PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Diaphragm/bladder expansion tanks.

B. Air vents.

C. Air separators.

D. Strainers.

E. Suction diffusers.

F. Flexible connectors.

G. Balancing valves.

H. Automatic flow control valves.

I. Radiator valves.

J. Diverting fittings.

K. Relief valves.

L. Combination Piping Packages (Coil Kits).

M. Glycol automatic feed system.

1.02 SUBMITTALS

A. Submit in accordance with Division 01 Submittals and Division 23 General Mechanical Requirements.

B. Product Data: Include rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties and accessories, component sizes, rough-in requirements, service sizes, and finishes.

1. Balancing Valves and Diverting Fittings: Include flow and pressure drop curves based on manufacturer's testing.

C. Water Filtration System: Include piping layout and assembly drawings of cooling tower basin sweeper systems. Include all dimensions, piping, water jets, couplings, valves, pressure gauges, and other components required to assemble the complete sweeper system inside the cooling tower basin.

D. Certificates:

1. Inspection certificates for pressure vessels for compliance with ASTM and ANSI manufacturing standards.
2. Welders' certificates complying with the requirements specified in Article, "Quality Assurance."

E. Manufacturer's installation instructions.

F. Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list for inclusion in Operating and Maintenance manual.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Comply with ASME B31.9 "Building Services Piping" for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label.

C. Fabricate and stamp air separators, air and dirt separators, expansion tanks, and buffer tanks to comply with ASME BPVC-VIII-1.

D. Comply with ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualification" for qualifications for welding processes and operators.

E. Comply with AWWA Standards for governing filter media; American Water Works Association, Current Edition.

F. Hydronic specialties shall be manufactured in plants located in the United States or certified to meet the specified ASTM and ANSI standards.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 - PRODUCTS

2.01 DIAPHRAGM/BLADDER EXPANSION TANKS

A. Manufacturers:

1. American Wheatley.
2. Amtrol, Inc.
3. Armstrong Fluid Technology.
4. Bell & Gossett; Xylem.
5. Caleffi.
6. Grundfos.
7. John Wood Co.
8. Patterson Pump Co.
9. Taco, Inc.
10. Wessels.

B. Construction: Closed, welded carbon steel, tested and stamped in accordance with ASME BPVC-VIII-1; with flexible EPDM diaphragm or bladder sealed into tank, cleaned and prime coated; with tappings for installation of accessories.

1. Pressure rating: As scheduled on the drawings.
2. Maximum operating temperature: 240 degrees F.

C. Accessories: Pressure gauge, air charging fitting, and drain fitting.

2.02 AIR VENTS

A. Manufacturers:

1. American Wheatley.
2. Amtrol, Inc.
3. Armstrong International.
4. Bell & Gossett; Xylem.
5. John Wood Company.
6. Nexus Valves.
7. Spirax Sarco.
8. Taco, Inc.

B. Manual Type: Bronze body and nonferrous internal parts; working pressure as defined by the ANSI fitting class of the system, 225 deg F operating temperature; manually operated with screwdriver or thumbscrew; and having 1/8 inch discharge and inlet connections.

C. Automatic Type: Designed to vent automatically with float principle; bronze body and nonferrous internal parts; working pressure as defined by the ANSI fitting class of the system, 240 deg F operating temperature; and having 1/4 inch discharge connection and 1/2 inch inlet connection.

2.03 AIR SEPARATORS

A. Air and Dirt Coalescing Medium Type:

1. Manufacturers:

a) American Wheatley.
b) Armstrong Fluid Technology.
c) Bell & Gossett; Xylem.
d) Caleffi.
e) Spirotherm.
f) Taco, Inc.
g) Thrush.
h) Wessels.

2. Construction: Closed, welded steel; tested and stamped according to ASME BPVC-VIII-1; with the bottom of the vessel extended for dirt separation with the system connection nozzles equidistant from the top and bottom of the vessel, and flanged connection or removable cover for access to the internal media for maintenance or cleaning.

a) Pressure rating: As scheduled on the drawings.
b) Maximum operating temperature: 270 degrees F.

