Modify *Section 23 21 13, subsection .03.B and add .03. F* per the following (deletions are shown struck through and additions are double underlined). Remainder of section is unchanged.

23 21 13 Hydronic Piping

.03 Hydronic Specialties

B. Air Eliminator and Dirt Separators
   1. High Performance Coalescing type air eliminator and dirt separators shall be installed in each closed hydronic system.
      a. Pipe size is not a factor and all units should be selected at the point of peak efficiency per the manufacturer's recommendations, typically with entering velocities not to exceed 4 feet per second at specified GPM. Units specifically designed for high velocity systems may have an entering velocity of up to 10 feet per second. Units shall be selected for low to negligible permanent system pressure drop, not to exceed maximum of 3 feet of head.
      b. Air Eliminators shall be capable of removing 100% of the free air, 100% of the entrained air, and up to 99.6% of the dissolved air in the system fluid. Dirt separation shall be at least 80% of all particles 30 micron and larger within 100 passes. Performance shall be third party tested by independent laboratory.
      c. All combination units shall be fabricated steel, rated for a minimum working pressure of 150 psig and temperature of 250°F.
         1) Any units not meeting the exemption criteria for unfired pressure vessels in the PA L&I Boiler and Unfired Pressure Vessel Regulations must be constructed and stamped in accordance with the latest revision of the ASME Boiler and Pressure Vessel Code.
      d. Units shall include an internal bundle of highly durable, superior corrosion resistant, coalescing media filling the entire vessel to suppress turbulence and provide high efficiency. The bundle shall consist an assembly of rigidly constructed vertical tubes of stainless steel or copper wire matrix designed to coalesce microbubbles out of solution and form larger air bubbles that rise to the top of the vessel and to separate dirt particles that collect at the bottom.
      e. Each eliminator shall have a separate venting chamber to prevent system contaminants from harming the float and venting valve operation. At the top of the venting chamber shall be a high capacity, automatic float actuated air venting mechanism with a separate ball isolation valve to enable service of auto air vent without shutting off the main flow.
      f. Units shall include a side tap near the top with a manual ball skim valve to flush floating dirt or liquids and for quick bleeding of large amounts of air during system fill or refill.

g. Separator shall have the vessel extended below the main pipe connections an equal distance for dirt separation with a bottom tap and blow down valve of sufficient size to not easily become blocked. Unit shall be designed such that pressure drop does not increase as the dirt collection area fills.
h. Manufacturers: Subject to compliance with requirements and final review and approval by OPP, manufacturers offering coalescing air and dirt separators include:
    1) Armstrong Pump, DAS series
    2) Bell and Gossett, CRS series
    3) Spirotherm, Inc, Spirovent Dirt series.
    4) Thrush, AAR-O-Vent series,
    5) Wessels, WVA series,

2. Dirt blowdown connection shall be connected with a tee. The side tap shall be piped to bag filter assembly with isolation valve. During filtered blowdown, system water shall be continuously recirculated back into main piping to minimize fluid loss and addition of makeup water and associated air. The straight through bottom tap shall include blow down valve to allow optional start-up flushing and purging significant dirt in the system without going through the bag filter. Refer to Hydronic Plant Piping Detail.

3. Do not retrofit to air management type systems with existing open (non-diaphragm) type expansion tanks without also upgrading the expansion tank to closed diaphragm type.

F. Guideline Details:
    1. Professional shall carefully review and edit the guideline installation details below, adapting them as needed to achieve application-specific, fully developed details for each project.

Document	Version Date	Description
232113-D01.dwg 232113-D01.pdf	November 9, 2011	Hydronic Plant Piping Schematic: This schematic detail indicates general requirements and arrangement of hydronic specialties associated with each closed hydronic plant system.

