

## SECTION 22 00 00 - PLUMBING

## PART 1 GENERAL

## 1.1 RELATED DOCUMENTS

- A. The drawings and the specifications including Section 23 05 00 "Common Work Results for HVAC" are hereby made a part of the work of this section.

## 1.2 DESCRIPTION

- A. The work covered by this Section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections, and incidentals and the performing of operations required to provide a complete and functional plumbing system.
- B. Work shall be in accordance with the current edition of the Maine State Plumbing Code and applicable local ordinances.

## 1.3 SUBMITTALS

- A. Substitutions: Your attention is directed to Section 23 05 00 "Substitutions", relative to competition and the (ONLY) notation. Familiarity with this section shall be achieved before reading the PRODUCTS section of this specification.
- B. The items for which the submittals paragraph in Section 23 05 00 "Common Work Results for HVAC", apply are as follows:
  - 1. Piping materials.
  - 2. Valves.
  - 3. Pipe hangers.
  - 4. Fixtures and trim.
  - 5. Miscellaneous equipment.
  - 6. Water heating equipment.
  - 7. Piping, valves and equipment identification.
  - 8. Gas piping system.
  - 9. Thermostatic mixing valves.
  - 10. Firestopping.
  - 11. Elevator pit drainage system.
  - 12. Electric Heat Trace.
  - 13. Solar domestic hot water system (Alternate).
  - 14. Backwater valves.
  - 15. Seismic connectors.

PART 2 PRODUCTS

## 2.1 PIPING MATERIALS

- A. Soil and Waste (Sanitary), Rainwater and Vent Piping:
  - 1. Below Grade: Cast iron with push-on joints.

2. Above Grade: Sanitary and rainwater piping shall be cast iron "no Hub" (ONLY). Vent piping may be Sched. 40 PVC at contractor's option, cast iron (ONLY) thru roof.
- B. Domestic Cold and Hot Water Piping and Solar Collector System Piping: Type L hard copper tubing and cast bronze or wrought copper solder fittings. Domestic Cold and Hot Water piping 1" and smaller may be PEX.
- C. Exposed Water and Waste Piping at Fixtures: I.P.S. copper with cast brass fittings chrome plated finish, with deep one piece escutcheon plates at traverse points. Traps shall be PVC.
- D. Solder: Lead-free (ONLY), Englehard Silvabrite 100, 440°F melting point, ASTM B32.
- E. Underground Cold Water Piping (Building Entrance): Schedule 40 cement-lined ductile iron.
- F. Condensate Piping: Schedule 40 PVC with solvent welded joints.
- G. Radon Vent Piping: Schedule 40 ABS with solvent-welded joints.
- H. Sprinkler / Water Service Piping: Schedule 40 cement-lined ductile iron, per NFPA13.

## 2.2 GAS PIPING SYSTEM

- A. Gas Piping: Schedule 40 carbon steel pipe conforming to ASTM 120 or A53, with threaded joints and malleable iron fittings (Above grade).
- B. Ball Valves for Gas Service: Copper alloy with chromium plated floating ball per Federal Specification WW-V-35B, Type II, Class 3. Blowout-proof stem, reinforced teflon seats, threaded ends, quarter turn on-off, 600 WOG rating, 250 psi rating for natural gas, UL-listed as a natural gas shutoff valve, Apollo Model 80-100 series.

## 2.3 NO HUB COUPLINGS

- A. For DWV piping, couplings shall be Clamp-All HI-TORQ125, shall maintain 15 PSI hydrostatic seal, constructed with a 304SS housing and ASTM C-564 neoprene gasket. Couplings shall meet FM 1680, the IBC and local codes and requirements.

## 2.4 VALVES

- A. Ball Valves: Apollo 70-100 and 70-100-07 series, Watts, Nibco, or equal bronze body with stationary seat ring and chromium plated or stainless steel floating ball per Federal Specification WW-V-35B. Blowout proof stem, reinforced PTFE seal, 600 psig WOG. Sizes 1½" and larger shall have threaded ends and lever handles. For sizes 1¼" and smaller, provide steel tee handles. Provide with stem extension as required to allow operation without interfering with pipe insulation.
- B. Check Valves: Horizontal Swing, MSS SP-80, Type 3, Class 125.
- C. Drain Valves: Provide ball valves with ¾" hose connection and brass cap.
- D. Fixture Service Stop Valves: Angle Wheel Handle Stop, ASME A112.18M.

