METROLINX

Capital Projects Group

Refrigerant Piping, Valves and Accessories Specification

Specification 23 23 00

Revision 1
Date: September 2018

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Amendment Record Sheet

Amendment in Clause No.	Date of Amendment	Description of Changes
Various	Sept. 20, 2018	Revised to coordinate with corresponding specifications.

LIST OF CONTENT

1. GENERAL

1.1. SCOPE OF WORK

1.1.1. Provide refrigerant piping, valves and accessories as required, scheduled and specified herein.

1.2. DESIGN REQUIREMENTS

1.2.1. Design requirements are based on Part 2 specified requirements of products.

1.3. RELATED WORKS

1.3.1. Section 20 05 05 - Mechanical Work General Instructions.

1.3.2. Section 20 05 10 - Basic Mechanical Materials and Methods.

1.3.3. Section 20 05 40 – Mechanical Work Commissioning.

1.4. REFERENCE STANDARDS

1.4.1. Standards and codes to be latest editions adopted by and enforced by local governing authorities.

1.4.2. ANSI B9.1 Safety Code for Mechanical Refrigeration.

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

1.4.4. ASTM B280 Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

1.4.5. ASME Code for Unfired Pressure Vessels.

1.4.6. CSA B52, Mechanical Refrigeration Code.

1.4.7. applicable local Codes and Regulations.

1.5. SPARE PARTS

1.5.1. For filter driers with replaceable filters, supply 1 spare element of each type and size.

1.6. TRAINING

1.6.1. Training is to be a full review of all components including but not limited to a full operation and maintenance demonstration, with abnormal events.

1.6.2. Include for 3 training sessions of maximum 7 hours duration per session for 10 Metrolinx people per session.

1.6.3. Refer to Section 20 05 05 for additional general requirements.

1.7. WARRANTY

1.7.1. Products to be guaranteed by manufacturer, for a minimum of 2 years after acceptance by Metrolinx.

1.8. DELIVERY, STORAGE AND HANDLING

1.8.1. Handle and store products in accordance with manufacturer's instructions, in locations approved by Metrolinx. Include one copy of these instructions with product at time of shipment.

1.9. SUBMITTALS

1.9.1. Refer to submittal requirements in Section 20 05 05.

1.9.2. Submit, in shop drawing form, a schematic piping diagram for each refrigerant piping system indicating pipe sizes, slopes, valves, traps, and piping specialties. Piping schematics must be reviewed, approved, and signed by refrigeration equipment manufacturers prior to being submitted to Consultant for review.

1.9.3. Submit letters from equipment suppliers certifying proper installation and start-up of piping systems and equipment as specified in Part 3 of this Section.

1.9.4. Submit shop drawings/product data sheets as follows:

a) to regulatory authority for review and approval prior to submitting to Consultant;

b) for all products specified in Part 2 of this Section except for pipe and fittings;

c) copies of all calculations, stamped and signed by same engineer who signs layout drawings, and a listing of all design data used in preparing the calculations, system layout and sizing requirements.

1.9.5. Product Data

a) Submit product data sheets indicating:

1) technical data, supplemented by bulletins, component illustrations, detailed views, technical descriptions of items, and parts lists;

2) performance criteria, compliance with appropriate reference standards, characteristics, limitations, and troubleshooting protocol;

3) product transportation, storage, handling, and installation requirements;

4) product identification in accordance with Metrolinx requirements.

1.9.6. Shop Drawings

a) Submit shop drawings indicating:

1) capacity and ratings;

2) mounting details to suit locations shown, indicating methods and hardware to be used;

3) applicable control components and control wiring schematic.

1.9.7. Commissioning Package

a) Submit the following in accordance with Sections 20 05 05 and 20 05 40:

1) Commissioning Plan;

2) Commissioning Procedures;

3) Certificate of Readiness;

4) complete test sheets specified in Section 20 05 40 and attach them to the Certificate of Readiness;

5) Source Quality Control inspection and test results and attach to the Certificate of Readiness.

