Medium-voltage power distribution and control systems > Switchgear >

Metal-enclosed switchgear—MVS medium-voltage 5–15 kV narrow design load interrupter switch

Contents

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General Description MVS-ND

MVS-ND Medium-Voltage—Load Interrupter Switchgear—5 and 15 kV (18.00-Inch Wide)

Indoor Unit

Indoor with Top Hat

Outdoor with Top Hat

Type MVS-ND load interrupter switchgear offers the same great functionality of traditional MVS switchgear in a reduced footprint. It uses a Type MVS-ND load interrupter switch with its poles arranged front-to-back and provides the narrowest footprint available. Type MVS-ND switchgear, like all other Eaton metal-enclosed and metal-clad switchgear, depends on air for its primary phase-to-phase and phase-to-ground insulation. It is designed for general power distribution or transformer primary switching, where infrequent switching means is required.

Type MVS-ND load interrupter switchgear is available as follows:

- Rated maximum voltage of 4.76 kV or 15 kV
- Rated continuous and load-break current rating of 600 A or 1200 A
- Indoor or outdoor non-walk-in enclosures
- Can be supplied as single unit or lineup of multiple units with main bus
- Duplex arrangement for Source 1 or Source 2 selection
- Main-tie-main lineup
- Close-coupled primary for dry or liquid-filled transformer
- Close-coupled to Eaton's Type MVS, Type VCP-W or AMPGARD motor control center via an 18.00-inch transition section
- Supplied with manually or motor operated switches
- Supplied with non-fused or fused switches with 5 kV BHLE 10–450 A or 15 kV BHLE 10–250 A or BHCL 300 A primary fuses
- Optional auxiliary switch with up to 5a/5b contacts
- Optional space heaters for indoor switchgear
- Supplied with key interlocks to force a desired sequence of operation
- Surge arresters (optional) can be added to the line or load side

Standard Features

- Air insulated three-pole, gang-operated, quick-make, quick-break load interrupter switch mechanism provides speed of operation that is independent of the operator for safe and reliable switching
- Proven load interrupter switch design that uses main and flicker blade technology
- A through-the-door switch operation from the front of the switchgear
- A door interlock prevents inadvertent opening of the enclosure's front door while the load interrupter switch is in the closed position
- A switch interlock prevents inadvertent closing of the switch when the enclosure's front door is open
- Viewing window provides clear, visible confirmation of opened and closed switch contacts
- Mechanical indicators show whether the switch mechanism is open or closed
- Provisions for padlocking the switch in open or closed position
- Provision for padlocking the main door in closed position
- Space heaters are provided as standard for outdoor switchgear (120 V or 240 Vac control supply is to be provided by he purchaser)

Instrumentation, CTs, VTs and CPT

Due to compact dimensions, MVS-ND units are not designed for mounting of CTs, VTs or a CPT. If the application requires CTs, VTs or a CPT, a conventional 36.00-inch-wide MVS unit is required, which can be close-coupled to the MVS-ND unit through an 18.00-inch transition section.

Standards and Certifications

Eaton's MVS-ND load interrupter switchgear meets or exceeds the requirements of the following industry standards:

- IEEE® Standard C37.20.3
- ANSI C37.57
- NEMA® SG5
- Canadian Standard CAN/CSA® C22.2 No. 31

Type MVS-ND switches meet or exceed the requirements of the following industry standards:

- IEEE Standard C37.20.4
- ANSI C37.58
- ANSI C37.22
- NEMA SG6
- Canadian Standards CAN/CSA C22.2 No. 193 and CAN/CSA C22.2 No. 58

Third-Party Certification

5/15 kV MVS-ND load interrupter switchgear can be provided with UL® or CSA listing.

Seismic Qualification

5/15 kV MVS-ND load interrupter switchgear has been qualified for seismic applications by actual testing to meet requirements of IBC 2006 and CBC 2007.

Switch Mechanism

The quick-make, quick-break mechanism uses a heavy-duty coil spring that provides powerful opening and closing action. To close the switch, the handle is inserted into the spring charging cam, then rotated upward through an angle of 120 degrees. This action charges the operating spring, and as the mechanism is forced past toggle, the stored energy of the spring is released and transferred to the main shaft that snaps the switch closed.

As a result of the over-toggle action, the blades are moved independently of the operator. It is impossible to operate the switch into an intermediate position.

To open the switch, the handle is inserted into the spring charging cam and rotated downward through 120 degrees resulting in charging of the operating spring, then releasing its stored energy in similar sequence.

Quick-Break DE-ION Arc Interruption

With the switch closed, both main and auxiliary (flicker) blades are closed, and all of the current flows through the main blades. The flicker blades are in the closed position in the arc chutes, but are past the arcing contacts and thus carry no current. As the main blades open, current is transferred momentarily to the flicker blades, which are held in the arc chutes by high pressure contact fingers. There is no arcing at the main blades.

When the main blades reach a pre-determined angle of opening, a stop post on the main blades prevents further angular movement between the main and flicker blades. This starts the flicker blades out of the high pressure contacts in the arc chutes and as contacts are broken, the flicker blades are snapped into position by their torsion springs.

The heat of the arc, meanwhile, releases a blast of de-ionizing gas from the gas-generating material of the arc chute. This combination of quick-break and DE-ION action quickly extinguishes the arc and the circuit is safely de-energized.

A non-fused switch has the ability to close and latch four times when rated 40 kA, and one time when rated 61 kA, and continue to carry rated current thus adding a large margin of integrity to the electrical system.

The 5/15 kV switch designs have also demonstrated the ability to surpass the number of ANSI C37.22 required loadbreak current operations by no less than 200%.

