Switchgear, 27 kV, Three-Pole, Padmount

1. Scope

1.1 This document specifies self-contained, totally enclosed, outdoor, metalclad, 27-kV, three-phase switchgear assembly with a switched source and either (1) three additional un-fused switched ways, (2) three-phase load tap(s) with either fused holders that are suitable for load interruption or (3) electronic fuses. The switch, tap and fuse configuration will be specified in the purchase order.

1.2 This switchgear is intended for use on a 26.4-kV, three-phase, 60-Hertz, grounded neutral underground distribution system. The load will be single- and three-phase, distribution transformers serving public-use facilities that require high reliability.

2. General

2.1 Except as modified by this specification, the switchgear furnished shall comply with the material and testing requirements of the latest revisions of all applicable standards by ANSI, IEEE, and NEMA.

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 All components of the switchgear shall be completely factory assembled and tested.

2.4 The manufacturer shall provide sufficient notice to allow Seattle City Light representatives to inspect the switchgear during its manufacture, if requested.

3. Ratings

3.1 The rating of the entire switchgear assembly shall be 27 kV.

3.2 The source switch(es) and the un-fused switched ways shall have a continuous current rating of 600 amperes and a live switching rating of 400 amperes. The switch shall have a two-time, fault-closing duty cycle of 22,400 amperes asymmetrical at 27 kV.

3.3 Each power fuse mounting shall have a continuous current rating of 200 amperes and a load-switching rating of 200 amperes. They shall have a minimum, one-time, fault-closing, duty cycle of 20,000 amperes asymmetrical and a two-time, fault-closing duty cycle of 13,000 amperes asymmetrical at 27 kV. The power fuses, if specified, shall be rated to interrupt 540 MVA, three-phase, symmetrical at rated voltage.

3.4 The short-circuit, fault duty rating of the power fuse mounting and interrupters shall be 540 MVA or 12,500 amperes RMS symmetrical.

3.5 Each electronic fuse mounting shall have a continuous current rating of 600 amperes and a load-switching rating of 200 amperes. The minimum interrupting rating of the electronic fuses shall be 40,000 amperes RMS symmetrical. It shall have a minimum, one-time, fault-closing, duty cycle of 22,400 amperes asymmetrical and a two-time, fault-closing duty cycle of 13,000 amperes asymmetrical at 27 kV.

3.6 Each fused tap, fuse, and fuse assembly shall be capable of withstanding full line-to-line AC voltage (27 kV) across each fuse unit after operation.

4. Insulation

4.1 The basic impulse insulation level shall be 125-kV BIL.

4.2 The maximum RIV at 1,000 kHz shall be 100 microvolts when energized at rated voltage.

5. Primary Connections

5.1 All terminal pads shall have two holes sized and spaced per NEMA standards (9/16" holes drilled on 1-3/4" centers) that shall be located at least 34" above the lowest point of the switchgear for connecting the cables. A 12” base spacer may be necessary to achieve the termination height required. There shall be ample clearance around these landing pads to accommodate the following terminators:

Raychem	Type HVT	3M	5600

5.2 A primary connector, S&C #4745 or prior user-approved equal, shall be furnished for every primary termination.

6. Interlocks and Barriers

6.1 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.

6.2 All switches shall have means of padlocking in the open position.

6.3 Each power or electronically fused switch shall have a 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.

6.4 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.

7. Grounding Studs

7.1 Each switch terminal, each fuse terminal, and each compartment ground terminal shall have a stud for attaching working grounds that use hot-line clamps such as A.B. Chance #1530GP (0.745" to 0.162").

7.2 These studs shall be located in such a manner that the clamps may be readily applied or removed with a "hotstick."

7.3 The grounding studs shall be capable of carrying the fault duty of the switchgear.

7.4 The compartment grounding studs shall be at least 10" long.

8. Buses

All buses shall be of copper or aluminum. Buses wrapped with organic material will not be permitted. All joints shall have suitable hardware and treatment to prevent harmful oxidation and loss of optimum contact pressure. All switches and fuse mountings shall have a grounded steel base between the contact end support insulator and the hinge end support insulator to eliminate possible energization across the open gap.

9. Fuses and Mounting

9.1 The power fuse mountings, when specified, shall be **completely** interchangeable with all parts of S&C Electric Company SML-20, 45° opening disconnect style, vertically mounted with silencer unless otherwise specified on the purchase order.

