



15kv Air-Insulated Live-Front Pad-Mounted Switchgear

Originator: D. Smith

Date: 2/17/06

Approval: D. Smith

Date: 3/17/06

Revision: **See Revision Log in Section 19.0**

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1.0 Scope

- 1.1 This specification covers the requirements for furnishing and delivering free-standing, self-contained, cabinet enclosed 15kV rated air-insulated live-front pad-mounted switchgear with 600 amp interrupter switches and/or 200 amp fuses with integral load interrupters configured as shown in Figure 1.
- 1.2 This switchgear is intended for use in 60 hertz, three-phase, 12470 volt grounded-WYE underground distribution systems.
- 1.3 This switchgear will be used for sectionalizing and protecting underground distribution express feeders, sub-loops, and laterals as well as switching and protecting transformers.
- 1.4 This switchgear shall be designed for outdoor installation and operation. It shall be designed for mounting on a concrete pad or Fiberglass Ground Sleeve.

2.0 General

- 2.1 The manufacturer shall be responsible for ensuring compatibility among all components of the switchgear.
- 2.2 The manufacturer shall be solely responsible for the performance of the basic switch components as well as the complete integrated assembly as rated.
- 2.3 Upon the District's request, the manufacturer shall provide sufficient notice to allow the District or its representatives to inspect the switchgear during its manufacture and to witness any or all tests performed on it.
- 2.4 The manufacturer shall furnish, upon request, certified tests establishing the electrical ratings of the switchgear, including ratings of the basic switches and fuse components.
- 2.5 The manufacturer shall provide product information for the pad-mounted switchgear with the initial bid or as changes are made for, but not limited to, the following:
 - A. Internal and external dimensions
 - B. Electrical specifications
 - C. Weight of unit
 - D. Method of latching and stops on doors

3.0 Reference Standards

Except as modified by this specification, the switchgear furnished shall meet the requirements of the latest revisions of all applicable ANSI, IEEE and NEMA standards in addition to the standards listed below:

- 3.1 IEEE C37.7 IEEE Standard Requirements for Pad-Mounted Fused Switchgear



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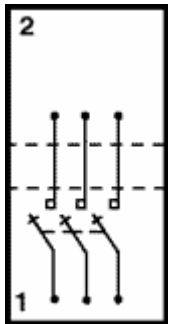
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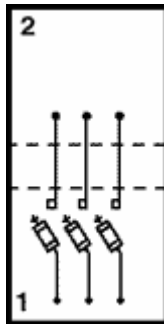
3.2 ANSI C57.12.28 ANSI Standard for Switchgear and Transformers Pad-Mounted Equipment Enclosure Integrity

3.3 ANSI C2 National Electrical Safety Code

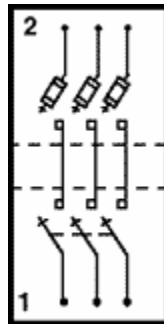
4.0 Connection Diagrams and Stock Numbers (Figure 1)



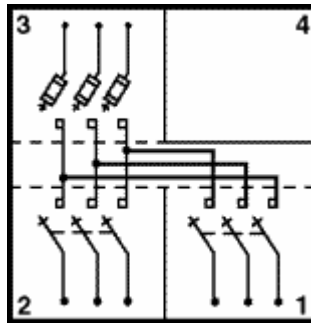
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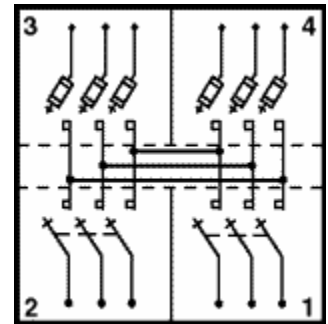
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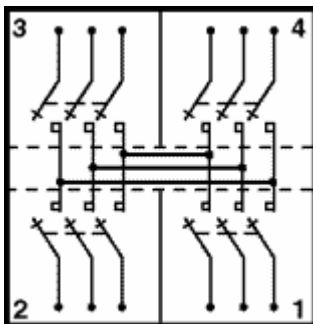
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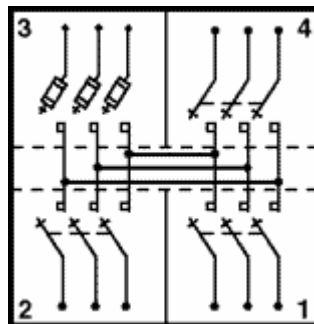
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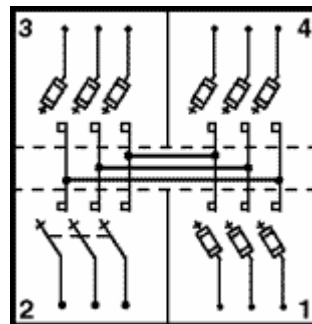
PM-9
 Stk# 049420



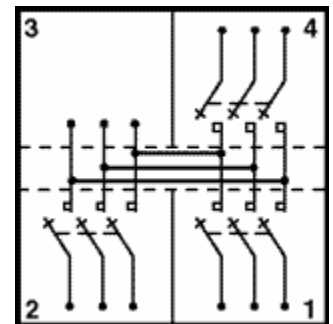
PM-10
 Stk# 049417



PM-11
 Stk# 049425



PM-12
 Stk# 049426



PM-13
 Stk# 049430

FIGURE 1



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5.0 Ratings

5.1 The switchgear shall have the following electrical ratings:

- | | |
|---|---------|
| A. Power Frequency | 60 Hz |
| B. Nominal Voltage | 14.4kV |
| C. Maximum Voltage | 15.5kV |
| D. BIL | 95kV |
| E. Main Bus Continuous Current. | 600A |
| F. Three-Pole Interrupter Switches | |
| Continuous Current | 600A |
| Load Dropping Current..... | 600A |
| Two-Time Fault Closing Duty Cycle | |
| RMS Asymmetrical at 14.4kV..... | 20,000A |
| G. Fuses (S&C Type SML-4Z) with Integral Load Interrupter | |
| Continuous Current (Fuse) | 200A |
| Load Dropping Current (Fuse) | 200A |
| One-Time Fault Closing Duty-Cycle Capability, | |
| RMS Asymmetrical at 14.4kV | 20,000A |
| Two-Time Fault Closing Duty-Cycle Capability, | |
| RMS Asymmetrical at 14.4kV | 12,500A |
| H. Short Circuit Ratings of All Components | |
| RMS Symmetrical | 12,500A |
| RMS Asymmetrical | 20,000A |

5.2 Fuse mountings shall have a minimum three-phase RMS symmetrical short circuit interrupting rating of 200 MVA at 14.4kV.

6.0 Enclosure

6.1 General

- A. The switchgear cabinet shall be of unitized construction (not structural frame and bolted sheet).
- B. The cabinet, including the doors, shall be of 11 gauge steel sheet.
- C. All structural joints and butt joints shall be welded, and the external seams shall be ground flush and smooth.



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- D. The base shall be square and smooth to enable it to rest solidly on a smooth concrete surface. The base shall consist of continuous 90° flanges, 1-inch minimum width, turned inward and welded at the corners for bolting to a concrete pad.
- E. The cabinet shall have adequate size and strength for fuse handling, fuse exhaust and venting, and shall withstand all pressure build-up during interruption without permanent distortion or damage to any portion of the structure.
- F. The cabinet shall be so designed to permit free flow ventilation from bottom to top to minimize condensation without sacrificing security.
- G. The cabinet shall meet or exceed ANSI C57.12.28 tamper resistance requirements.
- H. A stainless steel noncompartmented base spacer shall be provided to increase the elevation of live parts in the pad-mounted gear above the mounting pad by 18 inches.

6.2 Dimensions

- A. The nominal height of all cabinets shall be 52 inches high (not counting the lifting tabs).
- B. The footprint external dimensions of the switchgear enclosure shall be 35 ½ inches wide x 58 ½ inches deep for PM-3, 4, 5. This may require the 15 inch base spacer to be sloped on one or more sides for the PM-3 and PM-4.
- C. The footprint external dimensions of the switchgear enclosure shall be 67 inches wide x 58 ½ inches deep for PM-6, 9, 10, 11, 12, 13.

6.3 Roof

- A. The cabinet roof shall be constructed so as to shed water. If two roofs are used, water shall not collect at their intersection.
- B. The roof shall be undercoated with a heavy coat of an insulating "no-drip" compound to prevent condensation of moisture on its inside surface.

6.4 Access

- A. Access into the cabinet shall be through the doors to the switch and fuse compartments only.
- B. The design of the cabinet, bus work, and support insulators shall be such that all support insulators shall be completely visible without disassembly (in order to facilitate inspection and cleaning).

