

## SECTION 15170

### MOTORS

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. This section describes general requirements, products and methods of execution relating to electric motors at ANC and shall apply to motors furnished as integral parts of equipment specified in this and other Divisions.
- B. Related Sections and Divisions:
  - 1. Section 15010 - Mechanical General Provisions.
  - 2. Section 15540 - HVAC Pumps
  - 3. Section 15560 - Direct Fired Gas Makeup Air Units
  - 4. Section 15720 - Component Air Handling Units
  - 5. Section 15721 - Hydronic Makeup Air units
  - 6. Section 15850 - Fans

##### 1.2 REFERENCES

- A. Motors shall conform to the following codes and standards:
  - 1. Governing NEMA Standards (NEMA MG1).
  - 2. ASA Form C-50 for rotating machinery.
  - 3. NFPA 70-1999, National Electrical Code (NEC)

#### PART 2 PRODUCTS

##### 2.1 SUPPLY VOLTAGE

- A. Motor voltage shall be stamped on the nameplate and relate to the nominal voltage as follows:

###### THREE PHASE MOTORS

<u>Nominal Volts</u>	<u>Motor Ratings</u>
208 volts	200V, 208V, or 208/220V
480 volts	460V

###### SINGLE PHASE MOTORS

<u>Nominal Volts</u>	<u>Motor Ratings</u>
120 volts	115V or 115/230V
208 volts	200V or 208V
277 volts	277V

- 1. If a motor is to be operated on 208 or 277 volts, the nameplate shall indicate that this voltage is suitable.

- B. Two speed motors shall have two sets of windings.
- C. Voltage variation: Motors shall be designed to operate within the parameters of these requirements at rated load and with a voltage variation from the name plate voltage of plus or minus 10 percent.
- D. Motors shall operate successfully at rated load and at rated voltage with a maximum frequency variation of 5 percent above or below rated frequency.
- E. Motors shall operate successfully at rated load with a combined maximum variation in the voltage and frequency of 5 percent above or below rated voltage and rated frequency.
- F. Motors which operate with a Variable Frequency Drive (VFD) shall be suitable for the application.
  - 1. Motors operated from a PWM (Pulse Width Modulation) type VFD: conform to NEMA MG 1 Part 31 requirements.

## **2.2 LOCKED ROTOR CURRENT**

- A. No motor above 15 HP shall have a locked rotor current in excess of NEMA code letter "G". Smaller motors may have a higher locked rotor rating, but in no case exceeding the recommended NEMA rating as related to motor size.

## **2.3 MOTOR INSULATION**

- A. Unless otherwise specified, the motor insulation shall be NEMA Class "B" (or better). Based on 40 degrees C. maximum ambient, and 90 degrees C. maximum rise, total maximum operating temperature shall not exceed 130 degrees C.

## **2.4 MOTOR LOADING**

- A. No motors shall be subjected to loads exceeding the motor name plate rating, under any normal operating condition.

## **2.5 MOTOR RATING**

- A. Size motors in conformity with the manufacturer's published information and best information available during design. Verify each motor for adequacy in relation to the specific application.

## **2.6 HIGH EFFICIENCY AC MOTORS**

- A. Furnish high efficiency electric motors for equipment that:
  - 1. Requires a three horsepower or larger drive motor.
  - 2. Has a duty cycle classified as continuous.

- B. Efficiency of the motors shall be determined by NEMA Standard MG 1 - 12.536 and shall have an efficiency equal to or better than:

<b>Motor Size</b>	<b>Nominal Efficiency</b>
Through 3 HP	89 percent
Over 3 HP through 10 HP	91 percent
Over 10 HP through 30 HP	93 percent
Over 30 HP through 60 HP	94 percent
Over 60 HP through 100 HP	95 percent
Over 100 HP	95 percent

## **2.7 MOTOR HOUSING FEATURES**

- A. Motor housings: Open drip-proof, totally enclosed fan cooled (TEFC), or explosion-proof, as appropriate for the use intended and the environment where installed. Provide totally enclosed fan cooled motors for equipment below grade, located outdoors, or operating in damp or dust-laden locations. Provide a continuous moisture drain that is screened against insect entry for totally enclosed motors.
- B. Oversize external conduit boxes at least one size larger than NEMA standard.

## **PART 3 EXECUTION**

### **3.1 GENERAL**

- A. Electrical connections for the motor shall conform to NEC Articles 430 and 440 as applicable, and to any state and local code having jurisdiction.
- B. Unless furnished as part of a complete package including disconnects and control, and/or motor fuse protection, protect motors by Bussmann Fusetron Dual-Element Time Delay fuses.
- C. Megger all motor windings prior to starting. Include log of megger readings in the Operations and Maintenance manuals. Include in log full load amps.
- D. Verify correct rotation of all motors.

**END OF SECTION**