

SECTION 23 21 16 - HYDRONIC SPECIALTIES

PART I – GENERAL

1.1 SECTION INCLUDES

- A. Wye Strainers
- B. Basket Strainers
- C. Pump Suction Diffusers
- D. Flexible Pipe Connectors
- E. Safety Relief Valves
- F. Air/Dirt Separators
- G. Expansion Tanks
- H. Hydronic Fill Units

Note: Specifications for Bag Type Bypass Filters provided in *Section 23 25 10 – Fluid Filtration*.

1.2 RELATED SECTIONS

- A. *23 21 13 - Hydronic Piping*
- B. *23 25 10 – Fluid Filtration*
- C. *23 09 13 - Instrumentation and Control Devices for HVAC*
- D. *23 07 19 - HVAC Piping Insulation*
- E. *23 07 16 – HVAC Equipment Insulation*

1.3 REFERENCES

- A. *ASME B31.9 – Building Services Piping*
- B. Applicable *ASME* codes and standards
- C. *International Mechanical Code*

1.4 QUALITY ASSURANCE

- A. Products and execution shall be in compliance with applicable codes and standards including those referenced above in paragraph entitled *REFERENCES*.
- B. Installation, start-up and operation shall be in compliance with Manufacturer's recommendations and IOM.

1.5 SUBMITTALS

- A. Strainers and suction diffusers: Type, materials of construction, temperature/pressure rating, strainer screen mesh size.
- B. Flexible pipe connectors: Type, materials of construction, temperature/pressure rating, size/length, allowable offset.
- C. Safety relief valves: Type, design, materials of construction, temperature/pressure rating, size, capacity.
- D. Air/dirt separators: Type/design, features, materials of construction, temperature/pressure rating, performance.

- E. Expansion tanks: Type, materials of construction, temperature/pressure rating, acceptance volume.
- F. Hydronic fill unit:
 - 1. Full unit description including accessories
 - 2. Dimensional data, capacities, materials of construction, shipping weight
 - 3. Detailed pump, motor and control panel componentry
 - 4. Pump performance curve with design operating point indicated
 - 5. Motor characteristics as indicated in schedule
 - a. Phase, voltage, full load amps, efficiency, frequency (Hz.)
 - 6. Wiring diagram
 - 7. Piping diagram
 - 8. Operation and maintenance manual

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING.

- A. Materials and equipment shall be protected from physical damage and weather during transport.
- B. Materials and equipment shall be stored indoors protected from physical damage and exposure to dust and debris.
- C. Materials and equipment shall be protected from physical damage and exposure to dust and debris during construction.

1.7 WARRANTY

- A. Products shall be warranted to be free from defects in material and workmanship for period of one year from date of startup or 18 months from date of delivery, whichever occurs first. Defective product shall be repaired or replaced at no cost to Owner.
- B. Assembled units including hydronic fill unit shall be warranted by manufacturer to be free from defects in material and workmanship for period of one year from date of startup or 18 months from date of delivery, whichever occurs first. Manufacturer shall repair or replace unit at no cost to Owner.
- C. Air/dirt separator shall be warranted by manufacturer to provide specified performance for period of one year from date of startup. Manufacturer shall adjust, repair or replace unit at no cost to Owner.

PART 2 - PRODUCTS

2.1 Y-PATTERN PIPELINE STRAINERS

- A. Size 2" and Smaller, Threaded Bronze Wye Strainer
 - 1. 150 SWP, 200 CWP
 - 2. Cast bronze body
 - 3. 2" and smaller: NPT connections
 - 4. Threaded blow-off connection
 - 5. 20 mesh stainless steel screen
- B. Size 2" and Smaller, Flanged Cast Iron Y-Pattern
 - 1. 250 SWP, 400 CWP, Cast Iron
 - 2. Cast iron body
 - 3. NPT connections

