
Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Electrical motors, drives and guards for mechanical equipment and systems.
 - .2 Supplier and installer responsibility indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.
 - .3 Control wiring and conduit is specified in Division 26 except for conduit, wiring and connections below 50 V which are related to control systems specified in Division 22 and 23. Refer to Division 26 for quality of materials and workmanship.
- .2 Related Requirements
 - .1 Section 23 05 00 - Common Work Results for HVAC
 - .2 Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment
 - .3 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC
 - .4 Section 23 21 23 - Hydronic Network Pumps
 - .5 Section 23 34 00 - HVAC Fans
 - .6 Section 23 38 13 - Commercial Kitchen Hoods
 - .7 Section 23 52 00 - Heating Boilers
 - .8 Section 23 73 10 - Air Handling – Built-up
 - .9 Section 23 82 19 - Fan Coil Units

1.2 REFERENCES

- .1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)
 - .1 ASHRAE 90.1-01, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA cosponsored; ANSI approved; Continuous Maintenance Standard).
- .2 Electrical Equipment Manufacturers' Association Council (EEMAC)
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL 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 in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
 - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings: submit drawings stamped and signed by a professional engineer registered or licensed in Canada and member of the OIQ.
- .3 Quality Control: in accordance with Section 01 45 00 - Quality Control.
 - .1 Certificates: submit certificates signed by manufacturer certifying that products and materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.
 - .1 Departmental Representative will make available 1 copy of system's supplier installation instructions.
- .4 Closeout Submittals
 - .1 Provide maintenance data for motors, drives and guards for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 QUALITY ASSURANCE

- .1 Regulatory Requirements: work to be performed in compliance with applicable Provincial /Territorial regulations.
- .2 Health and Safety: take necessary precautions in regards to construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 GENERAL

- .1 Motors: high efficiency, in accordance with local power distribution company standards and with ASHRAE 90.1.

2.2 MOTORS

- .1 Provide motors for mechanical equipment as specified.
- .2 All required motors to be included with driven machinery.
- .3 Bearings of 1 HP motors and over to be fitted with fittings for lubrication and grease removal. Fractional motors must have factory lubricated and sealed bearings.
- .4 Asynchronous NEMA motors must be of design type B, with squirrel cage, class B insulation, temperature rise of 90 °C (162 °F) for an ambient temperature of 40 °C (104 °F), T-type frame, double adjustment base, ball or roller bearings and grease lubricated.
- .5 Service factor to be 1.15 for open motors and 1.10 for totally enclosed motors. As a general rule, motors of less than ½ HP operate on a single phase, 120 Volts, 60 Hz system and motors of ½ HP and over operate on a three phase, 600 Volts, 60 Hz system.
- .6 Motor junction boxes to be accessible at all times and located opposite to machinery.
- .7 All motors 30 HP and over to be provided with three (3) PTC type thermistors to protect windings against excessive temperature rises, compatible with Siemens 3RN1 relay type.
- .8 Motors smaller than 373 W (1/2 HP) : unless otherwise specified, single phase motors, 120 V, speed as indicated, continuous duty, built-in overload protection, resilient mount.
- .9 Motors 373 W (1/2 HP) and larger: unless otherwise specified, drip-proof motor, complies with EEMAC standards, Class B, squirrel cage induction, speed as indicated, continuous duty, ball bearing, maximum temperature rise of 40 degrees C, 3 phase, 600 V
- .10 All motors associated with a variable frequency drive must comply with standard MG-1, part 31.

