**PART 1 - GENERAL**

**1.01 SUMMARY**

A. Section Includes: Furnishing and installation of electric motors, machinery drives, and equipment as indicated. Sizes, capacities, and operating conditions shall be as tabulated on equipment schedules.

C. Related Requirements:

1. Division 01 - General Requirements.

2. Section 23 05 48: HVAC Sound, Vibration and Seismic Control.

3. Section 23 20 13: HVAC Piping.

4. Section 23 60 00: Central Cooling Equipment.

5. Section 23 80 00: Heating, Ventilating and Air Conditioning Equipment.

6. Section 23 09 00: HVAC Instrumentation and Controls.

**1.02 ELECTRICAL REQUIREMENTS**

A. Except where modified by specific requirements of an individual mechanical section, the following electrical Work required by Division 23 is included under Division 26, 27 and 28, and as indicated on Drawings:

1. Motor starters and disconnect switches for motors.

2. Line voltage wiring and conduit to motors, motor starters and controls.

3. Installation of line voltage wall-mounted electric controls.

B. Power Supply: Provide necessary power supplies for the intended operation and application as indicated on the Drawings. Verify indicated power supplies with Architect/Engineer prior to ordering equipment.

C. Pre-wired Control Panels: Where pre-wired control panels or equipment are provided under Division23, internal wiring shall extend neatly to a terminal strip which shall have same designation for terminals that are indicated on wiring diagrams. Pre-wired panels shall be listed and labeled by UL, or other Nationally Recognized Testing Laboratory (NRTL).

D. Workmanship: Where Work of Division 23 includes either factory or field wiring, materials and workmanship shall conform to requirements of Division 26, 27 and 28 Specifications and governing codes.

**1.03 SUBMITTALS**

A. Provide in accordance with Division 01 and 23 0500: Common Work Results for HVAC.

B. Manufacturer's Data

1. Complete material list of items proposed to be provided under this section.

2. Manufacturer's specifications and other data required to demonstrate compliance with specified requirements.

3. Shop Drawings indicating complete system layout, diagrams, and schedules.

4. Manufacturer's recommended installation procedures.

C. Manufacturer's recommended installation procedures, when reviewed by the Architect, will become basis for inspecting actual installation procedures.

**1.04 QUALITY ASSURANCE**

A. Manufacturer and Installer Qualifications: Comply with provisions stated under Section23 0500: Common Work Results for HVAC.

1. Qualifications of Manufacturers: Products furnished for the Work of this section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a five-year history of successful production.

**1.05 PRODUCT HANDLING**

A. Protection, Replacement, Delivery, and Storage: Comply with provisions stated under Section 23 05 00: Common Work Results for HVAC.

**PART 2 - PRODUCTS**

**2.01 EQUIPMENT**

A. Electrical Motors: Motors shall provide adequate starting torque to bring driven equipment up to rated speed in the stipulated time intervals:

1. In general, motors 1/2 horsepower and larger shall be squirrel cage induction type for 3-phase, 60 cycle power supply.

2. Motors below 1/2 horsepower shall be capacitor start, induction run type or split-phase type for single phase, 60 cycle power supply.

B. Motors Furnished with Equipment: Where motors are an integral part of equipment, motors shall be as recommended by the equipment manufacturer.

C. Motor Operation Criteria:

1. Motors that are not directly exposed to weather, and are located in non-hazardous spaces, shall be furnished with drip-proof enclosures and shall be continuous duty rating of 100 degrees F.

2. Motors installed unprotected in outdoor locations shall be totally enclosed, fan-cooled, and continuous duty rating at 130 degrees F.

3. Single phase motors shall be furnished with built-in overload protection. Overload protectors shall be single pole automatic reset type, except where frequent start/stop may constitute a hazard, reset shall be manual.

4. Hermetic polyphase motors shall be furnished with built-in hermetic thermostatic protection devices, which shall interrupt the control circuit to protect the motor from overheating.

5. Motors shall be furnished with UL, or other NRTL approved terminal boxes. All motors including mountings and shaft sizes, shall be built to NEMA standard dimensions, except where integral with hermetic equipment

6. Where application is unique, or location is contaminated or hazardous, high starting torque totally enclosed, or explosion-proof motors shall be provided.

7. Where Drawings schedule 3-phase for motors smaller than 1/2 horsepower or single phase for motors larger than 1/2 horsepower, specifically verify schedule with the Architect before ordering motors.

8. Two-speed motors shall be separately wound if speeds required are not a two-to-one ratio. If two-to-one speed ratio is required, motors shall be single wound. Two-speed motors shall be furnished with variable horsepower.

9. Motors shall be furnished with sealed lifetime lubricated ball bearings.

10. Motors shall be energy efficient complying with NEMA standards.

D. Machinery Drives:

1. Couplings: Where couplings are specified for direct drive, non-lubricated types shall be furnished, and rating shall be at least 125 percent motor horsepower rating.

2. Belt Drives: Where V-belt drive is required, provide for overload in accordance with manufacturer's recommendations, but not for less than 150 percent of motor horsepower.

a. Drive selection shall provide not less than 95 percent efficiency.

b. Fan drives smaller than 25 horsepower shall be furnished with adjustable pitch drive sheaves.

c. Other drives shall be machined cast iron or steel fixed pitch.

E. Machinery Accessories:

1. Lubricating Devices: Provide level gages, oil pressure gages, grease cups, and grease gun fittings as required by the equipment. Extend lubricating fittings to readily accessible locations.

2. Guards: Rotating equipment shall be provided with guards to protect operating and/or maintenance personnel.

a. Belt guards shall enclose belts, pulleys and sheaves. They shall be constructed of galvanized expanded sheet steel, installed in an angle frame with angle or channel supports.

b. Couplings guards shall completely enclose rotating couplings and shall be constructed of galvanized sheet steel, installed to eliminate vibrations.

c. Guards shall be readily removable to provide access to belt drives and couplings.

d. Provide opening at shaft end for revolution counter.

**PART 3 - EXECUTION**

**3.01 INSTALLATION**

A. Install equipment as indicated on Drawings and in compliance with manufacturer's recommendations, with vibration isolation, mounting pads or foundations as specified in other sections.

**3.02 PROTECTION**

1. Protect the Work of this section until Substantial Completion.

**3.03 CLEANUP**

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION