This master should be used by designers working on Port of Portland construction projects and by designers working for PDX tenants (“Tenants”). Usage notes highlight a few specific editing choices, however the entire section should be evaluated and edited to fit specific project needs.

SECTION 230520 - PIPING SPECIALTIES FOR HVAC PIPING

1. GENERAL
	* + 1. DESCRIPTION
				1. This section describes piping specialties for HVAC piping systems.
			2. RELATED WORK SPECIFIED ELSEWHERE
				1. Section 230529, Hangers and Supports for HVAC Piping and Equipment
				2. Section 230545, Seismic Restraints for HVAC Piping and Equipment
				3. Section 230553, Identification for HVAC Piping and Equipment
				4. Section 230719, HVAC Insulation
				5. Division 26, Electrical
			3. REFERENCES
				1. ASME: American Society of Mechanical Engineers

ASME BPVC: Boiler and Pressure Vessel Code for Unfired Vessels

* + - * 1. IEEE: Institute of Electrical and Electronics Engineers

IEEE Bulletin 515: Standard for the Testing, Design, Installation, and Maintenance of Electrical Resistance Trace Heating for Industrial Applications

* + - * 1. NEC: National Electric Code
			1. SUBMITTALS
				1. For each item specified herein, submit product/material data; shop drawings; operation and maintenance data; as-constructed data; installation, startup, and testing manuals; operation and maintenance manuals; and as-constructed drawings.

Use only if Section 019100, General Commissioning Requirements, is included in the contract.

* + - * 1. For the following items, submit commissioning plans and schedules; checkout, start up, operational, functional and final acceptance test plans, procedures, checklists, and reports; and operation and maintenance training plans.

Heat trace cables and accessories.

Provide calculations for heat trace cable, including power requirements and points of connection.

1. PRODUCTS
	* + 1. SYSTEM SPECIALTIES
				1. Automatic Air Vents:

Acceptable Manufacturers: Amtrol, Armstrong, Spirax/Sarco, or equal.

Description: Water main type, cast brass body, built-in check valve, 1/8-inch I.P.S. top tapping for moisture discharge, 3/4-inch size, 150 psi operating pressure.

* + - * 1. Pressure/Temperature Test Plug:

Acceptable Manufacturers: Petersen Engineering, Inc., Trerice Flow Design, or equal.

General: 1/2-inch N.P.T. fitting to receive either a temperature or pressure probe 1/8‑inch o.d., fitted with a color coded and marked cap with gasket.

Material: Solid brass with valve core of Nordel.

Rating: Minimum 300 psig at 275ºF.

Gauges and Thermometers: Provide two pressure gauge adapters with 1/8-inch o.d. probe and two 5-inch stem pocket test thermometers, 25-125ºF for chilled water, 40‑240ºF for heating water.

* + - 1. STRAINERS
				1. Acceptable Manufacturers:

Armstrong, Spirax/Sarco, Steamflo, Mueller, or equal.

For grooved coupling systems: Victaulic Series 732 or equal.

* + - * 1. Wye Pattern:

Bronze: Bronze body, 2-inch and below screwed, 250 psi, 1/16-inch perforated type 304 stainless steel screen.

Cast Iron: Cast iron body, 2-inch and below screwed, 2 1/2-inch and above flanged, 125 psi, 1/16-inch perforated type 304 stainless screen.

Cast Iron, High Pressure: Cast iron body, 2-inch and below screwed, 2 1/2-inch and above flanged, 250 psi, 1/16-inch perforated type 304 stainless screen.

* + - 1. HEAT TRACE CABLE (FREEZE PROTECTION)
				1. Acceptable Manufacturers: Nelson LT, Chromalox, Thermon, Raychem, or equal.
				2. General:

Provide a complete FM and UL listed heat tracing system to maintain insulated pipes at a fixed set point of 40ºF, including 208-volt, single phase heaters, components, controls and accessories.

Determine pipe heat loss using the standard heat loss equation published in IEEE bulletin 515 and based on specified design conditions with a 10 percent safety factor.

Heater selection and installation shall be based on a heater having a power output equal to or greater than the heat loss at maintain temperature. Selection shall be in accordance with heat tracing manufacturer’s published specifications.

Size breaker based on a heater start up temperature of 32ºF unless otherwise specified.

* + - * 1. Heat Trace Cable:

Low temperature self regulating heaters shall be rated for continuous power-on at 165ºF and for intermittent exposure to 185ºF. The heater shall have a radiation cross-linked semi-conductive heating core extruded continuously over two parallel bus wires. The heating cable shall vary power output inversely with temperature so that power output decreases as pipe temperature increases. Heater construction shall consist of a primary radiation cross-linked dielectric jacket thermally bonded to the heating core, a secondary dielectric jacket extruded over the primary jacket, a tinned copper braid, and fluoropolymer outer jacket. Heaters shall carry a 10-year warranty against factory defects.

Service: Heating hot water and chilled water piping exposed to ambient temperatures of less than or equal to 40ºF and without other means of freeze protection.

Self regulating heater power, splice and tee connections shall include terminal block and silicone power boot to prevent water ingress. End terminations shall use silicone cap.

* + - * 1. Controls:

High temperature heating cable control shall be capable of controlling to a temperature of 25-325ºF in an enclosure appropriate for area classification.

High temperature, self-regulating cable shall operate with the use of thermostats or transformers to control the heating cable.

