

## **SECTION VIII MOTORS AND CONTROLLERS**

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### **Section VIII. Motors and Controllers**

#### **1. General.**

It is important that the Company be consulted concerning the type of electrical service available to assure correct application (phase and voltage) of the motor to be used.

Starting current limitations are prescribed for conventional motorized equipment rated in horsepower, and air conditioning or heat pump equipment rated in BTUH.

#### **2. Company to be Advised.**

The Company shall be advised before any single phase motor rated in excess of 5 HP (equivalent 40,000 BTUH) or any three phase motor rated 10 HP (equivalent 75,000 BTUH) or larger is installed by a customer. The information given to the Company shall include the nameplate data of the motor, the nature of the load and operating characteristics of the proposed installation, such as how frequently the motor will be started and if the load fluctuates rapidly, such as in a sawmill, stone crusher, elevator, etc.

#### **3. Single Phase Motors.**

Single phase motors larger than 1/2 HP or with running current exceeding 10 amperes should normally be arranged for operating at 208 or 240 volts. Generally, motors larger than 5 HP should be three phase, but the Company may require the use of single phase motors or appropriate phase converters where three phase service is not readily available.

#### **4. Protection.**

All motors should be properly protected against overload, including overloads caused by low voltage conditions. It is the customer's responsibility to protect three phase motors against the possibility of single phase operation. Reverse phase relays, together with circuit breakers, or the equivalent devices should be used on all three phase installations for elevators, cranes and similar applications to protect the installation from phase reversal.

#### **5. No Voltage Release.**

Motor controllers are recommended to be arranged so that in the event of sustained interruption the motor will be disconnected from the line, unless it is equipped for automatic starting after such an interruption. Where continuous operation of motorized equipment is essential, motor controllers should be arranged to allow motors to operate through a transient no-voltage condition lasting for 1/2 second (30 cycles). The Company should be consulted where problems of this nature might be encountered.

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### 6. Motor Starting Requirements.

Momentary fluctuation of circuit voltage occurs each time a motor is started on the circuit. Where this effect is pronounced, a visual disturbance or lighting flicker may be observed by the customer or other customers served from the same system. In extreme cases, the motor itself may have difficulty in starting.

To avoid objectionable voltage variations and maintain proper service to the customer and neighbors, it is necessary to set a maximum permissible limit to the current drawn from the service during each step of a motor-starting operation, based upon frequency of starts.

### 7. Motor Starting Currents.

The maximum starting currents permitted for single phase and three phase conventional motorized equipment rated in horsepower and for air conditioning or heat pump equipment rated in BTUH are:

#### SINGLE PHASE MOTORS

Service Voltage	Max. Starting Current per Step, Max. Four Starts per Hour	Max. Equiv. Rating of Air Conditioner or Heat Pump BTUH
120 Volts	50 Amperes	10,000
208 or 240 Volts	60 Amperes for 2 HP Motor	20,000
208 or 240 Volts	80 Amperes for 3 HP Motor	25,000
208 or 240 Volts	120 Amperes for 5 HP Motor	40,000

#### THREE PHASE MOTORS

Service Voltage	Max. Starting Current per Step, Max. Four Starts per Hour	Max. Equiv. Rating of Air Conditioner or Heat Pump BTUH
208 or 240 Volts	100 Amperes up to 5 HP Motor	40,000
208 or 240 Volts	130 Amperes for 7½ HP Motor	50,000
208 or 240 Volts	160 Amperes for 10 HP Motor	75,000
208 or 240 Volts	230 Amperes for 15 HP Motor	150,000
480 Volts	50 Amperes up to 5 HP Motor	40,000
480 Volts	65 Amperes for 7½ HP Motor	50,000
480 Volts	80 Amperes for 10 HP Motor	75,000
480 Volts	115 Amperes for 15 HP Motor	150,000

### 8. Explaining Starting Limits.

The specific motor-starting current limitation stated in Paragraph 7 is the maximum allowable increase in current on the line side of the motor-starting device at any instant during the starting operation.

The limitation does not restrict the total current that can be taken by the motor in starting, but may require that the total be built up gradually, or in steps, each of which does not exceed the specific limitation for the motor. Where a step type starter is used, an appreciable time must be allowed on each step and the current increase of each step shall not exceed the imposed limitation.

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### **9. Group Starting.**

When motors are started in group instead of individually, the starting current limitations apply to the group and not to the individual motors. In some case sequential starting may be necessary.

### **10. Favorable Locations.**

There are locations on the Company's system where starting currents larger than specified may be permitted. These locations are on network systems or systems which supply large loads or where special conditions exist. The Company shall be consulted whenever larger starting currents are contemplated for a specific installation.