

SECTION 23 05 13 - COMMON MOTOR REQUIREMENTS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Basic requirements for factory and field-installed motors.
- B. See individual Sections for application of motors and reference to specific motor requirements for motor-driven equipment.
- C. This section does not apply to motors provided through Kroger Direct Buy Program.

1.2 SUBMITTALS:

- A. Submit product data for motors, starters and other electrical components, with submittal data required for the equipment which it serves, as required by the individual equipment specification sections.

1.3 QUALITY ASSURANCE:

- A. Provide all factory assembled and wired equipment listed and labeled in accordance with the National Electrical Code (NEC) and by an organization acceptable to the authorities having jurisdiction.
- B. References:
 - 1. NEMA Standard MG 1: Motors and Generators.
 - 2. NEMA Standard ICS 2: Industrial Control Devices, Controllers and Assemblies.
 - 3. NEMA Standard 250: Enclosure for Electrical Equipment.
 - 4. NEMA Standard KS 1: Enclosed Switches.
- C. Standards: Where not otherwise indicated, comply with applicable provisions of the National Electrical Code (NFPA 70), NEMA Standards and Division 26 Sections.

1.4 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices and features that comply with the following:
 - 1. Compatible with the following:
 - a. Magnetic controllers.
 - b. Multispeed controllers.

- c. Reduced-voltage controllers.
- 2. Designed and labeled for use with variable frequency controllers, and suitable for use throughout speed range without overheating.
- 3. Matched to torque and horsepower requirements of the load.
- 4. Matched to ratings and characteristics of supply circuit and required control sequence.
- B. Coordinate motor support with requirements for driven load; access for maintenance and motor replacement; installation of accessories, belts, belt guards; and adjustment of sliding rails for belt tensioning.
- C. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-In-Place Concrete Slabs."

1.5 DESCRIPTION OF WORK:

- A. This section specifies the basic requirements for electrical components which are an integral part of packaged HVAC equipment. These components include, but are not limited to, factory installed motors, starters and disconnect switches furnished as an integral part of packaged HVAC equipment; wiring from HVAC equipment to electrical work termination (junction box or disconnect switch); control switch, pilot lights, interlocks and similar devices; electrical work specified as HVAC work in temperature control systems; and drip pans to protect electrical work.
- B. Specific electrical requirements (i.e., horsepower and electrical characteristics) for HVAC equipment are scheduled on the Drawings.

PART 2 - PRODUCTS

2.1 MOTOR REQUIREMENTS

- A. Motor requirements apply to factory- and field-installed motors except as follows:
 - 1. Different ratings, performance, or characteristics for motors are specified in other Sections.
 - 2. Motorized-equipment manufacturer requires ratings, performance, or characteristics, other than those specified, to meet performance specified.

2.2 MOTORS:

- A. Manufacturers
 - 1. Emerson Electric Company, U.S. Motors
 - 2. A. O. Smith Electrical Products Company, Century Motors
 - 3. General Electric Company, GE Motors
 - 4. The Louis Allis Company, A Division of Alliance Specialty Motors

5. Marathon Electric, Inc.
 6. Rockwell Automation, Reliance Electric
 7. TECO-Westinghouse Motor Company
- B. Where motor manufacturer selection is independent of HVAC equipment selection, provide motors produced by single manufacturer to greatest extent possible.
- C. Standards: Comply with applicable provisions of NEMA MG 1, NEC Article 430, ANSI C50, ANSI C6.1. Provide equipment listed and labeled, in accordance with the National Electric Code, by an organization acceptable to the authorities having jurisdiction (i.e., UL).
- D. Temperature Rating: Class A insulation, except where otherwise indicated or required for service indicated.
- E. Starting Capability: As required for service indicated, but not less than five starts per hour.
- F. Provide 2-speed motors as 2-speed - one winding, with consequent pole starters.
- G. Motor Size: Provide motor size as indicated or, if not indicated, large enough so that driven load will not require the motor to operate in the service factor range.
- H. Service Factor: Unless otherwise indicated on drawings or in specifications, 1.15 for polyphase; 1.35 for single-phase.
- I. Construction: General purpose, continuous duty; Design "B", except "C" for high starting torque applications.
- J. Bearings: Ball or roller, and designed for thrust, where applicable; shaft seals and regreasable, except provide permanently sealed where not accessible for greasing. Sleeve type bearings permitted only where indicated for light-duty fractional horsepower motors.
- K. Enclosure Type: Open drip-proof for normal concealed indoor use, guarded where exposed to employees or occupants. Type II for outdoor use, except where weather-protected; Type I where adequately housed. Totally enclosed fan-cooled (TEFC) where specified or indicated on drawings.
- L. Overload Protection: Built-in thermal for all single-phase motors, with internal sensing device for stopping motor.
- M. Noise Rating: Provide "quiet" rating on motors located in occupied spaces of building.

2.3 MOTOR CHARACTERISTICS

- A. Motors 1/2 HP and Larger: Squirrel-Cage induction polyphase.
- B. Motors Smaller Than 1/3 HP: Single phase.
- C. Frequency Rating: 60 Hz.

- D. Voltage Rating: NEMA standard voltage selected to operate on nominal circuit voltage to which motor is connected.
- E. Duty: Continuous duty at ambient temperature of 105 deg F (40 deg C) and at altitude of 3300 feet (1005 m) above sea level.
- F. 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.