4. Blow-off connection
5. Threaded blow-off connection
6. 20 mesh stainless steel screen

C. Size 2 ½" and Larger, Flanged Cast Iron Y-Pattern

1. 125 SWP, 200 CWP
2. Cast iron body
3. Flanged connections
4. Threaded blow-off connection
5. Size 2 ½" through 4": 1/16" perforated stainless steel screen
6. Size 6" and larger: 1/16" perforated stainless steel screen

D. Size 2 ½" and Larger, Flanged Cast Steel Y-Pattern Strainer

1. Pressure class 150
2. Cast steel body
3. Flanged connections
4. Threaded blow-off connection
5. Size 2 ½" through 4": 1/16" perforated stainless steel screen
6. Size 6" and larger: 1/16" perforated stainless steel screen

2.2 BASKET STRAINERS

A. Size 2" and Smaller, Threaded Bronze Basket Strainer

1. 250 SWP, 400 CWP
2. Cast iron body
3. Bolted cover
4. Threaded drain with plug
5. NPT connections
6. Threaded blow-off connection
7. 20 mesh stainless steel screen

B. Size 2 ½" and Larger, Flanged Cast Iron Basket Strainer

1. 125 SWP, 200 CWP
2. Cast Iron body
3. Flanged connections
4. Threaded blow-off connection
5. Size 2 ½" through 4": 1/16" perforated stainless steel screen
6. Size 6" and larger: 1/16" perforated stainless steel screen

C. Size 2 ½" and Larger, Flanged Cast Steel Basket Strainer

1. Pressure class 150
2. Cast steel body
3. Flanged connections
4. Threaded blow-off connection

5. Size 2 ½" through 4": 1/16" perforated stainless steel screen
6. Size 6" and larger: 1/16" perforated stainless steel screen

2.3 PUMP SUCTION DIFFUSERS

- A. Angle Pattern, Rear Pull-Out
 1. Cast iron body
 2. 175 PSIG working pressure
 3. Temperature rating: 250F
 4. Connections
 - a. Size 2" and smaller: NPT
 - b. Size 2 ½" and larger: Flanged
 5. Full length straightening vanes
 6. Combination strainer-diffuser
 - a. Size 2" and smaller: 20 mesh stainless steel screen
 - b. Size 2 ½" through 4": 1/16 perforated stainless steel screen
 - c. Size 6" and larger: 1/8" perforated stainless steel screen
 7. Removable access cover
 8. Gauge tappings
 9. Adjustable support foot
 10. Disposable startup strainer, fine mesh
 11. Approved manufacturers: Bell & Gossett, Armstrong, Wheatley

2.4 FLEXIBLE PIPE CONNECTORS

- A. Application: Flexible pipe connectors shall be used for spring/inertia base supported pumps applications only. "Hard mounted" pumps shall typically be "hard-piped".
- B. Corrugated braided type connector
 1. Stainless steel inner bellows
 2. Stainless steel braid, single or double braid as required for pressure rating
 3. 200 PSIG working pressure minimum
 4. Connections
 - a. NPT or flanged (flat face) to match pump connections
 5. Length: As required to provide adequate flexibility per manufacturers recommendations
 6. Basis of design: US Hose model USBX
 7. Other approved manufacturers
 - a. Hyspan
 - b. Engineered Flexible Products
 - c. Metraflex

2.5 SAFETY RELIEF VALVES

- A. Diaphragm and spring type
 1. Bronze body, side outlet

2. Lifting lever
3. Brass seat
4. EPDM diaphragm
5. Temperature rating: 250F
8. Rated for 50% glycol solution
9. ASME certified and labeled
10. Pressure and heat capacity shall comply with ASME Pressure Vessel Code
11. BTU rating in excess of maximum heat input
12. Pressure setting as indicated on drawings or in schedule

2.6 AIR/DIRT SEPARATORS

[Note to PSC: It is the intent of the University to provide an in-line air/dirt separator in each closed loop hydronic system in lieu of a traditional centrifugal air separator (e.g. B&G Rolairtrol).]

