

Switchgear, 27 kV, Padmount, Live-Front**1. Scope**

This standard covers the information necessary to install S&C Electric Co. (S&C) manual and remote supervisory capable PMH padmount switchgear in the Seattle City Light (SCL) 26 kV underground electrical distribution system.

These instructions represent the installation of manual PMH switchgear and are intended to be used in conjunction with the manufacturer's instructions. Installation requirements for remote supervisory capable PMH switchgear will be slightly different. It is important to read, understand, and follow the specific instructions provided with the switchgear to be installed.

See SCL 4507.90 for the material specifications for this switchgear.

2. Application

This standard provides direction to SCL engineers, crews, and contractors for the installation of manual and remote supervisory capable PMH switchgear.

3. Requirements

Switchgear shall be constructed as shown in the figures and in accordance with the manufacturer's installation instructions.

Standards Coordinator
Muneer Shetab

Standards Supervisor
John Shipek

Unit Director
Darnell Cola

Muneer Shetab

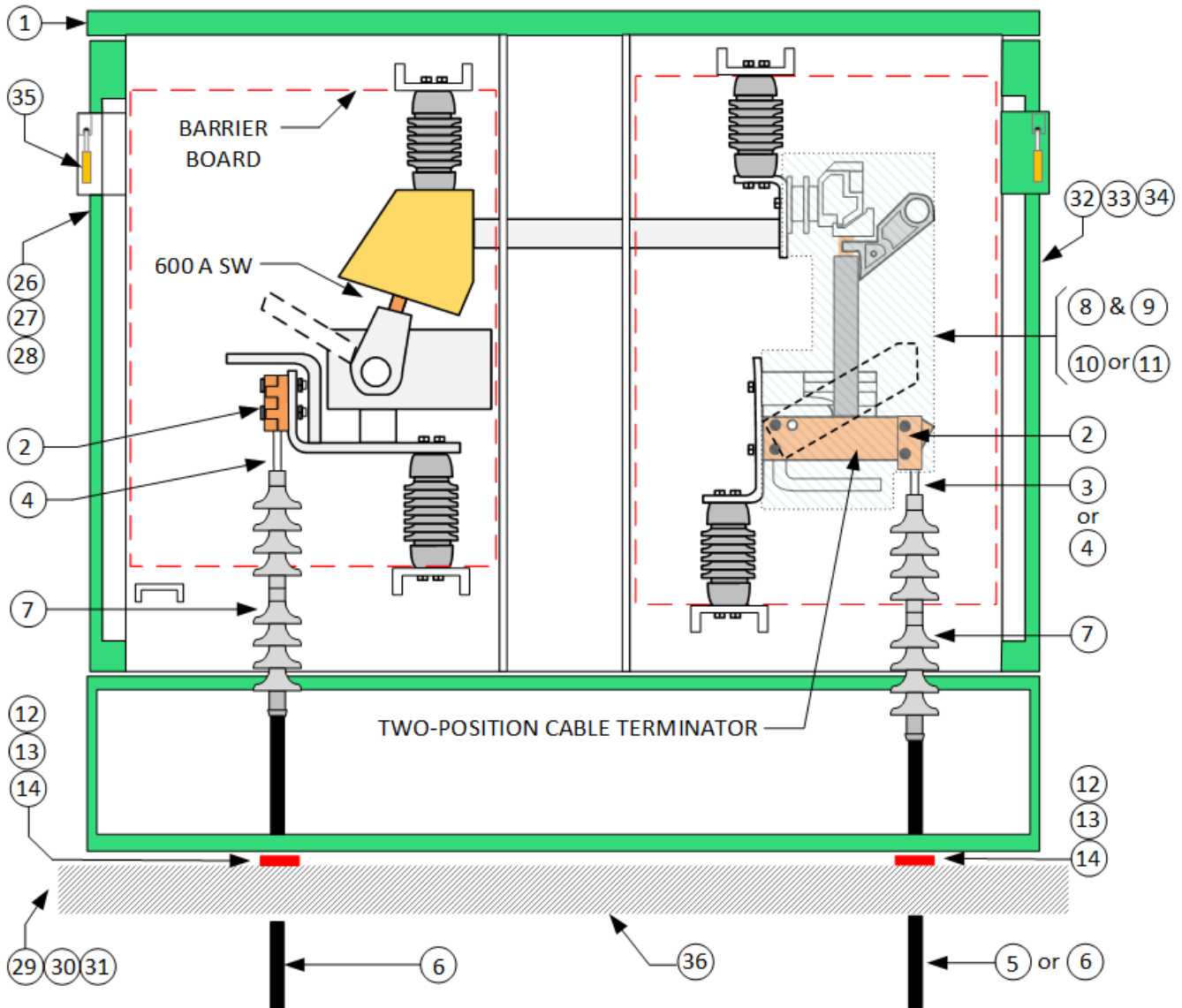
Darnell Cola

3.1 Compartment Connections

Cables, terminations, connectors, and cable support assemblies shall be constructed as shown in the figures. The SCL engineer shall determine the size, type, and quantity of each item.

Terminations shall be made by following the cable terminator manufacturer instructions. See SCL 0525.81 for primary cable preparation. See SCL U5-26.20/NSP-285 for cold shrink terminations.