- .11 All motors must produce the following minimum efficiencies:

Horsepower	Motors – Minimum efficiency							
	3600 T/m		1800 T/m		1200 T/m		900 T/m	
	ODP	TEFC	ODP	TEFC	ODP	TEFC	ODP	TEFC
	Open	Enclosed	Open	Enclosed	Open	Enclosed	Open	Enclosed
1 HP	77.0	77.0	85.5	85.5	82.5	82.5	74.0	74.0
1,5	84.0	84.0	86.5	86.5	86.5	87.5	75.5	77.0
2	85.5	85.5	86.5	86.5	87.5	88.5	85.5	82.5
3	85.5	86.5	89.5	89.5	88.5	89.5	86.5	84.0
5	86.5	88.5	89.5	89.5	89.5	89.5	87.5	85.5
7,5	88.5	89.5	91.0	91.7	90.2	91.0	88.5	85.5
10	89.5	90.2	91.7	91.7	91.7	91.0		
15	90.2	91.0	93.0	92.4	91.7	91.7		
20	91.0	91.0	93.0	93.0	92.4	91.7		
25	91.7	91.7	93.6	93.6	93.0	93.0		
30	91.7	91.7	94.1	93.6	93.6	93.0		
40	92.4	92.4	94.1	94.1	94.1	94.1		
50	93.0	93.0	94.5	94.5	94.1	94.1		
60	93.6	93.6	95.0	95.0	94.5	94.5		
75	93.6	93.6	95.0	95.4	94.5	94.5		
100	93.6	94.1	95.4	95.4	95.0	95.0		
125	94.1	95.0	95.4	94.4	95.0	95.0		
150	94.1	95.0	95.8	95.8	95.4	95.8		
200	95.0	95.4	95.8	96.2	95.4	95.8		

2.3 TEMPORARY MOTORS

- .1 If delivery of specified motor will delay completion or commissioning work, install motor approved by Departmental Representative for temporary use. Work will only be accepted when specified motor is installed.

2.4 BELT DRIVES

- .1 Fit reinforced belts in sheaves matched to drive. Multiple belts on unit to be matched set.
- .2 Use cast iron or steel sheaves secured to shafts with removable keys.
- .3 For motors over 10 HP, use sheave with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheave of correct size to suit balancing.
- .4 Minimum drive rating: 1.2 times nameplate rating on motor for fans and pumps of less than 10 HP and 1.5 times for 10 HP and over. Keep overhung loads within manufacturer's design requirements on prime mover shafts.
- .5 Mount motor on slide rail adjustment plates and provide space to allow for centre line adjustment. Reinforced belts must be installed in the drive sheave. Multiple belts must be provided and installed in matched sets.
- .6 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise indicated.

- .7 For motors under 7.5 kW (10 HP): standard adjustable pitch drive sheaves, with a 10% plus or minus range. Use mid-position of range for specified r/min.
- .8 For motors of 7.5 kW (10 HP) and over: unless otherwise specified, fixed pitch sheave with split tapered bushing and crankshaft keyway. Provide sheaves of correct size to suit balancing.
- .9 Correct size of sheave determined during commissioning.
- .10 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.
- .11 Motor slide rail adjustment plates to allow for centre line adjustment.
- .12 Supply one set of spare belts for each set installed in accordance with Section 01 78 00 - Closeout Submittals.

2.5 DRIVE GUARDS

- .1 Provide guards for unprotected drives.
- .2 Guards for belt drives;
 - .1 Expanded metal screen welded to steel frame.
 - .2 Minimum 1.2 mm thick sheet metal tops and bottoms.
 - .3 38 mm dia holes on both shaft centres for insertion of tachometer.
 - .4 Removable for servicing.
- .3 Provide means to permit lubrication and use of test instruments with guards in place.
- .4 Install belt guards to allow movement of motors for adjusting belt tension.
 - .1 "U" shaped, minimum 1.6 mm thick galvanized mild steel.
 - .2 Securely fasten in place.
 - .3 Removable for servicing.
- .5 Unprotected fan inlets or outlets:
 - .1 Wire or expanded metal screen, galvanized, 19 mm mesh.
 - .2 Net free area of guard: not less than 80% of fan openings.
 - .3 Securely fasten in place.
 - .4 Removable for servicing.

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 INSTALLATION

- .1 Fasten securely in place.
- .2 Make removable for servicing, easily returned into, and positively in position.

3.3 FIELD QUALITY CONTROL

- .1 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.
- .2 Verification requirements in accordance with Section 01 47 17 - Sustainable Requirements: Contractor's Verification, include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Local/regional materials.
 - .5 Low-emitting materials.

3.4 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION