

## Operating Padmount, In-Building, and Subsurface Switchgear



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### 1. Scope

This work practice outlines the preferred steps for maximizing operator safety when operating dead front, Looped Radial and Network switchgear located on pads, in in-building vaults, or in subsurface vaults.

The following content is outside the scope of this work practice:

- Overhead switchgear
- Livefront switchgear
- PPE
- Confined space protocol
- Clearance procedures
- Worker training and certification requirements
- Voltage detection
- Grounding
- Emergency, pre-service testing, and other non-routine situations

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## 2. Application

This work practice is directed at qualified persons who operate manual and remote-supervisory capable padmount and underground distribution switchgear.

Any individual operating distribution switchgear shall have read and understand the manufacturer's operating instructions.

The objective behind this work practice is to make the workplace as free from recognized hazards as reasonably possible. Following these rules may sometimes require that employee safety receive a higher priority than speed and work performance.

See SCL 9202.17 for detailed discussions of the different types of S&C Electric switchgear and accessories in service on the City Light Looped Radial and Network distribution systems.

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## 3. Specialized Equipment

### 3.1 Manual Switchgear

Manual switchgear is operated using a remote (portable) motor operator. Kits are available from the Tool Room. See Figure 3.1.

For more information, see S&C Electric Co. Instruction Sheet 681-525 (available online).

**Figure 3.1. Remote (Portable) Motor Operator Kit Items**



**Remote (Portable) Motor Operator**



**50-ft Cable with Remote Control**

### 3.2 Remote Supervisory Capable Switchgear

Remote supervisory capable switchgear requires a portable remote control (Stock No. 013348) and a 50-ft control cable (Stock No. 013350) to operate a switch away from the LVE.

For more information, see S&C Electric Co. Instruction Sheet 681-525 (available online).

## 4. Procedures, S&C Electric Vista Switches

### 4.1 Manually Controlled

#### 4.1.1 Padmount Style

Follow these steps. See Figure 4.1.1.

Step	Action
1	Approach the switch.
2	Open the padmount (PM) cabinet.
3	Lift viewing window cover for Way 1 and confirm SF6 gas pressure is in the green (ok to operate) zone.
4	Lift viewing window cover for the way being operated and confirm the position of the load interrupter switch by visually observing the position of the blades.
5	Remove the padlock for the way being operated.
6	Install a portable motor operator on the switch way to be operated. <sup>1</sup>
7	Connect low voltage pendant to the portable motor operator.
8	Connect power to the portable motor operator.
9	Direct personnel in the vicinity to step back from the switch.
10	Step back a comfortable distance from the switch and open, close, or ground the switch way using the low voltage pendant.
11	Return to the switch, lift viewing window cover, and confirm the position of the load interrupter switch by visually observing the position of the blades.
12	Disconnect the low voltage pendant and power from the portable motor operator to remove the tripping hazard and reduce the chance of inadvertent operation.
13	Remove portable motor operator.
14	Relock the way operated.
15	Complete planned work.

<sup>1</sup> Some padmount switch enclosures interfere with the PMO. See Vista Switch Memo No. 012 for details.

**Figure 4.1.1. Manually Controlled Padmount-Style Switch**

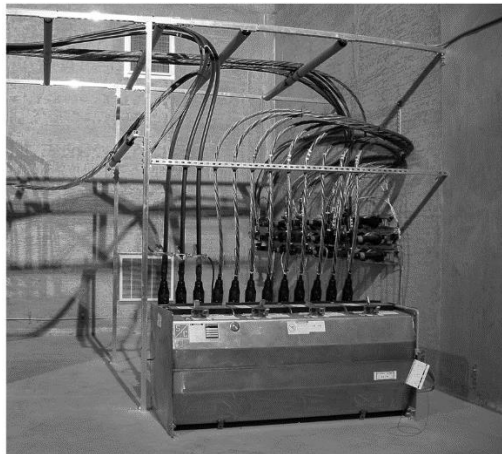


#### 4.1.2 Dry, In-Building Vault

Follow these steps. See Figure 4.1.2.

Step	Action
1	Enter the room containing the switch.
2	Lift viewing window cover for Way 1 and confirm SF6 gas pressure is in the green (ok to operate) zone.
3	Lift viewing window cover for the way being operated and confirm the position of the load interrupter switch by visually observing the position of the blades.
4	Remove the padlock for the way being operated.
5	Install a portable motor operator on the switch way to be operated.
6	Connect low voltage pendant to the portable motor operator.
7	Connect power to the portable motor operator.
8	Exit the room ensuring it is vacant of personnel.
9	Open, close, or ground the switch way using the low voltage pendant.
10	Return to the switch, lift viewing window cover, and confirm the position of the load interrupter switch by visually observing the position of the blades.
11	Disconnect the low voltage pendant and power from the portable motor operator to remove the tripping hazard and reduce the chance of inadvertent operation.
12	Remove portable motor operator.
13	Relock the way operated.
14	Complete planned work.

