

Switchgear, 27 kV, Padmount, Dead-Front, PSE-Style**1. Scope**

This standard covers the information necessary to install Federal Pacific Electric (FPE) manual PSE padmount switchgear in the Seattle City Light (SCL) 26 kV underground electrical distribution system.

These instructions represent the installation of manual PSE switchgear and are intended to be used in conjunction with the manufacturer's installation instructions. It is important to read, understand, and follow the specific instructions provided with the switchgear to be installed.

See SCL 4507.80 for the material specifications for this switchgear.

See SCL 0801.03 for installation of PME-style dead-front switchgear.

2. Application

This standard provides direction to SCL engineers, crews, and contractors for the installation of manual PSE switchgear.

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3. Requirements

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

3.1 Switchgear Dimensions (all dimensions are in inches)

Figure 3.1a. Front View Applicable to PSE-9, -10, -11, and -12 Switchgear Models

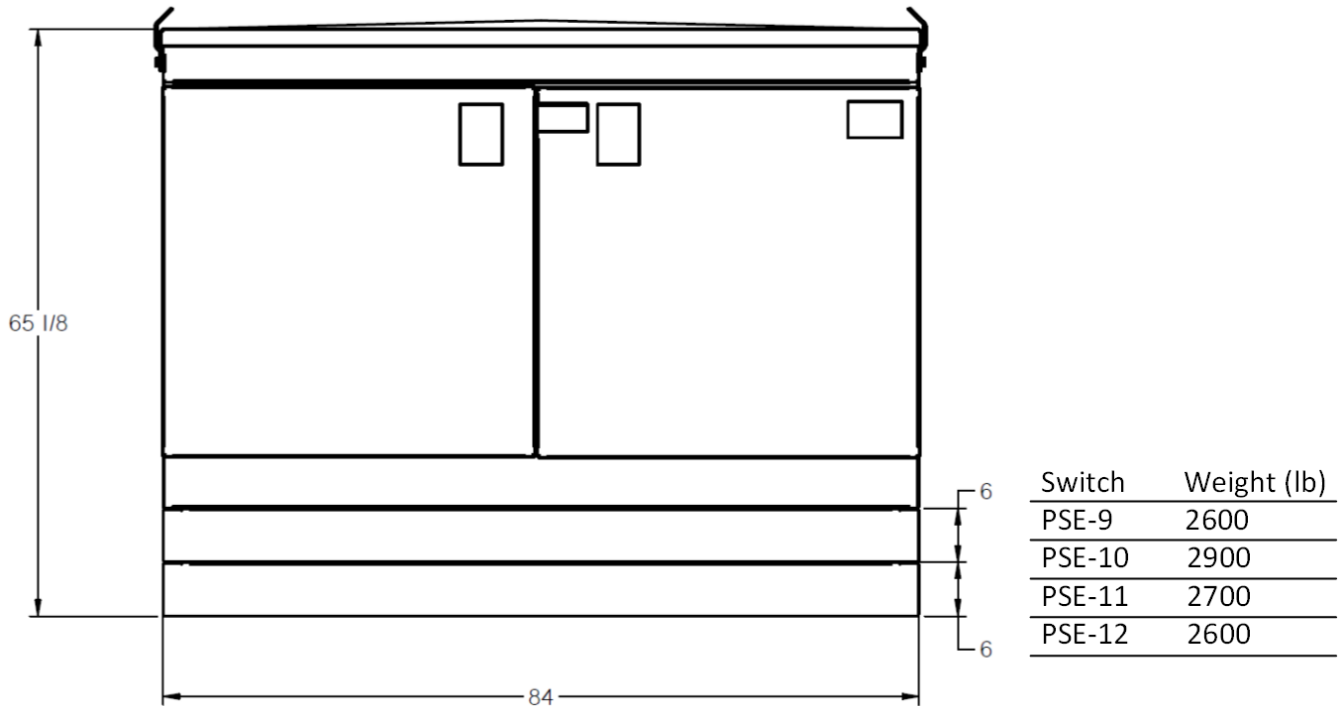


Figure 3.1b. Side View Applicable to PSE-9, -10, -11, and -12 Switchgear Models

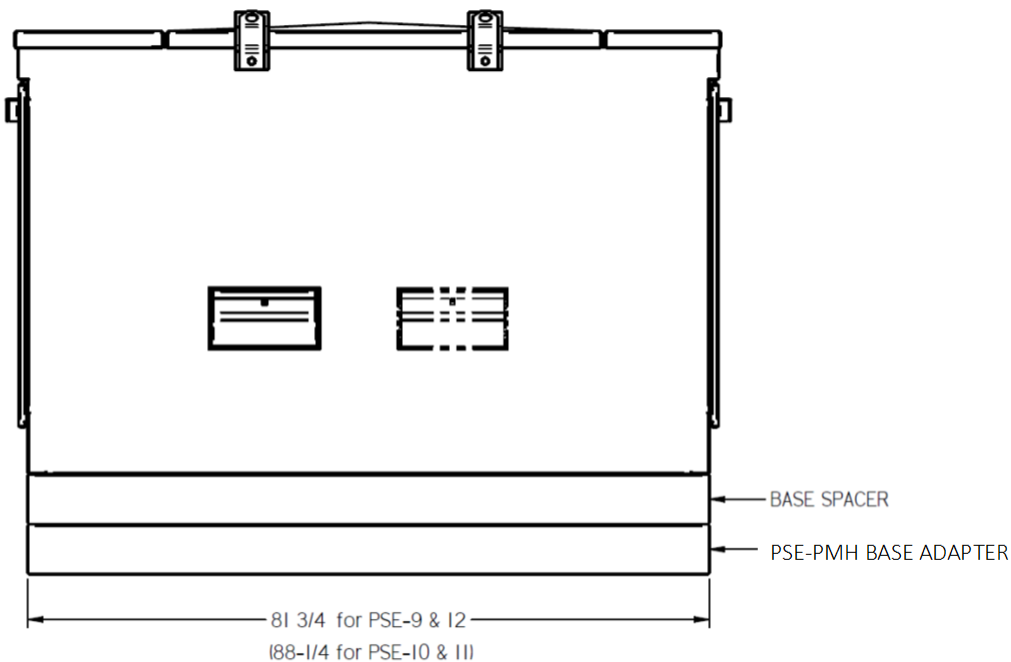
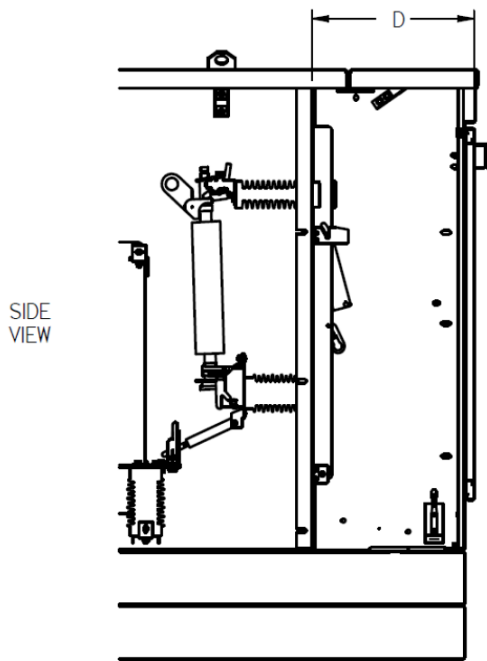
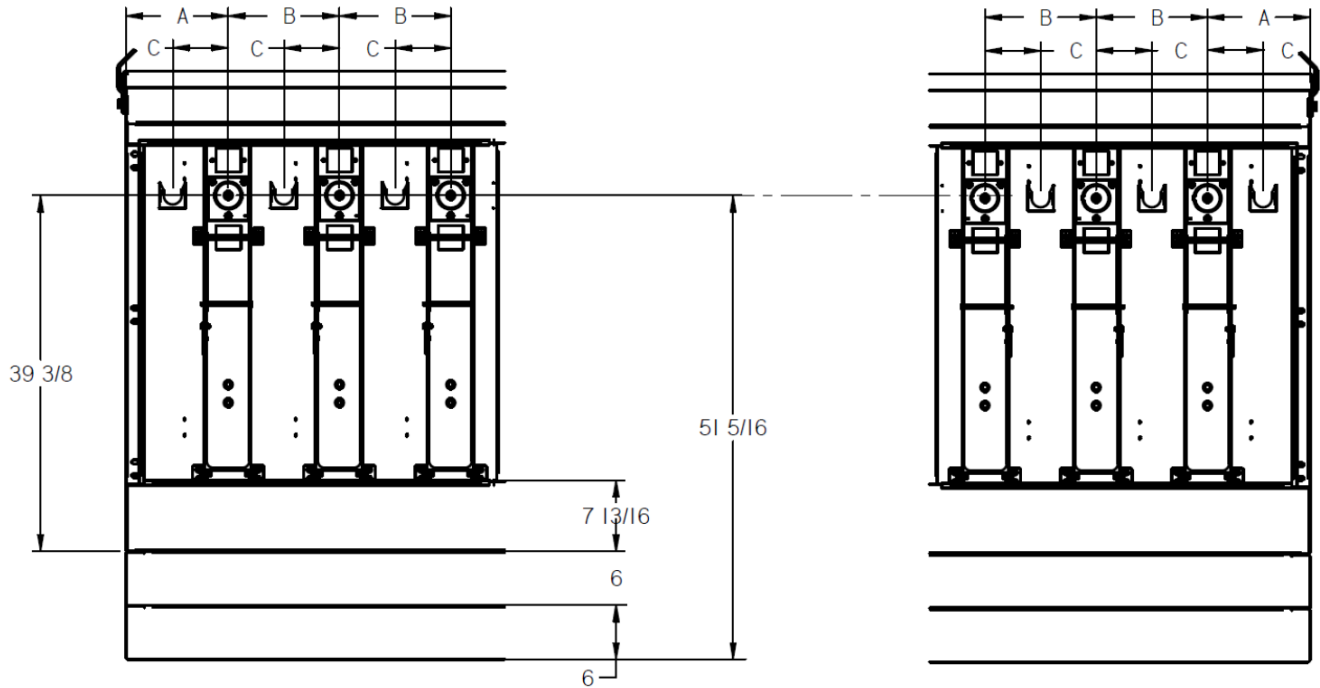