9.2 Each power fuse compartment shall be furnished with end fittings for three fuses and, if specified, six fuses with ampere ratings as specified in the purchase requisition.

9.3 The power fuse mounting disconnects shall be quick-break and fully capable of load-break operation unless otherwise specified.

10. Electronic Fuses

10.1 The electronic fuse components and mountings, when specified, shall be completely interchangeable with all parts of the S & C Electric Company Fault-Fiter, disconnect style, unless otherwise specified on the purchase order.

10.2 Each electronic fuse compartment shall be furnished with holders for three electronic fuses.

11. Switches

The switches shall be provided with quick-make and quick-break mechanisms.

12. Motor operators

PMH-5 type switches shall be supplied with factory installed S & C type PM motor operators including 24 volt dc ZSD relay with 400 ampere blocking level, potential transformer, current transformers, battery packs and battery charger.

13. Arrester Mounting

The switch manufacturer shall incorporate provisions for mounting surge arresters in all 600 ampere switch compartments. The arresters to be mounted will be 17 kV MCOV heavy-duty distribution class gaped or ungaped metal oxide arresters. The bottom mounting on the arrester will consist of a 3/8" threaded stud with washers and nut. Seattle City Light will provide and install the arresters.

14. Fault Indicator Mounting

The switch manufacturer shall incorporate mounting provisions for a three phase fault indicator in each 600 ampere switch compartment. A single window shall be provided in the door of each 600 ampere switch compartment.

15. Enclosure

15.1 The switchgear cabinet shall be constructed to provide adequate space, volume, 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.

15.2 Access to the unit for maintenance and cable termination shall be through the doors to the switch or to the switch or fuse compartments only. The doors shall be secured with a padlock shackle and penta head bolts for back-up protection.

15.3 The enclosure ground connection shall consist of one (or more) unpainted, copper-faced steel or stainless steel pad(s), 2" x 3-1/2" with two 9/16" - 13 NC holes spaced on a 1-3/4" center. The pad(s) shall be welded to the frame on the interior of the frame near the high-voltage conductor entrances.

15.4 The cabinet shall be 11 gauge (0.12 inches) minimum thickness stainless steel.

15.5 Four-compartment padmount enclosure shall be mountable without overhanging on a concrete pad, 84" wide x 79" deep, allowing a one-inch concrete margin around the perimeter of the enclosure. (Footprint 82" wide x 76-3/4" deep.)

15.6 Two-compartment padmount enclosure shall be mountable without overhanging on a concrete pad, 45" x 67-1/2" deep, allowing a one-inch concrete margin around the perimeter of the enclosure. (Footprint 43" wide x 65-1/4" deep.)

15.7 The cabinet shall have an equivalent of 4" x 12" or 48 square inches of ventilation in each sectioned cubicle of the cabinet, designed to provide cross-ventilation. The ventilation method shall be tamper proof.

15.8 The entire underside of the roof shall be coated with a "no-drip" asphalt-base mastic, minimum 1/8" thick.

15.9 The enclosure shall meet all requirements for enclosure security required by ANSI C57.12.28.

15.10 Provisions for securing the enclosure to the concrete pad shall include attachments for all four sides.

16. Paint Finish

16.1 The color of the finish coat shall be Munsell 7GY 3.29/1.5 padmount green.

16.2 The paint coating system shall meet all of the enclosure coating system performance requirements specified by the latest revision of ANSI C57.12.28.

17. Data to be Submitted for Qualification as an Approved Manufacturer

Each manufacturer shall submit with its qualification proposal the data listed below. The manufacturer shall submit a description of any changes, additions, or exceptions to this specification it proposes, together with the reasons for the departure. Product evaluation will be conducted 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, 15.5, and 15.6.
(b) Information concerning details of construction including type of stainless steel to be used.
(c) Complete fuse data.
(d) Detailed information on short-circuit capability.
(e) State all electrical tests given and whether these tests apply to all units or only to sample units.
(f) Total weight of complete switchgear assembly.
(g) Electrical schematics.
(h) Indicate construction and testing compliance per latest revision of ANSI C57.12.28.
(I) Names and addresses of users of the equipment the bidder intends to furnish.
(j) One copy of an instruction book covering installation, operation, and maintenance of the equipment.

18. Data to be Submitted with Bid

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, 15.5, and 15.6.
(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.
(f) One copy of an instruction book covering installation, operation, and maintenance of the equipment.

19. Data to be Furnished by Successful Bidder

The successful bidder shall supply:

(a) Outline drawings with overall dimensions; see Sections 5.1, 15.5, and 15.6, dimension requirements.
(b) 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.
(c) Time-current curves of all fuses and protective relays.
(d) One certified copy of all standard tests except as noted below.
(e) One certified copy of the enclosure coating system performance tests required by ANSI C57.12.28 only when requested.
(f) One certified copy of the enclosure security performance tests required by ANSI C57.12.28 only when requested.

20. Guarantee

If any part of this equipment fails due to defective design, material, and/or workmanship within 24 months after delivery, it shall be replaced without cost to Seattle City Light.

21. Patents and Infringements

The manufacturer shall defend Seattle City Light against any litigation arising from all patent infringements of the equipment furnished under this specification. If such equipment is judged as infringing, the manufacturer shall either secure for Seattle City Light the right for its continued use, or replace it with non-infringing devices that comply with this specification at no cost to Seattle City Light.

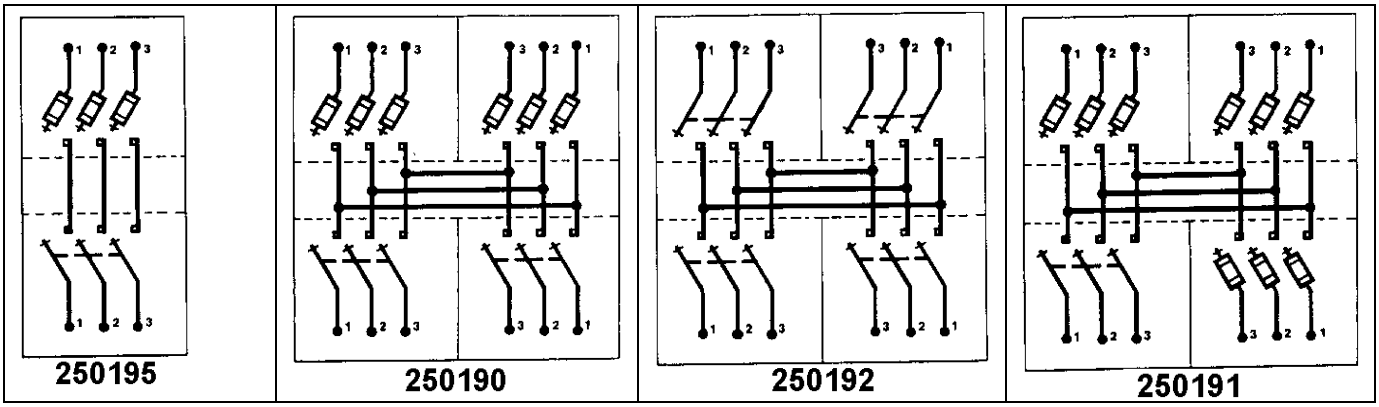
22. Approved Manufacturers

Stock No.	Description	Type	S & C Cat. No.
250195	3∅ 2-Way 1 600A switch & 1 set of Fault-Fiter fuse mountings	PMH-5	156513R3- A10-F12-K20-P5-E102, Rev. 0
250190	3∅ 4-Way 2 600A switches & 2 sets of SM-20 fuse mountings	PMH-9	55153R3-A10-F12-K18-P5
250192	3∅ 4-Way 4 600A switches	PMH-10	55243R3-A10-F12-K18-P5
250191	3∅ 4-Way 1 600A switch & 3 sets of SM-20 fuse mountings	PMH-12	55173R3-A10-F12-K18-P5
250163	Motor Operator Kit w/ ZSD Relay with 400 Ampere blocking level	PM	38971R2-A1-A10-Y8-Z1

A10 Stainless steel enclosure w/ “olive green” finish
F12 Fault indicator provisions w/ viewing windows in (SS) doors
K18 12” stainless steel spacer
K20 24” stainless steel spacer

P5 Mounting provisions for “18 kV” arresters
From S&C cat. Section 662-32, pages 8 thru 10 dated May 31, 1994

SWITCH CONFIGURATION DIAGRAMS



In October 2015, this standard was renumbered from 2501.9 to 4507.90.