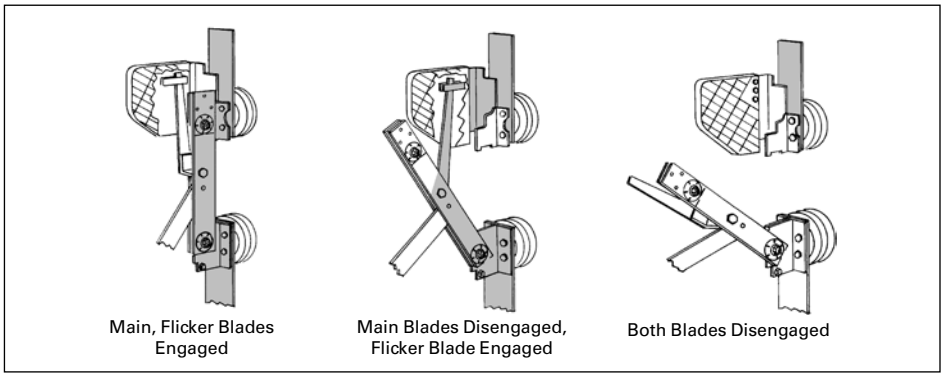
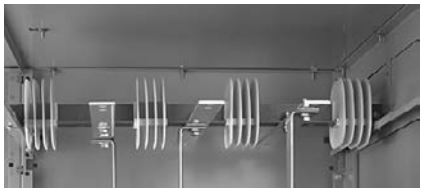


Figure 8.5-1. Switch Operation

Bus Insulation System

All bus runs are supported using a high strength and high creep, finned support providing in excess of 12.00 inches (304.8 mm) for 5/15 kV of creep distance between phases and ground. The molded high track-resistant fins are constructed as standard of Aramid nylon or optional Cycloaliphatic epoxy.

- Significantly superior bus bracing than standoff type A20 insulators
- Significantly increased creep distance phase-to-phase and phase-to-ground
- Improved endurance from fault incidents
- Minimizes bus system failures due to tracking
- Eliminates additional ground planes in the switchgear for bus supporting systems



Bus Support

Duplex Switch Configuration

Two MVS load interrupter switch sections can be used to provide cost- effective source selectivity with a common load side bus feeding one load, fused or nonfused. Key interlocks are a standard feature provided to permit only one switch to be closed at one time and prevent opening any switch door unless both switches are open.

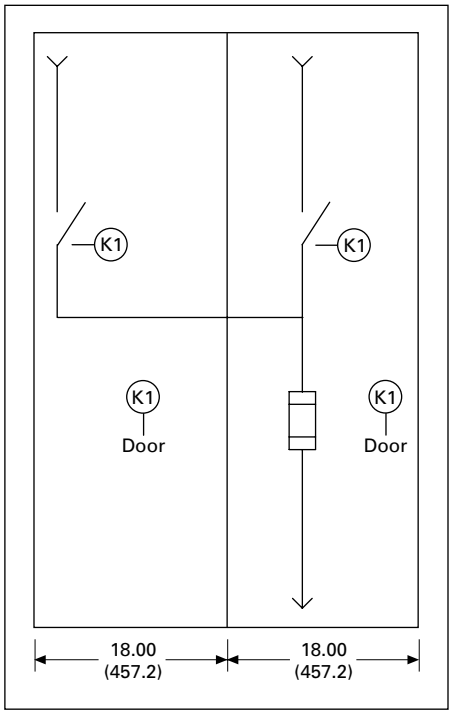


Figure 8.5-2. Typical Duplex Switch Configuration with One K1 Key—Dimensions in Inches (mm)

Technical Data

Available Ratings

Refer to **Table 8.5-1** for available Type MVS-ND switchgear assembly and **Table 8.5-2** for MVS-ND switch ratings.

Table 8.5-1. Type MVS-ND Metal-Enclosed Load Interrupter Switchgear Assembly Main Cross Bus Ratings

Rated Maximum Voltage	Power Frequency Withstand Voltage, 60 Hz, 1 Minute	Lightning Impulse Withstand Voltage (LIWV) (BIL)	Rated Main Bus Continuous Current	Rated Short-Time Short-Circuit Current Withstand (2 Second)	Rated Momentary Short-Circuit Current Withstand (10 Cycle) (167 ms)	
kV rms	kV rms	kV Peak	Amperes	kA rms sym	kA rms Asym	kA Peak
4.76	19	60	600, 1200	25	40	65
4.76	19	60	600, 1200	38	61	99
15.00	36	95	600, 1200	25	40	65
15.00	36	95	600, 1200	38	61	99

Table 8.5-2. Type MVS-ND Non-Fused Load Interrupter Switch Ratings ①

Rated Maximum Voltage	Power Frequency Withstand Voltage, 60 Hz, 1 Minute	Lightning Impulse Withstand Voltage (LIWV) (BIL)	Rated Continuous and Load Break Current	Rated Short-Time Short-Circuit Current Withstand (2 Second)	Rated Fault-Close and Momentary Short-Circuit Current (10 Cycle) (167 ms)		Rated Magnetizing Current	Rated Load Break Current Operations
kV rms	kV rms	kV Peak	Amperes	kA rms sym	kA rms Asym	kA Peak	Amperes	
4.76	19	60	600	25	40	65	12	50
4.76	19	60	600	38	61	99	12	50
4.76	19	60	1200	25	40	65	24	20
4.76	19	60	1200	38	61	99	24	20
15.00	36	95	600	25	40	65	12	30
15.00	36	95	600	38	61	99	12	30
15.00	36	95	1200	25	40	65	24	10
15.00	36	95	1200	38	61	99	24	10

① Fault-close rating of MVS-ND when supplied with 5BHLE 10–450 A and 15BHLE 10–250 A or 15BHCL 300 A fuses is 160.6 kA peak.

System Options

Surge Protection

IEEE standard C62.11 for Metal Oxide Surge Arresters lists the maximum rated ambient temperature as 40 °C. The ambient temperature inside an Eaton MVS switchgear vertical section may exceed this temperature, especially in outdoor applications where solar radiation may produce a significant contribution to the temperature.

Table 8.5-3 lists the recommended minimum duty cycle voltage rating for various system grounding methods. Surge arrester rating is based upon the ambient air temperature in the switchgear vertical section not exceeding 55 °C.

