

1 PART 1 GENERAL**2 DESCRIPTION**

3 The requirements of this section apply to the HVAC heating and cooling water systems. Provide pipe, pipe
4 fittings, pumps, and related items required for complete piping system.

5
6 Related Work: The requirements of Section 23 05 00, Common HVAC Materials and Methods, also apply to
7 this section.

**8
9 QUALITY ASSURANCE**

10 General: ASTM and ANSI Standards are indicated. In addition, special standards are referenced where
11 neither ASTM nor ANSI Standards are applicable.

12
13 Labeling: All piping shall be continuously and legibly labeled on each length as required by codes and
14 standards and including as a minimum, country of origin, manufacturers identification marking, wall thickness
15 designation, and applicable standards and approvals. Fittings shall be labeled as required by the referenced
16 standard.

17
18 Concealed Plastic Piping: No concealed plastic piping inside the building unless approved by Code or
19 Governing Authorities.

20
21 Definitions: Where piping fluid is not indicated in the following paragraphs, provide similar piping materials for
22 similar fluids.

23
24 To assure uniformity and compatibility of piping components in grooved piping systems, all grooved products
25 utilized shall be supplied by a single manufacturer. Grooving tools shall be supplied from the same
26 manufacturer as the grooved components.

27 All castings used for coupling housings, fittings, and valve bodies shall be date stamped for quality
28 assurance and traceability.

29
30 See Commissioning specification for additional requirements.

**31
32 STORAGE AND HANDLING**

33 Provide factory-applied end caps on each length of pipe and tube. Maintain end caps through shipping,
34 storage and handling as required to prevent pipe-end damage and eliminate dirt and moisture from inside of
35 pipe and tube. Protect flanges and fittings from moisture and dirt by inside storage and enclosure, or by
36 packaging with durable, waterproof wrapping.

**37
38 SUBMITTALS**

39 Submit catalog data, construction details, and performance characteristics for all equipment.

40
41 Submit operating and maintenance data.

42 PART 2 PRODUCTS**43 PIPING MATERIALS**

44 Copper Pipe and Tube:

45 Application:

46 Heating water.

47 UPC approved copper fitting with EPDM o-ring.

48 Press fit connection.

49 Viega Pro Press or approved.

50

51 Copper Pipe and Tube:

52 Application:

53 Heating water

54 Pipe: Type L hard temper copper with brazed or soldered joints, ASTM B88. Brazing required for 2"
55 and larger lines.

1 Fittings: Wrought copper solder-joint fittings, ANSI B16.22.

2
3 Plastic Pipe:

4 Application:

5 Indoor heating water where continuously supported per specifications with manufacturers
6 support channel and concealed.

7 Size shall be one nominal pipe size greater than the size on the Drawings.

8 **Limited to PEX lines 2" and smaller. (Revised in Rev 1)**

9 Pipe:

10 Cross-linked polyethylene (PEX) tubing manufactured by PEX-a or Engel Method for closed
11 loop heating service (with oxygen barrier): Tested/listed to ASTM E84, ASTM F876 and
12 F877, and CSA B137.5 listed certified to NSF standards 14 and 61. Rated for 100 PSI at
13 180° F. Wirsbo AQUAPEX or approved.

14 Fittings: ASTM F1960 cold expansion fittings. Provide fittings of the type matching piping
15 manufacture and recommended by the piping manufacturer for the service indicated.

16 Insulate per specification - pre-insulated pipe is not allowed.

17
18 MISCELLANEOUS PIPING MATERIALS/PRODUCTS

19 Insulating (Dielectric) Fittings: Do not use. See Part 3.

20
21 ~~Welding Materials: Provide welding materials as determined by the installer to comply with installation~~
22 ~~requirements. (Revised in Rev 1)~~

23
24 Soldering and Brazing Materials: Provide soldering materials as determined by the installer to comply with
25 installation requirements.

26 Tin-Antimony Solder: ASTM B32, Grade 95TA.

27 Lead-Free Solder: ASTM B32, Grade HB. Harris "Bridgit" approved.

28 Silver Solder: ASTM B32, Grade 96.5TS.

29
30 Gaskets for Flanged Joints: ANSI B16.21; full-faced for cast-iron flanges; raised-face for steel flanges.
31 Pressure and temperature rating required for the service indicated.

32
33 Strainers: "Y-pattern," ductile iron or bronze body (depending on pipe system) rated for pressures indicated
34 with blow-off connection and 20 mesh stainless steel screen or perforated metal basket with 1/16" or 1/8"
35 openings. Basis of Design: Victaulic Style 732.

