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 ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Provide nameplate data including manufacturer, model, service factor, frame size, rpm, HP, voltage, phase, frequency, NEMA enclosure type, full load amperes, Design and Code letters, and insulation class.
2. Provide NEMA nominal and guaranteed minimum efficiencies and power factor at full load, weights and dimensions, UL listing where applicable, and bearing L10 life.
3. Certified sound-power ratings.

B. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For centrifugal fans to include in emergency, operation, and maintenance manuals.

1.6 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. Motors 1 hp and larger shall be premium efficiency.

D. Motors on equipment located outdoors shall be totally-enclosed, fan-cooled (TEFC) type. Motors on equipment located indoors shall be open drip-proof (ODP) or TEFC type unless otherwise noted.

E. Motors and drives shall not produce sound levels exceeding 90 dBA in accordance with Subpart G, Occupational Noise Exposure, of OSHA Standards. Sound measurement data shall be obtained in accordance with IEEE 85. Noise levels exceeding specified limit shall be clearly stated in Submittals.

F. Two-speed motors shall include separate windings.

G. 120 volt motors less than 1 hp shall include integral thermal overload protection with manual reset. If an integral overload is not available, format a motor rated toggle switch with thermal overload and provide to the electrical contractor for installation by electrical contractor.

H. Provide thermostats for hazardous duty and inverter duty motors, where required for warranty, to prevent overheating. Thermostat settings shall be 80 percent of temperature rating.

I. Motors 10 hp and higher shall include power factor correction to 95 percent, using either factory-installed and wired capacitors, or separately mounted and field-wired capacitors. Capacitors shall be UL-listed, non-PCB with self-healing dielectric film, pressure-sensitive interrupter, discharge resistors, grounding lug, and current-limiting protective fuses. Capacitors shall have 20-year nominal life, two (2) year special warranty, and shall be General Electric-Aerovox, Sprague, ABB, or Versatex. If correction devices are not so furnished, it shall be the responsibility of the Contractor furnishing the equipment to pay all wiring and installation costs.

J. For VFD motors, provide shaft mounted static discharge dissipation ring with conductive microfibers (Electro Static Technology AEGIS SGR or approved equal) to shunt bearing currents or provide electrically insulated ceramic bearings.

K. Motor Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. General Electric.
2. MagneTek.
3. Marathon.

4. Reliance.
5. Emerson Motors.
6. Baldor.
7. Toshiba.

L. Motor Base Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Korfund Dynamics Corp.
2. Mason Industries, Inc.
3. Consolidated Kinetics Corp.

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: Energy 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. Bearings for 460-volt motors: shielded, regreasable, vacuum degassed steel ball bearings sized for a minimum life (L-10) of 100,000 hours. Bearing housings shall be large enough to hold sufficient lubricant to minimize need for frequent lubrication. Provide extended grease tubes suitable for regreasing bearings in service.

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. Energy- and 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.

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: Prelubricated, 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 MOTOR DRIVE AND BASES

A. Provide motors with Type A, B, C or D matched set V-belt drives or direct drives as indicated.

1. Drives shall be designed for 150 percent of specified motor nameplate horsepower rating.
2. Provide V-belts of endless cord impregnated rubber of trapezoidal cross-section.
3. Provide adjustable screw device for belt tensioning.
4. Drives shall include minimum of two (2) belts.

B. Provide variable-pitch motor sheaves for fans and other belt-driven equipment under 25 hp. Provide fixed-pitch “initial” motor sheaves for fans and other belt-driven equipment 25 hp and larger. Deliver variable and fixed pitch sheaves to Owner’s Representative.

2.7 BELTS AND COUPLING GUARDS

A. Provide easily removable guards to completely enclose all V-belt drives, pulleys, sheaves and couplings.

B. Guards shall comply with requirements of Subpart O (Machinery and Machine Guarding) of referenced OSHA Standards.

C. Tachometers shall be readable with guards in place.

D. Where grease fittings are enclosed by guards, provide grease fitting extensions to accessible location outside of guard.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install Work in accordance with manufacturer's written instructions.

B. When not installed with driven equipment on a common base, install and align motors and drives.

C. Provide field wiring where separately mounted motor capacitors are used.

D. Provide control wiring from motor thermostats for hazardous duty and inverter duty motors to starter control circuit.

3.2 FIELD QUALITY CONTROL

A. Visually inspect motors for correct mounting, grounding, power connections and lubrication. Verify that thermostats, RTDs, and other auxiliaries are connected.

B. Furnish calibrated instruments for testing motors.

C. Perform rotation test for proper shaft direction.

D. Prepare test and inspection reports.

END OF SECTION 230513