**Figure 4.1.2. Switch in Dry, In-Building Vault**



### 4.1.3 Wet, Subsurface Vault

Follow these steps. See Figure 4.1.3.

Step	Action
1	Enter the space containing the switch.
2	Lift viewing window cover for Way 1 and confirm SF6 gas pressure is in the green (ok to operate) zone.
3	Lift viewing window cover for the way being operated and confirm the position of the load interrupter switch by visually observing the position of the blades.
4	Remove the padlock for the way being operated.
5	Install a portable motor operator on the switch way to be operated.
6	Connect low voltage pendant to the portable motor operator.
7	Connect power to the portable motor operator.
8	Exit the space ensuring it is vacant of personnel.
9	Open, close, or ground the switch way using the low voltage pendant.
10	Return to the switch, lift viewing window cover, and confirm the position of the load interrupter switch by visually observing the position of the blades.
11	Disconnect the low voltage pendant and power from the portable motor operator to remove the tripping hazard and reduce the chance of inadvertent operation.
12	Remove portable motor operator.
13	Relock the way operated.
14	Complete planned work.

**Figure 4.1.3. Switch in Wet, Subsurface Vault**



## 4.2 Remote Supervisory Capable

### 4.2.1 Padmount Style with Low Voltage Enclosure (LVE)

Follow these steps. See figures 4.2.1a and 4.2.1b.

Step	Action
1	Approach the switch.
2	Open the padmount (PM) cabinet.
3	Lift viewing window cover for Way 1 and confirm SF6 gas pressure is in the green (OK to operate) zone. <sup>1</sup>
4	Lift viewing window cover for the way being operated and confirm the position of the load interrupter switch by visually observing the position of the blades.
5	Remove the padlock for the way being operated.
6	Unlock and open the LVE cabinet. <sup>2</sup>
7	Connect portable remote control and 50-ft control cable to the appropriate way port on face of LVE panel. See Figure 4.2.1b.
8	Direct personnel in the vicinity to step back from the switch.
9	Step back a comfortable distance from the switch and open, close, or ground the switch way using the pendant.
10	Return to the switch, lift viewing window cover, and confirm the position of the load interrupter switch by visually observing the position of the blades.
11	Relock the way operated.
12	Disconnect the remote control and 50-ft control cable from the LVE panel to remove the tripping hazard and prevent inadvertent operation.
13	Complete planned work.

<sup>1</sup> Some LVEs have an SF gas pressure indicator LED. "LED ON" means "OK to operate."

<sup>2</sup> A small number of pedestal-type LVE control panels have open, close, and ground buttons that do not function. For these locations, follow the steps listed in Section 4.2.2.



Figure 4.2.1a. Padmount-Style Switch

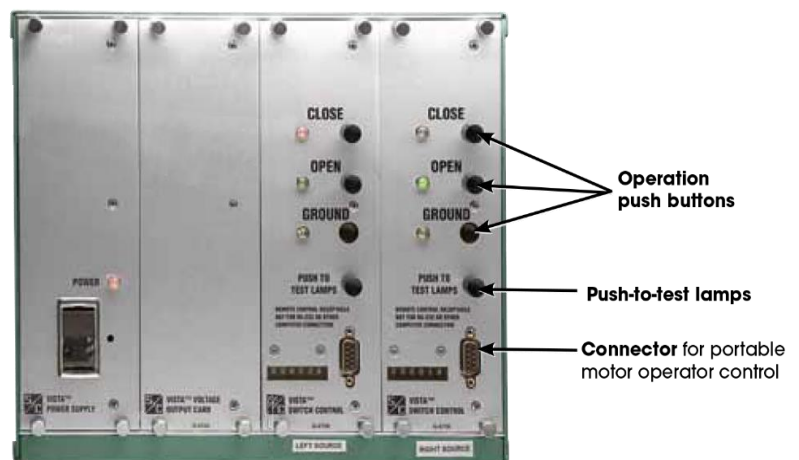


Figure 4.2.1b LVE Front Panel (representative)



#### 4.2.2 Dry, In-Building Vault with LVE in Same Room as Switch

Follow these steps. See figures 4.2.1b, 4.2.2a and 4.2.2b.

Step	Action
1	Enter the room containing the switch.
2	Lift viewing window cover for Way 1 and confirm SF6 gas pressure is in the green (ok to operate) zone.
3	Lift viewing window cover for the way being operated and confirm the position of the load interrupter switch by visually observing the position of the blades.
4	Remove the padlock for the way being operated.
5	Unlock and open the LVE cabinet.
6	Connect portable remote control and 50-ft control cable to the appropriate way port on face of LVE panel.
7	Ensure the room containing the switch is vacant of personnel.
8	Exit the switch room with the portable remote control in hand.
9	Open, close, or ground the switch way using the portable remote control.
10	Re-enter the switch room.
11	Return to the switch, lift viewing window cover, and confirm the position of the load interrupter switch by visually observing the position of the blades.
12	Relock the way operated.
13	Disconnect the remote control and 50-ft control cable from the LVE panel to remove the tripping hazard and prevent inadvertent operation.
14	Complete planned work.