1. Each plumbing fixture shall have individual stop valves in the hot and cold supplies.
  2. Service stop valves exposed in finished areas shall be chrome-plated brass; in non-finished areas, ball valves shall be used in lieu of chromed supplies.
- E. Temperature and Pressure Relief Valves: Bronze body, tested under ANSI Z21.22, AGA and ASME rated, 125 psig/210°F relief settings.
- F. Balancing Valves: Taco “Accu-Flo”.
1. Bronze or brass body and internals, teflon seats, memory stop, 300 psi working pressure, 250°F working temperature. Balancing devices shall have provisions for connecting a portable differential pressure gauge. Each balancing device shall be sized to provide a differential pressure reading between 2 and 5 feet with the valve full open at design flow rates.
  2. Install per manufacturer's recommendations for adjacent length of straight pipe.
  3. Submittals shall indicate gpm, size, wide open differential pressure meter reading, and actual water pressure drop.
- G. Make-Up Water Pressure Reducing Valve: Watts Regulator series U5LP bronze body, bronze internals, 200 psi working pressure, 200°F maximum temperature, adjustable pressure range 10-25 psig. Provide with inlet strainer (screen).
- H. Main Service Entrance Pressure Reducing Valves (PRV-1A, PRV-1B): Watts Regulator Model X65BP, 1½”, bronze body, bronze and stainless steel internals, 400 psi working pressure, 180°F maximum temperature, adjustable pressure range 20-80 psig. Provide with inlet strainer (screen). Capacity shall be 80 GPM at a 6 psig pressure drop.
- I. Seismic Connectors: Seismic connectors shall be FlexHose “TriFlex Loop”, or approved equal, UL536-listed.

## 2.5 PIPE HANGERS

- A. Adjustable Swivel Hangers:
1. Pipe sizes 2" and less: Carpenter and Paterson Fig. 800, oversize for insulated piping systems.
  2. Pipe sizes larger than 2": Carpenter and Paterson Fig. 100, oversize for insulated piping systems.
- B. Riser Clamp: Carpenter and Paterson Fig. 126 CT copper plated for copper piping, Fig. 126 for iron and PVC piping.
- C. Insulation Shields: 18 ga. galvanized steel, 180° wrap, Carpenter and Paterson Fig. 265P, Type H.
- D. All piping 20' upstream and downstream of pumps shall also have Mason Industries PC30N precompressed double deflection spring isolators installed.

## 2.6 FIXTURES AND TRIM

- A. (P-1) ADA Water Closet: Floor-mounted, tank type, American Standard "Right Height" Cadet 16-1/2"H EL 1.28, or Kohler, HET, elongated bowl, white vitreous china, low consumption (1.28 gpf). Trip lever shall be mounted on the wide side of the stall. Fixture shall be suitable for 12" rough-in.
1. Seat: Church Model 380TC, commercial weight solid plastic, closed front with cover, self sustaining check hinge, for elongated bowl, white color.
  2. Total installed height of front edge of seat shall be 17" to 19" above finished floor. Final installation shall meet ADA guidelines and ANSI A117.1.
- B. (P-1A) ADA Water Closet: Floor-mounted, tank type, American Standard "Right Height" Cadet 16-1/2"H EL 1.28, or Kohler, HET, elongated bowl, white vitreous china, low consumption (1.28 gpf). Trip lever shall be mounted on the wide side of the stall. Fixture shall be suitable for 12" rough-in.
1. Seat: Church Model 380TC, commercial weight solid plastic, open-front without cover, self sustaining check hinge, for elongated bowl, white color.
  2. Total installed height of front edge of seat shall be 17" to 19" above finished floor. Final installation shall meet ADA guidelines and ANSI A117.1.
- C. (P-2) ADA Lavatory: The countertop will be furnished by the General Contractor.
1. Faucet: Symmons Symmetrix Model S-20-2 single handle, Moen "Commercial" or Chicago-Faucets, 0.5 GPM flow aerator, polished chrome finish, ceramic control cartridge.
  2. Drain: Pop-up drain assembly with bright metal finish.
  3. Trap: PVC, 1-1/4" P-trap with cleanout plug. Adjustable with connected elbow and nipple to wall.
  4. Final installation of lavatory and accessories shall meet ADA guidelines and ANSI A117.1. Insulate traps and supplies with Truebro Lavguard.
- D. (P-2A) ADA Lavatory, Wall Hung: American Standard "Comrade", or Eljer, 20"x18", white vitreous china, faucet holes on 4" centers, front edge shall extend minimum of 17" from rear finished wall.
1. Faucet: Symmons Symmetrix Model S-20-2 single handle, Moen "Commercial" or Chicago-Faucets, 0.5 GPM flow aerator, polished chrome finish, ceramic control cartridge.
  2. Drain: Pop-up drain assembly with bright metal finish.
  3. Trap: PVC, 1-1/4" P-trap with cleanout plug. Adjustable with connected elbow and nipple to wall.

