

Division 22 Plumbing

1.1 220500 – COMMON WORK RESULTS FOR PLUMBING

A. Code Compliance: All work should comply with the applicable laws and regulations of the City of Omaha and State of Nebraska. Mechanical work shall be performed by persons skilled in the trade involved and shall be done in a manner consistent with normal industry standards. All work shall conform to all applicable sections of currently adopted additions of the following codes, standards and specifications:

1. International Building Code (IBC)
2. Safety and Health Regulations for Construction
3. Occupational Safety and Health Standards (OSHA)
4. National Fire Protection Association (NFPA)
5. Life Safety Code (NFPA #101)
6. American Gas Association (AGA)
7. Underwriters Laboratories, Inc. (UL)
8. Factory Mutual Engineering Corporation or other recognized National Laboratories
9. Environmental Protection Agency (EPA)
10. Omaha Plumbing Code

B. Contract documents shall provide for coordination of connection of all equipment, whether it is provided by other divisions of the specifications or by the Owner.

C. Plumbing Submittal Schedule:

PLUMBING SCHEDULE	PRODUCT DATA	SHOP DRAWINGS	SAMPLES	WARRANTY	OTHER
220500 – Common Work Results for Plumbing					✓
220513 – Common Motor Requirements for Plumbing	✓				
220519 – Meters and Gages for Plumbing Piping	✓				
220523 – General-Duty Valves for Plumbing Piping	✓				
220529 – Hangers and Supports for Plumbing Piping and Equipment	✓				
220553 – Identification for Plumbing Piping and Equipment	✓				
220700 – Plumbing Insulation	✓				
221113 – Facility Water Distribution Piping	✓	✓			
221116 – Domestic Water Piping	✓				
222119 – Domestic Water Piping Specialties	✓				
221123 – Domestic Water Pumps	✓				
221313 – Facility Sanitary Sewers	✓	✓			
221316 – Sanitary Waste and Vent Piping	✓				

PLUMBING SCHEDULE		PRODUCT DATA	SHOP DRAWINGS	SAMPLES	WARRANTY	OTHER
221319 – Sanitary Waste Piping Specialties		✓				
221413 – Facility Storm Drainage Piping		✓	✓			
221423 – Storm Drainage Piping Specialties		✓				
221429 – Sump Pumps		✓				
223200 – Domestic Water Filtration Equipment		✓				
223300 – Electric Domestic Water Heater		✓			✓	
223400 – Fuel-Fired Domestic Water Heaters		✓			✓	
223500 – Domestic Water Heat Exchangers		✓				
224000 – Plumbing Fixtures		✓		✓		
224500 – Emergency Plumbing Fixtures		✓				
224700 – Drinking Fountains and Water Coolers		✓		✓	✓	

- D. Contract documents shall require all welders to be certified and to stamp their work.
- E. PVC piping shall not be installed in return air plenum.
- F. Require cut pipe to be reamed to full inside diameter.
- G. Design drawings should include water risers, gas risers, and waste and vent risers.
- H. Require any rough in stubs that do not have units installed under the contract to be valved and capped.
- I. Require all systems be vented and provided with adequate valve drains.
- J. Require that valves be located where they are readily accessible wherever possible. All lavatories and sinks shall include stops on both hot and cold water supplies. Water supply stops shall be Brass Craft, OCR19R, angle stops 1/2-inch nominal compression, chrome finish, 125 psi operating pressure, brass body and stem.

1.2 220513 – COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

- A. All electrical work should be done in accordance with Division 16 requirements.
- B. All Electric motors shall be induction-type 1750 RPM, unless approved otherwise.
- C. Motors 1/2 horsepower and larger shall be three-phase.

- D. All motors should be high efficiency-type.
- E. All motor starters should be provided as part of the work described in Division 16-Electrical, unless provided as an integral part of the manufacturer's package equipment.
- F. Multiple belts should be factory-matched sets.
- G. Require Contractor to provide a complete set of replacement belts to the Owner at project completion.

