

**SECTION 26 24 19
MOTOR CONTROL CENTERS**

SPEC WRITE NOTE: Delete between //___//
if not applicable to project. Also,
delete any other item or paragraph not
applicable to the section and renumber
the paragraphs.

PART 1 - GENERAL

1.1 DESCRIPTION

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

1.2 RELATED WORK

//A. Section 03 30 00, CAST-IN-PLACE CONCRETE: Requirements for concrete equipment pads.//

//B. Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS: Requirement for seismic restraint for nonstructural components.//

//C. Section 25 10 10, ADVANCED UTILITY METERING: Electricity meters installed in motor control centers.//

D. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Requirements that apply to all sections of Division 26.

E. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES: Low-voltage conductors.

F. 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.

G. Section 26 05 73, OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY. Short circuit and coordination study, and requirements for a coordinated electrical system.

H. Section 26 29 11, MOTOR CONTROLLERS: Control and protection of motors.

1.3 QUALITY ASSURANCE

A. Quality Assurance shall be in accordance with Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES) in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 SUBMITTALS

A. Submit in accordance with Paragraph, SUBMITTALS in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, and the following requirements:

1. Shop Drawings:

- a. Submit sufficient information to demonstrate compliance with drawings and specifications.
- b. Prior to fabrication of motor control centers, submit the following data for approval:
 - 1) Single line diagram showing each bus, instrument and control power transformer, relay, motor starter, circuit breaker, fuse, motor circuit protector, overload, and other components.
 - 2) Control wiring diagram for each motor starter.
 - 3) Complete electrical ratings for all components.
 - 4) Interrupting ratings.
 - 5) Safety features.
 - 6) Accessories and nameplate data.
 - 7) Dimensioned exterior views of the motor control centers.
 - 8) Dimensioned section views of the motor control centers.
 - 9) Floor plan of the motor control centers.
 - 10) Approximate design weights.

SPEC WRITER NOTE: Include the following paragraph for projects in seismic areas of moderate-high, high and very high seismicities as listed in Table 4 of VA Handbook H-18-8, Seismic Design Requirements. Coordinate with the structural engineer.

//c. Certification from the manufacturer that a representative motor control center has been seismically tested to International Building Code requirements. Certification shall be based upon simulated seismic forces on a shake table or by analytical methods, but not by experience data or other methods.//

2. Manuals:
 - a. Submit, simultaneously with the shop drawings, companion copies of complete maintenance and operating manuals, including technical data sheets, wiring diagrams, and information for ordering replacement parts.
 - 1) Schematic control diagrams, with all terminals identified, matching terminal identification in the motor control centers.
 - 2) Include information for testing, repair, troubleshooting, assembly, disassembly, and factory recommended periodic maintenance procedures and their frequency.

- 3) Provide a replacement and spare parts list. Include a list of tools, and instruments for testing and maintenance purposes.
- b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.
- 3. Test Reports:
 - a. Two weeks prior to the final inspection, submit certified field test reports and data sheets to the //Resident Engineer// //COTR//.
- 4. Certifications: Two weeks prior to final inspection, submit the following.
 - a. Certification by the manufacturer that the motor control centers conform to the requirements of the drawings and specifications.
 - b. Certification by the Contractor that the motor control centers have been properly installed, adjusted, and tested.

1.5 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 designation only.
- B. International Code Council (ICC):
 - IBC-21.....International Building Code
- C. National Electrical Manufacturers Association (NEMA):
 - ICS 1-15.....Industrial Control and Systems: General Requirements
 - ICS 2-20.....Industrial Control and Systems: Controllers, Contactors and Overhead Relays Rated 600 volts
 - ICS 6-16.....Industrial Control and Systems: Enclosures
 - FU 1-12.....Low-Voltage Cartridge Fuses
 - 250-20.....Enclosures for Electrical Equipment (1000 Volts Maximum)
- D. National Fire Protection Association (NFPA):
 - 70-23.....National Electrical Code (NEC)
- E. Underwriters Laboratories, Inc. (UL):
 - 845-21.....Motor Control Centers

PART 2 - PRODUCTS**2.1 GENERAL REQUIREMENTS**

- A. Motor control centers shall comply with NFPA, NEMA, UL, and as shown on drawings.
- B. Motor control centers shall be complete, free-standing, floor-mounted, dead-front, and metal-enclosed.
- C. Ratings shall be not less than shown on drawings. Interrupting ratings shall be not less than the maximum short circuit currents available at the motor control center location, as shown on drawings // or as calculated as specified in Section 26 05 73, OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY//.
- D. Enclosure shall be NEMA-type rated 1, 3R, or 12 as indicated on drawings or as required per the installed environment.
- E. Motor control centers shall conform to the arrangements and details of drawings and to the spaces designated for installation.
- F. Wiring: The motor control centers shall be NEMA Standard, Class 1, Type B.
- G. Finish:
 - 1. All metal surfaces shall be thoroughly cleaned, phosphatized and factory primed prior to applying baked enamel or lacquer finish.
 - //2. Provide a light gray finish for indoor motor control centers.//
 - //3. Outdoor motor control centers:
 - a. Finish shall be light gray.
 - b. The underside of the motor control centers shall be treated with corrosion resistant compounds, epoxy resin, or rubberized sealing compound.//
- H. All steel parts shall be factory-phosphatized, painted with primer, and baked enamel or lacquer finishes, except for ground connections. I. Vertical Sections:
 - 1. Approximately 2-1/4 M (90 inches) high.
 - 2. Shall be designed to permit connection of future additional vertical sections, and installation of future motor controller units in available space in each vertical section.
 - 3. Spaces within the vertical sections shall be suitable and adequately sized for motor controller units and accessories as indicated on drawings.
 - 4. End panels shall be removable to facilitate future additions.

5. All vertical section parts shall be accessible from the front for maintenance rearrangement.
6. 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 intact.
7. Each vertical section shall have a minimum 300 mm (12 inches) high horizontal wireway at the top, section and a minimum 150 mm (6 inches) high horizontal wireway at the bottom.
8. Each vertical section shall have minimum 100 mm (4 inches) wide vertical full height wireways. Vertical wireways shall connect with both the top and bottom horizontal wireways.
9. Each vertical section for motor controller units shall be equipped with all necessary hardware and busing for the units to be added or relocated. 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 shall be as shown on drawings. Horizontal bus bars shall be fully rated for the entire length of the motor control centers.
- B. Bus bars shall be tin-plated copper.
- C. All bolts, nuts, and washers shall be //zinc-plated//cadmium-plated// steel, torqued to the values recommended by the manufacturer.
- D. A ground bus shall extend across the entire length of the motor control centers.
- E. Bus bars and interconnections shall include provisions to extend the motor control center horizontal bus into additional future vertical sections.
- F. Provide shutter mechanism to isolate vertical bus when the motor controller unit is withdrawn.

SPEC WRITER NOTE: Show on drawings a schedule of starters with accessories. Also coordinate with other design disciplines.

2.3 MOTOR CONTROLLERS

- A. Product of the same manufacturer as the motor control centers.
- B. Shall conform to the applicable requirements in Section 26 29 11, MOTOR CONTROLLERS.
- C. Plug-in, draw-out type up through NEMA size 4. NEMA size 5 and above require bolted connections.

- D. Doors for each space shall be interlocked to prevent their opening unless disconnect is open. A "defeater" mechanism shall be incorporated for inspection by qualified personnel.

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, ENCLOSED SWITCHES AND CIRCUIT BREAKERS.

SPEC WRITER NOTE: Edit the paragraph below to conform with project requirements.

