SECTION 23 21 16
HYDRONIC PIPING SPECIALTIES

PART 1 – GENERAL

1.01 WORK INCLUDED

A. The work of this Section shall include, but is not limited to, the following:

1. Air vents
2. Air separators
3. Relief valves
4. Suction diffuser
5. Expansion tanks
6. Ethylene glycol

1.02 RELATED DOCUMENTS

A. Section 23 05 01 – HVAC General Provisions

B. Section 23 05 48 – Vibration and Seismic Controls for HVAC

C. Section 23 09 23 – Building Management System (BMS)

D. Section 23 21 13 – Hydronic Piping

1.03 REFERENCE STANDARDS

Published specifications standards, tests or recommended methods of trade, industry or governmental organizations apply to work in this Section where cited below:

A. ANSI – American National Standards Institute

B. ASME – American Society of Mechanical Engineers

1. Standard for Boiler and Pressure Vessel Code – Sections I through XII

2. ASME DRF U-1 Manufacturer's Data Report for Pressure Vessels – As Required by the Provisions of the ASME Boiler and Pressure Vessel Code Rules, Section VIII, Division 1

C. ASTM – American Society for Testing and Materials

D. NFPA – National Fire Protection Association

1. NFPA 70 National Electrical Code

E. UL – Underwriters Laboratories Inc.

1.04 QUALITY ASSURANCE

A. Comply with the applicable provisions and recommendations of the standards and codes listed in Paragraph 1.03 – Reference Standards, and with the requirements listed in Paragraph 1.02 – Related Documents.

1.05 SUBMITTALS

A. Product Data: Certified manufacturer's latest published data indicating performance data, catalog cuts, model numbers, materials of construction, dimensional information, and pressure rating and pressure drops.

B. Submit ASME Pressure Vessel Forms.

C. Submit manufacturer analysis of installed glycol solution.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Air Vents: Armstrong, Bell & Gossett, Sarco, Hoffman, Amtrol

B. Air Separators: Armstrong, Bell & Gossett, Amtrol

C. Relief Valves: Armstrong, Bell & Gossett, Amtrol, McDonnell Miller, Kunkle

D. Suction Diffusers: Armstrong, Bell & Gossett

E. Expansion Tanks: Armstrong, Bell & Gossett, Amtrol, Taco, Wessels

F. Ethylene Glycol: Dow Chemical Dowtherm SR-1 or Union Carbide Ucartherm

2.02 AIR VENTS

A. Provide air vents with ¾-inch IPS inlet connection and ⅜-inch outlet, suitable for the system and for the system working pressure and temperature. Design vents to eliminate air from the system automatically without permitting the passage of water. Construct vents of brass or semi-steel body, copper float and stainless steel valve parts.

2.03 AIR SEPARATORS

A. In-Line Air Separator: Provide as indicated on the Drawings, a horizontal in-line air separator designed to effectively separate free air in water systems. Construct the air separator of heavy-duty cast iron designed to function satisfactorily at working pressures up to 175 pounds per square inch and liquid temperatures to 300 degrees F. Provide an integral weir designed to decelerate system flow to maximize air separation.

B. Centrifugal Air Separator:

C. Provide as indicated on the Drawings, a centrifugal type air separator. Provide with inlet and outlet connections tangential to the vessel shell. Vessel shell diameter to be minimum three times the nominal inlet/outlet pipe diameter.

1. Provide an internal stainless steel air collector tube with $^{5}/_{32}$-inch diameter perforations and 63 percent open area designed to direct accumulated air to an external air vent via an NPT connection at top of unit.
2. Construct the unit with a removable galvanized steel system strainer with $^{3}/_{16}$-inch diameter perforations and a free area of not less than five times the cross-sectional area of the connecting pipe. Provide a blow-down connection to facilitate routine cleaning of the strainer.
3. Manufacturer shall provide data sheet specifying air collection efficiency and pressure drop at rated flow.
4. Provide a Manufacturer's Data Report for Pressure Vessels, Form U-1 as required by the provisions of the ASME Boiler and Pressure Vessel Code for each air separator.

2.04 RELIEF VALVES

A. Provide diaphragm-operated safety relief valve, ASME labeled, for relieving pressure. Refer to the Drawings for pressure rating of valve and relief setting. Discharge water shall be through NPT connection.