4. Lavatory shall be installed at 34" above finished floor (See Architectural drawings). Final installation of lavatory and accessories shall meet ADA guidelines and ANSI A117.1. Insulate traps and supplies with Truebro Lavguard.
- E. (P-3) ADA 36"x36" Shower: Lasco, 38"x37"x77" overall dimensions, Aquarius or Comfort Designs, one piece, gelcoat construction. Provide unit with ADA compliant grab bars with returns and padded fold-up seat, white curtain rod, weighted anti-bacterial curtain, and collapsible flexible dam.
1. Shower Unit: Symmons Temptrol II packaged unit Model S-25-500-B30-V. Pressure-Balancing mixing valve with adjustable stop screw to limit handle turn. Levertrol diverter with integral volume control. Provide integral checks and service stops. Clear-Flo shower head (1.5 gpm) with arm and flange, wall/hand shower with in-line vacuum breaker, flexible 5' metal hose, wall connection and flange, 30" slide bar for hand shower mounting. Provide Symmons part number FP-1E-BRASS chrome plated brass swivel clip to attach hand shower to slide bar.
  2. Installation of shower and accessories shall meet ADA guidelines and ANSI A117.1.
- F. (P-3A) ADA 63"x34" Shower: 63"x33"x76.88" overall dimensions, no interior / exterior threshold, gelcoat construction. Provide unit with ADA compliant grab bars with returns and padded fold-up seat, white curtain rod, weighted anti-bacterial curtain, and collapsible flexible dam.
1. Shower Unit: Symmons Temptrol packaged unit Model S-25-500-B30-V. Pressure-Balancing mixing valve with adjustable stop screw to limit handle turn. Levertrol diverter with integral volume control. Provide integral checks and service stops. Clear-Flo shower head (1.5 gpm) with arm and flange, wall/hand shower with in-line vacuum breaker, flexible 5' metal hose, wall connection and flange, 30" slide bar for hand shower mounting. Provide Symmons part number FP-1E-BRASS chrome plated brass swivel clip to attach hand shower to slide bar. Locate the fixed head on the short wall opposite the seat and the handheld shower on the long wall adjacent to the seat. Coordinate with the Architect.
  2. Installation of shower and accessories shall meet ADA guidelines and ANSI A117.1.
- G. (P-3B) ADA Tub / Shower: Comfort Designs XST6032GTS, one-piece gelcoat, 60"L x 33"W x 77"H overall dimensions, white ADA/ANSI grab bars, blocking for future fold-up seat, weighted anti-bacterial curtain and curtain rod.
1. Shower Unit: Symmons Temptrol packaged unit Model S-96-400-B30. Pressure-Balancing mixing valve with combination intergral diverter and volume control. Provide integral checks and service stops. Tubspout, wall/hand shower (2.0 gpm) with flexible metal hose, vacuum-breaker, wall connection and flange, 30" slide bar for hand shower mounting.
  2. Installation of shower and accessories shall meet ADA guidelines and ANSI A117.1.
- H. (P-4) ADA Kitchen Sink, Single Bowl: Dayton GE2521L / GE2521R, 22 gauge stainless steel, 25"x 21.25"x 6½" deep overall size, ADA-compliant, 4 faucet holes on 4" centers, fully sound deadened. Coordinate the drain outlet location with the casework.