//2.5 METERS

- A. Meters shall be provided as shown on the plans. Meters shall be in accordance with Section 25 10 10, ADVANCED UTILITY METERING.//

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install motor control centers in accordance with the NEC, as shown on the drawings, and as recommended by the manufacturer.
- B. Anchor motor control centers with rustproof bolts, nuts, and washers not less than 13 mm (1/2 inch) diameter, in accordance with manufacturer's instructions, and as shown on drawings.
- //C. In seismic areas, motor control centers shall be adequately anchored and braced per details on structural contract drawings to withstand the seismic forces at the location where installed.//

SPEC WRITER NOTE: Mounting slab connections may have to be given in detail depending on the requirements for the seismic zone in which the equipment is located. Include construction requirements for concrete slab only if slab is not detailed in drawings.

- D. Exterior Location. Mount motor control centers on concrete slab. Unless otherwise indicated, the slab shall be at least 200 mm (8 inches) thick, reinforced with a 150 by 150 mm (6 by 6 inches) No. 6 mesh placed uniformly 100 mm (4 inches) from the top of the slab. Slab shall be placed on a 150 mm (6 inches) thick, well-compacted gravel base. The top of the concrete slab shall be approximately 100 mm (4 inches) above the finished grade. Edges above grade shall have 15 mm (1/2 inch) chamfer. The slab shall be of adequate size to project at least 200 mm (8 inches) beyond the equipment. Provide conduit turnups

and cable entrance space required by the equipment to be mounted. Seal voids around conduit openings in slab with water- and oil-resistant caulking or sealant. Cut off and bush conduits 75 mm (3 inches) above slab surface. Concrete work shall be as specified in Section 03 30 00, CAST-IN-PLACE CONCRETE.

- E. Interior Location. Mount motor control centers on concrete slab. Unless otherwise indicated, the slab shall be at least 100 mm (4 inches) thick. The top of the concrete slab shall be approximately 100 mm (4 inches) above finished floor. Edges above floor shall have 15 mm (1/2 inch) chamfer. The slab shall be of adequate size to project at least 100 mm (8 inches) beyond the equipment. Provide conduit turnups and cable entrance space required by the equipment to be mounted. Seal voids around conduit openings in slab with water- and oil-resistant caulking or sealant. Cut off and bush conduits 75 mm (3 inches) above slab surface. Concrete work shall be as specified in Section 03 30 00, CAST-IN-PLACE CONCRETE.

3.2 ACCEPTANCE CHECKS AND TESTS

- A. Perform in accordance with the manufacturer's recommendations. In addition, include the following:
1. Visual Inspection and Tests:
 - a. Compare equipment nameplate data with specifications and approved shop drawings.
 - b. Inspect physical, electrical, and mechanical condition.
 - c. Verify appropriate anchorage and required area clearances.
 - d. Verify that circuit breaker, fuse, motor circuit protector, and motor controller sizes and types correspond to approved shop drawings.
 - e. Use calibrated torque-wrench method to verify the tightness of accessible bolted electrical connections, or perform a thermographic survey after energization.
 - f. Vacuum-clean motor control center enclosure interior. Clean motor control center enclosure exterior.
 - g. Inspect insulators for evidence of physical damage or contaminated surfaces.
 - h. Exercise all active components.
 - i. Verify the correct operation of all indicating devices.
 - j. If applicable, inspect control power transformers.
 2. Electrical Tests:

- a. Perform insulation-resistance tests on each bus section.
- b. Perform insulation-resistance test on control wiring. Do not perform this test on wiring connected to electronic components.

3.3 FOLLOW-UP VERIFICATION

- A. Upon completion of acceptance checks, settings, and tests, the Contractor shall demonstrate that the motor control centers are in good operating condition and properly performing the intended function.

3.4 TRAINING

- A. Furnish the services of a competent, factory-trained engineer or technician for a 2-hour period to instruct VA personnel in operation and maintenance of the equipment, including review of the operation and maintenance manual, on a date requested by the //Resident Engineer// //COTR//.

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