3. Coalescing Medium: Structured copper or stainless steel medium filling the entire vessel to suppress fluid turbulence and provide air elimination efficiency of 100 percent free air, 100 percent entrained air, and 99.6 percent dissolved air at the installed location.
4. Air Vent: Integral float actuated air vent at the top fitting of tank, threaded to the top of the separator. There shall be no restrictions in the connection from the venting chamber to the vent. Provide side taps with shutoff valve to flush floating dirt or liquids and for quick bleeding of large amounts of air during system fill or refill.
5. Inlet and Outlet Connections: Threaded for 2 inch NPS and smaller; flanged connections for 2-1/2 inch NPS and larger.
6. Blowdown Connection: Bottom connection with threaded shutoff valve.
7. Size: Not to exceed 10 feet per second at the scheduled flow rate.

2.04 STRAINERS

A. Manufacturers:

1. American Wheatley.
2. Armstrong International.
3. Hoffman Specialty; Xylem.
4. Keckley.
5. Metraflex Co.
6. Mueller Steam Specialties.
7. Spirax Sarco.
8. Nexus Valve.

9. Watts Water Technologies.

B. Pressure Rating: Rated for working pressure as defined by the ANSI fitting class of the system.

C. Size 2 inch and Smaller:

1. Body: Bronze, ASTM B62 or forged brass ASTM B283.
2. Ends: Threaded.
3. Cover: Screwed.
4. Screen: Type 304 stainless steel with mesh rating based on the Strainer Schedule in Part 3.

D. Size 2-1/2 inch and Larger:

1. Body: Cast iron, ASTM A126 Class B.
2. Ends: Flanged or grooved.
3. Cover: Bolted.
4. Screen: Type 304 stainless steel with mesh rating based on the Strainer Schedule in Part 3.

2.05 SUCTION DIFFUSERS

A. Manufacturers:

1. American Wheatley.
2. Armstrong Fluid Technology.
3. Bell & Gossett; Xylem.
4. Keckley.
5. PACO; Grundfos Pumps Corp.
6. Patterson Pump Co.
7. Taco, Inc.
8. Victaulic.

B. Construction: Angle pattern, cast-iron body, threaded connections for 2 inch and smaller, flanged connections for 2-1/2 inch and larger.

1. Pressure Rating: As scheduled on the drawings, minimum working pressure as defined by the ANSI fitting class of the system.
2. Maximum operating temperature: 300 degrees F.

C. Accessories:

1. Inlet vanes with length 2-1/2 times pump suction diameter or greater.
2. Cylinder strainer with 3/16 inch diameter openings with total free area equal to or greater than 5 times cross-sectional area of pump suction, designed to withstand pressure differential equal to pump shutoff head. Provide stainless steel strainer in condenser water system.
3. Provide disposable screen (5/32 inch mesh) to fit over cylinder strainer for cleaning during startup procedures.

4. Adjustable foot support, designed to carry weight of suction piping.
5. Blowdown tapping in bottom; gauge tapping in side.

2.06 FLEXIBLE CONNECTORS

A. General: Fabricated from materials suitable for system fluid and that will provide flexible pipe connections.

B. Metal-Type:

1. Manufacturers:

a) American Wheatley.
b) Duraflex.
c) Flex-Hose, Inc.
d) Flexicraft Industries.
e) Flex Pipe USA
f) Hyspan Precision Products.
g) Mason Industries, Inc.
h) Metraflex Co.
i) Twin City Hose.
j) Unaflex, Inc.

2. Construction:

a) Braided Hose: Flanged or threaded to match equipment connection, corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include stainless-steel nipples or flanges, welded to hose.
b) Bellows: Flanged, stainless-steel bellows with woven, flexible, stainless steel, wire-reinforcing protective jacket.

