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SECTION 23 21 23_HYDRONIC PIPING SYSTEMS ABOVE GRADE

PART 1 GENERAL

1.1 SUMMARY

This standard includes hydronic piping requirements for both chilled water and heating hot water at buildings either served by district heating or standalone.

The intent of these standards are to provide input to the design team on the University's preference of manufacturers, design, equipment options and quality assurance to maintain the longevity of its assets.

1.2 REFERENCES

1.2.1 Common Work for HVAC Systems 23 05 00

1.2.2 Common Requirements for HVAC Systems 23 05 01

1.2.3 Identification of HVAC Piping & Equipment 23 05 53

1.2.4 HVAC Insulation 23 07 00

1.2.5 Hydronic Piping Systems Below Grade 23 22 23.2

1.2.6 Hydronic Pumps 23 22 23.13

1.2.7 Utility Metering Design Guidelines 25 05 00

1.3 DESIGN REQUIREMENTS

1.3.1. All vents, air release valves, balancing valves and drains shall be shown on drawings. Drain valves shall be included at main shut off valves, at the branch shut-off valves, low points, bases of vertical risers and at all terminal equipment. Manual and auto air vents shall be included at all high points in the hydronic systems and have full port ball valves to isolate for ease of replacement. All drain valves shall be full port ball valves with hose end connection.

1.3.2. Risers shall have isolation valves between each floor and at each floor branch. All take offs from mains shall have isolation valves.

1.3.3. Refer to section 25 05 00 Utility Metering Guidelines for requirements regarding metering of all systems related to hydronic piping systems including, but not limited to; Make-up water systems, CHW and HW service(s) entering the building, and sub divided uses within the building.

1.3.4. All branch take offs from piping mains are required to have shut off valves at the take offs so that repairs can be performed on the branch piping without shutting down the system.

1.3.5. All balancing valves shall be manual standalone, not combination type, and have a memory setting feature.

1.3.6. All hydronic systems shall be variable flow. All hydronic pumps shall have variable frequency drives. Flow through hydronic coils shall be controlled by two way modulating control valves. Consulting engineer is responsible for maintaining pump minimum flow requirements.

1.3.7. Heating water systems shall have water treatment including a chemical bypass feeder. Chemical by-pass feeder piping shall include provisions to temporarily install a side stream media filter.

1.3.8. All hydronic piping utilities entering and exiting a building shall have a double block and bleed valve configuration.

1.3.9. Pipe routed exterior to the building and above grade shall be electrically heat traced with current monitoring through BAS.

1.3.10. Shell and tube heat exchangers shall be used in hydronic heating and cooling systems. The use of plate and frame heat require a variance from the University Energy and Engineering group.

1.3.11. All Equipment shall have isolation valves

1.4 SUBMITTALS

1.4.1 Submit isometric piping fabrication drawings of the following:

A. Air handling unit coil connections, including all related valves and instruments.

B. Heat exchanger connections including all related valves and instruments.

1.5 CLOSE-OUT SUBMITTALS

1.5.1 Balancing report(s)

1.5.2 Hydrostatic Test Report(s)

1.5.3 As-built drawings

1.6 QUALITY ASSURANCE

1.6.1 Verify field measurements prior to fabrication.

1.6.2 Pressure test must comply with ASME B31.9

1.6.3 Pressure test must be witnessed by a representative designated by the University of Delaware.

1.6.4 After completion, flush all hydronic piping systems with clean water until all grease, weld slag and metal filings are removed from system.

1.7 DELIVERY, STORAGE AND HANDLING

1.7.1 Furnish temporary end caps and closures on pipe and fittings. Maintain in place until installation.

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

PART 2 PRODUCTS

2.1. The University of Delaware will entertain all relevant materials for hydronic piping systems.

2.2. If copper tubing is used it must be ASTM B280 Type K hard drawn. All copper fittings shall be wrought copper and comply with ASME B16. All joints larger than 2" shall be brazed.

2.3. If steel pipe is used it must be Schedule 40 or greater

2.4. All fittings shall be threaded, socket weld or butt weld type and Conform to ASME B31.9. All joints larger than 2" diameter shall be welded. All threaded steel pipe less than 2" shall be schedule 80.

2.5. For hydronic piping less than 200 degrees Fahrenheit (including chilled water), all isolation valves 6" and larger shall be resilient seat butterfly valves, tripled sealed, hard backed cartridge seat, lug body, S.S. disc, EPDM seal. Valves shall be ABZ 397. Incoming

services shall utilize ABZ 402-100 high performance butterfly valves with gear operators.

2.6. For hydronic piping less than 200 degrees Fahrenheit (including chilled water), all isolation valves 2-1/2" to 4" shall be flanged three piece full port ball valves with Teflon seats and stainless steel ball and trim.

2.7. For hydronic hot water service over 200 degrees Fahrenheit use High Performance butterfly valves such as ABZ 402-100 with Teflon seat/seal, 17/4PH stainless stem, 316SS disc.

2.8. For all hydronic services, isolation valves 2 inches in diameter and smaller shall be two piece, Teflon seated, bronze, full port, w/ stainless steel trim, ball valves. American, Apollo, and Nibco are acceptable valve manufacturers.

2.9. Dirt/air eliminators, when applied, shall be manufactured by Spirotherm. All units (where applicable) shall include a full port ball valve at the bottom blow down connection and be piped to a Rosedale filter (see attachment 1).

2.10. In-line wye strainers shall be manufactured by Spirax Sarco with stainless steel baskets, bolted cover and plugged blow-off.

2.11. All balancing valves shall be Manual type by Tour Andersson, Armstrong and B&G

2.12. Pump check valves shall be silent type, stainless steel trim w/ viton seats.

2.13. By-pass chemical filter feeders shall be 5 gallon, filter feeder type, FTF-5DB equipped w/ 10 micron filter bags, qty ten (10).

2.14. Thermometers to be liquid filled thermometer type, 90 degree angle, w/ well, equal to Trerice, Model AX, range code 41 for chilled water and range code 47 for hot heating water.

2.15. All pressure gages shall be liquid filled. Pressure gages shall be accurate to within plus or minus one percent of range span, stainless steel bourdon-tube system, bronze movement, a dial diameter of 4 to 5" is acceptable when installed 8 feet or less above finished floor, 8" dial diameter when installed higher than 8 feet above finished floor. Each gage connection shall have a full port ball valve for isolation.

2.16. Differential Pressure Indicator, DPI, for by-chemical chemical filter feeder shall be Midwest Instrument, Model 555-10.0.

2.17. Expansion tanks shall be floor mounted pressurized captive air bladder type with replaceable bladder(water in bladder), all welded steel, constructed, tested and stamped in accordance with ASME, and rated for a minimum working pressure of 125 psig. Only vertical expansion tanks with integral steel support stand are acceptable.

Expansion tank shall be supplied with an air-charging fitting and tank drain. Connection to the unit shall have a valve and union for service replacement.

2.18. Heat exchangers for HVAC heating and cooling systems shall be shell and tube constructed, tested and stamped in accordance with ASME and rated for a minimum working pressure of 125 psig. Tubes shall be U-type with ¾" minimum cupro-nickel tubes.

PART 3 EXECUTION

3.1. All expansion loops shall be hard piped.

3.2. Install non-conducting dielectric connections wherever jointing dissimilar metals. All connections shall use dielectric nipples, couplings or insulating flanges. No dielectric unions allowed.

3.3. Install piping to allow for expansion and contraction without stressing pipe, joints and/or connected equipment.

3.4. Wherever possible group piping at common elevations.

3.5. Provide clearance in hangers and from structure to allow for installation of insulation.

3.6. Provide flanged connections to all equipment.

3.7. Ensure, valve handles, test and balance ports are extended beyond the outside surface of the insulation for all services.

3.8. Filter bags on by-pass chemical by-pass feeders will be in place and and maintained by construction @ 10 micron @ 5 psid following cleaning and flushing of piping systems.

3.9. Set point for VFD shall be determined by the balancer placing all coils at peak flow that equals peak load and measuring the most remote coil's differential pressure w/ valves wide open.

3.10. All control valves shall have unions installed before and after the valve to facilitate the repair and ease of removal/replacement.

3.11. All ceiling mounted equipment (VAVs, reheat coils, etc.) shall not be mounted more than 12" above finished ceiling and shall have a "no fly zone" on all sides around the unit for maintenance access.

3.12. No "all-thread" shall be permitted to be used for bolted connections. In the event that a bolt cannot be utilized, a stud of the proper length and strength shall be permitted.