1.3 220519 – METERS AND GAGES FOR PLUMBING PIPING

- A. Manufacturers:
 - 1. Inline turbine flow meter:
 - a. EMCO
 - b. ISTECH
 - c. Venture Measurement
 - d. Thermo Measurement
 - 2. Insertion turbine flow meter
 - a. ONICON, Inc.
 - b. Data Industrial
 - c. Thermo Measurement
 - 3. Vortex shedding flow meter
 - a. Bailey Fischer & Porter
 - b. EMCO
 - c. Venture Measurement
 - 4. Turbine flowmeter
 - a. Badger Meter
 - b. Bailey Fischer & Porter
 - c. AMCO
 - 5. Venturi Flow Meter
 - a. Armstrong Pumps
 - b. Badger Meter
 - c. Bailey Fischer & Porter
 - d. Flow Design
 - e. Gerand Engineering
 - f. Hyspan Prevision Products
- B. All utilities should be metered; including electricity, steam, condensate, chilled water, and domestic water.
- C. Water meters should be provided and installed by the Contractor for each new facility and as directed by Creighton personnel. The domestic water entrance shall include a valved tee for the future addition of a separately metered line to serve a lawn irrigation system.

- D. Install meters in straight lengths of pipe the same size at the meter connection. Provide 20 pipe diameters upstream and 10 pipe diameters downstream. Provide isolation valves before and after meters with a manual valve bypass. Valves shall be outside the straight pipe limits.

1.4 220523 – GENERAL-DUTY VALVES FOR PLUMBING PIPING

- A. Acceptable ball valve manufacturers:
 - 1. Apollo
 - 2. Watts
 - 3. Nibco
- B. Acceptable butterfly valve manufacturers:
 - 1. Dezurik
 - 2. Nibco
- C. Note: All butterfly valves 6 inches and over shall be Dezurik.
- D. Valves 4 inches and larger should be gear-operated with a chain when 8 feet or more above the floor.
- E. Valves shall be installed from horizontal to vertical upright.
- F. Isolation valves shall be provided each branch or riser location.
- G. Isolation valves shall be provided the supply and return connections to each piece of equipment.
- H. All ball valves shall have a minimum of 600 W.O.G.
- I. Isolation valves should be installed at every reasonable branch to minimize shutdown areas and at island, reagent, and fume hood sinks.

1.5 220529 – HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

- A. Require piping passing through masonry or concrete floors and walls be installed with Schedule 40 pipe sleeves, sized to allow insulated pipe to pass through and with sufficient annular space to allow fire sealant.
- B. Require pipe hangers for insulated pipe with vapor barrier jackets be installed around the outside of the insulation and a metal insulation support shield be provided to prevent crushing of the insulation.

1.6 220553 – IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

- A. Identification: Manufacturer's standard pre-printed nomenclature which best describes piping system in each instance, as selected by Engineer in cases of variance with names as shown or specified:

Pipe Commodity	Legend	Lettering Colors	Background Colors
Natural gas	"Natural Gas"	Black	Yellow
Propane gas	"Propane Gas"	Black	Yellow
Nitrogen gas	"Nitrogen"	Black	White/Green
Compressed air	"Compressed Air"	White	Blue
City (potable water, cold water)	"Domestic Cold Water"	White	Green
Potable hot water	"Domestic Hot Water"	White	Green
Recirculating potable water	"Recirculating Potable Water"	White	Green
Deionized water	"Deionized Water"	White	Green
Non-potable water	"Non-Potable Water"	Black	Yellow
Vacuum	"Vacuum"	Black	Yellow
Oxygen	"Oxygen"	White	Green
Pure water	"Pure Water"	White	Blue
Sewer	"Sanitary Sewer"	White	Green
Storm	"Storm"	White	Green
Vent	"Vent"	White	Green

B. Valve Tags:

1. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units, plumbing and fixture supply stops; shutoff valves, faucets, convenience and lawn watering hose connections and similar roughing-in connections of end use fixtures and units. List tagged valves in a valve schedule.
2. Valve Tags: 1-1/2-inch round with stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers with numbering scheme approved by Owner. Provide 5/32-inch hole for fasteners.
 - a. Material: 3/32-inch-thick laminated plastic.
 - b. Valve Tag Fasteners: Brass wire-link or beaded chain; or S-hook.
 - c. Valve Tag Color:
 - 1) Domestic Water: Green
 - 2) Gas: Yellow
 - d. Letter Color:
 - 1) Domestic Water: White
 - 2) Gas: White

