SECTION 15400

PLUMBING

PART 1 - GENERAL

1.1 Related Documents

A. All sections of Division 1.

B. Examine all drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section. Work shall be coordinated with other trades prior to installation to prevent interference and relocations.

1.2 References

A. In all instances where an item is referred to in the singular number in these Specifications or on the Drawings, it shall be understood that the references shall apply to as many such items as are necessary to complete the work.

B. Before starting work, visit the site and examine the conditions under which the work is to be performed. Report in writing to the Engineer any conditions which might adversely affect the work. Do not proceed with the work until the defects have been corrected and conditions are satisfactory. Commencement of work shall be construed as complete acceptance of preparatory work by others.

C. Perform all work and provide all material and equipment as shown on the Drawings or as specified under this Section. All work shall be completely coordinated with the work of all trades and shall provide for a complete and fully functional installation in all respects.

D. Although such work is not specifically shown or specified, provide as part of this work, all supplementary or miscellaneous items, appurtenances, devices or materials incidental to or necessary for a sound, secure and complete installation.

1.3 Summary

A. The work shall include, but not be limited to, the following:

1. Domestic Hot and Cold Water Piping.

2. Sanitary Waste and Vent Piping.

3. Plumbing Fixtures.

1.4 Submittals

A. After award of contract as soon is reasonably possible, the Contractor shall submit: five (5) copies of submittals for equipment and materials listed below. Submittals shall include

catalogue cuts and descriptive data-showing conformance with this Specification for:

1. Water Closets
2. Urinals
3. Lavatories
4. Kitchen Sink
5. Service Sink
6. Drinking Fountains
7. Shower Assemblies
8. Faucets
9. Roof and floor drains
10. Water Heater
11. Clean Outs
12. Interceptors
13. Backflow preventers
14. Water hammer arrestors
15. Thermostatic mixing valves
16. Hose bibs/hydrants.
17. Insulation

PART 2 - PRODUCTS

2.1 Water piping, buried beyond building

A. Ductile Iron Pipe: AWWA C151 with ductile iron fittings rubber gasket joints and 3/4 inch diameter rods.

B. Copper Tubing: ASTM B42, Type K, annealed with wrought copper fittings and compression fit joints. If used under building, no fittings shall be placed under the building.

C. PVC Pipe: ASTM D2241.

2.2 Water piping, above grade

A. Copper Tubing: ASTM B88, Type-L hard drawn copper tubing with wrought copper or bronze fittings, 95-5 or "Silvabrite" solder.

B. Galvanized Steel Pipe (Cold Water Only Sizes 4 Inch and Larger): ASTM A53 Schedule 40 with 150 lb. malleable iron fittings or grooved mechanical couplings.

C. CPVC Pipe: ASTM D2846 with CPVC fittings and solvent weld joints.

2.3 Storm, Sanitary Waste and Vent Piping

A. Hubless cast iron pipe and fittings, service weight or heavier, using neoprene sealing sleeves and stainless steel bands or cast iron connectors with neoprene inserts meeting specifications of ASTM A74 or CISPI 301.

B. Below grade, hub type cast iron, ASTM A74, service weight or heavier. Hub shall be neoprene gasket type in which gasket is locked into a modified hub and spigot joint. Tyler "Tystall" or approved equal.

C. Polyvinyl chloride (PVC), ASTM D3034, Type PSM, SDR 35 with solvent welded joints complying with ASTM D2855 using ASTM D2564 cement, or elastomeric joints complying with ASTM D3212 using ASTM F477 seals.

D. Concrete Pipe: ASTM C14, with rubber gaskets.

E. Above ground only, Copper, ASTM B306, Type DWV with wrought copper or bronze fittings may be used for vent lines.

2.4 Natural gas piping, buried

A. Steel Pipe: ASTM A53, Schedule 40 black with polyethylene jacket and welded joints.

B. Polyethylene Pipe: ASTM D2513, SDR 11.5, with socket type fittings and fusion welded joints.

2.5 Natural gas piping, above grade

A. Steel Pipe: ASTM A53, Schedule 40 black, with malleable iron or forged steel fittings, screwed or welded.

B. Copper Tubing: ASTM B88 (ASTM B88M), Type [K,] [L,] annealed with wrought copper fittings and compression joints.

2.6 Fuel oil piping, buried

A. Steel Pipe: ASTM A53, Schedule 40 black, polyethylene jacket and welded joints.

2.7 Fuel oil piping, above ground

A. Copper Tubing: ASTM B88 (ASTM B88M), Type [M,] [L,] hard drawn with cast brass or wrought copper fittings and Grade 95TA solder joints.

B. Steel Pipe: ASTM A53, Schedule 40 black with malleable iron or forged steel fittings and screwed or welded joints.

2.8 Flanges, Unions, and Couplings

A. Pipe Size 3 Inches (80 mm) and Under: Malleable iron unions for threaded ferrous piping; bronze unions for soldered copper pipe joints.

B. Pipe Size Over 1 Inch (25 mm): Forged steel flanges for ferrous piping; bronze flanges for copper piping; neoprene gaskets.

