
SECTION 23 23 00
REFRIGERANT PIPING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Piping.
- B. Moisture and liquid indicators.
- C. Valves.
- D. Strainers.
- E. Pressure regulators.
- F. Pressure relief valves.
- G. Filter-driers.
- H. Solenoid valves.
- I. Expansion valves.
- J. Flexible connections.

1.2 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping.
- B. Section 23 07 19 - HVAC Piping Insulation.
- C. Section 23 62 13 - Packaged Air-Cooled Refrigerant Compressor and Condenser Units.

1.3 REFERENCE STANDARDS

- A. AHRI 495 - Performance Rating of Refrigerant Liquid Receivers 2005.
- B. AHRI 710 - Performance Rating of Liquid-Line Driers 2009.
- C. AHRI 750 - Thermostatic Refrigerant Expansion Valves 2007.
- D. AHRI 760 - Performance Rating of Solenoid Valves for Use With Volatile Refrigerants 2007.
- E. ASHRAE Std 15 - Safety Standard for Refrigeration Systems 2019, with All Amendments and Errata.
- F. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants 2019.
- G. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators 2021.
- H. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2021.
- I. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes 2018.
- J. ASME B31.5 - Refrigeration Piping and Heat Transfer Components 2022.
- K. ASME B31.9 - Building Services Piping 2020.
- L. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2022.
- M. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) 2020.
- N. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service 2020.
- O. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding 2019.
- P. ICC (IMC)-2018 - International Mechanical Code 2018.
- Q. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018, with Amendment (2019).
- R. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical Current Edition, Including All Revisions.

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- S. UL 429 - Electrically Operated Valves Current Edition, Including All Revisions.

1.4 SYSTEM DESCRIPTION

- A. 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.
- B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.
- C. 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.
- D. Valves:
1. Use service valves on suction and discharge of compressors.
- E. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.
- F. Filter-Driers:
1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.
- G. Solenoid Valves:
1. Use in liquid line of single or multiple evaporator systems.
- H. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.
- C. Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.
- D. Design Data: Submit design data indicating pipe sizing. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- E. Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.
- F. Submit welders certification of compliance with ASME BPVC-IX.
- G. Installer's Qualification Statement.
- H. Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
 2. Extra Filter-Dryer Cartridges: One of each type and size.

1.6 QUALITY ASSURANCE

- A. Designer Qualifications: Design piping system under direct supervision of a Professional Engineer experienced in design of this type of work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store piping and specialties in shipping containers with labeling in place.
- B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.
- C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

- A. Comply with ASME B31.9 for installation of piping system.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.
- C. Welders Certification: In accordance with ASME BPVC-IX.
- D. Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.

2.2 PIPING

- A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
 - 1. Fittings: ASME B16.22 wrought copper.
 - 2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.
 - 3. Mechanical Press Sealed Fittings: Double pressed type complying with UL 207 and ICC (IMC)-2018.
 - a. Manufacturers:
 - 1) RLS, LLC; RLS Cu (Copper): www.rlspressfittings.com/#sle.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.
- B. Copper Tube to 7/8 inch OD: ASTM B88 (ASTM B88M), Type K (A), annealed.
 - 1. Fittings: ASME B16.26 cast copper.
 - 2. Joints: Flared.
 - 3. Mechanical Press Sealed Fittings: Double pressed type complying with UL 207 and ICC (IMC)-2018.
 - a. Manufacturers:
 - 1) RLS, LLC; RLS Cu (Copper): www.rlspressfittings.com/#sle.
 - 2) Substitutions: See Section 01 60 00 - Product Requirements.
- C. Pipe Supports and Anchors:
 - 1. Provide hangers and supports that comply with MSS SP-58.
 - a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron adjustable swivel, split ring.
 - 3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
 - 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 5. Vertical Support: Steel riser clamp.
 - 6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
 - 7. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
 - 8. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.3 MOISTURE AND LIQUID INDICATORS

- A. Manufacturers:
 - 1. Henry Technologies: www.henrytech.com/#sle.
 - 2. Sporlan, a Division of Parker Hannifin: www.parker.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.4 VALVES

- A. Manufacturers:
 - 1. Hansen Technologies Corporation: www.hantech.com/#sle.
 - 2. Henry Technologies: www.henrytech.com/#sle.
 - 3. Flomatic Valves: www.flomatic.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Service Valves:
 - 1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psi.

2.5 STRAINERS

- A. Manufacturers:
 - 1. Hansen Technologies Corporation: www.hantech.com/#sle.
 - 2. Sporlan, a Division of Parker Hannifin: www.parker.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.6 PRESSURE REGULATORS

- A. Manufacturers:
 - 1. Hansen Technologies Corporation: www.hantech.com/#sle.
 - 2. Sporlan, a Division of Parker Hannifin: www.parker.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Brass body, stainless steel diaphragm, direct acting, adjustable over 0 to 80 psi range, for maximum working pressure of 450 psi.

2.7 PRESSURE RELIEF VALVES

- A. Manufacturers:
 - 1. Hansen Technologies Corporation: www.hantech.com/#sle.
 - 2. Henry Technologies: www.henrytech.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Straight Through or Angle Type: Brass body and disc, neoprene seat, factory sealed and stamped with ASME UV and National Board Certification NB, selected to ASHRAE Std 15, with standard setting of 235 psi.

2.8 FILTER-DRIERS

- A. Manufacturers:
 - 1. Flow Controls Division of Emerson Electric: www.emersonflowcontrols.com/#sle.
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2. Sporlan, a Division of Parker Hannifin: www.parker.com/#sle.
 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Performance:
1. Flow Capacity - Liquid Line: ____ ton, minimum, rated in accordance with AHRI 710.
 2. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.
 3. Design Working Pressure: 350 psi, minimum.
- C. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.
- D. Construction: UL listed.
1. Connections: As specified for applicable pipe type.

2.9 SOLENOID VALVES

- A. Manufacturers:
1. Flow Controls Division of Emerson Electric: www.emersonflowcontrols.com/#sle.
 2. Sporlan, a Division of Parker Hannifin: www.parker.com/#sle.
 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Valve: AHRI 760 I-P, pilot operated, copper, brass or steel body and internal parts, synthetic seat, stainless steel stem and plunger assembly (permitting manual operation in case of coil failure), integral strainer, with flared, solder, or threaded ends; for maximum working pressure of 500 psi.
- C. Coil Assembly: UL 429 UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box with pilot light.

2.10 EXPANSION VALVES

- A. Manufacturers:
1. Flow Controls Division of Emerson Electric: www.emersonflowcontrols.com/#sle.
 2. Sporlan, a Division of Parker Hannifin: www.parker.com/#sle.
 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Angle or Straight Through Type: AHRI 750; design suitable for refrigerant, brass body, internal or external equalizer, bleed hole, adjustable superheat setting, replaceable inlet strainer, with non-replaceable capillary tube and remote sensing bulb and remote bulb well.
- C. Selection: Evaluate refrigerant pressure drop through system to determine available pressure drop across valve. Select valve for maximum load at design operating pressure and minimum 10 degrees F superheat. Select to avoid being undersized at full load and excessively oversized at part load.

2.11 FLEXIBLE CONNECTORS

- A. Manufacturers:
1. Flexicraft Industries: www.flexicraft.com/#sle.
 2. Penflex: www.penflex.com/#sle.
 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure of 500 psi.

PART 3 EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

- A. Install refrigeration specialties in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and avoid interference with use of space.
- D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- E. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.5.
 - 2. Support horizontal piping as indicated.
 - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches of each horizontal elbow.
- F. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.
- G. Provide clearance for installation of insulation and access to valves and fittings.
- H. Insulate piping and equipment; refer to Section and Section 23 07 16.
- I. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.
- J. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.
- K. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.
- L. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.
- M. Fully charge completed system with refrigerant after testing.

3.3 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Test refrigeration system in accordance with ASME B31.5.
- C. Pressure test system with dry nitrogen to 200 psi. Perform final tests at 27 inches vacuum and 200 psi using halide torch. Test to no leakage.

3.4 SCHEDULES

- A. Hanger Spacing for Copper Tubing.
 - 1. 1/2 inch, 5/8 inch, and 7/8 inch OD: Maximum span, 5 feet; minimum rod size, 1/4 inch.
 - 2. 1-1/8 inch OD: Maximum span, 6 feet; minimum rod size, 1/4 inch.
 - 3. 1-3/8 inch OD: Maximum span, 7 feet; minimum rod size, 3/8 inch.
 - 4. 1-5/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 - 5. 2-1/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.

END OF SECTION 23 23 00