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## 230513 COMMON MOTOR REQUIREMENTS

### Part 1 – GENERAL

#### 1.1 Description

A. This section details the guidelines and expectations for induction motors for use on AC power systems up to 600 V on Johns Hopkins University Homewood Campus. Project conditions and requirements vary, thus precluding the absolute adherence to the items identified herein in all cases. However, unless there is adequate written justification and approval from the JHFRE Engineering and Energy Department, it is expected that these guidelines will govern the design and specifications.

#### 1.2 Submittals

N/A

#### 1.3 Quality Assurance

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.

#### 1.4 Delivery and storage

- A. Material deliveries and storage areas to be approved by Owner.
- B. Material storage to comply with manufacturer's recommendations.

### Part 2 – PRODUCTS

#### 2.1 General Requirements

- A. Motor needs to comply with NEMA MG 1 unless otherwise indicated.
- B. Motors operating on 3-phase, 600 volts and less shall be NEMA Premium efficient rated in accordance with NEMA MG-1 with a service factor of 1.15.

#### 2.2 Motor Characteristics

- A. Continuous duty at ambient temperature of 105° F and 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 Motor Requirements

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. Rotor: Random-wound, squirrel cage.

F. Bearings: Greaseable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Insulation: Class F

I. 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.

J. 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:

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 for thermally protected motors.

## 5. Shaft Grounding Ring:

a. General: Protects motor bearings from Electrical Discharge Machining (EDM), by discharging shaft currents to ground, via motor frame.

b. Type: Circumferential, with aluminum frame, and frictionless, conductive microfiber shaft brushes.

c. Mounting Location: Drive end or non-drive end of motor; Internal to the motor frame; Installed by motor manufacturer.

d. Maintenance Required: None

e. Service Life: Designed to last for service life of motor

f. RPM Limitation: None

g. Manufacturer: Aegis SGR, or approved equal

## 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.

## Part 3 – EXECUTION

N/A