C. Grooved and Shouldered Pipe End Couplings: Malleable iron housing; "C" shape composition sealing gasket; steel bolts, nuts, and washers.

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.9 Valves *Pressures in WOG*

A. All valves shall be manufactured by one manufacturer. Valves 3/4" and smaller shall be rated for a working steam pressure of 150 lbs. Valves 1" and larger shall be rated for a working steam pressure of 125 lbs.

B. All valves shall be Jenkins Brothers or approved equal, threaded, conforming to the following table.

Valve	Jenkins Bros.-Fig.
Gate	370
Globe	106-A
Ball	32-AS
Check	92-A

C. All ball valves shall have stainless steel balls, and teflon seats.

2.10 Gas cocks

A. Up to 2 Inches (50 mm):
1. Manufacturers:
   a) [_____] Model [_____].
   b) [_____] Model [_____].
   c) [_____] Model [_____].
2. Bronze body, bronze tapered plug. non-lubricated, teflon packing, threaded ends.

B. Over 2-1/2 Inches (65 mm):
1. Manufacturers:
   a) [_____] Model [_____].
   b) [_____] Model [_____].
   c) [_____] Model [_____].
2. Cast iron body and plug, pressure lubricated, teflon packing, flanged or grooved ends.

2.11 Butterfly valves

A. Manufacturers:
1. [_____] Model [_____].
2. [_____] Model [_____].
3. [_____] Model [_____].

B. Over 1-1/2 inches (40 mm): Cast or ductile iron body, aluminum bronze disc, resilient

replaceable seat, extended neck, [10 position lever handle] [infinite position lever handle with memory stop]; wafer, lug, or grooved ends.

2.12 Swing check valves

A. Up to 3 Inches (80 mm):
   1. Manufacturers:
      a) [_____] Model [_____].
      b) [_____] Model [_____].
      c) [_____] Model [_____].
   2. Bronze body and cap, bronze swing disc, solder or threaded ends.

B. Over 2 Inches (50 mm):
   1. Manufacturers:
      a) [_____] Model [_____].
      b) [_____] Model [_____].
      c) [_____] Model [_____].
   2. Iron body, bronze swing disc, renewable disc and seat, flanged or grooved ends.

2.13 Spring loaded check valves

A. Manufacturers:
   1. [_____] Model [_____].
   2. [_____] Model [_____].
   3. [_____] Model [_____].

B. Iron body, bronze trim, spring loaded, bronze disc, rubber seals, wafer ends.

2.14 Water pressure reducing valves

A. Up to 2 Inches (50 mm):
   1. Manufacturers:
      a) [_____] Model [_____].
      b) [_____] Model [_____].
      c) [_____] Model [_____].
   2. Bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, [threaded and single union] [double union] ends.

B. Over 2 Inches (50 mm):
   1. Manufacturers:
      a) [_____] Model [_____].
      b) [_____] Model [_____].
      c) [_____] Model [_____].
   2. Cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.15 Relief valves

A. Manufacturers:

1. [_____] Model [_____].
2. [_____] Model [_____].
3. [_____] Model [_____].

B. Bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

2.16 Strainers

A. Size 2 inch (50 mm) and Under:
1. Manufacturers:
a) [_____] Model [_____].
b) [_____] Model [_____].
c) [_____] Model [_____].
2. Screwed brass or iron body, Y pattern with stainless steel perforated screen.

B. Size 1-1/2 inch (40 mm) to 4 inch (100 mm):
1. Manufacturers:
a) [_____] Model [_____].
b) [_____] Model [_____].
c) [_____] Model [_____].
2. Flanged iron body, Y pattern with stainless steel perforated screen.

C. Size 5 inch (125 mm) and Larger:
1. Manufacturers:
a) [_____] Model [_____].
b) [_____] Model [_____].
c) [_____] Model [_____].
2. Flanged iron body, basket pattern with stainless steel perforated screen.

2.17 Roof drains

****
Lacquered finish is standard. Dome strainer options are listed from the most common and least costly. Most options reflect an adaptation to varying roof types.
****

A. Roof Drains:
1. Manufacturers:
a) [_____] Model [_____].
b) [_____] Model [_____].
c) [_____] Model [_____].
2. Lacquered cast iron body with sump:
a) Strainer: Removable [polyethylene] [metal] dome.
b) Accessories: Coordinate with roofing type:
1. Membrane flange and membrane clamp with integral gravel stop.
2. Adjustable under deck clamp.
3. Roof sump receiver.

4. Waterproofing flange.
5. Controlled flow weir.
6. Levelling frame.
7. Adjustable extension sleeve for roof insulation.
8. Perforated or slotted ballast guard extension for inverted roof.
9. Perforated stainless steel ballast guard extension.

B. Parapet Drains:
1. Manufacturers:
a) [_____] Model [_____].
b) [_____] Model [_____].
c) [_____] Model [_____].
2. Lacquered cast iron body with flashing clamp collar and nickel bronze [sloping] [flush] grate.

C. Roof Overflow Drains:
1. Manufacturers:
a) [_____] Model [_____].
b) [_____] Model [_____].
c) [_____] Model [_____].
2. Lacquered cast iron body and clamp collar [and bottom clamp ring]; pipe extended above flood elevation.