3. Pressure Rating: Minimum working pressure as defined by the ANSI fitting class of the system.
4. Maximum operating temperature: 250 degrees F.
5. Lateral Movement: Capable of accepting 3/4 inch misalignment.

C. Rubber-Type:

1. Manufacturers:

a) American Wheatley.
b) Duraflex.
c) Flex-Hose, Inc.
d) Flexicraft Industries.
e) Flex Pipe USA.
f) General Rubber Corp.
g) Griswold Controls.
h) Hydronic Components Inc.
i) IMI Hydronic Engineering.
j) Mason Industries, Inc.

k) Mercer Rubber Co.
l) Metraflex Co.
m) Nexus Valves
n) Nutech Hydronic Specialty Products
o) Proco Products, Inc.
p) Twin City Hose.
q) Unaflex, Inc.

2. Construction:

a) Braided Hose: Threaded, CPE or EPDM inner tube, stainless steel braid, stainless steel ferrules, brass or steel end connections.
b) Bellows Type: Flanged, fiber-reinforced EPDM rubber body with steel flanges. Do not use control rods.

1) Basis of Design: Mason Industries Type SFDEJ twin sphere connection or equal.

3. Pressure Rating: Minimum working pressure as defined by the ANSI fitting class of the system.
4. Maximum operating temperature: 250 degrees F.
5. Lateral Movement: Capable of accepting 3/4 inch misalignment.

2.07 TRIPLE DUTY VALVES

A. Manufacturers:

1. American Wheatley.
2. Armstrong Fluid Technology.
3. Bell & Gossett; Xylem.
4. Keckley.
5. PACO; Grundfos Pumps Corp.
6. Taco, Inc.
7. Watts Water Technologies.

B. Construction: Straight or angle pattern, flanged, cast-iron body with bolt-on bonnet, non-slam check valve with spring-loaded bronze disc and seat, stainless steel stem, and calibrated adjustment permitting flow regulation.

1. Pressure Rating: Minimum working pressure as defined by the ANSI fitting class of the system.
2. Maximum operating temperature: 300 degrees F.

2.08 BALANCING VALVES

A. Manufacturers:

1. American Wheatley.
2. Armstrong Fluid Technology.
3. Bell & Gossett; Xylem.
4. Caleffi.

5. Griswold Controls.
6. Hays Fluid Controls.
7. Hydronic Components Inc.
8. IMI Hydronic Engineering.
9. Nexus Valve.
10. Nibco Inc.
11. Nutech Hydronic Specialty Products
12. Oventrop.
13. Pro Hydronic Specialties.
14. Taco, Inc.
15. Victaulic Company of America.

B. Construction: Provide balancing valve with fixed orifice flow balancing, flow measurement, and shut-off capabilities, memory stops, and minimum of two differential pressure metering ports.

1. Quarter Turn: Provide ball or butterfly quarter turn style for measurement use in variable flow applications.
2. Full Turn: Provide plug or globe, full or multiple turn style for balancing use in constant flow applications.
3. Size 2 inch and Smaller: Bronze or forged brass body, threaded connections.
4. Size 2-1/2 inches and Larger: Cast iron, carbon steel, or ductile iron body, with flanged or grooved connections.
5. Pressure Rating: Minimum working pressure as defined by the ANSI fitting class of the system.
6. Maximum operating temperature: 250 degrees F.

C. Accessories: Valve shall include integral pointer and calibrated scale to register degree of valve opening, with position indication readout for repeatable regulation and control.

2.09 AUTOMATIC FLOW CONTROL VALVES

A. Manufacturers:

1. Griswold Controls.
2. Hays Fluid Controls.
3. Hydronic Components Inc.
4. IMI Hydronic Engineering.
5. Nexus Valve.
6. Nutech Hydronic Specialty Products.
7. Pro Hydronic Specialties.
8. Victaulic (TA Series).

B. Construction: Bronze or forged brass body with threaded connections for sizes 2 inch and smaller, cast iron or ductile iron body with flanged connections for sizes 2-1/2 inch and larger. Include temperature and pressure test plug on inlet and outlet.

1. Pressure Rating: Minimum working pressure as defined by the ANSI fitting class of the system.
2. Maximum operating temperature: 250 degrees F.

C. Calibration: Control flow within 5 percent of selected rating, over minimum pressure 2 psi through 32 psi.

D. Control Mechanism: Provide stainless steel or nickel-plated, brass piston or regulator cup, operating against stainless steel helical or wave formed spring.

E. Accessories: Metal identification tag with chain for each valve, factory marked with the zone identification, valve model number, and flow rate in GPM.

2.010 RADIATOR VALVES

A. Manufacturers:

1. Armstrong International.
2. ITT Bell & Gossett.
3. Myson, Inc.
4. Oventrop Corporation.

B. Construction: Angle or straight pattern, rising stem, inside screw globe valve for 125 psi working pressure, with bronze body and integral union for screwed connections, renewable composition disc, plastic wheel handle for shut-off service, and lockshield key cap and set screw memory bonnet for balancing service.

2.011 DIVERTING FITTINGS

A. Manufacturers:

1. Amtrol, Inc.
2. Armstrong Fluid Technology.
3. Bell & Gossett; Xylem.
4. Taco, Inc.

B. Constructions: Cast iron body with threaded ends or wrought copper with solder ends, rated for 125 psig working pressure, 250 deg F maximum operating temperature. Indicate flow direction on fitting.

2.012 RELIEF VALVES

A. Manufacturers:

1. American Wheatley.
2. Armstrong International.
3. Bell & Gossett; Xylem.
4. Caleffi.
5. Keckley.

6. Spence Engineering Company, Inc.
7. Spirax Sarco.
8. Watts Water Technologies.

B. Safety Relief Valves: Forged brass, bronze, or cast iron, compatible with the piping system, Teflon seat, brass or stainless steel stem, stainless steel springs, EPDM or rubber diaphragm; designed, manufactured, tested, and labeled in accordance with the requirements of Section IV of the ASME Boiler and Pressure Vessel Code.

C. Combined Pressure/Temperature Relief Valves: Forged brass, bronze, or cast iron, compatible with the piping system, diaphragm operated, with low inlet pressure check valve, inlet strainer removable without system shut-down, and non-corrosive valve seat and stem. Provide with fast fill feature for filling hydronic system. Valve shall be factory-set at operating pressure and have the capability for field adjustment; designed, manufactured, tested, and labeled in accordance with the requirements of Section IV of the ASME Boiler and Pressure Vessel Code.

D. Pressure Rating: Minimum working pressure as defined by the ANSI fitting class of the system.

E. Maximum operating temperature: 250 degrees F.

F. Opening Pressure and Capacity Setpoint: As scheduled on the drawings.

2.013 PRESSURE REDUCING VALVES

A. Manufacturers:

1. American Wheatley.
2. Armstrong International.
3. Bell & Gossett; Xylem.
4. Caleffi.
5. Keckley.
6. Spence Engineering Company, Inc.
7. Watts Water Technologies.

B. Construction: Valve shall be diaphragm operated, cast-iron or forged brass body valve, with low inlet pressure check valve, inlet strainer removable without system shut-down, and non-corrosive valve seat and stem. Select valve size, capacity, and operating pressure to suit system. Valve shall be factory-set at operating pressure and have the capability for field adjustment.

2.014 COMBINATION PIPING PACKAGES (COIL KITS)

A. Combination piping packages are allowed in lieu of individual components specified for hydronic coils and devices containing hydronic coils.

B. Components shall be same size as piping serving the unit as shown on the drawings. Control valves do not need to be same size as piping subject to the sizing requirements set forth in Division 23 "Instrumentation and Control Devices for HVAC."