Table 8.5-3. Suggested Minimum Ratings (kV) for Metal Oxide Surge Arresters Located in Metal-Enclosed Switchgear

Service Voltage Line-to-Line kV	Distribution Class Arresters						Station Class Arresters					
	Solidly Grounded System		Low Resistance Grounded System		High Resistance or Ungrounded System		Solidly Grounded System		Low Resistance Grounded System		High Resistance or Ungrounded System	
	Arrester Ratings kV						Arrester Ratings kV					
	Nominal	MCOV	Nominal	MCOV	Nominal	MCOV	Nominal	MCOV	Nominal	MCOV	Nominal	MCOV
2.30	3	2.55	3	2.55	3	2.55	3	2.55	3	2.55	3	2.55
2.40	3	2.55	3	2.55	6	5.10	3	2.55	3	2.55	6	5.10
3.30	3	2.55	3	2.55	6	5.10	3	2.55	3	2.55	6	5.10
4.00	3	2.55	6	5.10	6	5.10	3	2.55	6	5.10	6	5.10
4.16	6	5.10	6	5.10	6	5.10	6	5.10	6	5.10	6	5.10
4.76	6	5.10	6	5.10	9	7.65	6	5.10	6	5.10	9	7.65
4.80	6	5.10	6	5.10	9	7.65	6	5.10	6	5.10	9	7.65
6.60	6	5.10	6	5.10	9	7.65	6	5.10	6	5.10	9	7.65
6.90	6	5.10	6	5.10	9	7.65	6	5.10	9	7.65	9	7.65
7.20	6	5.10	6	5.10	10	8.40	6	5.10	9	7.65	10	8.40
8.32	9	7.65	9	7.65	12	10.20	9	7.65	9	7.65	12	10.20
8.40	9	7.65	9	7.65	12	10.20	9	7.65	9	7.65	12	10.20
11.00	9	7.65	9	7.65	15	12.70	9	7.65	10	8.40	15	12.70
11.50	9	7.65	10	8.40	18	15.30	9	7.65	12	10.20	18	15.30
12.00	10	8.40	10	8.40	18	15.30	10	8.40	12	10.20	18	15.30
12.47	10	8.40	12	10.20	18	15.30	10	8.40	12	10.20	18	15.30
13.20	12	10.20	12	10.20	18	15.30	12	10.20	12	10.20	18	15.30
13.80	12	10.20	12	10.20	18	15.30	12	10.20	15	12.70	18	15.30
14.40	12	10.20	12	10.20	21	17.00	12	10.20	15	12.70	21	17.00
18.00	15	12.70	15	12.70	27	22.00	15	12.70	18	15.30	27	22.00
20.78	18	15.30	18	15.30	30	24.40	18	15.30	21	17.00	30	24.40
22.00	18	15.30	18	15.30	30	24.40	18	15.30	21	17.00	30	24.40
22.86	18	15.30	21	17.00	—	—	18	15.30	24	19.50	36	29.00
23.00	18	15.30	21	17.00	—	—	18	15.30	24	19.50	36	29.00

Note: MCOV = Maximum Continuous Operating Voltage.

MVS-ND Layouts

Typical Arrangements—5 kV and 15 kV

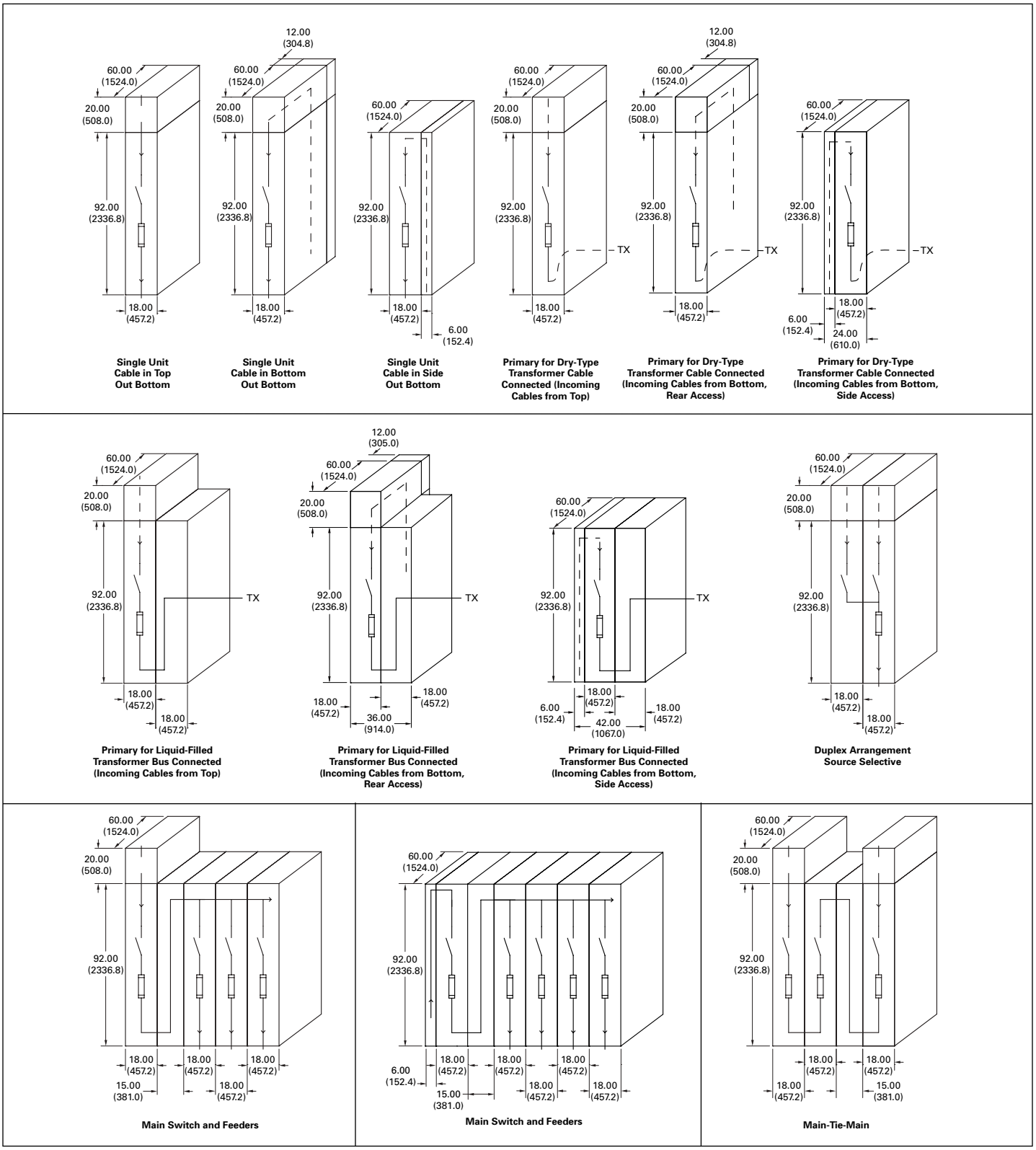


Figure 8.5-3. 5 kV and 15 kV—Dimensions in Inches (mm)