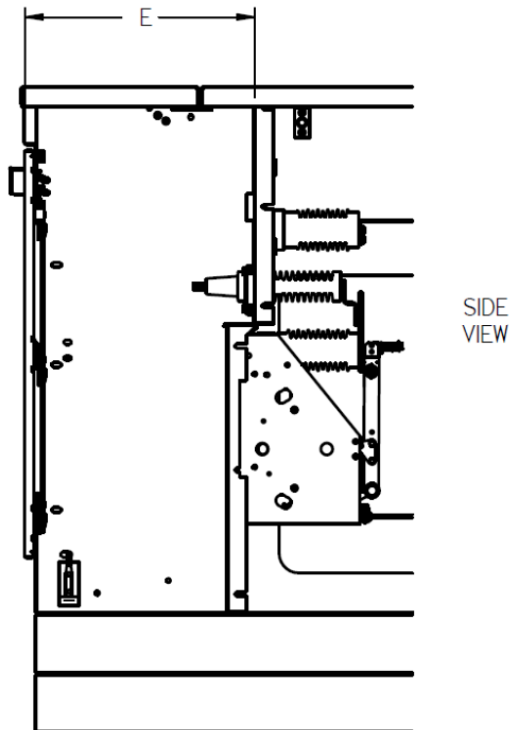
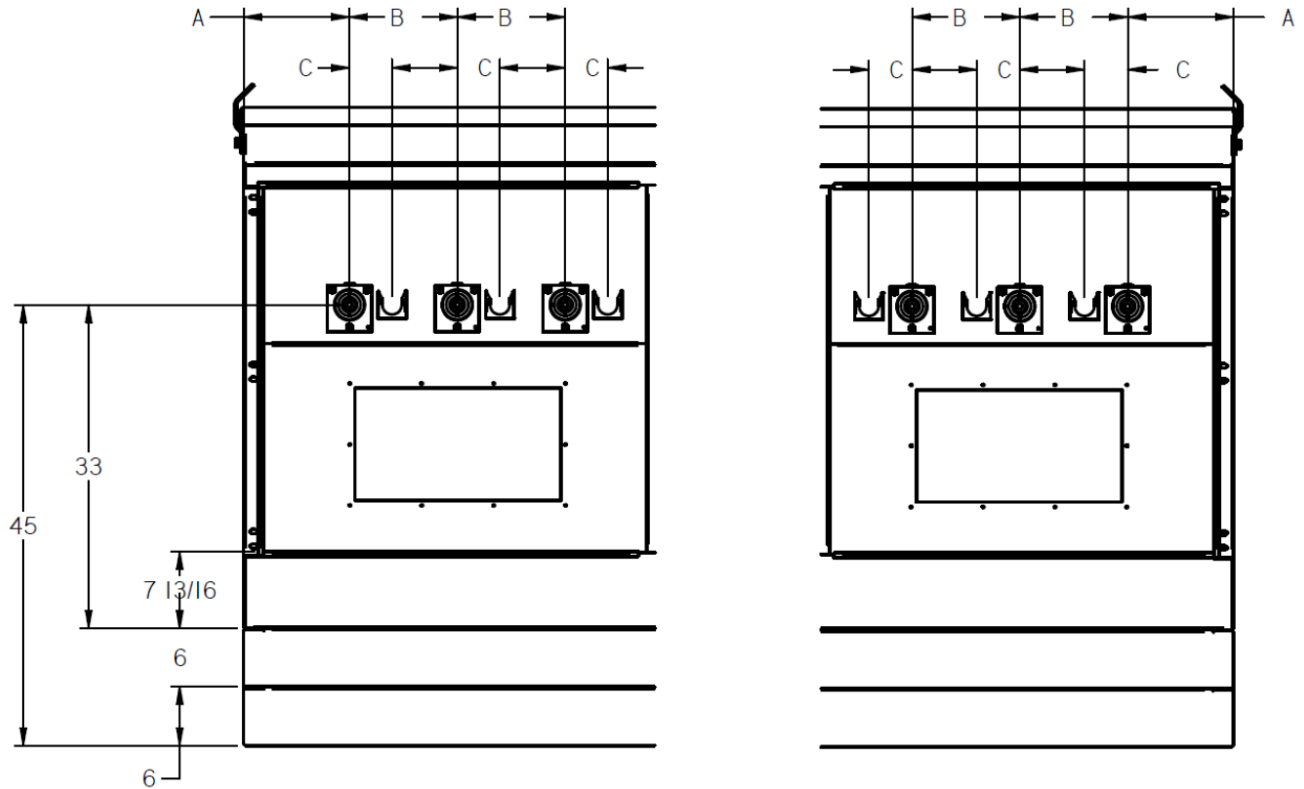
Figure 3.1c. Cable Compartment for Fuses



SIDE VIEW

| Dimensions (in) | |
|-----------------|------------|
| A | 11 - 3/8 |
| B | 12 - 5/16 |
| C | 6 - 3/16 |
| D | 17 - 11/16 |

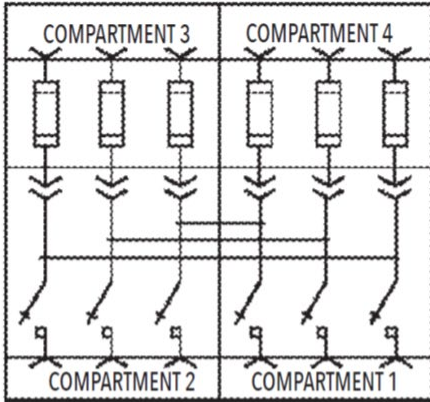
Figure 3.1d. Cable Compartment for Switches



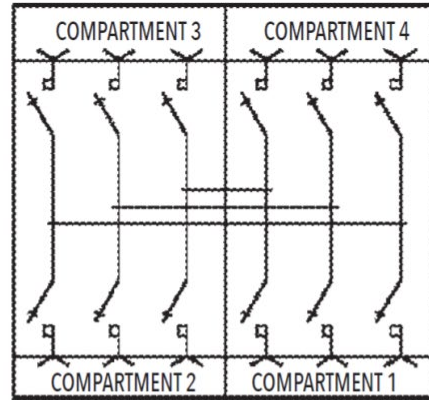
| Dimensions (in) | |
|-----------------|------------|
| A | 10 - 13/16 |
| B | 11 |
| C | 4 - 3/8 |
| D | 12 - 15/16 |
| E | 23 - 3/16 |

3.2 Switch Connection Diagrams and Switch Ratings

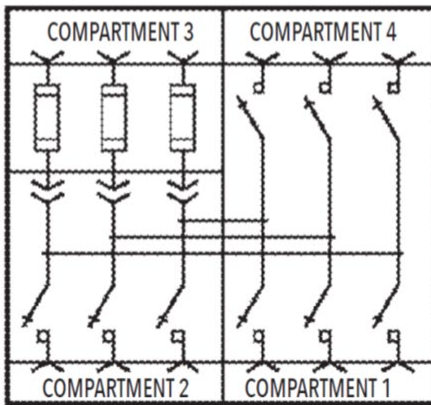
Figure 3.2. Switch Connection Diagrams



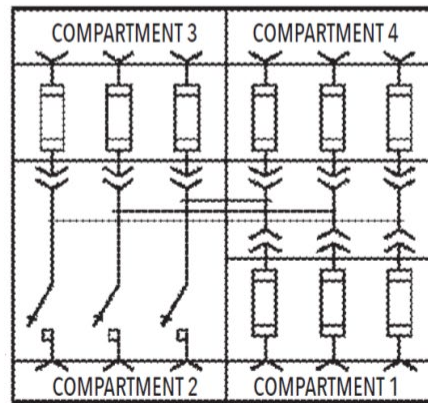
PSE-9 Connection Diagram



PSE-10 Connection Diagram



PSE-11 Connection Diagram



PSE-12 Connection Diagram

Table 3.2 Switch Ratings

| | |
|---|--------|
| Rated frequency (Hz) | 60 |
| Maximum voltage (kV) | 27 |
| Number of phases | 3 |
| Basic insulation level (BIL) (kV) | 125 |
| Main bus, continuous current (A) | 600 |
| Short circuit: | |
| Withstand current, amperes, peak | 32,500 |
| One-second short-time withstand current | 12,500 |
| Three-phase symmetrical at rated nominal voltage (MVA) | 540 |
| Three-pole interrupter switches: | |
| Continuous current (A) | 600 |
| Load-dropping current (A) | 600 |
| Three-time duty-cycle fault-closing current, peak (A) | 32,500 |
| Fuse bays: | |
| Continuous current (fuse) (A) | 2000 |
| Load-dropping current (fuse) (A) | 200 |

3.3 Compartment Connections

Cables, terminations, connectors, and cable support assemblies shall be constructed as shown in figures 3.3a and 3.3b. 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.

Figure 3.3a. Compartment Connections – Side View

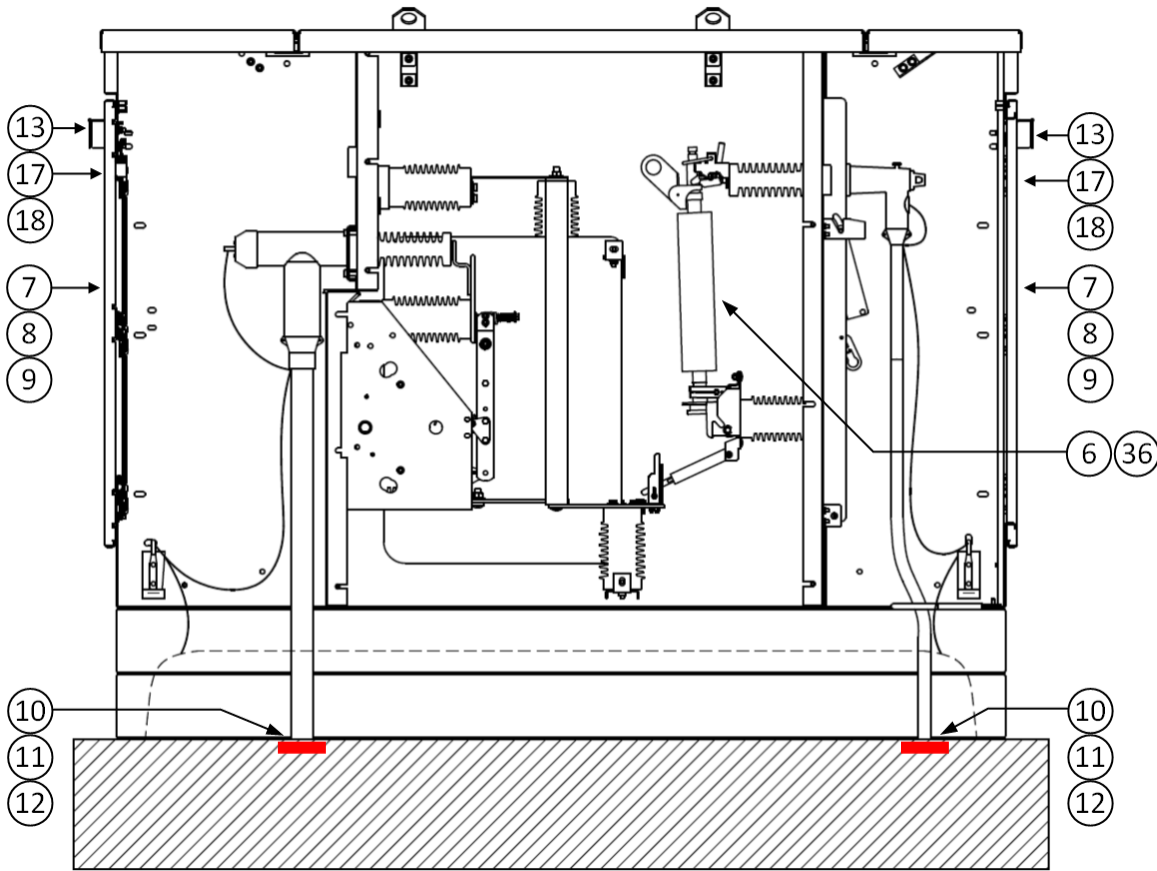
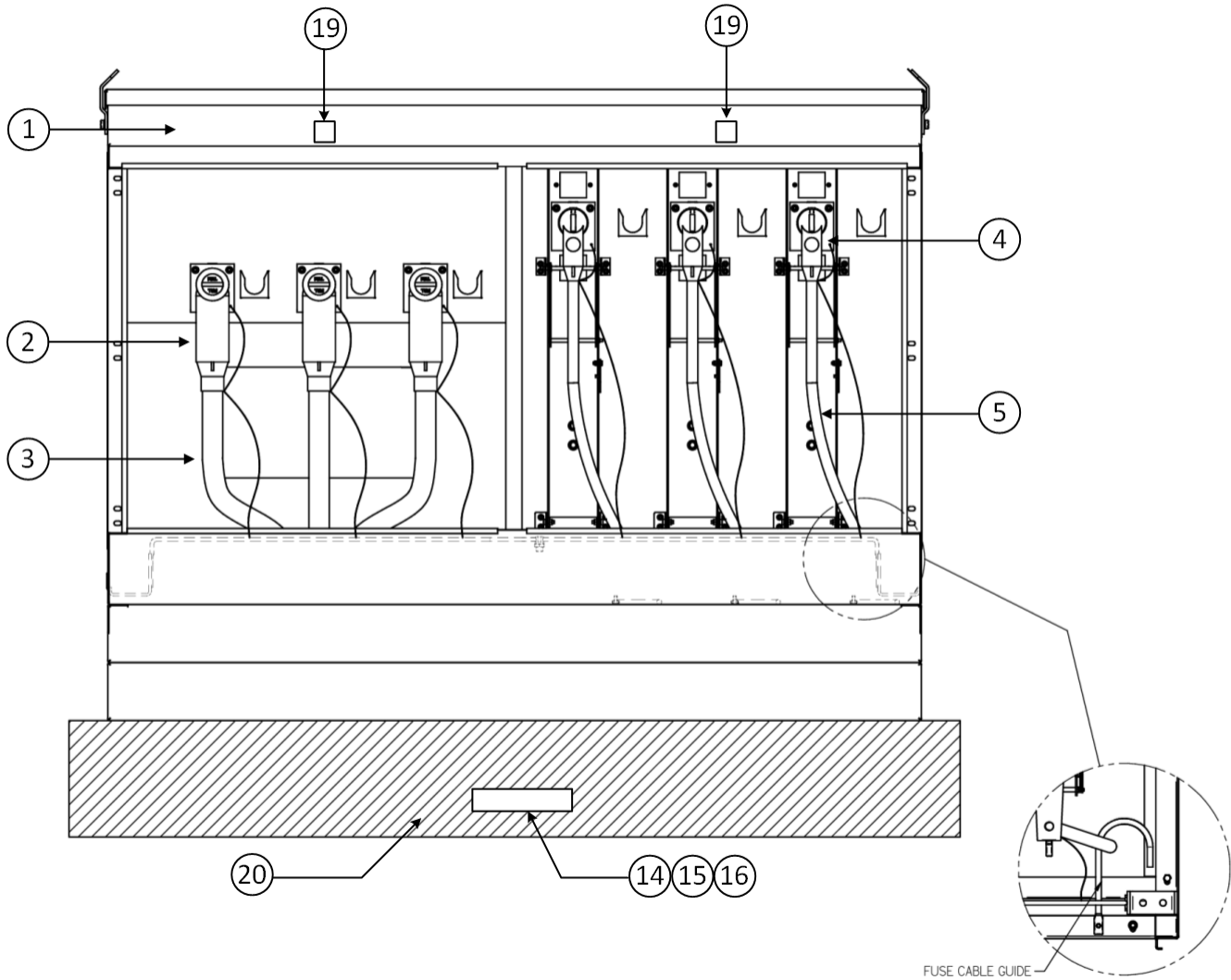