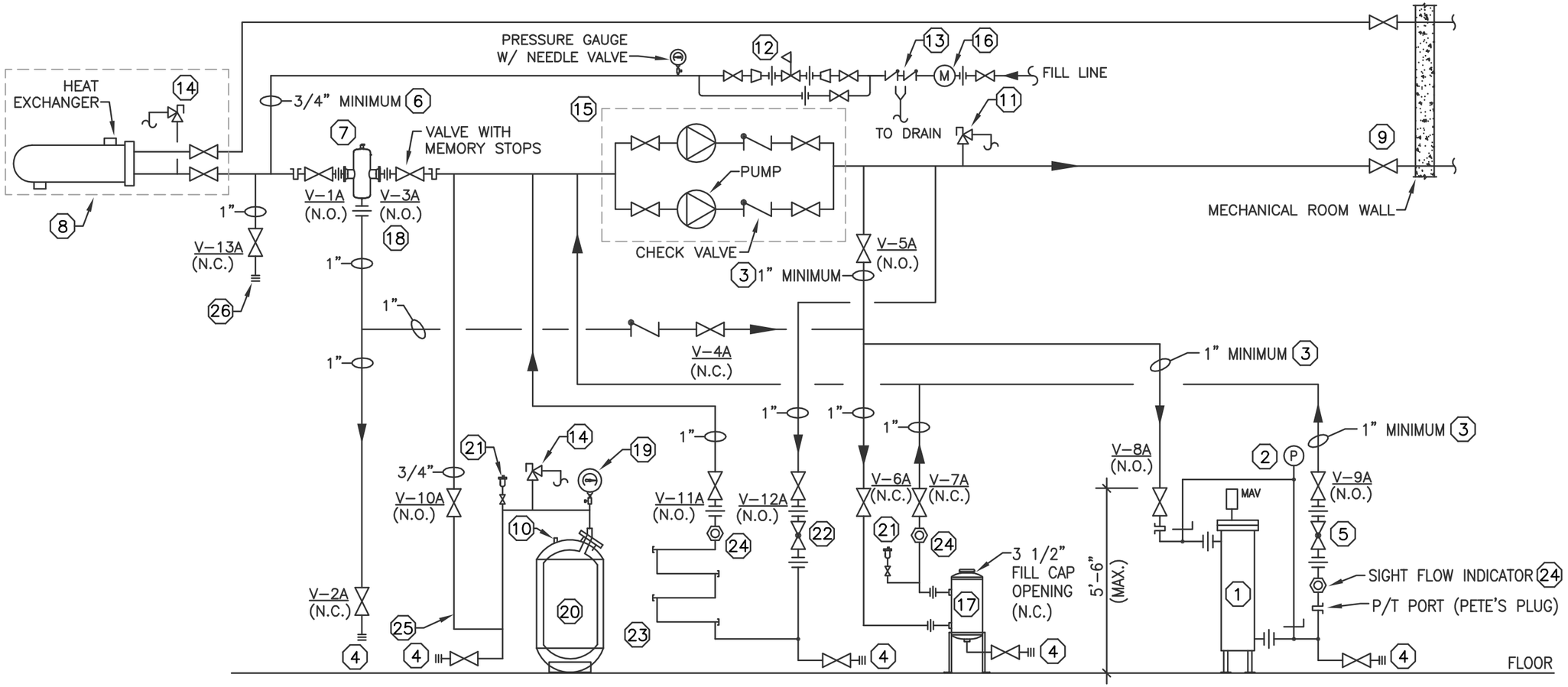
END of revision

Update Commentary:

Section was updated primarily for the following reasons:

1) *To achieve better continuous operating performance of closed systems by improving air and dirt removal method.*
2) *To keep system pressure drop low with full system flow dirt separation.*
3) *To allow blowdown through recirculating bag filer assembly to avoiding need for ongoing makeup water and associated addition of dissolved air and losses of chemical treatment and anti-freeze solutions when present.*
4) *To add schematic piping detail for closed hydronic plants.*

NOTE TO DESIGNER: THIS DETAIL IS TO BE APPLIED TO ALL HYDRONIC HEATING OR COOLING SYSTEM DESIGNS. SLIGHT MODIFICATIONS MAY BE REQUIRED FOR INDIVIDUAL APPLICATIONS. EXAMPLES INCLUDE: CAMPUS CHILLED WATER BUILDING HEAT EXCHANGERS, CHILLER(S), BOILER(S), PRIMARY/SECONDARY PUMPING, WATER SOURCE OR GROUND SOURCE HEAT PUMPS, MULTIPLE STEAM HEAT EXCHANGERS, SYSTEMS CONTAINING GLYCOL.