1.9.8. Commissioning Closeout Package

a) Submit the following in accordance with Section 20 05 05:

1) Deficiency Report;

2) Commissioning Closeout Report;

3) submit the following for each Product for incorporation into the Operation and Maintenance Manuals in accordance with Section 20 05 05:

i) Identification: manufacturer's name, type, year, serial number, number of units, capacity, and identification to related systems;

ii) functional description detailing operation and control of components;

iii) performance criteria and maintenance data;

iv) safety precautions;

v) operating instructions and precautions;

vi) component parts availability, including names and addresses of spare part suppliers;

vii) maintenance and troubleshooting guidelines/protocol;

viii) product storage, preparation, handling, and installation requirements;

ix) Commissioning Report.

1.10. QUALITY ASSURANCE

1.10.1. Products are to comply with codes, regulations and standards listed above and applicable local codes and regulations.

1.10.2. Site personnel are to be licensed in jurisdiction of the work and under continuous supervision of a foreman who is an experienced system installer.

1.10.3. Installing contractor is to install refrigerant piping in accordance with manufacturer's installation instructions and in accordance with local codes. Contractor is responsible for all regulatory approvals, if required. Upon completion of installation, documentation of refrigerant amount, test certificates and verification documentation, etc., is to be provided in a binder, in accordance with requirements of local authorities having jurisdiction.

1.10.4. Refrigerant piping and direct expansion refrigeration equipment must be installed by or under direct on-site supervision of a licensed journeyman refrigeration mechanic.

1.10.5. Manufacturers Qualifications

a) Manufacturer shall be ISO 9000, 9001 or 9002 certified. Manufacturer of product shall have produced similar product for a minimum period of five years. When requested by Consultant, an acceptable list of installations with similar product shall be provided demonstrating compliance with this requirement.

b) Where manufacturers provide after installation onsite inspection of product installations, include for manufacturer's authorized representative to perform onsite inspection and certificate of approvals.

1.10.6. Installers Qualifications

a) Refrigerant piping installing contractor is to be certified by Technical Standards and Safety Authority (TSSA).

b) Installers for work to be performed by or work under licensed Mechanical Contractor.

c) Installers of equipment, systems and associated work are to be fully qualified and experienced installers of respective products and work in which they are installing.

d) Where manufacturers provide training sessions to installers and certificates upon successful completion, installers to have obtained such certificates and submit copies with shop drawings.

1.10.7. Regulatory Requirements

a) Products and work to comply with applicable local governing authority regulations, bylaws and directives.

b) Include for required inspections and certificate of approvals of installation work from local governing authorities.

2. PRODUCTS

2.1. PIPE, FITTINGS AND JOINTS

2.1.1. Type ACR hard drawn seamless copper refrigerant tubing to ASTM B280, factory degreased, dehydrated and capped or nitrogen filled and capped, complete with factory washed and bagged wrought copper soldering fittings to ASME B16.22, and brazed joints made with high melting point silver brazing alloy conforming to AWS Classification BcuP-5.

2.2. PIPING LINE SETS

2.2.1. Great Lakes Copper Inc "EZ-Roll" or approved equivalent, soft annealed copper to ASTM B280, suitable for use with refrigerant involved, factory cleaned and capped, and with sizes and lengths as required.

2.3. GENERAL RE: VALVES AND PIPING SPECIALTIES

2.3.1. Refrigerant valves and piping specialties specified below are to factory cleaned, degreased, and supplied to site with capped ends.

2.4. SHUT-OFF VALVES

2.4.1. Ball Valves

a) ¼ turn, CSA certified forged brass ball valves, each suitable for a maximum working pressure of 3445 kPa (500 psi) and complete with carbon filled Teflon ball seals, 2 O-ring stem seals, a gasketed seal cap, a flow direction arrow cast into body, a ball position indicator on stem, and extended copper tube connections to permit brazing the valve into line without disassembling valve.

b) Standard of quality assurance manufacturers are:

1) Mueller Industries Inc.;

2) Sporlan Valve Co.;

3) Superior Refrigeration Products/Sherwood;

4) or approved equivalent.

