

**1 PART 1 - GENERAL****2 DESCRIPTION**

3 The requirements of this section apply to the refrigerant piping system connecting refrigeration and HVAC  
4 equipment specified in other sections of these specifications. Provide pipe, pipe fittings and related items  
5 required for complete piping system.  
6

7 Related Work: The requirements of Section 23 05 00, Common HVAC Materials and Methods, also apply to  
8 this section.  
9

**10 QUALITY ASSURANCE**

11 General: ASTM, and ANSI Standards are indicated. In addition, special standards are referenced where  
12 neither ASTM nor ANSI Standards are applicable. Comply with federal and local regulations regarding the  
13 handling of refrigerant.  
14

15 Labeling: All piping shall be continuously and legibly labeled on each length as required by codes and  
16 standards and including as a minimum, country of origin, manufacturer's identification marking, wall thickness  
17 designation, and applicable standards and approvals. Fittings shall be labeled as required by the referenced  
18 standard. Tubular fixture traps shall be stamped with manufacturer's mark and material thickness.  
19

20 Air Conditioning and Refrigeration Equipment Rating: Rated in accordance with ARI certified rating  
21 procedures and bear the ARI label.  
22

23 Installation Contractor: Manufacturer's authorized installation and start-up agency normally engaged and  
24 experienced in air conditioning/refrigeration work and certified in the handling of refrigerant.  
25

26 See Commissioning specification for additional requirements.  
27

**28 SUBMITTALS**

29 Submit catalog data, construction details, and performance characteristics for each type and size of  
30 refrigeration equipment.  
31

32 Submit operating and maintenance data.  
33

34 Provide routing and size of refrigerant lines with all traps fittings and devices shown.  
35

**36 STORAGE AND HANDLING**

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

**41 PART 2 - PRODUCTS****42 PIPING MATERIALS**

43 Copper Pipe and Tube:

44 Application: Refrigerant.

45 Pipe: ASTM B280. Type ACR hard temper straight length copper with soldered joints. Cleaned and  
46 sealed at the factory.

47 Refrigerant Fittings: ANSI/ASME B31.5 or SAE J 513-F, "Refrigeration Tube Fittings." Where  
48 conflicts occur, B31.5 shall govern.  
49

50 Copper Pipe and Tube:

51 Application: Refrigerant.

52 Pipe: ASTM B280. Type ACR soft drawn copper with soldered joints or joint style that matches the  
53 cooling equipment. Cleaned and sealed at the factory.  
54

**55 MISCELLANEOUS PIPING MATERIALS/PRODUCTS**

1 Brazing Materials: Provide brazing filler rod and flux materials as determined by the installer to comply with  
2 installation requirements.

3  
4 Gaskets for Flanged Joints: ANSI B16.21 with pressure and temperature rating required for the service  
5 indicated.

### 6 7 REFRIGERATION SPECIALTIES

8 General: Provide the following equipment where they are not a part of the factory installed equipment  
9 accessories. Select equipment for operation with the refrigerant being utilized and for the pressure and  
10 temperature conditions indicated. Sporlan, Alco, Henry, Detroit, or as listed for each equipment.

11  
12 Thermostatic Expansion Valve: Capacity matched for the system, angle or straight through pattern external  
13 equalizer, brass body complete with capillary and remote sensing bulb.

14  
15 Solenoid Valves: For installation in liquid, suction and/or hot gas circuit as indicated. Brass body,  
16 replaceable coil of voltage indicated.

17  
18 Liquid and Moisture Indicators: Moisture and liquid indicator installed after the liquid line filter dryer.

19  
20 Liquid Line Filter Dryer: Sealed container up to approximately 10 tons of capacity and replaceable desiccant  
21 dryer core and strainer on larger capacity systems.

22  
23 Charging Valves: Quick coupling type connection with removable valve core.

24  
25 Service Valves: Install liquid, suction and discharge line valves, all suitable for refrigerant used and location  
26 in the system, designed so as to be easily packed with pressure on the line and with wing caps that  
27 completely enclose valve stem. Install all purge valves, relief valves or other valves required for safe and  
28 proper operation of the system and as may be required by State or local codes. Detroit, Alco, Sporlan or  
29 Automatic Products approved substitute.

## 30 **PART 3 - EXECUTION**

### 31 PIPE INSTALLATION

32 Air Conditioning Refrigeration Subcontractor: Submit 5 copies of piping diagram for approval. Install all  
33 refrigerant piping, major components and all minor components, such as dehydrator, service valves, etc., and  
34 arrange piping for hot gas bypass for low load operation. Test system, evacuate, charge, start-up and adjust.  
35 Refer to applicable sections of these Specifications for test, evacuation, etc.

36  
37 Piping Runs: Route piping close to and parallel with walls, overhead construction, columns and other  
38 structural and permanent-enclosure elements of the building. If not otherwise indicated, run piping in the  
39 shortest route which does not obstruct usable space or block access for servicing the building or equipment  
40 and avoid diagonal runs. Wherever possible in finished and occupied spaces, conceal piping from view. Do  
41 not encase horizontal runs in solid partitions.