B. Provide valve with a low blow-down differential constructed of bronze or iron body. The valve seat and all moving parts exposed to fluid shall be of non-ferrous material.

2.05 SUCTION DIFFUSER

A. Provide suction diffuser as indicated on the Drawings. Units shall consist of angle type body with straightening vanes and combination diffuser-strainer-orifice cylinder with $^{3}/_{16}$-inch diameter openings. Provide a permanent magnet located within the flow stream and removable for cleaning. Equip the orifice cylinder with a start-up disposable fine mesh strainer. Design orifice cylinder to withstand pressure differential equal to pump shut-off head a free area equal to five times cross-section area of pump suction opening. Straightening vanes shall extend the full length of the orifice cylinder and be replaceable. Provide unit with adjustable support foot to carry weight of suction piping.

2.06 EXPANSION TANKS

A. Provide a replaceable bladder type hydro-pneumatic expansion tank especially designed for use on the services specified. Construct the compression tank of welded steel and equip with a heavy-duty butyl rubber flexible bladder to maintain a separation between the system water and the air cushion. The system water shall be contained within the bladder. Provide with top inlet connection for all water systems. Each tank shall bear an appropriate ASME label for the following minimum working pressures and temperatures:

1. Building Chilled Water: 125 pounds per square inch gauge; 100 degrees F.
2. Building Hot Water: 125 pounds per square inch gauge; 240 degrees F.

B. The minimum total tank and bladder volume shall be as specified on the Drawings. Provide a factory initial charge of 12 pounds per square inch gauge.

C. Provide suitable structural and seismic support as required for each tank as indicated on the Drawings.

D. Provide for each tank, lifting lugs, base ring, drains, charging connections, piping connections, and specialties as required for bladder replacement and as indicated on the

Drawings. Provide one (1) bottle of nitrogen gas and manifold to be used to charge all tanks. Each tank shall have an ASME relief valve set at the appropriate pressure.

E. Provide a UL Listed pressure operated by a brass bourdon tube activating a mercury switch. This switch shall activate a low-pressure alarm as indicated in Section 23 09 00 – Building Management System (BMS). Mercoid Series DA31-153-7 or approved equal.

F. Paint the outside of the tank with a shop coat of approved rust-inhibiting primer after fabrication.

2.07 MANUAL AIR VENT

A. Construct from short vertical section of 2-inch diameter maximum or line size pipe to form air chamber. Provide ⅛-inch brass needle valve at top of chamber.

2.08 ETHYLENE GLYCOL

A. Provide 25 percent ethylene glycol solution. Submit system volume calculation and certification report indicating glycol concentration.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Provide automatic air vents at high points of all piping and as required for removal of air from the system using ¾-inch steel pipe suitable for the pressure service between the main pipe and inlet. Provide ⅜-inch OD hard drawn Type L copper tubing from vent outlet for overflow in case of defective action. Copper tubing shall run into a suitable drain. When vents are located above hung ceilings, connect all vent drains to a common drain main and pipe to nearest sink or floor drain. Provide ¾-inch valve in the inlet line for servicing of automatic air vent. Manual vents may be substituted for automatic vents, at system high points, only as directed by the Architect and where readily accessible.

B. Provide at each heat transfer element supplied with water, not less than one ½-inch manual air vent.

C. Provide manual air vent valves in the piping connections to each hot water heating coil and each chilled water coil (both supply and return where not automatically vented). Provide a soft tempered copper tube pigtail or manual vents so that vent can be discharged into a bucket.

D. Provide relief valves at expansion tanks, pressure tanks and as indicated. Install relief valves in upright position with discharge piped to nearest floor drain.

E. System relief valve capacity shall equal makeup valve capacity. Equipment relief valve capacity shall exceed flow rating of connected equipment. Where one pipe vents several relief valves, cross-section area shall equal sum of individual vent areas.

F. Install suction diffusers on pump inlets with ample space for basket removal. Where pumps are mounted on inertia pads, suction diffuser will be supported with steel pipe section on inertia pad. All other installations, the suction diffuser shall be supported by steel pipe section on a neoprene pad 1-inch thick. Remove start-up strainer after start-up and pipe cleaning has been accepted by Owner.

G. Provide two glycol concentration analysis kits for on-site analysis of glycol system. After charging the system with glycol and circulating for minimum 30 minutes, take glycol sample and send to glycol manufacturer for analysis.

END OF SECTION 23 21 16

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