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SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on alternating-current power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation; and general requirements for direct-drive equipment mounted on an EC external rotor motor with integrated control electronics and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation

1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with NEMA MG 1 unless otherwise indicated.
- B. Comply with IEEE 841 for severe-duty motors.
- C. Approvals of UL1004-7 (Standard for Electronically Protected Motors) and CSA C22.2 No. 77 (Motors with Inherent Overheating Protection) for EC motors.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Premium efficient, as defined in NEMA MG 1.
- C. Service Factor: 1.15.
- D. Multispeed Motors: Variable torque.
 - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
 - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
- E. Multispeed Motors: Separate winding for each speed.
- F. Rotor: Random-wound, squirrel cage.
- G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- H. Temperature Rise: Match insulation rating.
- I. Insulation: Class F
- J. Code Letter Designation:
 - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
 - 2. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.
- K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T .

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

- B. Motors Used with Variable-Frequency Controllers: [Ratings, characteristics, and features coordinated with and approved by controller manufacturer.]
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width-modulated inverters.
 - 2. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - 3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
 - 4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
 - 5. Motors shall have a shaft grounding brush to prevent bearing failure from presence of voltage on the shaft.
- C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split phase.
 - 3. Capacitor start, inductor run.
 - 4. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Pre-lubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

2.6 EC MOTORS

- A. Description: Direct-drive equipment mounted on an EC external rotor motor with integrated control electronics.
- B. Efficiency: EC motors to meet or exceed Super Premium Efficiency Class (IE4).
- C. Service Factor: 1.10.

- D. Bearings: Maintenance free ball bearings with long term lubrication and nominal service life of at least 40,000 operational hours.
- E. Temperature Rise: Match insulation rating.
- F. Insulation Rating:
 - 1. For motors greater than 7HP – Class F or better
 - 2. For motors 2.5-7HP – Class B or better
 - 3. For motors 1-2.5HP – Class A or better
- G. Electrical Requirements:
 - 1. Motor to be suitable for use with all standard AC power supply systems.
 - 2. Motor to include integrated electronics, low-noise commutation logic, and 100% speed control.
 - 3. Motor electronics to take control input of 0-10 VDC/PWM for open loop speed control.
 - 4. Each EC motor assembly shall have integrated harmonic reduction/power factor correction. Manufacturer to provide harmonic data.
 - 5. Motor to have over temperature protection.
 - 6. Electronics to have line under-voltage and phase failure detection capabilities.
 - 7. Electronics to impose motor current limit.
 - 8. Motor capable of soft starting.
 - 9. Motor/electronics to have EMC interference immunity in accordance with EN 61000-6-2 (Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments).
- H. Mechanical Requirements:
 - 1. Complete motorized impeller assembly shall have been statically and dynamically balanced by the manufacturer per ISO 21940-11 or equivalent.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513