PSU OPP STANDARD DETAIL		
TITLE: HYDRONIC PLANT PIPING SCHEMATIC		DETAIL #: 232113-D01
SCALE: NONE	PAGE #1 OF 2	DATE: 11/9/2011

(1) SIDE STREAM BAG FILTER W/ BOLT-ON TOP. FILTER FLOW RATE FOR A GIVEN SYSTEM SHALL BE THAT REQUIRED TO PROVIDE EIGHT (8) TOTAL WATER SYSTEM VOLUME CHANGES PER DAY. DESIGNER SHALL UTILIZE THE FOLLOWING EQUATION:

BAG FILTER FLOW (GPM) = [(TOTAL SYSTEM VOLUME X 8) / 1440]

FOR SIDESTREAM FLOWS UP TO 25GPM, USE #BFN11 BY FILTER SPECIALIST INC. GASKETS RATED FOR 230°F MINIMUM. CARBON STEEL VESSEL. 30 MICRON BAG FILTER. 1-1/2" FLANGED SIDE INLET AND BOTTOM OUTLET. FOR HIGHER SIDESTREAM FLOW APPLICATIONS, SPECIFY A LARGER BFN SERIES VESSEL. FURNISHED BY OWNER, INSTALLED BY CONTRACTOR.

(2) PRESSURE GAUGE W/ ISOLATION COCKS

(3) SIZE FOR 4 FOOT PER SECOND MAXIMUM VELOCITY AT DESIGN FLOW.

(4) DRAIN VALVE (N.C.) WITH MALE HOSE THREAD END.

(5) FLOW DESIGN MODEL AC COMBINATION BALL VALVE, AUTOFLOW REGULATOR, AND UNION. SIZE FOR REQUIRED SIDESTREAM BAG FILTER FLOW.

(6) FOR SYSTEMS HAVING A TOTAL VOLUME GREATER THAN 500 GALLONS, INCREASE SIZE OF MAKE-UP SYSTEM COMPONENTS AS NEEDED TO ALLOW FOR A TOTAL SYSTEM FILL TIME OF UNDER 2 HOURS.

(7) SPIROVENT AIR/DIRT SEPARATOR. AUTOMATIC AIR VENT INCLUDED WITH UNIT. SELECT BASED UPON MANUFACTURER'S FLOW VELOCITY GUIDELINES.

(8) SEE TYPICAL PSU HEAT EXCHANGER PIPING DETAIL

(9) WHERE PSU VALVE SPECIFICATION DICTATES THAT BUTTERFLY VALVES MUST BE USED BASED UPON PIPE SIZE, PROVIDE HIGH PERFORMANCE BUTTERFLY VALVES ONLY WHERE PIPING EXITS MECHANICAL ROOM. ALL OTHERS IN HOT WATER SYSTEM SHOULD BE STANDARD BUTTERFLY VALVES.

(10) AIR CHARGING VALVE. DRY TANK FILL VALVE PRESSURE (PSIG) IS DETERMINED BY THE FOLLOWING EQUATION:
P=[(0.433 X VERTICAL DISTANCE IN FEET FROM SYSTEM HIGHPOINT DOWN TO TANK CENTERLINE) + 4]

(11) SAFETY PRESSURE RELIEF VALVE – PIPED TO FLOOR DRAIN. SELECT RELIEF VALVE TO PREVENT SYSTEM PRESSURE FROM RISING MORE THAN 10% ABOVE THE MAXIMUM ALLOWABLE WORKING PRESSURE OF THE SYSTEM COMPONENTS, TAKING INTO ACCOUNT THE EFFECT OF STATIC HEAD. NOT REQUIRED AT THIS LOCATION IF SAFETY PRESSURE RELIEF VALVE IS BEING PROVIDED ELSEWHERE IN THE SYSTEM TO MEET PA L&I REQUIREMENTS.