Figure 3.3b. Compartment Connections – Front View



3.4 Clearances

Clearances between switchgear and non-conductive structures or material shall be a minimum of 10 ft from the front and back, and 3 ft from the sides.

Clearances between switchgear and conductive (metal) structures or material shall be a minimum of 10 ft from the front and back, and 7 ft from the sides.

3.5 Fuses

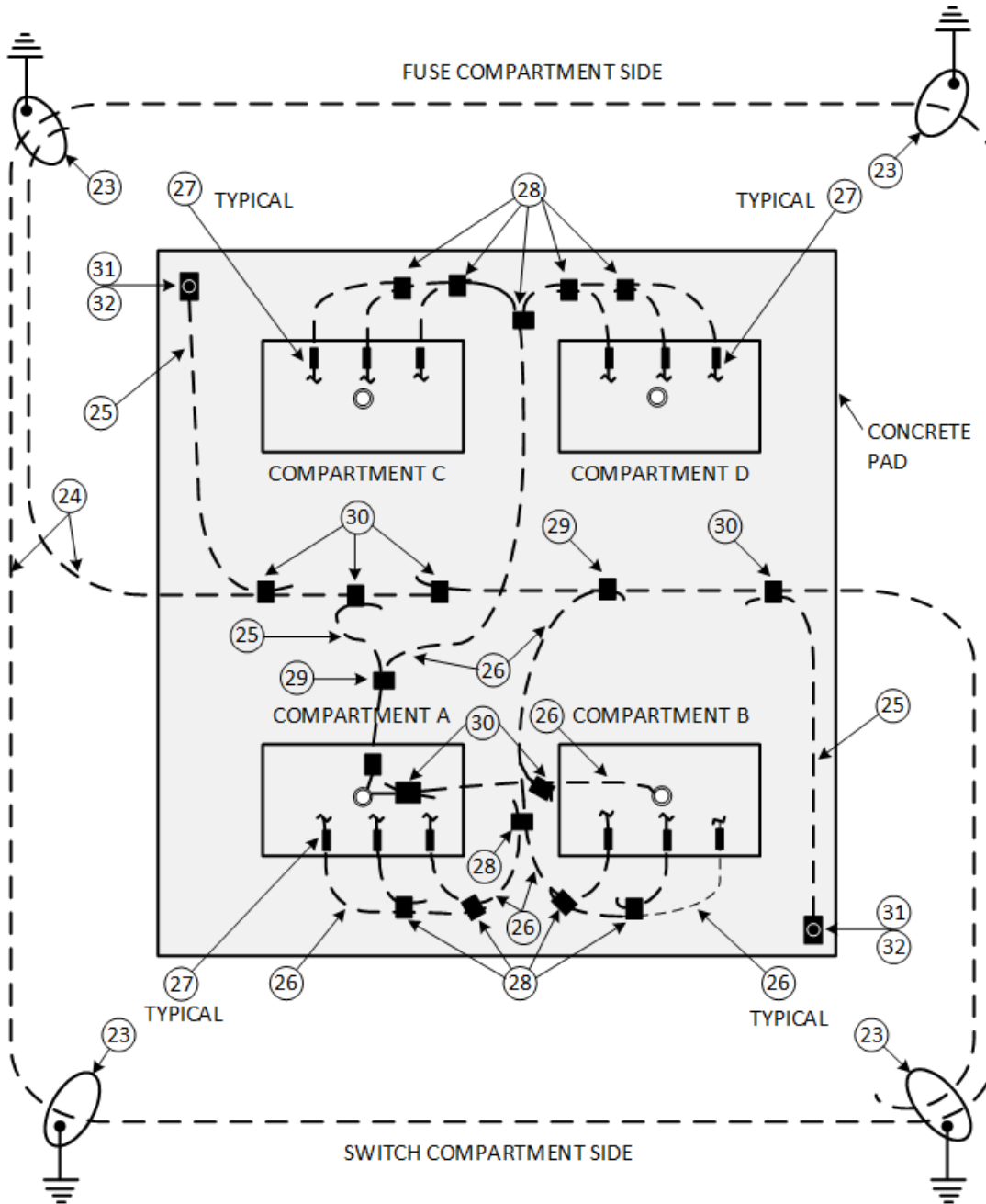
The SCL Engineer shall determine fuse size, type, and quantity. See SCL 6840.10 and SCL 6840.15 for the fuse material standard. See SCL 1065.17 for the primary fuse selection work practice for the Looped Radial system.