1. Faucet: Symmons Symmetrix Model S-23-2-10CP wrist operation handle, Moen "Commercial" or Chicago-Faucets, 10-7/8" swing spout, polished chrome finish, ceramic control cartridge, single lever, 2.0 gpm.
  2. Strainer: Removable basket and neoprene stopper.
  3. Sink installation shall be in compliance with the ADA guidelines.
  4. Exposed traps and supplies with Truebro Lavguard.
- I. (P-5) Mop Basin: Fiat Model TSBC1610, molded stone, 24"x24"x12" with 1" wide shoulders, 6" drop front; 3" stainless steel drain with combination dome strainer and lint basket.
1. Faucet: Fiat Service Faucet Model 830-AA, chrome-plated with vacuum breaker, integral stops, adjustable wall brace, pail hook, and 3/4" hose thread on spout.
  2. Hose and Hose Bracket: Fiat Model 832-AA, 30" long flexible heavy duty 5/8" cloth reinforced rubber hose with 3/4" chrome coupling at one end, 5"x3", stainless steel bracket with rubber grip.
  3. Wall Guard: Fiat Model MSG-2424, stainless steel wall guards.
  4. Mop Bracket: Fiat Model 889-CC, 24" stainless steel.
  5. Caulk around mop basin at floor and walls with white silicone caulk.
- J. (P-6) Washing Machine Supply and Drain: In-wall concealed, galvanized metal, (IPS Corporation) Guy Gray WB200HA, 2" drain, single shutoff valve to provide simultaneous control of hot and cold water and water hammer arrestors. The hot water connection shall be capped per Avesta Housing requirements.

## 2.7 MISCELLANEOUS EQUIPMENT

- A. Floor Drains / Roof Drains / Indirect Wastes:
1. 2"FD: Zurn FD-2240, or Watts, cast iron body with steel flange for wood deck mounting with flexible sheet flooring, 2" bottom outlet, nickel top
  2. 3"FD: Zurn Z-415, or Watts, cast iron body with 3" bottom outlet, combination invertible membrane clamp and adjustable collar. Strainer shall be 6" diameter Zurn "Type B", polished nickel-bronze.
  3. Floor drains shall have "deep seal" traps and trap primer connection, connect to nearest Electronic Trap Primer.
  4. 4"HDFD: Floor drains located in the Garage shall be Heavy Duty Floor Drains, Zurn Model Z610, or Watts, 12" heavy duty square hinged ductile iron grate, with sediment bucket, Dura-coated cast-iron body.
  5. Indirect Waste Receptor (IW): Zurn Model Z1025-4, 4", fixed air gap, dura-coated cast-iron, with Z1000-P, trap primer connection.