Figure 4.2.2a. Switch in In-Building Vault

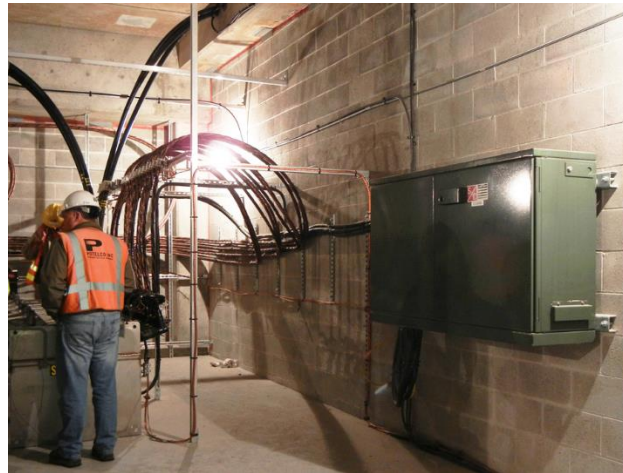


Figure 4.2.2b. Wall-Mount LVE in Same Room as Switch

#### 4.2.3 Dry, In-Building Vault with LVE in Different Room as Switch

Follow these steps.

<b>Step</b>	<b>Action</b>
1	Enter the room containing the switch.
2	Lift viewing window cover for Way 1 and confirm SF6 gas pressure is in the green (ok to operate) zone.
3	Lift viewing window cover for the way being operated and confirm the position of the load interrupter switch by visually observing the position of the blades.
4	Remove the padlock for the way being operated.
5	Ensure the room containing the switch is vacant of personnel.
6	Exit the switch room.
7	Unlock and open the LVE cabinet located outside the switch room.
8	Push the open, close, or ground, button on face of LVE panel for the appropriate way.
9	Close and lock the LVE cabinet.
10	Re-enter the switch room.
11	Return to the switch, lift viewing window cover, and confirm the position of the load interrupter switch by visually observing the position of the blades.
12	Relock the way operated.
13	Complete planned work.



#### 4.2.4 Wet, Subsurface Vault with LVE

Follow these steps. See figures 4.2.1b, 4.2.4a and 4.2.4b.

Step	Action
1	Enter the space containing the switch.
2	Lift viewing window cover for Way 1 and confirm SF6 gas pressure is in the green (ok to operate) zone.
3	Lift viewing window cover for the way being operated and confirm the position of the load interrupter switch by visually observing the position of the blades.
4	Remove the padlock for the way being operated.
5	Exit the space ensuring it is vacant of personnel.
6	Unlock and open the LVE cabinet.
7	Push the open, close, or ground, button on face of LVE panel for the appropriate way.
8	Return to the switch, lift viewing window cover, and confirm the position of the load interrupter switch by visually observing the position of the blades.
9	Relock the way operated.



**Figure 4.2.4a. Switch in Wet, Subsurface Vault**



**Figure 4.2.4b. Pedestal-Type LVE**

## 5. Canada Power Products Puffer Pak Subsurface SF6 Switches

CPP switches are predominately found in the Downtown Network System.

CPP switches were originally purchased without motor operators. Attempts to identify an adequate motor operator to retrofit existing switches never succeeded. CPP switches are operated by means of a (removable) swing handle.

**Figure 5. Puffer Pak Subsurface SF6 Switches**



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## 6. Powerdyne / Kearney / Cooper Power Systems (Eaton) VACpac Switches

VACpac Switches are predominately found on the First Hill Network System. Some switches are operated by means of mechanical handle on the end of a control cable that has been permanently-mounted inside the vault near the entrance. The mechanical handle is intended to be operated from the sidewalk with a shotgun. Note: mechanical handle/control cable systems do not provide electrical isolation for the operator.

There are at least six different types of VACpac switch operators. They are designated VACopI, VACopII, VACopIII, VACop IV, VACopV, and VACopVI.

**Figure 6. VACop IV Operator Attached to VACpac Switch.**



## 7. References

**S&C Electric Co. Instruction Sheet 681-525**; "S&C Vista Underground Distribution Switchgear, Pad-Mounted, Vault-Mounted, and Undercover Styles, Instructions for Installation and Operation of Portable Motor Operator," December 10, 2001

**SCL Design Standard 9202.17**; "Vista Switch Application Guide"

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## 8. Sources

**Cooper Power Series, Underground Distribution Switchgear CA285003EN**; "VACpac Vacuum Switchgear," Eaton, Cleveland, OH, January 2016

**S&C Electric Co. Descriptive Bulletin 680-30**; "S&C Vista Underground Distribution Switchgear Outdoor Distribution, 15.5 kV through 38 kV," S&C Electric Co., June 1, 2004

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