6.5 Doors

- A. All doors shall include a three-point latching scheme that requires doors to be latched before the padlock shackle can be inserted. The door handles shall be padlockable and shall use a hood to protect the padlock from tampering. This door latching scheme shall



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require only a single padlock per door or per set of double doors. Each door handle shall be provided with a recessed Penta head bolt as part of its security system.

- B. Doors shall be bulkhead type, side-hinged to swing open horizontally. Top-hinged, clam shell type are unacceptable.
- C. Doors shall be equipped with stainless steel hinge assemblies and hinge pins.
- D. Each door shall be equipped with a zinc-nickel plated steel or stainless-steel door-holder located above the door opening. These holders shall be hidden from view when the door is closed. It shall not be possible for the door-holders to swing inside the enclosure. The door-holders shall hold the doors open at an angle of at least 103° and at most 120°.

6.6 Interlocks and Barriers

- A. All enclosures shall include compartmentalization between three-phase circuits to permit isolated access to individual circuits while other circuits are energized. Steel barriers shall separate side-by-side compartments.
- B. Each switch shall have a removable front barrier to guard against inadvertent contact with the live parts. These barriers shall be capable of being inserted in the open gap when the switch is in the open position.
- C. All switches shall have means of padlocking in the open position.
- D. Each power or electronically fused switch shall have a **transparent** movable front barrier to guard against inadvertent contact with live parts. These barriers shall be capable of being inserted in the open gap when the power or electronic fuses are in the disconnect position.
- E. All phase separation panels and barriers shall be of inert material. The manufacturer shall insure that the phase separation panels will not warp or bend and or in any way decrease design clearances.

6.7 Lifting Tabs

- A. Lifting tabs shall be removable.
- B. A resilient material shall be placed between the lifting tabs and the enclosure to prevent the tabs from scratching the enclosure finish. To help retard corrosion, the resilient material shall be closed-cell to prevent moisture from being absorbed and held between the tabs and the enclosure in the event that the lifting tabs are not removed.

6.8 Finish

- A. The finish of the switchgear cabinet shall meet or exceed the requirements of ANSI C57.12.28, latest revision. Combined primer and topcoat thickness shall be no less than



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3.0 mils. Paint and primer shall be lead free. A certified test abstract to indicate compliance with these requirements shall be furnished upon request.

- B. The topcoat of the finish shall be dark green Munsell No. 7GY 3.29/1.5.
- C. A resilient closed-cell material, such as PVC gasket, shall be applied to the entire underside of the enclosure bottom flange to protect the finish on this surface from scratching during handling and installation. This material shall isolate the bottom flange from the alkalinity of a concrete foundation to help protect against corrosive attack.

7.0 Grounding Provisions

7.1 Grounding Pads

- A. A ground connection pad shall be provided in each compartment of the pad-mounted gear. The pads shall be welded to the interior of the enclosure near the cable entrances.
- B. The pads shall be of unpainted copper-faced steel, unpainted stainless steel or unpainted galvanized steel. The pads shall be a minimum of 2 inches x 3-1/2 inches with two 1/2-13 UNC tapped holes, a minimum 7/16 inch deep, spaced 1-3/4 inches center-to-center.
- C. The grounding pads shall be capable of carrying the fault duty of the switchgear.

7.2 Grounding Studs

- A. Each switch terminal, fuse terminal and compartment ground terminal shall have a grounding stud for attaching working grounds equipped with duckbill type clamps.
- B. The grounding studs shall be of galvanized steel.
- C. The compartment grounding studs shall be a minimum of 10 inches long.
- D. The grounding studs shall be located such that the working ground clamps may be easily applied or removed with a hotstick.
- E. The grounding studs shall be capable of carrying the fault duty of the switchgear.

8.0 Buses

- 8.1 All buses shall be of copper or aluminum.
- 8.2 All joints shall have suitable hardware and treatment to prevent harmful oxidation and loss of optimum contact pressure.
- 8.3 Bus and interconnections shall withstand the stresses associated with short circuits up through the maximum rating of the switchgear.

9.0 Cable Terminal Pads

- 9.1 All cable terminal pads shall be of tinned or silver-plated copper.



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- 9.2** All cable terminal pads shall have two - 9/16 inch holes spaced 1-3/4 inch center-to-center for connecting cable terminators.
- 9.3** The cable terminal pads shall be located such that the bottom cable terminator mounting hole is at least 16 inches above the bottom surface of the switchgear cabinet ignoring the 18 inch base spacer.
- 9.4** There shall be ample space around the cable terminal pads to accommodate 3M coldshrink, or District approved equivalent, outdoor type 1000 kcm 15 kV cable terminators with rainskirts.

10.0 Interrupter Switches

- 10.1** All interrupter switches shall be dry type, in-air, three-pole, externally group operable through an operating handle external to the enclosure.
- 10.2** An operating handle shall be provided for each interrupter switch. The switch-operating handle shall be secured to the inside of the switch operating hub pocket by a corrosion-resistant chain or cable. The handle shall be stored behind the switch operating hub access door.
- 10.3** The switch-operating hub pocket shall include a padlockable access cover that shall use a hood to protect the padlock from tampering.
- 10.4** The group-operated interrupter switches shall be actuated through a nondefeatable quick-make, quick-break mechanism installed by the switch manufacturer. The quick-make, quick break mechanism shall assure high speed closing and opening of the switches independent of the speed of the manual switch operating handle and operating hub.
- 10.5** The manual operating handle shall include an over-travel stop feature to prevent the operator from overpowering the mechanism and possibly breaking parts in the drive train.
- 10.6** Labels or targets to indicate switch positions shall be provided in all switch operating hub pockets.
- 10.7** Interrupter switch contacts shall be silver-plated and backed up by stainless steel springs to provide constant high-contact pressure.
- 10.8** Circuit interrupting shall take place completely within the interrupter, with no external arc or flame. Any exhaust shall be vented in a controlled manner.
- 10.9** Interrupter switches shall have a readily visible open gap when in the open position to allow positive verification of switch position. Each interrupter switch compartment shall include a removable window panel located above the dual purpose barriers to permit visual checking of the interrupter switch position after opening the compartment door. The preferred installation of this window panel is to mount it on threaded studs equipped with large wing nuts readily accessible from the door side of the cabinet.



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10.10 Bearings shall be maintenance-free or sealed type, with all-temperature lubricants, and shall be capable of free-operation through a specified temperature range.

11.0 Fuse Mountings

11.1 Each fuse compartment shall be equipped with mountings to accommodate three S&C SML-4Z power fuseholders designed for S&C SM-4 power fuses.

11.2 Three S&C SML-4Z power fuseholders will provided for each fuse compartment.

11.3 All power fuse mountings are to have a built-in load-break device in the contact assembly to provide live switching ability using only a standard hotstick with station prong or grappler, without the necessity of opening the line switches to isolate and replace a single blown fuse unit.

11.4 Live-switching shall be accomplished by a firm steady opening pull on the fuse pull ring with a hook stick. No separate load-interrupting tool shall be required.

11.5 Circuit interruption shall take place completely within the integral load interrupter with no external arc or flame.

11.6 The integral load-interrupter and the fuse shall be provided with separate fault-closing contacts and current-carrying contacts. The fuse hinge shall be self-guiding and, together with the fault-closing contacts, shall guide the fuse into the current carrying contacts during closing operations. Circuit-closing inrush currents and fault currents shall be picked up by the fault-closing contacts, not by the current-carrying contacts or interrupting contacts.

11.7 A storage rack shall be provided in each fuse compartment to accommodate up to thee S&C SM-4 fuse refill units.

12.0 Fuse Handling Tool

12.1 A fuse handling tool recommended for use by the fuse manufacturer shall be identified.

13.0 Labeling

13.1 Hazard-Alerting Signs

- A. All external doors shall be provided with "Warning—Keep Out—Hazardous Voltage Inside—Can Shock, Burn, or Cause Death" signs.
- B. The inside of each door shall be provided with a "Danger—Hazardous Voltage—Failure to Follow These Instructions Will Likely Cause Shock, Burns, or Death" sign. The text shall further indicate that operating personnel must know and obey the employer's work rules, know the hazards involved, and use proper protective equipment and tools to work on this equipment.



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- C. Interrupter switch compartments shall be provided with “Danger” signs indicating that “Switches May Be Energized by Backfeed.”
- D. Fuse compartments shall be provided with “Danger” signs indicating that “Fuses May Be Energized by Backfeed.”
- E. Barriers used to prevent access to energized live parts shall be provided with “Danger—Keep Away—Hazardous Voltage—Will Shock, Burn, or Cause Death” signs.

