## PART 1 GENERAL

### 1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for copper tubing and fittings for refrigerant systems.

.2 Pressure test and evacuation services testing of refrigerant piping systems including supply and installation of any necessary refrigerant charge.

### 1.2 RELATED SECTIONS

.1 Section 23 05 05 - Installation of Pipework.

.2 Section 23 07 15 – Thermal Insulation for Piping

.3 Section 23 73 11 – Air Handling Units – Packaged

### 1.3 REFERENCES

.1 American Society of Mechanical Engineers (ASME)

.1 ASME B16.22, Wrought Copper and Copper Alloy Solder - Joint Pressure Fittings.

.2 ASME B16.24, Cast Copper Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500 and 2500.

.3 ASME B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.

.4 ASME B31.5, Refrigeration Piping and Heat Transfer Components.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM A 307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 ASTM B 280, Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

.3 Canadian Standards Association (CSA International)

.1 CSA B52, Mechanical Refrigeration Code.

.4 Environment Canada (EC)

.1 EPS 1/RA/1, Environmental Code of Practice for the Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.

.5 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

**1.4 SUBMITTALS**

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet for piping, fittings and equipment.

.3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Instructions: submit manufacturer's installation instructions.

.6 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

**1.5 QUALITY ASSURANCE**

.1 Pre-Installation Meeting:

.1 Convene pre-installation meeting three weeks prior to beginning work of this Section in accordance with Construction Progress Schedule - Critical Path Method specified in D14.

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordination with other building sub-trades.

.4 Review manufacturer's installation instructions and warranty requirements.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with applicable codes and regulations.

**1.6 DELIVERY, STORAGE AND HANDLING**

.1 Waste Management and Disposal:

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.2 Divert unused metal materials from landfill to metal.

## PART 2 PRODUCTS

### 2.1 TUBING

.1 Processed for refrigeration installations, deoxidized, dehydrated and sealed.

.1 Hard copper: to ASTM B 280, type ACR B.

.2 Annealed copper: to ASTM B 280, with minimum wall thickness as per CSA B52 and ASME B31.5.

### 2.2 FITTINGS

.1 Service: design pressure 2758 kPa and temperature 121 degrees C.

.2 Brazed:

.1 Fittings: wrought copper to ASME B16.22.

.2 Joints: silver solder, 15% Ag-80% Cu-5%P or copper-phosphorous, 95% Cu-5%P and non-corrosive flux.

.3 Flanged:

.1 Bronze or brass, to ASME B16.24, Class 150 and Class 300.

.2 Gaskets: suitable for service.

.3 Bolts, nuts and washers: to ASTM A 307, heavy series.

.4 Flared:

.1 Bronze or brass, for refrigeration, to ASME B16.26.

### 2.3 PIPE SLEEVES

.1 Hard copper or steel, sized to provide 6 mm clearance around between sleeve and un-insulated pipe or between sleeve and insulation.

### 2.4 VALVES

.1 22 mm and under: Class 500, 3.5 Mpa, globe or angle non-directional type, diaphragm, packless type, with forged brass body and bonnet, moisture proof seal for below freezing applications, brazed connections.

.2 Over 22 mm: Class 375, 2.5 Mpa, globe or angle type, diaphragm, packless type, back-seating, cap seal, with cast bronze body and bonnet, moisture proof seal for below freezing applications, brazed connections.

### 2.5 REFRIGERANT

.1 Consistent with equipment specified and meeting manufacturer’s specific refrigerant specifications for the equipment supplied.

**2.6 SUCTION LINE ACCUMULATOR**

.1 To ARI standards for the refrigerant type and pressure class.

**2.7 SIGHT GLASS**

.1 To ARI standards for liquid lines and refrigerant type and pressure class.

**PART 3 EXECUTION**

**3.1 MANUFACTURER'S INSTRUCTIONS**

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

**3.2 GENERAL**

.1 Install in accordance with CSA B52, EPS1/RA/1 and ASME B31.5 Section 23 05 05 - Installation of Pipework.

**3.3 BRAZING PROCEDURES**

.1 Bleed inert gas into pipe during brazing.

.2 Remove valve internal parts, solenoid valve coils, sight glass.

.3 Do not apply heat near expansion valve and bulb.

**3.4 PIPING INSTALLATION**

.1 General:

.1 Soft annealed copper tubing: bend without crimping or constriction Hard drawn copper tubing: do not bend. Minimize use of fittings.

.2 Hot gas lines:

.1 Pitch at least 1:240 down in direction of flow to prevent oil return to compressor during operation.

.2 Provide trap at base of risers greater than 2400 mm high and at each 7600 mm thereafter.

.3 Provide inverted deep trap at top of risers.

.4 Provide double risers for compressors having capacity modulation.

.1 Large riser: install traps as specified.

.2 Small riser: size for 5.1 m/s at minimum load. Connect upstream of traps on large riser.

.3 Pipe Appurtenances:

.1 Incorporate all loose supplied refrigerant pipe appurtenances supplied by the Section and by Section 23 73 11.

.2 Utilize reviewed refrigerant pipe flow schematic submittal provided by Section 23 73 11 for field installed refrigerant pipe installation.

## 3.5 PRESSURE AND LEAK TESTING

.1 Close valves on factory charged equipment and other equipment not designed for test pressures.

.2 Leak test to CSA B52 before evacuation to 2MPa and 1MPa on high and low sides respectively or as dictated by equipment manufacturer's recommended instructions.

.3 Test Procedure: build pressure up to 35 kPa with refrigerant gas on high and low sides. Supplement with nitrogen to required test pressure. Test for leaks with electronic or halide detector. Repair leaks and repeat tests.

## 3.6 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:

.1 Close service valves on factory charged equipment.

.2 Ambient temperatures to be at least 13 degrees C for at least 12 hours before and during dehydration.

.3 Use copper lines of largest practical size to reduce evacuation time.

.4 Use two-stage vacuum pump with gas ballast on 2nd stage capable of pulling 5Pa absolute and filled with dehydrated oil.

.5 Measure system pressure with vacuum gauge. Take readings with valve between vacuum pump and system closed.

.6 Triple evacuate system components containing gases other than correct refrigerant or having lost holding charge as follows:

.1 Twice to 14 Pa absolute and hold for 4 h.

.2 Break vacuum with refrigerant to 14 kPa.

.3 Final to 5 Pa absolute and hold for at least 12 h.

.4 Isolate pump from system, record vacuum and time readings until stabilization of vacuum.

.5 Submit test results to Contract Administrator.

.7 Charging:

.1 Charge system through filter-drier and charging valve on high side. Low side charging not permitted.

.2 With compressors off, charge only amount necessary for proper operation of system. If system pressures equalize before system is fully charged, close charging valve and start up. With unit operating, add remainder of charge to system.

.3 Re-purge charging line if refrigerant container is changed during charging process.

.8 Checks:

.1 Make checks and measurements as per manufacturer's operation and maintenance instructions.

.2 Record and report measurements to Contract Administrator.

## 3.7 CLEANING

.1 Perform cleaning operations as specified in accordance with manufacturer's recommendations.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**