3.13. At no time will it be acceptable to cut bolts to length.

END OF SECTION

ATTACHMENT 1: DIRT/AIR ELIMINATOR PIPING ARRANGEMENT

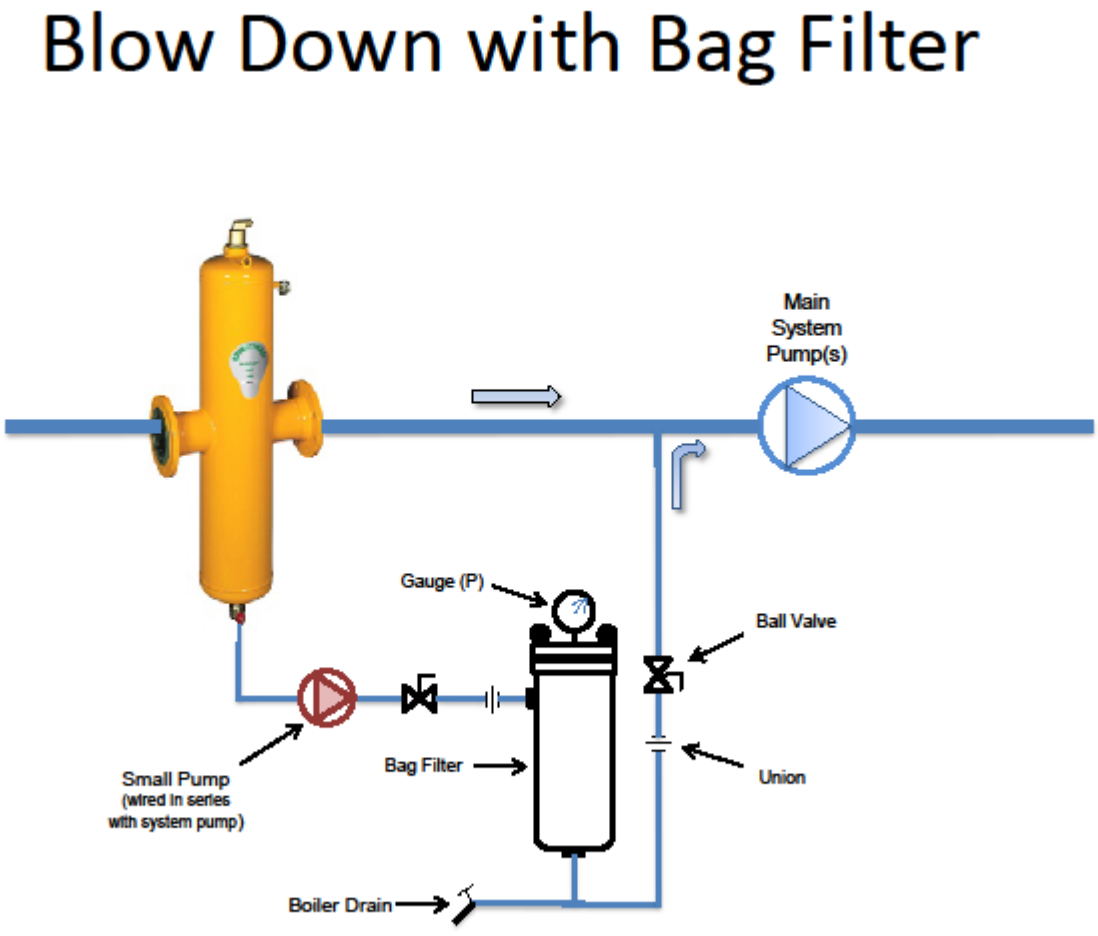
ATTACHMENT 2: AIR/DIRT SEPARATOR DETAIL

ATTACHMENT 3: END SUCTION PUMP DETAIL

ATTACHMENT 4: INLINE PUMP DETAIL

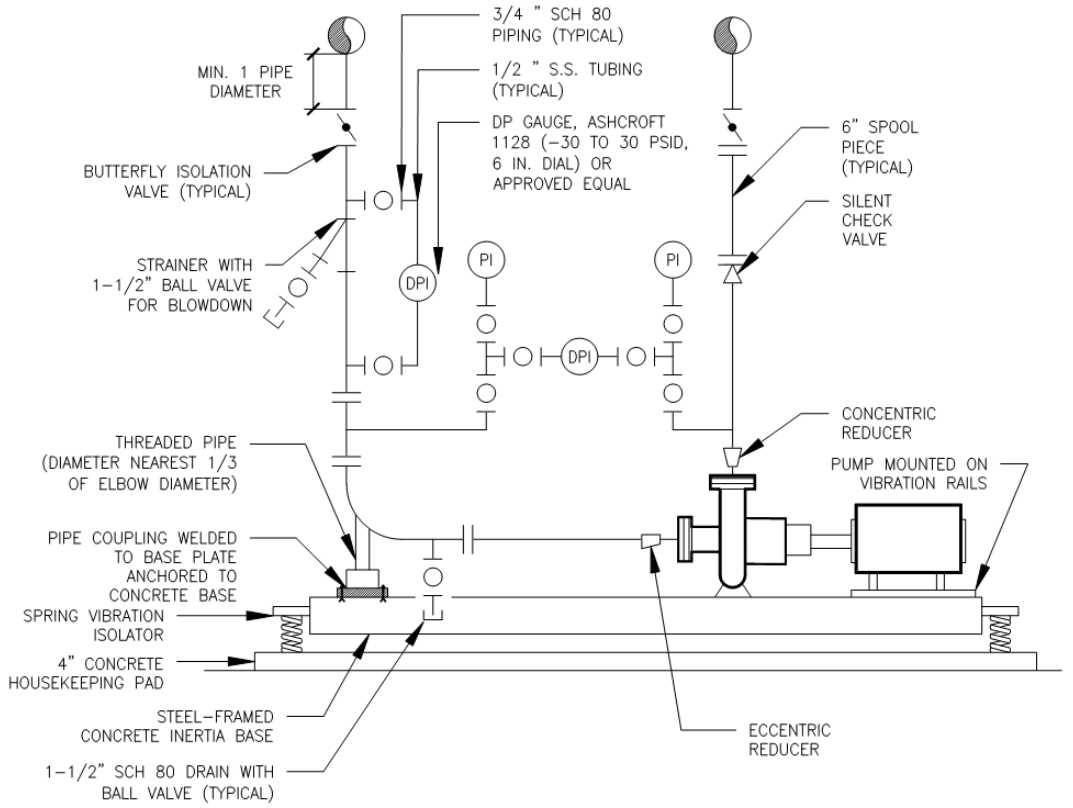
ATTACHMENT 1

DIRT/AIR ELIMINATOR PIPING ARRANGEMENT



NOTES

1. TRIPLE DUTY VALVES WILL NOT BE APPROVED.
2. NO TUBING SMALLER THAN 1/2" AND NO COCKS (VALVES ONLY).
3. PRESSURE GAUGES TO BE INSTALLED ACROSS PUMP AT SAME ELEVATION.
4. ALL TAKEOFFS AND INSTRUMENTATION TO BE WITHIN ISOLATION VALVES.
5. PIPE SIZES AS NOTED ON PLANS AND ONE-LINES.