- A. Coated steel housing
 1. Dimensions established by basis of design product
 2. Pressure rating: 150 PSIG
 3. Temperature rating: 250 degrees F.
 4. Two-piece flanged housing with bottom blow-down connection
 5. Straight-through inlet-outlet design
 6. Pipe connections
 - a. 2" and smaller: NPT
 - b. 2 ½" and larger: Flanged
- B. Engineered coalescing medium
 1. Vertical, cylindrical configuration
 - a. Copper core tubes with continuous wound copper wire medium permanently affixed
 - b. Type 316 stainless steel coalescing elements acceptable if documented and guaranteed on submittal data
 - c. Media shall fill entire vessel
 - d. Perforated steel shapes or tubes, coiled screen or loosely filled rings not acceptable
- B. Proper function
 1. Not reliant upon following:
 - a. Fluid velocity
 - b. Centrifugal action
 - c. Pressure change
- C. Appurtenances
 1. Skim valve
 2. High capacity automatic air vent
- D. Performance

1. Air elimination
 - a. 100% free and entrained air removal
 - b. 99% dissolved air removal
2. Particulate removal
 - a. 80% removal of 30 micron particulates within 100 passes
 - b. Final particulate removal to 5 micron

E. Approved Manufacturer: Spirotherm

[Note to PSC: Spirotherm is the only unit that offers all essential design elements. Viable competitors' products have been evaluated either hands-on or via photographs of actual unit cutaways. Some units use the equivalent of "scrap iron" to serve as the coalescing media. Thrush appears to be second-best but a distant second. As stated in the spec above, perforated steel shapes or tubes, coiled screen or loosely filled rings not acceptable. This describes the competition.]

2.7 AUTOMATIC AIR VENTS

A. Dry vent type

1. Rated 150 PSIG at 250F degrees
2. Brass, stainless steel, non-ferrous materials of construction
3. Viton seat
4. ½" NPT inlet and outlet connections
5. 20 year limited warranty
6. Approved Manufacturer: Spirotherm Spirotop

[Note to PSC: As with air-dirt separators, the Spirotherm automatic air vent is far above the competition in quality and long-term functionality. The University installs these products exclusively.]

2.8 EXPANSION TANKS

A. Replaceable bladder type, air charged

1. Floor mounted
2. Welded steel shell, painted
3. Full acceptance volume
4. ASME rated, stamped
5. 125 PSIG working pressure
6. Flanged bladder access opening
7. NPT pipe and drain connections
8. Heavy duty butyl rubber bladder
9. Operating temperature: 240F
10. Rated for 50% glycol solution
11. Schrader air charging valve
12. Approved manufacturers
 - a. Bell and Gossett
 - b. Wessels
 - c. Armstrong

- d. Amtrol
- e. Taco

2.9 HYDRONIC FILL UNITS, PORTABLE

[Note to PSC: For many years the installation of permanently mounted fill units has been disallowed. Yet in recent years the University has come to see value in providing units that can readily be made portable if so desired. This specification addresses such equipment.]

A. Factory packaged unit

1. Readily portable with standard hand truck
2. Non-metallic cabinet; completely enclosed
3. Steel structural base frame with corrosion resistant coating
4. Free standing floor supported, unanchored
5. Non-metallic mixing tank
6. Integral air gap compliant with Illinois Plumbing Code
7. Peripheral/regenerative turbine pump
8. Pump suction strainer
9. Suction and discharge isolation valves
10. 120V single phase, 60 Hz
11. Electrical extension cord for connection to wall outlet
12. Packaged controls with low water cut-out
13. Suitable for use with 100% glycol
14. Pump fill pressure: 65 PSIG min.
15. Tank capacity: 40 gallon min.
16. Weight: 200 lb. max.
17. Basis of Design: Armstrong Model GLA

2.10 VENTURI FLOW ELEMENTS

- A. Venturi flow elements shall comply with requirements listed in Section 23 05 19 - Meters and Gauges for HVAC Piping

PART 3 – EXECUTION

3.1 STRAINERS

- A. Wye strainer shall be provided upstream of each control valve and at other locations shown on drawings.
- B. Full port ball valve with nipple and cap shall be provided at blow-off connection.
- C. Wye and basket strainers shall be installed in horizontal piping. Wye strainer may also be installed in vertical piping with downward flow.

