.

B. Steam hot water heaters shall be instantaneous. The style installed shall be one that is easy to service, requires low maintenance and has economical parts for replacement. Our requirement for steam water heater is Cemline. For ease of coil removal during maintenance horizontal water heaters are to be specified unless approved by the UND Plumbing Supervisor.

1. AO Smith or Bradford White is the requirement for gas or electric water heater brands.

22 4000 – PLUMBING FIXTURES

A. The plumbing system shall be designed to provide excellent service to the occupants and incorporate water saving fixtures. The plumbing system shall utilize fixtures and components that are easily replaceable, economical and that have ready local access to replacement parts and components.

B. Fixtures

1. Floor mounted toilets (1.28 - 1.6 GPF) shall be white, elongated supplied by Kohler with open front seats
2. Provide wall hung water closets (1.28 - 1.6 GPF) supplied by Kohler with white, elongated, open front seats.
3. Toilet seats shall be white elongated open front with self-sustaining hinge and no cover.
4. For non-tank style water closets install automatic flush valves (1.28 - 1.6 GPF) supplied by Sloan.
5. White Vitreous China Urinals supplied by Kohler are preferred with flush valves

(1/2 GPF) supplied by Sloan.

6. Vitreous china lavatories supplied by Kohler.
7. Moen, Kohler, or Sloan commercial grade faucets with lever handles on all lavatories and sinks.
   a. Use water saver aerators in all sinks and wash basins.
8. Sloan hands free lavatory faucets with electric power and battery backup.
   a. In places of public use mixing valves shall be in use.
9. Moen or Symmons shower valves.
   a. Water saver shower heads should be installed in all shower rooms.
10. Elkay electric water coolers constructed of stainless steel with bottle fillers.
11. Elkay or Dayton stainless steel kitchen, bar and hand sinks.

C. All laboratories shall be supplied with emergency shower and eye wash stations per code.

D. For a specific list of approved fixtures, see cutsheets located at V:\UND Design Standards\Division 22 – Plumbing\Standard PL Fixtures

22 4300 – HEALTHCARE PLUMBING FIXTURES

A. Lavatories: Typical sink installations are Kohler vitreous china white 20- ¾" x 18 ¼" (4" center) vitreous china white ADA lavatory with back-splash and back wall mount. Preference for lavatory faucets is Kohler complete lavatory faucet with ADA compliant wrist blade handles and aerator. For sinks, we understand that, based on the application, different sinks may be desired. If the design is different from what is listed here, Facilities Management will want to review the recommendation prior to approving, to ensure what is selected will be easy to clean and service.

22 6005 – MEDICAL AIR, GAS AND VACUUM SYSTEMS - TBD