

SECTION 22 00 00 - PLUMBING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The drawings and the specifications including Section 22 05 00 “Common Work Results for Plumbing” 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. Elevator sump pump systems
 - 11. Firestopping.
 - 12. Rainwater filters.
 - 13. Water pressure booster system.

PART 2 PRODUCTS

2.1 PIPING MATERIALS

- A. Soil and Waste (Sanitary), Rainwater and Vent Piping: Piping shall be Schedule 40 PVC.
- B. Domestic Water Piping:

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1. Pipe sizes larger than 1": Type L hard copper tubing and cast bronze or wrought copper solder fittings.
 2. Pipe sizes 1" and smaller: Uponor AquaPEX, NSF rated, 180°F at 100psi, red (HW), blue (CW) and white (RHW).
- C. Exposed Water and Waste Piping at Fixtures: Schedule 40 PVC with solvent welded joints and deep one piece escutcheon plates at traverse points. Provide cleanout plug at all sink traps.
- D. Solder: Lead-free (ONLY), Englehard Silvabrite 100, 440°F melting point, ASTM B32.
- E. Condensate Piping: Schedule 40 PVC with solvent welded joints.
- F. Underground Cold Water Piping (building entrance, to 10 ft outside of building): ASTM D2737 black polyethylene tubing, 200 psi rated with brass or bronze adapters complete with stainless steel clamps. Coordinate with Civil Documents.
- G. Sprinkler Service Entrance Piping (to 10 ft outside of building): Cement-lined ductile iron, coordinate with Section 211313 - Automatic Fire Protection and Civil Documents.

2.2 GAS PIPING SYSTEM

- A. Rigid Gas Piping: Schedule 40 carbon steel pipe conforming to ASTM 120 or A53, with threaded joints and malleable iron fittings (exposed above grade).
- B. Belowgrade Gas piping: TracPipe PS stainless steel underground gas piping with a polyethylene jacket and a vented polyethylene sleeve and vent tees.
- C. 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.
- D. Flexible Gas Piping: OmegaFlex TracPipe (concealed above grade no joints). Provide appropriate grounding if used.
- E. Gas Pressure Regulators: Maxitrol 325 Series, lever acting, vent limiting device.

2.3 NO HUB COUPLINGS

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

2.4 VALVES

- A. Ball Valves: Copper alloy with stationary seat ring and chromium plated or stainless steel floating ball per Federal Specification WW-V-35B. Blowout proof stem, reinforced

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PTFE seal. Sizes 2" and larger shall have threaded ends. Provide lever handle 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 3/4" hose connection and brass cap.
- D. Fixture Service Stop Valves: Quarter-Turn Ball Valve Stop, Lead-Free, NSF & ANSI compliant, similar to Watts KwikStop.
 - 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. Main Service Entrance Pressure Reducing Valve (PRV): Watts Regulator Model X65BP, 2", 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 100 GPM at a 6 psig pressure drop.

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.

2.6 FIXTURES AND TRIM

- A. Any substitutions to fixtures specified below must be submitted and approved by the Architect during the bid period. Even after review by the Architect, the fixtures will be subject to the normal submittal process and review by the Engineer.
- B. (P-1) Water Closet: Fixture by others, installed by Plumbing Contractor.
- C. (P-2) Lavatory: Fixture by others, installed by Plumbing Contractor.

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- D. (P-3) Tub / Shower: Fixture by others, installed by Plumbing Contractor.
- H. (P-3A) Shower: Fixture by others, installed by Plumbing Contractor.
- J. (P-4) Kitchen Sink: Fixture by others, installed by Plumbing Contractor.
- K. (P-5) Washing Machine Supply and Drain: Water-Tite (IPS Corporation) or approved equal, in-wall concealed supply/drain box, 2" drain with "wide mouth" opening for piped AC condensate, with integral hammer arrestor (ASSE1010) quarter turn valves. Washing Machine Drain Pans: Oatey Model 34051 or Driptide, 28"x30"x1.75"D
- L. (P-6) Icemaker Connection: IPS Water-Tite AB9700HA, ½" outlet, quarter turn ball valve shutoff and water hammer arrestor.