2.18 Floor drains (also spec'd in fixture schedule)

A. Manufacturers:
1. [_____] Model [_____].
2. [_____] Model [_____].
3. [_____] Model [_____].

B. Floor Drain (FD-1):
1. Manufacturers:
a) [_____] Model [_____].
b) [_____] Model [_____].
c) [_____] Model [_____].
2. Lacquered cast iron two piece body with double drainage flange, weep holes, [reversible clamping collar,] and round, adjustable nickel-bronze strainer.

C. Floor Drain (FD-2):
1. Manufacturers:
a) [_____] Model [_____].
b) [_____] Model [_____].
c) [_____] Model [_____].
2. Lacquered cast iron two piece body with double drainage flange, weep holes, [reversible clamping collar,] with removable perforated sediment bucket and adjustable [round] [square] strainer.

D. Floor Drain (FD-3):

1. Manufacturers:
   a) [_____] Model [_____].
   b) [_____] Model [_____].
   c) [_____] Model [_____].
2. Lacquered cast iron two piece body with double drainage flange, weep holes, [reversible clamping collar,] and round, adjustable nickel-bronze strainer with polished bronze funnel [or anti-splash rim] type strainer.

2.19 Sumps

****
Cast-in-place concrete sumps are not included in this Section. They should be specified in Division 2.
****

A. [Precast concrete] [Epoxy coated fabricated steel] [Glass fiber reinforced] with required openings and drainage fittings, 3/8 inch (9 mm) thick checkered steel plate cover with gasket seal frame and anchor bolts.

2.20 Grease interceptors

A. Manufacturers:
   1. [_____] Model [_____].
   2. [_____] Model [_____].
   3. [_____] Model [_____].

B. Construction: Epoxy coated fabricated steel for [_____] installation, with multi-weir baffle assembly, integral deep seal trap, removable integral flow control, and epoxy coated steel cover with gasket, securing handle, and enzyme injection port.

C. Unit Rating: [_____] gpm ([_____] L/s) flow and [_____] lbs ([_____] kg) grease capacity.

2.21 Oil interceptors

A. Manufacturers:
   1. [_____] Model [_____].
   2. [_____] Model [_____].
   3. [_____] Model [_____].

B. Construction: Epoxy coated fabricated steel for [_____] installation, with multi-weir bucket assembly, integral deep seal trap, adjustable draw-off assembly, and epoxy coated steel cover with gasket and securing handle;

C. Unit Rating: [_____] gpm ([_____] L/s) flow and [_____] lbs ([_____] kg) oil capacity.

2.22 Sediment interceptors

A. Manufacturers:
   1. [_____] Model [_____].

2. [_____] Model [_____].
3. [_____] Model [_____].

****
Cast iron interceptors are common in the smaller manufactured sizes. Use stainless steel for corrosive fluids.
****

B. [Epoxy coated cast iron] [Stainless steel] body and secured cover with removable stainless steel sediment bucket.

2.23 Cleanouts

A. Finished Floor:
1. Manufacturers:
a) [_____] Model [_____].
b) [_____] Model [_____].
c) [_____] Model [_____].
2. Lacquered cast iron body with anchor flange, reversible clamping collar, and adjustable nickel-bronze round scored cover in service areas and [round] [square] depressed cover to accept floor finish in finished floor areas.

B. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

2.24 Cleanouts

Provide cleanouts as indicated in drawings, and at other points where required by code. Cleanouts shall be same size as pipe up to and including 4", and 4" for larger pipes.

A. Floor cleanouts shall be set flush with floor, Zurn Model Z1400-2 or approved equal.

B. Wall cleanouts shall be Zurn Model Z-1440-1 or approved equal.

2.25 Backflow preventers

A. Reduced Pressure Backflow Preventers:
1. Manufacturers:
a) [_____] Model [_____].
b) [_____] Model [_____].
c) [_____] Model [_____].
2. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

B. Double Check Valve Assemblies:

1. Manufacturers:
   a) [_____] Model [_____].
   b) [_____] Model [_____].
   c) [_____] Model [_____].
2. ASSE 1012; Bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

2.26 Water hammer arrestors

A. Manufacturers:
   1. [_____] Model [_____].
   2. [_____] Model [_____].
   3. [_____] Model [_____].

B. [Stainless steel construction, bellows] [Copper construction, piston] type To PDI WH-201, precharged suitable for operation in temperature range -100 to 300 degrees F (-73 to 149 degrees C) and maximum 250 psi (1700 kPa) working pressure.

2.27 Thermostatic mixing valves

A. Capacity [_____] gpm ([_____] L/s) at 45 psi (310 kPa) differential, with check valve, volume control shut-off valve on outlet, stem type thermometer on outlet, strainer stop check on inlet, mounted in lockable cabinet of 16 gage (1.5 mm) prime coated steel.

2.28 Hose bibs/hydrants

A. Interior Hose Bibs:
   1. Manufacturers:
      a) [_____] Model [_____].
      b) [_____] Model [_____].
      c) [_____] Model [_____].
   2. Bronze or brass, replaceable hexagonal disc, hose thread spout, chrome plated with vacuum breaker.