6. Roof Drains (**RD**) shall be Zurn Model Z-100ERC, 4" unless otherwise indicated as 3", or Josam with underdeck clamp, vertical expansion joint, extension and sump with galvanized strainer and cast-iron body, "no-hub" connection. Furnish with Zurn Model Z-190 vertical expansion joint or flexible elastomeric boot for expansion compensation. Overflow Roof Drains (**ORD**) shall be Froet Model 100C4, 4", Zurn, or approved equal, with two (2) separate 4" drain connections. See Architectural and Mechanical Drawings for quantities, types, sizes and locations.
  7. Rainwater downspouts shall be Zurn Model Z199, nickel bronze body with wall flange.
- B. Floor/Yard Cleanout (FCO/YCO): Zurn Z-1400, or Watts, adjustable floor cleanout, cast iron body, with gas and watertight ABS tapered thread plug. Provide size equal to piping served with maximum size of 4".
1. Concrete floor finishes: Scoriated round polished bronze top.
  2. Sheet tile finishes: Scoriated square polished bronze top recessed to receive tile.
  3. Carpeted finishes: Scoriated round polished bronze top and carpet marker.
  4. Heavy-duty cleanout (HDCO): Zurn Model Z1402-HD with heavy duty cover.
- C. Wall Cleanout (WCO): Sanitary tee with threaded raised nut or countersunk-nut cleanout plug located behind Zurn Z-1468 round stainless steel wall access cover.
- D. Vacuum Breaker: Watts Model N36, 3/4" size, 20 CFM capacity.
- E. Strainer: Watts Series 777, MIL-S-16293, bronze body wye-type, 200 WOG rating, screwed end connections, 20 mesh stainless steel, monel, or bronze screen.
- F. Backflow Preventer (BFP): Conforming to AWWA C506, FCCHR-USC Manual Section 10, and UL listed. Types, sizes and capacities scheduled, Apollo, Zurn or Watts.
1. Double Check (DC): Double check backflow assembly with test ports, bronze body with stainless steel springs, corrosion resistant internals, stop and waste ball valves.
  2. Atmospheric Double Check (DCA): Double check continuous pressure type with atmospheric port for low hazard applications, 250°F maximum water temperature, bronze body, stainless steel internals with rubber seals and integral strainer.
  3. Reduced Pressure Zone (RPZ): Reduced pressure principle type; bronze body with stainless steel internals. Provide bronze body ball valves, test cocks, and air gap fittings.
- G. Freezeless Wall Hydrant: Zurn Model Z-1300, "Ecolotrol", Josam, or approved equal, encased, non-freeze, anti-siphon, automatic draining, flush installation, 3/4" connection, hinged cover. Wall box shall be nickel bronze construction. Wall hydrants shall have an integral backflow preventer. Furnish with key lock.

- H. Thermometers: Terice Series V80445 or Ashcroft Series 600A-04, vapor actuated, adjustable angle, 4-1/2" diameter face, cast aluminum case, stainless steel ring, glass window, white background dial with black figures, black finished stainless steel pointer, brass movement with bronze bearings, phosphor bronze bourdon tube. Accuracy shall be to within one scale division.
1. Thermowell: Provide with brass thermometer wells projecting a minimum of 2" into the pipe with extension to face of insulation. Provide with heat transfer fluid to fill interstitial space between bulb and well.
  2. Range: 30°F to 240°F for domestic hot water systems.
- I. Pressure Gauges: Terice Series 800 or Ashcroft Type 1005, Grade B, 3-1/2" dial, ANSI B40.1, drawn steel case, white background dial with black figures, clear glass window, brass movement, beryllium copper bourdon tube, 0 to 100 PSI range, accuracy shall be within 2% over middle half of scale and 3% over the remainder. Provide with shut off petcock and restrictor.
- J. Circulators (inline)(CP): Taco model indicated, pumps shall be inline cartridge-type or close coupled pump of capacity and performance indicated with all bronze or stainless steel construction 125 psig rated working pressure, 200°F maximum water temperature, carbon Ni-resist mechanical seal, flexible coupling, resilient-mount drip-proof sleeve bearing motor. The pumps shall be factory tested, cleaned and painted with machinery enamel. A set of installation instructions shall be included with pump. Provide high efficiency motors if available as an option of the manufacturer. If high efficiency motors are not available as an option of the manufacturer, submit a certification stating same.
- K. Water Hammer Arrestor (Shock Absorber): Plumbing and Drainage Institute listed.
- Schedule:
- "A" - Size #100 PDI - 0-11 Fixture Units  
 "B" - Size #200 PDI - 12-32 Fixture Units  
 "C" - Size #300 PDI - 33-60 Fixture Units
- L. Vacuum Breaker: Watts Model N36, 3/4" size, 15 CFM capacity.
- M. Strainer: Watts Series 777, MIL-S-16293, bronze body wye-type, 200 WOG rating, screwed end connections, 20 mesh stainless steel, monel, or bronze screen.
- N. Thermostatic Mixing Valve: Shall be Heat-Timer Model TMC / ETV "Electronic Tempering Valve" and "Temperature Monitoring Control" or equal, capacities and performance as scheduled with stainless steel tempering valve, control module with built-in transformer, model "TMC" monitoring high limit control, stainless steel solenoid valve, thermometer, shut-offs and strainer, UL-listed. Installation shall be per the manufacturers recommendations.
- O. Trap Primer: Zurn Z-1022 Automatic Trap Primer, all bronze body with integral vacuum breaker, non-liming internal operating assembly with gasketed bronze cover.
- P. Electronic Trap Primer (ETP): PPP Inc. PT-series, Mifab MI-200 or Zurn, 120V., atmospheric vacuum breaker, pre-set 24 hour clock, manual over-ride switch, shut-off valve, water hammer arrestor, calibrated manifold with multiple connections as required.