2.4.2. Diaphragm Valves

a) Forged brass, frost-proof, Type 1 Series, CSA certified packless diaphragm valves, each suitable for a 3445 kPa (500 psi) working pressure and complete with an O-ring to prevent moisture from entering diaphragm chamber, one phosphor bronze and two stainless steel diaphragms, and extended copper tube brazing connections.

b) Standard of quality assurance manufacturers are:

1) Mueller Industries Inc.;

2) Sporlan Valve Co.;

3) Superior Refrigeration Products/Sherwood;

4) or approved equivalent.

2.5. CHECK VALVES

2.5.1. Straight through type for valves 6.4 mm to 16 mm (¼" to 5/8") diameter, globe type for valves 22 mm (7/8") diameter and larger, each complete with extended tubing for brazing connections, and as follows:

a) straight through type check valves complete with a machined brass gasketed body, phosphor bronze spring, and neoprene seat;

b) globe type check valves complete with a cast bronze body, forged brass cap, phosphor bronze spring, Teflon seat disc, and neoprene O-ring seal.

2.5.2. Standard of quality assurance manufacturers are:

a) Mueller Industries Inc.;

b) Sporlan Valve Co.;

c) Superior Refrigeration Products/Sherwood;

d) or approved equivalent.

2.6. PIPING TRAPS

2.6.1. Mueller Industries Inc, Style No. WE-554P or approved equivalent, brazing end copper "P" traps.

2.6.2. Standard of quality assurance manufacturers are:

a) Mueller Industries Inc.;

b) Sporlan Valve Co.;

c) Superior Refrigeration Products/Sherwood;

d) or approved equivalent.

2.7. PRESSURE VESSEL RELIEF VALVES

2.7.1. Factory set pressure relief valves, straight through or angle type as required, each constructed in accordance with requirements of ANSI B9.1 and the ASME Code for Unfired Pressure Vessels, and each complete with a brass body, neoprene seat disc, and lead seal and locking wire.

2.7.2. Standard of quality assurance manufacturers are:

a) Mueller Industries Inc.;

b) Sporlan Valve Co.;

c) Superior Refrigeration Products/Sherwood;

d) or approved equivalent.

2.8. REFRIGERANT LIQUID MOISTURE INDICATORS

2.8.1. Forged brass, triple sealed, CSA certified liquid moisture indicators, each suitable for a maximum working pressure of 3445 kPa (500 psi) and complete with a liquid indicator which shows "FULL" when system is fully charged with refrigerant and remains blank when there is a restriction or shortage of refrigerant in liquid line, a moisture indicator which changes colour from blue to pink when moisture is present in system, a plastic dust cover, and extended copper tube brazing connections.

2.8.2. Standard of quality assurance manufacturers are:

a) Mueller Industries Inc.;

b) Sporlan Valve Co.;

c) Superior Refrigeration Products/Sherwood;

d) or approved equivalent.

2.9. LIQUID LINE FILTER-DRIER

2.9.1. Mueller Industries Inc "Drymaster" or approved equivalent, CSA certified filter-driers, each suitable for a maximum 3445 kPa (500 psi) working pressure and complete with a combination of desiccants in a fluted briquette for drying, and a fluted briquette type filter.

2.9.2. Standard of quality assurance manufacturers are:

a) Mueller Industries Inc.;

b) Sporlan Valve Co.;

c) Superior Refrigeration Products/Sherwood;

d) or approved equivalent.

2.10. FLEXIBLE PIPING CONNECTIONS

2.10.1. Senior Flexonics Canada "VIBRA-SORBERS" or approved equivalent, phosphor bronze construction, factory cleaned, dried, and sealed flexible piping connections with copper tube brazing ends.

2.10.2. Standard of quality assurance manufacturers are:

a) Senior Flexonics Canada;

b) The Metraflex Co;

c) or approved equivalent.

2.11. THERMOSTATIC EXPANSION VALVES

2.11.1. Factory tested, balanced port design thermostatic expansion valves, with exact selection to suit the application and refrigerant used, each complete within a replaceable stainless steel diaphragm and welded element construction thermostatic element charged with hydraulic fluid, and removable inlet strainer.