* + - 1. DIAPHRAGM AND BLADDER EXPANSION TANK SYSTEM (HYDRONIC SYSTEMS)
				1. Acceptable Manufacturers: Amtrol, Bell & Gossett, Armstrong, Wheatley, Taco, or equal.
				2. Expansion Tank: Diaphragm type of welded steel, constructed and stamped in accordance with ASME code for 125 psi working pressure. Support with steel legs or bases for vertical installation, or steel saddles for horizontal installation. Tank shall be pre-charged with compressed air to minimum fill pressures as indicated.
				3. Configure bladder type expansion tanks with a replaceable bladder.
			2. CENTRIFUGAL AIR SEPARATOR
				1. Acceptable Manufacturers: Bell & Gossett “Rolairtrol,” Armstrong, Taco, Amtrol, Wheatley, Spirotherm “Spirovent,” or equal.
				2. Description: Fabricated steel tank, constructed in accordance with ASME Boiler and Pressure Vessel Code for Unfired Vessels, and stamped for 150 psi design pressure, with tangential inlet and outlet connections with internal perforated stainless steel air collector tube, and blowdown connection.
			3. SUCTION DIFFUSERS
				1. Acceptable Manufacturers:

Bell & Gossett, Armstrong, Wheatley, Grundfos, Mueller, or equal.

For Grooved Piping Systems: Victaulic, or equal.

* + - * 1. Description: Angle-type body with inlet straightening vanes and combination orifice cylinder-diffuser-strainer with 3/16-inch diameter openings. Provide inlet vane length equal to 2‑1/2 times pump connection diameter. Provide adjustable support foot to carry the weight of suction piping, drain plug, and pressure gauge tap.
				2. Construction: Cast iron body rated for 175 psig operating pressure at 300ºF. Provide steel inlet vanes on closed systems, stainless steel on open systems and domestic water systems. Provide steel orifice cylinders on closed systems, stainless steel on open systems and domestic water systems. Provide bronze mesh start-up strainers on closed systems and domestic water systems, none on open systems.
				3. Selection: Outlet size shall match pump inlet size. Inlet size shall match pipe size upstream. Maximum of 2 psi drop without start-up strainer.
1. EXECUTION
	* + 1. INSTALLATION
				1. Automatic Air Vents:

Install automatic air vents at high points where air can collect in water systems where indicated. Route drain lines from vent to nearest floor drain.

Install 3/4-inch globe shut-off valve ahead of air vent.

Insulate to prevent condensation on chilled water systems.

* + - * 1. Test Plugs:

Install where indicated and in accordance with the manufacturer’s recommendations.

Insulate to prevent condensation on chilled water systems.

* + - * 1. Strainer:

Provide valved blow off for each strainer of same size as plugs with maximum size of 1 1/2-inch. Pipe blow-off full size and terminate over floor drains.

Insulate strainer as specified in Section 230719.

Insulate blow off valve to prevent condensation on chilled water systems.

Applied Locations: Cast iron wye, chilled and heating water.

* + - * 1. Expansion Tanks:

Except where seismic restraints are required, support with steel rods and brackets from structure or from structural steel stand as required.

Pipe valved to over-floor drain.

* + - * 1. Centrifugal Air Separator:

Except where seismic restraints are required, suspend from structure with steel rods or brackets or support from steel stand as required.

Install in accordance with the manufacturer’s recommendations.

* + - * 1. Suction Diffusers:

Install on inlets of pumps where indicated in accordance with the manufacturer’s recommendations.

Support suction diffuser and piping from same surface as pump base is supported unless shown otherwise. Adjust foot so that pump inlet does not carry any piping weight.

Pipe pressure gauges to gauge port and blow down to drain with ball shut-off valve.

After operating pumps for 7 days, clean strainer and remove startup strainer.

* + - 1. HEAT TAPE (FREEZE PROTECTION)
				1. Provide heat trace on all piping in unheated spaces, as shown on the drawings, to prevent freezing.
				2. Install cable in a straight run(s) and without heat transfer aids. Install in accordance with the manufacturer’s instructions and recommendations and with the NEC.
				3. Heating installation shall include allowances for valves, flanges, and other heat sinks based on the manufacturer’s recommendations.
				4. All circuits shall be protected with 30mA ground fault interruption devices.
				5. Before and after installing thermal insulation, the heater shall be meggered at 500-2500 VDC. Minimum insulation resistance is 20 megohms regardless of heater length.
				6. Install heat trace cable on pipes indicated to maintain a minimum of 35ºF at pipe surface in an ambient temperature of 0ºF. Lay cable parallel on pipe or spiral wrap to maintain adequate temperature as required by pipe size and thermal properties of the pipe insulation to be applied.
				7. Attach heat trace cable to pipe with polyester tape at maximum 1‑foot increments.
				8. Install with temperature sensing element outside of the pipe insulation.
				9. Install thermostat at accessible location adjacent to pipe with a minimum of exposed capillary. Tape capillary to pipe run under insulation to bulb.
				10. Coordinate installation with work specified in Division 26 for adequate electrical service to each thermostat.
				11. Affix an “Electric Traced” label to the outside of the pipe’s thermal insulation on alternating sides at intervals of 5 to 15 feet immediately after the piping has been insulated.

Choose one of the following two articles. Use Commissioning if Section 019100, General Commissioning Requirements, is included in the contract; otherwise use Testing.

* + - 1. COMMISSIONING
				1. Commission the following items:

Heat trace cables and accessories.

* + - 1. TESTING
				1. Check out, start up, and test the following items:

Heat trace cables and accessories.

END OF SECTION 230520