

**SECTION 26 28 39**  
**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

1.2 REFERENCES

- A. NEMA ICS 6 - Enclosures
- B. FS W-C -375 - Circuit Breakers, Molded Case; Branch Circuit and Service
- C. UL 489 - Molded Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
- D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts
- E. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches
- F. NEMA PB 1 - Panelboards
- G. NEMA PB 1.1 – General Instructions for Proper 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 01 33 00.
- B. Indicate on shop drawings, front and side views of motor control center enclosures with overall dimensions.
  - 1. 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 over current protection devices.
- D. Submit manufacturers' instructions under provisions of Section 01 33 00.

1.4 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Section 01 77 00.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section 01 60 00.
- 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 01 60 00.
- D. Store in a clean, dry space
  - 1. 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.
  - 1. Lift only with lugs provided for the purpose.
  - 2. Handle carefully to avoid damage to motor control center components, enclosure, and finish.

1.6 SPARE PARTS

- A. Keys: Furnish two each to Owner.

1.7 COMMISSIONING

The School District of Palm Beach County

Project Name:

SDPBC Project No.:

- A. Commissioning of a system or systems specified in this section is part of the construction process.
- B. Documentation and testing of these systems, as well as training of the Owner's operation and maintenance personnel, is required in cooperation with the Owner's Representative and the Commissioning Authority.
- C. Project Closeout is dependent on successful completion of all commissioning procedures, documentation, and issue closure.
- D. Refer to Section 01 77 00 - Contract Closeout, for substantial completion details.
- E. Refer to Section 01 91 00, Commissioning, for detailed commissioning requirements.

## **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 with full-voltage controller for fractional horsepower induction motors, without thermal overload unit, red pilot light, auxiliary contact, and push button operator.
- D. Enclosure: 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.

The School District of Palm Beach County

Project Name:

SDPBC Project No.:

- O. Provide motor starters with overload heaters sized from nameplate full load amperage for each phase, manually reset.
  - P. Motor starters provided with phase failure-relay protection.
    - 1. Provide phase failure, under voltage and phase reversal.
    - 2. Automatic reset between 10 to 20 seconds after fault condition correction.
- 2.4 CONTROLLER OVERCURRENT PROTECTION AND DISCONNECTING MEANS
- A. Molded Case Thermal-Magnetic Circuit Breakers: Provide UL 489 circuit breakers with integral thermal and instantaneous magnetic trip in each pole.
  - B. Motor Circuit Protector: Provide UL 489 circuit breakers with integral instantaneous magnetic trip in each pole.
  - C. Non-fusible Switch Assemblies:
    - 1. NEMA KS 1 quick-make quick-break, load interrupter enclosed knife switch with externally operable handle.
    - 2. Provide interlock to prevent opening front cover with switch in ON position. (Handle lockable in OFF position.)
  - D. Fusible Switch Assemblies:
    - 1. NEMA KS 1 quick-make quick-break load interrupter enclosed knife switch with externally operable handle.
    - 2. Provide interlock to prevent opening front cover with switch in ON position.
    - 3. Handle lockable in OFF position.
- 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 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: Provide the 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.

The School District of Palm Beach County

Project Name:

SDPBC Project No.:

- 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.

### 3.2 FUNCTIONAL PERFORMANCE TESTING

- A. System Functional Performance Testing is part of the Commissioning Process.
  - 1. The Contractor shall perform the Functional Performance Testing and the Commissioning Authority shall witness and document the test.
  - 2. Refer to Section 01 91 00, Commissioning, for functional performance tests and commissioning requirements.
- B. Systems Readiness Checklists shall be completed and submitted for each piece of equipment included in this section.
- C. Perform the functional performance testing of Motor Controls as part of the Electrical System Functional Performance testing.

### 3.3 DEMONSTRATION AND TRAINING

- A. Training of the Owner's operation and maintenance personnel is required in cooperation with the Owner's Representative.
  - 1. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems.
  - 2. Schedule the instruction in coordination with the Owner's Representative after submission and approval of formal training plans.
  - 3. Refer to Section 01 91 00, Commissioning, for further contractor training requirements.
- B. Provide demonstration and training for all types of motor controls installed in this project.

END OF SECTION