PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Tubes.
   2. Fittings.
   4. Specialties.

B. Related Sections:
   1. Section 07 92 00 (07920) - Joint Sealants
   2. Section 07 84 00 (07840) - Firestopping: Firestopping materials and requirements for penetrations through fire and smoke barriers.
   3. Section 23 05 00 (15050) – Common Work Results for HVAC
   4. Section 23 05 29 (15060) - Hangers and Supports for HVAC Piping and Equipment: for pipe hanger restraints.
   5. Section 23 05 53 (15075) – Identification for HVAC Piping and Equipment
   6. Section 23 07 00 (15083) – HVAC Insulation

1.02 REFERENCES


B. The American Society of Mechanical Engineers (ASME) Publications:
   1. "Boiler and Pressure Vessel Code"
   2. B16.22 "Wrought Copper and Copper Alloy Solder Joint Pressure Fittings"
   3. B31.5 "Refrigeration Piping and Heat Transfer Components"

C. ASTM International (ASTM) Publications: (Former American Society for Testing and Materials)
   1. B88 "Standard Specification for Seamless Copper Water Tube"
   2. B280 "Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service"

D. American Welding Society (AWS) Publications:
   1. A5.8 "Specification for Filler Metals For Brazing And Braze Welding"

E. Manufacturers Standardization Society of the Valve and Fittings Industry. (MSS) Publications:
   1. SP-69 "ANSI/MSS Edition Pipe Hangers and Supports - Selection and Application"

F. Underwriter's Laboratories, Inc. (UL) Standards:
   1. 207 "Standard for Refrigerant-Containing Components and Accessories, Nonelectrical"
   2. 429 "Standard for Electrically Operated Valves"

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

• SECTION 23 23 00 (15530) - REFRIGERANT PIPING •
• PAGE 1 •
B. Submit “Letter of Conformance” in accordance with Section 01 33 00 (01330) indicating specified items selected for use in project with the following supporting data.

1. Product Data for each valve type and refrigerant piping specialty specified.
2. Refrigerant piping indicated is schematic only. Contractor shall size and design the piping configuration and install the piping, including oil traps, double risers, specialties, and pipe and tube sizes, to ensure proper operation and conformance with warranties of connected equipment.
3. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience.
4. Maintenance data for refrigerant valves and piping specialties to include in the operation and maintenance manual specified in Division 01 Sections.

1.04 QUALITY ASSURANCE

A. ASME Compliance: Qualify brazing and welding processes and operators according to ASME Boiler and Pressure Vessel Code, Section IX, "Welding and Brazing Qualifications."

B. Regulatory Requirements: Comply with provisions of the following codes:
   1. ASME B31.5, "Refrigeration Piping."

C. UL Standard: Provide products complying with UL 207, "Refrigerant-Containing Components and Accessories, Non-electrical"; or UL 429, "Electrically Operated Valves."

D. Listing and Labeling: Provide products specified in this Section that are UL listed and labeled.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Approved Manufacturers:
   1. Refrigerant Valves and Specialties:
      a. Henry Pratt Company, Subsidiary of Mueller Water Products, Inc. (877-436-7966)
      b. Parker-Hannifin Corporation; Refrigeration & Air Conditioning Division (800-272-7537)
      c. Sporlan Valve Company (314-647-2775)

2.02 TUBES

A. Use pre-charged tubing where possible.
   B. Soft Copper Tube: ASTM B280, Type ACR, annealed temper.

2.03 TUBE FITTINGS


2.04 JOINING MATERIALS

A. Brazing Filler Metals: AWS A5.8, Classification BAg-1 (Silver).

2.05 REFRIGERANT PIPING SPECIALTIES

A. Moisture/Liquid Indicators: 500-psig operating pressure, 200 deg F operating temperature; forged-brass body, with replaceable, polished, optical viewing window with color-coded moisture indicator, and solder-end connections.

Fairfield Inn and Suites by Marriott at the Highlands Town Center

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B. Permanent Filter-Dryer: 350-psig maximum operating pressure, 225 deg F maximum operating temperature; steel shell, and wrought-copper fittings for solder-end connections; molded-felt core surrounded by desiccant.

**PART 3  EXECUTION**

**3.01  EXAMINATION**

A. Examine roughing-in for compliance with requirements for installation tolerances and other conditions affecting performance of refrigerant piping. Do not proceed with installation until unsatisfactory conditions have been corrected.

**3.02  APPLICATIONS**

A. Above ground, within Building: Type ACR drawn-copper tubing.

B. Below ground for 2-Inch NPS (DN50) and Smaller: Type L (Type B) annealed-copper tubing installed in schedule 40 PVC sleeve.

