SECTION 232116 - HYDRONIC PIPING SPECIALTIES

Revise this Section by deleting and inserting text to meet Project-specific requirements.

1. GENERAL
	* + 1. RELATED DOCUMENTS
				1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			2. SUMMARY
				1. Section Includes:

Hydronic specialty valves.

Air-control devices.

Strainers.

Connectors.

* + - 1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Product Data: For each type of product:

Include construction details and material descriptions for hydronic piping specialties.

Include rated capacities, operating characteristics, and furnished specialties and accessories.

Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.

* + - 1. CLOSEOUT SUBMITTALS
				1. Operation and Maintenance Data: For hydronic piping specialties to include in emergency, operation, and maintenance manuals.
			2. MAINTENANCE MATERIAL SUBMITTALS

Retain "Differential Pressure Meter" paragraph below if retaining calibrated-orifice, balancing valves in Part 2.

* + - * 1. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.
			1. QUALITY ASSURANCE
				1. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
				2. Safety Valves and Pressure Vessels: Shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

* + - 1. HYDRONIC SPECIALTY VALVES

MSS SP-122, "Plastic Industrial Ball Valves," is a standard for plastic ball valves. It is not comprehensive and additional data may be required for certain applications. In general, end types and pressure and temperature ratings are required. No applicable standards are available for plastic butterfly or check valves. CPVC piping in this Section is rated for up to 180 deg F (82 deg C). Verify that plastic valves are adequate for operating temperature of piping systems.

* + - * 1. Plastic Ball Valves:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Hayward Flow Control.

IPEX USA LLC.

NIBCO INC.

Approved equivalent.

Body: One-, two-, or three-piece CPVC or PVC to match piping.

Ball: Full-port CPVC or PVC to match piping.

Seats: PTFE.

Seals: EPDM.

End Connections: Socket, union, or flanged.

Handle Style: Tee shape.

CWP Rating: Equal to piping service.

Maximum Operating Temperature: Equal to piping service.

Not all manufacturers comply with the standard in subparagraph below.

Comply with MSS SP-122.

Large plastic butterfly valves may have reduced pressure ratings.

* + - * 1. Plastic Butterfly Valves:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Hayward Flow Control.

IPEX USA LLC.

NIBCO INC.

Approved equivalent.

Body: PVC or CPVC to match piping wafer type for installation between flanges.

Disc: EPDM-coated steel.

Seats: PTFE.

Handle Style: Locking lever.

CWP Rating: Equal to piping service.

Maximum Operating Temperature: Equal to piping service.

* + - * 1. Plastic Check Valves:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Hayward Flow Control.

IPEX USA LLC.

NIBCO INC.

Approved equivalent.

Body: Bronze, ball or plug type with calibrated orifice or venturi.

Ball: Brass or stainless steel.

Plug: Resin.

Seat: PTFE.

End Connections: Threaded or socket.

Pressure Gage Connections: Integral seals for portable differential pressure meter.

Handle Style: Lever, with memory stop to retain set position.

CWP Rating: Minimum 125 psig.

Maximum Operating Temperature: 250 deg F.

* + - * 1. Bronze, Calibrated-Orifice, Balancing Valves:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Armstrong Pumps, Inc.

Bell & Gossett; a Xylem brand.

NIBCO INC.

Approved equivalent.

Body: Bronze, ball or plug type with calibrated orifice or venturi.

Ball: Brass or stainless steel.

Plug: Resin.

Seat: PTFE.

End Connections: Threaded or socket.

Pressure Gage Connections: Integral seals for portable differential pressure meter.

Handle Style: Lever, with memory stop to retain set position.

CWP Rating: Minimum 125 psig.

Maximum Operating Temperature: 250 deg F.

* + - * 1. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Armstrong Pumps, Inc.

Bell & Gossett; a Xylem brand.

NIBCO INC.

Approved equivalent.

Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.

Ball: Brass or stainless steel.

Stem Seals: EPDM O-rings.

Disc: Glass and carbon-filled PTFE.

