METROLINX

General Service Compressed Air System Specification

Specification 22 15 00

Revision 02
Date: March 2023

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Metrolinx,

an Agency of the Government of Ontario

Amendment Record Sheet

Amendment in Clause No.	Date of Amendment	Description of Changes
Various	Sept. 20, 2018	Revised to coordinate with corresponding specifications.
Section 2.7 Section 2.8	March 2023	Section 2.7 designated for "Desiccant Dryer" Section 2.8 designated for existing section "Piping System Components"
Section 3.2 Section 3.3	March 2023	Section 3.2 designated for "Installation of Desiccant Dryer" Section 3.3 designated for existing section "Installation of Piping and Piping System Components"

LIST OF CONTENT

1. GENERAL

1.1. SCOPE OF WORK

1.1.1. Provide general service compressed air systems 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. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

1.4.3. ASTM B88 Standard Specification for Seamless Copper Water Tube.

1.4.4. CSA B51 Boiler, Pressure Vessel, and Pressure Piping Code.

1.5. SPARE PARTS

1.5.1. Unless otherwise noted, supply minimum 1 spare filter of each type used on project.

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 8 Metrolinx people per session.

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

1.7. WARRANTY

1.7.1. Warranty shall be in line with Contractual Requirements.

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 a letter from compressor manufacturer/supplier to certify proper compressor set installation as specified in Part 3 of this Section.

1.9.3. 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 this Section, except piping 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.

1.9.4. 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.

1.9.5. 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) control components and control wiring schematic.

1.9.6. 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.

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

1.10.2. 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.

1.10.3. Installers Qualifications

a) Installation works to be performed by licensed Mechanical Contractor.

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

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

1.10.4. 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. Galvanized Steel

a) Schedule 40 mild steel, galvanized, ASTM A53, screwed, complete with Class 125 galvanized cast iron screwed fittings and screwed joints.

2.1.2. Stainless Steel

a) Stainless steel pipes, ASTM A312 in Types 304/304L and 316/316L. Types 316/316L have a higher corrosion resistance and may be required based upon an externally corrosive environment. Type "L" stainless steel contains less than 0.03% carbon for the pipe needs to be welded.

2.1.3. Copper

a) Type "L" hard drawn seamless copper to ASTM B88, complete with forged solder type fittings to suit pipe, and soldered joints using 95% tin / 5% Antimony solder.

2.2. PIPING UNIONS

2.2.1. Screwed Steel Piping

a) Malleable iron, galvanized, ground joint, brass to iron or bronze to bronze seat unions and union elbows with a minimum pressure rating of 1725 kPa (250 psi) steam at 260 °C (500 °F).

2.2.2. Soldered Copper Piping

a) Solder-on forged copper or bronze screwed unions suitable in all respects for the application.

2.3. LOW PRESSURE SHUT-OFF VALVES

2.3.1. Class 600, 4140 kPa (600 psi) WOG rated full port ball valves, each complete with a forged brass or bronze body with solder joint or screwed joint ends as required, forged brass cap and blowout-proof stem, forged brass chrome plated ball, "Teflon" or "PTEF" seat, and a removable lever handle.

2.3.2. Standard of quality assurance products are:

a) Toyo Valve Co. Fig. 5049A solder or Fig. 5044A screwed;

b) Watts Industries (Canada) Ltd. #FBV-3 or #FBVS-3;

c) Kitz Corporation Code 59 solder or Code 58 screwed;

d) Apollo Valves #70-100 screwed or #70-200 solder;

e) or approved equivalent.

2.4. HIGH PRESSURE SHUT-OFF VALVES

2.4.1. Apollo Valves or approved equivalent, #70-100-27, 4140 kPa (600 psi) rated Class 600, screwed bronze ball valve with a PTFE seat, automatic relief vent, and removable lever handle.

2.5. DRAIN VALVES

2.5.1. Minimum 2070 kPa (300 psi) water rated, 20 mm (¾") dia. straight pattern full port bronze ball valves, each complete with a threaded outlet suitable for coupling connection of 20 mm (¾") dia. garden hose, and a cap and chain.

