

1 General

1.1 **WORK INCLUDED**

.1 Furnish Work of this section in accordance with the Contract Documents including but not limited to, the following:

.1 Air cooled, pressure oil-lubricated duplex reciprocating air compressors package, 2-stage, 2 cylinder cast iron compressor pump unit with system pressure controller, one 120 gal horizontal air receiver, complete with automatic condensate drainage, and related compressed air piping, including design, shop drawings, fabrication, shop and field testing, delivery to Job Site, supervision and start-up of units.

.2 The constant speed compressor shall be capable of delivering 37 scfm at 150 psi in accordance with ISO 1217, Annex C scfm is actual cubic feet per minute at inlet conditions.

.3 Conform to all sections of Division 1, 21, 22, 23 and 25 as applicable.

2 Products

2.1 **GENERAL**

.1 Minimum expected useful life is twenty years.

.2 This specification is for NEW air compressors.

2.2 **ELECTRICAL RECIPROCATING COMPRESSORS**

.1 The reciprocating air compressor shall be capable of producing and delivering 100% of the required air demand as specified at Air Compressor Schedule.

.2 The compressor shall be designed and supplied as a complete package with all necessary equipment, including but not limited to the following components: inlet filter, air compressor system with drive motor, microprocessor regulation and control system. The package system shall be factory built, assembled and tested.

.3 The compressor package shall be rated to operate in ambient conditions from 32°F to 115°F.

.4 The units shall be manufactured by a qualified manufacturer who has been manufacturing air compressors for at least 10 years.

.5 The compressor manufacturer shall be certified under ISO 9001/9002 quality standards and ISO 14001 environmental standards.

.6 The manufacturer must participate in the Compressed Air & Gas Institute (CAGI) Performance Verification program.

2.3 **COMPRESSOR**

.1 The compressor shall be reciprocating type consisting of;

.1 High pressure: Heat treated and stress relieved connecting rod made from solid cast ductile iron.

- .2 Low Pressure: Heat treated and stress relieved connecting rod made from aluminum alloy.
- .3 It shall have tin-plated compression rings designed to work with oil control rings and scraper.
- .4 It shall have babbit inserts.
- .5 Short stroke design to be a combination of large and short stroke and slow operating speeds.
- .6 Cylinder shall be made of cast iron. Walls shall be precision machined for friction reduction and minimal oil carryover. It shall have extra deep fins for cooling and assembly strength.
- .7 It shall have quick quiet-acting valves machined from carbon steel. Valva guide shall be of hardened carbon steel complimenting stainless steel valve discs and springs.
- .8 Bearings shall be designed for heavy load capacity. It shall be lubricated from the crankcase and shall be maintenance free.
- .9 Intercoolers shall be made of deep finned cast iron.
- .10 Flywheel shall be balanced fan type with airfoil-type spokes.
- .11 Crankshaft shall have integral counter weights and shall be balanced. Journals are precision ground and furnished with inserts. It shall be drilled and ported for carrying oil to beraing surfaces.

2.4 **NOISE LEVELS**

- .1 The compressor package shall not exceed 74 dB(A) when measured in the free field conditions at one meter in accordance with the CAGI-Pneurop Test Code.

2.5 **DRIVE MOTOR**

- .1 The drive motor must be a Open Drip Proof (ODP) type.
- .2 The full-load efficiency rating must meet or exceed NEMA premium standards.
- .3 The motor shall conform with NEMA MG 1 for 60 Hz applications and IEC 34-1, EN60034-1 for 50 Hz applications.
- .4 The complete motor shall be 100% maintenance free.
- .5 Approved manufacturers include:
 - .1 DV Systems
 - .2 Siemens
 - .3 Lincoln
 - .4 ABB
 - .5 TECO Westinghouse
 - .6 Reliance

.7 Leroy Somer

.8 Toshiba

.9 Baldor

2.6 **ELECTRONIC WATER DRAIN**

.1 The compressor will have zero loss electronic water drain plumbed to the aftercooler.

.2 These drains shall discharge no compressed air during removal of the condensate.

.3 The zero loss drains shall be monitored by the microprocessor controller.

.4 A manual condensate drain shall also be included.

2.7 **INLET AIR FILTER**

.1 The filter shall be a paper cartridge type and be factory installed inside the compressor enclosure.

.2 The filter shall have the following SAE fine efficiency ratings:

.1 1 micron: 98.0%

.2 2 microns: 99.5%

.3 3 microns: 99.9%

.3 The filter shall be equipped with a differential pressure indicator for monitoring by the control system.

.4 The service interval of the filter must be at least 4,000 hours.

2.8 **OIL SYSTEM**

.1 The oil system shall include an ASME approved air/oil separator with oil level indicator. The service interval of the separator element must be at least 8,000 hours.

.2 The oil filter shall be a spin-on type with an integrated bypass valve. The oil filter element will have a 12 micron beta 75 rating and the service interval must be at least 8,000 hours.

.3 The oil temperature shall be regulated by means of a thermostatic bypass valve. Oil circulation is achieved through differential pressure.

.4 The oil must be synthetic and rated for a change interval of 8,000 hours.

.5 The oil system must use o-rings to provide a positive seal. No gaskets can be used.

