

1 General

1.1 **SUMMARY**

.1 Section Includes

- .1 Labour, Products, equipment and services necessary to complete the Work of this section.

1.2 **CODES, REGULATIONS AND STANDARDS**

- .1 Comply with municipal and provincial codes, rules and regulations and/or authorities having jurisdiction.
- .2 Comply with the National Building Code in areas where municipal or provincial regulations and/or codes are not mandatory.
- .3 Revisions issue: Latest version as amended to date.

1.3 **REFERENCES**

- .1 Comply with applicable requirements of the latest issue of the following Standards:
- .1 OFC - Ontario Fire Code
- .2 NFPA 10 - Portable Fire Extinguishers
- .3 SMACNA - Seismic Restraint Manual Guidelines for Mechanical Systems
- .4 NFPA - 13 Installation of Sprinkler Systems
- .5 ASHRAE - HVAC Applications, Seismic and Wind Restraint Design
- .6 CAN/ULC-S508 - Rating and Fire Testing of Fire Extinguishers
- .7 NFPA - All relevant sections

1.4 **WORKING DRAWINGS AND DOCUMENTS**

.1 Design Drawing Intent

- .1 The design drawings are schematic in arrangement, and describe the general design intent but do not show the exact details for the installation. They are not fabrication or installation drawings.
- .2 The Work is suitably outlined on the drawings with regard to sizes, locations, general arrangements and installation details, and has been generally coordinated for routing of services. The routing of ductwork, piping and equipment arrangement are shown more or less in diagram except where in certain cases the Drawings may include details giving the exact locations and arrangements required.
- .3 The location of equipment, and the associated arrangement of piping, ductwork, and other material describes the general requirements of the Work. Final location is dependant on the actual equipment supplied. The Consultant reserves the right to make reasonable adjustment of up to 1 m to the location of equipment, floor drains, routing of major piping and ductwork, at no cost to the Owner.

- .4 In order to provide clarity to the arrangement of the Work, not all details including valves, thermometers, pressure gauges, etc. are shown on the Plan Drawings. Refer to Schematic Drawings, standard details and the Specification for these requirements.
  - .5 Where specific installation dimensions for location of equipment and access space requirements are indicated on the drawings, install to these requirements.
  - .6 Where standard details are provided, these show the general installation requirements, and are applicable to each occurrence in the Work, unless otherwise specified or shown.
- .2 Contractor Coordination Responsibilities
- .1 Provide the services of a mechanical/electrical coordination supervisor, to coordinate this division of the Work, as well as providing coordination with other divisions and/or contracts. This supervisor may be full time or part time on site, as appropriate to the work stage and complexity of the Work, at the discretion of the Owner.
  - .2 Where multiple trades are required, the mechanical coordinating supervisor shall be the lead coordinator.
  - .3 The Owner reserves the right to require the coordinating supervisor to increase their attendance at site, at no cost to the Owner, if in the Owner's opinion the current level of coordination is not sufficient for the progress of the Work.
  - .4 Make changes and modifications as necessary to ensure coordination and to avoid interference and conflicts with other trades.
  - .5 Prepare construction/installation/fabrication drawings, coordinated with other trades and contracts, as required.
    - .1 Provide sufficient detail to disclose critical interferences of major equipment and services to ensure adequate accessibility.
    - .2 Specific dimensions for equipment location or access which are shown on the Consultants Drawings.
    - .3 Indicate sleeves, openings and stress points (such as anchors, guides and inserts).
    - .4 Indicate deviation in sizes and weights and also in water, drainage, electric power or other service requirements for all equipment proposed which is different from those shown on the design drawings.
    - .5 Provide these drawings to other trades for coordination with their work.
    - .6 Update these drawings as part of the As-Built Drawings, showing actual locations of major equipment, services, access doors, shut-off valves, etc.
  - .6 The Design Drawings show the major requirements for the installation of equipment based on one manufacturer's requirements, but may not show all installation requirements. The Contractor will include as part of the Work the specific manufacturer's installation requirements for the equipment actually provided by the Contractor.

- .7 The construction/installation/fabrication drawings are not to be submitted as Shop Drawings. Make them available for viewing at site when requested by the Consultant.

- .3 Review Before Proceeding (HOLD)

- .1 Where the word "HOLD" appears on drawings and other Contract Documents, the Work is included in the Contract.
  - .2 Execute such Work only after verification of dimensions, verification of materials and obtaining Consultant's written permission to proceed.

