

SECTION 23 23 00
REFRIGERANT PIPING AND SPECIALITIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Refrigerant piping.
 - 2. Unions, flanges, and couplings.
 - 3. Pipe hangers and supports.
 - 4. Refrigerant moisture and liquid indicators.
 - 5. Valves.
 - 6. Refrigerant strainers.
 - 7. Refrigerant pressure regulators.
 - 8. Refrigerant pressure relief valves.
 - 9. Refrigerant filter-driers.
 - 10. Refrigerant solenoid valves.
 - 11. Refrigerant expansion valves.

1.2 REFERENCES

- A. American Society of Heating, Refrigerating and Air-Conditioning Engineers:

1.3 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of valves, equipment and refrigerant accessories.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ASME B31.5 code for installation of refrigerant piping systems.

1.5 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

2.1 REFRIGERANT PIPING

- A. 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 1190 to 1480 degrees F.
- B. Copper Tubing to 7/8 inch OD: ASTM B88, Type K, annealed.
 - 1. Fittings: ASME B16.26 cast copper, compression type.

2. Joints: Flared.

2.2 UNIONS, FLANGES, AND COUPLINGS

- A. 2 inches and Smaller:
 1. Copper Pipe: Bronze, soldered joints.
- B. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.3 REFRIGERANT VALVES AND ACCESSORIES

- A. Manufacturers:
 1. Alco Controls Div, Emerson Electric Co.
 2. Parker Hannifin Corp., Refrig. & Air Cond. Div.
 3. Sporlan Valve Co.
- B. Refrigerant moisture and liquid indicators
 1. Port: Single, UL listed.
 2. Body: Copper or brass, flared or solder ends.
 3. Sight glass: Color-coded paper moisture indicator with removable element cartridge and plastic cap.
 4. Maximum working pressure: 500 psig
 5. Maximum working temperature: 200 degrees F.
- C. Diaphragm Packless Valves:
 1. UL listed, globe or angle pattern, forged brass body and bonnet solder or flared ends.
 2. Phosphor bronze and stainless steel diaphragms, rising stem and hand wheel.
 3. Stainless steel spring, nylon seats, disc with positive back seating.
 4. Maximum working pressure: 500 psig.
 5. Maximum working temperature: 275 degrees F.
- D. Packed Angle Valves:
 1. Forged brass or nickel-plated forged steel, solder or flared ends.
 2. Forged brass seal caps with copper gasket, rising stem and seat with back seating, molded stem packing.
 3. Maximum working pressure: 500 psig
 4. Maximum working temperature: 275 degrees F.
- E. Ball Valves:
 1. Two piece forged brass body with teflon ball seals and copper tube extensions, brass seal cap, chrome plated ball, stem with neoprene ring stem seals, soldered ends.
 2. Maximum working pressure: 500 psig and
 3. Maximum working temperature: 300 degrees F.
- F. Service Valves:
 1. Forged brass body with copper stubs, brass caps, removable valve core, flared or solder ends.
 2. Maximum working pressure: 500 psig.
- G. Refrigerant Check Valves:
 1. Globe Type:
 - a. Cast bronze or forged brass body, forged brass cap with neoprene seal, brass guide and disc holder, phosphor-bronze or stainless steel spring, teflon seat disc.

- b. Maximum working pressure: 500 psig.
 - c. Maximum working temperature: 300 degrees F.
 - 2. Straight Through Type:
 - a. Spring, neoprene seat.
 - b. Maximum working pressure: 500 psig.
 - c. Maximum working temperature: 200 degrees F.
- H. Straight Line or Angle Line Type Strainer:
 - 1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass.
 - 2. Maximum working pressure: 430 psig.
- I. Straight Line, Non-Cleanable Type Strainer:
 - 1. Steel shell, copper plated fittings, stainless steel wire screen.
- J. Refrigerant Pressure Regulators:
 - 1. Brass body, stainless steel diaphragm, direct acting, adjustable over 0 to 80 psig range, for maximum working pressure of 450 psig.
- K. Refrigerant Pressure Relief Valves:
 - 1. Straight Through or Angle Type: Brass body and disc, neoprene seat, factory sealed and stamped with ASME UV and National Board Certification NB; for standard 235 psig setting; selected to ASHRAE 15.
- L. Refrigerant Filter-Driers.
- M. Replaceable Cartridge Angle Type:
 - 1. Shell: ARI 710, UL listed, brass, removable cap, for maximum working pressure of 350 psig.
 - 2. Filter Cartridge: Pleated media with integral end rings, stainless steel support.
 - 3. Filter/Dryer Cartridge: Pleated media with solid core sieve with activated alumina.
- N. Permanent Straight Through Type:
 - 1. ARI 710, UL listed, steel shell with molded desiccant filter core, for maximum working pressure of 350 psig.