Seat: PTFE.

End Connections: Flanged or grooved.

Pressure Gage Connections: Integral seals for portable differential pressure meter.

Handle Style: Lever, with memory stop to retain set position.

CWP Rating: Minimum 125 psig.

Maximum Operating Temperature: 250 deg F.

* + - * 1. Diaphragm-Operated, Pressure-Reducing Valves: ASME labeled.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

AMTROL, Inc.

Armstrong Pumps, Inc.

Bell & Gossett; a Xylem brand.

Approved equivalent.

Body: Bronze or brass.

Disc: Glass and carbon-filled PTFE.

Seat: Brass.

Stem Seals: EPDM O-rings.

Diaphragm: EPT.

Low inlet-pressure check valve.

Inlet Strainer: <**Insert materials**>, removable without system shutdown.

Valve Seat and Stem: Noncorrosive.

Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

* + - * 1. Diaphragm-Operated Safety Valves: ASME labeled.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

AMTROL, Inc.

Armstrong Pumps, Inc.

Bell & Gossett; a Xylem brand.

Approved equivalent.

Body: Bronze or brass.

Disc: Glass and carbon-filled PTFE.

Seat: Brass.

Stem Seals: EPDM O-rings.

Diaphragm: EPT.

Wetted, Internal Work Parts: Brass and rubber.

Inlet Strainer: <**Insert materials**>, removable without system shutdown.

Valve Seat and Stem: Noncorrosive.

Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

* + - * 1. Automatic Flow-Control Valves:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Flowcon Americas LLC.

Griswold Controls.

NIBCO INC.

Approved equivalent.

Body: Brass or ferrous metal.

Flow Control Assembly, provide either of the following:

Piston and Spring Assembly: [**Stainless steel] [Corrosion resistant**], tamper proof, self-cleaning, and removable.

Elastomeric Diaphragm and Polyphenylsulfone Orifice Plate: Operating ranges within 2- to 80-psig differential pressure.

Combination Assemblies: Include bronze or brass-alloy ball valve.

Identification Tag: Marked with zone identification, valve number, and flow rate.

Size: Same as pipe in which installed.

Performance: Maintain constant flow within plus or minus 10 percent, regardless of system pressure fluctuations.

Minimum CWP Rating: [**175 psig] [300 psig**].

Maximum Operating Temperature: [**200 deg F] [250 deg F].**

* + - 1. AIR-CONTROL DEVICES

Air vents aid in system filling. Air removal after initial startup is accomplished by air separator or boiler dip-tube.

Leakage from automatic air vents may cause damage to ceilings and other finished surfaces. Manual air vents may be preferred over automatic air vents in finished spaces.

* + - * 1. Manual Air Vents:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

AMTROL, Inc.

Armstrong Pumps, Inc.

Bell & Gossett; a Xylem brand.

Approved equivalent.

Body: Bronze.

Internal Parts: Nonferrous.

Operator: Screwdriver or thumbscrew.

Inlet Connection: NPS 1/2.

Discharge Connection: NPS 1/8.

CWP Rating: 150 psig.

Maximum Operating Temperature: 225 deg F.

* + - * 1. Automatic Air Vents:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

AMTROL, Inc.

Armstrong Pumps, Inc.

Bell & Gossett; a Xylem brand.

Approved equivalent.

Body: Bronze or cast iron.

Internal Parts: Nonferrous.

Operator: Noncorrosive metal float.

Inlet Connection: NPS 1/2.

Discharge Connection: NPS 1/4.

CWP Rating: 150 psig.

Maximum Operating Temperature: 240 deg F.

* + - * 1. High Capacity Air Vents:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

AMTROL, Inc.

Armstrong Pumps, Inc.

Bell & Gossett; a Xylem brand.

Or equal.

Body: Bronze or cast iron.

Internal Parts: Nonferrous.

Operator: Noncorrosive metal float.

Inlet Connection: NPS 1/2.

Discharge Connection: NPS 3/8.

CWP Rating: 150 psig.