- A. Mineral Fiber: Maximum k value of 0.25 at 100° F; non-combustible; one-piece snap-on; temperature range 0° F to +500° F; nominal density of 4 lbs per cubic foot with ASJ, all service jacket.
- B. Unicellular Foam: Flexible, plastic; maximum k value of 0.28 at 75° F; temperature range of -40° to +220° F; minimum density of 6 lbs. per cubic foot. Apply a UV resistant paint for piping with foam insulation installed outdoors.
- C. Application of Pipe Insulation:
 - 1. Insulation shall be installed only by persons skilled at such work. The appearance of the completed insulation is a significant factor in determining the acceptability of the work.
- D. Pipe Insulation Schedule:
 - 1. Cold domestic water – glass fiber, 1/2-inch thick.
 - 2. Hot domestic water and circulating – glass fiber, 1/2-inch on run-outs less than 12 feet, 1-inch thick on pipes 1/2-inch to 2-inch; 1-1/2-inch thick on pipes 2-1/2-inch and larger.
 - 3. Chilled domestic drinking water – glass fiber, 1-inch thick.
 - 4. Hot and cold domestic water direct buried below floor slab – unicellular foam; 3/4-inch thick.
 - 5. Storm drainage and roof drain body – glass fiber; 1/2-inch thick.
 - 6. Plumbing vents, 2-foot section below roof – glass fiber, 1/2-inch thick.
 - 7. Provide a field-applied jacket over the normal insulation and jacket for all piping in tunnels, exposed to the weather, or in congested areas where damage may occur due to traffic. Jackets may be PVC, aluminum, or stainless steel depending upon the potential for damage and as requested by the Owner.

1.8 221113 – FACILITY WATER DISTRIBUTION PIPING

- A. Pipe Schedule:

SERVICE	MATERIAL
Domestic water, buried	Type K copper
Fuel oil piping, buried	Fiberglass reinforced plastic
Fuel oil piping, aboveground	Welded Schedule 40 black steel OR screwed Schedule 40 black steel

- B. Require all pumps to have 4-inch thick, reinforced concrete pad, with chamfered edges 4 inches larger than the pump on all sides.
- C. Require piping to be supported so the weight of the piping does not rest on the pump.

- D. Require valves the same size as the piping be connected to the pump.
- E. Require isolation valves and strainer on the inlet or suction side of the pump.
- F. Require non-slam check, balance, and isolation valves on the pump discharge. Triple-duty valves may be used.
- G. Require a pressure gauge across the suction and discharge of each pump.
- H. Require that pumps be installed with a minimum of five (5) pipe diameters of straight pipe on the suction side of the pump, or use a suction diffuser if unable to meet these criteria.
- I. Require pump vibration isolators on the suction and discharge of each pump. Isolators shall be installed between the casings and valves, on discharge and upstream of suction diffuser, or inlet pipe on suction.
- J. Centrifugal pumps shall be separately coupled, base-mounted. End-suction pumps shall generally be used for flows of 500 gpm and smaller, while horizontal split-case double suction pumps used for larger flows.
- K. Closed-coupled, inline pumps shall be used for low flow booster applications.

1.9 221116 – DOMESTIC WATER PIPING

- A. Pipe Schedule:

SERVICE	MATERIAL
Domestic water, abovegrade	Type L, hard drawn

1.10 221119 – DOMESTIC WATER PIPING SPECIALTIES

- A. Acceptable reduced pressure backflow preventor manufacturer:
 - 1. Wilkins (preferred)
 - 2. Watts
 - 3. Conbraco
- B. Require that domestic water test valve discharge be routed to the nearest floor drain or terminate through the exterior wall.