3.2 PUMP SUCTION DIFFUSERS

- A. Support foot shall be installed and adjusted prior to attaching piping.
- B. Startup screen shall be removed and temporarily attached to pump/piping for later inspection

3.3 FLEXIBLE PIPE CONNECTORS

- A. Pump installation shall be complete. Piping shall be in final position, fully supported and properly aligned with pump connections.

- B. Flexible connector shall be installed “straight” and at “neutral” length. Flexible connector shall not be used to accommodate piping misalignment. At a maximum, flexible connector offset, bend radius and length shall not exceed factory recommended limitations.

3.4 SAFETY RELIEF VALVES

- A. Relief valves shall be provided at each location required by Code and at other locations shown on drawings.
- B. Relief valve capacity and pressure setting shall be as specified, shown on drawings and/or indicated in schedule. *[Note to PSC: Provide this information in project documents. Pressure setting shall typically be 50-60 PSIG unless height of building requires higher setting.]*
- C. At a minimum, relief valve capacity and pressure setting shall be in compliance with ASME Pressure Vessel Code.
- D. Full size discharge piping shall be extended from relief valve outlet to floor.

3.5 AIR/DIRT SEPARATORS

- A. One air/dirt separator shall be provided for each closed loop hydronic system. *[Note to PSC: Show in drawings.]*
- B. For hot water heating applications, air/dirt separator shall be installed in-line between hot water heat exchanger (hot water convertor) and pump suction connection. Blow-down piping shall connect to system immediately upstream of bypass bag filter as shown in *Drawing 23 21 00-1. [Note to PSC: Indicate in project drawings.]*
- C. For chilled water cooling applications air/dirt separator shall be installed in return main upstream of chiller (not applicable to systems served by central chilled water system).
- D. Air/dirt separator shall be supported indirectly via hangers supporting adjacent piping.
- E. Full size piping shall be provided from bottom blow-down valve to floor drain or as shown on drawings. Pipe union or flanged connection shall be provided near valve.

3.6 AUTOMATIC AIR VENTS

- A. Automatic air vents shall be used for initial system filling and startup only.
- B. ½” ball valve with NPT connections shall be provided between hydronic system connection and air vent.
 - 1. Valve shall satisfy specifications provided in *23 21 13 – Hydronic Piping.*
- C. Copper tubing shall be connected to vent outlet and extended to drain location identified by PSV. Such requirement may be deleted in part or in whole at discretion of PSV and Owner.

3.7 EXPANSION TANKS

- A. Reinforced concrete curb shall be provided, 4” minimum height. Curb shall be firmly anchored into concrete floor. Tank shall be firmly anchored to curb.
- B. Tank piping and instrumentation shall comply with drawings.
- C. Air charge shall be adjusted as follows:
 - 1. Ensure system fluid is room temperature.
 - 2. Ensure all air is vented from system.
 - 3. Close valve between expansion tank and system.
 - 4. Open (to atmosphere) vent/drain valve at expansion tank.
 - 5. Adjust air pressure to design pressure indicated on drawings or in schedule. If not provided, determine as follows:
 - a. Full height of system above tank plus 10-20 ft., (convert to PSIG).

[Note to PSC: Provide pressure setting on drawings or in schedule.]

6. Close drain/vent valve at tank.
7. Open valve between expansion tank and system.

3.8 HYDRONIC FILL UNITS

- A. One hydronic fill unit shall be provided for each closed loop hydronic system. Base curb not required. Unit shall not be anchored. [Note to PSC: Show unit on drawings as appropriate.]
- B. Fill unit shall initially be located near expansion tank for each hydronic system and connected to system fill connection with contractor grade reinforced rubber hose. Standard 3/4" hose connections shall be provided on each end of hose.
- C. Isolation valve shall be kept in closed position while unit is not in operation.
- D. Glycol solution shall be completely flushed from unit after each use.

END OF SECTION **23** 20 16

This section of the *U of I Facilities Standards* establishes minimum requirements only.
It should not be used as a complete specification.