Individually pipe to floor drain traps. In finished spaces the trap primer shall be enclosed in a flush stainless steel wall box with hinged door and tamper-resistant lock. Run trap primer piping (1/2" PEX) to each floor drain trap or indirect waste receptor trap as required by Code. Provide a ball shut-off valve on the inlet to the trap primer.

- Q. Flow Meter (Solar System Alternate): Istec 1800 Series Multi-Jet Water Meter, 1" pipe size, rated for 0.4gpm minimum and 26gpm continuous at 1.5psi pressure drop and hermetically sealed counter with pulse output.
- R. Elevator Pit Drainage Systems: Stancor, Inc., Model SE50 "Oil-Minder System", Liberty Pumps "ELV" series, SeeWater, Inc. "Oil-Smart", Zoeller, or approved equal, 1/2 HP., 3600 RPM, 120V., 1 1/2" discharge with float switch, 3000 GPH (min.). A NEMA 4X control panel and a self-cleaning, hermetically sealed, stainless steel oil sensing probe shall alarm if oil is sensed. The pump shall be submersible with discharge check valve. The equipment shall be UL-listed.
- S. Washing Machine Drain Pans: Oatey Model 34051 or Driptide, 28"x30"x1.75"D., plastic with 1" drain fitting.

## 2.8 WATER HEATING EQUIPMENT

- A. Indirect-Fired Water Heaters (**IFWH-1, 2**): Thermo2000 "TurboMax", or approved equal, packaged unit of make, model, and performance as scheduled on Drawings; UL 732 and ASHRAE 90.1 compliant, ASME code construction with adjustable range thermostat. Set to provide 140°F water temperature. Hot and cold water connections shall be 2" (minimum).
  1. The tank and tube rated working pressures shall be 200 psig.
  2. Shall have 2" thick foam or fiberglass insulation and steel storage tank. Multiple copper tube heat exchange coils shall be provided. The tank shall be warranted for a minimum of three (3) years in commercial service.
  3. Installation shall be in accordance with the manufacturer's recommendations.

## 2.9 PIPING, VALVE, AND EQUIPMENT IDENTIFICATION

- A. Piping identification: Provide plastic "wrap-around" identification markers indicating flow and fluid flowing for the following:
  1. Domestic Hot Water
  2. Recirculated Domestic Hot Water
  3. Domestic Cold Water
  4. Vent Piping
  5. Exposed Above-ground Sanitary Drain Piping
  6. Gas Piping
  7. Condensate Piping
  8. Radon Vent Piping
- B. Markers shall be placed 30-50 ft. apart for piping in accessible areas.
- C. Markers shall be placed outside the pipe insulation and in the most obvious location for viewing.

## D. Valve Tags:

1. Attach to each valve a 1-1/2" round or octagonal brass tag with 1/2" indented numerals filled with a durable black compound. In addition to the valve numbers, each tag shall identify the system it controls. Service stop valves exposed in finished areas need not be tagged.
2. Tags shall be securely attached to stems of valves with copper or brass "S" hooks, or chains.
3. Valve charts shall be provided for each piping system and shall consist of schematic drawings of piping layouts, showing and identifying each valve and describing its function. Upon completion of the work, one (1) copy of each chart, sealed to rigid backboard with clear lacquer placed under glass and framed, shall be hung where directed. Two (2) additional unmounted copies shall be delivered to the Architect.
4. Tags and charts shall be coordinated with Section 23 00 00 HVAC System and when completed this work shall have been done sequentially.