2.7 MISCELLANEOUS EQUIPMENT

- A. Floor Drain (FD): Zurn Z-415B, 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. Floor drains shall have "deep seal" traps and trap primer connection, connect to nearest plumbing fixture.
- B. Floor Drain, wood deck (FD): Zurn FD-2240, cast iron body with steel flange for wood deck mounting with flexible sheet flooring, 3" bottom outlet, nickel top. Floor drains shall have "deep seal" traps and trap primer connection, connect to nearest plumbing fixture.
- C. Heavy Duty Floor Drain (HDFD): Zurn Z-535 heavy duty parking structure drain, square drain with acid resistant, epoxy coated aluminum body with bottom outlet, top membrane clamping collar, anti-ponding slots, sediment bucket and heavy-duty anti-tilt hinged slotted grate with stainless steel hinge pins.
- D. Heavy Duty Floor Cleanout (HDFCO): Zurn Z-1402 non-adjustable floor cleanout with Dura-Coated cast iron body, gas and water tight ABS tapered thread plug and round scoriated cast iron heavy duty secured cover and frame.
- E. Floor/Yard Cleanout (FCO/YCO): Zurn Z-1400 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.
- F. 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.
- G. Vacuum Breaker: Watts Model N36, ¾" size, 20 CFM capacity.

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- H. 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.
- I. Backflow Preventor (BFP): Conforming to AWWA C506, FCCHR-USC Manual Section 10, and UL listed. Types, sizes and capacities scheduled.
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.
 2. 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.
- J. Freezeless Wall Hydrant (FPHB): 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.
- K. 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.
- L. 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.
- M. 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

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- N. Vacuum Breaker: Watts Model N36, 3/4" size, 15 CFM capacity.
- O. 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.
- P. Thermostatic Mixing Valve (TMV): Shall be Powers, Symmons or Leonard, capacities and performance as scheduled with swivel action check-stops, thermometer, shut-off and removable cartridge with strainer. Controller shall consist of a liquid fill thermal motor with bellows mounted out of the water. Finish shall be rough bronze.
- Q. Trap Primer (TP): Zurn Z-1022 Automatic Trap Primer, all bronze body with integral vacuum breaker, non-liming internal operating assembly with gasketed bronze cover, flow-thru design operates on a 2-5psi pressure drop.
- R. Roof Drain (RD):
 - 1. RD-1: Zurn Z-100, 15" Diameter, 4" outlet, or as indicated, cast iron body with combination membrane flashing clamp/gravel guard and low silhouette cast iron dome. Provide with roof sump receiver, underdeck clamp, static extension as required, and line size vertical expansion joint as required due to inflexibility of drainage piping.
 - 2. RD-2: Zurn Z-100, 15" Diameter, 4" outlet, or as indicated, cast iron body with combination membrane flashing clamp/gravel guard and low silhouette cast iron dome. Provide with 2" internal water dam, roof sump receiver, underdeck clamp, static extension as required, and line size vertical expansion joint as required due to inflexibility of drainage piping. RD-2 shall be used for overflow system.
- S. Rainwater Inline Filters: BioClean Model BC-DF6 downspout filter with stainless steel filter cartridge with #40 stainless steel screen, powder coated housing, high flow bypass and hydrocarbon boom, 6" inlet and 6" outlet. Unit shall include 10 year warranty.
- T. 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.
- U. Electronic Thermostatic Mixing Valve (TMV): Shall be Heat-Timer Model ETV Plus "Electronic Tempering Valve" and TMC "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, swivel action check-stops, thermometer, shut-offs and strainer. Controller shall consist of a liquid fill thermal motor with bellows mounted out of the water, UL-listed. Installation shall be per the manufacturers recommendations, complying with ASSE 1017 or CSA B125.3. Furnish with integral check-stops and thermometer. Construction shall be lead-free.