Figure 3.1. Compartment Connections

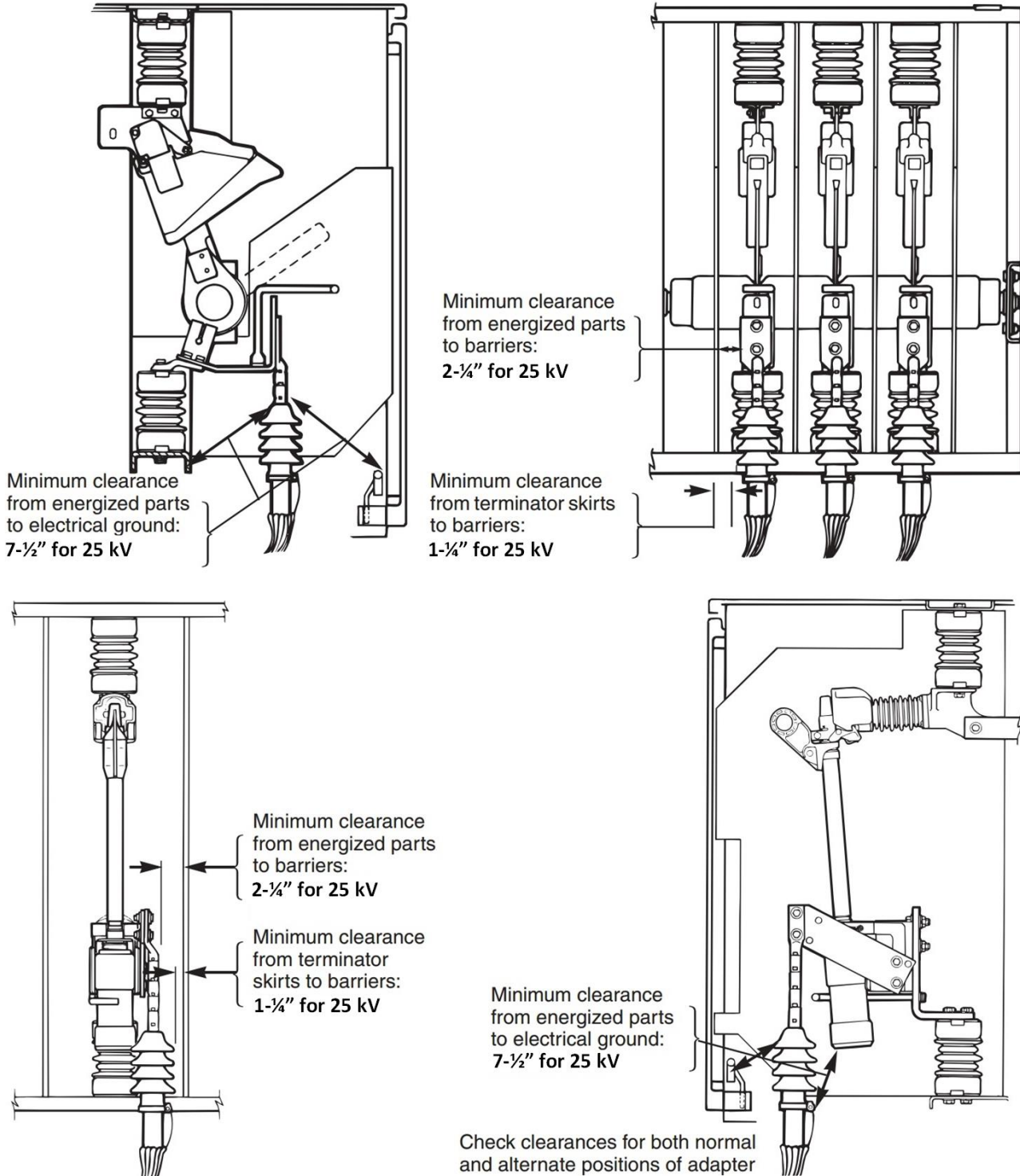


3.2 Clearances

Recommended physical clearances around the switchgear are 10 ft from the front and back, and 3 ft from the sides.

Required minimum electrical clearances are specified in the S&C Instruction Sheet 662-505 and shown in Figure 3.2.

Figure 3.2. Minimum Electrical Clearances



3.3 Fuses

The SCL Engineer shall determine fuse size, type, and quantity.

3.4 Grounding Connection

Grounding for switchgear shall be constructed in accordance with figures 3.4a and 3.4b.

The SCL engineer shall determine the size and quantity of customer-supplied material.
 See Table 5c.

Figure 3.4a Example of PMH-9 through PMH-12 Switchgear Grounding

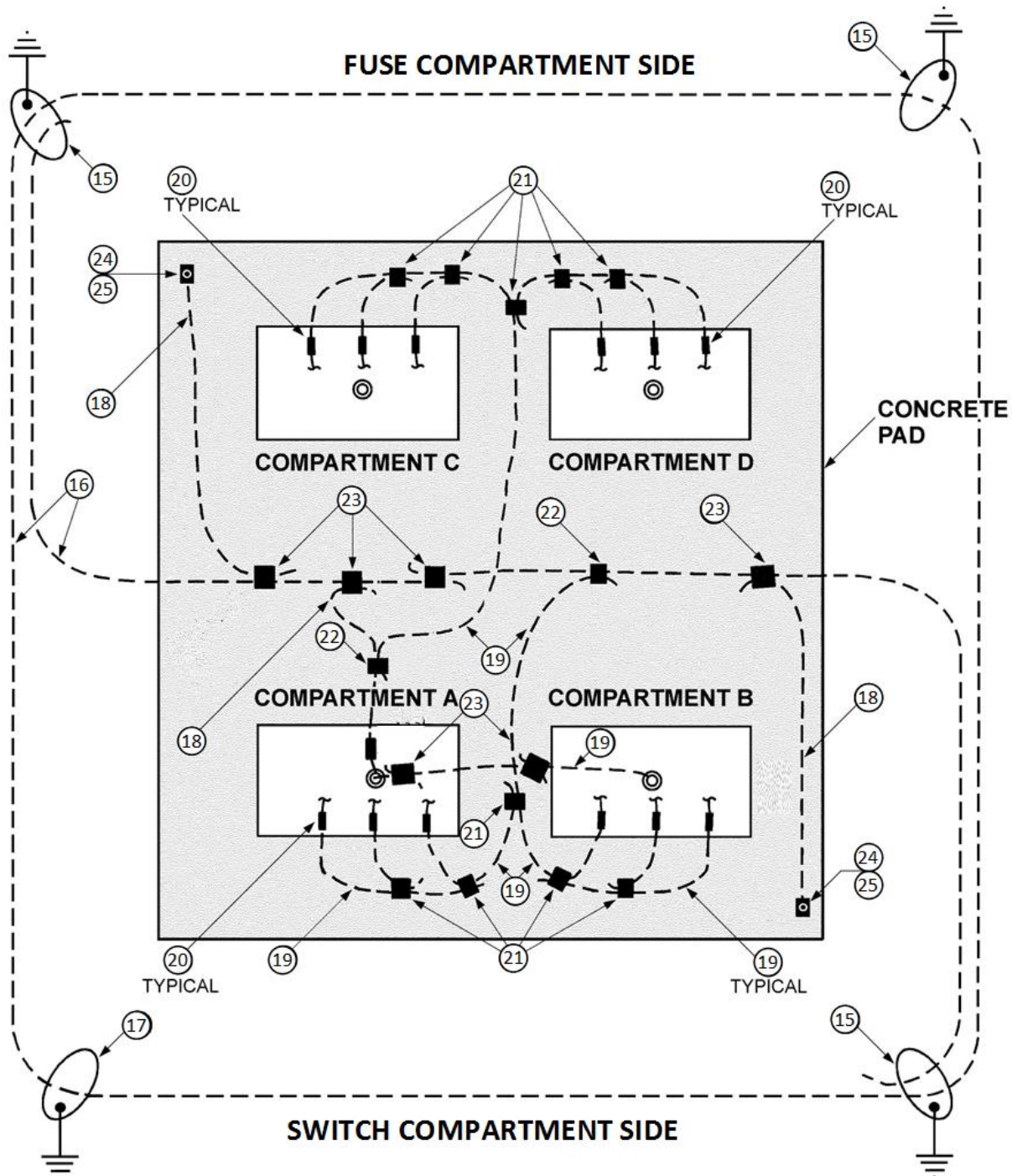
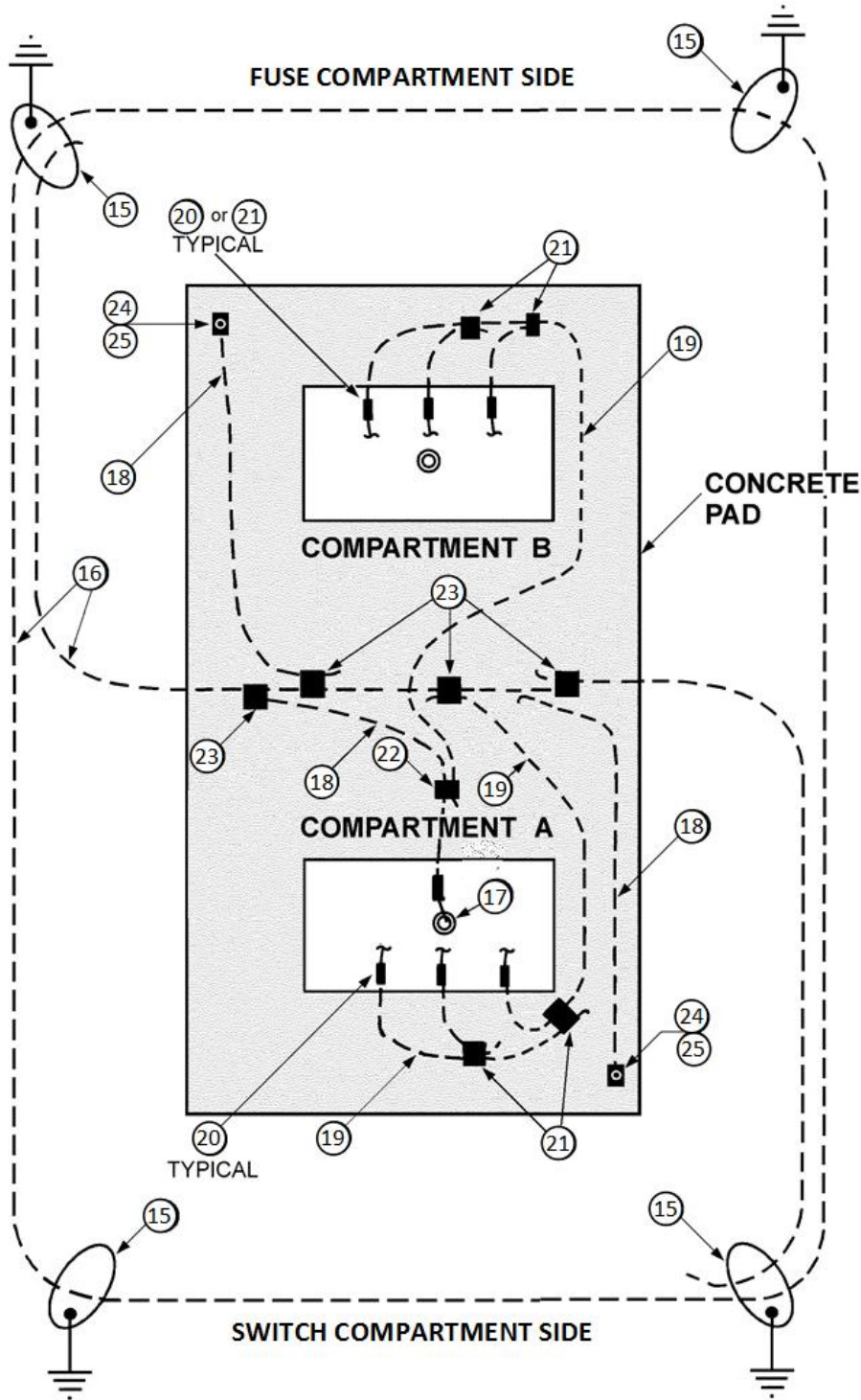