2.5.2. Standard of quality assurance products are:

a) Toyo Valve Co. Fig. 5046;

b) Kitz Corporation Code 58CC;

c) Apollo Valves #78-100 or #78-200;

d) Watts Industries (Canada) Ltd. #B6000-CC;

e) or approved equivalent.

2.6. AIR COMPRESSOR SET

2.6.1. CompAir Kellogg "American" or approved equivalent, CSA certified, tank mounted, package type, duplex, pre-piped and pre-wired air compressor set designed for loadless starting, and complete with 2-stage, air cooled compressors arranged for automatic operation, and a separate power/control panel.

2.6.2. Identify compressor set model number, performance and electrical characteristics as follows:

a) model number;

b) motor characteristics: __ HP, __ volts, __ phase;

c) displacement: __ L/s (_ gpm);

d) delivery at 552 kPa (80 psi): __ L/s (__ cfm);

e) tank capacity: __ L (__ gal.).

2.6.3. Each compressor complete with:

a) cast iron cylinders, heads, crankcase, and cast iron connecting roads with replaceable automotive type insert bearings;

b) cast iron crankshaft supported on both ends by oversized tapered roller bearings;

c) pressure type oil lubrication with oil sight gauge;

d) steel inlet and discharge valves, and a high efficiency intercooler with steel fins on copper tubes;

e) heavy-duty dry type inlet filter-silencer;

f) high volume, statically balanced flywheel/cooing fan;

g) motor conforming to requirements specified in Section 20 05 10, on an adjustable support base, and V-belt drive with OHSA type steel belt guard, also as specified in Section 20 05 10.

2.6.4. Welded steel receiver including an ASME rated tank in accordance with CSA B51 and TSSA requirements, complete with welded steel support feet, and following:

a) ASME rated safety relief valve;

b) positive seating ball type outlet valve, a screwed union, and a length of braided metallic flexible connection;

c) pressure gauge with gauge cock;

d) adjustable pressure switch for automatic start-stop operation of the compressors;

e) valved manual tank drain, and an automatic tank drain;

f) properly sized neoprene-steel-neoprene vibration isolating mounting pads;

g) braided stainless steel flexible pipe connectors supplied loose.

2.6.5. Surface wall mounting power and control panel in a NEMA 1 (NEMA 2 if room is sprinklered) enameled steel enclosure with a hinged (piano hinge) lockable front door, door interlock disconnect switch, and following:

a) overload protected across-the-line, non-reversing magnetic starter, and a door mounted H-O-A switch for each motor, in accordance with Section 20 05 10;

b) fused control transformer;

c) electronic alternator to automatically alternate lead compressor after each start cycle, and to automatically start lag compressor should the lead compressor fail to start;

d) door mounted "power on" LED for panel and door mounted "run" LED for each compressor;

e) terminal block and strips for power and control wiring connections, including control wiring from receiver mounted pressure switch;

f) required communications interfaces (analogue and digital) for connections for alarm monitoring and BAS integration; exact requirements to be compatible with connected systems and confirmed with Metrolinx.

2.6.6. Standard of quality assurance products are:

a) CompAir Kellog;

b) Atlas Copco Compressors Canada;

c) DeVair Systems;

d) or approved equivalent.

2.7. REFRIGERATED DRYER

2.7.1. Package type, wall mounting refrigerated air dryer supplied with air compressor set, capable of reducing the dew point of total compressor set air delivery to 4 °C (37 °F) with a maximum 20 kPa (3 psi) pressure drop at rated capacity, and complete with:

a) pressure regulator;

b) moisture separator with automatic drain;

c) manual 3-valve bypass to permit isolation and removal of heat exchanger for servicing without interrupting air flow;

d) pressure relief valve;

e) pre-wired NEMA 1 (NEMA 2 if room is sprinklered) power and control panel with disconnect switch, motor starter, power on LED, air inlet temperature gauge, high temperature LED, refrigerant suction pressure gauge, air outlet temperature gauge, air outlet pressure gauge, and terminal strips for wiring connections;

f) non-CFC refrigerant, and HFO refrigerant preferred;

g) hot gas by-pass to maintain continuous operation and stable dew point;

h) replaceable element air filter capable of removing 99 % of the total oil present, 100 % of solid particles 0.6 micron or larger, and 90 % of solid particles 0.4 micron or larger.