3.6 Grounding Connection

Grounding for switchgear shall be constructed in accordance with Figure 3.6.

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

Figure 3.6. Switchgear Grounding



3.7 Insulated Neutral

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

3.8 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

When connecting elbows, avoid placing any intentional strain on the switch or fuse bushings.

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

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

Cables in the fuse termination compartments must be fed between the horizontal cable guides so they will not interfere with the TransFuser Mounting operation. See Figure 3.3b for cable routing details.

Clip-style fuses are used with S&C PME switchgear. Hinge-mounted fuses are used with FPE PSE switchgear. Engineers should select the fuse based on the type of switchgear that is being purchased. If the switchgear type is unknown, select both fuse styles. The unused clip-style or hinge-mounted fuses can then be returned back to stock.

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 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. Material List

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

| Fig | Compatible Unit | ID | Quantity | | | |
|------|---|---------|----------|----|----|----|
| 3.3a | PSE-12 Switchgear | SWPSE12 | | | | |
| 3.3b | | | | | | |
| 3.3a | PSE-11 Switchgear | SWPSE11 | | | | |
| 3.3b | | | | | | |
| 3.3a | PSE-10 Switchgear | SWPSE10 | | | | |
| 3.3b | | | | | | |
| 3.3a | PSE-9 Switchgear | SWPSE9 | | | | |
| 3.3b | | | | | | |
| # | Material Description | ID | | | | |
| 1 | PSE-9 | 014805 | 1 | - | - | - |
| 1 | PSE-10 | 014806 | - | 1 | - | - |
| 1 | PSE-11 | 014807 | - | - | 1 | - |
| 1 | PSE-12 | 014808 | - | - | - | 1 |
| 7 | Sign, "Danger Hazardous Voltage" | 765182 | 2 | 2 | 2 | 2 |
| 8 | Sign, "Call 811 Before You Dig" | 765255 | 1 | 1 | 1 | 1 |
| 9 | Sign, "Notice: Landscaping Requirements" | 014125 | 1 | 1 | 1 | 1 |
| 10 | Channel rack, support, 1-5/8" x 1-5/8" | 723502 | 10 | 10 | 10 | 10 |
| 12 | Anchor bolt, carbon steel, expansion | 780104 | 4 | 8 | 8 | 8 |
| 14 | Panel | 766300 | 1 | 1 | 1 | 1 |
| 15 | Nail, anchor drive, 1/4" x 1" | 780010 | 2 | 2 | 2 | 2 |
| 21 | Sealant, electrical (not shown in figure) | 736470 | 1 | 1 | 1 | 1 |
| 22 | Tape, plastic, electrical (not shown in figure) | 736655 | 2 | 2 | 2 | 2 |

Table 5b. Materials for Switchgear Grounding

| Fig | Compatible Unit | ID | Qty |
|-----|--|------------|-----|
| 3.6 | PSE Switchgear Grounding | GRND-SWPSE | |
| | | | |
| # | Material Description | ID | |
| 25 | Wire, 2/0, bare Cu, soft drawn, stranded | 610425 | 6 |
| 26 | Wire, #2, bare Cu, soft drawn, stranded | 610434 | 50 |
| 27 | Connector, compression, Cu, "C", #2 to #4 | 677325 | 12 |
| 28 | Connector, compression, Cu, "C", #2 to #2 | 677326 | 13 |
| 29 | Connector, compression, Cu, "C", 2/0-4/0 to #2 | 677330 | 2 |
| 30 | Connector, compression, Cu, "C", 2/0-4/0 | 677332 | 3 |
| 31 | Terminal, Compression, Cu, paddle 2/0 | 677077 | 2 |
| 32 | Bolt assembly kit, stainless steel, 1/2" - 13 x 2" | 782040 | 2 |