Figure 3.4b. Example of PMH-5 Switchgear Grounding



3.5 Insulated Neutral

The SCL engineer shall determine the size of the insulated neutral.

3.6 Signs and Labels

The SCL engineer shall determine the type and quantity of signs and labels required for each type of switchgear per SCL 1167.13.

4. Construction Notes

4.1 Compartment Connections

Before connecting the cable terminators to the aluminum terminal pads, thoroughly wire-brush aluminum contact surfaces to remove any dirt or foreign materials as well as natural surface oxides. Immediately coat both contact surfaces to one-half inch beyond the joint with a uniform layer of oxide-inhibiting compound, SCL Stock No. 726180.

When connecting cable terminators, avoid placing any intentional strain on a switch or fuse terminal. It is important that each cable terminator connector to be flat against the corresponding fuse or switch terminal pad with the bolt holes in alignment. Do not use the connecting bolts to pull the cable into alignment.

Position cable before it is cut and terminated so that it is not pulling on or supported by the cable connectors on the switchgear.

Route cable so that it does not come into contact with the barrier boards.

Cable terminations should come directly to the switch and fuse terminals and should not be bent.

Install cable terminations such that the top skirt of the termination is approximately the same level as the switch and fuse grounding studs.

Maintain electrical clearances as outlined in Section 3.2.

Torque cable connector steel bolts to 50 foot-pounds.

Construct the cable support assembly from aluminum strut and thermoplastic cable assembly. Cut the ends of the aluminum strut and drill holes to accommodate 3/8" x 3" Hilti bolts.

4.2 Fuses

Two-position cable terminator fuse adaptors are provided at the fuse hinge assemblies. Figure 3.1 shows both, the standard (solid) and alternate (dotted) positions. The adapters are placed in alternate position when required for increased clearance from energized parts to ground parts of the cable terminators.

4.3 Grounding

Make only one connection between the primary neutral and the grounding conductors.

The connection point to the neutral shall be a minimum of six inches above the bottom of the manhole to protect against neutral corrosion.

In cases where all primary cables are drain wire construction, connect drain wires together, but not do not ground them.

4.4 Pad

The pad is usually provided by the customer. The SCL engineer provides general pad design information.

4.5 Sealing

Seal conduits with inflatable conduit sealing devices as specified in Table 5d.

5. Materials List

Table 5a. Materials for Switchgear, 27 kV Padmount, Live-Front

Fig	Compatible Unit	ID	Quantity				
3.1	PMH-12 Switchgear	SWPMH12					
3.1	PMH-11 Switchgear	SWPMH11					
3.1	PMH-10 Switchgear	SWPMH10					
3.1	PMH-9 Switchgear	SWPMH9					
3.1	PMH-5 Switchgear	SWPMH5					
#	Material Description	ID					
1	PMH-5	250195	1	-	-	-	-
1	PMH-9	250190	-	1	-	-	-
1	PMH-10	250192	-	-	1	-	-
1	PMH-11	014292	-	-	-	1	-
1	PMH-12	250191	-	-	-	-	1
2	Connector, cable to flat	661255	6	12	12	12	12
8	Fault-Fiter fuse interrupting module	259500	3	-	-	-	-
12	Channel rack, support, 1-5/8" x 1-5/8"	723502	1	1	1	1	1
14	Anchor bolt, carbon steel, expansion	780104	4	8	8	8	8
26	Sign, "Danger Hazardous Voltage"	765182	2	2	2	2	2
27	Sign, "Call 811 Before You Dig"	765255	1	1	1	1	1
28	Sign, "Notice: Landscaping Requirements"	014125	1	1	1	1	1
29	Nail, anchor drive, 1/4" x 1"	780010	2	2	2	2	2
30	Panel	766300	1	1	1	1	1
37	Sealant, electrical	736470	1	1	1	1	1
38	Tape, plastic, electrical	736655	2	2	2	2	2
39	Oxide-inhibiting compound	726180	1	1	1	1	1

Table 5b. Materials for Switchgear Grounding

Fig	Compatible Unit	ID	Qty
3.4a	PMH Switchgear Grounding	GRND-SWPMH	
#	Material Description	ID	
18	Wire, 2/0, bare Cu, soft drawn, stranded	610425	6
19	Wire, #2, bare Cu, soft drawn, stranded	610434	50
20	Connector, compression, Cu, "C", #2 to #4	677325	12
21	Connector, compression, Cu, "C", #2 to #2	677326	13
22	Connector, compression, Cu, "C", 2/0-4/0 to #2	677330	2
23	Connector, compression, Cu, "C", 2/0-4/0 to 2/0-4/0	677332	3
24	Terminal, Compression, Cu, paddle 2/0	677077	2
25	Bolt assembly kit, stainless steel, 1/2" - 13 X 2"	782040	2

Table 5c. Customer Supplied Material

#	Material Description	Stock No.	PMH 5	PMH 9	PMH 10	PMH 11	PMH 12
15	Ground rods and clamps	564238	4	4	4	4	4
41	Connector, 2 cables, (#4 AWG -2/0) to 5/8" rod	676551	4	4	4	4	4
16	Wire, 2/0, bare Cu, SD, stranded (ft)	610425	60	80	80	80	80
36	Pad (typical design drawing provided by SCL)	-	1	1	1	1	1

Table 5d. Materials to Be Selected and Quantified by Engineer

Figures 3.1, 3.4a. 3.4b)