Maximum Operating Temperature: 250 deg F.

* + - * 1. Expansion Tanks:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

AMTROL, Inc.

Armstrong Pumps, Inc.

Bell & Gossett; a Xylem brand.

Or equal.

Tank: Welded steel, rated for 125-psig working pressure and 375 deg F maximum operating temperature, with taps in bottom of tank for tank fitting and taps in end of tank for gage glass. Tanks shall be factory tested after taps are fabricated and shall be labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

Air-Control Tank Fitting: Cast-iron body, copper-plated tube, brass vent tube plug, and stainless-steel ball check, 100-gal. unit only; sized for compression-tank diameter. Provide tank fittings for 125-psig working pressure and 250 deg F maximum operating temperature.

Tank Drain Fitting: Brass body, nonferrous internal parts; 125-psig working pressure and 240 deg F maximum operating temperature; constructed to admit air to compression tank, drain water, and close off system.

Gage Glass: Full height with dual manual shutoff valves, [**3/4-inch-] <Insert dimension**> diameter gage glass, and slotted-metal glass guard.

* + - * 1. [**Diaphragm] [Bladder**]-Type ASME Expansion Tanks:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

AMTROL, Inc.

Armstrong Pumps, Inc.

Bell & Gossett; a Xylem brand.

Approved equivalent.

Tank: Welded steel, rated for 125-psig working pressure and 375 deg F maximum operating temperature. Factory test after taps are fabricated and supports installed and are labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

[**Diaphragm] [Bladder**]: Securely sealed into tank to separate air charge from system water to maintain required expansion capacity.

Air-Charge Fittings: Schrader valve, stainless steel with EPDM seats.

* + - * 1. Diaphragm-Type Non-ASME Expansion Tanks:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

AMTROL, Inc.

Armstrong Pumps, Inc.

Bell & Gossett; a Xylem brand.

Or equal.

Tank: Carbon steel, rated for minimum 100-psig working pressure at minimum 200 deg F maximum operating temperature. Non-ASME construction.

Diaphragm: Securely sealed into tank to separate air charge from system water to maintain required expansion capacity.

* + - * 1. Air-Charge Fittings: Schrader valve, stainless steel with EPDM seats.
				2. Coalescing-Type Air and Dirt Separators:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Armstrong Pumps, Inc.

Bell & Gossett; a Xylem brand.

Spirotherm, Inc.

Approved equivalent.

Tank: Fabricated steel tank; ASME constructed and stamped for 125-psig (862-kPa) working pressure and 270 deg F (130 deg C) maximum operating temperature.

Not all manufacturers offer the coalescing mediums listed below. Coordinate with retained manufacturers.

Coalescing Medium: [**Copper] [Stainless steel] <Insert material**>.

Air Vent: Threaded to the top of the separator.

Inline Inlet and Outlet Connections: Threaded for NPS 2 (DN 50) and smaller; Class 150 flanged connections for NPS 2-1/2 (DN 65) and larger.

Blowdown Connection: Threaded to the bottom of the separator.

Size: Match system flow capacity.

* + - * 1. Tangential-Type Air Separators:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

AMTROL, Inc.

Armstrong Pumps, Inc.

Bell & Gossett; a Xylem brand.

Approved equivalent.

Tank: Welded steel; ASME constructed and labeled for 125-psig minimum working pressure and 375 deg F maximum operating temperature.

Air Collector Tube: Perforated stainless steel, constructed to direct released air into expansion tank.

Tangential Inlet and Outlet Connections: Threaded for NPS 2 and smaller; flanged connections for NPS 2-1/2 and larger.

Blowdown Connection: Threaded.

Size: Match system flow capacity.

* + - * 1. In-Line Air Separators:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

AMTROL, Inc.

Armstrong Products, Inc.

Bell & Gossett; a Xylem brand.

Approved equivalent.

Tank: One-piece cast iron with an integral weir constructed to decelerate system flow to maximize air separation.

Maximum Working Pressure: Up to 175 psig.