C. Package shall include the components and shall match layouts specified on the Drawings. Each component of the combination piping package shall meet the specifications for the individual components being combined.

2.015 GLYCOL AUTOMATIC FEED SYSTEM

A. Manufacturers:

1. Bell & Gossett; Xylem.
2. John Wood Company.
3. Wessels Company.

B. General: Provide a packaged, automatic glycol solution make-up unit complete with the following components and accessories:

1. Structural steel base, primed and enamel painted.
2. Minimum 50 gallon polyethylene solution container with removable lid.
3. Solution level scale.
4. Isolation, check and balance valves, strainer, and expansion tank.
5. Provide pump as scheduled on drawings with magnetic starter, 110 volt, 60 Hz motor and controls, and 1/2 inch system connection.
6. Pressure control and interconnecting piping
7. Automatic pump start on falling system pressure
8. Low level cut-off with 110 volt signal for remote alarm

PART 3 - EXECUTION

3.01 HYDRONIC SPECIALTY APPLICATIONS

A. Reference Division 23 Section "General Duty Valves for HVAC Piping" for general duty valve applications.

B. Air Vents:

1. Manual Type: High points in the system outside of mechanical rooms, at heat transfer coils, and elsewhere as required for system air venting.
2. Automatic Type: Air separator outlets, expansion tank connections, high points in outlet piping of boilers and hot water heat exchangers, and elsewhere as required for system air venting within a mechanical room.

C. Strainers: Inlet of each pressure reducing valve, pump, and elsewhere as indicated. Do not install strainers on the inlet of pumps serving open loop condenser water systems. Provide strainers in open loop condenser water system where shown on the drawings.

D. Suction Diffusers: Install on the pump suction inlet. Do not include strainer in suction diffusers installed on pumps serving open condenser water systems, such as cooling towers. Provide strainers in open loop condenser water system where shown on the drawings.

E. Flexible Connectors:

1. Metal Type: Inlet and discharge connections to pumps (unless otherwise indicated) and other vibration producing equipment.
2. Rubber Type: Inlet and discharge connections to pumps (unless otherwise indicated) and other vibration producing equipment.
3. Omit flexible connectors if replaced by series of three grooved couplings on projects where grooved pipe is used.

F. Triple Duty Valves: Contractor has option to provide triple duty valve in the pump discharge line if lieu of balance and check valves. Shutoff valve is still required even if triple duty valve is used.

G. Balancing Valves:

1. Constant Volume Pumping Systems: Where shown on the drawings and elsewhere as required to facilitate system balancing.
2. Variable Volume Pumping Systems: Where shown on the drawings, sized for the smaller of the pipe size or to have a minimum pressure drop of 1 psig at the design flow rate.

H. Automatic Flow Control Valves: Water source heat pumps.

I. Radiator Valves: Water inlet to radiators.

J. Relief Valves: Where located on the plans and at pressure tanks, hot water generators, low pressure side of reducing valves, heat exchangers, and expansion tanks. Install elsewhere as required by ASME Boiler and Pressure Vessel Code.

K. Pressure Reducing Valves: Hot water generators, and elsewhere as required to regulate system pressure.

3.02 STRAINER SCHEDULE

A. Acceptable strainer types based on fluid and pipe size:

1. Hydronic in Pipes Smaller than 4 inch: Y-Type.
2. Hydronic in Pipes Larger than 4 inch: Y-Type, T-Type, Basket.

B. Acceptable strainer types based on orientation:

1. Horizontal: Y-Type, T-Type, Basket.
2. Vertical: Y-Type, T-Type.

C. Screen Mesh Rating Based on Application:

1. General Piping:

    a) Pipe size 4 inch and smaller: 0.062 inches (12 mesh).
    b) Pipe size larger than 4 inch: 0.125 inch (6 mesh).

