Part 1 General

1.1 REFERENCES

.1 Unless otherwise noted, refer to the latest references and standards listed herein adopted by the local Authority Having Jurisdiction.

1.2 SUBMITTALS

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

.2 Shop drawings to show:

- .1 Mounting arrangements; and,
- .2 Operating and maintenance clearances.

.3 Shop drawings and product data accompanied by:

- .1 Detailed drawings of bases, supports, and anchor bolts;
- .2 Acoustical sound power data, where applicable;
- .3 Points of operation on performance curves;
- .4 Manufacturer to certify current model production; and,
- .5 Certification of compliance to applicable codes.

.4 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

.5 Closeout Submittals:

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 10 - Closeout Submittals;
- .2 Operation and maintenance manual reviewed by, and final copies deposited with, Contract Administrator before final inspection; and,
- .3 Operation data to include:
  - .1 Control schematics for systems including environmental controls
  - .2 Description of systems and their controls
  - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances
  - .4 Operation instruction for systems and component
  - .5 Description of actions to be taken in event of equipment failure
  - .6 Valves schedule and flow diagram
  - .7 Colour-coding chart
- .4 Maintenance data to include: servicing, maintenance, operation and trouble-shooting instructions for each item of equipment:
  - .1 Data to include schedules of tasks, frequency, tools required and task time
- .5 Performance data to include:
  - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete

.2 Equipment performance verification test results

.3 Special performance data as specified

.6 Reviews:

.1 Submit two copies of draft Operation and Maintenance Manual to Contract Administrator for review. Submission of individual data will not be accepted unless directed by Contract Administrator

.2 Make changes as required and re-submit as directed by Contract Administrator

.7 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions

.8 Site records:

.1 Departmental Representative will provide white prints of the mechanical drawings. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring

.2 Transfer information weekly to white prints, revising white prints to show work as actually installed

.3 Use different colour waterproof ink for each service

.4 Make available for reference purposes and inspection

.9 As-built drawings:

.1 Prior to testing mechanical equipment, finalize production of as-built drawings

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date)

.3 Submit to Contract Administrator for review and make corrections as directed

.4 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals

1.3 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

.1 NOT USED

.2 Not Used

Part 3 Execution

3.1 DEMOLITION

.1 Preparation

.1 Coordinate utility service outages with utility company and schedule utility to locate buried services;

.2 Provide temporary connections to maintain existing system in service during construction. When Contractor elects to perform work on energized equipment, use personnel experienced in such operations; and,

.3 Beginning of demolition means installer accepts existing conditions.

.2 Demolition

.1 Connect equipment which is existing and is to remain to the new system as required to maintain its proper operation; and,

.2 Maintain access to existing mechanical installations which remain active. Modify installation or provide access as appropriate.

.3 Scheduling and Phasing

.1 Prior to the start of any demolition work within the building, provide the Contract Administrator a schedule of phased selective demolition for all mechanical demolition at the Site; and,

.2 Provide the following information for the schedule:

.1 Number of phases of demolition

.2 Limits of each phase

.3 Dates of start / finish demolition by phase

.4 Critical dates for disruptions in other mechanical systems

.5 Dates and duration of temporary measures to maintain occupancy in adjacent areas

.3 Coordinate the mechanical demolition schedule with all aspects of demolition under other Divisions of the Specifications.

3.2 PAINTING REPAIRS AND RESTORATION

.1 Prime and touch up marred finished paintwork to match original.

.2 Restore to new condition, finishes which have been damaged.

3.3 CLEANING

.1 Clean interior and exterior of all systems.

3.4 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in Part 1 - Submittals.

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in Part 1 – Submittals;

.2 Provide manufacturer's field services consisting of product use recommendations and periodic Site visits for inspection of product installation in accordance with manufacturer's instructions; and,

.3 Schedule Site visits, to review Work, as directed in Part 1 - Quality Assurance.

3.5 DEMONSTRATION

.1 Contract Administrator will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Trial usage to apply to following equipment and systems:

.1 Compressed air system.

.3 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.4 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.5 Instruction duration time requirements as specified in appropriate sections.

3.6 PROTECTION

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for piping, fittings, equipment used in compressed air systems.

.2 Related Sections:

.1 Section 01 33 00 - Submittal Procedures
.2 Section 01 45 00 - Quality Control
.3 Section 01 74 19 - Construction/Demolition Waste Management and Disposal
.4 Section 01 78 00 - Closeout Submittals
.5 Section 22 05 00 - Common Work Results for Plumbing
.6 Section 23 05 17 - Pipe Welding

1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME)

.1 ASME Boiler and Pressure Vessel Code Section VIII Pressure Vessels:

.1 BPVC-VIII B, BPVC Section VIII - Rules for Construction of Pressure Vessels Division 1

.2 BPVC-VIII-2 B, BPVC Section VIII - Rules for Construction of Pressure Vessels Division 2 - Alternative Rules

.3 BPVC-VIII-3 B, BPVC Section VIII - Rules for Construction of Pressure Vessels Division 3 - Alternative Rules High Press Vessels

.2 ASME B16.5, Pipe Flanges and Flanged Fittings; and,

.3 ASME B16.11, Forged Fittings, Socket-Welding and Threaded.

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

.1 ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless; and,

.2 ASTM A181/A181M, Standard Specification for Carbon Steel Forgings for General Purpose Piping.

.3 Canadian Standards Association (CSA International)

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

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

.1 Material Safety Data Sheets (MSDS).

1.3 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; and,

.2 Submit WHMIS MSDS in accordance with Section 02 61 33 - Hazardous Materials. Indicate VOC's for adhesive and solvents during application and curing.

.3 Shop Drawings:

.1 Submit shop drawings to indicate project layout including layout, dimensions and extent of piping system:

.1 Vertical and horizontal piping locations and elevations and connections details

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

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

.4 Instructions: submit manufacturer's installation instructions

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

1.4 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 – Quality Control.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and disposal: Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 AIR COMPRESSOR

.1 Refer to equipment schedule on Drawing M3.

2.2 AIR RECEIVER

.1 Refer to equipment schedule on Drawing M3.

2.3 AIR DRYER

.1 Refer to equipment schedule on Drawing M3

2.4 PIPING FOR LOWER LEVEL PIPES AND RISERS

.1 Piping: to ASTM A53/A53M, schedule 80 seamless black steel.

.2 Fittings:

.1 NPS2 and smaller: to ASME B16.11, schedule 80 steel, socket welded; and,

.2 NPS2 1/2 and larger: to ASME B16.11, schedule 80 steel, butt or socket welded.

.3 Couplings: to ASME B16.11, socket welded or threaded half coupling type.

.4 Unions: 1000 kPa malleable iron with brass-to-iron ground seat.

.5 Dissimilar metal junctions: use dielectric unions.

.6 Flanges:

.1 NPS2 and smaller: to ASME B16.5, forged steel, raised face and socket welded; and,

.2 NPS2 1/2 and larger: to ASME B16.5, forged steel, raised face and slip-on or weld neck.

.7 Joints:

.1 NPS2 and smaller: socket welded; and,

.2 NPS2 1/2 and larger: butt welded.

2.5 PIPING FOR HIGH PRESSURE MAIN LOOP AND DROPS

.1 Piping: Aircom Purestream aluminium extrusion alloy EN AW T6 UNI-EN 755-2 with inside and outside titanium-based, chrome-free and RoHS-complying treating and electrocoated outside surface, rated for 174 PSIG operating pressure.

.2 Fittings: Aircom Purestream enameled die-cast aluminium alloy compression fitting rated for 174 PSIG operating pressure. Provide adaptors for steel pipes as required.

2.6 BALL VALVES

.1 Three piece design or top entry for ease of in-line maintenance.

.1 To ASTM A181/A181M, Class 70, carbon steel body socket welded or screwed ends, carbon steel ball and associated trim suitable for compressed air application; and,

.2 To withstand 1034 kPa maximum pressure.

2.7 COUPLERS/CONNECTORS

.1 Industrial interchange series, full-bore.

.2 Maximum inlet pressure: 1700 kPa.

.3 Valve seat: moulded nylon.

.4 Body: zinc plated steel.

.5 Threads: NPT.

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 COMPRESSOR STATION

.1 Install on vibration isolators on the floor.

3.3 COMPRESSED AIR PIPING CONNECTIONS AND INSTALLATION

.1 Install shut-off valves at outlets, major branch lines and in locations as indicated.

.2 Install unions to permit removal or replacement of equipment.

.3 Install compressed air trap and pressure equalizing pipe at moisture collecting points. Drain pipe to nearest floor drain.

.4 Make branch connections from top of main.

.5 Install compressed air trap at bottom of risers and at low points in mains, piped to nearest drain. Distance between drain points to be 30 m maximum.

.6 Provide drain from refrigerated air dryer.

.7 Weld steel piping in accordance with Section 23 05 17 - Pipe Welding and;

.1 To ASME code and requirements of authority having jurisdiction; and,

.2 Weld concealed and inaccessible piping regardless of size.

3.4 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:

.1 Testing: pressure test in accordance with requirements of Section 22 05 00 - Common Work Results for Plumbing, for four (4) hours minimum, to 1100kPa, with outlets closed and with compressor isolated from system. Pressure drop not to exceed 10kPa.

.2 Manufacturer's Field Services:

.1 Have manufacturer of products supplied under this Section review work involved in handling, installation/application, protection and cleaning of its product[s], and submit written reports, in acceptable format, to verify compliance of work with Contract;

.2 Provide manufacturer's field services, consisting of product use recommendations and periodic Site visits for inspection of product installation, in accordance with manufacturer's instructions; and,

.3 Schedule Site visits to review work at stages listed:

.1 After delivery and storage of products, and when preparatory work on which work of this Section depends is complete, but before installation begins;

.2 Twice during progress of work at 25% and 60% complete; and,

.3 Upon completion of Work, after cleaning is carried out.

.3 Obtain reports within three (3) days of review and submit immediately to Contract Administrator.

3.5 CLEANING

.1 Refer to Section 23 08 01 - Performance Verification of Mechanical Piping Systems and Section 23 08 02 - Cleaning and Start-Up of Mechanical Piping System.

.2 Cleaning: blow out piping to clean interior thoroughly of oil and foreign matter.

.3 Check entire installation is approved by authority having jurisdiction.

.4 Perform cleaning operations in accordance with manufacturer's recommendations.

.5 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION