## SECTION 16220 - PROVISIONAL

## GENERAL PURPOSE INDUCTION MOTORS

***Provisional Specification Summary:***

*1.2.06 – Add paragraph four as shown below.*
*1.2.07 – Replace this section as shown below.*
*1.5 thru 1.8.03- Add sections as shown below.*
*2.3.14 – Delete this subsection*
*2.3.18 – Replace this subsection as shown below.*
*2.3.19 – Replace this subsection as shown below.*
*2.3.21 - Replace this subsection as shown below.*
*2.9 thru 2.13 - Add sections as shown below.*

1.2.06 Governing Standards. Add the following as paragraph four at the end of this subsection:

Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.2.07 Nameplates. The motor nameplates shall be engraved or embossed on stainless steel and fastened to the motor frame with stainless steel screws or drive pins. Nameplates shall indicate clearly all of the items of information enumerated in NEMA Standard MGI-10.38 or MGI-20.60, as applicable.

1.5 DESCRIPTION

1.5.01 The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install Electric Motors.

1.6 RELATED DOCUMENTS

1.6.01 Section 11205 (S), Vertical Mixed Flow Pumps
1.6.02 Section 16120, Wires and Cables 600 Volt and Less
1.6.03 Section 16151 Low Voltage Variable Frequency Drives

1.7 DESCRIPTION OF SYSTEMS

1.7.01 Electric motors are for the operation of equipment furnished and installed by other trades.

1.7.02 The types of motors shall be selected to be suitable for the ambient conditions in which they are to operate, including moisture, dust, temperature, etc.

1.8 WORK SPECIFIED

1.8.01 Furnish all labor, materials, equipment, technical supervision, and incidental services required to complete, test and leave ready for operation the electrical motors as specified in all Sections of these specifications or as indicated.

1.8.02 Place motor operated equipment and accessories into proper adjustment and operating condition so that the component parts function together as a workable unit.

1.8.03 Provide all labor, material, and equipment required to install, wire, connect, set, and place in operation all motors as part of equipment furnished by other trades as specified and as shown on the plans of these contract documents. The work shall include all conduits, fittings, wires, mounting systems, etc., as shown in the specifications and as instructed by the equipment manufacturers.

2.3.18 Motor Space Heaters. Motors shall be provided with a space heater element sized to prevent condensation on the core and windings. The space heaters shall be isolated or so located as to prevent heat damage to adjacent painted surfaces and shall be suitable for 120 volt, 60 Hz, single phase power supply.

2.3.19 Temperature Sensing Devices. Each motor shall be furnished with resistive temperature devices (RTD) placed to sense temperature in the motor windings and bearings. All RTD's shall be 100 ohm, platinum type. Each motor shall be equipped with a pair of RTD's in each phase winding and a pair in the thrust and guide bearings. All RTD's shall be connected with a twisted shielded triad to the motor protection relay and shall be connected as indicated on the electrical schematics and one-line diagrams.

Temperature detectors for sleeve or antifriction bearings, complete with detector head and holder assemblies, shall be furnished in accordance with the applicable requirements of ANSI MC96.1 and IEEE 119.

2.3.21 Efficiency. Minimum motor efficiencies shall conform to the requirements of Energy Policy Act of 1992 (EPACT) and shall be premium efficiency type and shall have a NEMA nominal efficiency nameplate value equal to or greater than values indicated in the following table. Efficiency shall be determined in accordance with IEEE 112, Test Method B.

Vertical motors shall be premium efficiency type and shall have efficiency values equal to or greater than those indicated in the following table minus 0.50.

| | | Nominal Efficiency Values | | | | Nominal Efficiency Values | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Open Drip Enclosure | | | | TEFC Enclosure | | | |
| Motor | | 3600 | 1800 | 1200 | 900 | 3600 | 1800 | 1200 | 900 |
| kW | hp | rpm | rpm | rpm | rpm | rpm | rpm | rpm | rpm |
| 0.7 | 1 | 84.0 | 83.0 | 80.5 | 75.0 | 75.5 | 81.5 | 81.5 | 75.5 |
| 1.1 | 1.5 | 82.5 | 84.0 | 84.5 | 78.0 | 82.5 | 84.0 | 86.5 | 80.0 |
| 1.5 | 2 | 84.0 | 84.0 | 86.5 | 86.5 | 84.0 | 84.0 | 87.5 | 85.5 |
| 2.2 | 3 | 85.0 | 87.5 | 88.0 | 89.5 | 87.0 | 88.0 | 89.0 | 86.5 |
| 3.7 | 5 | 87.5 | 88.5 | 89.0 | 89.5 | 88.0 | 88.0 | 89.5 | 85.0 |
| 5.6 | 7.5 | 88.5 | 89.5 | 90.0 | 88.5 | 90.0 | 90.0 | 90.0 | 86.5 |
| 7.5 | 10 | 89.0 | 90.0 | 91.0 | 91.0 | 91.0 | 90.0 | 91.0 | 91.0 |
| 11.2 | 15 | 90.2 | 91.7 | 91.0 | 91.0 | 91.0 | 92.0 | 92.0 | 91.0 |
| 14.9 | 20 | 91.7 | 92.4 | 91.7 | 92.0 | 92.0 | 93.0 | 92.0 | 91.0 |
| 18.7 | 25 | 92.4 | 93.0 | 92.4 | 92.0 | 92.0 | 93.0 | 93.0 | 91.0 |
| 22.4 | 30 | 93.0 | 93.0 | 93.0 | 93.0 | 93.0 | 93.0 | 93.0 | 93.0 |
| 29.8 | 40 | 93.0 | 94.0 | 93.5 | 93.0 | 93.0 | 94.0 | 94.0 | 93.0 |
| 37.3 | 50 | 93.0 | 94.1 | 93.5 | 93.0 | 92.4 | 94.0 | 94.0 | 93.0 |
| 44.8 | 60 | 93.0 | 95.0 | 94.5 | 94.0 | 93.5 | 95.0 | 95.0 | 93.0 |
| 56 | 75 | 94.0 | 95.0 | 95.0 | 94.0 | 93.6 | 95.0 | 95.0 | 94.0 |
| 74.6 | 100 | 94.5 | 95.0 | 95.0 | 95.0 | 95.0 | 95.0 | 95.0 | 94.0 |
| 93.2 | 125 | 95.0 | 95.0 | 95.0 | 95.0 | 95.0 | 95.0 | 95.0 | 94.0 |
| 112 | 150 | 95.0 | 95.0 | 95.0 | 95.0 | 95.0 | 95.0 | 95.0 | 94.0 |

2.9 ADDITIONAL REQUIREMENTS. Unless otherwise specified or permitted, all electric motors furnished and installed by the Contractor shall conform to the requirements hereinafter set forth.

2.9.01 Ratings of Motors

2.9.01.01 Every motor shall be of sufficient horsepower and speed to operate the driven equipment under all load and operating conditions without exceeding its rated nameplate current or power or specified temperature limits.

2.9.01.02 Each motor shall develop ample torque for its required service throughout its acceleration range at a voltage 10 percent below nameplate rating. Where shown on the Electrical Drawings to be operated on a reduced voltage starter, the motor shall develop ample torque under the conditions imposed by the reduced voltage starting method.

2.10 TYPE OF MOTORS

2.10.01 All motors shall be of a type having starting characteristics and ruggedness as may be necessary under the actual conditions of operation and, unless otherwise specified, shall be suitable for full-voltage starting.

2.11 GENERAL DESIGN OF MOTORS

2.11.01 Motor windings shall be braced to withstand successfully the stresses resulting from the method of starting. The windings shall be treated thoroughly with acceptable insulating compound suitable for protection against moisture and slightly acid or alkaline conditions.

2.11.02Bearings shall be of the self-lubrication type, designed to ensure proper alignment of rotor and shaft and to prevent leakage of lubricant. The motors shall be lifetime lubricated with silicone grease. Antifriction bearings shall be designed to be regreasable and initially shall be filled with grease suitable for ambient temperature of 40° C. Bearings shall be AFBMA Types BC or RN, heavy duty, or shall otherwise be shown to be suitable for the intended application in terms of B-10 life rating, Class M3 or better. All grease lubricated bearings, except those specified to be factory sealed and lubricated, shall be fitted with easily accessible grease supply, flush, drain and relief fittings. Extension tubes shall be used when necessary. Grease supply fittings shall be standard hydraulic type by the Alemite Division of the Stewart-Warner Corporation.

2.11.03 Vertical motors shall be provided with thrust bearings adequate for all thrusts to which they can be subjected in operation.

2.11.04 Locked rotor current shall not be greater than specified in NEMA Standard MGI-12.32, Design "N".

2.11.05 Motor shall be totally enclosed in conformance with NEMA Standard MGI-10.35. Small fan motor may be open type if suitably protected from moisture, dripping water and lint accumulation.

2.11.06 The motors shall be provided with x-y, velocity type vibration sensors with transmitters at each end of the motor. The sensors & transmitters shall be as per 17550, 3.2.17. All wiring shall be brought out to a separate terminal box for external connections.

2.12 SINGLE PHASE MOTORS AUXILIARY DEVICES

2.12.01 Single phase motors requiring switching devices and auxiliary starting resistors, capacitors, or reactors shall be furnished as combination units with such auxiliaries either incorporated within the motor housing or housed in suitable enclosures mounted upon the motor frames. Each combination unit shall be mounted upon a single base and shall be provided with a single conduit box.

2.13 SPECIAL MOTORS

2.13.01 Hoists and other devices complying with special safety codes shall be furnished complete with their control equipment and with all accessories and safety devices for code-approved, safe and efficient operation.

End of Provisional Section

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