1.11 221123 – DOMESTIC WATER PUMPS

- A. Acceptable domestic hot water circulation pump manufacturers:
 - 1. Taco
 - 2. Bell and Gossett

- B. Require all pumps to have 4-inch thick, reinforced concrete pad, with chamfered edges 4 inches larger than the pump on all sides.
- C. Require piping to be supported so the weight of the piping does not rest on the pump.
- D. Require valves the same size as the piping be connected to the pump.
- E. Require isolation valves and strainer on the inlet or suction side of the pump.
- F. Require non-slam check, balance, and isolation valves on the pump discharge. Triple-duty valves may be used.
- G. Require a pressure gauge across the suction and discharge of each pump.
- H. Require that pumps be installed with a minimum of five (5) pipe diameters of straight pipe on the suction side of the pump, or use a suction diffuser if unable to meet these criteria.
- I. Require pump vibration isolators on the suction and discharge of each pump. Isolators shall be installed between the casings and valves, on discharge and upstream of suction diffuser, or inlet pipe on suction.
- J. Centrifugal pumps shall be separately coupled, base-mounted. End-suction pumps shall generally be used for flows of 500 gpm and smaller, while horizontal split-case double suction pumps used for larger flows.
- K. Closed-coupled, inline pumps shall be used for low flow booster applications.

1.12 221316 – SANITARY WASTE AND VENT PIPING

- A. Pipe Schedule:

SERVICE	MATERIAL
Equipment drains and overflows	Schedule 40 galvanized steel OR Type L copper, hard drawn
Waste and vent piping above grade	Cast iron, no hub
Waste and vent piping below grade	Cast iron

1.13 221319 – SANITARY WASTE PIPING SPECIALTIES

- A. Floor Drain Manufacturers:
 - 1. Smith
 - 2. Zurn
 - 3. Wade

- B. Require floor drains in all Toilet Rooms and Janitor Rooms where mop sink is not floor-mounted and in all mechanical rooms.
- C. Ensure Architectural drawings require the floor be sloped to drain.
- D. Allow no floor drain lines less than 2 inches in diameter under the floor in toilet rooms and 3-inch diameter for mechanical rooms. Provide trap primers where needed to prevent moisture in trap from evaporating.

1.14 221329 – SANITARY SEWERAGE PUMPS

- A. If sewage ejector pumps are required, they should be installed as a duplex system in such a manner that either pump may be removed for maintenance without disturbing the other. A high water alarm should be part of the system. Provide column-type pump with the motor out of the sewage liquid.

1.15 221413 – FACILITY STORM DRAINAGE PIPING

- A. Pipe Schedule:

SERVICE	MATERIAL
Storm piping above grade	Cast iron, no hub
Storm piping below grade	Cast iron

1.16 221423 – STORM DRAINAGE PIPING SPECIALTIES

- A. Manufacturers:

- 1. Smith
- 2. Zurn
- 3. Wade

1.17 221429 – SUMP PUMPS

- A. Submersible pumps are to be used in gray water applications only.

1.18 223200 – WATER SOFTENERS

- A. Description: Factory-assembled, pressure-type water softener.

- 1. Comply with NSF 61, “Drinking Water System Components – Health Effects.”
- 2. Configuration: Twin unit with two mineral tanks and one brine tank factory-mounted on skids.

- B. Manufacturers:

- 1. Culligan International Company.

2. Marlo, Inc.

1.19 223300 – ELECTRIC DOMESTIC WATER HEATERS

- A. Acceptable manufacturers for point of use water and kitchen booster heaters:

1. State
2. Hobart

- B. Acceptable manufacturers for residential water heaters:

1. State
2. Ruud

- C. Acceptable commercial water heaters:

1. Ace
2. Thermal Flow
3. PVI

1.20 223400 – FUEL-FIRED DOMESTIC WATER HEATERS

- A. Acceptable manufacturers for residential water heaters:

1. State
2. Ruud

- B. Acceptable commercial water heaters:

1. Ace
2. Thermal Flow
3. PVI

1.21 223500 – DOMESTIC WATER HEATER EXCHANGERS

- A. Acceptable commercial water heaters:

1. Ace
2. Thermal Flow
3. PVI

1.22 224000 – PLUMBING FIXTURES

- A. Manufacturers:

