

- 1 General
- 1.1 **SUMMARY**
  - .1 Section Includes
    - .1 Labour, Products, equipment and services necessary to complete the Work of this section.
- 1.2 **RELATED SECTIONS**
  - .1 Division 26: Electrical
    - .1 Power wiring between the electrical distribution system and motor or equipment.
    - .2 Motor Control Centres (MCC).
    - .3 Motor starters including variable frequency drives and soft-start starters, except where specified as an integral component of the mechanical equipment.
    - .4 Fused or unfused disconnects, except where specified as an integral component of the mechanical equipment.
- 1.3 **REFERENCE STANDARDS**
  - .1 Standards
    - .1 CSA 390 M (motor efficiency ratings).
    - .2 IEEE 112 (motor efficiency ratings) for three phase motors.
    - .3 IEEE 114 (motor efficiency ratings) for single phase motors.
- 1.4 **CODES AND REGULATIONS; PERMITS, COSTS AND FEES**
  - .1 Codes
    - .1 Electrical Safety Authority (ESA).
    - .2 Canadian Electrical Code.
  - .2 Permits
    - .1 Obtain electrical permits and inspections and pay all costs for the portion of the Work performed by this division.
- 1.5 **QUALITY ASSURANCE**
  - .1 Contractor Qualifications
    - .1 Electrical wiring for mechanical trades work performed by a specialist firm with an established reputation in this field.
- 1.6 **SUBMITTALS**
  - .1 Shop Drawings
    - .1 Submit in accordance with Section 01 33 00.

- .2 Include nameplate data, motor efficiencies, NEMA rating and insulation rating.
- .3 Warranty shall be minimum of 4 years. Provide extendable option.

2 Products

2.1 **MOTORS**

.1 General

.1 Motor nameplate rating:

- .1 Not less than input brake horsepower of driven equipment plus 5%, at specified operating conditions, and
- .2 Not less than the scheduled minimum horsepower.
- .3 Premium efficiency.
- .4 Selected for chemical duty or explosion proof where scheduled.
- .5 Service factor: 1.15 minimum for three phase motors.

.2 Single Phase Motors

.1 Continuous duty, resilient mount.

- .1 Motor rating: Less than 375 W (1/2 HP).
- .2 Voltage, frequency and RPM as scheduled.

.3 Three Phase Motors, 350 W to 525 W (1/2 HP to 3/4 HP)

.1 EEMAC, Class B, Type F insulation, squirrel cage induction, continuous duty, ball bearing.

- .1 Voltage, frequency and RPM as scheduled.
- .2 Motor type: ODP with 90°C (194°F) temperature rise (TEFC with 80°C (176°F) temperature rise) unless otherwise scheduled.
- .3 1800 RPM or as scheduled.

.4 Three Phase Motors, 750 W (1 HP) and Larger

.1 EEMAC, T-Frame, Class B, Type F insulation, squirrel cage induction, continuous duty, ball or sleeve bearing.

- .1 Motor efficiency: Premium efficiency.
- .2 Voltage and frequency as scheduled.
- .3 Motor type: TEFC with 80°C (176°F) temperature rise (ODP with 90°C (194°F) temperature rise) unless otherwise scheduled.
- .4 1800 RPM or as scheduled.

- .5 Three Phase Motors, 750 W (1 HP) and Larger, Variable Frequency Drive Applications
  - .1 EEMAC, T-Frame, Class B, Type F triple build, form wound insulation, squirrel cage induction, continuous duty, ball bearing, 40°C (104°F) temperature rise.
    - .1 Motor efficiency: Premium efficiency.
    - .2 Inverter duty rated.
    - .3 Maximum speed turndown: 25%.
    - .4 Voltage and frequency as scheduled.
    - .5 Motor type: ODP for variable torque applications, TEFC for constant torque applications.
    - .6 1800 RPM or as scheduled.
- .6 Multiple Speed Motors
  - .1 For 2:1 speed ratios: Single winding consequent pole (two winding).
  - .2 For all other speed ratios: Two winding.
- .7 Grounding Lug
  - .1 Motors less than 15 kW (20 HP):
    - .1 Ground lug on motor terminal box.
  - .2 Motors 15 kW (20 HP) and larger:
    - .1 Directly bolted to motor frame.
    - .2 Located inside terminal box on motor.
- .8 Winding Temperature Sensors - RTD's
  - .1 Where required:
    - .1 Motors greater than 224 kW (300 HP).
    - .2 Inverter duty motors greater than 112 kW (150 HP).
  - .2 Type:
    - .1 RTD sensor in each winding, wired to separate terminal box on side of motor.
    - .2 RTD relay/control circuit by others.
- .9 Winding Temperature Sensor Protection
  - .1 Where required:
    - .1 Motors 37 kW (50 HP) up to 225 kW (300 HP).
    - .2 Motors 18.6 kW (25 HP) up to 30 kW (40 HP) located in air ducts, plenum chambers or in air stream inside air conditioning equipment.

- .2 Type:
  - .1 Winding temperature sensor wired to disconnect motor on high temperature.
  - .2 120 V control transformer.
  - .3 "Push-to-Test" red pilot light (high winding temperature).
  - .4 Reset button.
  - .5 Supply control unit to the Contractor under Division 26 for installation in motor starter.
  - .6 Acceptable Manufacturers:
    - .1 Siemens Canada Limited - PTC thermistor with 3-UN2131 tripping unit

.10 Winding Temperature Thermostat

- .1 Where required:
  - .1 Single phase, and three phase motors up to 15 kW (20 HP) located in air ducts, plenum chambers or in air stream inside air conditioning equipment.
- .2 Type:
  - .1 Klixon Motor winding thermostats.

2.2 **WIRING AND CONDUIT**

- .1 Wire
  - .1 RW-90 X-link.
  - .2 Minimum No. 12 AWG for power.
  - .3 Colour coded No. 14 AWG for control power, 120 VAC and lower.
  - .4 Individually identify conductors on each end with slip-on, plastic wire markers. Identification to match wiring diagrams.
- .2 Conduit
  - .1 Thin wall conduit:
    - .1 Up to 32 mm size in ceilings, furred spaces, in hollow walls and partitions and where not exposed to mechanical injury.
  - .2 Rigid galvanized steel:
    - .1 38 mm size and larger.
    - .2 Any size where located in poured concrete, and where exposed.

2.3 **EQUIPMENT SERVICE LIGHTS**

.1 Service Lights

.1 LED type with tempered glass globe and wire guard (silicone free).

.2 Acceptable Manufacturers:

.1 Crouse Hinds

.2 Killark

.2 Switches

.1 Twenty ampere, single pole, with pilot light, installed in cast metal box.

.2 Acceptable Manufacturers:

.1 Hubbell

.2 P & S

.3 Arrow Hart

.4 Leviton

2.4 **CORROSION PROTECTION ANODES**

.1 Sacrificial Anode

.1 High grade electrolytic zinc, 99.99% pure: To ASTM B-418 Type II.

.2 Supplied with 5 mm diameter minimum steel core with #8 TWH stranded connecting wire or bolt-on strap connection where required.

2.5 **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 **INSTALLATION**
    - .1 Motor and Equipment Control
      - .1 Motor control centre, starters and/or disconnect switch for each motor or electrically connected item: Provided by Electrical Division 26.
        - .1 Exception: Disconnects which are specified as part of the equipment.

.2 Power Conduit and Wire

.1 Provided by Mechanical Division:

- .1 Line voltage thermostats, and wiring from thermostat to fan coil units, unit heaters and cabinet unit heaters.
- .2 Hardwire interlock wiring between control devices (pressure switches, temperature switches, limit switches, etc.) and motor starters.
- .3 Between junction box provided by Division 26, to switch and equipment service lights.

.2 Provided by Electrical Division 26:

- .1 Power wiring at all voltages 120 VAC and higher to motors or equipment.
- .2 To junction box on adjacent wall, column or ceiling for equipment service lights (marine lights).

.3 Control Conduit and Wire

.1 Provided by Mechanical Division:

- .1 Control wiring, conduit and relays to interlock starters and connect safety and operating controls.

.4 Equipment Service Lights

- .1 Mount switches in accessible location on outside of plenum.
- .2 Provide one switch for each fan system.
- .3 Provide minimum of one marine light per 3 m length of plenum.

.5 Grounding

- .1 Ground electrical equipment and wiring in accordance with Electrical Safety Authority and local authority's rules and regulations.

.6 Corrosion Protection Anodes

- .1 Provide external corrosion protection anodes for:
  - .1 Buried ductile iron water mains, fittings, and hydrants
  - .2 Metallic services as shown.

End of Section

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