42  
43 Refrigerant Piping:

44 The use of hard drawn or soft drawn is a contractor option. All pipe runs regardless of material shall  
45 be run straight and true. Deviation from straight and true due to the use of soft drawn material is not  
46 allowed.

47 Take special care to keep all tubing clean and dry.

48 Install all refrigerant piping straight and free from kinks and restrictions, properly supported to  
49 minimize vibration. Provide hangers at 5' spacing for 1/2" lines, 6' spacing for 1" lines and 8' spacing  
50 for 1-1/2" and larger lines. Submit complete diagram for approval. Where soft drawn tube is used  
51 reduce support interval by 1'.

52 Comply with the refrigerant piping installation instructions of the refrigeration equipment  
53 manufacturer.

### 54 55 PIPING JOINTS

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

1  
2 Braze Copper Tube and Fitting Joints: Where indicated, in accordance with ANSI/ASME B31.5. Pass a slow  
3 stream of dry nitrogen gas through the tubing at all times while brazing to eliminate formation of copper oxide.

4  
5 Flanged Joints: Match flanges within piping system and at connections with valves and equipment. Clean  
6 flange faces and install gaskets. Tighten bolts to provide uniform compression of gasket.

7  
8 Changes in Direction: Use fittings for all changes in direction. Run lines parallel with building surfaces.

9  
10 Unions and Flanges: At all equipment to permit dismantling and elsewhere as consistent with good  
11 installation practice.

12  
13 Expansion: Provide loops, swing joints, anchors, runouts and spring pieces to prevent damage to piping or  
14 equipment.

#### 15 MISCELLANEOUS PIPING EQUIPMENT

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

18  
19 Filters: Install in a manner to permit access for removal and replacement of filter cartridge.

20  
21 Sleeves: At all penetrations of concrete or masonry construction. PVC, 24 gauge galvanized steel or  
22 Schedule 40 galvanized steel pipe. Fabricate sleeves 1" diameter larger than pipe or insulation. PVC and  
23 sheet metal sleeves at non-structural penetrations only.

24  
25 Sleeve Caulking: Grout insulated pipe with cement mortar or approved waterproof mastic. All caulking or  
26 grouting shall extend full depth of sleeve. Install UL sealing caulk, putty and/or system at all penetrations of  
27 fire rated walls, floors and ceiling.

#### 28 CLEANING

29  
30 General: Clean all dirt and construction dust and debris from all mechanical piping systems and leave in a  
31 new condition. Touch-up paint where necessary.

32  
33 Refrigeration System Piping: If, for any reason, sanitized and sealed-at-the-mill tubing is not used, clean the  
34 tubing as follows:

35  
36 Wipe each tube internally with a dry, lintless cloth followed with a clean lintless cloth saturated with  
37 recommended refrigerant.

38 Repeat until the saturated cloth is not discolored by dirt.

39 Wipe with a clean cloth saturated with compressor oil and squeezed dry.

40 Wipe with a dry, lintless cloth.

#### 41 TEST

42 General:

43  
44 Minimum duration of two hours or longer, as directed for all tests. Furnish report of test observation  
45 signed by qualified inspector. Make all tests before applying insulation, backfilling, or otherwise  
46 concealing piping or connecting fixtures or equipment. Where part of the system must be tested to  
47 avoid concealment before the entire system is complete, test that portion separately, same as for  
48 entire system.

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

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

55  
56 Repair: Repair piping system sections which fail the required piping test by disassembly and re-installation,  
57 using new materials to the extent required to overcome leakage. Do not use chemical stop-leak compounds,  
58 solder, mastics, or other temporary repair methods.

59

1 Refrigerant System:  
2 When the refrigerant connections have been completed, close the compressor suction and discharge  
3 valves (or receiver outlet valve in the case of condensing unit) and test the balance of the system to  
4 near operating pressure with a dry nitrogen.  
5 Carefully test all joints, using soap and water or other sudsing solution. After all joints are tested,  
6 discharge the gas and repair all leaks, then repeat the test with a mixture of nitrogen and R-410A and  
7 a halide torch or an electronic leak detector.  
8 Evacuate the system to remove moisture and non-condensables. Lower the absolute pressure with a  
9 vacuum pump to 1000 microns of mercury. Apply external heat as required to vaporize moisture.  
10 Dehydrate each refrigerant circuit by satisfactory use of a vacuum pump before charging with  
11 refrigerant. Furnish all necessary refrigerant and oil for complete operating charge of the system.  
12 Upon completion of the work of construction, test all refrigeration equipment under normal operating  
13 conditions and leave in operating order. Adjust automatic temperature controls.  
14 After the first 24 hours of operation, measure the pressure drop across the suction filter. If the  
15 pressure drop exceeds 5 pounds per square inch, replace the cartridge with a new one, retesting and  
16 replacing the cartridge and/or adjusting the system as necessary to achieve a pressure drop of less  
17 than 5 pounds per square inch in 24 hours.

18  
19

END OF SECTION