2.8. DESICCANT DRYER

2.8.1. Package type, floor mounted desiccant air dryer supplied with air compressor set, capable of reducing the dew point of total compressor set air delivery to -40°C (-40 °F) with a maximum 20 kPa (3 psi) pressure drop at rated capacity, and complete with:

a) Pressure regulator;

b) Pre-filtration min. grade of 0.01 micron or better and Post-filtration min. grade 1 micron or better.

c) Reactivation circuit fully automatic, externally heated blower purge, twin tower compressed air dryer. Uses atmospheric air via blower and passes through electric heater to remove moisture from the desiccant bed, followed by atmospheric air cooling or optional dry air cooling. Operates on an 10-minute NEMA cycle, with temperature dependent heating and cooling steps to ensure proper operation.

d) Valves: Inlet switching valves to be high performance air actuated piston valves with bronze body and viton seal. Purge exhaust valves to be high performance, normally closed, piston valves with bronze body and viton seals. Outlet check valves to be spring loaded piston type with viton seat. Regeneration check valves to be high temperature spring type check valve with metal seat. Re-pressurization valves to be Normally-closed air actuated ball valves and depressurization valves to be normally-closed bronze piston valves.

e) Desiccant to be a high quality, non corrosive, abrasion resistant activated alumina specially designed for high moisture adsorption capacity and low pressure drop. Dryers to be shipped with a full desiccant charge.

f) Desiccant towers to be welded carbon steel construction designed in accordance with ASME section VIII and CRN stamped. Stainless steel desiccant bed support and air diffuser screens to be provided as well as pressure relief valves and drain ports. Configuration to be down flow drying and upflow regeneration.

g) Corrosion protection with a textured, high solids, acrylic polyurethane abrasion and impact resistant coating. Include UV stabilizers and anti-corrosive additives for weather resistance.

h) Control system to be provided to monitor condition of operation, energy management, humidity sensor, dew point sensor, touch access to maintenance and operational data.

2.8.2. Desiccant dryer and all associated equipment and components shall be weather-proof and suitable for outdoor installation. Provide enclosures for all outdoor installations to protect equipment from damage from outdoor elements, wildlife and vandalism. Where required, provide heat tracing of air lines to prevent pipe freeze due to moisture.

2.9. PIPING SYSTEM COMPONENTS

2.9.1. Outlets: DeVair or ARO Fluid Products or approved equivalent, female bayonet lock type quick-connect outlets with exact type and size as directed, each complete with a non-corrosive hose hanger.

2.9.2. Pressure regulators: Watts (CompAir) R119 Series or approved equivalent, adjustable, heavy-duty diaphragm type pressure regulators, each complete with a pressure gauge and a mounting bracket.

2.9.3. Filters: Watts (CompAir) F602 Series or approved equivalent, heavy-duty 40 micron filters, each complete with a zinc bowl with sight glass, internal automatic drain, and mounting bracket.

2.9.4. Combination filter-regulator assemblies: Watts (CompAir) B11 Series or approved equivalent, general purpose filter-regulators, each complete with an adjustable diaphragm type pressure regulator with pressure gauge, a 40 micron filter with zinc bowl, sight glass and automatic drain, and a mounting bracket.

2.9.5. For train air brake systems: pressure gauges complete with ball valves and accessories, TSSA certified for specific application and rated for specific design pressures. Preference is for stainless steel type valves.

3. EXECUTION

3.1. INSTALLATION OF AIR COMPRESSOR SET

3.1.1. Provide an air compressor set.

3.1.2. Secure set in place on vibration isolation on a concrete housekeeping pad.

3.1.3. Ensure housekeeping pad is keyed to structure, and compressor assembly is secured to structure by slack cable restraints. Provide seismic control and restraints as noted or as required by local governing codes and authorities.