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- V. Trap Primer: Zurn Z-1022-XL Automatic Trap Primer, all bronze body with integral vacuum breaker, non-liming internal operating assembly with gasketed bronze cover.
- W. Elevator Pit Drainage System: Stancor, Inc., Model SE75 "Oil-Minder System", Zoeller or approved equal, 50GPM at 20FT head, 3/4HP, 3600 RPM, 120V, 5A, 2" discharge with check valve, float switch. 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. Provide control panel cable extensions as required for location indicated on drawings. The Code requirement is 50GPM per elevator cab, provide a sump pump per cab or a single unit rate at total GPM required.
- X. Freezeless Roof Hydrants (RH): Woodford Model RHY2-MS, Zurn, Josam, or approved equal, encased, non-freeze, anti-siphon, automatic draining, 3/4" connection. The hydrant shall secure above and below the roof deck. Roof hydrants shall have an integral backflow preventer. Furnish with key-operated padlock. Install per the manufacturers recommendations.
- Y. Freezeless Yard Hydrant: Woodofrd model Y95, Zurn, Josam or approved equal, automatic draining anti-siphon freezeless yard hydrant with tamper-proof hinged door on cast brass box, one-piece variable flow plunger. Provide with automatic draining backflow preventer (model 50HF) with two independent check valves. Bury depth of valve body shall be a minimum of 5ft..
- Z. Hose Bibb (HB): For indoor use only. Woodford model 24, Zurn, Josam or approved equal, anti-siphon, vacuum breaker protected hose bibb with EPDM packing, adjustable packing nut with metal wheel handle.

2.8 WATER HEATING EQUIPMENT

- A. High Efficiency Gas Water Heaters (GWH-#): AO Smith "BTH-250A", Bradford-White, State Industries, 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. Provide thermostatic mixing valve set to 120°F (see TMV spec) to fixtures. Controls shall include a microprocessor based system with LCD display. Provide with condensate neutralization kit.

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
 - 3. Domestic Cold Water
 - 4. Vent Piping
 - 5. Exposed Above-ground Sanitary Drain Piping
 - 6. Gas Piping

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- 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 DOMESTIC WATER PRESSURE BOOSTER (WPB) PUMP

- A. Furnish and install one VC Systems "ECO Series", 2VC-ECO-V-5-252-208 variable speed domestic water booster system, or equal. The system shall be rated for a total capacity of 85 GPM at a system pressure of 75 PSIG when supplied with a minimum suction supply pressure of 40 PSIG and designed for a maximum suction supply pressure of 64 PSIG. The system shall be UL Listed as a packaged pumping system, and shall bear the UL Listed Mark. The system shall be third party certified to NSF 372 (Lead Free).
- B. Pump and Motors: Pumps shall be VC Model V, ductile iron, 304 S/S fitted, end suction centrifugal pumps with 304 stainless steel impeller and stainless steel trim & sleeve. Motor shall be a Baldor or equal C frame, ODP, Premium Efficiency motor for 3500 RPM and suitable for "Inverter Duty". Motors shall be supplied with a 1.15 service factor. Pumps shall be selected for non-overloading service through the entire curve.

The impeller shall be warranted for no less than 5 years from corrosion and defects.
Pumps shall be NSF/ANSI 61 Certified.