B. Wall Hydrant:
   1. Manufacturers:
      a) [_____] Model [_____].
      b) [_____] Model [_____].
      c) [_____] Model [_____].
   2. Non-freeze, self-draining type with [chrome plated] [polished bronze] [wall plate] [lockable recessed box] hose thread spout, removable key, and vacuum breaker.

2.29 Fixtures

P- Water closet, floor mount, tank type (handicap): American Standard, elongated, water saver, "Cadet" #2109.500 (#2108.500) white vitreous china, siphon jet action, floor mounted, close coupled with aquaguard liner (18" high). Seat to be elongated, open front with bolt caps. Provide supply stop.

Rough-In: 1/2"CW, 4"W, 2"V.

P- Water closet, floor mount, flush valve, handicap: American Standard, elongated, water saver "Cadet" #9468.018 white vitreous china, siphon jet action, floor mounted, flush valve, 18" high. Seat shall be elongated, open front, with bolt caps. Provide Sloan Royal 110-3 flush valve.
Rough-In: 1"CW, 4"W, 2"V.

P- Water closet, floor mount, flush valve: American Standard, water saver, "Madera" #2221.018, white vitreous china, siphon jet action, floor mounted, flush valve. Seat to be elongated, open front, with bolt caps. Provide Sloan Royal 110-3 flush valve.
Rough-In: 1"CW, 4"W, 2"V.

P- Water closet, wall mount, tank type: American Standard "Glenwall" #2093.500, white vitreous china, siphon jet action, wall mounted, close coupled, with aquaguard line. Seat to be elongated, open front with bolt caps. Provide supply stop and carrier.
Rough-In: 1/2"CW, 4"W, 2"V.

P- Water closet, wall mount, flush valve: [American Standard], (Kohler) elongated, [water saver, "Afwall" #2477.016] (water-guard, "Kingston", #K4430-ET), white vitreous china, siphon jet action, wall mounted, flush valve. Seat to be elongated, open front, with bolt caps. Provide carrier and Sloan Royal 110-3 flush valve.
Rough-In: 1"CW, 4"W, 2"V.

P- Water closet, wall mount, electronic flush valve: Kohler, elongated bowl, water-guard, "Kingston-lite", #K-4329, white vitreous china, siphon jet action, wall mounted, flush valve. Seat to be elongated, open front, check hinge, with microbial treatment, Kohler #K-4670-CA. [[Provide Jay R. Smith "Linebacker" series carrier with M51 anchor foot, or Zurn Z-120X series with anchor foot; and Sloan Royal 152-1.5-ES-S electronic flush valve.]]
Rough-In: 1-1/2"CW, 4"W, 2"V.

P- Urinal, wall hung: [American Standard "Washbrook" #6501.010] (Kohler, water-guard, "Darfield" #K-5024-T) , 3/4" top spud, white vitreous china, wash out urinal, with Sloan Royal 186 flush valve and compatible carrier, and chrome P-trap.
Rough-In: 3/4"CW, 2"W, 1-1/4"V.

P- Lavatory, wall hung: [American Standard "Regalyn" #4869.012] (Kohler "Hudson", K-2861), 19" x 17", white enameled cast iron, front overflow, 4" center faucet Holes , and carrier. Fittings shall be chrome single lever control with pop-up drain and P-trap, American Standard "Reliant" model *2000-101, Kohler "Coralais" Model K-15582 or Delta Series 500 model 520.
Rough-In: 1/2"HW, 1/2"CW, 1-1/4"W, 1-1/4"V.

P- Lavatory counter top: American Standard "Horizon" model #3301.025, white enameled cast iron, with 4" centers. Fittings shall be chrome, single lever control with pop-up drain and P-trap, American Standard "Reliant" model *2000.101 or Delta Series 500 model 520.
Rough-In: 1/2"HW, 1/2"CW, 1-1/4"W, 1-1/4"V.

P- Lavatory counter top, electronic faucets: [American Standard "Horizon" model #3301.025,

white enameled cast iron], with 4" centers. Faucet shall be polished brass, electronic sensor operated faucet, offset grid strainer and P-trap. Kohler K-13662, with K-13667 power supply. Provide check valves for hot and cold supplies.
Rough-In: 1/2"HW, 1/2"CW, 1-1/2"W, 1-1/2"V.

P- Service sink: American Standard "Lakewell" service sink #7692.049, 22" x 18", white enameled cast iron. Provide with wall hangers, American Standard "Heritage" faucet #8340.242 and American Standard 3" P-trap #7798.176.
Rough-In: 3/4"HW, 3/4"W, 3"W, 1-1/2"V.

P- Service Sink, floor mounted: (American Standard "Florwell" service sink #7740.020) [Kohler "Whitby" service sink, K-6710, white enameled cast iron. (American Standard "Heritage" faucet #8340.242) [Kohler "Knoxford" faucet #K@89071. Provide with P-trap.
Rough-In: 3/4"HW, 3/4"CW, 3"W, 1-1/2"V.