Maximum Operating Temperature: Up to 300 deg F.

* + - * 1. Air Purgers:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

AMTROL, Inc.

Armstrong Pumps, Inc.

Bell & Gossett; a Xylem brand.

Approved equivalent.

Body: Cast iron with internal baffles that slow the water velocity to separate the air from solution and divert it to the vent for quick removal.

Maximum Working Pressure: 150 psig.

Maximum Operating Temperature: 250 deg F.

* + - 1. STRAINERS
				1. Y-Pattern Strainers:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Keckley Company.

Metraflex Company (The).

WATTS.

Approved equivalent.

Body: ASTM A126, Class B, cast iron with bolted cover and bottom drain connection.

End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.

In "Strainer Screen" subparagraph below, larger mesh numbers have larger passages, thus allowing larger objects to pass.

Strainer Screen: Stainless-steel, [**20] [40] [60**]-mesh strainer, or perforated stainless-steel basket.

CWP Rating: 125 psig.

* + - * 1. Basket Strainers:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Keckley Company.

Metraflex Company (The).

WATTS.

Approved equivalent.

Body: ASTM A126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.

End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.

Strainer Screen: [**40] [60**]-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.

CWP Rating: 125 psig.

* + - * 1. T-Pattern Strainers:

Body: Ductile or malleable iron with removable access coupling and end cap for strainer maintenance.

End Connections: Grooved ends.

Strainer Screen: [**40] [60**]-mesh startup strainer, and perforated stainless-steel basket with 57 percent free area.

CWP Rating: 750 psig.

* + - 1. CONNECTORS

Retain "Stainless-Steel Bellow, Flexible Connectors" paragraph below for small pipe sizes. Allow sufficient length for installation. Where space is limited and for larger piping applications, consider using flexible joints and spherical connectors.

* + - * 1. Stainless-Steel Bellow, Flexible Connectors:

Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.

End Connections: Threaded or flanged to match equipment connected.

Performance: Capable of 3/4-inch misalignment.

CWP Rating: 150 psig.

Maximum Operating Temperature: 250 deg F.

* + - * 1. Spherical, Rubber, Flexible Connectors:

Body: Fiber-reinforced rubber body.

End Connections: Steel flanges drilled to align with Classes 150 and 300 steel flanges.

Performance: Capable of misalignment.

CWP Rating: 150 psig.

Maximum Operating Temperature: 250 deg F.

1. EXECUTION
	* + 1. VALVE APPLICATIONS
				1. Install shut off-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.
				2. Install [**throttling-duty] [calibrated-orifice, balancing**] valves at each branch connection to return main.
				3. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.
				4. Install check valves at each pump discharge and elsewhere as required to control flow direction.
				5. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.
				6. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.
			2. HYDRONIC SPECIALTIES INSTALLATION

Retain one of first two paragraphs below. Leakage from automatic air vents may cause damage to ceilings and other finished surfaces. Air vents aid in system filling. Air removal after initial startup is accomplished by air separator or boiler dip-tube. Manual air vents may be a better solution.

* + - * 1. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.
				2. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Install manual vents at heat-transfer coils and elsewhere as required for air venting.
				3. Install piping from boiler air outlet, air separator, or air purger to expansion tank with a 2 percent upward slope toward tank.

Retain one of first two paragraphs below according to air separator specified in Part 2.

* + - * 1. Install in-line air separators in pump suction. Install drain valve on air separators NPS 2 and larger.
				2. Install tangential air separator in pump suction. Install blowdown piping with gate or full-port ball valve; extend full size to nearest floor drain.

Retain one of two paragraphs below.

* + - * 1. Install expansion tanks above the air separator. Install tank fitting in tank bottom and charge tank. Use manual vent for initial fill to establish proper water level in tanks.

Install tank fittings that are shipped loose.

Support tank from floor or structure above with sufficient strength to carry weight of tank, piping connections, fittings, plus tank full of water. Do not overload building components and structural members.

END OF SECTION 232116