

Part 1 General

1.1 SECTION INCLUDES

- .1 Piping.
- .2 Refrigerant.
- .3 Moisture and liquid indicators.
- .4 Valves.
- .5 Strainers.
- .6 Check valves.
- .7 Pressure relief valves.
- .8 Filter-driers.
- .9 Solenoid valves.
- .10 Expansion valves.
- .11 Receivers.
- .12 Flexible connections.

1.2 RELATED SECTIONS

- .1 Section 25 90 00 - Sequence Of Operation.
- .2 Section 23 07 19 - Piping Insulation.
- .3 Section 23 63 14 - Condensing Units - Air Cooled.
- .4 Section 23 82 16 - Air Coils.

1.3 REFERENCES

- .1 ARI 495 - Refrigerant Liquid Receivers.
- .2 ARI 710 - Liquid-Line Driers.
- .3 ARI 730 - Flow-Capacity Rating and Application of Suction-Line Filters and Filter-Driers
- .4 ARI 750 - Thermostatic Refrigerant Expansion Valves.
- .5 ARI 760 - Solenoid Valves for Use With Volatile Refrigerants.
- .6 ASHRAE 15 - Safety Standard for Refrigeration Systems.
- .7 ASHRAE 34 - Designation and Safety Classification of Refrigerants.
- .8 ASME - SEC 9 - Welding and Brazing Qualifications.

- .9 ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- .10 ASME B16.26 - Cast Copper Alloy Fittings For Flared Copper Tubes.
- .11 ASME B31.5 - Refrigeration Piping and Heat Transfer Components.
- .12 ASME B31.9 - Building Services Piping.
- .13 ASME SEC 8D - Boilers and Pressure Vessels Code - Rules for Construction of Pressure Vessels.
- .14 ASTM A234/A234M - Piping Fittings of Wrought-Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
- .15 ASTM B88 - Seamless Copper Water Tube.
- .16 ASTM B280 - Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
- .17 ASTM F708 - Design and Installation of Rigid Pipe Hangers.
- .18 AWS A5.8 - Filler Metals for Brazing and Braze Welding.
- .19 AWS D1.1 - Structural Welding Code - Steel.
- .20 MSS SP89 – Pipe Hangers and Supports – Selection and Application
- .21 UL 429 - Electrically Operated Valves.

1.4 SYSTEM DESCRIPTION

- .1 Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- .2 Provide pipe hangers and supports to ASTM B31.5 unless indicated otherwise.
- .3 Liquid Indicators:
 - .1 Use line size liquid indicators in main liquid line leaving condenser.
 - .2 If receiver is provided, install in liquid line leaving receiver.
 - .3 Use line size on leaving side of liquid solenoid valves.
- .4 Valves
 - .1 Use service valves on suction and discharge of compressors.
 - .2 Use gauge taps at compressor inlet and outlet.
 - .3 Use gauge taps at hot gas bypass regulators, inlet and outlet.
 - .4 Use check valves on compressor discharge.
 - .5 Use check valves on condenser liquid lines on multiple condenser systems.
- .5 Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.
- .6 Strainers:

- .1 Use line size strainer upstream of each automatic valve.
- .2 Where multiple expansion valves with integral strainers are used, use single main liquid line strainer.
- .3 On steel piping systems, use strainer in suction line.
- .4 Use shut-off valve on each side of strainer.
- .7 Pressure Relief Valves: Use on ASME receivers and pipe to outdoors unless otherwise noted or restricted according to local code requirements.
- .8 Permanent Filter-Driers:
 - .1 Use in low temperature systems.
 - .2 Use in systems utilizing hermetic compressors.
 - .3 Use filter-driers for each solenoid valve.
- .9 Replaceable Cartridge Filter-Driers:
 - .1 Use vertically in liquid line adjacent to receivers.
 - .2 Use filter-driers for each solenoid valve.
- .10 Solenoid Valves:
 - .1 Use in liquid line of systems operating with single pump-out or pump-down compressor control.
 - .2 Use in liquid line of single or multiple evaporator systems.
 - .3 Use in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.
- .11 Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

1.5 SUBMITTALS

- .1 Section 21 05 00: Procedures for submittals.
- .2 Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.
- .3 Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalogue data including load capacity.
- .4 Design Data: Submit design data indicating pipe sizing. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- .5 Test Reports: Indicate results of leak test, acid test.
- .6 Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.
- .7 Submit welder's certification of compliance with ASME SEC 9.

1.6 PROJECT RECORD DOCUMENTS

- .1 Section 21 05 00: Submittals for project closeout.
- .2 Record exact locations of equipment and refrigeration accessories on record drawings.

1.7 OPERATION AND MAINTENANCE DATA

- .1 Section 21 05 00: Submittals for project closeout.
- .2 Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.

1.8 QUALIFICATIONS

- .1 Installer: Company specializing in performing the work of this section with minimum 3 years experience.
- .2 Design piping system under direct supervision of a Professional Engineer experienced in design of this work and licensed at the place where the Project is located.