2.30 SERVICE SINKS

A. Bowl:
1. Manufacturers:
a) [_____] Model [_____].
b) [_____] Model [_____].
c) [_____] Model [_____].
2. 22 x 18 x 12 inch (560 x 460 x 300 mm) deep, porcelain enamelled (inside only) cast iron roll-rim sink, with 12 inch (300 mm) high back, concealed hanger, chrome plated strainer, cast iron P-trap with adjustable floor flange.

****** [OR] ******

A. Bowl:
1. Manufacturers:
a. [_____] Model [_____].
b. [_____] Model [_____].
c. [_____] Model [_____].
2. [36] [24] x 24 x 10 inch ([900] [600] x 600 x 250 mm) high [white] [_____] molded stone, floor mounted, with one inch (25 mm) wide shoulders, stainless steel strainer.

B. Trim:
1. Manufacturers:
a. [_____] Model [_____].
b. [_____] Model [_____].
c. [_____] Model [_____].
2. Exposed wall type supply with [cross] [lever] handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges; 5 feet (1.5 m) of 1/2 inch (13 mm) diameter plain end reinforced [plastic] [rubber] hose, hose clamp, mop hanger.

P- Sink, Kitchen: Elkay, single compartment, 18 gauge, stainless steel with 4 hole faucet deck

model LR-2222. Fittings shall be chrome single lever control with separate spray, stainless dou strainer, cup strainers, and P-trap, American Standard "Reliant" Model *2000.641 or Delta Series 400 Model 400.
Rough-In: 1/2"HW, 1/2"CW, 2"W, 1-1/2"V.

P- Drinking fountain, handicap: Halsey Taylor Barrier Free Fountain #6800WC, satin finished stainless steel drinking fountain. Provide with P-trap.
Rough-In: 3/8"CW, 1-1/4"W, 1-1/4"V.

P- Drinking fountain bubbler: Halsey Taylor bracket fountain #6600 satin finished stainless steel receptor, chrome plated brass bubbler, self closing valve. Provide with P-trap.
Rough-In: 3/8"CW, 1-1/4"W, 1-1/4"V.

P- Drinking fountain, water cooler, electric.
Rough-In: 1/2"CW, 1-1/4"W, 1-1/4"V.

2.45 ELECTRIC WATER COOLERS

A. Fountain:
1. Manufacturers:
a. [_____] Model [_____].
b. [_____] Model [_____].
c. [_____] Model [_____].
2. ARI 1010; [surface] [semi-recessed] [recessed] [handicapped] mounted electric water cooler with stainless steel top, [vinyl on steel] [stainless steel] [_____] body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, mounting bracket, refrigerated with integral air cooled condenser.

B. Capacity: [_____] gpm ([_____] L/s) of 50 degree F (10 degree C) water with inlet at 80 degree F (27 degree C) and room temperature of 90 degree F (32 degree C), [_____] hp ([_____] kW) compressor.

P- Shower assembly: Stall shall be a ____ piece fiberglass enclosure ____"x____". _____ model #_____, color shall be _____. Fittings shall be chrome, single lever control, pressure balanced, with screwdriver stops. American Standard "Reliant" model *#2000.501 or Delta Series 600 model 623. Provide a chrome strainer and P-trap.
Rough-In: 1/2"HW, l/2"CW, 2"W, 1-1/4"V.

P- Shower assembly, handicap: Stall shall be a piece _____ fiberglass enclosure ____"x ____", with seat. _____ Model #_____, color shall be _____. Fittings shall be chrome Eljer "Ultima" #539-0305 flexible hose shower assembly with grab bar and vacuum breaker. American Standard "Reliant" *#2000.500 or Delta model 603, single lever: control only with pressure balance, and screwdriver stops. Provide chrome strainer and P-trap.
Rough-In: 1/2"HW, 1/2"CW, 2"W, 1-1/4"V.

P- Floor Drains: Floor drains shall have a Dura-Coated cast iron body with bottom outlet, combinatin invertible membrane clamp and adjustable collar with "TYPE J" polished bronze slotted square cover. Drain shall discharge through a P-trap. Zurn model ZB-415-6S.
Rough-In: 2"W, 1-1/2"V.

P- Water Heater:

Water heater shall be an 80 gallon, energy saving water heater, with 20 gph recovery, with 90° temperature rise. Heater shall be Bradford White Model M-II-8OR5D, or approved equal. Rough-In: 3/4"HW, 3/4"CW, P&T Valve.

2.46 RESIDENTIAL GAS WATER HEATERS

A. Manufacturers:
1. [_____] Model [_____].
2. [_____] Model [_____].
3. [_____] Model [_____].

B. Automatic, natural gas fired, vertical storage type:
1. Storage: [____] gal ([____] L) capacity.
2. Input: [____] Btuh ([____] kW).
3. Minimum recovery rate: [____] gph ([____] L/s) with 100 degrees F (38 degrees C) temperature rise.
4. Maximum working pressure: 150 psi (1000 kPa)

2.47 COMMERCIAL GAS WATER HEATERS

A. Manufacturers:
1. [_____] Model [_____].
2. [_____] Model [_____].
3. [_____] Model [_____].

B. Automatic, natural gas fired, vertical storage type:
1. Storage: [____] gal ([____] L) capacity.
2. Input: [____] Btuh ([____] kW).
3. Minimum recovery rate: [____] gph ([____] L/s) with 100 degrees F (38 degrees C) temperature rise.
4. Maximum working pressure: 150 psi (1000 kPa)

C. Welded steel ASME labelled pressure vessel; [glass] [copper] lined, with ASME rated temperature and pressure relief valve.

