HVL/cc™ Medium Voltage, Metal-Enclosed Switchgear

2.4 to 38 kV, 60 to 150 kV BIL
25 kA Short-time, Indoor or Outdoor
Class 6045

Instruction Bulletin

Retain for future use.

a brand of Schneider Electric

SQUARE D

HAZARD CATEGORIES AND SPECIAL SYMBOLS

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

CAUTION

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** property damage.

NOTE: Provides additional information to clarify or simplify a procedure.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

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SECTION 1— INTRODUCTION

This bulletin contains instructions for the proper installation, operation, and maintenance of HVL/cc™ Metal-Enclosed Switchgear manufactured by Schneider Electric. This product offers switching, metering, and interrupting capabilities for medium voltage systems ranging from 2.4 kV to 38 kV, 60 kV BIL to 150 kV BIL. The equipment is available in a variety of arrangements and in enclosures designed and constructed for indoor (NEMA 1) and outdoor (NEMA 3R) use.

BEFORE YOU BEGIN

Read and understand:

— this bulletin before performing the installation, operation, and maintenance steps described in this bulletin.

— the *HVL/cc Grounding Switch Application* section of the *Metal Enclosed Load Interrupter Switchgear with HVL/cc Switches* catalog (document number 6045CT9801).

NOTE: If more information on the grounding switch application for this equipment is needed, contact your Schneider Electric representative.

Electrical equipment should be installed and serviced only by qualified electrical personnel in accordance with national and local electrical codes.

GENERAL DESCRIPTION

HVL/cc switchgear is made up of modular units containing fixed mounted interrupters with or without replaceable E-rated fuses. It is a compact design with front accessibility. Equipment may be furnished in single or multiple bay units. Sections are shipped assembled for ease of handling and installation. HVL/cc metal-enclosed switchgear from Schneider Electric is designed, manufactured, and tested in accordance with ANSI standards C37.20.3, C37.20.4, C37.57, C37.58, Canadian standards CSA 22.2 no. 31, CSA 22.2 no. 193, and NEMA SG5 where applicable.

ENCLOSURES

HVL/cc Metal-Enclosed Switchgear is available in indoor and outdoor enclosures.

Figure 1: Indoor Switchgear (NEMA1 construction)

Indoor switchgear enclosures (see Figure 1) include these standard features:

- Lifting angles on the top of each shipping section
- Provisions for future expansion (when using main cross bus)
- Clear acrylic viewing ports for inspection of switch blade position
- Steel enclosure per ANSI C37.20.3, NEMA 1
- Full-length ground bus in multiple bay enclosures
- Interlock which prevents removing the load-side panel while the switch or circuit interrupter is closed and/or ground switch is open
- Switch or circuit interrupter interlock (electrical and/or mechanical) which prevents operating the switches main contacts while the load-side door is removed
- Provisions for padlocking the load-side panel
- Key interlocking is optional

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Figure 2: Outdoor Switchgear (NEMA 3R construction)

Outdoor switchgear enclosures (see Figure 2) are designed and manufactured with the following standard features:

- Roof sloped to rear for precipitation runoff
- Operating handles are enclosed
- Formed steel base
- Full-height gasketed front doors.
- Steel enclosure per ANSI C37.20.3, NEMA 3R
- Split rear panels with tamper proof bolts
- Strip heaters in each switch bay
- Stay rods to hold outer-hinged doors in open position

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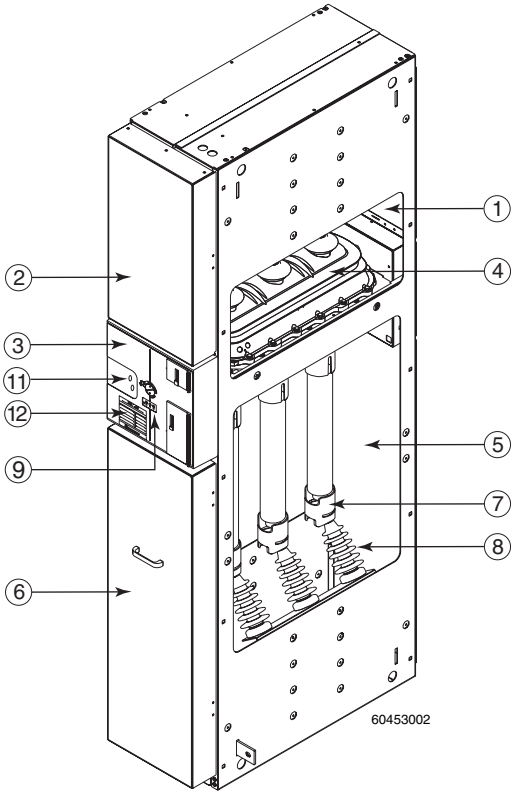
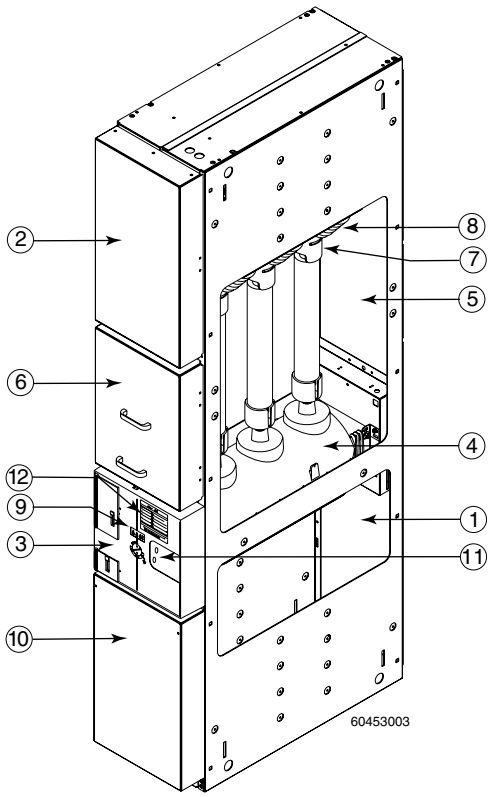
COMPARTMENTS

The information contained in this section describes the compartments of HVL/cc Switchgear (see Figure 3).

Figure 3: Switch Cubicle



Application A (Load side–Bottom)



Application B (Load side–Top)

1. Bus bar compartment
2. Upper panel or LV compartment
3. Mechanism compartment
4. Interrupter switch or disconnector
5. Fuse or Load-side compartment
6. Load-side access Panel
7. Cable Termination
8. Capacitive Divider
9. Live Line Indicators (LLIs)
10. Bolted Front Panel (App. B only)
11. Viewing Ports
12. Rating nameplate

Bus-Bar Compartment

The bus-bar compartment is completely isolated from the other compartments of the equipment by the epoxy body of the interrupter or 11 gauge steel barriers. The bus bars extend continuously through the length of the switchgear and may transition from application A to application B bus compartments and vice versa. Two main bus positions allow future extensions and connections to existing equipment.

HVL/cc bus has been tested to 25 kA for two seconds with 68 kA peak (40 kA momentary) current levels. It has been further tested to the full-integrated level of 63 kA using a four-frame run of bus, including a 29.5 in. (750 mm) compartment. The bus bar is 1/4 in.x 2 in. (6 x 51 mm) tin-plated copper for 600 A or two 1/4 in.x 2 in. (6 x 51 mm) for 1200 A.

Upper Panel/Low Voltage Compartment

The Upper Panel/Low Voltage Compartment has a bolted panel when there are no controls or relays present in this vertical section. When any of these devices are present the low-voltage compartment will have a hinged panel.

The Low Voltage Compartment houses terminal blocks and supports relay or monitoring device that may be supplied with the switchgear line-up. All auxiliary contacts for the control of the mechanism are wired to terminal blocks for customer access and are located in this compartment. Provision for an optional thermal scanning window can be provided in this panel.

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Fuse/Load-side Compartment

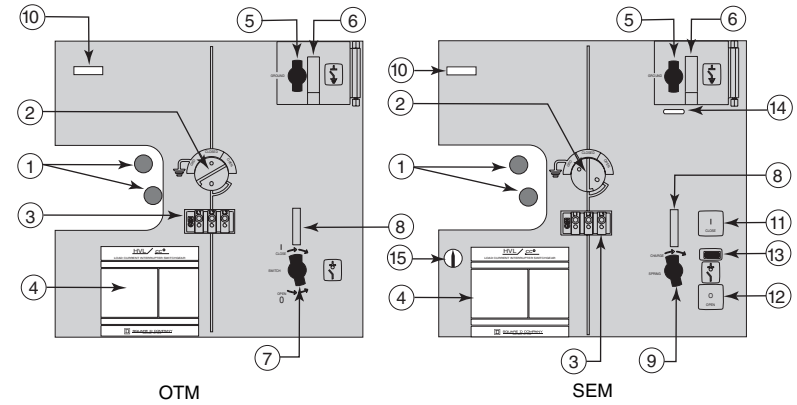
The Fuse/Load-side compartment houses fuses, voltage transformers (VT), the control power transformer (CPT), or bus connections. The panel is interlocked with the switch and can be padlocked by several methods (see Figure 10 on page 16).

Mechanism Compartment

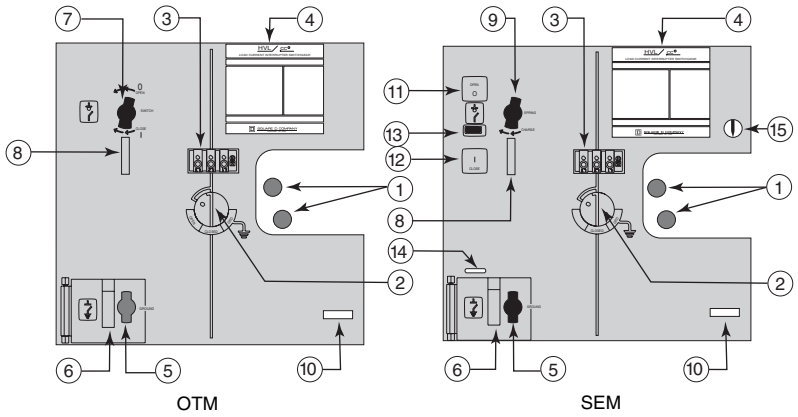
The HVL/cc can be equipped with either an over toggle mechanism (OTM) or a stored energy mechanism (SEM).

The mechanism compartment has a black polycarbonate and steel cover that protects the mechanism. It is etched with instructions for operating the mechanism. The cover also has a mimic bus that shows the position of the switch and contains nameplate information for the interrupter. Two ports for viewing the position of the main blades are located within the mechanism cover. The load-side Live Line Indicators (LLIs) are also positioned on the cover.

Figure 4: Mechanism Covers



Application A (Load-side–Bottom)



Application B (Load side–Top)

1. Viewing Ports
2. Mimic Bus
3. Live Line Indicators (LLIs)
4. Rating Nameplate
5. Ground Switch Operating Port (OTM/SEM if equipped)
6. Ground Switch Padlock Provision
7. Switch Operating Port (OTM)
8. Padlock Provision
9. Spring Charging Port (SEM)
10. Switch Operation Counter (if equipped)
11. Close Push Button (SEM)
12. Open Push Button (SEM)
13. Spring Charge Indicator (SEM)
14. Mechanical Interlock Opening Lever (SEM only if equipped)
15. Motor Cut-off Switch (SEM only—if equipped)

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MECHANISMS

The mechanism compartment cover comes with optional padlock provisions for blocking access to the control functions of the interrupter. The covers do not prevent electrical operation of either the mechanism or the Fuselogic™ function from tripping the interrupter.

Optional electrical mechanical, and/or keyed interlocks can be supplied to block the switch operations outlined in this bulletin.

The HVL/cc Switchgear Mechanism Compartment contains the operators for both the main switch and the grounding switch. Available mechanisms are listed below:

- — Manually operated Over Toggle Mechanism (Type OTM)
- — Motor operated Over Toggle Mechanism (Type OTM)
- — Manually operated Stored Energy Mechanism (Type SEM) with optional Fuselogic system
- — Motor operated Stored Energy Mechanism (Type SEM) with open and close coils, and optional Fuselogic system

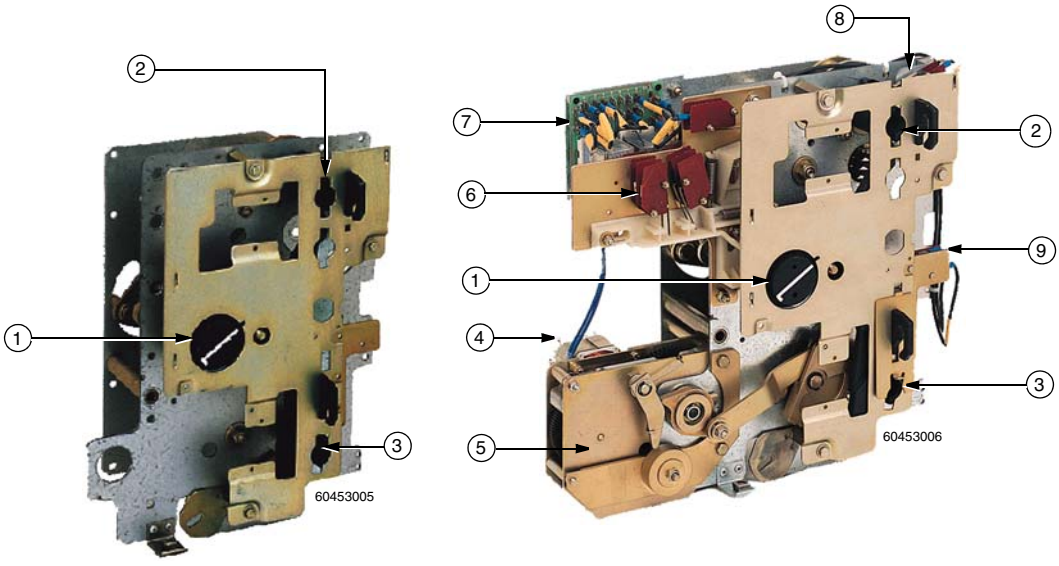
NOTE: Only manually operated OTM and SEM available in Class 1, Division 2 applications.

Over-toggle Mechanism (OTM)

The OTM is the standard mechanism supplied with the HVL/cc switchgear. The mechanism requires the springs to be compressed into an over-toggle position where they release their energy for closing and opening the device. The speed of the blades is independent of the user. The OTM is available with a motor for remote electrical operation and can be supplied with auxiliary contacts with or without the motor (see Figure 5).

The grounding switch actuator is optional on the OTM mechanism. It is an over-toggle actuator and has a fault close rating equal to that of the switch. It may be blocked if required for application. Motor operation is not available for the grounding switch.