#	Material Description	ID
3	Connector, compression, pigtail, 1/0 solid	686056
4	Connector, compression, pigtail, 350 kcmil	650578
4	Connector, compression, pigtail, 500 kcmil	650579
4	Connector, compression, pigtail, 750 kcmil compact	686075
4	Connector, compression, pigtail, 1000 kcmil compact	010320
5	Cable, 28 kV, AL, Concentric Neutral, 1/0 solid	602025
6	Cable, 28 kV, Triplex Insul., Flat Strap Shielded, 350 kcmil	012099
6	Cable, 28 kV, Triplex Insul., Flat Strap Shielded, 500 kcmil	012100
6	Cable, 28 kV, Triplex Insul., Flat Strap Shielded, 750 kcmil	012101
6	Cable, 28 kV, Triplex Insul., Flat Strap Shielded, 1000 kcmil	012102
7	Terminator, cold shrink, 25 kV, #1 to 350 kcmil	686532
7	Terminator, cold shrink, 25 kV, 350 to 500 kcmil, flat strap	012125
7	Terminator, cold shrink, 25 kV, 750 to 1000 kcmil, flat strap	012126
9	Fault-Fiter fuse electronic control module, 5 MVA XFR	259413
9	Fault-Fiter fuse electronic control module, 7.5 MVA XFR	259423
9	Fault-Fiter fuse electronic control module, 10 MVA XFR	259426
9	Fault-Fiter fuse electronic control module, 15 MVA XFR	012682
10	Fuse, K Rating, SMU-20, 27 kV, 25K with silencer	703025
10	Fuse, K Rating, SMU-20, 27 kV, 50K with silencer	703050
10	Fuse, K Rating, SMU-20, 27 kV, 65K with silencer	703065
10	Fuse, K Rating, SMU-20, 27 kV, 100K with silencer	703100
11	Fuse, current-limiting, full range, 25E	014332
11	Fuse, current-limiting, full range, 40E	014331
11	Fuse, current-limiting, full range, 65E	014330
13	Thermoplastic cable support assembly, 28 kV, 1/0, 2/C, bare	011961
13	Thermoplastic cable support assembly, 28 kV, 350 kcmil, 1/C	011962
13	Thermoplastic cable support assembly, 28 kV, 500 kcmil, 1/C	011963
13	Thermoplastic cable support assembly, 28 kV, 750 kcmil, 1/C	011964
13	Thermoplastic cable support assembly, 28 kV, 1000 kcmil, 1/C	012501
19	Wire, 600 V, Cu, poly insulated, 2/0 (fault current \geq 20 kA)	613733
19	Wire, 600 V, Cu, poly insulated, 4/0 (fault current < 20 kA)	613735
40	Inflatable conduit sealing device, 4.75"–5" conduit range	737533
40	Inflatable conduit sealing device, 3.25"–4.5" conduit range	737532

Table 5e. Miscellaneous Non-Stock Materials

31	Label, Pad (P) Number
32	Label, Equipment (PS) Number
33	Label, Switch (SW) Number
34	Label, Compartment Identification Letter
35	Padlock, SNM-1

6. References

- SCL Construction Guideline U5-26.20/NSP-285**; "Termination, 200 kV BIL, Cold Shrink"
- SCL Material Standard 4507.90**; "Switchgear, 27 kV, Three-Pole, Padmount"
- SCL Work Practice 1167.13**; "Padmount Switch Signs and Labels"
- SCL Work Practice 0525.81**; "Primary Cable Preparation"
- 662-505**; "S&C Manual PMH Pad-Mounted Gear, Outdoor Distribution (14.4 kV and 25 kV), Instructions for Installation, Instruction Sheet 662-505," April 25, 2005.

7. Sources

- SCL Construction Standard U10-5** (canceled); "Padmount Switch Installation Guideline"
- Material Standard 4507.95**; "Padmount PMH Switchgear, 27 kV, Parts"
- SCL Material Standard 6840.10**; "Fault Limiter, General Purpose, Current-Limiting Fuse"
- SCL Material Standard 7216.75**; "Strut Framing Systems"
- SCL Stock Catalog 68-7**; "Fuse, High Voltage (Primary)"
- SCL Stock Catalog 70-41**; "Cable Support Materials – Underground"
- SCL Work Practice 1167.19**; "Padmount PMH Switchgear Condition Assessment"
- 662-90**; "S&C Manual PMH Pad-Mounted Gear, Outdoor Distribution (14.4 kV and 25 kV), Instruction Recommendations, Data Bulletin 662-90," August 8, 1994.
- Shetab, Muneer**; SCL Standards Engineer, subject matter expert, and originator of 0801.02 (muneer.shetab@seattle.gov)
- Hanson, Brett**; SCL Standards Engineer and subject matter expert for 0801.02 (brett.hanson@seattle.gov)