SECTION 16420
MOTOR STARTERS

PART 1 - GENERAL

1.01 PROVISIONS INCLUDED

A. The general provisions of the Contract, including General and Supplementary General Conditions, and Division 1 General Requirements, apply to work specified in this Section.

B. Requirements of Section 16050, "Basic Electrical Materials and Methods," apply to this Section.

1.02 SUMMARY

A. This Section specifies motor starters. Furnish in quantities sufficient for a complete installation as indicated on the drawings and in these Specifications. Furnish and install starters complete with enclosures, controllers, anchors and fasteners and accessories.

B. Related Work Specified in Other Sections:
1. Conductors, Section 16120.
2. Hangers and supports, Section 16070.
3. Electrical Identification, Section 16075.
4. Disconnect Switches, Section 16410.
5. Fuses, Section 16490.
6. Control wiring: Division 15.

1.03 REFERENCED STANDARDS

A. Underwriter's Laboratories: UL 98, Enclosed Switches.

B. National Fire Protection Association, NFPA-70, National Electric Code.

C. American National Standards Institute: ANSI-C37.96, Guide for Induction Motor Protection.

D. National Electrical Manufacturers Association (NEMA): NEMA ICS 2, Industrial Control Devices, Controllers and Assemblies.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's catalogue cuts for each type of motor starter specified in this section.

1.05 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing the work of this section with minimum three years experience.

1.06 COORDINATION

A. Coordinate voltage, current, and horsepower rating of the motor-driven mechanical equipment as purchased, to confirm correct electrical ratings before procuring motor starters and before submitting product data.

B. Coordinate the placement of starters with other trades.

PART 2 - MATERIALS

2.01 MANUFACTURER

A. Furnish motor starters manufactured by one of the following:
   1. Allen-Bradley Co.
   2. General Electric
   3. Square D Company
   4. Cutler-Hammer

2.02 MAGNETIC STARTERS

A. Furnish magnetic motor starters with electrically operated, electrically held controller, or a combination of the magnetic motor starter and fusible disconnect switch as shown on the drawings. Include the following accessories and features:
   1. Control transformer: 120 volts secondary, internally mounted in the starter enclosure, with fuses to protect control wiring; with rating as follows:
      a. Size 1 starter: 75 VA
      b. Size 2 starter: 100 VA
      c. Size 3 starter: 150 VA
   2. Thermal Overload Relays: Provide internal ambient-compensated thermal overload sensing device in each phase of the multi-phase motor starters. Unless shown otherwise, provide manual reset type. Size thermal overload relays for 125 percent of the actual motor full load current.
   3. Status indicating lamps: Red for "Run" and green for "Stop."
   4. Selector Switch: Three position type; "Hand-Off-Automatic." Provide four position switch for 2-speed motors.
   5. Auxiliary Contacts: Provide at least two NO and two NC unused contacts in each starter.
   6. Fuses: Provide fuses in accordance with the requirements of Section 16490.
   7. Phase loss protection: Provide relay for starters size 2 and larger.

B. Furnish three-pole magnetic motor starters for operation at 480 volt, 3-phase, 60 hertz for motors 1/2 HP and larger, unless shown otherwise on the Drawings.
   1. Furnish non-reversing, single-speed type, unless shown otherwise on the drawings.

2. Furnish full voltage, across-the-line type for motors 40 HP and smaller. Furnish reduced voltage (wye-delta) type for motors 50 HP and larger.
3. Furnish 2-speed, two windings type starter when motor two-speed operation is required by Division 15. Provide internal time delay relay for transition from high to low speed.

C. Size motor-starters rated 480 volts as follows:
1. 1/2 HP to 10 HP: NEMA Size 1.
2. 15 HP to 25 HP: NEMA Size 2.
3. 30 HP to 50 HP: NEMA Size 3.

D. Enclose each motor starter in a suitable metal enclosure, type NEMA 1 for dry indoor locations and type NEMA 3R for wet or outdoor locations.

2.03 MANUAL STARTERS

A. Manual Starters: Toggle-switch operated starter with thermal overload protection in each phase. Include the following accessories and features:
1. Quick-break operation mechanism.
2. Silver contacts.
3. Pressure-type terminal contacts.
4. Bi-metallic overload device.

B. Enclose each motor starter in a NEMA standard enclosure suitable for the environment in which the starter is installed.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install starters in conformance with the manufacturer's printed installation instructions, the approved shop drawings, and the requirements of the referenced Electrical Code.

B. Connect three-position switch in such manner that only the normal automatic control devices which are furnished, installed and wired under Division 15, will be bypassed when the switch is in manual position. Safety control devices, such as high pressure cutouts, high temperature cutouts and motor overload protection, shall be connected in the motor control circuit in both the manual and the automatic positions of the selector switch.

C. Single or double pole tumbler switches, specifically designed for alternating current operation only, may be used as manual controllers for single phase motors having a full load current rating not in excess of 80 percent of the switch rating. The switches shall be horsepower rated and shall disconnect all ungrounded conductors.

D. Automatic control devices furnished and installed under Division 15, such as thermostats, float or pressure switches, may control the starting and stopping of the single phase motors directly, provided the devices used are designed for that purpose and have an adequate horsepower rating.

E. Provide disconnecting means for each motor where required by the referenced Electrical Code. Furnish combination type magnetic motor starters, unless a circuit breaker or horsepower rated switch in a panelboard is located within sight of the motor controller.

F. Motor starters for the Owner furnished equipment: Install and provide power wiring of the motor starters, furnished by the Owner. Provide disconnecting means as herein specified and in compliance with referenced Electrical Code.

G. Install and wire motor starters furnished by other trades.

H. Install starters plumb, level, and true to line; support them with rigid supports, and securely fasten them in place.

I. Install starters on 3/4 inch plywood backboard mounted to wall, or mount free-standing on "Unistrut" type supports. Group starters for several motors.

J. Attach to each motor starter and disconnect switch a permanent nameplate, complying with Section 16075, which identifies the equipment served by the motor starter or disconnect switch.

3.02 TESTING

A. Test mechanical and electrical operation of each starter.

B. Test each overload relay by current injection through relay heaters.

3.03 CLEANING

A. Clean motor starters before energizing. Vacuum enclosures inside and out, then wipe down equipment.

B. If equipment is wet or contains moisture, dry it thoroughly before energizing.

END OF SECTION 16420