1.9 REGULATORY REQUIREMENTS

- .1 Conform to ASME B31.9 for installation of piping system.
- .2 Welding Materials and Procedures: Conform to ASME SEC 9 and applicable provincial labour regulations.
- .3 Welders Certification: To ASME SEC 9.
- .4 Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.

1.10 DELIVERY, STORAGE, AND HANDLING

- .1 Section 21 05 00: Transport, handle, store, and protect products.
- .2 Deliver and store piping and specialties in shipping containers with labeling in place.
- .3 Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.
- .4 Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

Part 2 Products

2.1 PIPING

- .1 Copper Tubing: ASTM B280, Type ACR hard drawn.
 - .1 Fittings: ASME B16.22 wrought copper.
 - .2 Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 640 to 805 degrees C (1190 to 1480 degrees F).
- .2 Copper Tubing to 22 mm (7/8 inch) OD: ASTM B88, Type K, annealed.
 - .1 Fittings: ASME B16.26 cast copper.
 - .2 Joints: Flared.
- .3 Pipe Supports and Anchors:
 - .1 Refer to 23 05 29 – Supports and Anchors.

- .4 Refrigerant: ASHRAE 34;
- .5 Refrigerant: Type shall match equipment that the system serves.

2.2 MOISTURE AND LIQUID INDICATORS

- .1 Indicators: Single port type, UL listed, with copper or brass body, flared, sight glass, colour coded paper moisture indicator and plastic cap; maximum working pressure and maximum temperature to match system served.

2.3 FLEXIBLE CONNECTORS

- .1 Corrugated bronze hose with single layer of stainless steel exterior braiding, minimum 230 mm (9 inches) long with copper tube ends; for maximum working pressure 3450 kPa (500 psig).

2.4 VALVES

- .1 Valves and Specialties: seal cap type, brass with Teflon seats
- .2 Check valves: type CK-1 as manufactured by Refrigeration Specialties or equivalent.
- .3 Thermal expansion valves, filter/driers, solenoid valves, moisture indicators: Sporlan. All thermal expansion valves to be provided with external equalizers.

Part 3 Execution

3.1 PREPARATION

- .1 Ream pipe and tube ends. Remove burrs.
- .2 Remove scale and dirt on inside and outside before assembly.
- .3 Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

- .1 Install refrigeration specialties to manufacturer's written instructions.
- .2 A nitrogen purge shall be maintained when soldering all joints. Copper-to-copper joints shall be made with a brazing alloy similar to Sil-Fos. Copper-to-brass joints shall be made with silver solder.
- .3 Main piping fittings for dryers, sight glasses, expansion valves, and controls shall be flare or compression-type fittings.
- .4 Prior to being charged with refrigerant, the system shall be evacuated to 500 microns and held for at least 24 hours under this vacuum.
- .5 Double-suction risers shall be employed on systems with capacity reduction and where required by lift.
- .6 Pre-charged lines are not acceptable.
- .7 Isolation valves shall be provided at all specialties.

- .8 Installations shall be complete with dryers, sight glass, and thermostatically controlled solenoid valves for pump down operations.
- .9 Condensing systems shall be designed for -18°C (0°F) ambient conditions, using variable-frequency fans.
- .10 Refrigerant Suction Lines shall slope a minimum of 1/2" per 10 feet. Slope the pipe in the direction of gas flow (discharge line sloping to the condenser, and suction line sloping towards the compressor).
- .11 Provide a complete refrigeration piping system by a recognized Contractor regularly employed in commercial and industrial refrigeration.
- .12 Size piping equivalent to a maximum of 1.10°C (2°F) temperature drop.
- .13 Size and configure all suction and hot gas piping to ensure oil entertainment under minimum load.
- .14 Refrigeration circuits: provide strainer/driers, sight glasses, moisture indicators, shut-off valves, thermal expansion valves, solenoid valves, receiver, refrigerant, oil, safety accessories, etc.
- .15 Provide all control wiring and motor control interlocks as described on the drawings and as required by the equipment Manufacturer's installation instructions and control schematics to achieve required operating sequences and maximum equipment protection.
- .16 Provide a 100% parts and labour, and loss of refrigerant and oil (by leakage or contamination) warranty for a two-year period after acceptance by the Owner.
- .17 Main piping fittings for dryers, sight glasses, expansion valves, and controls shall be only flare or welded fittings.
- .18 Prior to being charged with refrigerant, the system shall be evacuated to 500 microns and held for at least 24 hours under this vacuum.
- .19 Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.
- .20 Install piping to conserve building space and not interfere with use of space.
- .21 Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.
- .22 Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- .23 Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required.
- .24 Provide clearance for installation of insulation and access to valves and fittings.
- .25 Insulate piping; refer to Section 23 07 19.
- .26 Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.

- .27 Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.
- .28 Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.
- .29 Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.
- .30 Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.
- .31 Fully charge completed system with refrigerant after testing.

END OF SECTION