Figure 5: Over-Toggle Mechanism (OTM)



Non-motorized **Motorized**

1. Open/Close & Ground Position Indicator
2. Ground Switch Port (if equipped)
3. Over-toggle Port
4. Motor
5. Motor Gear Box
6. Auxiliary Contacts
7. Motor Control Circuit Board
8. Ground Switch Cutoff Microswitch
9. Main Interrupter Cutoff Microswitch

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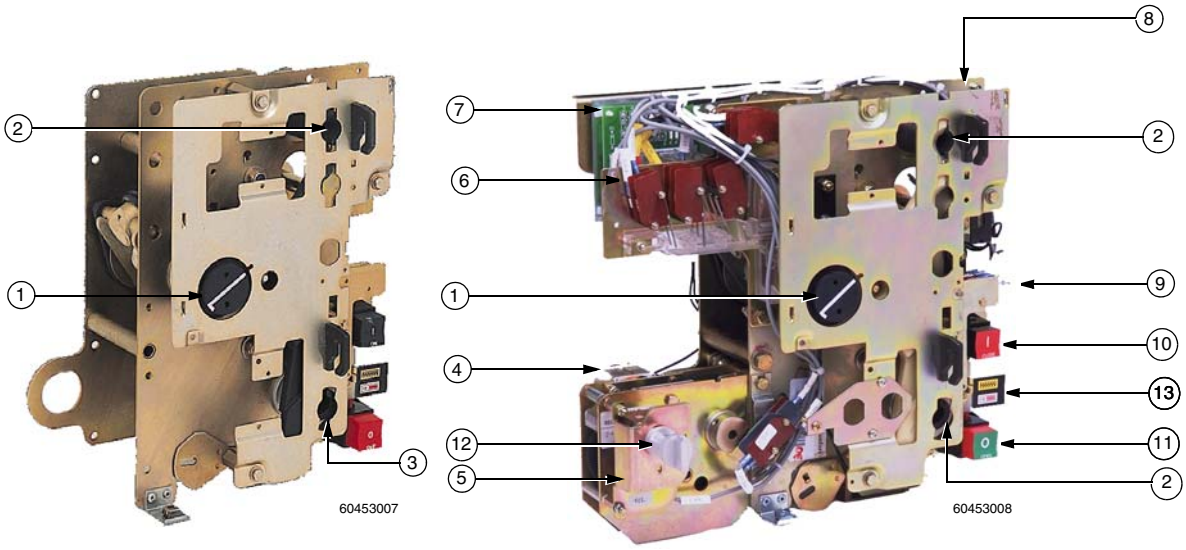
Stored Energy Mechanism (SEM)

The SEM is the optional mechanism for HVL/cc. It is supplied when remote trip or close is required.

The SEM requires a single action to charge both opening and closing springs. The opening spring is still charged first, therefore, the switch is immediately ready to trip after the switch has been closed. The SEM is provided when direct tripping for the Fuselogic™ system is ordered. The SEM is available with a motor for remote electrical operation and can be supplied with auxiliary contacts with or without the motor. It can be supplied with only an opening coil. When a motor is supplied the opening and closing coils are also included. An under voltage release is available with the mechanism. This mechanism is also used in all transfer schemes.

The grounding switch actuator is optional on the SEM mechanism. It is an over-toggle actuator as on the OTM and has a fault close rating equal to that of the switch. Motor operation is not available for the grounding switch.

Figure 6: Stored Energy Mechanism (SEM)



Non-motorized **Motorized**

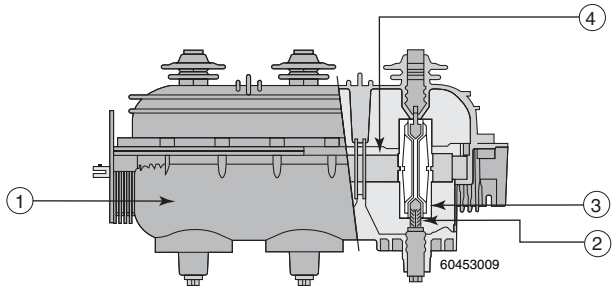
1. Open/Close & Ground Position Indicator
2. Ground Switch Port (if equipped)
3. Spring Charge Port
4. Motor
5. Motor Gear Box
6. Auxiliary Contacts
7. Motor Control Circuit Board
8. Ground Switch Cut-off Microswitch
9. Main Interrupter Cut-off Microswitch
10. Close Push Button
11. Open Push Button
12. Motor Cut-off Microswitch
13. Spring Charge Indicator

INTERRUPTER SWITCH

The interrupter housing is an epoxy enclosure that is sealed for life and contains SF_6 gas at 5.8 psi gauge for up to 17.5 kV switchgear and 22 psi gauge for 25.8–38 kV switchgear. The SF_6 gas is used to help extinguish the electrical arc. This low-pressure enclosure protects the main contacts from the environment. It completely contains all interruption by-products, including the arc, allowing this interrupter to be used in environments where air switches are not suitable.

NOTE: L1, L2, and L3 labeling on the switch housing is not representative of phase sequence A, B, C.

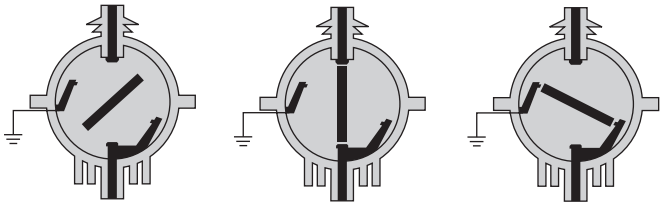
Figure 7: Cross-section of the Interrupter Switch/Disconnector



1. Switch Epoxy Housing
2. Fixed Contact
3. Switch Blades
4. Operating Shaft

The three rotating blades are sealed in the enclosure and have only one external rotating seal. Figure 8 shows the three positions of the rotating blades.

Figure 8: Contact Blade Positions



The distance between the fixed and moving contacts is sufficient to withstand the normal recovery voltage and system-imposed transient recovery voltages (TRVs). The distance is great enough to also withstand 110% of the rated BIL and 60 cycle withstand voltages.

Optional Grounding Switch

The interrupter switch has an optional feature which enables the switch to be grounded. For more information on units with grounding switches refer to the *HVL/cc Grounding Switch Application* section of the *Metal Enclosed Load Interrupter Switchgear with HVL/cc Switches* catalog (document number 6045CT9801) or call your local Schneider Electric representative.

LOAD-SIDE ACCESS PANEL

The load-side access panel is mechanically interlocked with the switch. It is provided with locating and latching hooks and a “tee” slot for the switch interlock (see Figure 10 on page 16). When the optional load-side discharge assembly (LDA) is supplied, a view port is also provided for identifying the position of the LDA. Provision for an optional thermal scanning window can also be provided in this panel.

CABLE TERMINATION

Lugs are provided for HVL/cc. **DO NOT USE OTHER MANUFACTURERS LUGS** for the medium voltage cable unless authorized by Schneider Electric. The lugs are mounted inside the field shapers and will accommodate one or two cables.

FUSELOGIC™ SYSTEM COMPONENTS

The Fuselogic system prevents inadvertent switching until fuses have been installed or blown ones replaced. The system is provided as an option on HVL/cc Metal-Enclosed Switchgear. It is available with the SEM mechanism only.

The Fuselogic system uses Square D medium voltage fuses with special blown fuse indicator pin. This blown fuse indicator works in conjunction with the switch to form a simple lockout mechanism. The Fuselogic™ system functions without auxiliary power in most cases.

BLOWN FUSE INDICATOR (BFI)

The optional BFI is available with either the OTM or SEM mechanisms. The assembly is located on the line side of the fuse. It operates a flag that can be seen through a hole in the mechanism cover. The BFI drives a direct acting trip or a time delayed trip when supplied with Fuselogic system schemes.

LIVE-LINE INDICATORS (LLI)/ CAPACITIVE DIVIDER (CD)

The LLIs are equipped with neon lamps that indicate the presence of voltage. They are visible on the front of the mechanism cover. They are wired to the CD located on the load side of the switch. Optional CDs are installed on the main bus or line side of the switch with the LLI mounted on the front panel.

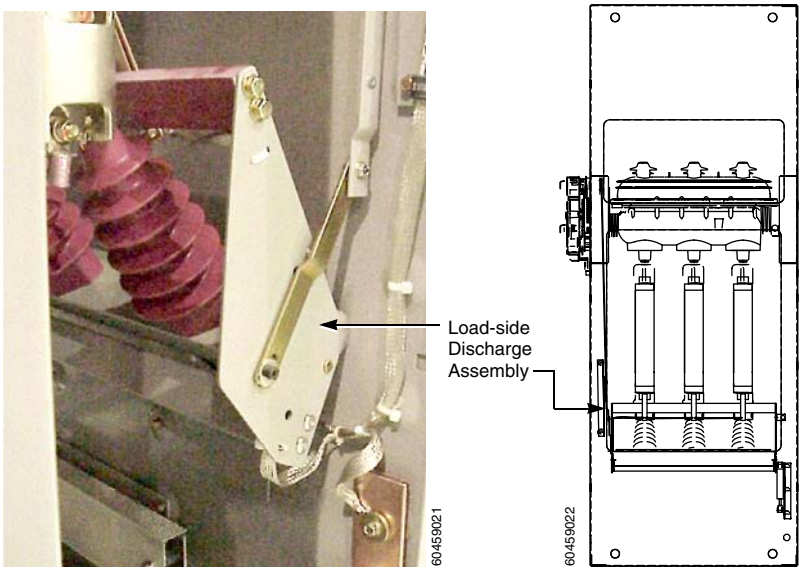
Test ports on the LLIs are suitable for testing voltage with a properly rated voltage sensing device (see Figure 34 on page 43). LLIs are not a replacement for voltage indication when accessing a switch compartment. Use properly rated test equipment to ensure no voltage is present before performing any maintenance procedures.

The CD is a standoff support insulator with the capacitor permanently bonded inside. The power from this capacitor provides the energy required for the neon lamps of the LLIs. The energy can also be used to activate optional features such as an auto-transfer scheme.

LOAD-SIDE DISCHARGE ASSEMBLY (LDA)

The LDA is a device used to discharge to ground any residual voltage on the load side of the fuses after the grounding switch has closed. The device operates in conjunction with the grounding switch and is available only on fused units equipped with an optional grounding switch.

Figure 9: Load-side Discharge Assembly Location



Front View **Side view (enclosure)**

For more information on units with grounding switches refer to the “HVL/cc Grounding Switch Application” section of the “Metal Enclosed Load Interrupter Switchgear with HVL/cc Switches” catalog (document number 6045CT9801) or call your local Schneider Electric representative.

⚠ WARNING

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- Use the load-side discharge assembly (LDA) only where there is no possibility of load-side back-feed from alternate power sources such as commercial power, down stream generator, and/or charged capacitor bank.

Failure to follow these instructions can result in death or serious injury.

NOTE: The LDA does not have fault making capabilities.

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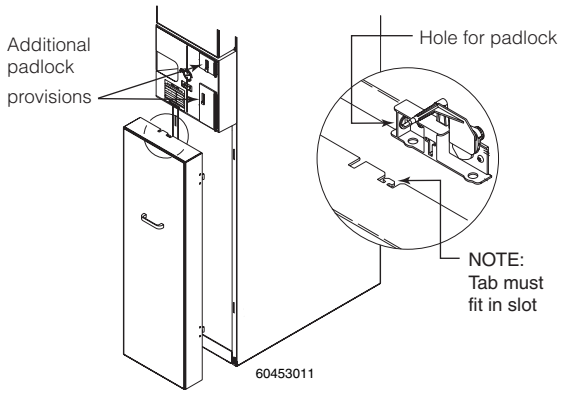
PANEL INTERLOCKS

The HVL/cc is equipped with mechanical interlocks as a standard feature to minimize hazards to the user. The switch interlock prevents removing the load-side panel while the load interrupter switch is closed (also open and ungrounded if so equipped). Padlock provisions are also available for the load-side panel.

Additional padlocking provisions are available for both or either the motor cut-off switch and/or the ground switch. The load switch can be padlocked by using an optional padlocking provision located on the polycarbonate hinge covers of the mechanism cover.

Key interlocks are optional equipment. They are often supplied in conjunction with metal-enclosed switchgear to direct proper operation and coordination of the equipment. The key interlock schemes are usually described on the switchgear assembly drawings supplied with the equipment.

Figure 10: Panel Interlock Provisions



CLASS 1, DIVISION 2 CERTIFICATION

The Class 1, Division 2 switchgear is used in hazardous areas and is self-certified for use in T3B locations with heaters and T5 locations without heaters. The Class 1, Division 2 switchgear is maintained in the same manner as the standard switchgear with the exceptions noted throughout this bulletin. Special features of Class 1, Division 2 rated equipment are:

- — Explosion proof T3B rated heaters
- — Uses only non-indicating fuses (see Figure 32 on page 40)
- — Uses only manually operated switch mechanisms (OTM or SEM)
- — Test ports on the LLI heads are factory plugged.

SEISMIC CERTIFICATION

Introduction

HVL/cc Metal-enclosed Switchgear that is seismically certified has been qualified to the site-specific seismic requirements of the listed model building codes and/or standards. Optional construction features may be required, depending on the location of the installation and the particular code and/or standard of interest. Seismic certificates of compliance and equipment labels are provided with all seismically certified switchgear. To maintain the validity of this certification, the installation instructions provided in this bulletin must be followed.

Responsibility for Mitigation of Seismic Damage

For the purposes of the model building codes, HVL/cc Metal-enclosed Switchgear is considered a nonstructural building component. Equipment capacity was determined from tri-axial seismic shake table test results as defined in the International Code Counsel Evaluation Service (ICC ES) Acceptance Criteria for Seismic Qualification Testing of Nonstructural Components (AC156).

Unless otherwise indicated, an equipment importance factor of 1.5 (IP = 1.5) was used, indicating that equipment functionality was verified before and after shaker table seismic simulation testing. This importance factor is indicative of critical facilities where maximizing the probability of post event functionality is a priority.

AC156 is published by the ICC ES and has been recognized by the Building Seismic Safety Council (BSSC) as an appropriate methodology in the 2003 National Earthquake Hazard Reduction Program (NEHRP) commentary. The National Institute of Building Sciences established the BSSC in1979 to develop and promote regulatory provisions for earthquake risk mitigation at the national level.

Incoming and outgoing cable and conduit must also be considered as related but independent systems. They must be designed and restrained to withstand the forces generated by the seismic event without increasing the load transferred to the equipment. For applications where seismic hazard exists, bottom entry and/or exit of cable and conduit is preferred.

If the spectral acceleration value (Ss as defined by the International Building Code or NFPA 5000) is in excess of 2.67g (such as the New Madrid seismic area), then the equipment must also be braced at the top using a lateral restraint system. A lateral restraint system is also required in situations where horizontal motion at the top of the switchgear is not desirable (such as applications where top entry and/or exit of conduit are used). This system must be capable of transferring the loads created to the load-bearing path of the building structural system.

Seismic qualification of nonstructural components by Schneider Electric is just one link in the total chain of responsibility required to maximize the probability that the equipment will be intact and functional after a seismic event. During a seismic event, the equipment must be able to transfer the loads that are created through the mounting pad and anchorage to the load-bearing path of the building structural system.