1. Pump No. 1: Model 6B2020-5, 85 GPM at 81' TDH with 5HP, 3500 RPM ODP motor.
 2. Pump No.2: Model 6B2020-5, 85 GPM at 81' TDH with 5HP, 3500 RPM ODP motor.
- C. ISOLATION VALVES: Furnish isolation valves on the inlet and outlet of each pump to provide for service of any individual pump without shut-down of entire system. Valves shall be butterfly valves with full lug epoxy coated body, stainless steel stem, EPDM seat and nylon coated ductile iron, bronze, or stainless steel disc for prevention of wear and corrosion control. Each valve shall be supplied with a lever handle and locking plate. Valves rated for 250 PSI working pressure.
- D. CHECK VALVES: Furnish pump check valves of the pilot style, non-slam "quiet" type with cast iron body and bronze trim, plug, stainless steel spring, bushing and seat. Valves shall be 125# flanged, for liquid duty at 240 psi maximum working pressure. Supply one check valve on the discharge of each pump. Basis of design is Cla-Valve 81-12, ANSI/NSF 61 Listed.
- E. THERMAL SAFETY VALVES: Furnish and supply a non-electric, modulating thermal safety valve for the discharge of each pump. This valve shall be of stainless steel construction with stainless steel trim, suitable for 400 psi working pressure. Valve shall be of two piece construction and require no electrical connection. Valve operates from 95 deg. to 105 deg. F.
- F. HEADERS AND PIPING: Furnish and install header pipe of 304 stainless steel, with 150# flanged connections and double ended system connections for field connection in either direction. The entire pumping system shall be flanged design, except for the transition from threaded pumps to the system piping. This transition shall be done with stainless steel nipples and cast iron companion flanges. The system headers shall be sized to match the system piping or a maximum velocity of 10 FPS.
- G. VIBRATION ISOLATION: The pumping system shall be mounted directly on rubber-in-shear vibration mounts and supplied with single sphere flexible connector at each system connection.
- H. CONTROL PANEL: (UL LISTED): Furnish and install one VFD motor control center. The control shall be mounted in a NEMA 4, UL Type 1, powder coated enclosure with door gasket for protection against the pump room environment. Each controller shall be supplied with the following standard features: Minimum SCCR rating 5,000 / 100,000 with class J fuses upstream.
1. Main disconnect switch with door interlocking handle & door lockout
 2. Main, Class J, high speed electronic fuses in accordance with NFPA 70

3. Control power transformer with primary and secondary fusing
4. Automatic and Manual alternation
5. Numbered control terminal strip
6. Low suction pressure alarm & cut-off with T.D. off, automatic reset
7. Low system pressure alarm with T.D., automatic reset
8. High system pressure alarm & cut-off with T.D. off, manual reset
9. Common audible alarm horn with silence pushbutton
10. Common red alarm pilot light & legend
11. Common NO & NC auxiliary dry alarm contacts for remote monitor
12. Panel door mounted HMI with PID control & Modbus interface
13. Dual stainless steel pressure transducers for system & suction pressure
14. 4.3" Color Touch Screen Display
15. All data adjustments provided from the CTS without entering the panel
16. Provide for drop down menu adjustments for primary operator settings

Displays shall display:

- a) System pressure
- b) Suction pressure
- c) Set point pressure
- d) Motor speed (RPM)
- e) Motor output current (AMPS)
- f) Motor output voltage
- g) Drive faults
- h) Active alarm status
- i) Event log in real time, recording up to 100 events & alarms
- j) Full Color Trend Graph for Speed, Suction & Discharge Pressure

I. VARIABLE FREQUENCY DRIVES: (ABB ACH550) Furnish a VFD for each motor, suitable for use with the Baldor or equal motor. The drives shall be a microprocessor controlled PWM output drive for variable torque duty and supplied for the maximum full load amps produced by the motor. The drive shall be Series ACH550, UL Listed, and in a NEMA 1 self contained enclosure. Each drive shall be furnished with a removable, digital keypad, to allow the operator flexibility and control. The keypad shall have a 32 character, English alpha-numeric display. The keypad shall allow the operator to individually control each motor manually from digital keypad, without entering the control panel. Drive must be supplied with input line reactors. The drives shall be mounted external from the control panel to keep heat outside the panel cabinet and extend life cycle of electrical equipment.

J. SEQUENCING AND LOGIC CONTROLS:

1. Logic controller shall contain a logic program that will monitor system operation and add or subtract pumps as required to meet changing demands. Field adjustable time delays shall be provided to prevent false starting of pumps. Controller shall employ cascaded sequence logic to provide smooth transitions and reduce overall pressure disturbance when pumps are added or removed from operation. All start

sequences shall be interlocked using a technique that prevents simultaneous starting or delay time to prevent short cycling of pumps. Stop delay timers shall stop in the reverse order in which they started. Control logic shall prevent multiple pumps from stopping simultaneously.