2.4 REFRIGERANT SOLENOID VALVES

- A. Manufacturers:
 - 1. Alco Controls Div, Emerson Electric Co.
 - 2. Parker Hannifin Corp., Refrig. & Air Cond. Div.
 - 3. Sporlan Valve Co.
- B. Valve: ARI 760, pilot operated, copper or brass body and internal parts, synthetic seat, stainless steel stem and plunger assembly, integral strainer, with flared, solder, or threaded ends; for maximum working pressure of 500 psig. Stem designed to allow manual operation in case of coil failure.
- 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.

2.5 REFRIGERANT EXPANSION VALVES

- A. Manufacturers:
 - 1. Alco Controls Div, Emerson Electric Co.

2. Parker Hannifin Corp., Refrig. & Air Cond. Div.
 3. Sporlan Valve Co.
- B. Angle or Straight Through Type: ARI 750; design suitable for refrigerant, brass body, internal or external equalizer, bleed hole, mechanical pressure limit (maximum operating pressure MOP feature), adjustable superheat setting, replaceable inlet strainer, with 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 oversized at part load.

2.6 ELECTRONIC EXPANSION VALVES

- A. Manufacturers:
1. Alco Controls Div, Emerson Electric Co.
 2. Parker Hannifin Corp., Refrig. & Air Cond. Div.
 3. Sporlan Valve Co.
- B. Electronic Expansion Valve:
1. Brass bodies with flared or solder connection, needle valve with floating needle and machined seat, stepper motor drive.
- C. Evaporation Control System:
1. Electronic microprocessor based unit in enclosed case, proportional integral control with adaptive superheat, maximum operating pressure function, pre-selection allowance for electrical defrost and hot gas bypass.
- D. Refrigeration System Control: Electronic microprocessor based unit in enclosed case, with proportional integral control of valve, on/off thermostat, air temperature alarm (high and low), solenoid valve control, liquid injection adaptive superheat control, maximum operating pressure function, night setback thermostat, timer for defrost control.

2.7 REFRIGERANT RECEIVERS

- A. Internal Diameter 6 inch and Smaller: ARI 495, UL listed, steel, brazed; 400 psig maximum pressure rating, with taps for inlet, outlet, and pressure relief valve.
- B. Internal Diameter 6 inch and Larger: ARI 495, welded steel, tested and stamped in accordance with ASME Section VIII; 400 psig with taps for liquid inlet and outlet valves, pressure relief valve, and magnetic liquid level indicator.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.

- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.3 INSTALLATION - ABOVE GROUND PIPING SYSTEMS

- A. Route piping parallel to building structure and maintain gradient.
- B. Install piping to conserve building space, and not interfere with use of space.
- C. Group piping whenever practical at common elevations.
- D. Sleeve pipe passing through partitions, walls and floors.
- E. Install pipe identification.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide access where valves and fittings are not exposed.
- H. Arrange refrigerant 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.
- I. Flood refrigerant piping system with nitrogen when brazing.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- K. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting.
- L. Install valves with stems upright or horizontal, not inverted.
- M. Insulate piping and equipment.
- N. Provide replaceable cartridge filter-dryers, with isolation valves and bypass with valve.
- O. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.
- P. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.
- Q. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.
- R. Provide electrical connection to solenoid valves.
- S. Fully charge completed system with refrigerant after testing.
- T. Follow ASHRAE 15 procedures for charging and purging of systems and for disposal of refrigerant.

3.4 INSTALLATION - REFRIGERANT SPECIALTIES

- A. Refrigerant Liquid Indicators:
 - 1. Install line size liquid indicators in main liquid line downstream of condenser.
 - 2. When receiver is provided, install line size liquid indicators in liquid line downstream of receiver.
 - 3. Install line size liquid indicators downstream of liquid solenoid valves.

- B. Refrigerant Valves:
 - 1. Install service valves on compressor suction and discharge.
 - 2. Install gage taps at compressor inlet and outlet.
 - 3. Install gage taps at hot gas bypass regulators, inlet and outlet.
 - 4. Install check valves on compressor discharge.
 - 5. Install check valves on condenser liquid lines on multiple condenser systems.
 - 6. Install refrigerant charging valve in liquid line between receiver shut-off valve and expansion valve.

- C. Strainers:
 - 1. Install line size strainer upstream of each automatic valve.
 - 2. Where multiple expansion valves with integral strainers are used, install single main liquid-line strainer.
 - 3. On steel piping systems, install strainer in suction line.
 - 4. Install shut-off valves on each side of strainer.

- D. Install pressure relief valves on ASME receivers. Install relief valve discharge piping to terminate outdoors.

- E. Filter-Dryers:
 - 1. Install permanent filter-dryers in low temperature systems.
 - 2. Install permanent filter-dryer in systems containing hermetic compressors.
 - 3. Install replaceable cartridge filter-dryer upstream of each solenoid valve.

- F. Solenoid Valves:
 - 1. Install in liquid line of systems operating with single pump-out or pump-down compressor control.
 - 2. Install in liquid line of single or multiple evaporator systems.
 - 3. Install in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into suction line when system shuts down.

3.5 FIELD QUALITY CONTROL

- A. Pressure test refrigeration system with dry nitrogen to 200 psig
- B. Repair leaks.
- C. Retest until no leaks are detected.

END OF SECTION 23 23 00