2.4 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Premium, as defined in NEMA MG 1.
- C. Stator: Copper windings, unless otherwise indicated.
 - 1. Multispeed motors shall have separate winding for each speed.
- D. Rotor: Squirrel cage, unless otherwise indicated.
- E. Bearings: Double-shielded, prelubricated ball bearings suitable for radial and thrust loading.
- F. Temperature Rise: Match insulation rating, unless otherwise indicated.
- G. Insulation: Class F, unless otherwise indicated.
- H. 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.
- I. Enclosure: Cast iron for motors 7.5 hp and larger; rolled steel for motors smaller than 7.5 hp.
 - 1. Finish: Gray enamel.

2.5 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Reduced-Inrush 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. Designed with critical vibration frequencies outside operating range of controller output.
 - 2. Temperature Rise: Matched to rating for Class B insulation.
 - 3. Insulation: Class H.

4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
- C. Rugged-Duty Motors: Totally enclosed, with 1.25 minimum service factor, greased bearings, integral condensate drains, and capped relief vents. Windings insulated with non-hygroscopic material.
 1. Finish: Chemical-resistant paint over corrosion-resistant primer.
- D. Source Quality Control for Field-Installed Motors: Perform the following tests on each motor according to NEMA MG 1:
 1. Measure winding resistance.
 2. Read no-load current and speed at rated voltage and frequency.
 3. Measure locked rotor current at rated frequency.
 4. Perform high-potential test.

2.6 STARTERS, SWITCHES:

- A. Manufacturers: Comply with Division 26 Sections.
- B. Starters Characteristics: Type I general purpose enclosure for indoor use and Type II for outdoor use, with padlock ears and supports of mounting, as indicated or required. Starter type and size as recommended by motor manufacturer. Locate disconnect switch within sight of motor.
- C. Manual Switches: Where indicated on drawings or specifications, provide on motors 1/3 horsepower and smaller, except where automatic control or interlock is indicated; include pilot light. Provide overload protection by panelboard circuit breaker or fused disconnect switch.
- D. Magnetic Starters: Where indicated on drawings or specifications, provide for 1/2 horsepower and larger motors on automatic control or with interlock switch. Include push- buttons, pilot lights, reset, trip-free relay on each phase, undervoltage release, and devices for coordination with control system (including 120 volt transformer for control circuit where service exceeds 120 volts).

2.7 WIRING, CONNECTIONS:

- A. Motors: Wired connections in rigid and flexible metal conduit, except where plug-in electrical cords are indicated and permitted by governing regulations.
- B. General Wiring: Comply with applicable provisions of Division 26 Sections.
- C. Piping, General: Do not run mechanical piping directly above electrical (or electronic) work.

2.8 DISCONNECT SWITCHES:

- A. Fusible Switches: Fused, each phase; general duty; horsepower rated; nontearable quick-mate, quick-break mechanism, dead front line shield; solderless lugs suitable for copper conductors; spring reinforced fuse clips; electro silver plated current carrying parts; hinged doors; operating lever arranged for locking in the "OPEN" position; arc quenchers; capacity and characteristic as indicated.
- B. Non-Fusible Switches: For equipment 2 horsepower and smaller, shall be horsepower rated; toggle switch type; quantity of poles and voltage rating as indicated. For equipment larger than 2 horsepower, switches shall be the same as fusible type.

2.9 SINGLE-PHASE MOTORS

- A. Type: One of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split-phase start, capacitor run.
 - 3. Capacitor start, capacitor run.
- B. Shaded-Pole Motors: For motors 1/20 hp and smaller only.
- C. 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.
- D. Bearings: Ball type for belt-connected motors and other motors with high radial forces on motor shaft; sealed, prelubricated-sleeve type for other single-phase motors.
- E. Source Quality Control for Field-Installed Motors: Perform the following tests on each motor according to NEMA MG 1:
 - 1. Measure winding resistance.
 - 2. Read no-load current and speed at rated voltage and frequency.
 - 3. Measure locked rotor current at rated frequency.
 - 4. Perform high-potential test.

PART 3 - EXECUTION

3.1 FIELD-INSTALLED MOTOR INSTALLATION

- A. Anchor each motor assembly to base, adjustable rails, or other support, arranged and sized according to manufacturer's written instructions. Attach by bolting. Level and align with load transfer link.

- B. Install motors on concrete bases complying with Division 03 Section "Cast-In-Place Concrete Slabs."
- C. Comply with mounting and anchoring requirements specified in Division 23 Section "Vibration And Seismic Controls For Facility Services."

3.2 FIELD QUALITY CONTROL FOR FIELD-INSTALLED MOTORS

- A. Prepare for acceptance tests.
 - 1. Align motors, bases, shafts, pulleys, and belts. Tension belts according to manufacturer's written instructions.
 - 2. Verify bearing lubrication.
 - 3. Run each motor with its controller. Demonstrate correct rotation, alignment, and speed at motor design load.
 - 4. Test interlocks and control and safety features for proper operation.
 - 5. Verify that current and voltage for each phase comply with nameplate rating and NEMA MG 1 tolerances.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Perform electrical tests and visual and mechanical inspections including optional tests and inspections stated in NETA ATS on field installed motors. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

END OF SECTION 23 05 13

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