D. Automatic immersion water thermostat with adjustable temperature range, automatic reset high limit thermostat, gas pressure regulator, burner with 100 percent safety shut-off pilot and thermocouple, [intermittent electronic ignition] [and automatic flue damper] [and power venter].

2.48 OIL FIRED WATER HEATERS

A. Manufacturers:
1. [_____] Model [_____].
2. [_____] Model [_____].

3. [_____] Model [_____].

B. Automatic, oil-fired, vertical storage type:
1. Storage Capacity: [____] gal ([____] L).
2. Input: [____] gph ([____] L/m).
3. Minimum recovery rate: [____] gph ([____] L/s) with 100 degrees F (56 degrees C) temperature rise.
4. Maximum working pressure: 150 psig (1000 kPa).

C. Glass lined welded steel with single flue passage, thermally insulated with enamelled steel jacket; baked-on enamel finish, dip tube, drain valve, magnesium anodes, and temperature and pressure relief valve.

D. Automatic water thermostat, temperature range adjustable from 120 to 170 degrees F (49 to 77 degrees C), flame retention oil burner, safety high limit control.

2.49 RESIDENTIAL ELECTRIC WATER HEATERS

A. Manufacturers:
1. [_____] Model [_____].
2. [_____] Model [_____].
3. [_____] Model [_____].

B. Factory-assembled and wired, electric, vertical storage type:
1. Storage: [____] gal ([____] L) capacity.
2. Input: [____] kW.
3. Minimum recovery rate: [____] gph ([____] L/s) with 100 degrees F (38 degrees C) temperature rise.
4. Maximum working pressure: 150 psi (1000 kPa).

2.50 COMMERCIAL ELECTRIC WATER HEATERS

A. Manufacturers:
1. [_____] Model [_____].
2. [_____] Model [_____].
3. [_____] Model [_____].

B. Factory-assembled and wired, electric, [vertical] [horizontal] storage type:
1. Storage: [____] gal ([____] L) capacity.
2. Input: [____] kW.
3. Minimum recovery rate: [____] gph ([____] L/s) with 100 degrees F (38 degrees C) temperature rise.
4. Maximum working pressure: 150 psi (1000 kPa)

C. Welded steel ASME labelled pressure vessel; [glass] [copper] lined, with automatic immersion water thermostat, flanged or screw-in nichrome elements, high temperature limit thermostat, and ASME rated temperature and pressure relief valve.

2.51 HEAT EXCHANGER

A. Manufacturers:
1. [_____] Model [_____].
2. [_____] Model [_____].
3. [_____] Model [_____].

B. Tubes: U-tube type with 3/4 inch (19 mm) OD minimum seamless copper tubes suitable for 125 psi (860 kPa) working pressure.

C. Heads: [Cast iron or steel,] [Brass,] with [steel] [brass] tube sheets, threaded or flanged for piping connections.

D. Shell and Tube Type: Steel shell, with threaded or flanged piping connections and necessary tappings, steel saddle and attaching U-bolts, designed for heating fluid in shell and heated fluid in tubes.

E. Immersion Type: Steel flange collar for mating to tank.

2.52 DOMESTIC HOT WATER STORAGE TANKS

A. Manufacturers:
1. [_____] Model [_____].
2. [_____] Model [_____].
3. [_____] Model [_____].

B. Tank: Welded steel, ASME labelled for working pressure of [125 psi (870 kPa)] [[___] psi ([___] kPa)], steel support saddles, tappings for accessories, threaded connections of stainless steel, access manhole.

C. Lining: [Corrosion-resistant concrete approximately 3/4 inch (20 mm) thick] [15 mil (0.38) epoxy] [_____], continued into flanged connections.

2.53 IN-LINE CIRCULATOR PUMPS

A. Manufacturers:
1. [_____] Model [_____].
2. [_____] Model [_____].
3. [_____] Model [_____].

B. Construction: Bronze casing, bronze impeller, alloy steel shaft with integral thrust collar and two oil lubricated bronze sleeve bearings, mechanical seal.

2.54 SUMP PUMPS

A. Manufacturers:
1. [_____] Model [_____].
2. [_____] Model [_____].

3. [_____] Model [_____].

B. Type: Vertical centrifugal, direct connected, [simplex] [duplex] arrangement.

C. Construction: Cast iron volute casing with [Cast iron;] [Bronze;] [open non-clog,] [closed,] impeller keyed to [stainless] steel shaft, cast iron pedestal, [forced grease] [oil] lubricated bronze sleeve bearings, flexible coupling to vertical, solid shaft ball bearing electric motor.

D. Sump: Steel cover plate [with steel curb frame for grouting into concrete sump] [on steel sump basin] with inspection opening and cover, and alarm fittings.