1. Vitreous China Fixtures:
 - a. American Standard (Preferred)
 - b. Kohler
2. Stainless Steel Sinks:

- a. Elkay
- b. Just
- c. Kohler
- d. Moen
3. Toilet Seats:
 - a. Bemis (preferred)
 - b. Church
 - c. Kohler
 - d. Olsonite
4. Mop Sink and Shower Receptors:
 - a. Crane/Fiat
 - b. Stem-Williams
5. Utility Sinks:
 - a. Crane/Fiat
 - b. Florestone
 - c. Mustee
6. Flush Valve Manufacturers:
 - a. Sloan Royal:
 - 1) Model 111 for water closets
 - 2) Model 186 for urinals
 - 3) EBV 89 side mount, battery-powered operator for retrofit applications
 - 4) Optima SMO exposed battery-powered operator
7. Shower Mixing Valves:
 - a. Kohler
 - b. Powers
 - c. Symmons
 - d. Moen
 - e. Delta
8. Supply Fittings and Faucets:
 - a. Kohler
 - b. American Standard
 - c. Moen
 - d. Delta
9. Vitreous China Fixtures:
 - a. American Standard (preferred)
 - b. Kohler
10. Showerhead:
 - a. Oxygenics, Model 630

- B. All plumbing fixtures should be wall-hung with floor supported carriers.
- C. The fixtures and valves should be of the water saver type.
- D. All urinals shall be Vitreous China. Urinals shall be wall-hung, siphon-jet type with integral flushing rims, self-concealed over-flow, integral trap.

- E. Urinals shall be Kohler, Freshman, K4989-T, flushing rim, 3/4-inch top spud, 1.0 gpf.
- F. Water closets shall be one of the following, as specified by the user:
 - 1. Water closets shall be Kohler, Kingston, K4330, elongated bowl, wall-hung, 1-1/2-inch top spud, 1.6 gpf for public use with open front seats, no cover.
 - 2. Water closets shall be Kohler, Wellworth K3422, elongated bowl, two-piece, 1.6 gpf, 2-inch passageway, for private use, open front seat with cover.
- G. Sinks and lavatories shall be one of the following, as determined by the user:
 - 1. Counter top lavatories shall be Kohler, Pennington, K2196, self-rimming, 4-inch centers, front overflow.
 - 2. Wall hung lavatories shall be Kohler, Greenwich, K2032, 20x18, 4-inch centers, front overflow.
 - 3. Stainless steel single bowl countertop sink, size to be selected, shall be Elkay deep bowl, 18 gallon type 304 SS, self-rimming, with coved corners, underside fully undercoated, 3-1/2-inch drain opening, 1-1/2-inch faucet holes on 4-inch centers.
 - 4. Lavatory faucets shall be Moen, Villeta, L4701 or Delta, 500/501, single handle deck mount, 4-inch counter set, 4-1/2-inch spout, 2.2 gpm. Residence rooms shall use a pop-up drain while other locations shall use a grid open drain.
 - 5. Sink faucets shall be Delta Waterfall Series, swing high spout, with separate hot and cold water cartridges, handles selected for specific use.
- H. Every restroom in the new facility should have handicapped fixtures.
- I. Water closets, urinals, and lavatories for new or remodeled toilets are to be installed with electronic faucets and flushing systems.
- J. Fixtures designated for use by the disabled should be mounted at the height specified in the design requirements for disabled persons. All other fixtures should be mounted at the standard heights recommended for the general population.

1.23 224500 – EMERGENCY PLUMBING FIXTURES

- A. Acceptable manufacturers of safety equipment include:
 - 1. Bradley
 - 2. Guardian
- B. All safety fixtures shall be Bradley or Guardian. Safety showers shall delivery 20 gpm for 15 minutes while face wash unit shall deliver 3 gpm for 15 minutes and

an eye wash shall delivery 0.4 gpm for 15 minutes. Handheld eye wash (drench hose) units may supplement but may not be used in place of dedicated eye wash equipment.

- C. All emergency showers and eyewashes shall deliver tepid (70° F to 90°F) water per ANSI Standard Z358.1. Provide a mixing valve.
 - 1. Hand held eyewashes shall be Bradley Model S19-460.
 - 2. Combination shower/eyewashes shall be Bradley Model S19-310.

1.24 224700 – DRINKING FOUNTAINS AND WATER COOLERS

- A. Electric Water Coolers and Drinking Fountains Acceptable Manufacturers:
 - 1. Halsey Taylor
 - 2. Elkay
- B. Require handicapped water coolers with push bars on three (3) sides.