36
37 Hot Water Valves up to 2": Model #'s listed are Nibco unless noted otherwise. Approved equal are Watts,
38 Hammond, Apollo, and Victualic. **(Revised in Rev 1)**

39 Ball (to 2"):

40 Two-piece, cast bronze body, full port, 600 psi WOG, T/S 585-70.

41 Two-piece, forged brass body, standard port, 300 psi, Victaulic Series P589.

42 Check: Bronze or ductile iron body, spring-assisted swing check, 300 psi WOG, T/S-413B and F-
43 918B, Grooved body – Victaulic Series 716.

44 **Butterfly: Ductile iron body, electroless-nickel coated ductile iron aluminum bronze disc, 300**
45 **psi WOG, pressure responsive elastomer seat, and stainless steel stem that is offset from the**
46 **disc centerline to provide complete 360-degree circumferential seating, suitable for water**
47 **temperatures to +250 degrees F. Lugged body – LD-2000, Wafer body – WD-2000. (Added in**
48 **REV-1)**

49
50 HEATING WATER SPECIALTIES

51 Pressurized Precharged Expansion Tank: Precharged diaphragm type hydropneumatic tank with all
52 necessary air elimination fittings. Install with ball valve on piping connection. Amtrol, Taco, Bell & Gossett,
53 Armstrong, Wheatley, Wessels or approved substitute.

54
55 Air Vents: Install at all system high points whether shown or not;

56 At all locations not in mechanical rooms use manual air vents.

57 At mechanical rooms fabricate of 2" diameter or larger pipe at least 12" long. At the high point of
58 each main install an Armstrong No. 1AV autovent, or equivalent Bell & Gossett, Armstrong, Dunham-
59 Bush approved substitute. Route discharge line to over floor sink.

1
2 Flow Control Valve:
3 Install where shown on plans, flow metering fittings complete with quick disconnect, flow meter
4 valves, with safety shut-off valves and with size and series identification tags. Install as
5 recommended by manufacturer, Victaulic, Griswold, Pro-Hydronic Specialties or approved substitute.
6 Valves shall be dynamic flow limiting devices sized to the nearest 0.5 gpm. Stainless steel cartridge
7 and spring with body and ends to match piping system.
8 Unless noted otherwise all flow control valves are flow limiting not balancing valves.
9

10 Circuit Setter and Balancing Valves: Globe style with calibrated handle style balancing fitting with differential
11 pressure taps, brass or bronze body and trim. TA Hydronics STAD Series, or equal Nexus, Wheatley or
12 approved substitute. Valves shall only be used where specifically called out for balance valve, otherwise use
13 flow control valve.
14

15 EXPANSION JOINT

16 Stainless steel bellows type with flanged ends, controlled flexing, internal liner rated at a minimum of 28,000
17 average life cycles. Provide amount of expansion indicated at each joint as shown on Drawings. Carefully
18 align joint and make proper allowance for temperature of pipe at time of installation. Flexonics, Hyspan, or
19 approved substitute.

20 **PART 3 EXECUTION**

21 PIPE INSTALLATION

22 General: Install pipe, tube and fittings in accordance with recognized industry practices. Install each run
23 accurately aligned with a minimum of joints and couplings, but with adequate and accessible unions and
24 flanges for disassembly, maintenance and/or replacement of valves and equipment. Reduce sizes (where
25 indicated) by use of reducing fittings.

26 Unions and flanges for disassembly, maintenance and/or replacement of valves and equipment are
27 not required in installations using grooved joint couplings. (The couplings shall serve as disconnect
28 points.)
29

30 Piping Runs: Route piping close to and parallel with walls, overhead construction, columns and other
31 structural and permanent-enclosure elements of the building (pitched for drainage). If not otherwise indicated,
32 run piping in the shortest route which does not obstruct usable space or block access for servicing the
33 building or equipment and avoid diagonal runs. Wherever possible in finished and occupied spaces, conceal
34 piping from view. Do not encase horizontal runs in solid partitions.
35

36 PIPING JOINTS

37 General: Provide joints of the type indicated in each piping system, and where piping and joint as
38 manufactured form a system, utilize only that manufacturer's material.
39

40 Solder Copper Tube and Fitting Joints: In accordance with recognized industry practice. Cut tube ends
41 squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply solder flux
42 to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in a manner which will
43 draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens. "T-Drill"
44 field formed tees may be utilized where the main is at least two pipe sizes larger than the branch.
45

46 Braze Copper Tube and Fitting Joints: Where indicated, in accordance with ANSI/ASME B31.5. Pass a slow
47 stream of dry nitrogen gas through the tubing at all times while brazing to eliminate formation of copper oxide.
48

49 Flanged Joints: Match flanges within piping system, and at connections with valves and equipment. Clean
50 flange faces and install gaskets. Tighten bolts to provide uniform compression of gasket.
51

52 Insulating (Dielectric) Fittings: Where the "joining of ferrous and non-ferrous piping". Use brass valve or
53 brass nipple with length/nominal diameter ratio of 8 or greater rather than dielectric fitting.
54

55 Changes in Direction: Use fittings for all changes in direction. Run lines parallel with building surfaces.
56

57 Line Grades: Pitch steam piping 1" to 40' minimum to low point drips or drains.

1
2 Unions and Flanges: At all equipment to permit dismantling and elsewhere as consistent with good
3 installation practice.

