

SECTION 26 13 16

MEDIUM-VOLTAGE FUSIBLE INTERRUPTER SWITCHES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the furnishing, installation, connection, and testing of medium-voltage fusible interrupter switches, indicated as switches in this section.

1.2 RELATED WORK

- A. Section 03 30 00, CAST-IN-PLACE CONCRETE: Requirements for concrete equipment pads.
- B. Section 09 06 00, SCHEDULE FOR FINISHES: Finishes for outdoor switches.
- C. Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS: Requirement for seismic restraint for nonstructural components.
- D. Section 25 10 10, ADVANCED UTILITY METERING: Electric meters installed in switches.
- E. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Requirements that apply to all sections of Division 26.
- F. Section 26 05 13, MEDIUM-VOLTAGE CABLES: Medium-voltage cables and terminations.
- G. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path to ground for possible ground fault currents.
- H. Section 26 05 73, OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY: Short circuit and coordination study, and requirements for a coordinated electrical system.
- I. Section 26 12 19, PAD MOUNTED, LIQUID –FILLED MEDIUM VOLTAGE TRANSFORMER.

1.3 QUALITY ASSURANCE

- A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 FACTORY TESTS

- A. Switches shall be thoroughly tested at the factory to assure that there are no electrical or mechanical defects. Tests shall be conducted as per UL

and ANSI Standards. Factory tests shall be certified. The following tests shall be performed:

1. Verify that fuse sizes and types are in accordance with drawings and
 2. Overcurrent Protective Device Coordination Study.
 3. Verify tightness of bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data.
 4. Verify operation of mechanical interlocks.
 5. Confirm correct operation and sequencing of key-type mechanical interlock systems for multiple switches by attempting closure on locked-open devices, and attempting to open locked-closed devices, and making key exchange with devices operated in off-normal positions.
 6. Verify correct phase barrier installation.
 7. Verify correct operation of all indicating and control devices.
 8. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
 9. Exercise all active components.
 10. Perform an insulation-resistance test, phase to ground, on each bus section, with phases not under test grounded, in accordance with manufacturer's published data.
- B. Furnish four (4) copies of certified manufacturer's factory test reports to the COR prior to shipment of the switches to ensure that the switches have been successfully tested as specified.
- C. The Government shall have an option to witness the factory tests. All expenses of the Government Representative's trips to witness the testing will be paid by the Government. Notify the COR not less than 30 days prior to making tests at the factory.

1.5 SUBMITTALS

- A. Submit six copies of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
1. Shop Drawings:
 - a. Shop drawings shall be submitted simultaneously with or after the Overcurrent Protective Device Coordination Study.
 - b. Submit sufficient information to demonstrate compliance with drawings and specifications.
 - c. Provide information such as complete electrical ratings, dimensions and approximate design weights, enclosure

- types, mounting details, materials, required clearances, cable terminations, fuse sizes and class, interrupting ratings, wiring diagrams, front, side and rear elevations, sectional views, safety features, accessories, and nameplate data.
2. Certification from the manufacturer that representative switches have 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.
 3. 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.
 - b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals to the COR two weeks prior to the final inspection.
 4. Certification: Two weeks prior to the final inspection, submit the following.
 - a. Certification by the manufacturer that switches conform to the requirements of the drawings and specifications.
 - b. Certification by the Contractor that switches have been properly installed, adjusted, and tested.

1.6 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. American National Standards Institute (ANSI):
 - C37.57-10.....Metal-Enclosed Interrupter Switchgear Assemblies - Conformance Testing
 - C37.58-10.....Indoor AC Medium-Voltage Switches for Use in Metal-Enclosed Switchgear - Conformance Test Procedures
- C. International Code Council (ICC):
 - IBC-12.....International Building Code
- D. Institute of Electrical and Electronics Engineers (IEEE):
 - C37.20.3-01Metal-Enclosed Interrupter Switchgear
 - C37.47-11High Voltage (>1000V) Current-Limiting Type Distribution Class Fuses and Fuse Disconnecting Switches

C37.48-05Guide for Application, Operation and Maintenance of High Voltage Fuses, Distribution Enclosed Single Pole Air Switches, Fuse Disconnecting Switches, and Accessories

E. National Electrical Manufacturers Association (NEMA):

C37.22-97Preferred Ratings and Related Required Capabilities for Indoor AC Medium-Voltage Switches Used in Metal-Enclosed Switchgear

F. National Fire Protection Association (NFPA):

70-11.....National Electrical Code (NEC)

PART 2 - PRODUCTS

2.1 MEDIUM-VOLTAGE FUSIBLE INTERRUPTER SWITCHES

A. Shall be in accordance with ANSI, IEEE, NEMA, NFPA, as shown on the drawings, and have the following features:

1. Deadfront air break, three-pole gang-operated, interrupter type.
2. Copper blades.
3. Key-type mechanical interlocks for multiple switches shall be provided as shown on the drawings.
4. Interphase barriers for the full length of each pole.
5. Protective shield to cover the cable connections on the line terminals.
6. Quick-make, quick-break, manual stored-energy type operation mechanism. The mechanism shall enable the switch to close against a fault equal to the momentary rating of the switch without affecting its continuous current carrying or load interrupting ability.
7. External manual operating handle with lock-open padlocking provisions.
8. When the switches are open, the fuses shall be de-energized.
9. Current limiting fuses.
10. Expulsion fuses.
11. Enclosures:
 - a. NEMA type shown on the drawings. Where the types of switch enclosures are not shown, they shall be the NEMA types which are most suitable for the environmental conditions where the switches are being installed.
 - b. Doors:

B. Concealed or semi-concealed hinges shall be used to attach doors. Weld hinges to the enclosure and door.

- C. A separate door for the fuse section. A mechanical interlock shall prevent opening the door unless the switch blades are open, and prevent closing the switch if the door is open.
- D. Three point door locking mechanism with suitable handles and padlocking provisions.
- E. Safety-glass window for viewing the switch blades.
- F. Door stops for the open position.
 - a. Finish:
- G. All metal surfaces shall be thoroughly cleaned, phosphatized, primed and painted at the factory.
- H. Final finish shall be enamel, lacquer or powder coating. Enamel and powder coatings shall be oven baked. Color shall be light gray.
- I. The minimum momentary current rating shall be 80 kA.
- J. The minimum short-time 2-second current rating shall be 25 kA.
- K. Provide full length ground bar.

2.2 METERING

- A. Refer to Section 25 10 10, ADVANCED UTILITY METERING.

2.3 NAMEPLATES AND MIMIC BUS

- A. Nameplates: For Normal Power system, provide laminated black phenolic resin with white core with 12 mm (1/2 inch) engraved lettered nameplates next to each switch. For Essential Electrical System, provide laminated red phenolic resin with white core with 12 mm (1/2 inch) engraved lettered nameplates next to each switch. Nameplates shall indicate equipment served, spaces, or spares in accordance with one line diagram shown on drawings. Nameplates shall be mounted with plated screws on front of switches. Mounting nameplates only with adhesive is not acceptable.
- B. Mimic Bus: Provide an approved mimic bus on front of each switch assembly. Color shall be black for the Normal Power system and red for the Essential Electrical System, either factory-painted plastic or metal strips. Plastic tape shall not be used. Use symbols similar to one line diagram shown on drawings. Plastic or metal strips shall be mounted with plated screws.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install switches in accordance with the NEC, manufacturer's instructions and recommendations, and as shown on the drawings.
- B. Anchor switches 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, switches shall be adequately anchored and braced per details on structural contract drawings to withstand the seismic forces at the location where installed.
- D. Exterior Location: Mount switches 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 switches 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 switches nameplate data with specifications and approved shop drawings.
 - b. Inspect physical and mechanical condition.
 - c. Confirm correct application of manufacturer's recommended lubricants.
 - d. Vacuum-clean switch enclosure interior. Clean switch enclosure exterior.
 - e. Verify appropriate anchorage and required area clearances.
 - f. Verify appropriate equipment grounding.
 - g. Verify correct blade alignment, blade penetration, travel stops, and mechanical operation.

- h. Verify that fuse sizes and types correspond to approved shop drawings.
- i. Inspect all field-installed bolted electrical connections, verifying tightness of accessible bolted electrical connections by calibrated torque-wrench method, or performing thermographic survey after energization under load.
- j. Exercise all active components.
- k. Confirm correct operation of mechanical interlocks.
- l. Confirm correct operation and sequencing of key-type mechanical interlocks for multiple switches.
- m. Inspect all indicating devices for correct operation.

3.3 FOLLOW-UP VERIFICATION

- A. Upon completion of acceptance checks, settings, and tests, the Contractor shall show by demonstration in service that switches are in good operating condition, and properly performing the intended function.

3.4 WARNING SIGN

- A. Mount on each entrance door on switchboard room, approximately 1500 mm (5 feet) above grade or floor, a clearly lettered warning sign for warning personnel. The sign shall be attached with rustproof metal screws.

3.5 SPARE PARTS

- A. Two weeks prior to the final inspection, provide one (1) set of spare fuses for each switch installed on this project.

3.6 ONE LINE DIAGRAM AND SEQUENCE OF OPERATION

- A. At final inspection, an as-built one line diagram shall be laminated or mounted under acrylic glass, and installed in a frame mounted in the switchgear room or in the outdoor switchgear enclosure.
- B. Furnish a written sequence of operation for the switchgear and connected line side/load side electrical distribution equipment. The sequence of operation shall be laminated or mounted under acrylic glass, and installed in a frame mounted in the switchgear room or in the outdoor switchgear enclosure.
- C. Deliver an additional four copies of the as-built one line diagram and sequence of operation to the COR.

3.7 INSTRUCTION

- A. Furnish the services of a factory-trained technician for one 4 hour period for instructing personnel in the operation and maintenance of the switches and related equipment on the date requested by the COR.

END OF SECTION 26 13 16