Table 5c. Customer-Supplied Material

| # | Material Description | Stock No. | PSE 9 | PSE 10 | PSE 11 | PSE 12 |
|----|--|-----------|-------|--------|--------|--------|
| 23 | Ground rods and clamps | 564238 | 4 | 4 | 4 | 4 |
| 33 | Connector, 2 cables, (#4 AWG -2/0) to 5/8" rod | 676551 | 4 | 4 | 4 | 4 |
| 24 | Wire, 2/0, bare Cu, SD, stranded (ft) | 610425 | 80 | 80 | 80 | 80 |
| 20 | Pad (typical design drawing provided by SCL) | - | 1 | 1 | 1 | 1 |

Table 5d. Materials to be Selected and Quantified by Engineer (see Figures 3.3a and 3.3b)

| # | Material Description | ID |
|----|--|--------|
| 2 | Cold Shrink 600 A Elbow Kit with Range-Taking, Shear Bolt, 350-500 AWG | 014312 |
| 2 | Cold Shrink 600 A Elbow Kit with Range-Taking, Shear Bolt, 750-1250 AWG | 014313 |
| 2 | Cold Shrink 600 A Elbow Kit with Range-Taking, Shear Bolt and Integral 200 A Loadbreak Tap, 350-500 AWG | 014315 |
| 2 | Cold Shrink 600 A Elbow Kit with Range-Taking, Shear Bolt and Integral 200 A Loadbreak Tap, 750-1250 AWG | 014316 |
| 3 | Cable, 28 kV, Triplex Insul., Flat Strap Shielded, 350 kcmil | 011962 |
| 3 | Cable, 28 kV, Triplex Insul., Flat Strap Shielded, 500 kcmil | 011963 |
| 3 | Cable, 28 kV, Triplex Insul., Flat Strap Shielded, 750 kcmil | 011964 |
| 3 | Cable, 28 kV, Triplex Insul., Flat Strap Shielded, 1000 kcmil | 012501 |
| 4 | Loadbreak elbow kit for 28 kV, 1/0 AWG cable | 686445 |
| 5 | Cable, 28 kV, AL, Concentric Neutral, 1/0 solid | 012098 |
| 6 | Fuse, current-limiting, full range, 25X, hinge-mounted | 014332 |
| 6 | Fuse, current-limiting, full range, 40X, hinge-mounted | 014331 |
| 6 | Fuse, current-limiting, full range, 65X, hinge-mounted | 014330 |
| 11 | Thermoplastic cable support assembly, 28 kV, 1/0, 2/C, bare | 011961 |
| 11 | Thermoplastic cable support assembly, 28 kV, 350 kcmil, 1/C | 011962 |
| 11 | Thermoplastic cable support assembly, 28 kV, 500 kcmil, 1/C | 011963 |
| 11 | Thermoplastic cable support assembly, 28 kV, 750 kcmil, 1/C | 011964 |
| 11 | Thermoplastic cable support assembly, 28 kV, 1000 kcmil, 1/C | 012501 |
| 34 | Inflatable conduit sealing device, 4.75"-5" conduit range (not shown) | 737533 |
| 35 | Inflatable conduit sealing device, 3.25"-4.5" conduit range (not shown) | 737532 |
| 36 | Fuse, current-limiting, full range, 25X, clip-style | 014775 |
| 36 | Fuse, current-limiting, full range, 40X, clip-style | 014776 |
| 36 | Fuse, current-limiting, full range, 65X, clip-style | 014477 |

Table 5e. Miscellaneous Non-Stock Materials

| # | Material Description |
|----|--|
| 13 | Padlock, SNM-1 |
| 17 | Label, Equipment (PS) Number |
| 18 | Label, Switch (SW) Number |
| 19 | Label, Compartment Identification Letter |

6. References

SCL Construction Standard 0801.03; “Switchgear, 27 kV, Padmount, Dead-Front, PME-Style”

SCL Material Standard 4507.80; “Switchgear, 27 kV, Three-Phase, Dead-Front, Padmount”

SCL Material Standard 6840.15; “Fuses, 15.5 kV, Full-Range, Current-Limiting, Type X, Clip Style”

SCL Material Standard 6840.10; “Fuses, 15.5 kV, Full-Range, Current-Limiting, Type X, Hinge-Mounted”

SCL Work Practice 1065.17; “Primary Fuse Selection, Looped Radial System”

SCL Work Practice 0525.81; “Primary Cable Preparation”

7. Sources

Federal Pacific Electric Product Bulletin PB-2A-215; Type PSE Manual Dead-Front Pad-Mounted Switchgear

Federal Pacific Electric Switchgear Product Catalog; Type PSE Manual Dead-Front Pad-Mounted Switchgear

Shetab, Muneer; SCL Standards Engineer, originator, and subject matter expert for 0801.04

SCL Construction Standard 0801.02; “Switchgear, 27 kV, Padmount, Live-Front”