**3.03  INSTALLATION**

A. Install refrigerant piping according to **ASHRAE 15**.

B. Basic piping installation requirements are specified in Section 23 05 00 (15050) - "Common Work Results For HVAC."

C. Install piping in short and direct arrangement, with minimum number of joints, elbows, and fittings.

D. Arrange piping to allow normal inspection and service of compressor and other equipment. Install valves and specialties in accessible locations to allow for service and inspection.

E. Install piping with adequate clearance between pipe and adjacent walls and hangers, or between pipes for insulation installation. Use sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation. Maximum fill: 40%

F. Below ground, install copper tubing in schedule 40 PVC conduit. Vent conduit outdoors.

G. Insulate suction lines.

1. Do not install insulation until system testing has been completed and all leaks have been eliminated.

H. Install branch lines to parallel compressors of equal length, and pipe identically and symmetrically.

I. Install copper tubing in rigid or flexible conduit in locations where copper tubing will be exposed to mechanical injury.

J. Slope refrigerant piping as follows:

1. Install horizontal suction lines with a uniform slope of 0.4 percent downward to compressor.

2. Install traps and double risers where indicated and where required to entrain oil in vertical runs.

3. Liquid lines may be installed level.

K. Use fittings for changes in direction and branch connections.

L. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.

M. Reduce pipe sizes using eccentric reducer fittings installed with level side down.
N. Provide bypass around moisture-liquid indicators in lines larger than 2-inch NPS (DN50).

O. Install unions to allow removal of solenoid valves, pressure-regulating valves, expansion valves, and at connections to compressors and evaporators.

P. Install refrigerant valves according to manufacturer's written instructions.

Q. When brazing, remove solenoid-valve coils; remove sight glasses; and remove stems, seats, and packing of valves, and accessible internal parts of refrigerant specialties. Do not apply heat near bulb of expansion valve.

R. Electrical wiring for solenoid valves is specified in Division 16 Sections. Coordinate electrical requirements and connections.

S. Charge and purge systems, after testing, dispose of refrigerant following ASHRAE 15 procedures.

3.04 HANGERS AND SUPPORTS

A. General: Hangers, supports, and anchors are specified in Section 23 05 29 - "Hangers and Supports for HVAC Piping and Equipment." Provide according to ASME B31.5 and MSS SP-69.

B. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes. Tube sizes are nominal or standard tube sizes as expressed in ASTM B88.
   1. 1/2 Inch: Maximum span, 60 inches; minimum rod size, 1/4 inch.
   2. 5/8 Inch: Maximum span, 60 inches; minimum rod size, 1/4 inch.
   3. 1 Inch: Maximum span, 60 inches; minimum rod size, 1/4 inch.
   4. 1-1/4 Inches: Maximum span, 72 inches; minimum rod size, 1/4 inch.
   5. 1-1/2 Inches: Maximum span, 96 inches; minimum rod size, 3/8 inch.

3.05 PIPE INSULATION

A. Piping insulation is specified in Section 23 07 00 “HVAC Insulation”.

3.06 SPECIALTIES APPLICATION AND INSTALLATION

A. Install permanent filter dryers in low-temperature systems using hermetic compressors, and before each solenoid valve.

3.07 PIPE JOINT CONSTRUCTION

A. Basic pipe and tube joint construction is specified in Section 23 05 00 - "Common Work Results for HVAC."

B. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide) during brazing to prevent formation of scale.

3.08 VALVE INSTALLATIONS

A. Install refrigerant valves according to manufacturer's written instructions.

3.09 CONNECTIONS

A. Electrical: Conform to applicable requirements of Division 26 Sections for electrical connections.

3.10 FIELD QUALITY CONTROL

A. Inspect and test refrigerant piping according to ASME B31.5, Chapter VI.
1. Pressure test with nitrogen to 200 psig. Perform final tests at 27-psig vacuum and 200 psig using halide torch or electronic leak detector. Test to no leakage.

B. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

C. Repair leaks using new materials; retest.

3.11 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat requirements.

3.12 CLEANING

A. Before installation of copper tubing other than Type ACR, clean tubing and fittings with trichloroethylene.

3.13 COMMISSIONING

A. Charge system using the following procedures:
   1. Install core in filter dryer after leak test, but before evacuation.
   2. Evacuate refrigerant system with vacuum pump until temperature of 35 deg is indicated on vacuum dehydration indicator.
   3. During evacuation, apply heat to pockets, elbows, and low spots in piping.
   4. Maintain vacuum on system for minimum of 5 hours after closing valve between vacuum pump and system.
   5. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
   6. Complete charging of system, using new filter-dryer core in charging line. Provide full-operating charge.