2. Pressure shall be controlled using a closed loop control strategy. A proportional integral derivative (PID) control algorithm will continuously monitor system pressure, process error, and current operating speed and calculate a new speed that will correct pressure deviations without overshoot. PID control system shall be provided with field configurable outputs, 100ms sampling, advanced PID logic that is adjustable from the operator interface from the panel door. PID functions shall conform to UL, CSA and CSE standards. Flow meters are not acceptable for pump staging, as they cannot detect normal pump wear and adjust as needed, and specified hear. Pump system shall be supplied with "Sleep Mode" when periods of no flow are detected.
- K. OPERATOR INTERFACE: Provide a minimum 4.3" full color touch screen operator interface located on the panel door, and carry a NEMA 4 rating. The operator interface shall provide for all control adjustments without entering the control cabinet. The operator interface shall be password protected to prevent unauthorized access to the control software, but allow the operator to make primary pressure adjustments from the door via drop down menus with instruction screens. The screen shall provide live display of system pressure, suction pressure, current motor speed by percent of speed and the ability to display the status of pumps from 1 to 3 units, and active alarm status. The controller shall allow the operator to monitor attempt to determine NO flow and display system status for Sleep Mode (Lead Pump Shut Down). The "Operator Interface" shall be powered from 24 VDC power supply.
- L. FABRICATION: The pumping system shall be provided as a complete packaged system mounted on a minimum 3" fabricated channel base suitable for mounting directly on vibration isolation without distortion. The system shall be piped, wired and supplied with control tubing to allow field installation with only two system connections, one electrical connection, and one run of tubing to drain for the thermal system. The entire package shall be painted with industrial grade primer and enamel.
- M. TESTING AND START UP: The entire system shall be cleaned and shop coated with industrial shop enamel and run tested prior to shipment. Systems providing hydrostatic pressure test and electrical circuit check will not be acceptable. The control settings shall be set in accordance with specified set points and verified at field start up. The start-up shall be done by a factory authorized representative with report to the owner's representative. The package shall be UL listed as a system for its intended use as required by OSHA and National Electric Code (NEC) Article 90-7.

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- N. Warranty: the pumping system shall be warranted from manufacturing defects and defects in materials and workmanship for a period of 12 months from start up, or 18 months from shipment.
- AA. Approved Manufacturer: VC Systems and Controls (Basis of design)
1. Alternates to basis of design must meet all specifications above to be considered equal. Contractor shall be responsible ensuring submitted products to the engineer meet the above specification and any deviations be noted clearly in submittal.
- O. Submittals: Manufacturer shall include a full submittal with the following cut sheets as a minimum.
1. Cover Page – Showing system manufacturer, type, capacities, pumps, and voltage.
 2. Drawing – Job specific drawing with all critical dimensions and connections.
 3. Pump Data – Pump curve, pump data sheet, and manufacturer.
 4. Valve Data – Data sheets on all isolation valves and check valves and sizes.
 5. Wiring Diagram – Including sequence of operation, connection diagram, complete wiring diagram, and electrical data – MCA, FLA, SCCR, Voltage.
 6. Variable Frequency Drive Data – Include data sheets for drive supplied.
 7. Certifications – UL, ARRA, NSF and Warranty shall be included.
- P. Contractor to provide and install, where shown on the drawings and specified, a water pressure booster system. The system shall be installed with flexible connectors and vibration isolators if max working pressure is under 200 PSI. Vibration isolation and flex connectors shall be supplied by booster system manufacturer. Minimum clearance is 18” around the system and NEC clearance in front of the control panel door.

2.11 ELECTRIC HEAT TRACE SYSTEM

- A. Heat Trace shall be Raychem XL-Trace, Chromalox, Thermon or approved equal, self-regulating heat trace system with nickel plated copper bus wires, tinned copper braid with modified polyolefin or fluoropolymer jacket. Heat trace shall include all required connectors and shall be suitable for use with 20V power. Provide Raychem ACCS-30 monitoring system capable of providing monitoring of the entire system with alarm output. Provide system diagram detailing entire heat trace system with circuit notation keyed to the monitoring system to aid in troubleshooting in the event of component failure.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

- A. Inspection:

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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.

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"

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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.

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

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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 eight (8) 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 *