SECTION 23 23 00
REFRIGERATION PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Piping
- B. Refrigerant
- C. Moisture and liquid indicators
- D. Valves
- E. Filter-dryers
- F. Brazing Materials

1.2 REFERENCES
- A. ARI 710 - Liquid Line Dryers
- B. ASHRAE 15 - Safety Standard for Refrigeration Systems
- C. ASHRAE 34 - Designation and Classification of Refrigerants
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
- E. ASME B16.26 - Cast Copper Alloy Fittings For Flared Copper Tubes
- F. ASME B31.5 - Refrigeration Piping and Heat Transfer Components
- G. ASME B31.9 - Building Services Piping
- H. ASTM B32 – Standard Specification for Solder Metal
- I. AWS A5.8/A5.8M Specification for Filler Metals for Brazing and Braze Welding
- J. AWS D1.1/D1.1M - Structural Welding Code, Steel
- K. UL 429 - Electrically Operated Valves
- L. ARI 760 - Solenoid Valves for Use With Volatile Refrigerants
- M. ASTM B280 – Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
- N. MIL V 23450C - Valves, Expansion, Thermostatic, Refrigerant 12 and 22

1.3 SUBMITTALS
- A. Submit shop drawings under provisions of Division 1.
- B. Submit shop drawings indicating schematic layout of system, including equipment, critical dimensions, and sizes.
- C. Submit product data under provisions of Division 1.
- D. Submit product data indicating general assembly of specialties, including manufacturer's catalogue information.
- E. Submit manufacturer's installation instructions under provisions of Division 1.
- F. Submit design data as a submittal under provisions of Division 1.
- G. Submit data indicating pipe sizing.
- H. Submit test reports under provisions of Division 1.
- I. Submit Test reports indicating results of leak test, acid test.

1.4 PROJECT RECORD DOCUMENTS
- A. Submit documents under provisions of Division 1.
- B. Accurately record the exact locations of equipment and refrigeration accessories on record drawings.

1.5 REGULATORY REQUIREMENTS
- A. Conform to ASME B31.9.

1.6 DELIVERY, STORAGE, AND HANDLING
- A. Deliver products to site under provisions of Division 1.
- B. Deliver and store piping and specialties in shipping containers with labeling in place.
- C. Store and protect products under provisions of Division 1.

D. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

PART 2 PRODUCTS

2.1 PIPING

A. Copper Tubing:
   1. Per ASTM B280, type ACR dehydrated hard drawn copper for exposed/accessible lines.
   2. Type ACR soft drawn (annealed) dehydrated rated up to 700 psi, inaccessible piping and for piping below slabs, and grade shall be installed without joints.
   3. Fittings: ASME B16.22 long radius 90-degree elbow, couplings, and Tees shall be fabricated from wrought copper with manufacture stamp on each fitting.

B. Brazing Compound shall be a minimum of 15% silver with melting point greater than 1000° F.

C. See section 23 05 00 part 2.1 F on additional material requirements.

2.2 REFRIGERANT

A. Refrigerant R-134A Tetrafluoroethane

B. Refrigerant R-410A Pentafluoroethane

2.3 MOISTURE AND LIQUID INDICATORS

A. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator and plastic cap; for maximum working pressure of 700 psi and maximum temperature of 200°F.

B. Sight Glass Moisture Indicator is determined by the type of refrigerant contained within the refrigeration system.

2.4 VALVES

A. Packed Angle Valves: Forged brass or nickel plated forged steel, forged brass seal caps with copper gasket, rising stem and seat with back seating, molded stem packing, solder or flared ends; for maximum working pressure of 500 psi and maximum temperature of 300°F.
   1. Compatible with all CFC, HCFC, and HFC refrigerants and oils.

B. Packed Ball Valves: Two piece forged brass Body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 300°F.
   1. Compatible with all CFC, HCFC, and HFC refrigerants and oils.

2.5 FILTER-DRIERS

A. Replaceable Cartridge Type: ARI 710, UL listed, brass shell and bronze cap, brass shell and molded desiccant filter core for maximum working pressure of 500 psi.
   1. Size determined by tonnage of system.
   2. Shell & Core type drier can be used on liquid and suction lines.
   3. Shell & Core type drier shall be used in liquid lines of refrigeration systems 7 tons and larger.
   4. Shell & Core dryer shall be provided with bypass piping and valves to isolate dryer for core replacement and include a Schrader valve port for dryer evacuation.

B. Provide a liquid line filter drier in all new units/systems 5 tons or less unless drier is provided by the Manufacturer of the unit or system.

2.6 EXPANSION VALVES

A. Provide thermostatic expansion valve on all cooling systems 7 tons and larger.

2.7 PRESSURE SWITCHES

A. Provide a high and low-pressure switch for each new refrigeration system or unit 1 ½ ton and larger.

B. Switch to disable the compressor when activated.

PART 3 EXECUTION

3.1 PREPARATION
- A. Ream pipe and tube ends removing burrs.
- B. Clean copper or brass fitting to original luster and remove any scale and dirt from the inside and outside of the pipe before assembly before installation.

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 not interfere with use of space.
- D. Group piping whenever practical at common elevations and locations, and slope piping one percent in direction of oil return.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
  1. Nitrogen purge lines during brazing.
- F. Provide clearance for installation of insulation and access to valves and fittings.
- G. Provide access to concealed valves and fittings.
- H. Insulate and support piping; refer to Section 23 07 19 and 23 05 29.
- I. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line as per manufacturer’s instructions.
- J. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.
- K. Test refrigerant system for leaks by evacuation and maintain pressures for min. of 24 hours, then pressurize system and test joints and connections with soap.
  1. Charge system with refrigerant per Manufacturer’s instructions relative to ambient conditions.
  2. If system was commissioned in cooler weather, installing contractor shall return upon warmer conditions to verify proper charge.
  3. Insure system is labeled indicating type of refrigerant installed. Locate label at condensing unit.

3.3 APPLICATION
- A. Provide line size liquid indicators in main liquid line leaving condenser.
  1. Install moisture indicator so it is viewable from service area.
- B. Provide replaceable cartridge filter-dryers, with three-valve bypass assembly, one for each refrigeration circuit.
- C. Provide an isolation valve in the high and low refrigerant piping located next to condensing unit.
- D. Provide charging service ports in high and low refrigerant piping located next to condensing unit. (Schrader Type).

3.4 FIELD QUALITY CONTROL
- A. Perform field-testing under provisions of Division 1.
- B. Test refrigeration system in accordance with ASME B31.5.
- C. Pressure test the system with small amount of refrigerant and dry nitrogen at 200-psi.
  1. Using a halide torch or an electronic leak detector, check for leaks in the system.
  2. Perform final test at 30" vacuum for a 24-hour period with no deviation.
  3. Provide notification a minimum of 48-hours prior to test and submit written report to A/E verifying test results.

END OF SECTION