(12) PRESSURE REDUCING VALVE. PRV SETTING (PSIG) IS DETERMINED BY THE FOLLOWING EQUATION:
P=[(0.433 X VERTICAL DISTANCE IN FEET FROM PRV TO SYSTEM HIGHPOINT) + 4]

(13) REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER WITH OPEN AIR GAP

(14) PROVIDE SAFETY PRESSURE RELIEF VALVE AT THIS LOCATION BETWEEN PRESSURE VESSEL AND FIRST ISOLATION VALVE IF PRESSURE VESSEL CAPACITY IS GREATER THAN OR EQUAL TO 120 GALLONS (PA L&I REQUIREMENT). PRESSURE VESSEL MUST BE ASME CERTIFIED IF GREATER THAN OR EQUAL TO 120 GALLON CAPACITY. SELECT RELIEF VALVE TO PREVENT SYSTEM PRESSURE FROM RISING MORE THAN 10% ABOVE THE MAXIMUM ALLOWABLE WORKING PRESSURE OF THE SYSTEM COMPONENTS, TAKING INTO ACCOUNT THE EFFECT OF STATIC HEAD, PIPE TO FLOOR DRAIN.

(15) SEE TYPICAL PSU PUMP PIPING DETAIL

(16) 5/8" NEPTUNE T-10 DIRECT READ WATER METER

(17) CHEMICAL POT FEEDER. NEPTUNE MODEL #DBF-2HP. FURNISHED BY OWNER, INSTALLED BY CONTRACTOR.

(18) SPIROVENT AIR/DIRT SEPARATOR SHOULD BE PERIODICALLY BLOWN DOWN THROUGH THE BAG FILTER FOR ABOUT 10 SECONDS ONCE EVERY 4 WEEKS. THIS SHALL BE ACCOMPLISHED BY FULLY CLOSING V-5A, FULLY OPENING V-4A, AND PARTIALLY CLOSING V-3A UNTIL FLOW IS DETECTED THROUGH THE BAG FILTER SIGHT FLOW INDICATOR. THIS IS THE POINT WHERE THE MEMORY STOPS ON V-3A SHOULD BE TIGHTENED TO PREVENT THE VALVE FROM BEING CLOSED ANY FURTHER IN THE FUTURE. ONCE BLOWN DOWN, THE VALVE POSITIONING DESCRIBED ABOVE SHOULD BE REVERSED.

(19) PRESSURE GAUGE WITH NEEDLE VALVE

(20) EXPANSION TANK (FIXED OR REPLACEABLE BLADDER TYPE)

(21) B&G #87 AUTOMATIC AIR VENT

(22) FLOW DESIGN MODEL AC COMBINATION BALL VALVE, AUTOFLOW REGULATOR, AND UNION. SIZE FOR 2GPM.

(23) COUPON RACK. GE PART #2032806. 304SS, 1"NPT, WITH 4 COUPON HOLDERS.

(24) JOHN C. ERNST CO. LOW PRESSURE, DOUBLE WINDOW, THREADED, BRONZE WITH PADDLE WHEEL INDICATOR. MODEL #138P. MATCH PIPE SIZE.

(25) UNDERSLUNG CONNECTION TO CREATE THERMAL TRAP (12" MIN. DROP)

(26) TAP FOR FUTURE AUTOMATED CHEMICAL INJECTOR

PSU OPP STANDARD DETAIL		
TITLE: HYDRONIC PLANT PIPING SCHEMATIC		DETAIL #: 232113-D01
SCALE: NONE	PAGE #2 OF 2	DATE: 11/9/2011