E. Controls (Simplex): Float switch and separate pressure switch high level alarm with alarm bell.

F. Controls (Duplex): Float operated mechanical alternator and separate high level alarm with alarm bell.

2.55 SUBMERSIBLE PUMPS

A. Manufacturers:
1. [_____] Model [_____].
2. [_____] Model [_____].
3. [_____] Model [_____].

B. Type: Completely submersible vertical centrifugal.

C. Construction: [Cast iron] [Bronze] pump body and oil filled motor chamber, [cast iron] [bronze] [open non-clog] [closed] impeller, [stainless] steel shaft.

D. Controls: Oil resistant power cord with integral [diaphragm] [mercury switch] level controls [with separate high level alarm with alarm bell].

PART 3 - EXECUTION

A. Provide Trubro "Handi-Lav Guards" on all exposed plumbing supplies and drains under lavatories and sinks, color shall be white.

3.1 General

A. Assemble all exposed, finished, polished, or enameled connections to fixtures with special care, showing no tool marks or threads at fittings and piping. No bowed or bent piping will be permitted. Run all piping through finished rooms and corridors in partitions, in chases, or in recesses where space is provided in walls, through floors, and in furred or hung ceilings. Run exposed pipes only where indicated or directed. Promptly install all sewers, drains, and piping after excavation or cutting for same has been done, so as to keep the opening for this piping open as short a time as possible. No piping shall be permanently closed up, furred in or covered before being inspected, tested, and approved.

B. Arrange piping in parallel groups, allow space for valves, fittings, and insulation. Run all water

piping as close to ceiling or other construction as possible. Separate all hot and cold water piping by at least 6" where possible and take every precaution to see that the pipes do not come in contact. Avoid locating water lines over electrical equipment.

C. All water piping shall be drainable to low points either by drain valves or fixture outlets. Any connection that may be hose connected will require a backflow preventer.

D. Provide sleeves for all piping passing through walls, floors, ceilings, foundations and footings, where exposed to view; provide chrome plated escutcheon plates. In absence of sleeves use core drilled holes.

E. Hangers and supports shall be provided at proper intervals and installed in accordance with manufacturers recommendations. Contacting materials shall be compatible.

F. Provide each fixture with separate control valves or stops located so as to be accessible. Provide sufficient elbows, swings, and offsets to permit free expansion and contraction of piping.

G. Provide air chambers with piping of each hot and cold water supply branch to groups of fixtures. Where single or small groups of fixtures occur, provide air chambers full size of branch lines 18" long, capped.

H. All exposed piping shall be copper or chrome-plated brass. Painting, if applicable, by others.

I. Ream pipe and tube ends. Remove burrs. [Bevel plain end ferrous pipe.]

J. Remove scale and dirt, on inside and outside piping before assembly.

K. Prepare piping connections to equipment with flanges or unions.

L. Coordinate cutting or forming of roof or floor construction to receive drains to required invert elevations.

M. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

N. Verify adjacent construction is ready to receive rough-in work of this Section.

3.2 Installation

A. Install Work in accordance with [written] manufacturer's instructions.

B. Provide dielectric connections wherever jointing dissimilar metals.

C. Install piping to conserve building space and not interfere with use of space. Group piping whenever practical at common elevations.

D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected

equipment.

E. Provide clearance for installation of insulation and access to valves and fittings.

F. Slope water piping and arrange to drain at low points.

G. Install bell and spigot pipe with bell end upstream.

H. Install specialties in accordance with manufacturer's instructions.

I. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

J. Install water hammer arrestors complete with accessible isolation valve.

K. Install each fixture with chrome plated rigid or flexible supplies with screwdriver stops, reducers, and escutcheons.

L. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

M. Securly anchor toilet carriers to building structure to prevent movement of fixture during use.

N. Install water heaters in accordance with manufacturer's instructions and to [AGA] [NSF] [NFPA] [UL] requirements. Coordinate with plumbing piping and related [fuel piping] [gas venting] [electrical] work to achieve operating system.

O. Install tanks in accordance with manufacturer's instructions.

P. Provide heat exchanger accessories:
   1. Wells for temperature regulator sensor at heated water outlet.
   2. ASME rated pressure and temperature relief valve on heated water discharge.
   3. ASME rated pressure relief valves from tapping on heated water side, set at 120 psi (820 kPa).
   4. ASME rated pressure relief valve on water inlet on downstream side of control valve.
   5. Thermometers and pressure gauge tappings on water inlets and outlets.

Q. Install heat exchangers with clearance for tube bundle removal without disturbing other installed equipment or piping. Pipe relief valves and drains to nearest floor drain.

R. Provide [steel pipe] [_____] support for tanks, independent of building structural framing members.

S. Clean and flush tanks [prior to delivery to site.] [after installation.] Seal until pipe connections are made.

T. On tanks, provide drain at water inlet and outlet, thermometer with range of 40 to 200 degrees

F (4 to 93 degrees C), and ASME pressure relief valve suitable for maximum working pressure.

U. Provide air cock and drain connection on horizontal pump casings.

V. Provide line sized gate valve and strainer on suction and line sized soft seated check valve and globe valve on discharge.

W. Ensure shaft length allows sump pumps to be located minimum 24 inches (600 mm) below lowest invert into sump pit and minimum 6 inches (150) clearance from bottom of sump pit.

