



**WMU Design Guidelines Instructions:** These guidelines are to be used by the Design Professional to inform the design process and outline WMU-specific desires for all University projects. These guidelines have been edited to reflect WMU preferences, and the intent is for the Design Professional to use this information to guide their normal specifications-writing process. Straying from what is indicated in the guidelines is not prohibited, but shall be discussed with WMU during the development of the project.

## SECTION 21 0513 - COMMON MOTOR REQUIREMENTS FOR FIRE SUPPRESSION EQUIPMENT

### PART 1 - GENERAL

**DESIGNER NOTE:** Fire Suppression Motors apply primarily to fire pumps and jockey pumps.

#### 1.1 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.
- B. Section includes general requirements for single-phase and polyphase, general-purpose, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed in field as a replacement.

#### 1.2 ACTION SUBMITTALS

- A. Product Data for Replacement Motors: For each type and size of motor indicated, provide nameplate data and ratings; mounting arrangements; size, type, and location of winding terminations; conduit entry and ground lug locations; and information on coatings or finishes.
- B. Shop Drawings for Field-Installed Motors: Dimensioned plans, elevations, sections, and details, including the following:
  - 1. Each installed unit's type and details.
  - 2. Nameplate legends.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data for replacement motors.

#### 1.4 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.



## WMU Design Guidelines

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3. Ratings and characteristics of supply circuit and required control sequence.
  4. Ambient and environmental conditions of installation location.
- B. For motors using variable frequency controller, motors to be designed for such application and suitable for use throughout speed range without overheating.
- C. Coordinate replacement motor support with requirements for driven load; access for maintenance; installation of accessories, belts, belt guards; and adjustment of sliding rails for belt tensioning.
- D. Coordinate replacement motor size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

### PART 2 - PRODUCTS

#### 2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with requirements in this Section except when stricter requirements are specified in fire suppression equipment schedules or Sections.
- B. Comply with NEMA MG 1 unless otherwise indicated.
- C. Comply with IEEE 841 for severe-duty 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: Energy efficient, as defined in NEMA MG 1.
1. Provide premium efficient motors where scheduled or when used with a variable frequency controller.
- 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. Insulation: [Class F] <Insert class>.
- K. Code Letter Designation:
  - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
  - 2. Motors [15] <Insert number> HP and Larger: NEMA starting Code F or Code G.
  - 3. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
  - 4. Motors Smaller than [15] <Insert number> HP: Manufacturer's standard starting characteristic.
- L. Enclosure Material: Manufacturer's standard material.
- M. Enclosure Material: Cast iron for motor frame sizes [324T] <Insert number> and larger; rolled steel for motor frame sizes smaller than [324T] <Insert number>.

### 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 controller manufacturer.
- C. 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. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
  - 4. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
  - 5. Shaft Grounding Ring: Factory or field installed Aegis Model SGR shaft grounding ring consisting of maintenance free, circumferential, bearing protection ring with conductive micro fiber shaft contacting material.
  - 6. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
- D. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.



## WMU Design Guidelines

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### 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.

### PART 3 - EXECUTION (Not Applicable)

#### 3.1 EXECUTION

#### 3.2 SHAFT GROUNDING RING INSTALLATION

- A. If not factory installed, field install at each three phase motors utilizing a variable frequency controller a shaft grounding ring. Attach according to manufacturer's written instructions.

#### 3.3 REPLACEMENT 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.

#### 3.4 FIELD QUALITY CONTROL OF REPLACEMENT MOTORS

- A. Adjusting: Align motors, bases, shafts, pulleys and belts. Tension belts according to manufacturer's written instructions.
  - 1. Alignment procedures are to be witnessed by Owner's representative.
- B. Testing: Perform the following field quality-control testing:



1. Run each motor with its controller. Demonstrate correct rotation, alignment, and speed at motor design load.
  2. Test interlocks and control features for proper operation.
  3. Verify that current in each phase is within nameplate rating.
  4. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- C. Adjusting: Align motors, bases, shafts, pulleys and belts. Tension belts according to manufacturer's written instructions.

END OF SECTION 21 0513