The structural civil engineer or design engineer of record is responsible for detailing the equipment connection and anchorage requirements (including the lateral restraint system if appropriate) for the given installation. The installer and manufacturers of the anchorage and lateral restraint system are responsible for assuring that the mounting requirements are met. Schneider Electric is not responsible for the specification and performance of these systems.

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SECTION 2— SAFETY PRECAUTIONS

Carefully read and follow to the safety precautions outlined below before attempting to lift, move, install, use, or maintain HVL/cc Metal-Enclosed Switchgear and its components.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Only qualified electrical personnel familiar with medium voltage circuits should perform the instructions in this bulletin. Personnel must understand the hazards involved in working with or near medium voltage equipment.
- Qualified electrical personnel must perform work in accordance with national and local electric codes.
- Perform such work only after reading and understanding all of the instructions contained in this bulletin.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Before performing visual inspections, tests, or maintenance on the equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, grounded, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of back-feeding.
- Before making any electrical connection, ensure that all leads to be connected are de-energized with proper safety grounds applied.
- Metal-enclosed switchgear have interlocks designed to minimize hazards to the user. It is not possible to eliminate every hazard with interlocks. The user of this device is responsible for recognizing the potential hazards, for wearing protective safety equipment, and for taking adequate safety precautions.
- Do not make any adjustments to the equipment or operate the system with safety features removed. Contact your local Schneider Electric representative for additional instructions if the device does not function as described in this manual.
- Handle this equipment carefully and install, operate and maintain it correctly in order for it to function properly. Neglecting fundamental installation and maintenance requirements may lead to personal injury, as well as damage to electrical equipment or other property.
- Carefully inspect your work area and remove any tools and objects left inside the equipment.
- Replace all devices, doors, and covers before turning on the power to this equipment.
- All instructions in this manual are written with the assumption that the customer has taken these measures before performing maintenance or testing.

Failure to follow these instructions will result in death or serious injury.

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SECTION 3— RECEIVING, HANDLING, AND STORAGE

This chapter contains information regarding the receiving, handling, and storage of HVL/cc Metal-Enclosed Switchgear.

RECEIVING

Metal-enclosed switchgear is shipped on skids with protective wrapping to prevent damage during normal transit. Check the packing list against the equipment received to ensure the order and shipments are complete. Claims for shortages or other errors must be made in writing to Schneider Electric within 30 days after receipt of shipment. Failure to do so constitutes unqualified acceptance and a waiver of all such claims by the purchaser.

Upon receipt, immediately inspect the switchgear for damage that may have occurred during transit. If damage is found or suspected, immediately file a claim with the carrier and notify Schneider Electric.

Identification

The rating nameplate is located on the front cover of the operating mechanism. Included on the nameplate is the following information:

- Factory order number
- Manufacture date
- Rated maximum voltage
- Impulse BIL (kV)
- Power frequency withstand (kV)
- Frequency
- Switch continuous current (amperes)
- Main bus ratings
- Momentary current (kA)
- Short time current (kA)
- Fault closing current (kA)
- Fuse information

NOTE: All ratings are the MAXIMUM limits of the equipment.

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HANDLING

Switchgear is normally shipped in an upright position. However, single frames may be shipped laying down. Be sure to return switchgear to an upright position prior to installation.

Use care when uncrating, rolling, hoisting, or handling the switchgear.

⚠ CAUTION

HAZARD OF PERSONAL INJURY OR EQUIPMENT DAMAGE

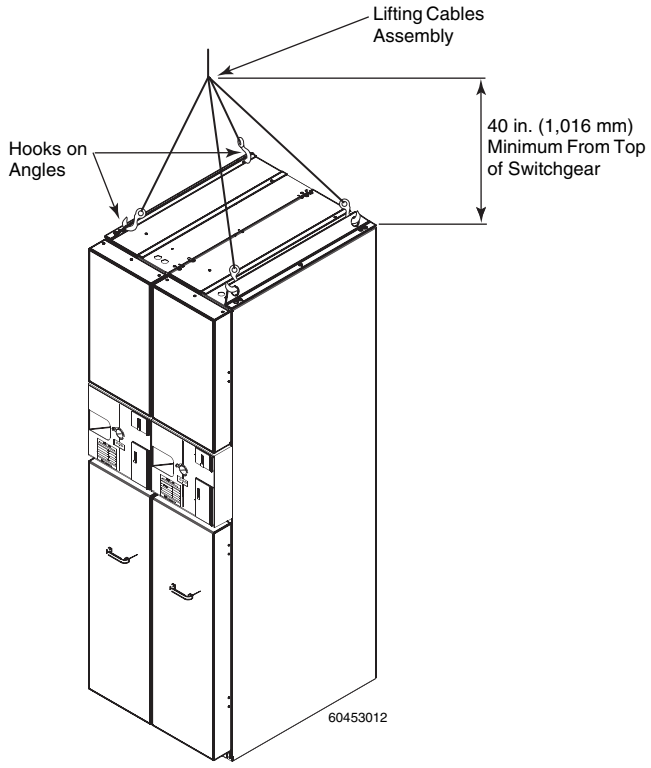
- Do not remove the skids until the shipping sections are at the final location.
- Always use the skids to prevent equipment distortion.

Failure to follow these instructions can result in serious injury or equipment damage.

Lifting Provision–Indoor

Removable lifting angles are provided for inserting hooks to lift each section. Use hooks on angles (see Figure 11) to properly lift and move indoor metal-enclosed switchgear. A minimum of 40 inches (1,016 mm) between the lifting cables assembly and the top of the switchgear is required.

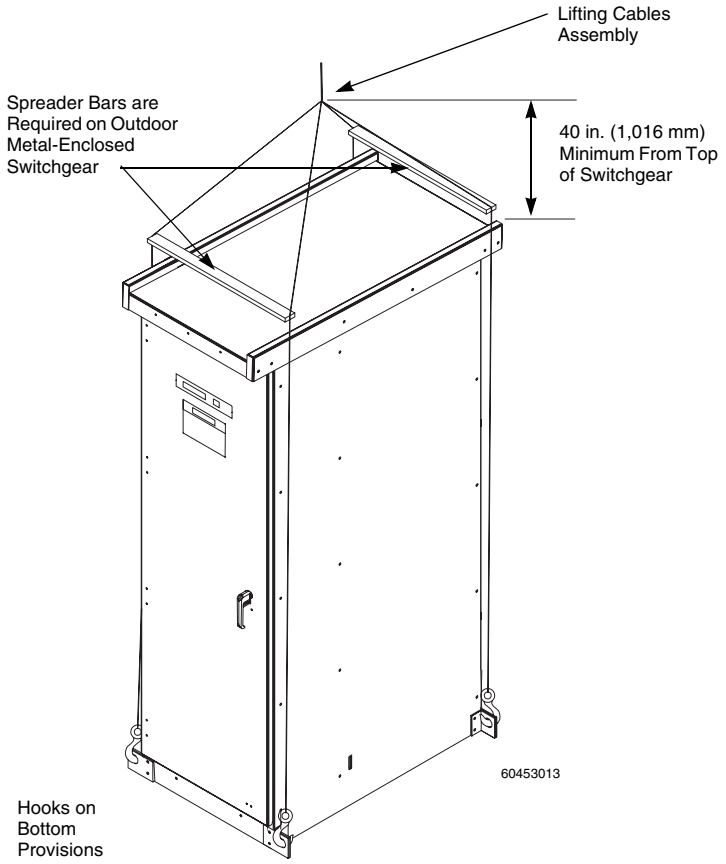
Figure 11: Lifting Provision–Indoor



Lifting Provision–Outdoor

Lifting angles are provided for inserting hooks to lift each shipping section. Retain these angles and hardware for use in anchoring outdoor shipping sections (see “Anchoring and Joining the Shipping Split Frames” on page 33 and Figure 24 on page 33). A minimum of 40 inches (1,016 mm) between the lifting cables assembly and the top of the switchgear is required. Use spreader bars and hook to the bottom provisions (see Figure 12) to properly lift and move outdoor metal-enclosed switchgear.

Figure 12: Lifting Provision–Outdoor



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Using a Forklift

Use only equipment of proper load range for lifting the switchgear. Review the shipping documentation for the actual weight of the equipment. When an overhead crane is not available, rollers or pipes may be used for moving the switchgear to its location. Forklifts of proper load range may be used (see Figure 13).

This equipment is shipped up to a maximum of 5 vertical units or to 75 inches (1,905 mm) wide.

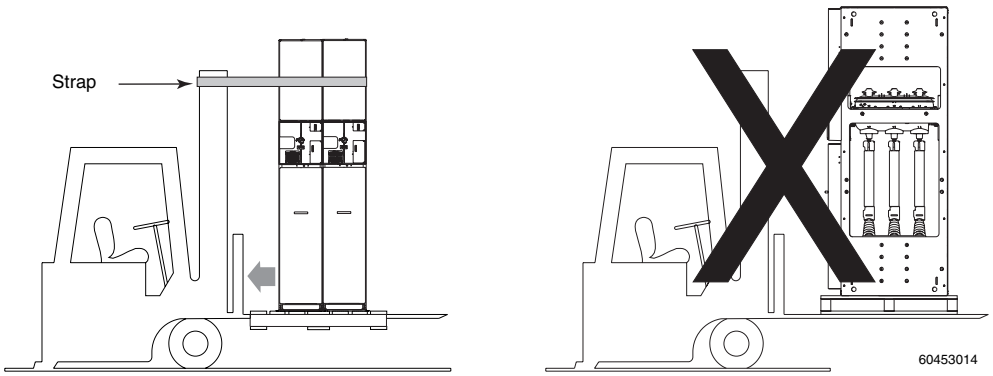
⚠ WARNING

TOP HEAVY LOAD

If lifting the switchgear by forklift, stabilize the shipping section with a safety strap to reduce the possibility of tipping.

Failure to follow this instruction can result in death or serious injury.

Figure 13:Handling Using a Forklift



STORAGE

If the switchgear is stored before being placed into service, keep it in a clean, dry place that is free from corrosive elements and mechanical abuse. Energize the heaters inside the switchgear, or add heat from a separate source, such as a light bulb or blower. Use a minimum of 100 watts of heat per vertical section to keep the equipment dry during storage.

Covering the equipment with a tarpaulin may be necessary to protect it from contaminants or moisture. Do not store indoor units outdoors.

In areas of high humidity, such as installations near oceans or large bodies of water, monitor the equipment closely. If necessary, use additional heat to keep the switchgear dry. Contact the factory if the internal heaters do not adequately prevent condensation for your location or environmental condition.

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The drawings below are examples of a typical Application A Indoor and Outdoor Metal-enclosed Switchgear.

Refer to the customer drawings for the actual weights, dimensions and conduit entry locations. The weights given below are approximate and are not correct for all possible combinations of gear.

2.4–15 kV Switchgear Indoor (NEMA 1 Construction)

Figure 14: Side, Front, and Plan Drawings—Indoor (Application A)

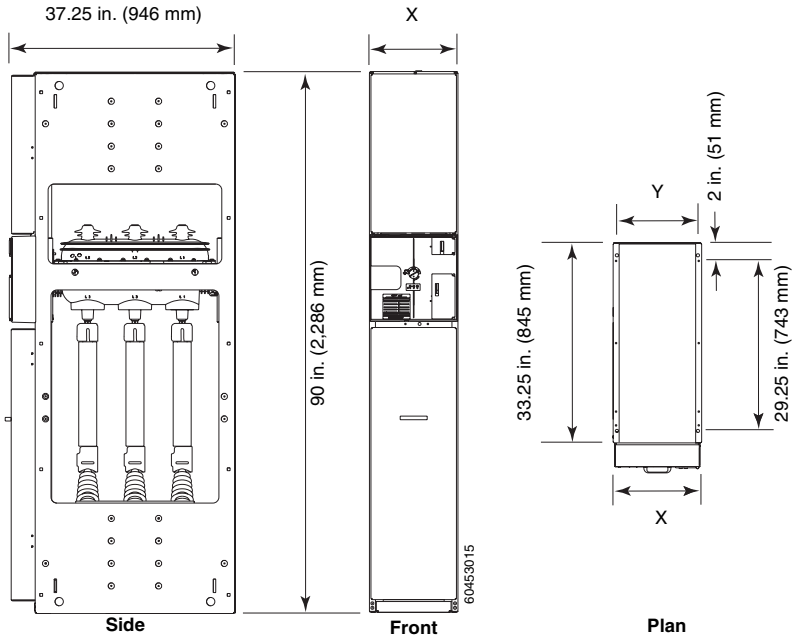

Table 1: Approximate Dimensions and Weights 2.4–15 kV—Indoor

	Frame Width (X)		
	14.75 in. (375 mm)	**20.00 in. (508 mm)**	**29.50 in. (750 mm)**
Bolt Center (Y)	13.50 in. (343 mm)	18.75 in.(476 mm)	28.25 in. (717 mm)
Unfused Switch	445 lbs (200 kg)	485 lbs (218 kg)	545 lbs (245 kg)
Fused Switch	480 lbs (216 kg)	520 lbs (234 kg)	580 lbs (261 kg)
Transition/Auxiliary Unit	210 lbs (95 kg)	250 lbs (160 kg)	—
VT Compartment	—	820 lbs (369 kg)	875 lbs (394 kg)
CT Compartment	—	—	835 lbs (376 kg)

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2.4–15 kV Switchgear Outdoor (NEMA 3R Construction)

Figure 15: Side and Plan Drawing—Outdoor (Application A)

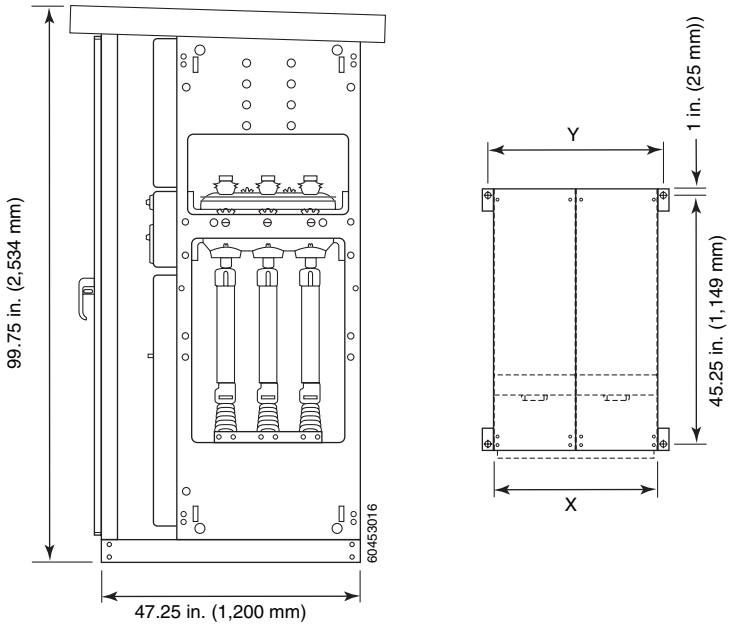

Table 2: Approximate Dimensions and Weights 2.4–15 kV—Outdoor

	Frame Width (X)		
	14.75 in. (375 mm)	**20.00 in. (508 mm)**	**29.50 in. (750 mm)**
Bolt Center (Y)	Add 2.25 in. (57 mm) to the total length of the switchgear lineup		
Unfused Switch	585 lbs (263 kg)	655 lbs (295 kg)	785 lbs (353 kg)
Fused Switch	629 lbs (278 kg)	685 lbs (308 kg)	820 lbs (370 kg)
Transition/Auxiliary Unit	440 lbs (200 kg)	450 lbs (205 kg)	—
VT Compartment	—	985 lbs (443 kg)	1115 lbs (502 kg)
CT Compartment	—	—	1075 lbs (484 kg)
End Panel	End panels add 90 lbs (40.5 kg) per end unit		

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25.8–38 kV Switchgear Indoor (NEMA 1 Construction)

Figure 16: Side, Front, and Plan Drawings—Indoor (Application A)

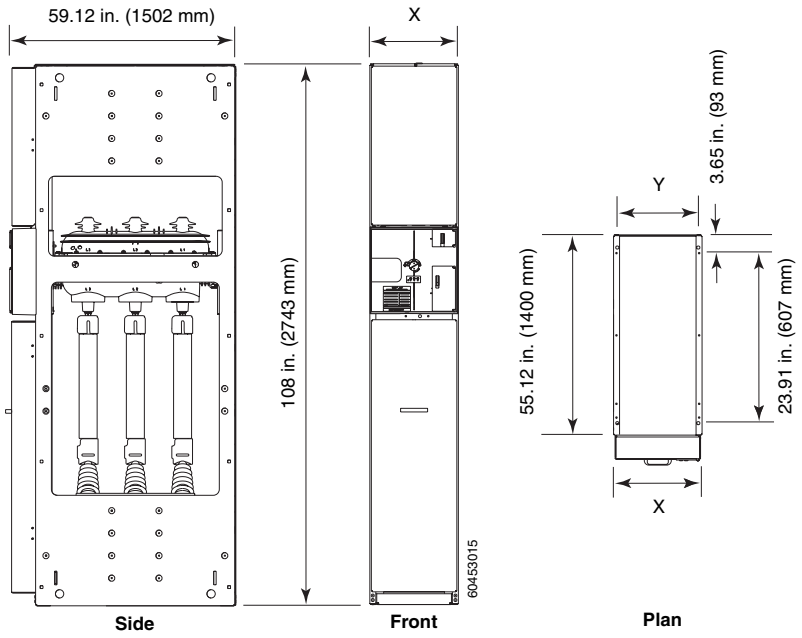

Table 3: Approximate Dimensions and Weights 25.8–38 kV—Indoor

	Frame Width (X)	
	29.50 in. (750 mm)	**39.37 in. (1000 mm)**
Bolt Center (Y)	25.76 in. (654 mm)	35.63 in. (905 mm)
Unfused Switch	760 lbs (345 kg)	877 lbs. (400 kg)
Fused Switch	795 lbs (360 kg)	915 lbs (420 kg)
Transition/Auxiliary Unit	510 lbs (230 kg)	625 lbs (280 kg)
VT Compartment	1090 lbs (495 kg)	1200 lbs (545 kg
CT Compartment	1050 lbs (475 kg)	1160 lbs (525 kg)

ENGLISH

25.8–38 kV Switchgear Outdoor (NEMA 3R Construction)

Figure 17: Side and Plan Drawing—Outdoor (Application A)

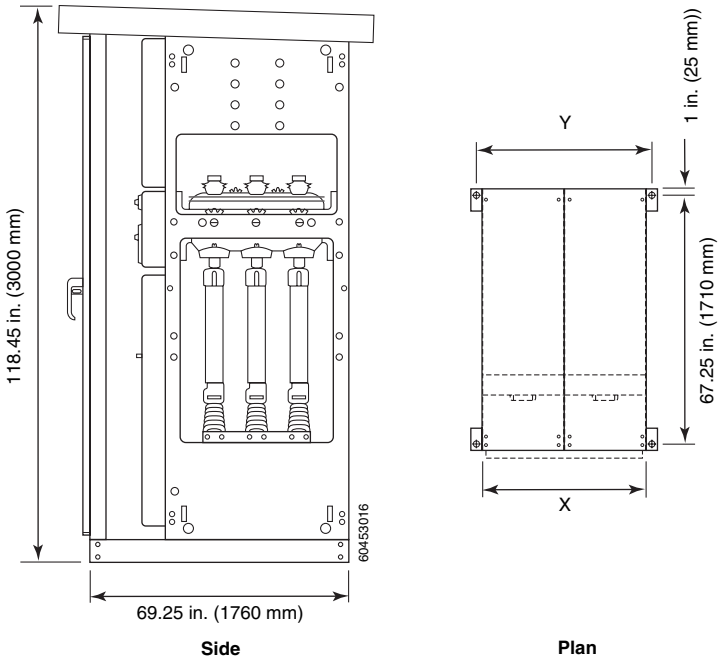

Table 4: Approximate Dimensions and Weights 25.8–38 kV—Outdoor

	Frame Width (X)	
	29.50 in. (750 mm)	**39.37 in. (1000 mm)**
Bolt Center (Y)	Add 2.25 in. (57 mm) to the total length of the switchgear lineup	
Unfused Switch	1010 lbs (460 kg)	1165 lbs (530 kg)
Fused Switch	1060 lbs (480 kg)	1220 lbs (553 kg)
Transition/Auxiliary Unit	680 lbs (310 kg)	830 lbs (375 kg)
VT Compartment	1450 lbs (650 kg)	1600 lbs (725 kg)
CT Compartment	1400 lbs (634 kg)	1545 lbs (700 kg)

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SECTION 4 —INSTALLATION

This chapter contains instructions for the installation of the equipment. Perform the installation in the following sequence:

- — Site Preparation
- — Switch Operation
- — Access Panel Removal
- — Field Assembly
- — Cable Connections
- — Fuse Inspection/Replacement (if necessary)
- — Hi-pot Testing

SITE PREPARATION

Good site preparation is necessary to eliminate installation problems and ensure proper switchgear operation. Compare the site plans and specifications with the switchgear drawings to be sure there are no discrepancies. Check the site to ensure that the equipment will fit properly (see Tables 1, 2, 3, and 4 on pages 23–26).

The floor should be flat and level within 1/16 inch per foot (2 mm per 305 mm), or a maximum of 1/4 inch (6 mm) within the area of the switchgear, to prevent distortion of the enclosures.

The equipment has been designed for front access. Schneider Electric recommends that the rear of indoor equipment be placed a minimum of 4–6 inches from the wall. Allow 5 feet (1,524 mm) of clearance on the front. However, minimum clearances must meet all local and national requirements.

On outdoor switchgear, 5 feet of clearance (on the front and back only) is recommended.

Provide area ventilation at all times to maintain the ambient temperature around the equipment between 0 °C and 40 °C degrees (see “Preventive Maintenance” on page 46).

Adequate lighting and convenience outlets should be available near the switchgear. Route sewer, water, and steam lines away from the equipment. Provide floor drains to prevent water buildup.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Before installing, removing, or performing any work on or inside the switchgear:

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- Turn off the power supply to the switchgear.
- Turn off the switchgear before removing or installing fuses or making load-side connections
- Always use a properly rated voltage sensing device at all line and load-side fuse clips to confirm that the switchgear is off.
- Never operate the switchgear with the access panels open.

Failure to follow these instructions will result in death, serious injury, or equipment damage.

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OPERATING THE SWITCHES

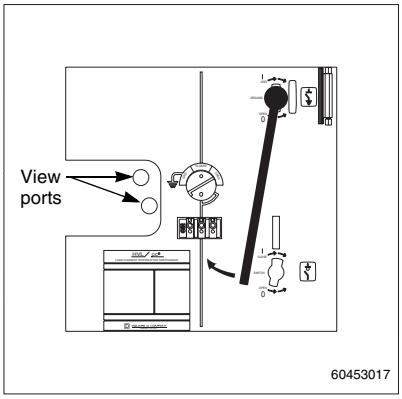
Switches are shipped in the closed position. Switches must be opened or grounded (if equipped) to gain access into the load-side compartment (see Figure 18 below, Figure 19 on page 29, and Figure 20 on page 30). The position of the switch blades may be obvious at first glance from the position indicator on the mimic bus. Always look through the viewing ports to verify the actual position of the blades. A flashlight is helpful.

NOTE: Never leave the operating handle in the switch port. The motor will not operate.

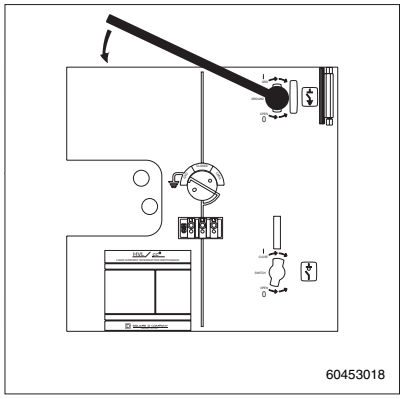
Operating the Ground Switch (if equipped)

Follow the steps outlined in this section to operate the ground switch (see Figure 18).

Figure 18:Operating the Ground Switch (if equipped)

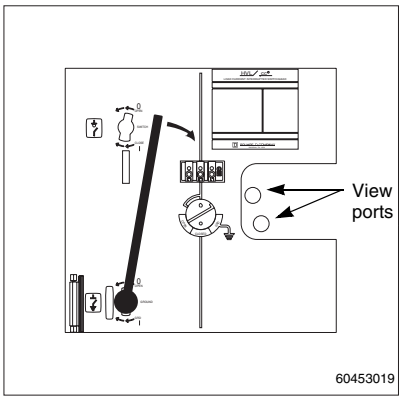


Closing the Ground Switch (Grounded)

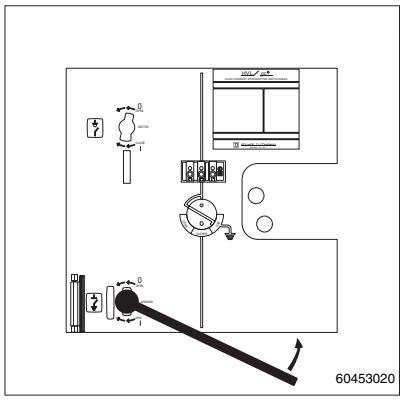


Opening the Ground Switch (Ungrounded)

Application A



Closing the Ground Switch (Grounded)



Opening the Ground Switch (Ungrounded)

Application B

1. To **GROUND** the switch, insert the mechanism handle into the ground port located on the front of the mechanism compartment cover.
2. Rotate the handle clockwise, charging the ground mechanism spring, until the ground mechanism advances past over-toggle. Once the mechanism moves past over-toggle, the ground mechanism springs will release their energy. This causes the switch blades to rotate at speeds independent of the user into the **GROUNDED** position.
3. Remove the mechanism handle.

To **UNGROUND** the switch, follow the steps previously outlined in this section except rotate the handle counter clockwise.

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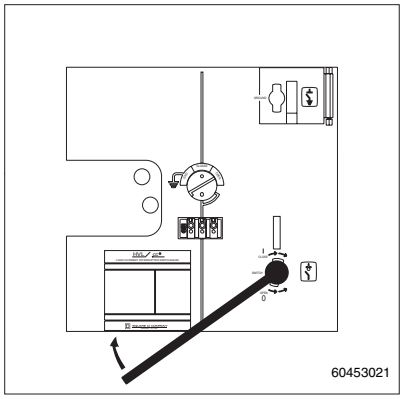
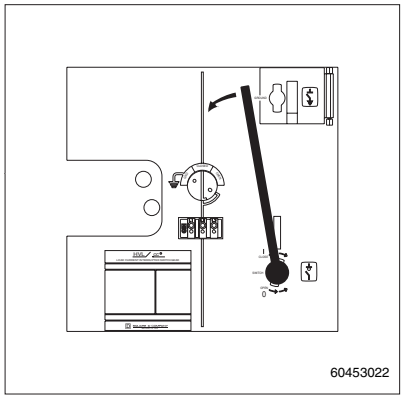
Operating Switchgear Equipped With an OTM

Follow the steps outlined in this section to operate switches equipped with an OTM (see Figure 19).

Figure 19:Switchgear Operation (OTM)

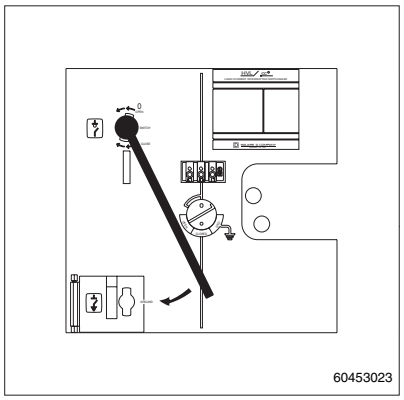


Closing the Switch (OTM)

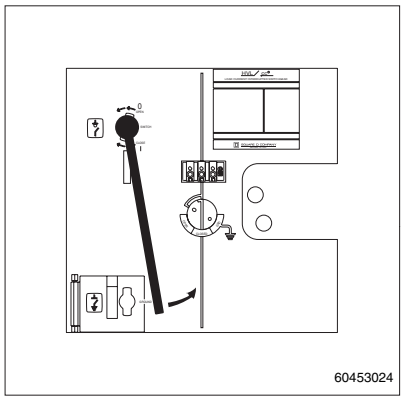


Opening the Switch (OTM)

Application A



Closing the Switch with an OTM Mechanism



Opening the Switch with an OTM Mechanism

Application B

1. To **OPEN** (**O**) the switch, insert the mechanism handle into the switch operating port located on the front of the mechanism compartment cover.
2. Rotate the handle counter-clockwise, until the operating mechanism advances beyond over-toggle.

   *NOTE: Rotating the handle charges the open/close springs of the operating mechanism. Once the mechanism moves beyond over-toggle, the operating mechanism springs will release their energy. This causes the switch blades to rotate at speeds independent of the user into the **OPEN** position.*
3. Remove the mechanism handle.

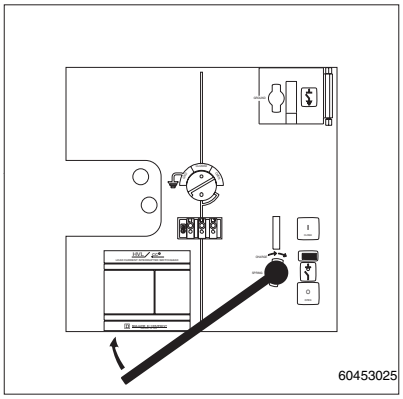
To **CLOSE** (**I**) the switch, follow the steps previously outlined in this section except rotate the handle clockwise.