- E. Equipment Identification: Provide laminated plastic nameplates for equipment, pumps, mixing valves, backflow preventers, and balancing valves. Nameplates shall be laminated 0.125-inch thick melamine plastic conforming to Fed. Spec. L-P-387, black with white center core. Surface shall be a matte finish, corners shall be square. Accurately align lettering and engrave into the white core. Minimum size of nameplates shall be 1.0 inch by 2.5 inches. Lettering shall be minimum of 0.25-inch high normal block lettering.

## 2.10 SOLAR DOMESTIC WATER PRE-HEAT SYSTEM (ALTERNATE)

- A. Shall be Veismann Vitosol 100-F SV-1, Oventrop, Apricus, or approved equal, packaged, integrated system consisting of (21) flat-plate solar collectors (absorbers), piped as detailed, collector supports, piping, electronic controls (coordinate w/ ATC Section 230900), circulator pump(s), sensors, four (4) indirect-type storage tanks (+/-120 gallon each) with integral heat exchangers, expansion tank, glycol mixture, relief valves, pipe insulation and wiring. The support system shall consist of Apricus "High Angle Frame Kit", UniStrut, or equal with angle bracing, compatible with the building structural framing, with intermediate structural supports, as required.
- B. The installation shall be in accordance with the manufacturer's recommendations and be started up and supervised by an authorized agent of the system manufacturer.
- C. The system shall be filled with manufacturers supplied heat transfer / freeze protection fluid.
- D. Storage tank ST-1 shall be Heat Transfer Products, 119 gallon, or equal, ASME construction.

## 2.11 ELECTRIC HEAT-TRACE

- A. Provide for piping in the Garage and where indicated for unheated areas subject to freezing, electric heat-trace for freeze protection on sanitary and roof drain piping, by Thermon, Nelson, Tyco Thermal, or approved equal. Furnish with Thermon Model PDMP, or equal, power distribution and monitoring panels, located as indicated. The panels shall monitor and alarm (audible-visual) for failure in each heat trace circuit, including ground-fault and

continuity. The system shall be enabled when the outside air temperature is below 40F. and be disabled above 40F. outside air temperature.

- B. The installation shall be in accordance with the manufacturer's recommendations and be started up and supervised by an authorized agent of the heat trace manufacturer.
- C. The heat-trace system shall include cable, terminations, power connections, power wiring, splice kits, labels, thermostats, sensors and controllers to provide a complete system. The system shall operate on 208V.-1PH. Power.
- D. Heat trace shall be self-limiting type designed specifically for freeze-protection service.

## 2.12 BACKWATER VALVES

- A. Shall be RectorSeal "CleanCheck" Model 96926, extendable backwater valve, direct-buried with cleanout plug, or approved equal. Access shall only be required from ground level for inspection, service and maintenance. Provide for each building sewer exit location per the City of Portland requirements.

## PART 3 EXECUTION

### 3.1 SURFACE CONDITIONS

- A. Inspection:
  1. Prior to work of this Section, carefully inspect the installed work of other trades and verify that such work is complete to the point where this installation may properly commence.
  2. Verify that plumbing may be installed in strict accordance with pertinent codes and regulations and the reviewed Shop Drawings.

### 3.2 INSTALLATION OF PIPING

- A. Provide and erect in accordance with the best practice of the trade piping shown on the drawings and as required to complete the intended installation. Make offsets as shown or required to place piping in proper position to avoid other work and to allow the application of insulation and finish painting to the satisfaction of the Architect.
- B. The size and general arrangements, as well as the methods of connecting piping, valves, and equipment, shall be as indicated, or so as to meet the requirements of the Architect.
- C. Piping shall be erected so as to provide for the easy and noiseless passage of fluids under working conditions.
- D. Install unions to facilitate removal of equipment.
- E. Copper pipe shall be reamed to remove burrs.
- F. Connections between copper and steel piping shall be made with brass fittings.

- G. Solder joints shall be made with lead free solder. Clean surfaces to be soldered and use a paste flux. Wash joints with sodium bicarbonate and water to remove corrosive effects of heated solder paste. Caution: Lead-bearing solder is not permitted.
- H. Pipe penetrations through walls, floors and ceilings shall be in accordance with Section 15000 "Supplemental General Mechanical Requirements". Traverse points of piping shall be escutcheoned with split chrome floor and ceiling plates and spring anchors, where visible to occupancy.
- I. Provide a cleanout in the vertical position at the base of each sanitary and roof drain drop.
- J. Sanitary and vent piping shall be sized and installed at 1/4" per foot slope. Sanitary piping 6" and larger may be installed at 1/8" per foot if approved by the Local Plumbing Inspector.

### 3.3 PIPE HANGERS

- A. Impact driven studs are prohibited.
- B. Copper Tubing: supported at intervals with rod sizes as follows, double nuts on hangers and on beam clips.

Copper Size	Hanger Intervals	Rod Sizes
1/2"	5'	3/8"
3/4"	6'	3/8"
1"	6'	3/8"
1-1/4"	8'	3/8"
1-1/2"	8'	3/8"
2"	10'	3/8"

- C. Cast Iron Pipe: Supported at intervals with rod sizes as follows, double nuts on hangers and on beam clips.

Cast Iron Size	Hanger Intervals	Rod Sizes
1-1/2"	5'	3/8"
2"	5'	3/8"
2-1/2"	5'	1/2"
3"	6'	1/2"
4"	7'	5/8"

- D. PVC Pipe: Supported at 4 foot intervals.
- E. Verticals: Supported by use of clamp hangers at every story height, and at not more than 6 feet intervals for copper piping 1-1/4" and smaller size.
- F. Spring Isolators: All pipe 20' upstream and downstream of pumps.

### 3.4 CLOSING IN UNINSPECTED WORK

- A. General: Cover up or enclose work after it has been properly and completely reviewed.
- B. If any of the work is covered or enclosed prior to required inspections and review, uncover the work as required for the test and review. After review, tests and acceptance, repairs and

replacements shall be made by the appropriate trades with such materials as necessary for the acceptance by the Architect and at no additional cost to the Owner.

### 3.5 CLEANUP AND CORROSION PREVENTION

- A. Upon completion of the work thoroughly clean and flush piping systems to the sewer with water.
- B. Fixtures, piping and equipment shall be thoroughly cleaned. Dirt, dust, and debris shall be removed and the premises left in a clean and neat condition.
- C. Caulk around fixtures at floor and wall.
- D. Before covering is applied to piping systems, clips, rods, clevises and other hanger attachments, and before uncovered piping is permitted to be concealed, corrosion and rust shall be wire brushed and cleaned and in the case of iron products, a coat of approved protective paint applied to these surfaces. When corrosion is from the effects of hot solder paste, the areas shall be cleaned and polished and a wash of bicarbonate of soda and water used to neutralize the acid condition.

### 3.6 DISINFECTING

- A. After the entire potable water system is completed, cleaned and tested, and just before the building is ready to be occupied, disinfect the system as follows: After flushing the mains, introduce a water and chlorine solution for a period of not less than three hours before final flushing of the system.

### 3.7 TESTS

- A. Sanitary soil, waste and vent piping: Fill with water to top of vents, and test as required by Code.
- B. Water piping shall be tested to a pressure of 100 lbs. per square inch for at least 30 minutes. Pressure drop in this period shall not exceed two pounds per square inch. Leaks shall be repaired and system retested. Notify Architect 24 hours before test is to be performed.

### 3.8 INSTRUCTIONS

- A. On completion of the project, provide a competent technician to thoroughly instruct the Owner's representative in the care and operation of the system. The total period of instruction shall not exceed four (4) hours. The time of instruction shall be arranged with the Owner.

### 3.9 FIRESTOPPING

- A. Firestopping shall be performed in accordance with Specification Section 07 84 00 "Firestopping". All penetrations of fire-rated assemblies including walls and floors by mechanical system components (piping, ductwork, conduits, etc.) shall be firestopped as specified.

\* END OF SECTION \*