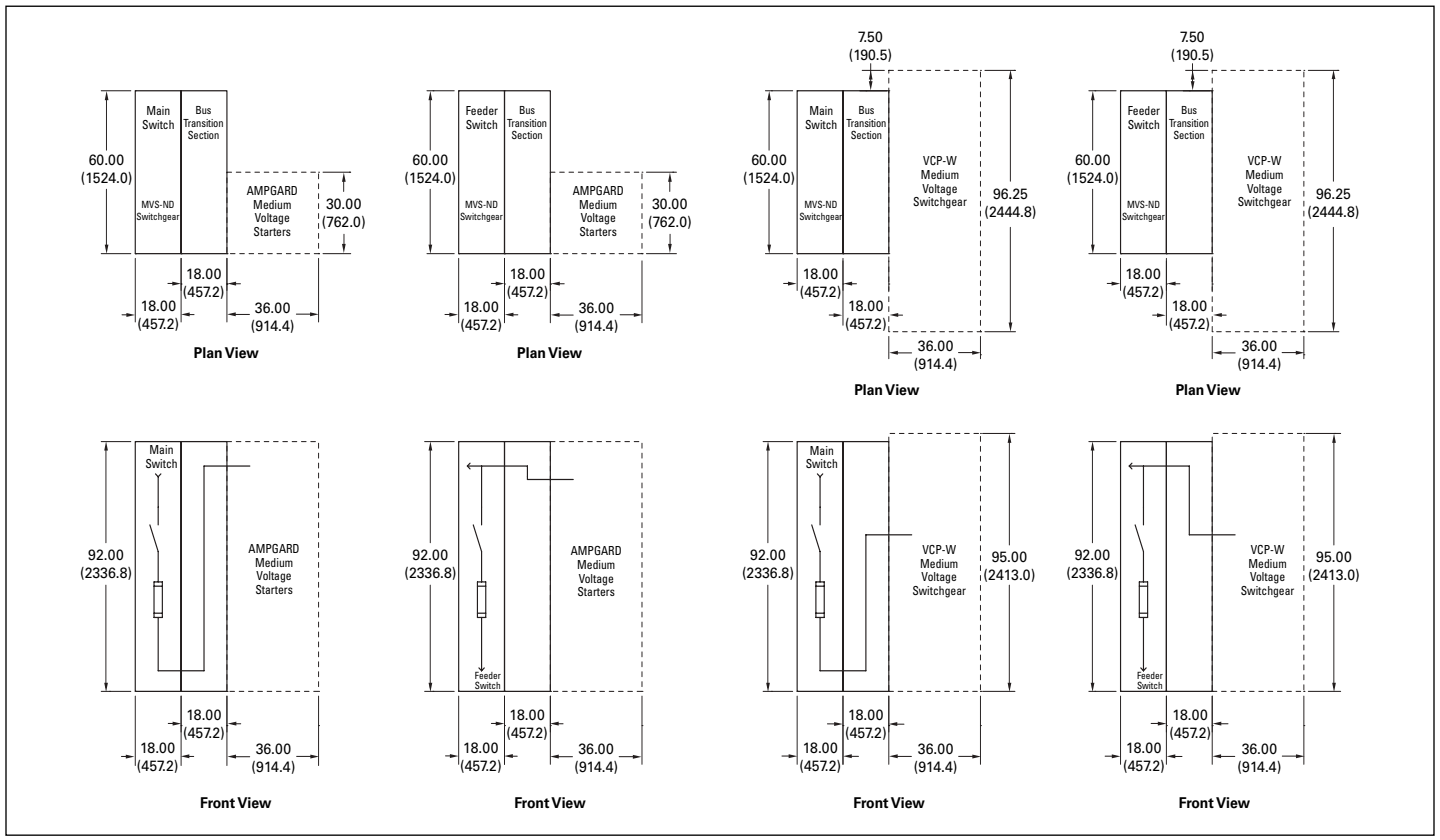


Figure 8.5-4. MVS Connecting to Other Switchgear (Indoor)—Dimensions in Inches (mm)