ENGLISH

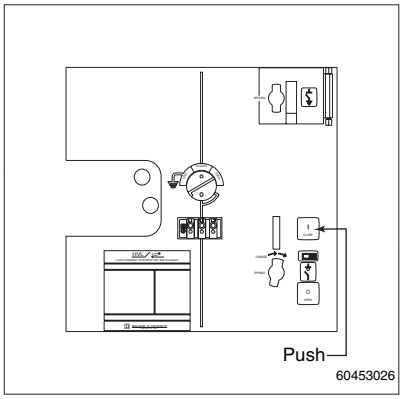
Operating Switchgear Equipped With an SEM

Follow the steps outlined in this section to operate switches equipped with an SEM (see Figure 20).

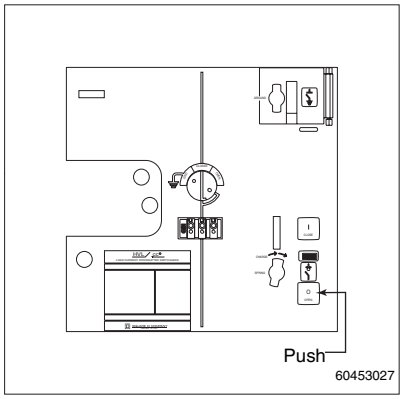
Figure 20: Switchgear Operation (SEM)



Charging the Springs with an SEM Mechanism

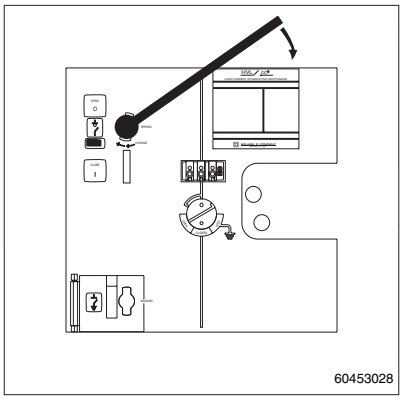


Closing the Switch with an SEM Mechanism

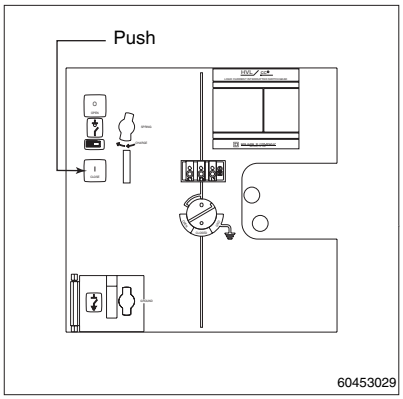


Opening the Switch with an SEM Mechanism

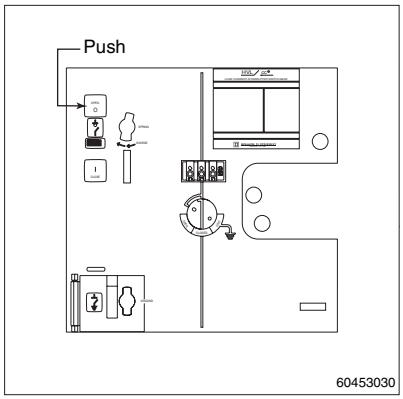
Application A



Charging the Springs with an SEM Mechanism



Closing the Switch with an SEM Mechanism



Opening the Switch with an SEM Mechanism

Application B

1. Press the **OPEN** (**O**) push button. The operating mechanism springs will release their energy, causing the switch blades to rotate into the **OPEN** position.
2. To **CLOSE** (**I**) the switch, insert the mechanism handle into the spring charging port located on the front of the mechanism compartment cover.
3. Rotate the handle clockwise to charge the open/close springs of the operating mechanism.
4. Continue to rotate the handle until the spring charge indicator shows that the springs have been fully charged. Both the open and close springs are now charged.
5. Remove the mechanism handle.
6. Press the **CLOSE** (**I**) push button. The operating mechanism springs will release their energy, causing the switch blades to rotate into the **CLOSE** position (the opening springs remain charged).

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ACCESS PANEL REMOVAL

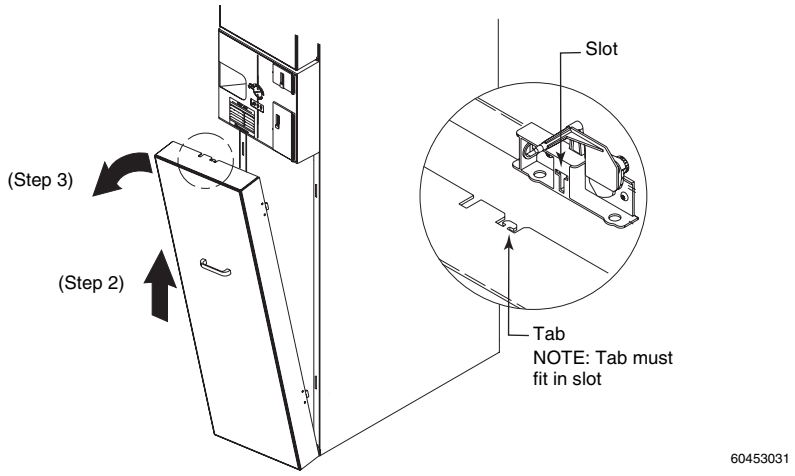
After the switch has been placed in the **OPEN** or **GROUNDED** (if equipped) position, remove all appropriate access panels. Removal of these panels will allow the user to access the necessary compartments in order to anchor and join shipping split frames, make bus and cable connections, install and/or remove fuses, and perform Hi-pot (dielectric) tests and pre-energization inspections.

Instructions for removing the load-side access panel are listed below. All other panels are bolted. The instrument compartment panel cannot be removed.

Removing the Load-side Access Panels

Follow the instructions listed below for removing the load-side access panels for **Application A** indoor or outdoor switchgear (see Figure 21):

Figure 21: Removing the Load-side Access Panel—Application A



1. Verify that the switch is in the **OPEN** or **GROUNDED** (if equipped) position.

   *NOTE: If the switchgear is equipped with a grounding switch, the switch must be in the **GROUNDED** position.*

2. Grasp the handle on the front of the access panel firmly and lift the access panel until the interlock tab clears the interlock slot.
3. Tilt (pull) the panel out until it clears the front of the switchgear.

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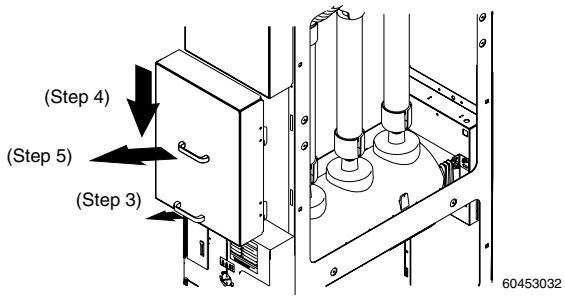
Follow the instructions listed below for removing the load-side access panels for **Application B** indoor or outdoor switchgear (see Figure 22):

Figure 22: Removing the Load-side Access Panel—Application B



1. Verify that the switch is in the **OPEN** (**O**) or **GROUNDED** (if equipped) position.

   *NOTE: If the switchgear is equipped with a grounding switch, then the switch must be in the **GROUNDED** position.*

2. Grasp both the top and bottom handles on the front of the load-side access panel.

   NOTE: Be sure to support the panel by grasping the TOP handle firmly.

3. Pull the lower handle to release the latch securing the access panel.
4. While supporting the panel allow it to slide down gently.
5. Pull out the panel to remove it.

FIELD ASSEMBLY

After proper site preparation has been made field assembly of shipping splits is required.

Field assembly includes:

- Joining shipping splits
- Anchoring shipping split assemblies
- Bus connections
- Control wiring connections

CAUTION

HAZARD OF EQUIPMENT DAMAGE

Install the shipping split bus connectors only after the shipping sections are fastened in place and no additional movement will be made to the assembly.

Failure to follow this instruction can result in equipment damage.

Anchoring and Joining the Shipping Split Frames

Follow the steps listed below for joining and anchoring shipping split frames.

1. Review the assembly drawings to ensure that the switchgear sections will be assembled in the correct order.

   NOTE: If the switchgear will connect to an existing lineup, mount the connecting sections first.

2. Locate and anchor the first shipping split.

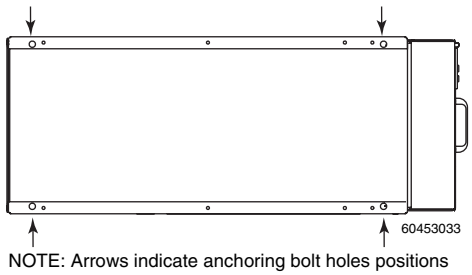
   NOTE: Be sure to mount all shipping splits on the same plane and level them to ensure proper connection.

   Follow the instructions below for anchoring indoor or outdoor units.

Indoor Shipping Splits

To anchor indoor shipping split frames to the floor, place the 3/8 in. anchoring bolts (supplied by customer) through the anchoring holes located in the flanges at the bottom of each enclosure (see Figure 23).

Figure 23: Bolt Hole Locations for Indoor Enclosures



NOTE: Arrows indicate anchoring bolt holes positions

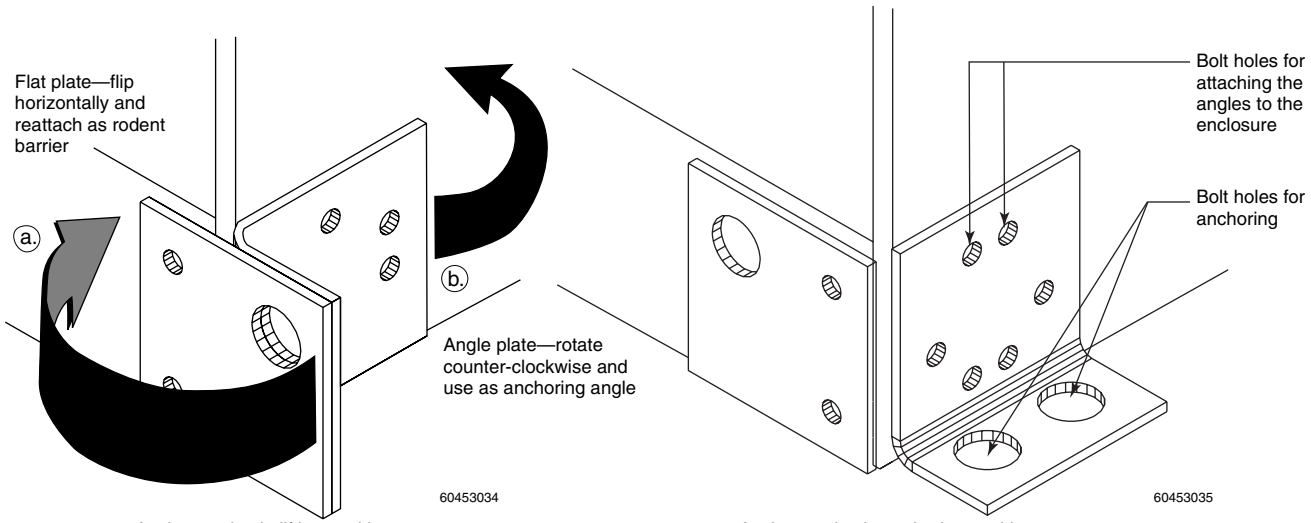
Outdoor Shipping Splits

a. Remove the lifting angle assemblies. Retain the hardware and lifting angle assembly parts for future use. The angle is to be used for anchoring the shipping split. The flat plate is to be used as a rodent barrier.

b. Rotate the angle and attach it to the side of the shipping split using the hardware retained in Step a.

c. To anchor the enclosure to the foundation, place 3/4 in. anchoring bolts through the holes in the anchoring angles (see Figure 24).

Figure 24: Anchoring Assemblies for Outdoor Enclosures



Anchor angles in lifting position

Anchor angles in anchoring position

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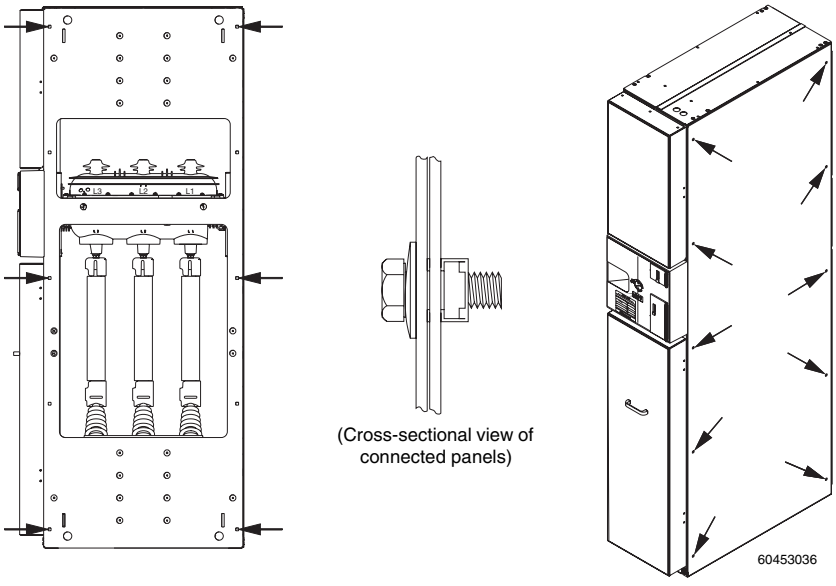
3. Locate the next shipping split according to the assembly drawing.
4. Level the shipping split and join it to the previously installed shipping split. Use 3/8-16, Grade 5 hardware to join shipping splits. Refer to Figure 25 for bolt hole locations.

.

Figure 25:Joining the Shipping Splits and Installing the End Panels

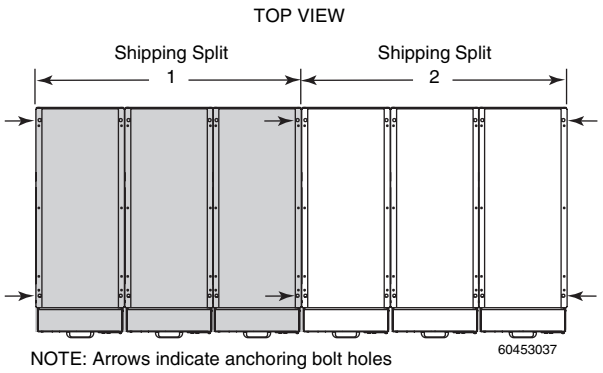


NOTE: Arrows indicate shipping split and end panel bolt locations

5. Anchor the shipping split.

   For indoor units, place the 3/8 in. anchoring bolts (supplied by customer) through the anchoring holes located in the flanges at the bottom of the enclosure (see Figure 26). See Table 5 on page 36 for torque values.

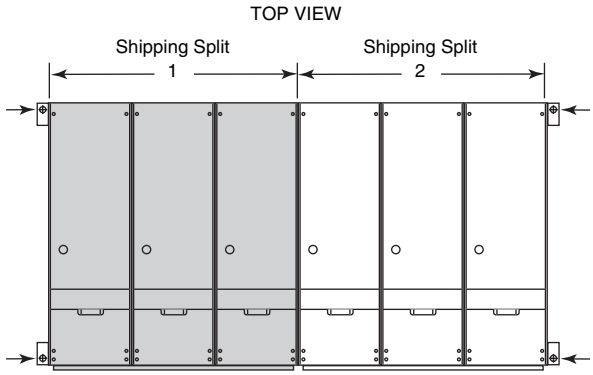
Figure 26: Anchoring Subsequent Indoor Shipping Splits



NOTE: Arrows indicate anchoring bolt holes

For outdoor units, place 3/4 in. anchoring bolts through the holes located in the anchoring angles. Attach anchoring angles to the end units only of outdoor switchgear lineups (see Figure 27). See Table 5 on page 36 for torque values.

Figure 27: Anchoring Subsequent Outdoor Shipping Sections



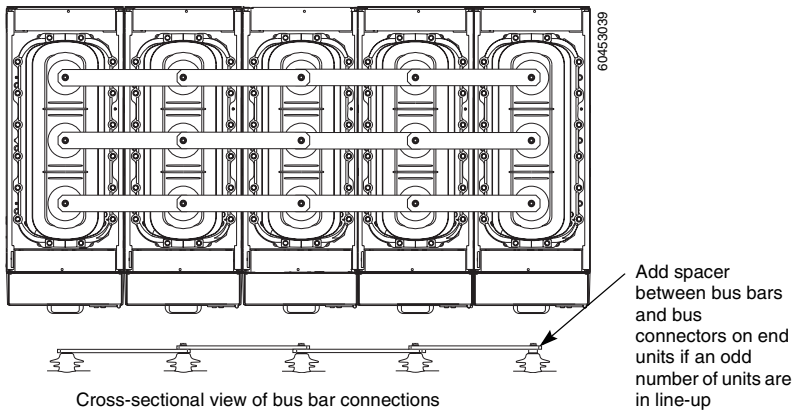
6. Repeat steps 3 through 5 for each additional shipping split
7. For outdoor units, rotate and reattach the flat plates (part of the lifting angle assembly) over the bolt holes left during removal of the lifting angle assemblies to prevent rodent entry (see Figure 24 on page 33).

Bus Connections

Follow the steps outlined in this section to make bus connections.

1. Make sure the bus connector contact surfaces are clean. When necessary, clean the bus bars with a mild, non-abrasive cleaning agent such as Scotch-Brite®. Be careful not to remove the bus bar's silver plating during cleaning.
2. Install the bus connectors one phase at a time. Loosely bolt the bus joints.The bus connector hardware is provided and can be found in the carton packing. Use M-8 (8 mm) hardware for line side bus connections and M-10 (10 mm) for the load-side bus connections.
3. After all three bus bars are in place and properly aligned, tighten the bolts using a torque wrench. See Table 5 on page 36 for torque values.

Figure 28: Bus Bar Connections



4. To connect the ground bus at each shipping split, remove and retain the existing hardware. Position the unit, then re-install and tighten the hardware per Table 5.

Table 5: Torque Values

Bolt Size (SAE #2 Steel Bolts)	Torque Values	
	Sheet Metal Joints	Electrical Connections
1/4-20	7 lb-ft (9.5 N•m)	10 lb-ft (13.5 N•m)
5/16-8	14 lb-ft (19 N•m)	20 lb-ft (27 N•m)
3/8-6	21 lb-ft (28.5 N•m)	35 lb-ft (47.5 N•m)
1/2-3	42 lb-ft (57 N•m)	70 lb-ft (95 N•m)
M8 (8 mm)	15 lb-ft (20.5 N•m)	21 lb-ft (28.5 N•m)
M10 (10 mm)	22 lb-ft (30 N•m)	36 lb-ft (49 N•m)

Control Wiring Connections

Follow the steps in this section to make control-wiring connections.

1. Consult the customer wiring diagrams for re-connection of control wiring at the shipping splits, when applicable. Each wire has been identified and previously connected during assembly when tested at the factory.
2. Make all outgoing control connections according to the wiring diagrams. After wiring is complete, carefully check all connections to verify they are secure and in their proper location.

CABLE CONNECTIONS

Before making the cable connections, determine the phase identity of each cable. Viewing the switchgear from the front, standard bus sequence is normally phased A-B-C front to rear, unless labeled otherwise.

CAUTION

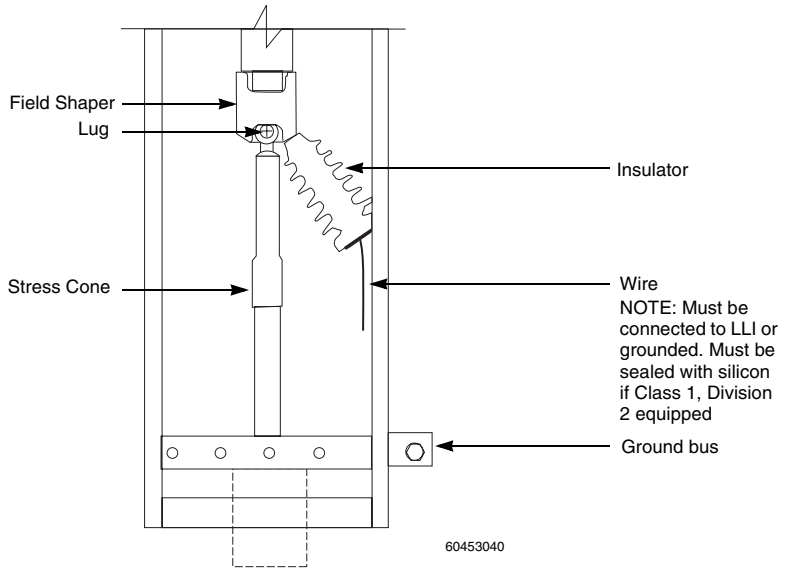
HAZARD OF EQUIPMENT DAMAGE

All cables must be terminated inside the field shapers with lugs supplied by Schneider Electric. (see Figure 29).

Failure to follow this instruction will increase the electrical stress on all components, thus shortening the life of the equipment.

When cable terminations are made, follow the cable manufacturer's instructions in stripping the shield and cleaning the unshielded portion of the cable. Install the appropriate stress cone in accordance with the stress cone manufacturer's instructions. All cable connections must be properly supported so as not to add additional stress on the field shaper assembly or its supports.

Figure 29: Example of a Typical Cable Connection



Forming the Cables

When forming cables for termination within switchgear, avoid sharp turns, corners, and edges which could damage or weaken the cable insulation. Follow the cable manufacturer's instructions carefully in determining the minimum bending radius of cables.

Shielded Cables Through Window-Type Current Transformers

When routing shielded cable through window-type current transformers or ground sensor current transformers, the shield-ground connection wire is normally routed **back through** the current transformer and solidly grounded.

ENGLISH

Unshielded Cable Connections

⚠ WARNING

HAZARD OF ELECTRICAL SHOCK OR ARC FLASH

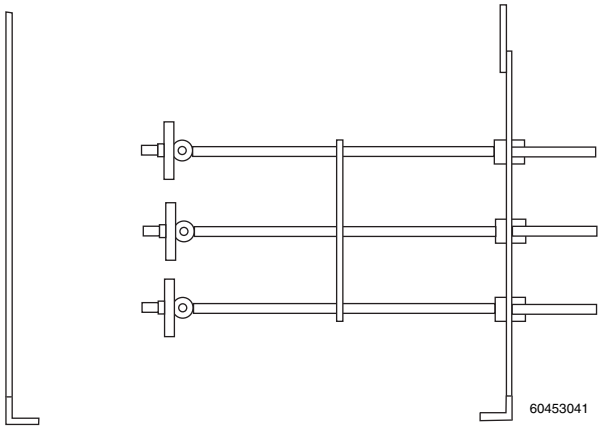
Maintain a minimum clearance of 4 inches (102 mm) between insulated cable and grounded metal parts or other phases.

Failure to follow this instruction can result in death or serious injury!

To meet switchgear requirements follow the cable manufacturers instructions for proper clearance of cables, conduits, and bus. These items must be securely fastened or braced to withstand short circuit forces and to prevent strain on the terminals.

NOTE: Maximum length of unsupported cable is 18 in. (457 mm).

Figure 30: Example of Unshielded Cable Support



FUSE REPLACEMENT

Proper fuse replacement for this equipment is very important. If FuseLogic™ fuse trip system is installed, the correct removal and installation will allow for proper function of the system. To maintain system coordination, always replace all three fuses even if only one has blown. Lubricate the fuse clips with Mobil® 28 red grease if needed.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on the power to this equipment.
- The body of a fuse that has blown or carried load current can be **EXTREMELY HOT** and burn unprotected hands.
- Never try to insert or remove both ends of the fuse at once. The fuse body is made of **FRAGILE PORCELAIN** (glass-like) and can shatter if handled incorrectly (see Figure 31 below and Figure 33 on page 40).
- Always remove the end opposite the switch first. This will avoid damaging the Fuselogic™ system assembly and fuse (see Figure 31 below). Never attempt to remove both ends at once.
- Always install the end of the fuse nearest the switch first; then install the opposite end. Always push on the ferrule being inserted (see Figure 33 on page 40). Never attempt to install both ends at once.

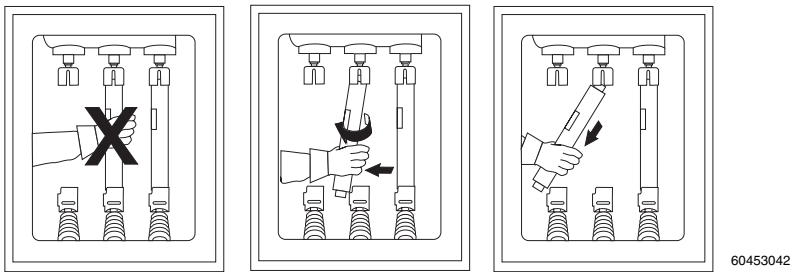
Failure to follow these instructions will result in death or serious injury.

Fuse Removal

1. Place the switch in the **OPEN** or **GROUNDED** position to access the load-side compartment (see “Removing the Load-side Access Panels” on page 31)
2. Use a properly rated voltage sensing device to verify that power is off.
3. Grasp the fuse by the end opposite the switch first. While gently pulling the fuse ferrule, rotate the fuse body slightly to help ease the fuse ferrule out of the fuse clip.
4. After the fuse has been removed from the fuse clip opposite the switch, pull the fuse down to remove the fuse from the remaining fuse clip.

   NOTE: To maintain system coordination, always replace all three fuses even if only one has blown.

Figure 31: Fuse Removal (Application A shown)



ENGLISH

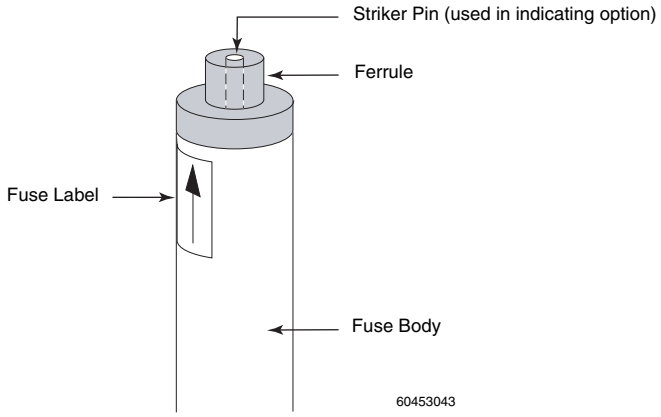
Fuse Installation

Follow the steps outlined below to install fuses

1. Using a properly rated voltage sensing device verify that power is off.
2. Insert the fuse ferrule into the fuse clip that is nearest the switch (Top on Application A, Bottom on Application B). Be sure to orient the striker pin properly (see Figure 32)

   NOTE: The striker pin assembly must always point toward the switch. For Application A the pin is at the top of the fuse. On Application B the pin must be at the bottom. The fuse characteristics and striker pin directions are printed on the fuse label. Always turn the fuse so that the label is in the front and the arrow is pointed toward the switch (up—Application A, down—Application B).

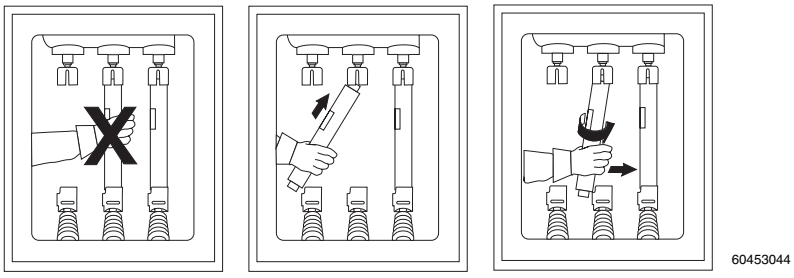
Figure 32: Fuse Characteristics and Striker Pin Directions (Application A position shown)



3. Insert the remaining end of the fuse into the fuse clip opposite the switch. Gently push while rotating the fuse body to help ease the fuse ferrule into the fuse clip.

   NOTE: Never insert both ends at once.

Figure 33: Fuse Installation (Application A shown)



HI-POT (DIELECTRIC) TESTING

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- Only qualified electrical personnel should perform this testing.
- During testing maintain a minimum clearance of 6 feet from equipment.

Failure to follow these instructions will result in death or serious injury.

Perform a standard 60-cycle hi-pot (dielectric) test to measure insulation integrity. See Table 6 for hi-pot test values.

In performing the hi-pot (dielectric) test, the following minimum actions must be taken to ensure the safety of personnel and equipment.

— Restrict entry into the area to prevent any unauthorized personnel from approaching the gear during testing.

— Notify all persons that the test is going to be conducted.

— Follow all local lockout & tag-out procedures.

— Remove all fuses both low voltage and medium voltage.

— Disconnect all potential transformer secondary connections.

— Disconnect LA's (if supplied)

— Short all current transformer circuits at shorting block.

— Capacitive dividers supplied with the equipment must be properly connected or grounded.

— All ground connections must be properly made and tightened according to Table 5 on page 36. Refer to "Bus Connections" on page 35, Figure 29 on page 37 ("Installation Note"), and the "HVL/cc Grounding Switch Application" section of the "Metal Enclosed Load Interrupter Switchgear with HVL/cc Switches" catalog (document number 6045CT9801).

Table 6: Hi-Pot Test Values

Equipment Rating	Field Test Voltages	
	(AC)	(DC)
4.76 kV	14 kV	20 kV
15 kV	27 kV	38 kV
17.5 kV	28.5 kV	40 kV
27 kV	45 kV	63 kV
38 kV	60 kV	85 kV

⚠ CAUTION

HAZARD OF ELECTRIC SHOCK

When using a DC voltage source, the load-side of the capacitive dividers must be grounded after the high-pot test is completed to discharge trapped charges.

Failure to follow this instruction can result in injury.

Apply the voltage to each phase individually for one minute with the other two phases and the enclosure grounded.

If the test is unsuccessful, inspect the insulators for leakage paths. If necessary, clean the surface of the insulator(s) and re-test. If problems persist, **DO NOT ENERGIZE THE SWITCHGEAR**. Contact your local Schneider Electric field sales office or your distributor.

ENGLISH

FINAL INSPECTION

If the switchgear has been stored for several months or has been exposed to high humidity during storage time period, **A STANDARD 60-CYCLE HI-POT TEST MUST BE PERFORMED**. Energize the heater circuits for a minimum of 24 hours. This should dry any moisture that has accumulated on the insulation. See Table 6 on page 41 for test values and additional information. Follow other equipment testing procedures as required by customer in-house standards.

After the switchgear is installed and all interconnections are made, follow the steps listed below to test the equipment and perform a final inspection before placing it in service.

1. Verify that a 60-cycle hi-pot test has been preformed recently on the equipment. This will help determine if the equipment is satisfactory for service.
2. Check all control wiring with the wiring diagrams. Verify that all connections are properly made and tightened to the proper torque value (see Table 5 on page 36 for torque values), all fuses are installed, current transformer circuits are complete, and all fault detection devices have been properly connected.
3. Verify that all insulating surfaces, including the primary support insulators and isolation barriers, are clean and dry.
4. Verify that all fuses are installed properly and do not exceed the nameplate rating.
5. Before any source of electric power is energized, make a final check of the equipment. Inspect every compartment for loose parts, tools, litter, and miscellaneous construction items.
6. Review key interlock schemes carefully (if used). Insert only the proper keys in the locks. Remove all extra keys and store them where only authorized personnel can access them.
7. Verify that all barriers and covers are secured.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- ALWAYS assume that all circuits are live until they have been completely de-energized, tested, grounded, and tagged.
- Exercise extreme care to prevent the equipment from being energized while conducting the preliminary tests. If disconnect switches cannot be opened, disconnect the line leads.

Failure to follow these instructions will result in death or serious injury.

ENGLISH

SECTION 5— FINAL PREPARATION AND ENERGIZATION

This chapter contains information on how to operate HVL/cc Metal-Enclosed Switchgear.

FINAL OPERATING CHECKS

The following is a minimum list of operating tests that should be performed before energization.

*NOTE: If any of the operating tests provide unacceptable results, **DO NOT ENERGIZE THE SWITCHGEAR**. Contact your local Schneider Electric field sales office or distributor.*

With all power off, perform the following checks:

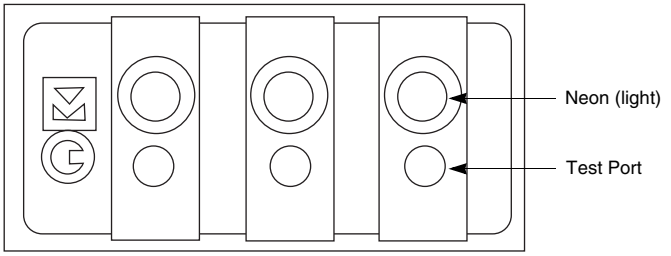
1. Operate the grounding switch (if equipped) a minimum of five times and verify that the LDA (if equipped) is functioning properly. (All contact fingers should touch the field shapers when the main switch is in the grounded position.)
2. Operate the load switch a minimum of five times.
3. With the switch in the **CLOSE** position, verify that the load-side panel cannot be removed (see “Removing the Load-side Access Panels” on page 31).
4. When mechanical interlocks are present for automatic transfer or duplex switching, verify that only one switch will operate at a time.
5. Verify that the CT circuits are not shorted at the terminal block.
6. Replace all devices, doors, and covers before turning on the power to the equipment.

ENERGIZATION

After the proper testing has been completed on the incoming service cables and before the switch is energized, perform the following operations.

1. Open the incoming main switch.
2. Energize the incoming cables.
3. The Live Line Indicators (LLIs) are located on the main source side of the line-up. (See Figure 34.) The LLIs will indicate voltage when the equipment is energized.

Figure 34: Using Live Line Indicators



NOTE: As soon as the circuits have been energized the voltage indicator lamps should illuminate.

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ENGLISH

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be serviced by qualified electrical personnel.

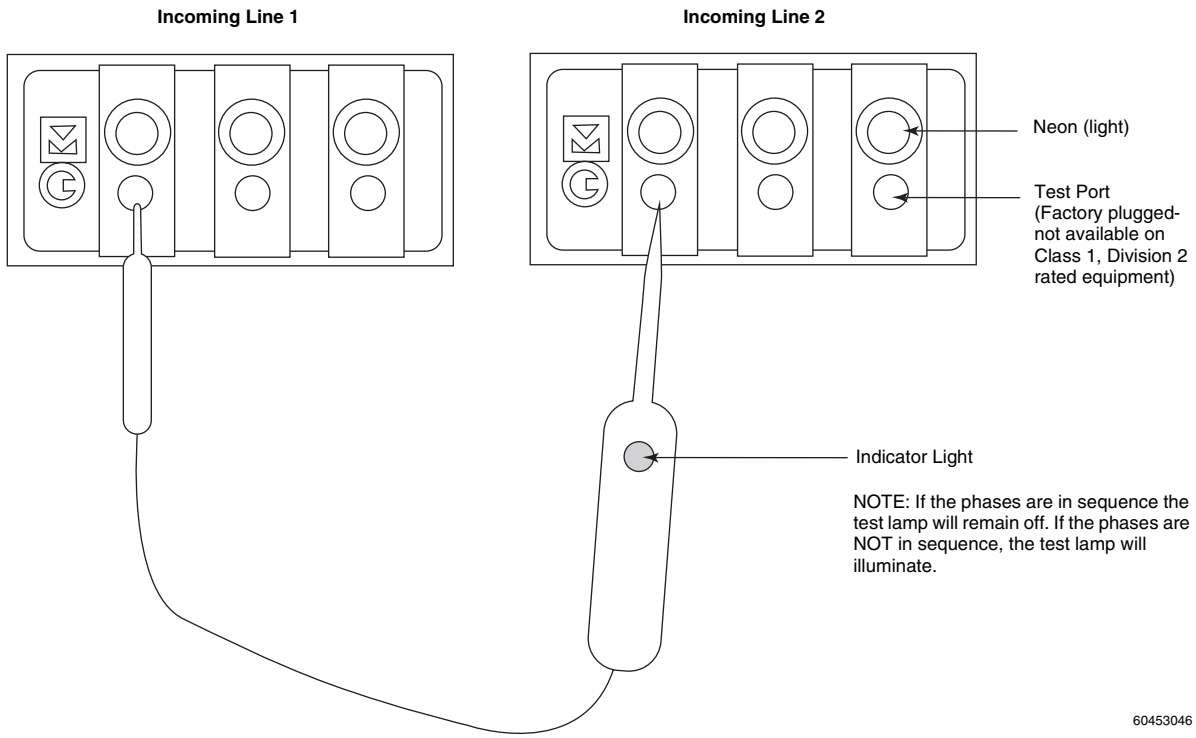
Failure to follow this instruction will result in death or serious injury.

4. Phase sequence tests must be performed on equipment with multiple incoming lines. Phase sequence tests can be performed through the test ports on the optional LLIs (see Figure 35).

   NOTE: Test ports will have a potential of 60–400 V.

5. The switch can now be closed and the load-side indicators should now illuminate.
6. The load and feeder circuits, if provided in the line-up, can now be closed one at a time.

Figure 35: Phase Sequence Testing



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SECTION 6— INSPECTION, MAINTENANCE, AND TROUBLESHOOTING

This chapter contains the following sections:

INSPECTION/PREVENTATIVE MAINTENANCE GUIDELINES

This section contains information on inspecting and performing preventive maintenance on HVL/cc Metal-Enclosed Switchgear.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Before performing visual inspections, tests, or maintenance on the equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, grounded, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death, serious injury or equipment damage!

Inspection

Follow the guidelines and procedures outlined in this section when performing periodic inspections on the equipment.

Recommended Inspection Interval

Periodic inspection of the equipment is necessary to establish the conditions to which the units are subjected (see Table 7). The maximum recommended inspection interval is one year.

Inspection Procedure

The following is a minimal list of inspection procedures that should be performed to ensure proper maintenance.

1. Bus and Connections. De-energize the primary and secondary circuits. Perform a standard 60-cycle hi-pot test to measure bus insulation integrity (see "Hi-pot (Dielectric) Testing" on page 41).
2. Inspect the connections for symptoms which indicate overheating or weakened insulation. Remove dust from the surfaces of the bus bars, connections, supports, and enclosures. Wipe clean with a solvent such as denatured alcohol. Vacuum the equipment. Do not use compressed air to blow dust from the surfaces inside the switchgear.

3. Maintain the instruments, relays, and other devices according to the specific instructions supplied. Inspect the devices and their contacts for dust or dirt; wipe clean as necessary. The maintenance schedule for individual devices such as meters and relays should be based upon recommendations contained in the individual instruction manual for each device. Coordinate the various schedules with the overall maintenance program.
4. Inspect control wiring connections for tightness and damage.
5. Manually operate mechanical moving parts such as switch assemblies, interlocks, and doors.
6. Make sure all bus areas are well ventilated. Inspect grille work and air passages on indoor and outdoor switchgear to make sure they are free from obstruction and dirt accumulation. Clean aluminum filters on outdoor switchgear by removing and thoroughly back-flushing with soap and water. Replace the filters only after they are clean and dry.

Preventive Maintenance

Follow the guidelines and procedures in this section when performing preventative maintenance.

Maintenance Log

It is recommended that a maintenance log (see page 55) be kept for this equipment. All inspection, service and maintenance calls should be listed and dated as well as any corrective and preventive actions taken.

Preventative Maintenance Intervals

Periodic maintenance on the switchgear includes cleaning, lubrication, and exercising component parts. The interval between maintenance checks can vary depending upon the amount of usage and environmental conditions of each installation. This definition for periodic maintenance applies throughout this manual, unless otherwise noted.

Inspect the equipment immediately after abnormal or stressful operating conditions occur or after the equipment experiences a fault current.

Table 7: Recommended Maintenance Guidelines

Component	Ideal Conditions*	Standard Conditions*	Aggressive Conditions*
Epoxy Switch Housing	Every 10 Years	Every 5 Years	Every 2 Years
Housing interior (all bus and mechanisms)	Every 10 Years	Every 5 Years	Every 2 Years
Housing	Every 10 Years	Every 5 Years	Every 2 Years

See “Environmental Conditions” on page 47 for definitions.

These inspection/maintenance guidelines cover only the switch and enclosure manufactured by Schneider Electric. If conditions cannot be established and documented, then the aggressive operating condition must be assumed.

These inspection/maintenance guidelines do not warrant any field connections, field modifications, or supersede any maintenance procedures or schedules recommended by component manufacturers. For more information regarding the warranty of this product refer to “Schneider Electric Conditions of Sale”, Doc. # 0100PL9702 R8/98.

Environmental Conditions

Ideal Conditions:

- Unit is installed and commissioned in accordance with manufacturer's instructions
- Humidity below 40% and no dripping water
- Indoor protected from weather
- Minimum dust and air circulation
- Ambient temperature between –0° C and +40° C
- No contact with any chemical agents (salt, H_2S, etc.)
- No infestation of any animal life (rodents, insects, etc.)
- No contact with any plant life (mold, etc.)
- No earth movements
- No damage to the unit of any kind
- No mal-operation of any kind
- No abnormally high number of operations (see Figure 36 on page 48)
- No abnormally high number of faults (see Figure 36)
- No over-voltage or over-current (above ratings)
- Thermal scanning of the joints at-least once a year

NOTE: (Optional thermal scanning windows or automatic scanning is available with the "Predictive Maintenance System" package offered by Schneider Electric).

Standard Conditions:

All the above conditions listed under "Ideal Conditions" apply with the exception of the following:

— Number 2: Humidity below 60%.

— Numbers 3 through 5: The unit may be indoors or outdoors but must not be subjected to regular extremes of weather (heavy rainstorms, dust storms, flooding, temperature cycles greater than 40° C, temperatures less than minus 30° C, dense coastal fog or acid rain).

— Number16: No regular thick covering of leaves or other debris.

Aggressive Conditions:

Any environmental conditions, which do not satisfy one of the two above descriptions, must be deemed aggressive.

This product is warranted per "Square D Condition of Sale", Doc. # 0100PL9702 R 8/98 and has been tested under ideal laboratory conditions to the values listed below.

- 1000 mechanical no load operations
- 100 full load current interruptions
- 3 fuse fault transfer current operations (see IEC 420 for application)

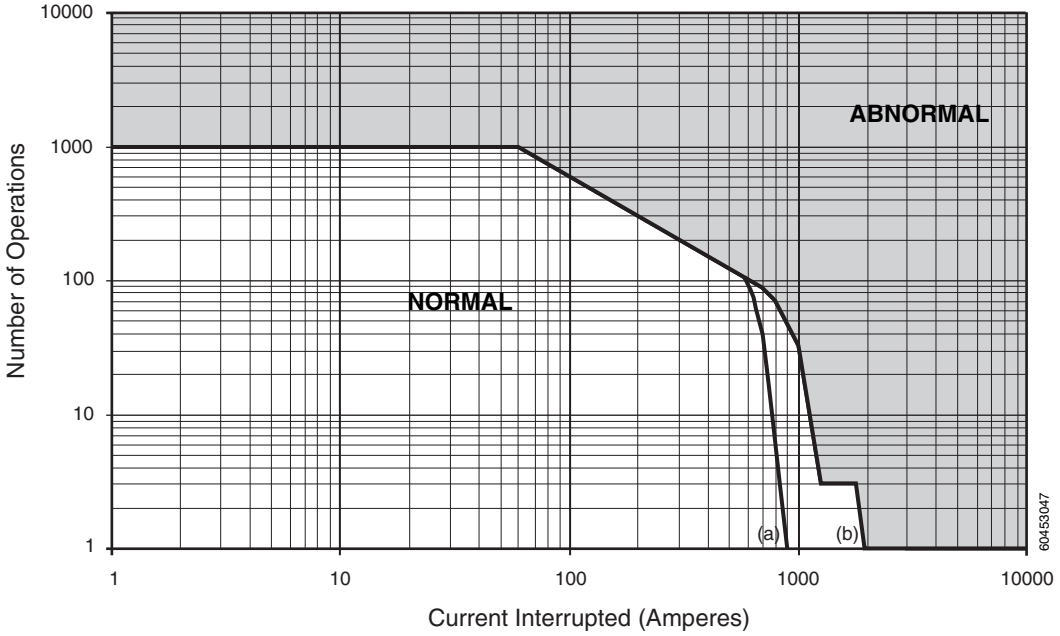
The device has been designed and tested to ANSI C37.20.4 and ANSI C37.22, CSA C22.2, No.193, IEC 420 requirements. Figure 36 illustrates the typical life of the equipment under ideal laboratory conditions. This chart represents an accumulated total (ksi) at greater than 80% power factor, less than 17.5 kV of the 600 A interrupter.