1.5 **COORDINATION AND EXAMINATION**

- .1 Reference

- .1 To Section 01 10 00.

- .2 Examination

- .1 Carefully examine Work and Drawings of all related trades and thoroughly plan the Work so as to avoid interferences.
  - .2 Report defects which would adversely affect the Work. Do not commence installation until such defects have been corrected.

- .3 Coordination

- .1 Coordinate Work of Division 21, 22, 23 and 25 such that items will properly interface with work of other divisions. Prepare Installation Drawings of critical locations and submit to Consultant for review.
  - .2 Architectural Drawings, or in their absence, Mechanical Drawings govern all locations.

1.6 **EXISTING SERVICE**

- .1 Tie-in to Existing Services

- .1 Do not shut down or make tie-in connections to any existing service without written permission of the Owner and/or Consultant.
  - .2 Arrange Work to minimize interruption to physical access to the building.
  - .3 Include for all costs associated with making connections to existing services, including but not limited to, cutting and patching of existing floors, partitions, ceilings and finishes.

- .2 Work in Existing Buildings

- .1 Route pipes, conduits and other services to avoid interference with existing installation.
  - .2 Relocate existing services and equipment to suit installation of new work.
  - .3 Cut back and cap existing services not being used, so that finished Work presents a neat and clean appearance.

- .4 Unless noted to be reused, fixtures and materials being removed become the property of the Contractor and are to be removed from site, unless otherwise noted.
  - .3 Continuity of Services
    - .1 Be responsible for any damage to existing systems, including insulation and coverings, when making connections.
    - .2 Keep existing buildings in operation with minimum length of shut-down periods.
    - .3 Include overtime work to tie-in piping or wiring at night or on weekends.
- 1.7 **PROVISION FOR FUTURE**
  - .1 Future Equipment
    - .1 Where indicated as reserved for future equipment or services, leave identified space clear and install services and equipment so that connections can be made in the future.
- 1.8 **SUBMITTALS**
  - .1 Shop Drawings
    - .1 Conform to Section 01 33 00 and the following.
    - .2 Shop Drawings showing more than one size or model will not be considered unless properly marked up.
    - .3 For electrically driven, and fuel fired appliances, provide the following information:
      - .1 Electrical characteristics including voltage, phase, frequency and power rating.
      - .2 For motors, NEMA, class and efficiency ratings.
      - .3 Fuel input ratings including flow rates and pressures.
      - .4 Equipment performance ratings, including flow rates, pressures, efficiencies, part load values and/or efficiencies (IPLV's), plotted flow characteristics (pump and fan curves) with operating points clearly plotted.
    - .4 For other equipment include the following information:
      - .1 Equipment performance ratings, including flow rates, pressures drops.
      - .2 Electrical control power requirements.
    - .5 For all equipment, include the following:
      - .1 Equipment dimensions and weights.
      - .2 Itemized product description with optional items clearly marked as being included.

- .6 Provide wiring Shop Drawings:
  - .1 Wiring diagrams and schematics for all equipment which has electrical controls or devices furnished with the equipment.
  - .2 Wiring diagrams alone are not sufficient; schematic and interconnecting drawings and sequence of operation of equipment are required for review.
  - .3 Clearly indicate the materials and/or equipment being supplied
    - .1 Details of construction, finish, accurate dimensions, capacities and performance.
    - .2 Certify drawings correct for construction by the manufacturer, before submission.
    - .3 Identify equipment Shop Drawings with designations as shown on the drawings or in the Specifications.
    - .4 If not complied with, Shop Drawings will not be reviewed and will be returned to the Contractor.
  - .4 Coordinate equipment which attaches to and/or where external wiring provided connects to other equipment.
    - .1 Do such coordination whether such equipment is supplied under this or other contracts or subcontracts, for which relevant information will be provided by Owner/Consultant.
  - .7 Shop Drawings shall conform to the requirements of NFPA 13, NFPA 14, NFPA 20, and other relevant sections as necessary.

1.9 **"AS-BUILT" RECORD DRAWINGS**

- .1 Reference
  - .1 Conform to Section 01 33 00.
  - .2 Maintain an accurate dimensional record of all underground piping and all deviations and changes in aboveground piping and equipment.

1.10 **INSTALLATION AND START-UP INSTRUCTIONS**

- .1 Reference
  - .1 Conform to Section 01 33 00.
  - .2 Submit copies of installation instructions and copies of start-up instructions for any item of equipment when requested by the Consultant.

