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**PART 1        GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 74 21 - Construction / Demolition Waste Management and Disposal.
- .3      Section 01 78 00 - Closeout Submittals.

**1.2            SUBMITTALS**

- .1      Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Shop drawings; submit drawings stamped and signed for approval by Department Representative.
- .3      Shop drawings to show:
  - .1          Mounting arrangements.
  - .2          Operating and maintenance clearances.
- .4      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.
  - .5          Certification of compliance to applicable codes.
- .5      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.
- .6      Closeout Submittals:
  - .1          Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
  - .2          Operation and maintenance manual approved by, and final copies deposited with, Department Representative before final inspection.
  - .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:
  - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
  - .2 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.
  - .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .6 Approvals:
  - .1 Submit 2 copies of draft Operation and Maintenance Manual to Department Representative for approval. Submission of individual data will not be accepted unless directed by Engineer / Architect.
  - .2 Make changes as required and re-submit as directed by Department Representative.
- .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 and Interference Drawings:
  - .1 Interference drawings for mechanical systems must be provided by the mechanical contractor and must incorporate the space requirements for all Divisions at locations designated by Department Representative.
  - .2 The mechanical contractor must co-ordinate the installation of all equipment, piping, ducts, conduit sprinkler piping etc. with all other Divisions, owner's own forces and with the General Contractor. All such devices must be shown on the interference drawings. The mechanical contractor must provide dedicated site/office and on-site personnel for the preparation of interference drawings throughout all phases of the construction. Personnel must be trained in the preparation of mechanical building systems with a minimum of 5 years experience in the preparation of mechanical drawings utilizing Autocad.
  - .3 Prepare interference drawings a 1:50 scale and submit to the engineer for approval prior to proceeding with work. These drawings are required throughout the building and include Levels 1, 2, 3, and service shafts. This work is considered an integral part of the scope of work under the mechanical contract. Drawings must be prepared utilizing Autocad, Release 2013 and must be included with the As-Built Drawing documentation

- .4 Department Representative will provide 1 set of reproducible mechanical drawings and AutoCAD files. Provide sets of white prints and Autocad drawings as required for each phase of work. Mark changes as work progresses and as changes occur on sets of white prints and in Autocad. Include changes to existing mechanical systems, control systems and low voltage control wiring.
- .5 Transfer information weekly to reproducible and in Autocad, revising to show work as actually installed.
- .6 Use different colour for each service.
- .7 Make available for reference purposes and inspection.
- .9 As-built drawings:
  - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings on reproducible and in Autocad.
  - .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 Department Representative for approval and make corrections as directed.
  - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
  - .5 Submit completed reproducible as-built drawings and disc with Autocad as-built drawings with Operating and Maintenance Manuals.
- .10 Submit copies of as-built drawings for inclusion in final TAB report.

### **1.3 QUALITY ASSURANCE**

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

### **1.4 MAINTENANCE**

- .1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals as follows:
  - .1 One set of packing for each pump.
  - .2 One casing joint gasket for each size pump.
  - .3 One head gasket set for each heat exchanger.
  - .4 One glass for each gauge glass.
  - .5 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.
- .3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

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**1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- .1 All materials used on this project shall be new and CSA approved unless noted otherwise.

**PART 3 EXECUTION**

**3.1 PAINTING, REPAIRS AND RESTORATION**

- .1 Do painting in accordance with Section 09 91 23 - Interior Painting.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

**3.2 CLEANING**

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

**3.3 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.
  - .1 Submit tests as specified in other sections of this specification.
- .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.
  - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

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**3.4 DEMONSTRATION**

- .1 Department Representative will use equipment and systems for test purposes prior to acceptance. Contractor to supply labour, material, and instruments required for testing.
- .2 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.
- .3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .4 Instruction duration time requirements as specified in appropriate sections.
- .5 Department Representative may record these demonstrations on video tape for future reference.

**3.5 PROTECTION**

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

**END OF SECTION**