NOTE: Example—The device will successfully interrupt 600 A current (nameplate rating) 100 times or 100 A current 600 times.

ENGLISH

The contact life can also be verified by performing a millivoltage or micrometer test. The value should not increase by 300% of the original value of 80 micro-ohms using a 100 A test micrometer.

Figure 36: Typical Life of HVL/cc (a) 25.8 and 38 kV, (b) 5 and 15 kV



REPLACEMENT PARTS

When ordering renewal or spare parts, include as much information as possible. In many cases, the part number of a new part can be obtained from identification of the old part. Always include the description of the part. Specify the rating, vertical section, and factory order number of the equipment in which the part is to be used.

Table 8: Replacement Parts

Description	Part Number
Auxiliary Switch	25713203
Bulb, push-button 120v 60 Hz	120MB
Fuse, 10-amp	BAF10
Mobil® red grease #28	1615-100950
Handle, operator	3728693
Motor limit switch,	25713203
Motor cut-off Switch	25713203
Motor, electric SEM & OTM	
Motor 24 Vdc	997932
Motor 48 Vdc	997933
Motor 125 Vdc/120 Vac	997934
Motor 250 Vdc/240 Vac	997935
Fuses	
Fuses for Motor 24Vdc	29743211DW
Fuses for Motor 48Vdc	29743211DH
Fuses for Motor 125Vdc/120 Vac	29743211CZ
Fuses for Motor 250Vdc/240 Vac	29743211CN
Coils	
Opening and Closing Coil 24 Vdc	178024
Opening and Closing Coil 48 Vdc	178026
Opening and Closing Coil 125 Vdc	178030
Opening and Closing Coil 250 Vdc	178032
Opening and Closing Coil 120 Vac	178027
Opening and Closing Coil 240 Vac	178030
Air Filters (NEMA 3R)	46011-560-01
Live-line Indicators	
Replacement lights	Contact Schneider Electric◆
Wiring harness	3736844
2.4–15 kV Capacitive Standoff Divider	44044-412-02
25.8–38 kV Capacitive Standoff Divider	0706202
Strip Heater ▲	29904-00682
Phase Sequence Testing Unit ▲	3723912
Class 1, Division 2 T3B rated Heater	XP13020T3B

◆ Must be ordered from the factory. Contact your local Schneider Electric representative for details.
▲ Do not use for Class 1, Division 2 rated equipment

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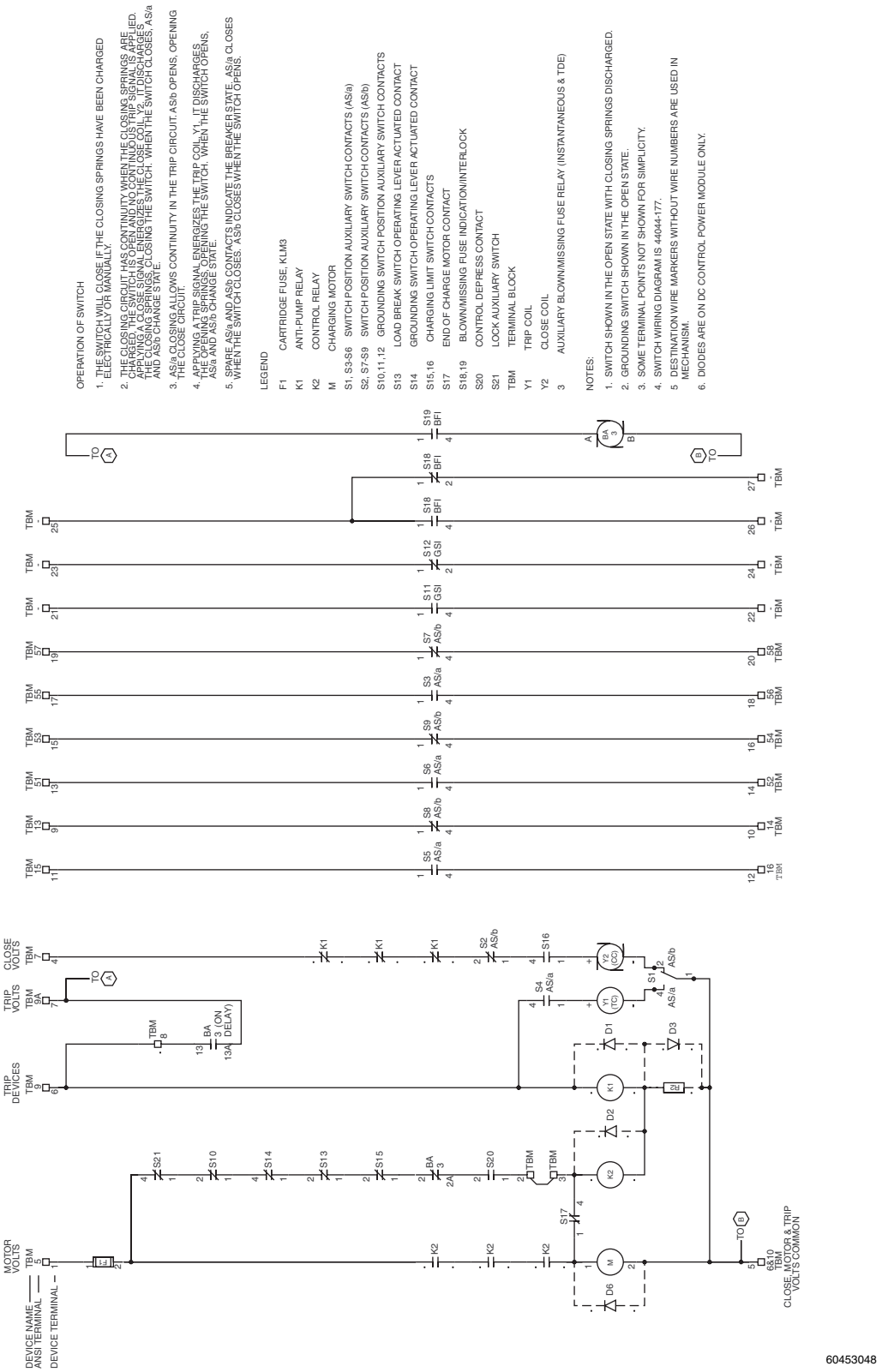
Figure 37: Typical Schematic



CORRECTIVE MAINTENANCE

This section contains information on how to perform corrective maintenance on HVL/cc Metal-Enclosed Switchgear.

Medium Voltage Fuses

Medium voltage fuses provide over-current protection for the medium-voltage switch as well as short circuit interrupting protection up to the short-circuit current rating of the equipment. Schneider Electric HVL/cc equipment can use only current-limiting fuses manufactured by Schneider Electric or Bussmann.

CAUTION

HAZARD OF EQUIPMENT DAMAGE

Do not substitute any other fuse.

Failure to follow this instruction can result in equipment damage.

Always follow the steps listed below before entering the fuse compartment to replace or perform maintenance on the fuses.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on the power to this equipment.

Failure to follow these instructions will result in death or serious injury.

1. To determine if a fuse has been blown, observe the blown fuse or live-line indicator.

   NOTE: If the live line indicator is not illuminating properly refer to"Troubleshooting" on page 54 or replace the indicator if necessary.

2. De-energize (turn off) the switch. Use a properly rated voltage sensing device to test and verify that the power is off. Padlock, and tag all upstream or downstream sources that could energize the primary fuses or control power to prevent inadvertent closure or energization.
3. Place the switch in the **OPEN** position. The load-side LLIs should not be on. Close the ground for the switch if so equipped (see Figure 18 on page 28, Figure 19 on page 29, and Figure 20 on page 30.

   NOTE: Always replace all three fuses even if only one has blown to maintain system coordination. When one fuse blows the other two will have seen an over-current condition therefore are also damaged.

4. Replace the load-side panel. Verify that it is properly placed in the interlock slot and all hooks are engaged.
5. Open the ground switch first (if so equipped), then the main switch can be closed re-energizing the circuit.

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Live Line Indicator (LLI) Replacement

Live Line Indicator (LLI) lights are connected by a capacitive circuit to the main bus bars on the line or load side of the HVL/cc switch. LLI lights connected to the load side of the HVL/cc switch are mounted on the front of the switch mechanism cover. LLI lights connected to the line side of the HVL/cc switch are mounted on the front door of the Low Voltage Compartment.

Follow the steps outlined below to replace LLIs.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

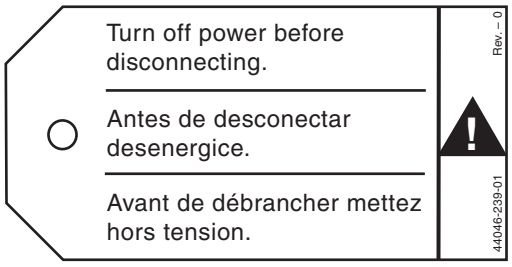
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on the power to this equipment.

Failure to follow these instructions will result in death or serious injury.

1. Turn off all power supplying the equipment. Use a properly rated voltage sensing device to confirm that the power is off.
2. Remove the two mounting screws.
3. Pull the LLI outside of the cover.
4. Unplug the wiring harness.
5. Plug the wiring harness into the new LLI head.
6. Push the LLI back into the cover opening.
7. Replace the two mounting screws.
8. Restore power to the equipment

If the lights on the LLI do not light up repeat steps 1–8 above. If after repeating the procedure results are not satisfactory, turn off all power to the equipment and contact your Schneider Electric representative.

Figure 38: LLI Tag (located on the wiring harness)



CLASS 1, DIVISION 2 MAINTENANCE REQUIREMENTS

Follow the maintenance requirements below for Class 1, Division 2 rated switchgear used in hazardous areas.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Before working on Class 1 Division 2 rated equipment located in hazardous areas, ALWAYS:

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Use a properly rated voltage sensing device to confirm that power is off.
- Before performing visual inspections, tests, or maintenance on the equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, grounded, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of back-feeding.
- Carefully inspect your work area and remove any tools and objects left inside the equipment.
- Replace all devices, doors, and covers before turning on the power to this equipment.

Failure to follow these instructions will result in death or serious injury.

— When replacing heaters, use only explosion proof T3B rated heaters. Wiring connections and openings must be sealed with silicone before turning on the power.

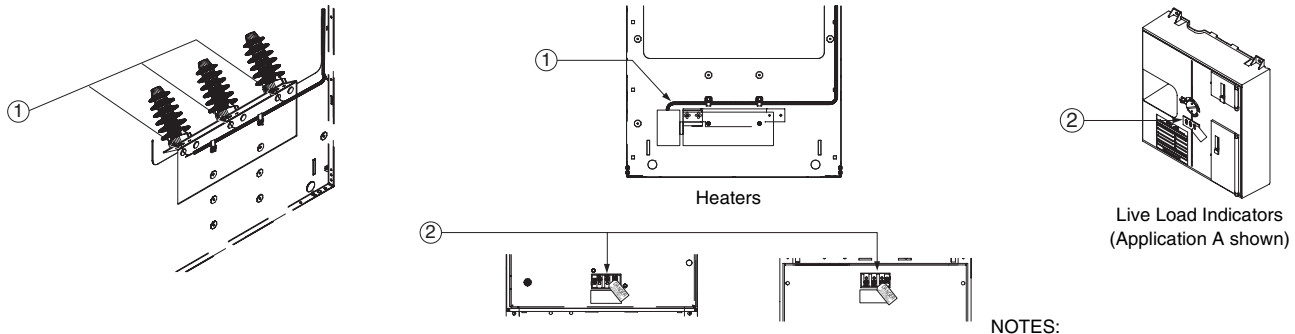
— When replacing LLIs, connections at the insulators must be sealed with silicone before turning on the power.

— Only Non-indicating fuses are to be used.

— Test ports on the LLI heads are factory plugged and not to be used for Class 1, Division 2 rated equipment.

— Only manually operated switch mechanisms (OTM and SEM) are to be used.

Figure 39: Class 1, Division 2 Required Features



ENGLISH

TROUBLESHOOTING

The following tables list conditions, mechanisms, and solutions to problems that may occur in HVL/cc Metal-Enclosed Switchgear.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- This equipment must only be installed and serviced by qualified electrical personnel.
- Qualified persons performing diagnostics or troubleshooting that require electrical conductors to be energized must comply with NFPA 70 E - Standard for Electrical Safety Requirements for Employee Workplaces and OSHA Standards - 29 CFR Part 1910 Subpart S - Electrical.

Failure to follow these instructions will result in death or serious injury.

Table 9: Troubleshooting General Issues

Condition	Mechanism	ACTION:
Live-line Indicator will not illuminate	ALL	• Test for voltage using a properly rated voltage sensing device on 2 of the test ports on the Live-line indicators • Check that the switch is closed • Check the Live-line block is okay • Check that the fuses are installed • Check that the fuses are not blown (blown fuse indicator in lexan cover if provided) • Check that the incoming cables are live
Load-side panel cannot be removed or installed	ALL	• Check that switch is open and in the grounded position (if applicable)
Ground switch cannot be operated	ALL	• Check that the switch is open • Check if fuse/load-side panel is properly installed
Switch cannot be operated	ALL	• Check that grounding switch is open • Check if fuses are installed and not blown (Fuselogic™) • Check if fuse/load-side panel is properly installed

Table 10: Troubleshooting Mechanism Issues

Condition	Mechanism	ACTION:
Electrical operation impossible but manual operation is possible	ALL	• Check for loose connections • Check coil circuit • Check control fuses • Check electrical interlocks Motor cutoff switch Main interrupter cutoff switch Open/Close microswitches • Check grounding switch position and cutoff switch • Check the configuration of the CIP1 subassembly (see Figure 5 and Figure 6)
Operation impossible following an electrical closing	SEM & OTM (with motor)	• Use the operating handle to apply torque in the closing direction until the end position is reached, then check voltage supply to ensure adequate power is available.
Insertion of operating handle is impossible following electrical closing	SEM & OTM (with motor)	• Open switch using backup power • Lock-out the electrical operating mechanism. Push the back of the switch shaft in the closing direction using a large screwdriver to allow insertion of handle, • Using a properly rated voltage sensing device, check voltage to ensure the correct power is being supplied to the motor.

Table 11: Maintenance Log

DATE	INITIALS	ACTION

Schneider Electric

330 Weakley Road
Smyrna, TN 37167 U.S.A.
1-888-SquareD
(1-888-778-2733)
www.SquareD.com

Replaces 6045-1, 02/2004

04/2005