3.3 Application

A. Use grooved mechanical couplings and fasteners, and dielectric connections only in accessible locations.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.

D. Install [gate] [ball] [butterfly] valves for shut-off and to isolate equipment, part of systems, or vertical risers.

E. Install [globe] [ball] [butterfly] valves for throttling, bypass, or manual flow control services.

F. Provide spring loaded check valves on discharge of water pumps.

3.4 Dielectric Fittings

1. Install dielectric fittings as follows:

A. Install dielectric unions to connect piping materials of dissimilar metals in dry piping systems.

B. Install dielectric waterway fittings to connect piping materials of dissimilar metals in wet piping systems.

C. Bronze bodied valves and devices installed in steel piping systems do not require dielectric fittings when both connections are made with steel piping, but **do** require dielectric fittings when the bronze bodied valves or devices are installed with one connection to steel piping and the other connection to copper piping. Iron bodied valves and devices installed in copper systems require dielectric fittings.

3.5 Cleaning

Each system of piping shall be blown through, washed out and/or flushed after completion to remove grit, pipe dope, dirt, sand, etc., from coils and piping for as long a time as required to thoroughly clean the apparatus. All elements within the system that may be damaged by the cleaning operation shall be removed or otherwise protected during the operation. Repair or replace any control valves or other

system components which do not function properly. All strainers shall be inspected and cleaned as often as required and left in clean condition.

1. Sterilization

A. The pipe system shall be disinfected in accordance with AWWA C651.

B. Prior to starting work, verify system is complete, flushed and clean. Ensure PH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 ppm (50 mg/L) residual. Bleed water from outlets to ensure distribution.

D. Maintain disinfectant in system for 24 hours. If final disinfectant residual tests less than 25 ppm (25 mg/L), repeat treatment.

E. Flush disinfectant from system. Take samples no sooner than 24 hours after flushing, and analyze in accordance with AWWA C601.

2. Tests

A. Upon completion of fabrication and before any enclosing, insulating or concealing in any way, test all piping, mains and joints for leaks in accordance with the requirements of this specification.

B. Test hot and cold water piping systems hydraulically at 100 p.s.i. before fixtures are connected. Maintain test for 4 hours with no appreciable drop in pressure.

C. Test sanitary, drain, waste and venting systems by plugging or capping all outlets and filling the system with water. Each section, except the upper most ten feet, shall be submitted to a test of at least a ten foot head of water. The water shall be kept in the system for at least 15 minutes before inspection starts. The system shall then be tight at all joints.

D. After all fixtures are completely set and connected, adjust the various supply valves, fixture fittings, etc., so that proper delivery of water is obtained at all fixtures.

E. Provide test pumps, gauges, instruments, materials and labor to perform all tests specified herein.

F. Tests may be made in sections to facilitate construction.

G. Notify the Engineer in advance of scheduled tests so that the Engineer may have a representative present during any or all tests.

H. Repeat tests until system is proven tight and in perfect operating condition.

3. Service connections

****
Select sewer system. If both sanitary and storm are provided, delete both options stated.
****

A. Provide new [sanitary] [storm] sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

****
Use back flow preventer and sand strainer where applicable. Select sleeve for through-wall or through-floor entry. The following paragraph makes the Contractor responsible for service connection and meter installation.
****

B. Provide new water service complete with water meter with by-pass valves. [Provide sleeve in wall for service main and supported at wall, calked and made watertight.] [Provide sleeve around service main to 6 inch (150 mm) above floor and 6 feet (1800 mm) minimum below grade.]

****
Indicate gas pressure. For pressures above 7 inch wg (1.7 kPa), optional regulators are required. The following paragraph makes the Contractor responsible for service connection and meter installation.
****

C. Provide new gas service [complete with gas meter and regulators]. Gas service distribution piping to have initial minimum pressure of [_____] inch wg ([_____] kPa). [Provide regulators on each line serving gravity type appliances, sized in accordance with equipment.]

4. Schedules

****
Provide a schedule when more than one and different sizes of equipment are required.

The following examples may assist in developing such a schedule.
****

A. Water Heaters:
   A. Drawing Code:
   B. Manufacturer:
   C. Model:
   D. Input:
   E. Number of stages:

F. Recovery:
G. Recovery Temp. Rise:
H. Storage Capacity:

B. Heat Exchangers:
A. Drawing Code:
B. Location:
C. Service:
D. Heating Media:
A. Type:
B. Entering:
C. Leaving:
D. Flow:
E. Max. Head Loss:
F. Fouling Factor:
G. Working Pressure:
E. Heated Media:
A. Type:
B. Entering:
C. Leaving:
D. Flow:
E. Max. Head Loss:
F. Fouling Factor:
G. Working Pressure:

C. Tanks:
A. Drawing Code:
B. Location:
C. Service:
D. Capacity:
E. Diameter:
F. Length:

D. Pumps:
A. Drawing Code:
B. Manufacturer:
C. Model No.:
D. Location:
E. Service:
F. Capacity:
G. Head:
H. Minimum Efficiency:
I. Motor Size:

END OF SECTION 15400