1.11 **OPERATING AND MAINTENANCE INSTRUCTION MANUALS**

- .1 Reference
  - .1 Conform to Section 01 33 00.
  - .2 In addition, include the following in the manuals:

- .1 Non-dimensional layout showing location of all electrical devices on mechanical equipment.
- .2 Operating instructions, including start-up and shut-down procedure.
- .3 Lubricating instructions and recommended cycle of lubrication for each item of equipment, including various types of lubricants.
- .4 List of spare parts.
- .3 All the above applies to component parts of equipment whether they are manufactured by the Supplier of the equipment or are supplied as a component part of an item of equipment.

1.12 **CLEANING, TESTING AND APPROVAL RECORDS**

- .1 Records
  - .1 Maintain records of all pressure tests and flushing and sterilization tests, glycol/water concentrations, inspections and approvals by the plumbing inspector.
  - .2 Forward these tests to the Owner on completion of the Work in accordance with Section 01 33 00.
  - .3 Forward to Consultant, copy of records on site on completion of each test, cleaning operation, etc.

1.13 **DIMENSIONS AND QUANTITIES**

- .1 Dimensions
  - .1 Dimensions shown on drawings are approximate.
  - .2 Verify dimensions by reference to Shop Drawings and field measurement.
- .2 Quantities
  - .1 Quantities or lengths indicated in any of the Contract Documents are approximate only and shall not be held to gauge or limit the Work.

1.14 **TRADE QUALIFICATIONS**

- .1 Applicable to the following trades
  - .1 Sprinkler/Fire Protection
- .2 Requirements
  - .1 Trade workers to have a certificate of qualification as journeyman or apprentice registration for the province where the work is performed or an interprovincial certificate.
  - .2 Ratio of journeyman to apprentice not to exceed the defined ratio in the Apprenticeship Act of Ontario.
  - .3 On award of Contract, submit a list of trade journeyman and apprentices, together with their certificate and registration numbers.
  - .4 Certificates and registration must be provided to the Consultant on request.

- .5 Maintain on-site an up-to-date record listing journeyman and apprentices working on site.

## 2 Products

### 2.1 MATERIALS

- .1 Use new materials and equipment, free from defects impairing strength and durability, as specified or specified equivalent.
- .2 Of Canadian manufacture wherever possible.
- .3 Labelled or listed as required code and/or inspection authorities.
- .4 Design of mechanical systems has been based on the first listed Supplier and model number/size stated on the equipment schedules on the drawings. Bear all costs due to physical or performance differences between stated equipment and proposed equipment. These differences include but are not limited to size, layout, arrangement, connection size, location and/or quantity of connections, or performance differences such as noise, power requirements, flow, throw, etc.

### 2.2 EQUIPMENT/STRUCTURE COORDINATION

- .1 Locations and dimensions of curbs and roof and floor opening framing, where indicated on the drawings, are based on an arrangement to suit the above named Supplier.
- .2 Be responsible to verify the actual size requirements of the openings, and notify the Consultant immediately in case the dimension of the unit supplied and the connecting ductwork/piping, etc. are at variance with the dimensions given on the Drawings.
- .3 Bear all costs for modification of curbs and floor/roof openings resulting from failure to notify the Consultant prior to the fabrication or construction of opening framing and curb.

### 2.3 STANDARD SPECIFICATIONS

- .1 Product Quality
  - .1 Ensure that the chemical and physical properties, design, performance characteristics and methods of construction of all Products provided comply with the latest issue of applicable standard Specifications issued by authorities having jurisdiction.
  - .2 Do not apply such standard Specifications to decrease the quality of workmanship, Products and services required by the Contract Documents.

### 2.4 MANUFACTURER'S NAMEPLATES

- .1 Metal Nameplates
  - .1 Provided with raised or recessed lettering, on each piece of equipment.
  - .2 Mechanically fasten nameplate on a metal stand-off bracket arranged to clear insulation.
  - .3 Mount, on same stand-off, Underwriters Laboratories and/or CSA registration plates.
- .2 Nameplate Data

- .1 Indicate:
  - .1 Size
  - .2 Capacity
  - .3 Equipment model
  - .4 Manufacturer's name
  - .5 Serial number
  - .6 Voltage
  - .7 Cycle
  - .8 Phase and power of motors

2.5 **MOTORS AND WIRING**

- .1 In accordance with Section 23 05 13 Motors and Wiring for Mechanical.

2.6 **PIPES, FITTINGS AND VALVES**

- .1 In accordance with Section 23 05 23 Pipes, Fittings and Valves.

2.7 **HANGERS AND SUPPORTS**

- .1 In accordance with Section 23 05 29 Pipe Hangers and Supports.

2.8 **VIBRATION AND SEISMIC RESTRAINT**

- .1 In accordance with Section 23 05 48 Noise and Vibration Control, and Section 23 05 49 Seismic Control.

2.9 **IDENTIFICATION FOR EQUIPMENT AND PIPING**

- .1 In accordance with Section 23 05 53 Mechanical Identification.

2.10 **GAUGES – WHERE APPLICABLE**

- .1 Pressure Gauge
  - .1 90 mm dial and overload stops and dial range approximately double the operating pressure, with 1% accuracy.
  - .2 Polished brass case, phosphor bronze bushed rotary movement, bronze bourdon tube
  - .3 Needle valve: Round handle, with NPS ¼ connecting piping or tubing with each gauge. Each gauge shall be provided with a snubber.
  - .4 Acceptable Manufacturers:
    - .1 Terice
    - .2 Ashcroft
    - .3 Winters



- .4      Weksler
  - .2      Thermometers
    - .1      225 mm scale, straight adjustable angle tubular glass type with red appearing mercury in lens front tube.
    - .2      Cast aluminum case, and brass stem complete with separable socket, and combination Celsius/Fahrenheit scale.
    - .3      Scale range to be approximately double the operating temperature range of the particular system in which thermometers are to be installed.
    - .4      Stems to be of sufficient length to provide for proper insertion in piping or equipment in which they are installed to ensure correct temperature readings.
    - .5      Acceptable Manufacturers
      - .1      Terice
      - .2      Ashcroft
      - .3      Weksler
      - .4      Winters
  - .3      Level Gauges
    - .1      150 mm diameter dial, with graduated scale with minor markings, and numbers at major depth levels.
    - .2      Scale range to be a minimum of 110% higher than overflow level of tank.
    - .3      Black finished cast aluminum case, adjustable micrometer type pointer, stainless steel bourdon tube and stainless steel rotary type movement. Dial range to be 0 to 18 m.
    - .4      Acceptable Manufacturers
      - .1      Ashcroft
      - .2      Terice
      - .3      Winters
      - .4      Weksler
- 2.11      **SUPERVISORY SWITCHES – WHERE APPLICABLE**
  - .1      Tamper Switches
    - .1      120 volt, N.O. switches on riser valves and other isolating valves. Listing: ULC, FM approved.
    - .2      Acceptable Manufacturers
      - .1      Potter Electric
      - .2      System Sensor

- .3 Viking
  - .2 Flow Switches
    - .1 120 volt, N.O. switches in risers in locations indicated on Drawings. Listing: ULC, FM approved.
    - .2 Acceptable Manufacturers
      - .1 Potter Electric
      - .2 System Sensor
      - .3 Viking
- 2.12 **FIRE DEPARTMENT PUMPER (INLET) CONNECTIONS – WHERE APPLICABLE**
  - .1 Wall Siamese Fittings - Flush Type
    - .1 Cast brass body, brass plate, brass swivel adapters and brass plugs with polished finish. ULC listed and FM approved.
    - .2 64 mm "Ontario" standard hose threads with caps and chains
    - .3 Double inlet clappers
    - .4 Imprinted escutcheon plate, embossed "SPRINKLER SYSTEM CONNECTION", "STANDPIPE" or "AUTOSPKR AND STANDPIPE" as required.
    - .5 Ball drip on yard side of Siamese check valve.
    - .6 Acceptable Manufacturers
      - .1 National Fire Equipment Ltd.
      - .2 Wilson and Cousins
      - .3 Croker
  - .2 Sidewalk Siamese Fitting - Standpipe Mounted
    - .1 Free-standing double inlet with 500 gpm capacity, ULC listed and FM approved
    - .2 Cast brass construction
    - .3 64 mm "Ontario" standard hose thread with caps and chains
    - .4 Double inlet clappers
    - .5 Imprinted escutcheon plate embossed "SPRINKLER SYSTEM CONNECTION", "STANDPIPE" or "AUTO SPKR AND STANDPIPE" as required.
    - .6 Acceptable Manufacturers
      - .1 National Fire Equipment
      - .2 Wilson and Cousins
      - .3 Croker