2.9 **REGULATING AND CONTROL SYSTEM**

.1 The compressor shall have a regulating system which is of the full load/no load design, controlled by an air compressor discharge pressure sensor which senses the pressure variations at the compressor discharge and maintains it within a pre-set adjustable range.

.2 The full load/no load regulation shall be combined with a start/stop regulation to automatically stop the compressor as required.

- .3 The compressor shall be equipped with an onboard microprocessor controller which will control, monitor and protect the operation and condition of the air compressor.
- .4 The controller shall have a 3.5" colour display.
- .5 The controller shall allow programming of two pressure bands for loading and unloading.
- .6 Time based start/stop and changeover for net pressure band shall be programmable.
- .7 The control algorithm shall include a function to proactively stop the compressor during periods of low demand without having to wait for the stop timer to time out.
- .8 The controller must be capable of automatically restarting the compressor in the event of a voltage failure.
- .9 The controller must be capable of graphing any of the measured temperature or pressure inputs on the display. The time frame of the graph shall be adjustable from 4 minutes to 10 days.
- .10 The compressor shall be able to be controlled locally, remotely or via a local area network.
- .11 The controller must be equipped with auxiliary contacts for external indication of automatic or manual load control, general warning and general shutdown conditions.
- .12 The controller must be capable of providing remote monitoring by a PC through the local Ethernet system via an Ethernet port on the controller.
- .13 The controller must be capable of providing remote monitoring via an Apple or Android phone or tablet.
- .14 The controller shall monitor the hours of operation and output a message on the display to notify the operator to provide preventative maintenance in accordance with the factory approved service plan.
- .15 The control system shall have the capability to monitor the following items:
 - .1 Discharge air pressure
 - .2 Element outlet temperature
 - .3 Ambient temperature
 - .4 Compressor status
 - .5 Motor overload status
 - .6 Running hours
 - .7 Loaded hours
 - .8 Regulator hours
- .16 Compressor protective functions shall include:
 - .1 Emergency stop
 - .2 Element outlet temperature

- .3 Service warnings
- .4 Drive and cooling fan motor overload
- .17 Acceptable Manufacturers
 - .1 Atlas Copco
 - .2 Ingersoll Rand
 - .3 Quincy
 - .4 DV Systems

~~2.10~~ ~~**MONITORING SYSTEMS (FUTURE BAS INTEGRATION)**~~

- .1 Any vendors that are authorized dealers or distributors of the following control systems are acceptable:
 - .1 Delta Controls
 - .2 Reliable Controls
 - .3 Schneider Electric SmartX Series
 - .4 Distech Controls
 - .5 Johnson Controls Facility Explorer
 - .6 Honeywell CIPer series, Spyder Models 5 or 7
- .2 BAS System Integration:
 - .1 All control systems must be integrated to the City's J2 Innovations Fluid Integration (FIN) serve, including but not limited to the following:
 - .1 Graphical user interface (monitoring and control)
 - .2 Alarming
 - .3 Data Trending
 - .4 Data Archiving
 - .5 Project Haystack naming convention
 - .2 The installer must be licensed by J2 Innovations to sell, install, program and configure Fluid INtegration (FIN).
 - .3 Building Controllers (BC) must be Tridium Niagara JACE with the Haystack module and driver. The installer must be a licensed Tridium system integrator for any Tridium BCs or embedded or edge Niagara Framework products used. Soft JACE is not accepted.
- .3 Licensing Requirements
 - .1 Licenses shall be provided to and in the name of the City of Toronto
 - .2 Licenses shall be perpetual, transferrable, assignable and royalty free.

- .3 *Tridium Licenses shall allow all workbench/supervisor brands complete system access and functionality.*

.4 Installer and Manufacturer Qualifications

- .1 *Installer shall have an established working relationship with Control System Manufacturer.*
- .2 *Installer shall have successfully completed control system's control system training. Upon request, installer shall present record of completed training including course outlines.*
- .3 *It is the intent of these specifications to define an open protocol state-of-the-art distributed computerized Building Management and Control System, which is user friendly, has known reliability, is extremely responsive, and which is to be designed, installed, implemented, and supported by a local office of approved bidders.*
- .4 *BAS Contractor provides three locations for successful installations of similar open protocol computer-based systems. Sites provided must consist of more than 150 hardware inputs/outputs. Project sites must be local to the location of this project.*

3 Execution

3.1 **SUPERVISION**

- .1 Coordinate with Installing Contractor and provide supervision for:
- .1 Unloading, transportation to final location, and installation of equipment.
- .2 Connection of piping and electrical wiring to equipment.
- .2 Submit report of satisfactory completion of each phase of Work to Project Coordinator.

3.2 **TESTING AND COMMISSIONING**

- .1 Provide all supervision and engineering support necessary to assist Mechanical/Controls Subcontractor start-up, test and prove performance of equipment meets specified requirements, from minimum to full load conditions. Tests shall conform to manufacturer's standard using all purchased components.
- .2 In addition to machine performance tests, carry out noise tests to demonstrate compliance with noise specification for both indoor and outdoor noise levels.
- .3 Shop tests shall comprise following:
- .1 Compressors
- .1 Comply with manufacturer's standards/ISO 1217 Annex "C".

End of Section