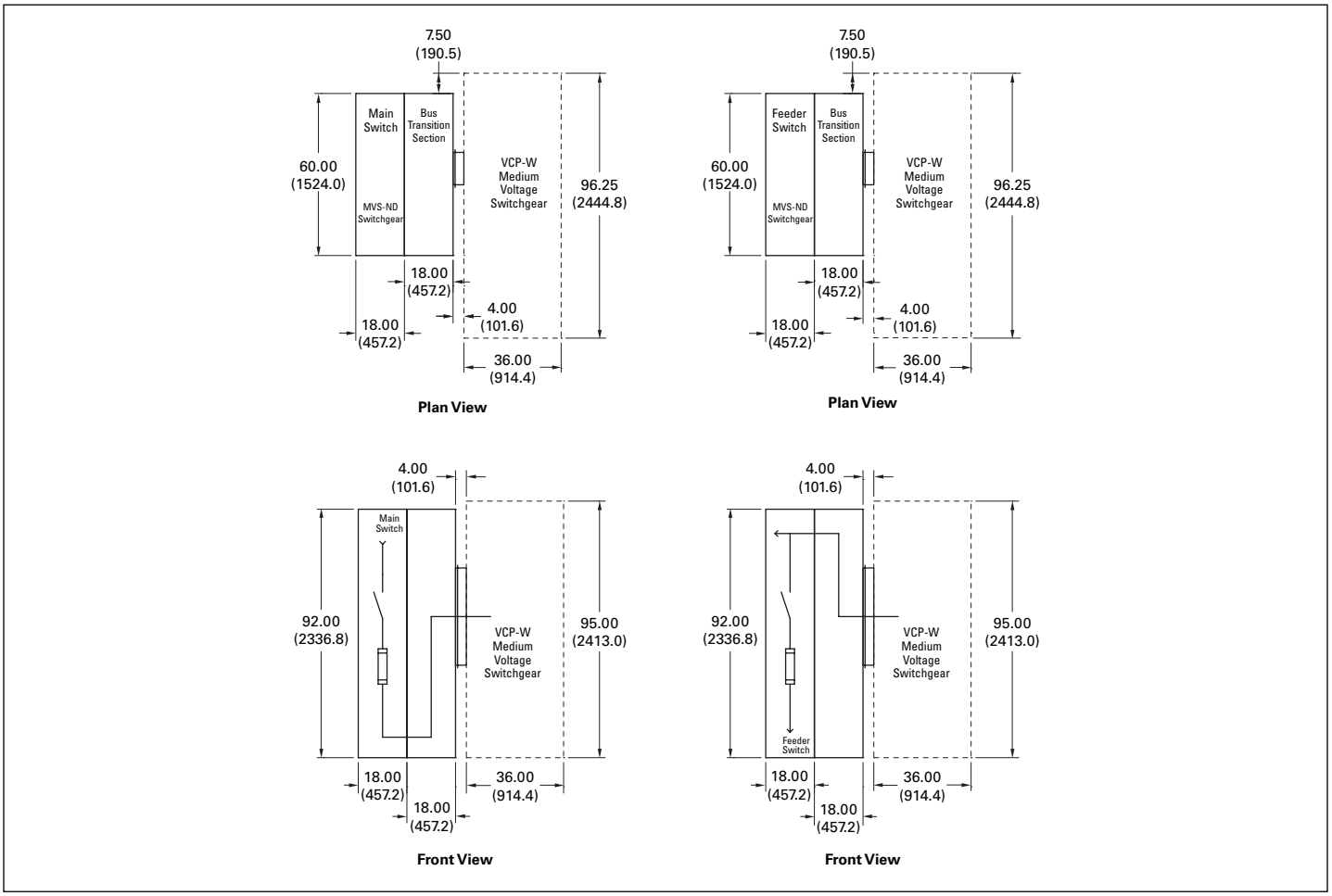


Figure 8.5-5. MVS Connecting to Other Switchgear (Outdoor)—Dimensions in Inches (mm)

Typical Sectional Side Views

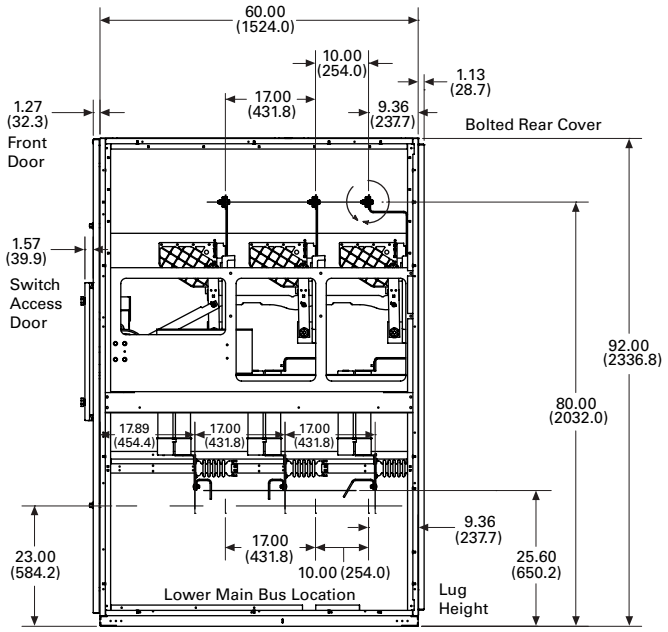


Figure 8.5-6. 5 kV and 15 kV Standard Switch Unit Detail—Dimensions in Inches (mm)

Layouts—Dimensions, 5 kV and 15 kV

5 kV and 15 kV Standard Switch Unit Detail Typical Sectional Side Views Layouts—Dimensions in Inches (mm)

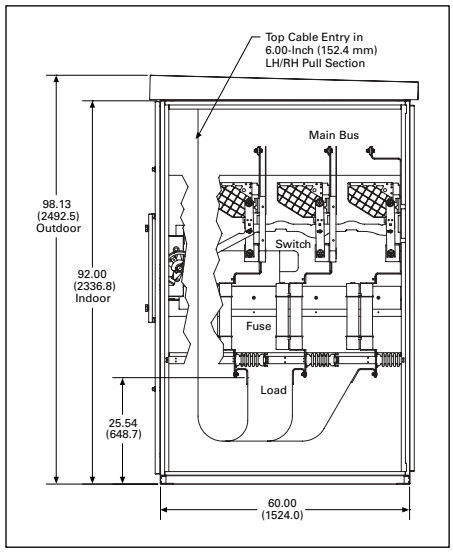


Figure 8.5-7. Front/Side Access Feeder Circuit—Fused or Unfused Top Cable Entry

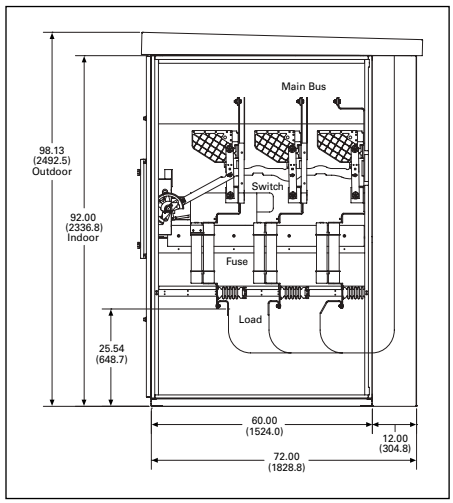


Figure 8.5-8. Front/Side Access Feeder Circuit—Fused or Unfused Top Cable Entry

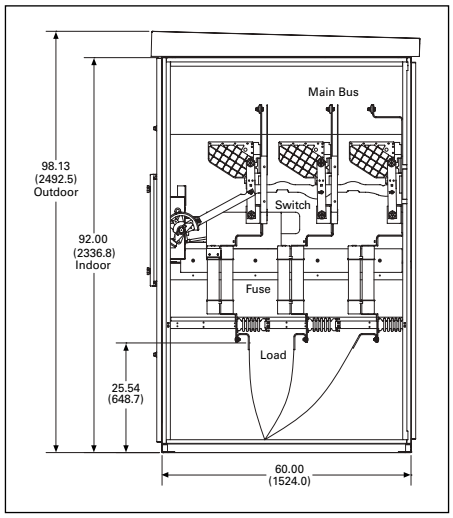


Figure 8.5-9. Front/Side Access Feeder Circuit—Fused or Unfused Bottom Cable Entry