2.11.2. Standard of quality assurance manufacturers are:

a) Mueller Industries Inc.;

b) Sporlan Valve Co.;

c) Superior Refrigeration Products/Sherwood;

d) or approved equivalent.

2.12. SOLENOID VALVES

2.12.1. ARI 760, UL-listed, two positions, direct acting or pilot-operated, moisture and vapor-proof type of correction resisting materials, designed for intended service, and solder-end connections. Fitted with suitable NEMA 250 enclosure type required by location.

2.12.2. Standard of quality assurance manufacturers are:

a) Mueller Industries Inc.;

b) Sporlan Valve Co.;

c) Superior Refrigeration Products/Sherwood;

d) or approved equivalent.

2.13. OIL SEPARATORS

2.13.1. Shall conform to ASHRAE Standard 69, ASME construction or UL listed. Provide for condensing units, where determined as necessary by the equipment manufacturer. All welded steel construction with capacity to eliminate a minimum of 95% of the oil from the hot gas flowing through it.

2.13.2. Provide manufacturer's published ratings for minimum and maximum refrigeration tonnage corresponding to this oil separating efficiency.

2.13.3. Separator shall be equipped with a float valve to prevent return of the hot gas to crankcase, and shall have isolating stop valves so it can be opened and serviced without pumping out any other part of the system.

2.13.4. Standard of quality assurance manufacturers are:

a) Mueller Industries Inc.;

b) Sporlan Valve Co.;

c) Superior Refrigeration Products/Sherwood;

d) or approved equivalent.

2.14. STRAINERS

2.14.1. Designed to permit removing screen without removing strainer from piping system, and provided with screens 80 to 100 mesh in liquid lines up to 30 mm (1-1/8 inch), 60 mesh in liquid lines over 30 mm (1-1/8 inch), and 40 mesh in suction lines.

2.14.2. Provide strainers in liquid line serving each thermostatic expansion valve, and in suction line serving each refrigerant compressor not equipped with integral strainer.

2.15. REFRIGERANT FILTER-DRYERS

2.15.1. ULC listed, angle or in-line type, as shown on drawings.

2.15.2. Conform to ASHRAE Standard 63.

2.15.3. Heavy gage steel shell protected with corrosion-resistant paint; perforated baffle plates to prevent desiccant bypass.

2.15.4. Size as recommended by manufacturer for service and capacity of system with connection not less than the line size in which installed.

3. EXECUTION

3.1. DEMOLITION

3.1.1. Perform required refrigerant piping system demolition work. Refer to demolition requirements specified in Section 20 05 35 - Demolition and Revision Work and / or as shown on drawings.

3.2. INSTALLATION OF REFRIGERANT PIPING, VALVES AND SPECIALTIES

3.2.1. Provide required refrigerant piping. Piping is to be type ACR copper with wrought copper fittings. Install piping in accordance with requirements of reviewed refrigerant piping schematics referred to in Part 1 of this Section.

3.2.2. Make refrigerant piping joints using a light coat of approved brazing flux applied to both pipe and fitting. Do not use acid flux. During brazing process, ensure pipe and fittings are kept full of nitrogen or carbon dioxide to prevent scale formation inside pipe and fitting.

3.2.3. Where shown or specified, use soft copper refrigerant piping line sets.

3.2.4. Provide shut-off valves to isolate each piece of equipment if shut-off valves are not supplied integral with equipment. Provide ball or diaphragm type shut-off valves inside building. Provide diaphragm shut-off valves outside building.

3.2.5. Provide a refrigerant charging valve for each system if such a valve is not supplied integral with equipment.

3.2.6. Provide refrigerant piping accessories shown and/or required and install in accordance with manufacturer’s recommendations.

3.2.7. Provide required refrigerant.

3.2.8. Provide flexible connections at piping connections to roof mounted condensing units. Install in accordance with manufacturer’s instructions.

3.2.9. Provide expansion valves where shown and/or required, each matched to coil and installed in accordance with manufacturer’s instructions.

3.2.10. Provide strainers and filters as required to suit equipment, and install in accordance with manufactures' instructions.

END OF SECTION