SECTION 16480
MOTOR CONTROL

PART 1 GENERAL

1.1 WORK INCLUDED:
   A. Manual motor starters.
   B. Magnetic motor starters.
   C. Combination magnetic motor starters.
   D. Motor control centers.
   E. Coordinate with Mechanical Section 15170 – Motors. PROVIDED UNDER THIS SECTION.

1.2 REFERENCES
   A. ANSI/NEMA ICS 6 - Enclosures for Industrial Controls and Systems.
   B. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service.
   C. FS W-P-115 - Power Distribution Panel.
   D. FS W-F-870 - Fuse holders.
   E. FS W-S-865 - Switch, Box, Enclosed, Surface-Mounted.
   F. NEMA AB 1 - Molded Case Circuit Breakers.
   G. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.
   H. NEMA KS 1 - Enclosed Switches.
   I. NEMA PB 1 - Panelboards.
   J. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or less.

1.3 SUBMITTALS
   A. Submit shop drawings and product data under provisions of Section 01300.
   B. Indicate on shop drawings, front and side views of motor control center enclosures with overall dimensions. Include conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase, neutral, and ground; electrical characteristics including voltage, frame size and trip ratings, withstand ratings, and time-current curves of all equipment and components.
   C. Provide product data on motor starters and combination motor starters, relays, pilot devices, and switching and overcurrent protective devices.
   D. Submit manufacturers' instructions under provisions of Section 01300.

1.4 OPERATION AND MAINTENANCE DATA
   A. Submit operation and maintenance data under provisions of Section 01700.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Deliver products to site under provisions of Section 01600.
   B. Deliver in 30” maximum width shipping splits, individually wrapped for protection, and mounted on shipping skids.
   C. Store and protect products under provisions of Section 01600.
   D. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
   E. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to motor control center components, enclosure, and finish.

1.6 SPARE PARTS
A. Keys: Furnish two each to Owner.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - MOTOR STARTERS
A. Square D.
B. General Electric.
C. Cutler Hammer.
D. Siemens/ITE.
E. Allen Bradley.

2.2 MANUAL MOTOR STARTERS
A. Manual Motor Starter: NEMA ICS 2; AC general-purpose Class A manually operated full-voltage controller for induction motors rated in horsepower, with overload relay, red pilot light, auxiliary contact, and push button operator.
B. Fractional Horsepower Manual Starter: NEMA ICS 2; AC general-purpose Class A manually operated, pole, full-voltage controller for fractional horsepower induction motors, with thermal overload unit, red pilot light, and key operator.
C. Motor Starting Switch: NEMA ICS 2; AC general-purpose Class A manually operated pole, full-voltage controller for fractional horsepower induction motors, without thermal overload unit, red pilot light, auxiliary contact, and push button operator.
D. Enclosure: ANSI/NEMA ICS 6

2.3 MAGNETIC MOTOR STARTERS
A. Magnetic Motor Starters: NEMA ICS 2; AC general-purpose Class A magnetic controller for induction motors rated in horsepower.
B. Full Voltage Starting
C. Reduced Voltage Starting.
D. Two Speed Starting: With integral time delay transition between FAST and SLOW speeds.
E. Coil Operating Voltage: 120 volts, 60 Hertz.
F. Size: NEMA ICS 2; size as shown on Drawings.
G. Overload Relay: NEMA ICS 2; melting alloy.
H. Enclosure: NEMA ICS 6
I. Combination Motor Starters: Combine motor starters with disconnecting means, type as scheduled.
J. Auxiliary Contacts: NEMA ICS 2; two normally opened and two normally closed contacts in addition to seal-in contact.
K. Indicating Lights: NEMA ICS 2; RUN: red in front cover.
L. Selector Switches: NEMA ICS 2; HAND/OFF/AUTO, in front cover.
M. Relays: NEMA ICS 2
N. Control Power Transformers: 120 volt secondary, capacity as scheduled.
O. Provide motor starters with overload heaters sized from nameplate full load amperage for each phase, manually reset.
P. Motor starters shall be provided with phase failure relay protection. Provide phase failure, under voltage and phase reversal. Automatic reset between 3 to 5 minutes after motor shut down.

2.4 CONTROLLER OVERCURRENT PROTECTION AND DISCONNECTING MEANS
A. Molded Case Thermal-Magnetic Circuit Breakers: NEMA AB\1; circuit breakers with integral thermal and instantaneous magnetic trip in each pole.
B. Motor Circuit Protector: NEMA AB 1; circuit breakers with integral instantaneous magnetic trip in each pole.
C. Non-fusible Switch Assemblies: NEMA KS 1; quick-make, quick-break, load interrupter enclosed
knife switch with externally operable handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

D. Fusible Switch Assemblies: NEMA KS 1; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: FS W-F-870.

2.5 ACCEPTABLE MANUFACTURERS - MOTOR CONTROL CENTER
A. Square D.
B. General Electric.
C. Cutler Hammer.
D. Siemens/ITE.
E. Allen Bradely.

2.6 MOTOR CONTROL CENTER
A. Motor Control Centers: NEMA ICS 2
B. Main Overcurrent Protection: As scheduled.
C. Motor Starters: As scheduled.
D. Feeder Tap Units: As scheduled.
E. Horizontal Bussing: Include copper ground bus entire length of control center.
F. Vertical Bussing: NEMA ICS 2; copper.
G. Configuration: Units front mounting only, accessible from the front only.
H. Enclosure: ANSI/NEMA ICS 6; Type as required to meet conditions of installation unless indicated on the Drawings.
I. Finish: Manufacturer's standard enamel color.
J. Provide phase loss protection relay with contacts to de-energize each motor starter in control center.
K. Control Transformer: Provide control transformer in motor control center to provide 120 volt control source for all motor starters in control center.

PART 3 EXECUTION

3.1 INSTALLATION
A. Install motor control equipment in accordance with manufacturer's instructions.
B. Install fuses in fusible switches.
C. Select and install heater elements in motor starters to match installed motor characteristics.
D. Motor Data: Provide neatly typed label inside each motor starter enclosure door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

END OF SECTION