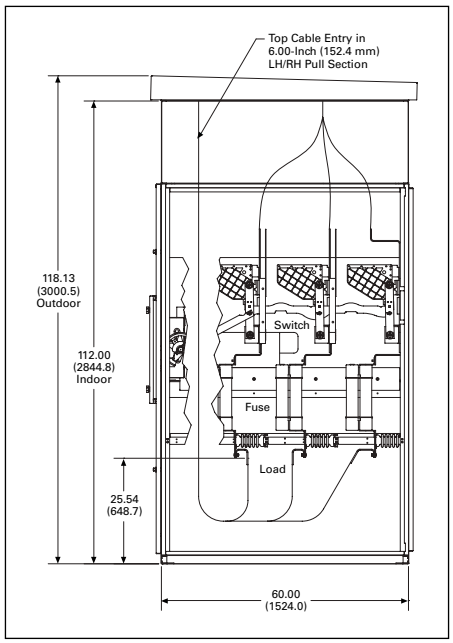


Figure 8.5-10. Front/Side Access Cable In/Cable Out—Fused or Unfused

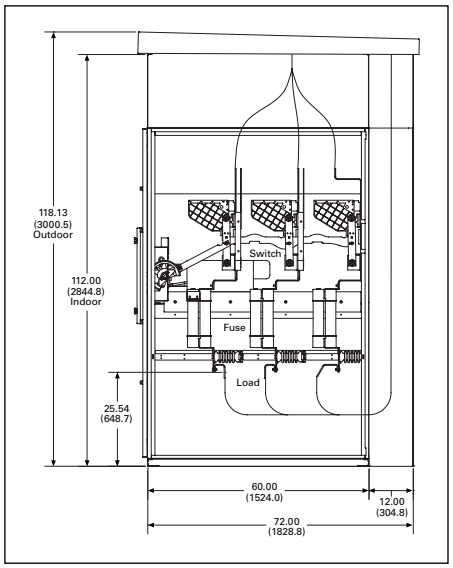


Figure 8.5-11. Front/Side Access Cable In/Cable Out—Fused or Unfused

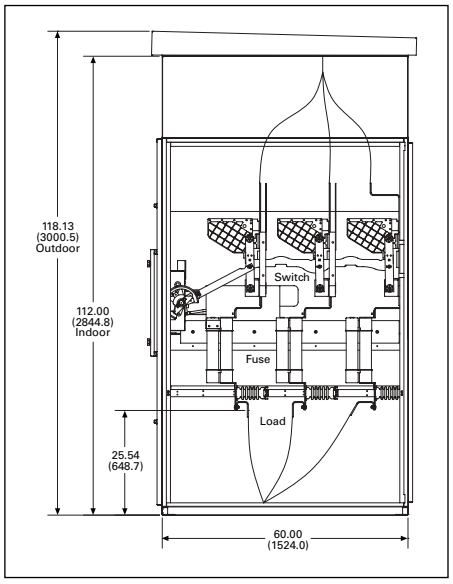


Figure 8.5-12. Front/Side Access Cable In/Cable Out—Fused or Unfused

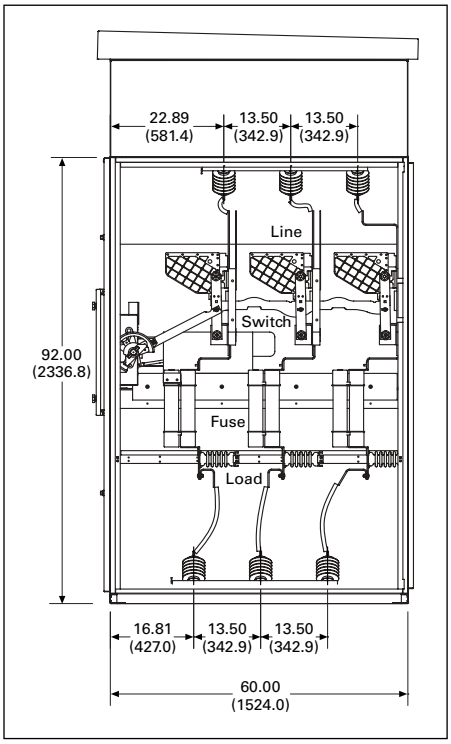


Figure 8.5-13. Typical Arrester Mounting

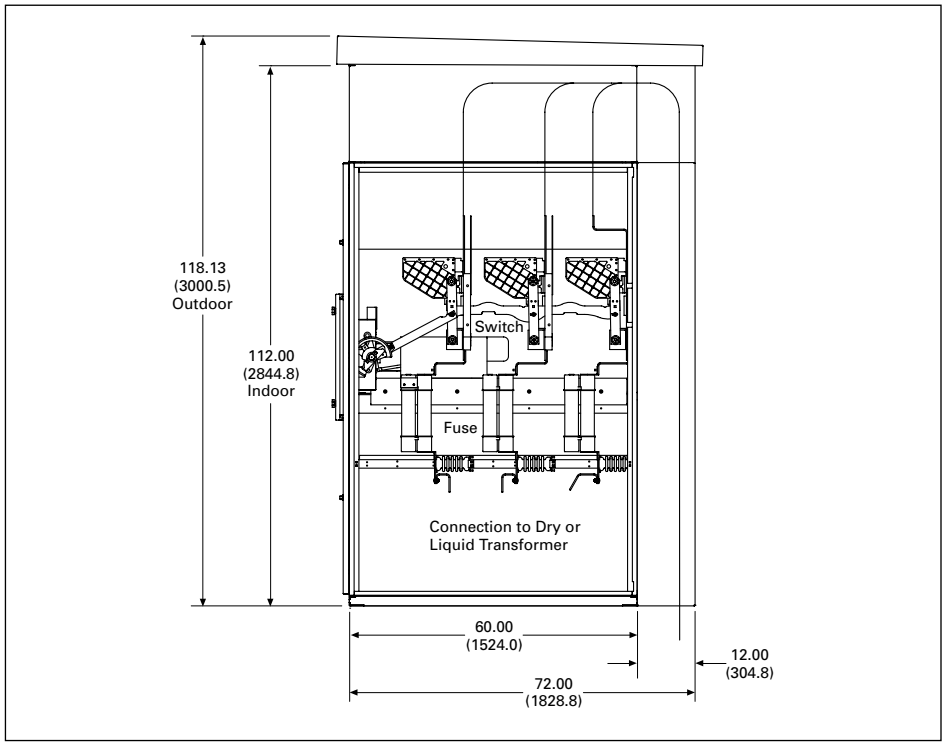


Figure 8.5-14. Close-Coupled to Dry and Liquid Transformers with 12-Inch Rear Extension, Bottom Incoming, Rear Access