3.1.4. Install accessories shipped loose with set, except power and control panel.

3.1.5. Extend type DWV soldered hard copper drainage piping from tank drain assemblies to nearest floor drain.

3.1.6. Hand power and control panel to electrical trade at site for mounting and power wiring connections as part of electrical work.

3.1.7. Connect receiver pressure switch to starter and control panel with wiring in conduit to the standards of the electrical work and in accordance with panel supplier's instructions.

3.1.8. Touch-up paint any damage to the factory finish.

3.1.9. Refer to Section 20 05 10 for equipment/system start-up requirements.

3.1.10. Refer to Section 20 05 10 for equipment/system manufacturer certification requirements. Submit a copy of the letter prior to Substantial Performance of the Work.

3.2. INSTALLATION OF REFRIGERATED DRYER

3.2.1. Provide a refrigerated dryer and wall mount adjacent to compressor set. Connect with piping, including type DWV hard copper drainage piping terminated over a floor drain.

3.2.2. Refer to Section 20 05 10 for equipment/system start-up requirements. Include also for leak test and affixation of leak test tag for refrigerant containing equipment.

3.2.3. Refer to Section entitled 20 05 10 for equipment/system manufacturer certification requirements. Submit copy of letter prior to Substantial Performance of the Work.

3.3. INSTALLATION OF DESICCANT DRYER

3.3.1. Provide a desiccant dryer for the corresponding compressor set where the application is for an installation in which the compressor and dryer will be subjected to sub-freezing conditions (i.e. at or below 0C) during operation.

3.3.2. Install the desiccant dryer in accordance with manufacturer’s requirements and if applicable local codes and requirements.

3.3.3. Refer to Section 20 05 10 for equipment/system start-up requirements.

3.3.4. Refer to Section entitled 20 05 10 for equipment/system manufacturer certification requirements. Submit copy of letter prior to Substantial Performance of the Work.

3.4. INSTALLATION OF PIPING AND PIPING SYSTEM COMPONENTS

3.4.1. Provide required compressed air piping. Install horizontal piping to train air brake system outlets 1.0 m (3.3') above finished floor level. Unless otherwise specified or directed by Metrolinx, install other horizontal piping to outlets 1.5 m (5') above finished floor level.

3.4.2. Pipe is to be Schedule 40 mild galvanized steel, screwed, or type "L" hard copper, soldered, or stainless steel pipes in Types 304/304L and 316/316L.

3.4.3. Install, support and secure piping generally as specified in Section 20 05 10, as required for above ground and below ground installations. Include extra support and securing hardware as required to prevent drumming. Provide rigid supports at each side of outlets.

3.4.4. Arrange piping so condensate will drain from mains and branches into drip legs. Provide drip legs at bottom of risers, every 30 m (100') of pipe run, and at the end of each branch piping run, whether indicated on drawings or not.

3.4.5. Drip legs are to extend down from bottom of pipe and consist of a piping tee and 250 mm (10") long pipe nipple same size as main or branch pipe, then a reducing fitting (if required) and 12 mm (½") dia. piping extended down to floor level and terminated with a ball valve. Ensure drain points are easily accessible and identified.

3.4.6. Extend branch piping to outlets and/or equipment off the top of the main(s).

3.4.7. Provide shut-off valves in piping at all equipment connections, to isolate piping components for removal or maintenance, and wherever else specified or shown. Provide vented type valves between air compressor set and pressure reducing stations.

3.4.8. Provide unions in piping at connections to equipment.

3.4.9. When piping is complete and has been pressure tested, but before connection of outlets, blowout piping to remove oil and foreign matter.

3.4.10. Provide adjustable pressure regulators, filters, compressed air outlets, etc. Unless otherwise indicated locate outlets 1.5 m (5') above floor and properly secured in place. Provide a hose hanger at each outlet location. Confirm exact location of piping components prior to roughing-in.

3.4.11. Provide required certified pressure gauges and install as required. Refer to Section 20 05 10 for additional requirements. Install required pressure gauges complete with ball valves to serve train air brake system, as confirmed with Metrolinx.

END OF SECTION