2.13 **PORTABLE FIRE EXTINGUISHING EQUIPMENT**

.1 Portable Fire Extinguishers

.1 Extinguishers to be complete with full operating charge and wall mounting bracket, and of the following class:

.1 Dry Chemical Class ABC 2.3 kg

.2 Acceptable Manufacturers

.1 Levitt (Ansul)/Tyco

.2 National Fire Equipment

.3 Flag Fire Equipment

.2 Fire Extinguisher Cabinets

.1 1.6 mm (16 gauge) steel tub

.2 2.8 mm (12 gauge) hollow channel door and rebated frame

.3 Where flush mounted, return edges by 13 mm or bevel on outer edge of door trim

.4 Semi-concealed piano hinges

.5 Door latch and 5 mm plate glass in door

.6 Cabinet finish: Grey primer to door, trim and full cabinet

.7 Door finish: Polished chrome plated

.8 Acceptable Manufacturers

.1 National Fire Equipment

.2 Herbert Williams

.3 Wilson and Cousins

2.14 **SIGNS**

.1 Enamelled steel with fire department red enamel background, white letters; inscription in accordance with (NFPA) (FM) Standards.

.2 150 mm x 150 mm for automatic control valves and alarm valves.

.3 50 mm x 150 mm for other valves.

.4 Fitted on control valves, shut-off valves, drain valves and test valves.

2.15 **CONTROL AND 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 **GENERAL**

- .1 Execute Work in accordance with requirements specified in the various sections of Division 22.
- .2 Lay out Work of each trade so that it does not interfere with work under other divisions of Specifications.
- .3 Make good any damage to Owner's property or other trade's work caused by improperly locating or carrying out of Work.
- .4 Supply anchor bolts and templates for installation by other divisions.
- .5 Location of pipes, ductwork, raceways and equipment may be altered without extra cost provided alteration is made before installation.

3.2 **EQUIPMENT INSTALLATION**

- .1 Set equipment in place, align, connect and place in operation with:
  - .1 Controls set for efficient, stable operation.
  - .2 Initial lubrication and oil sumps filled.
  - .3 Connections and required safety devices installed.
- .2 Protect equipment from damage during and after installation, and on completion of Work ensure that equipment is free from cracks, scratches, discolourations, tool marks, and other defects.
- .3 Thoroughly clean finished surfaces before acceptance of Work.
- .4 Install heater vents complete with necessary supports, hangers, braces, roof flashing, storm collar, and round top.

3.3 **PROTECTION**

- .1 Protect Work and materials before, during and after erection, from weather and other hazards and keep in a clean and orderly manner.
- .2 Protect pipe ends, valves and parts of equipment left unconnected to prevent damage or intrusion of foreign matter. Provide pipe caps for threaded male connections and plugs for threaded female connections.
- .3 Protect plumbing fixtures or mechanical equipment having a baked enamel finish by covering with polyethylene sheet securely held in place.
- .4 Protect finished floor slabs from scuffing, cracking, chipping, staining, cutting and other damage resulting from Work of this Contract.

- .1 Place a 19 mm thick plywood underlaid with 25 mm thick polystyrene insulation board adhered to same, over floor areas when working from, or over, such surfaces.
- .2 Provide such protection below hoist rigs, ladders, pallets of material, and in other circumstances where the flooring is exposed to potential damage.
- .3 Work damaged due to failure in providing such protection is to be removed and replaced, or repaired, as directed by the Owner, at no increase in Contract Price.

#### 3.4 **MAINTENANCE OF BEARINGS**

- .1 During Construction
  - .1 Turn-over rotating equipment at least once a month after delivery;
    - .1 Run-in sleeve type bearings in accordance with manufacturer's recommendations.
    - .2 Drain, flush out and refill with new charge of oil or grease.
    - .3 Protect bearings, shafts and sheaves against damage, corrosion and dust accumulation.
    - .4 Provide extended grease nipples for bearing lubrication.

#### 3.5 **FIRE EXTINGUISHERS**

- .1 Provide fire extinguishers as follows:
  - .1 In each fire hose cabinet
  - .2 One extinguisher for each 300 m<sup>2</sup> of floor area in an electrical or mechanical service room.
  - .3 In each extinguisher cabinet and at intervals to comply with the local fire code.
  - .4 At each fire hose reel, rack or tray, mounted to wall construction with substantial wall brackets provided with extinguishers.
  - .5 Type: Class ABC unless shown otherwise.
  - .6 As shown on drawings.

End of Section