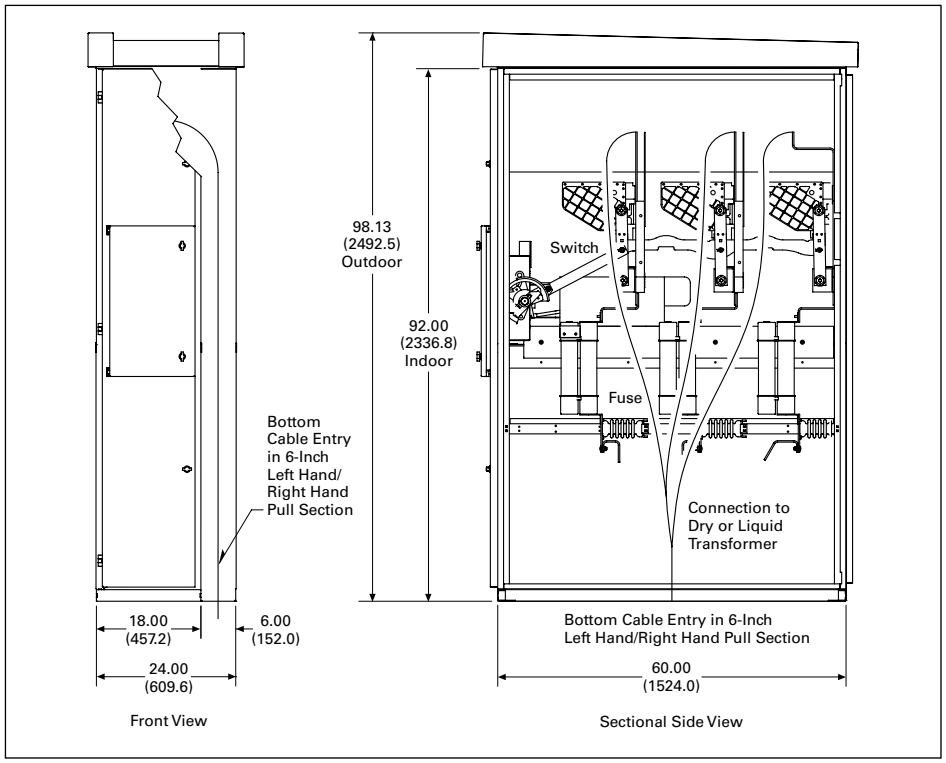


Figure 8.5-15. Close-Coupled to Dry and Liquid Transformers with 6-Inch Side Pull Section, Bottom Incoming, Side Access

Dimensions in inches (mm).
Not to be used for construction purposes unless approved .

Typical Base Plan and Recommended HV Cable Entry/Exit Locations

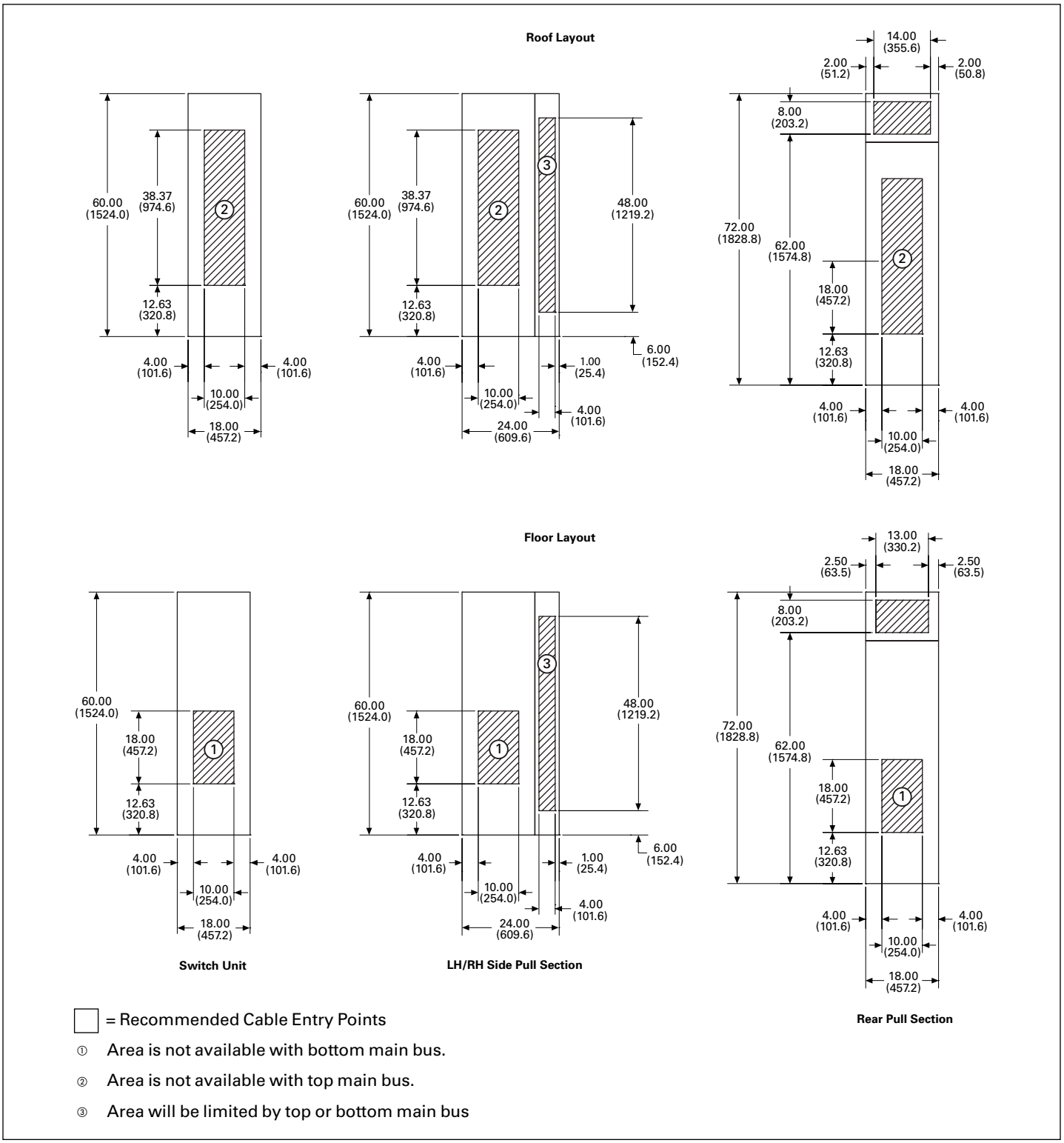


Figure 8.5-16. Recommended HV Cable Entry/Exit Locations—Dimensions in Inches (mm)

Weights

Typical Anchor Plan

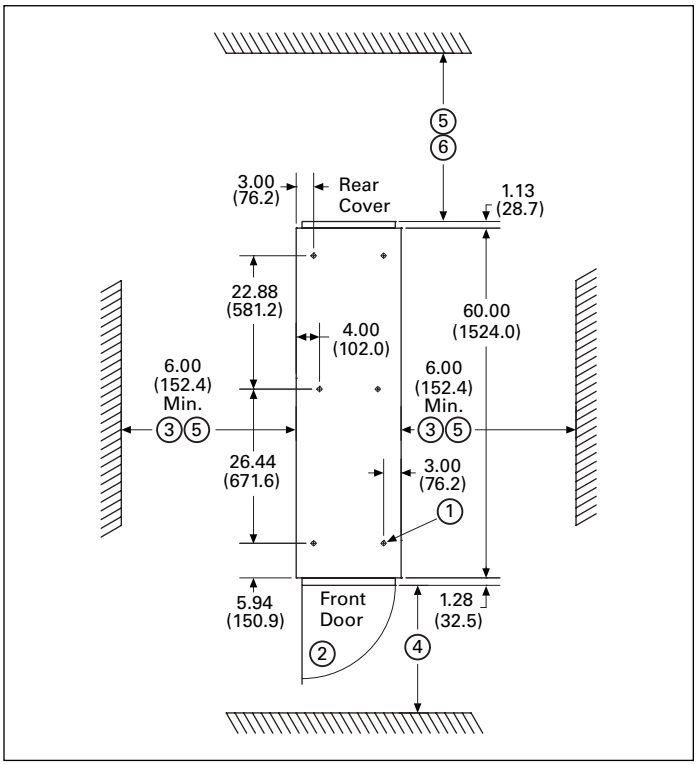


Figure 8.5-17. Typical Anchor Plan—Dimensions in Inches (mm)

① Locations for tie-down 0.75 (19.0) diameter holes in six places. Customer provided bolts for anchoring should be 0.50–13 min. Grade 5 (M12 x 1.75 CL 10.9) and tightened to 75 ft-lb (101.7 Nm).

② Door swing equals unit width at 90°.

③ The standard minimum clearances on side. The authority having jurisdiction may require a larger distance.

④ Minimum clearances in front is the width of the widest vertical section plus 1.00 inch (25.4 mm). The authority having jurisdiction may require a larger distance.

⑤ The standard minimum recommended distance is 36.00 inches (914.4 mm) for assemblies requiring rear or side access for installation and maintenance. The authority having jurisdiction may require a larger distance.

⑥ For MVS-ND only. The application is specifically provided by contract as not requiring rear access as stated in Note 5, then the minimum recommended distance is 6.00 inches (152.4 mm).

⑦ Finished foundation's surface shall be level within 0.06-inch (1.5 mm) in 36.00 inches (914.4 mm) left-to-right. Front-to-back and diagonally as measured by a laser level.

Table 8.5-4. Type MVS-ND Fused Load Interrupter Switch Structures—Approximate Weights

Structure Type	Dimensions—Inches (mm)			Weight—lb (kg)	
	Width	Depth	Height	Indoor Unit	Outdoor Unit
Switch without Top Hat	18.00 (457.2) 18.00 (457.2) 24.00 (609.6) 24.00 (609.6)	60.00 (1524.0) 72.00 (1828.8) 60.00 (1524.0) 72.00 (1828.8)	92.00 (2336.8) 92.00 (2336.8) 92.00 (2336.8) 92.00 (2336.8)	800 (363) 950 (431) 875 (397) 1025 (465)	900 (408) 1100 (499) 1000 (454) 1200 (544)
Switch with Top Hat	18.00 (457.2) 18.00 (457.2) 24.00 (609.6) 24.00 (609.6)	60.00 (1524.0) 72.00 (1828.8) 60.00 (1524.0) 72.00 (1828.8)	112.00 (2844.8) 112.00 (2844.8) 112.00 (2844.8) 112.00 (2844.8)	900 (408) 1050 (476) 975 (442) 1125 (510)	1000 (454) 1200 (544) 1100 (499) 1300 (590)
Main Bus Transition	15.00 (381.0)	60.00 (1524.0)	92.00 (2336.8)	500 (227)	600 (272)
Transition Unit	18.00 (457.2)	60.00 (1524.0)	92.00 (2336.8)	800 (363)	900 (408)
Duplex Unit with Top Hat	36.00 (914.0) 36.00 (914.0)	60.00 (1524.0) 72.00 (1828.8)	112.00 (2844.8) 112.00 (2844.8)	1700 (771) 1850 (839)	1900 (862) 2050 (930)
Duplex Unit without Top Hat	48.00 (1219.2)	60.00 (1524.0)	92.00 (2336.8)	2200 (998)	2500 (1134)

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Cleveland, OH 44122
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Printed in USA
Publication No. DG022015EN / Z23483
February 2020

Powering Business Worldwide