

SECTION 26 24 19
MOTOR-CONTROL CENTERS

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies the furnishing, complete installation, and connection of the motor control centers.

1.2 RELATED WORK

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements and items that is common to more than one section of Division 26.
- B. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Cables and wiring.
- C. Section 26 29 11, LOW-VOLTAGE MOTOR STARTERS: Control and protection of motors.
- D. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.

1.3 SUBMITTALS

- A. Submit in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- B. Catalog Data:
 - 1. Submit Catalog Data and information as required to demonstrate that materials conform to the specification requirements. Data shall include features, characteristics, ratings and settings of all adjustable components.
- C. Shop Drawings:
 - 1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
 - 2. Include electrical ratings, enclosure type, dimensions, weights, mounting details, front view, side view, equipment and device arrangement, running overcurrent protection, branch circuit overcurrent protection, wiring diagrams, materials, connection diagrams for each motor control center, and nameplate schedule.
 - 3. For starters: a list of overload sizes for each motor, and circuit breaker or fuse sizes.
- D. Manuals: Two weeks prior to the final inspection, submit four copies of the following to the Resident Engineer:
 - 1. Complete maintenance, operating and testing manuals including wiring diagrams, technical data sheets, including load current, overload

relay and settings of adjustable relays, and information for ordering replacement parts:

- a. Include complete "As Installed" diagrams, which indicate all items of equipment and their interconnecting wiring.
 - b. Include complete diagrams of the internal wiring for each of the items of equipment, including "As Installed" revisions of the diagrams.
 - c. The wiring diagrams shall identify the terminals to facilitate installation, maintenance, operation and testing.
 - d. Instructions for testing and adjusting overcurrent protective devices.
- E. Certification: Two weeks prior to final inspection, submit four copies of the following to the Resident Engineer:
1. Certification from the manufacturer that the motor control center(s), accessories, and components will withstand the seismic forces and that the unit will be fully operational after the seismic event at the project site.
 2. Certification by the manufacturer that the motor control centers conform to the requirements of the drawings and specifications.
 3. Certification by the Contractor that the motor control centers have been properly installed, adjusted, and tested.

1.4 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. National Electrical Manufacturers Association (NEMA):
- ICS 1-05.....Industrial Control and Systems: General Requirements
 - ICS 2-05.....Industrial Control and Systems: Controllers, Contactors, and Overhead Relays, Rated 600 volts
 - ICS 6-01.....Industrial Control and Systems: Enclosures
 - FU 1-02.....Low-Voltage Cartridge Fuses
 - 250-03.....Enclosures for Electrical Equipment (1000 Volts Maximum)
- C. National Fire Protection Association (NFPA):
- 70-05.....National Electrical Code (NEC)
- D. Underwriters Laboratories, Inc. (UL):

486A-04.....Wire Connectors and Soldering Lugs for Use with
Copper Conductors

845-04.....Motor Control Centers

PART 2 - PRODUCTS

2.1 MOTOR CONTROL CENTERS

- A. Factory-assembled and -wired motor control centers shall comply with NEC, NEMA, and UL, and as shown on the drawings.
- B. Motor control centers shall be complete, floor-mounted, dead-front metal-enclosed, free-standing, grounded, indoor type.
- C. Wiring: The motor control centers shall be NEMA Standard, Class 1, Type B.
- D. Ratings: Ratings shall be not less than shown on the drawings.
Interrupting ratings shall be not less than the maximum short circuit currents available at motor control center location as shown on the.
- E. Shall conform to the arrangements and details of the drawings and to the spaces designated for installation.
- F. Motor control centers shall be able to withstand the mechanical stresses caused by rough handling during shipment in addition to the normal electrical and mechanical stresses, which will occur during operation of the centers.
- G. The components and the control wiring shall conform to the approved shop drawings as furnished for the various applicable electrical and mechanical sections of the specifications.
- H. All Steel parts shall be factory phosphatized and painted with primer and baked enamel or lacquer finishes except for ground connections. The paint and finish shall withstand a minimum of 1000 hours salt spray test.
- I. Vertical Sections:
 - 1. Approximately 2.25 m (90 inches) high, front and rear line-up, dead-front assembly and fabricated by a single manufacturer. Unit shall be designed to permit future additions or rearrangement of units.
 - 2. Rugged steel assemblies with bracing, reinforcing gussets and jig-welding to assure rectangular-rigidity. The sections shall be completely metal-enclosed, including the base and capable of being bolted together to form a single assembly.
 - 3. The structure shall be NEMA Type rated (Type 1, Type 3R or Type 12) as indicated on the drawings or as required to suit the environment.
 - 4. Spaces within the sections shall be suitable and adequately sized for starters and accessories as indicated on the drawings.

5. Mount the sections on adequate structural steel supports at the factory, front and rear, for the full length of each center.
6. Each space shall have an individual door with hinges and latches for present and future starters.
7. End panels shall be removable to facilitate future additions.
8. All section parts shall be accessible from front for maintenance rearrangement.
9. Screws in the removable panels shall remain in the panels when the panels are removed. Self-aligning, self-retaining nuts, which are parts of the screw assembly, shall remain in tact.
10. The structure shall have a minimum 300 mm (12 inches) high wireway at the top of each section and a minimum 150 mm (6 inches) high wireway at the bottom of each section. The wireway shall run the full length of the structure.
11. Each section in the motor control center shall have isolated vertical full height wireways. Vertical wireways shall connect with both the top and bottom horizontal wireways.
12. Each section in the motor control center shall be marked with maximum short circuit current rating.
13. Each vertical section for starters shall be equipped with all necessary hardware and busing for modular plug-in units to be added or moved around. All unused space shall be covered by hinged doors and equipped to accept future units.

2.2 BUS BARS AND INTERCONNECTIONS

- A. Horizontal and vertical bus ratings as shown on drawings; bus bars shall be fully rated.
- B. Bus shall be tin plated copper .
- C. Bus bar joints and interconnection joints shall be plated, constant high-pressure type with high strength copper-silicon bolts, and nuts. Bellville type conical washers under the nuts and over plated flat steel washers against the aluminum shall be used for aluminum bus.
- D. Vertical bus shall have insulation as follows:
 1. High strength polyester glass or equal.
 2. High track-resistance.
 3. High impulse and dielectric strength, suitable for withstanding the maximum short circuit currents.
 4. High flame-retardant, self-extinguishing.
 5. Comply with NEMA Standard for 50 degree C (122 degrees F) temperature rise above the ambient temperature.

- E. Shall have horizontal main buses and vertical buses for connecting the motor starters, circuit breakers or switches. Buses shall be braced as indicated on the drawings.
- F. A ground bus shall be copper and shall extend across the entire length of the motor control center ground bus size as indicated on drawings.
- G. Shall include provisions to extend the motor control center.
- H. Provide shutter mechanism to isolate vertical bus when plug-in device is withdrawn.
- I. Equip future spaces for motor controllers, circuit breakers and switches with all hardware required to accept the future equipment.

2.3 STARTERS

- A. Product of the same manufacturer as the motor control centers.
- B. Factory tested, stab-on, draw-out type up through size 4. Size 5 and above require bolted connections.
- C. Shall conform to the requirements in Section 26 29 11, LOW-VOLTAGE MOTOR STARTERS. Include built-in red and green pilot lights.
- D. Interchangeable with starter of the same ratings in all of the motor control centers being installed for this contract. Each motor starter shall be provided with a label indicating all of its ratings.
- E. Disconnecting devices shall be circuit breaker or fused switch type with external operating handle with lock-open padlocking positions and on-off position indicator:
 - 1. Circuit Breakers:
 - a. UL listed and labeled, in accordance with the NEC, as shown on the drawings and as specified.
 - b. Bolt-on thermal-magnetic type with a minimum interrupting rating as indicated on the drawings.
 - c. Equipped with automatic, trip free, non-adjustable, inverse time, and instantaneous magnetic trips for 100 amperes or less. The magnetic trips shall be adjustable from 3X to 10X for breakers greater than 100 ampere frames. Factory setting shall be HI, unless otherwise noted.
 - d. Additional features shall be as follows:
 - 1) A rugged, integral housing of molded insulating material.
 - 2) Silver alloy contacts.
 - 3) Arc quenchers and phase barriers for each pole.
 - 4) Quick-make, quick-break, operating mechanisms.

- 5) A trip element for each pole, thermal magnetic type with long time delay and instantaneous characteristics, a common trip bar for all poles and a single operator.
 - 6) Electrically and mechanically trip free.
 - 7) An overload on one pole of a multi-pole breaker shall automatically cause all the poles of the breaker to open //.
2. Fused Switches:
- a. Quick-make, quick-break type in accordance with UL 98, NEMA KS 1 and NEC.
 - b. Minimum duty rating, NEMA classification General Duty (GD) for 240 volts and NEMA classification Heavy Duty (HD) for 480 volts.
 - c. Horsepower rated and shall have the following features:
 - 1) Copper blades, visible in the OFF position.
 - 2) An arc chute for each pole.
 - 3) Fuse holders for the sizes and types of fuses specified.
- F. Doors for each space shall be interlocked to prevent their opening unless disconnect is open. Incorporate "defeater" mechanism for inspection by qualified mechanic.
- G. Identify each motor controller, circuit breaker and switch with a separate nameplate of laminated black phenolic resin with white core and engraved lettering not less than 6 mm (1/4 inch) high. Identify each motor by its number or other designation, which indicates function fulfilled by the motor. Identify pilot light with ON and OFF designation.

2.4 FEEDER UNITS

- A. Circuit breaker: shall conform to the applicable portions of Section 26 24 16, PANELBOARDS.
- B. Fusible Switches: shall conform to the applicable portions of Section 26 29 21, DISCONNECT SWITCHES.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be in accordance with NEC, written instructions of the manufacturer, and as shown on the drawings.
- B. Install motor control center on concrete pads in accordance with the drawing details. Concrete shall be 3000 psi minimum Bolt the motor control center to the concrete pads.
- C. Clean interiors. Remove construction debris, dirt, and shipping materials.

Replace Low Voltage Equipment
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- D. Repaint scratched or marred surfaces to match original finish. Repaint in accordance with manufacturer's recommendations.

3.2 STARTUP AND TESTING

- A. At the final inspection in the presence of the VA representative, demonstrate that the motor control centers operate properly in all respects.
 - 1. Test and adjust all controls and safeties. Replace or repair all malfunctioning controls, safeties, and equipment as soon as possible to avoid any delay in the use of the equipment.

3.3 TRAINING

Furnish the services of a competent, factory-trained engineer or technician for a 2-hour period for instructing VA personnel in operation and maintenance of the equipment, including review of the operation and maintenance manual, on a date requested by the Owner.

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