13.2 Nameplate

- A. The outside of each door, or set of double doors, of the switchgear shall be provided with a durable corrosion-resistant nameplate indicating:
 - Name of manufacturer
 - Date of manufacture
 - Model No.
 - Catalog No.
 - Serial No.

13.3 Ratings Label

- A. The inside of each door, or set of double doors, shall be provided with a ratings label.
- B. This label shall include the ratings required in section 5.0 of this specification.

13.4 Connection Diagram

- A. The inside of each door, or set of double doors, and the inside of each switch operating hub access cover shall be provided with a three-line connection diagram of the switchgear.
- B. The diagram shall show the interrupter switches, fuses with integral load interrupters and bus.

13.5 Compartment and Phase Identification

- A. The number of each compartment shall be clearly labeled with a decal on the inside of the switchgear cabinet. The preferred location for each decal is on the face of the cabinet directly above each compartment.
- B. Each switch and fuse position phase shall be labeled with a decal on the inside of the switchgear cabinet. Phase identification labels shall be located on the face of the cabinet directly above each phase position.

14.0 Instruction Manual

One instruction manual covering installation, operation and maintenance of the equipment shall be provided with each switchgear cabinet. This manual shall be packaged in a weatherproof bag or envelope and secured on the inside of the door of compartment no. 1.



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15.0 Certification

15.1 Upon the District's request, the manufacturer shall provide certified test reports verifying that the equipment meets or exceeds the electrical ratings, tamper resistance and finish required by this specification.

16.0 Packaging

16.1 Each switchgear shall be completely assembled and packaged in accordance with good commercial practice to ensure safe delivery without damage to the finish or any other part of the unit.

16.2 Provisions shall be made to protect switchgear shipped on flatbed trucks from contamination of the cabinet exterior and interior from rocks, dirt, insects and other foreign materials encountered in shipment.

16.3 Each switchgear shall be shipped on a nonreturnable wood pallet designed for handling with a forklift. Pallets shall have a minimum of 3-1/2 inches of vertical clearance for the forks. Pallets shall be of adequate strength to withstand normal shipping and handling of the switch.

16.4 To reduce shipping costs, switchgear may be doubled stacked. If this shipping method is proposed, a detail sketch shall be provided and approved by the District prior to shipment.

16.5 Switchgear shall be shipped so that they may be removed from the truck or trailer by forklift.

16.6 No material or other switchgear shall be stacked or carried on top of the switchgear.

17.0 Data to be Submitted with Bid

17.1 Each bidder shall submit with its proposal the data listed below. The bidder shall submit a description of any changes, additions, or exceptions to this specification it proposes, together with the reasons for the departure. Product evaluation and conformance to specification will be determined on the basis of the information submitted. The drawings and data furnished must be sufficient in detail and clarity to enable making a complete and positive check with the technical provisions of this specification.

- A. Outline drawings with overall dimensions including those dimensions described in Sections 5.1.
- B. Statement of type of stainless steel to be used.
- C. Total weight of complete switchgear assembly.
- D. Electrical schematics.
- E. Indicate construction and testing compliance per latest revision of ANSI C57.12.28.



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- F. One copy of an instruction book covering installation, operation, and maintenance of the equipment.

18.0 Data to be Furnished by Successful Bidder

The successful bidder shall supply:

- 18.1** Outline drawings with overall dimensions; see Sections 5.1, 15.5, and 15.6, dimension requirements.
- 18.2** One copy of an instruction book covering installation, operation, and maintenance of the equipment shall be packaged in a water resistant envelope and placed inside each switch.
- 18.3** Time-current curves of all fuses and protective relays.
- 18.4** One certified copy of all standard tests except as noted below.
- 18.5** One certified copy of the enclosure coating system performance tests required by ANSI C57.12.28 only when requested.
- 18.6** One certified copy of the enclosure security performance tests required by ANSI C57.12.28 only when requested.

19.0 SPECIFICATIONS REVISIONS LOG

#	Date	Section	Description
1	4/13/06		Added Specifications Revision Log
2	4/13/06	6.6.D	Added "Transparent" requirement for barriers.
3	4/13/06	6.2	Modified dimensions to specify frontprint.
4			
5			
6			
7			
8			