4
5 Expansion: Provide loops, swing joints, anchors, runouts and spring pieces to prevent damage to piping or
6 equipment. Flexible hoses are not allowed.

7
8 Press Fittings: Cold Press Mechanical Joint Fittings shall be installed in accordance with the manufacturer's
9 installation instructions. The protective corrosion coating shall be removed from the outside of the pipe end.
10 The pipe shall be fully inserted into the fitting and the pipe marked at the shoulder of the fitting. The fitting
11 alignment shall be checked against the mark on the pipe to assure the pipe is fully engaged (inserted) in the
12 fitting. The joints shall be pressed using the tool(s) approved by the manufacturer.

13 MISCELLANEOUS PIPING EQUIPMENT

14 Floor, Wall and Ceiling Plates: Chrome plated pressed steel or brass screw locked split plates on all pipe
15 penetrations in finished spaces.

16
17 Strainers: Install in a manner to permit access for cleaning and screen removal and with blow-off valve.

18
19 Valves: Install valves in accordance with Section 23 05 00. Install control valves specified in other division 23
20 sections.

21 EQUIPMENT INSTALLATION

22
23 Installation and Arrangement: Install and arrange as shown on the Drawings. Comply with manufacturer's
24 recommendations for installation connections and start-up.

25
26 Lubrication: Lubricate all moving and rotating parts in accordance with the manufacturer's recommendations
27 prior to start-up.

28
29 Expansion Joint and Compensator Installation: Carefully align joint or compensator and make proper
30 allowance for temperature of pipe at time of installation.

31
32 Air Vents: Conduct 1/4" copper tubing from high end of air chambers to accessible locations and terminate
33 with screwdriver cock. Conduct 1/4" copper tubing from outlets of automatic air vents to floor drains indicated
34 or to the outside when approved by Governing Authorities.

35
36 Mechanical contractor and balancing contractor shall be trained on installation, connection, and balancing
37 procedures by certified representative of differential pressure control valves.

38 CLEANING

39
40 General: Clean all dirt and construction dust and debris from all mechanical piping systems and equipment
41 and leave in a new condition. Touch up paint where necessary.

42 Heating Water Piping Systems:

43
44 Add cleaning chemical in proper concentration to clean system of manufacturing and installation
45 contamination and residue.

46
47 Fill, vent and circulate the system with this solution at design operating temperature. After circulating
48 for four hours, bleed out cleaning solution by the addition of fresh water to the system.

49 Test for pH and add sufficient amount of the cleaning chemical to obtain a pH between 7 and 8.

50 Clean all strainers and remove start-up strainers (from suction diffusers) after the system has
51 operated for one week.

52 TEST

53 General:

54
55 Minimum duration of two hours or longer, as directed for all tests. Furnish report of test observation
56 signed by qualified inspector. Make all tests before applying insulation, backfilling, or otherwise
57 concealing piping or connecting fixtures or equipment. Where part of the system must be tested to
58 avoid concealment before the entire system is complete, test that portion separately, same as for
59 entire system.

1 Provide all necessary temporary equipment for testing, including pump and gauges. Remove control
2 devices before testing and do not use piping system valves to isolate sections where test pressure
3 exceeds valve pressure rating. Fill each section with water and pressurize for the indicated pressure
4 and time.

5 Observe each test section for leakage at end of test period. Test fails if leakage is observed or if
6 pressure drop exceeds 5% of test pressure.
7

8 **Repair:**

9 Repair piping system sections which fail the required piping test by disassembly and re-installation,
10 using new materials to the extent required to overcome leakage. Do not use chemical stop-leak
11 compounds, solder, mastics, or other temporary repair methods.

12 Drain test water from piping systems after testing and repair work has been completed.
13

14 Heating Water Piping: 75 psig hydrostatic for 30 psig systems without loss for four hours.
15

16 Tanks and Equipment: Hydrostatic pressure to 1.5 times operating pressure.
17
18

19 **END OF SECTION**