6. ALL INSTRUMENTATION, VALVE HANDLES, AND GAUGES TO BE INSTALLED TO CLEAR INSULATION.
7. ALL GAUGES SHALL BE ARRANGED TO BE VISIBLE FROM A SINGLE LOCATION.
8. ALL VALVE HANDLES TO BE FULLY OPERABLE THROUGH THEIR FULL RANGE OF MOTION.
9. ALL STRAINERS TO HAVE 5/32" MESH STRAINER BASKET.
10. REFER TO THE FOLLOWING FOR FURTHER INFORMATION:
    A. PRESSURE GAUGE DETAILS
11. ALL COMPONENTS INCLUDING DRAIN VALVES TO BE RATED FOR FULL SYSTEM OPERATING PRESSURE.



END SUCTION PUMP DETAIL

SCALE: NOT TO SCALE

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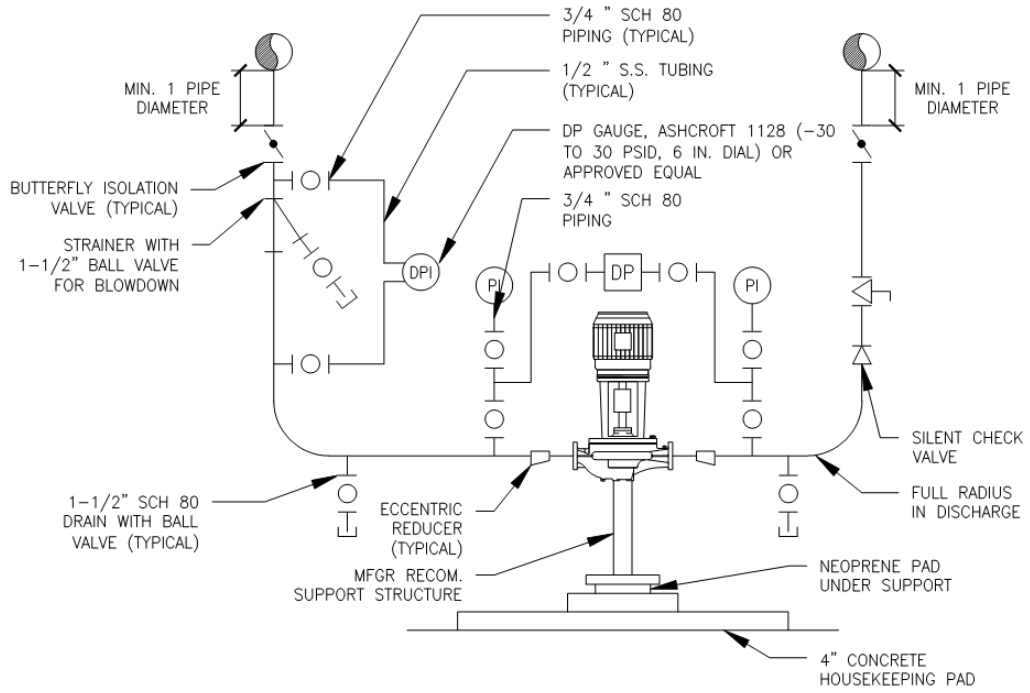

IN-LINE PUMP DETAIL

SCALE: NOT TO SCALE