2. Upstream of automatic flow control valves: 0.0331 inch (20 mesh).
3. Upstream of brazed plate heat exchangers: 0.0331 inch (20 mesh).
4. Upstream of plate and frame heat exchangers: 0.0787 inch (10 mesh).

3.03 INSTALLATION

A. Install specialties in accordance with manufacturer's instructions.

B. Reference Division 23 Section "Basic Piping Materials and Methods" for general piping installation requirements.

C. Expansion Tanks:

1. Diaphragm/Bladder Tanks:

    a) Install diaphragm/bladder-type expansion tanks on floor or support from structure as indicated on the drawings. Vent and purge air from hydronic system, charge tank with proper air charge to suit system design requirements.
    b) Support tank as detailed on the Drawings. In the absence of details, provide support from the floor or structure above, sufficient for the weight of the tank, piping connections, and fittings, plus weight of water assuming a full tank of water. Do not overload building components and structural members.
    c) Support vertical tanks with steel legs or base; support horizontal tanks with steel saddles.

D. Air Vents:

1. Where large air quantities can accumulate, provide enlarged air collection standpipes.
2. Install manual air vents in piping mains with a tee fitting, 1/2 inch ball valve, threaded nipple, and cap.
3. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.

E. Air Separators:

1. Install with shutoff valves on the inlet and outlet piping.
2. Install automatic air vent at air outlet and run piping to floor drain.
3. Install in-line air separators with drain valve on units 2 inch and larger.
4. Install combination air and dirt separator blowdown piping with gate valve; extend to nearest drain.
5. Install air and air/dirt separators on floor or support from structure as indicated on the drawings.

6. Support tank as detailed on the Drawings. In the absence of details, provide support from the floor or structure above, sufficient for the weight of the tank, piping connections, and fittings, plus weight of water assuming a full tank of water. Do not overload building components and structural members.

F. Strainers:

1. Provide valved drain and hose connection on strainer blowdown connection for strainers 2 inch and larger.

G. Suction Diffusers:

1. Adjust foot support to carry weight of suction diffuser. Install nipple and ball valve in blowdown connection.

H. Triple Duty Valves:

1. Install triple duty valves with stem in upward position. Allow clearance above stem for check mechanism removal.

I. Relief Valves:

1. Adjust relief valve setpoint as noted on the drawings.
2. Pipe relief valve outlet to nearest floor drain.
3. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.

J. Glycol Automatic Feed System.

1. Clean and flush glycol system before adding glycol solution. Perform tests determining strength of glycol and water solution and submit written test results. Reference Section 23 25 00 - HVAC Water Treatment.
2. Feed glycol solution to system through make-up line with pressure regulator, venting system high points.

3.04 STARTUP

A. Reference Division 23 Section Hydronic Piping for general startup requirements.

B. Start up and commissioning of water filtration unit shall be performed by a factory authorized representative.

C. Start up and commissioning of glycol makeup unit shall be performed by a factory authorized representative.

D. Remove temporary strainer after cleaning system.

3.05 TRAINING

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain water filtration equipment and/or glycol makeup equipment.

B. Training for Owner’s personnel shall include but not be limited to:

1. Overview of the system and /or equipment as it relates to the facility as a whole.
2. Operation and maintenance procedures and schedules related to startup and shutdown, troubleshooting, servicing, preventive maintenance and appropriate operator intervention.

C. Review manufacturer’s safety data sheets for handling of chemicals.

D. Review data in maintenance manuals, especially data on recommended parts inventory and supply sources and on availability of parts and service. Refer to Division 1 and Division 23 Section "General Mechanical Requirements."

E. Schedule at least four hours of training with Owner, through Architect, with at least seven days' advance notice.

F. Certification: Contractor shall submit to the Engineer a certification letter stating that the Owner’s designated representative has been trained as specified herein. Letter shall include date, time, attendees and subject of training. The certification letter shall be signed by the Contractor and the Owner’s representative indicating agreement that the training has been provided.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK