

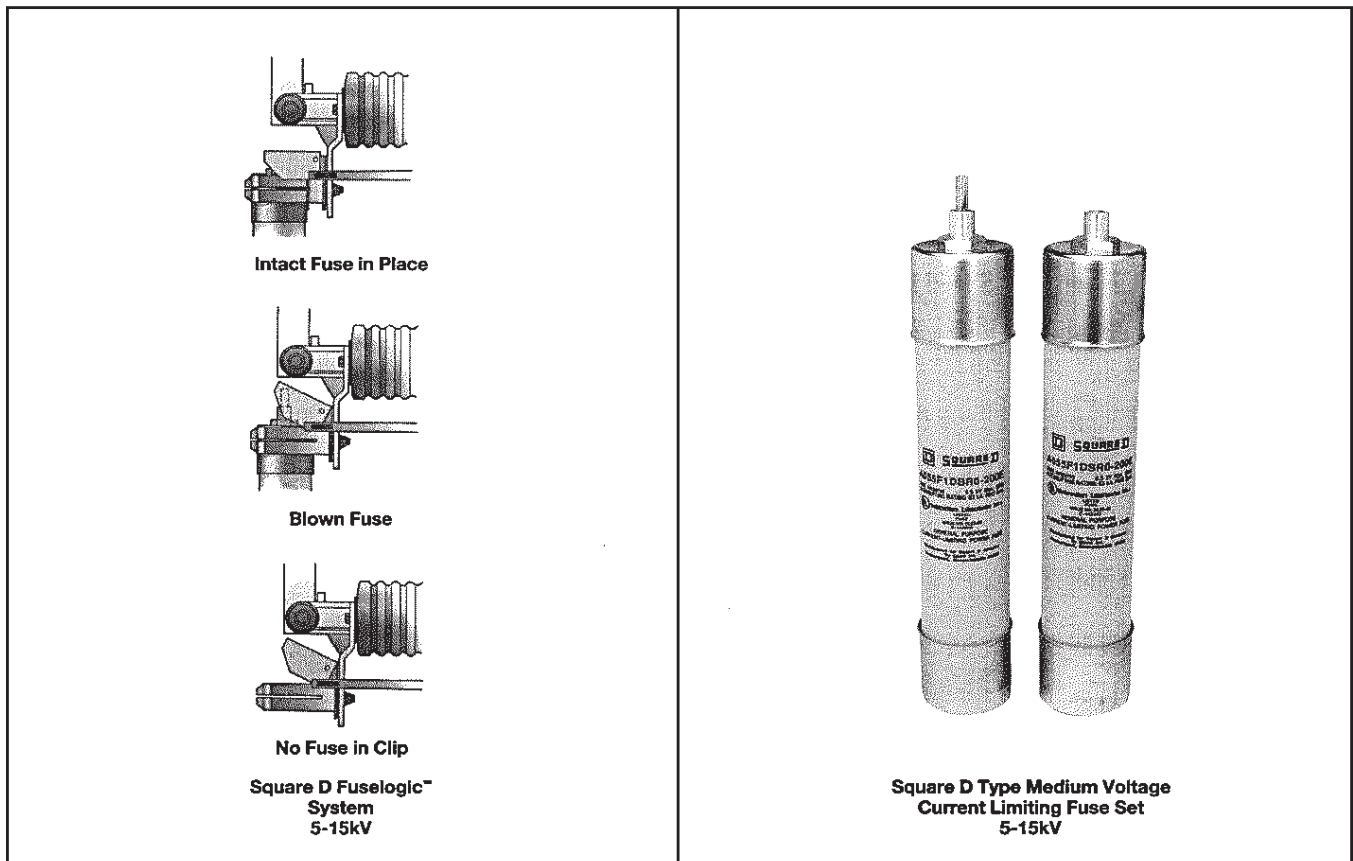
# Metal-Enclosed Load Interrupter Switchgear With HVL Switches Voltage Ratings 2.4kV to 38kV

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# Metal-Enclosed Load Interrupter Switchgear Application Data



## General

Better system performance and reliability, lower electrical power cost, easier system expansion, and reduced equipment expense are issues commanding serious attention in 2400 volt to 38,000 volt electrical power distribution system planning.

Square D Metal-Enclosed Load Interrupter Switchgear functions as a prime component of these systems providing necessary switching and overcurrent protection for the medium-voltage feeders. It is often used in conjunction with Square D unit substations. The switchgear is most frequently applied as service entrance equipment, although it performs equally well in controlling substation transformers and in sectionalizing medium-voltage feeder systems.

## Available Options

- UL Approved 4.76, 15 and 17kV switches
- Shunt trip
- Line selector switch
- Motor operator

(Contact Smyrna Marketing for details)

## FUSELOGIC™

The new Square D medium voltage current limiting fuse sets the standard for features and protection. The new *extended travel blown fuse indicator* provides more travel to positively operate the optional FUSELOGIC protection system.

The new FUSELOGIC system prevents closing of the HVL switch if a fuse is blown or has not been installed. This reduces the potential of equipment damage due to single phasing. The FUSELOGIC system can be used to operate auxiliary contacts for optional local and/or remote indication.

NOTE: FUSELOGIC can only be operated by Square D fuses.

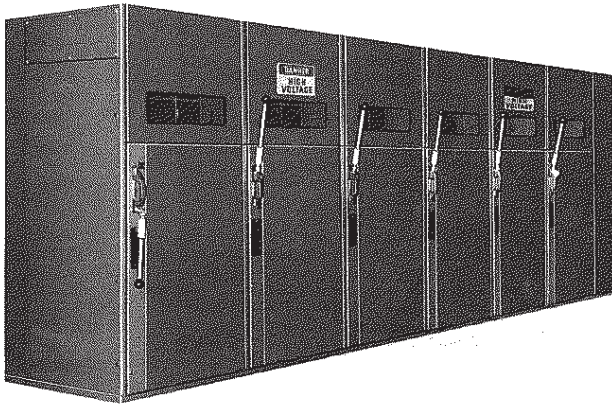


## Metal-Enclosed Load Interrupter Switchgear Application Data

### Type of Equipment Available — Indoor and Weatherproof

**Single Bay Switchgear** contains a single switch or fused switch in a free standing enclosure. It is ideally suited for locating close to a load to control a single high-voltage circuit.

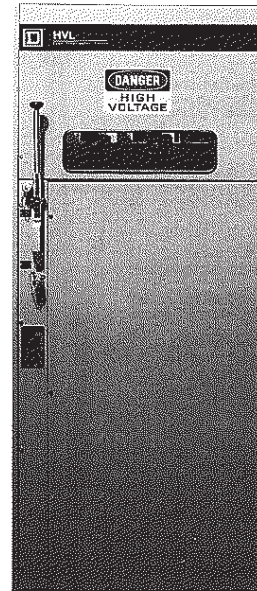
Special emphasis is placed on conduit area, cable entrance and terminations. Normally, no main bus is furnished. A ground pad bonded to the steel frame is furnished with a cable lug termination. Where future expansion is anticipated, the unit can be furnished with main bus to permit additional bays to be connected when needed.



Indoor Multiple Bay Load Interrupter Switchgear

**Multiple Bay Switchgear** generally consists of a lineup of individual feeder switch bays connected to a common main bus. A main switch, fused or not fused, can be included in the lineup with a utility or user metering cubicle, depending upon job requirements. A continuous ground bus is bonded to the frame of each bay for the complete length of the lineup. The end cubicle is furnished with provisions for the addition of future feeder switch bays.

**Outdoor** single switch or multiple bay switchgear consists of high-voltage components in a completely weatherproof enclosure. Access is through a gasketed front bulkhead-type door. The enclosure is designed so that the sheared edges of the steel are not exposed. The equipment is furnished with a welded, formed steel channel base and weatherproof paint finish.

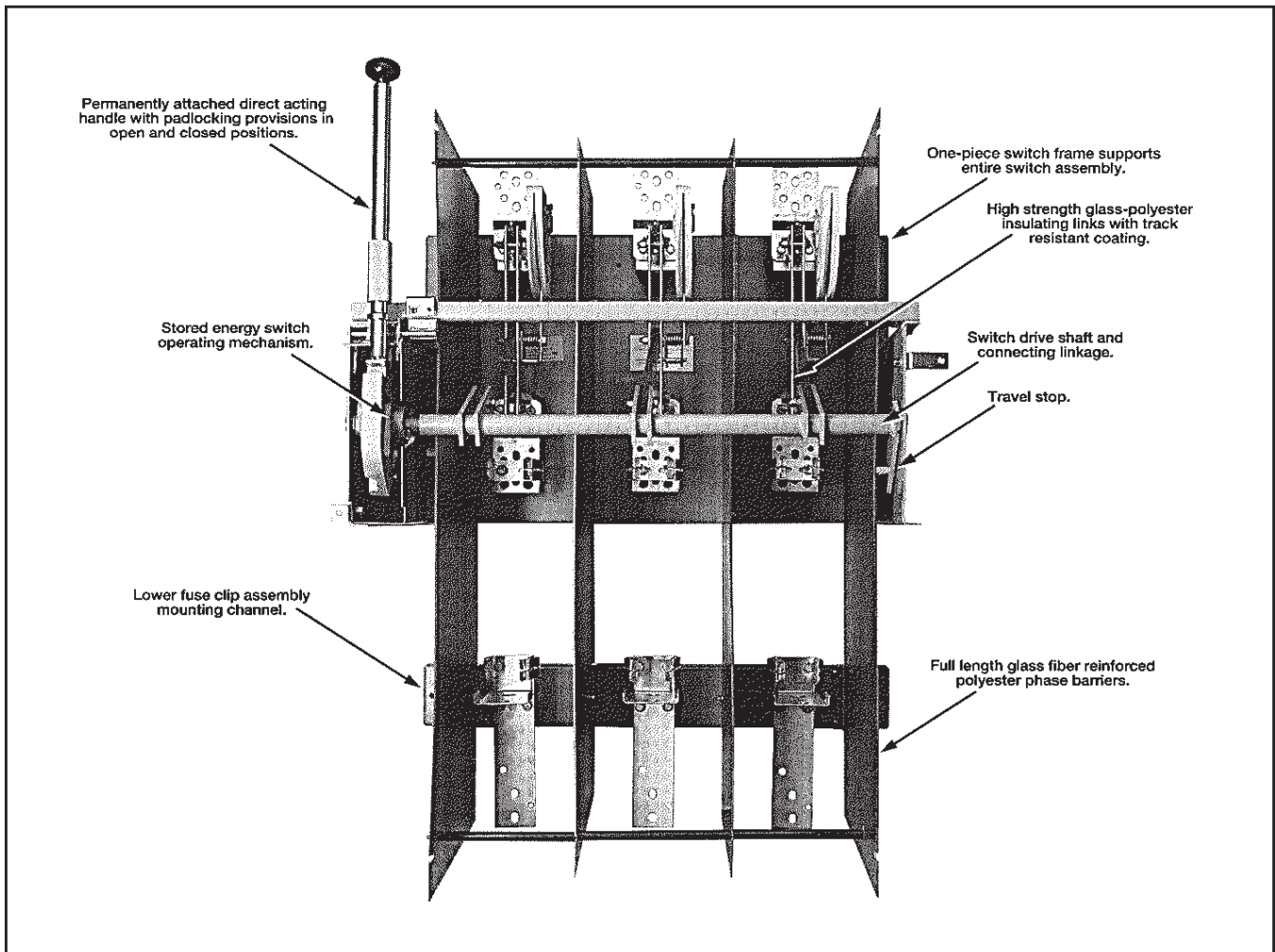


Indoor Single Bay Switchgear Unit



Outdoor Multiple Bay Load Interrupter Switchgear

# Metal-Enclosed Load Interrupter Switchgear Application Data



Square D Type HVL Load Interrupter Switch

## BIL

- 4.76 kV-60 kV BIL
- 15 kV-95 kV BIL
- 17 kV-95kV BIL
- 25.8/29 kV-125 kV BIL
- 38 kV-150 kV BIL

## 4.76 and 15 kV

- 600 Amperes
- 40,000 Amperes Momentary
- 61,000 Amperes Momentary (optional)
- 25,000 Amperes Short-Time
- 1200 Amperes
- 61,000 Amperes Momentary
- 38,000 Amperes Short-Time
- 80,000 Amperes Momentary (optional)
- 48,000 Amperes Short-Time (optional)

## 17 kV

- 600 Amperes
- 40,000 Amperes Momentary
- 25,000 Amperes Short-Time

## 25.8/29 kV

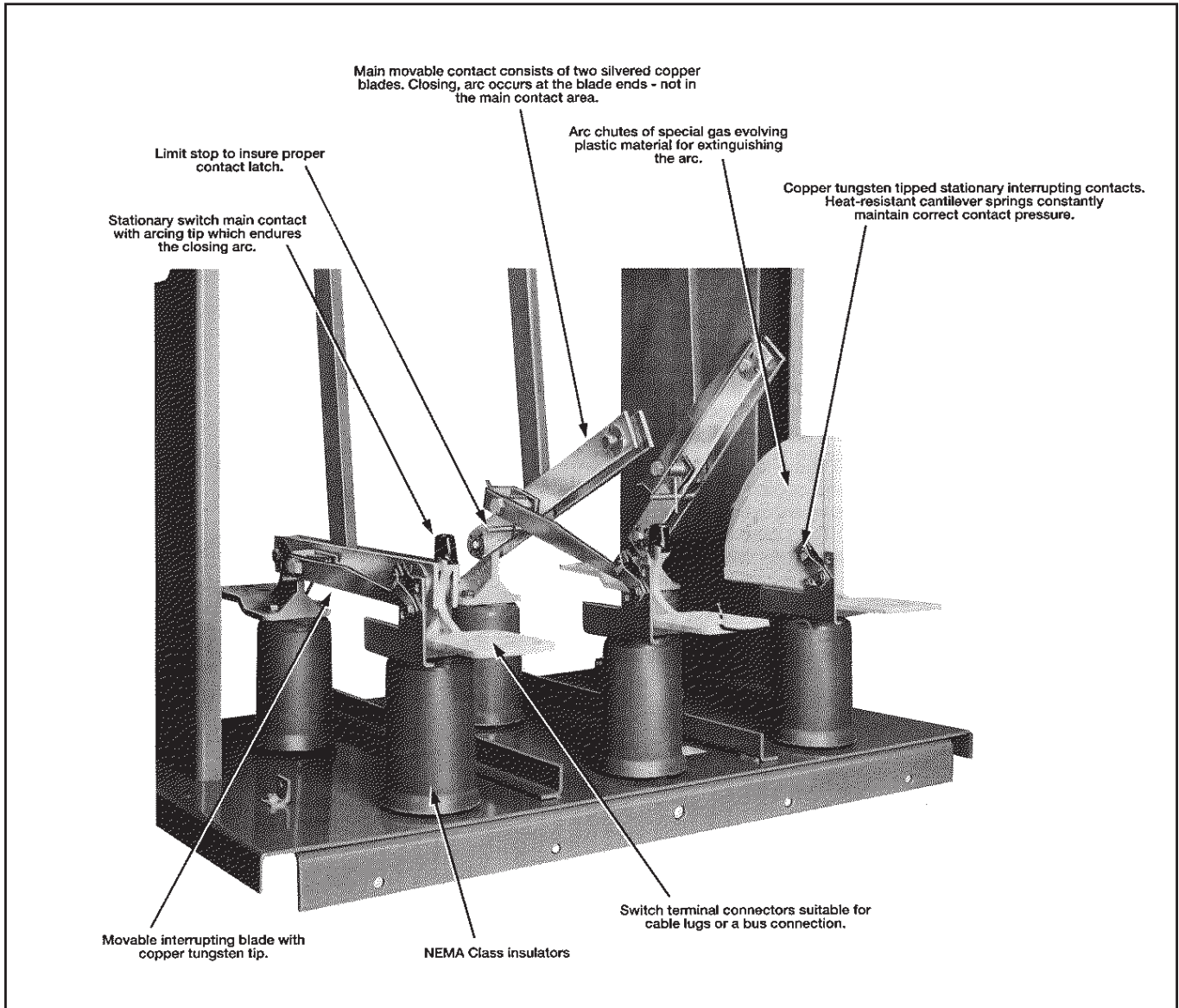
- 600 Amperes (400A interrupting @ 29kV)
- 40,000 Amperes Momentary
- 25,000 Amperes Short-Time
- 1200 Amperes (400A interrupting @ 29kV)
- 61,000 Amperes Momentary
- 25,000 Amperes Short-Time

## 38 kV

- 600 Amperes (400A Interrupting)
- 40,000 Amperes Momentary
- 25,000 Amperes Short-Time



# Metal-Enclosed Load Interrupter Switchgear Application Data



HVL Switch as Viewed Less Inter-phase Barriers and Completed Arc Chute Assemblies

**Sequence of Operation—Opening the Switch**

In the closed position (Figure 1), the main switch blades and the interrupting blade are engaged on the stationary contacts. The circuit current flows through the main blades.

As the switch operating handle is moved towards the open position, the stored energy springs are charged. After the springs become fully charged they toggle over the dead center position, discharging force to the switch operating mechanism.

The action of the switch operating mechanism forces the movable main blade off the stationary main contacts, without arcing, while the interrupting contacts are held closed, momentarily carrying all the current. Once the main contacts have separated well beyond arc striking distance (Figure 2), the interrupting blade contact, held captive, has charged the interrupter blade spring. The interrupting blade end then moves out from under the stationary interrupter contacts inside the arc chute. The spring then forces the blade quickly through the arc chute and to the open position with the main switch blades.

The resulting arc, drawn between the stationary and movable interrupting contacts, is elongated and cooled as the plastic arc chute absorbs heat and generates an arc extinguishing gas to break up and extinguish the arc. The combination of arc stretching, arc cooling and extinguishing gas causes a quick interruption with only minor erosion of the contacts and arc chutes.

The movable main and interrupting contacts (Figure 3), continue movement to the fully open position and are maintained there by spring pressure.

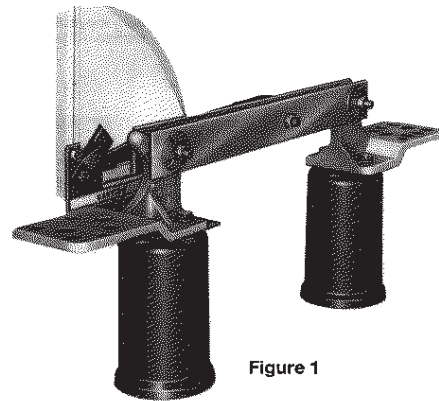


Figure 1

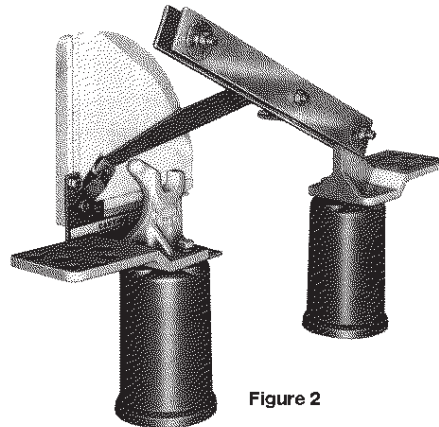


Figure 2

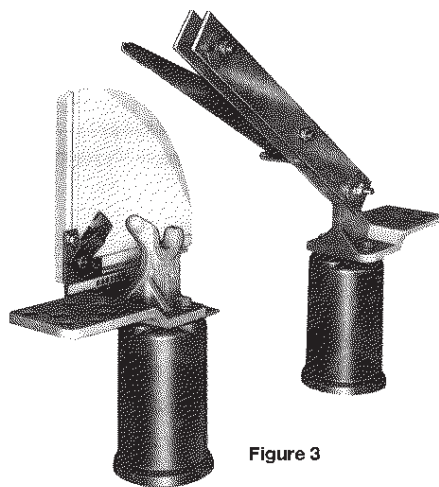


Figure 3

## Metal-Enclosed Load Interrupter Switchgear Application Data

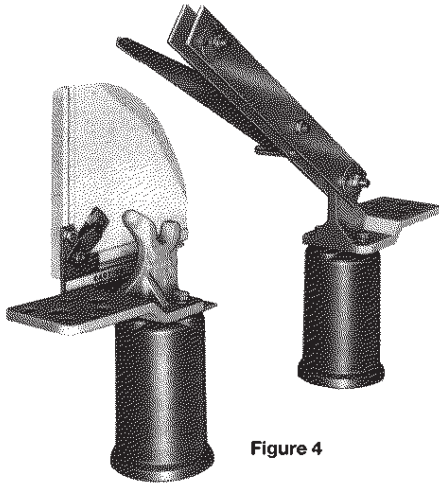


Figure 4

### Sequence of Operation—Closing the Switch

When the switch operating handle is moved toward the closed position, the stored energy springs are being charged. When the springs become fully charged and toggle over the dead center position, the switch blades begin to move toward the closed position (Figure 4).

When the main and movable blades approach the main stationary contacts, a high-voltage arc is established across the diminishing air gap attempting to complete the circuit. The arc occurs between the tip of the stationary main contacts and a remote corner of the movable main blades. This arc is short and brief, since the fast closing blades minimize the arcing time.

Spring pressure and the momentum of the fast moving main blades completely close the contacts (Figure 5). The force is great enough to cause the contacts to close even against repelling short circuit magnetic forces if a fault exists. At the same time, the interrupter blade tip is driven through the twin stationary interrupting contacts definitely latching and preparing them for an interrupting operation when the switch is opened.

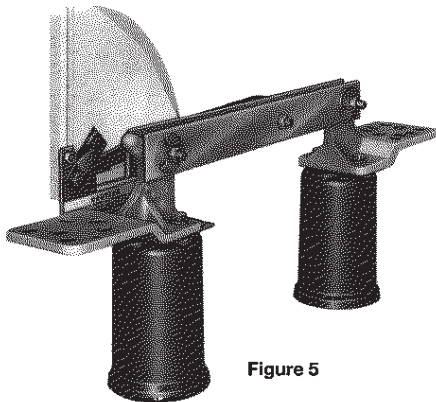
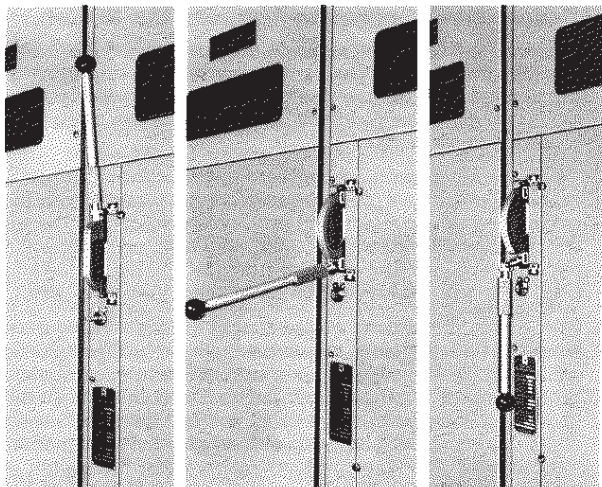
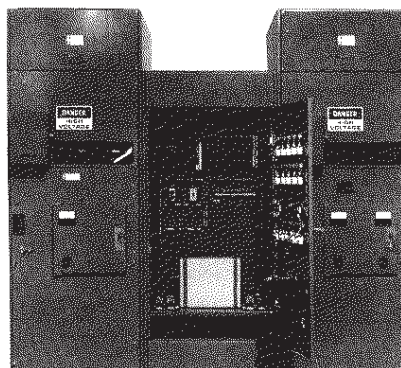


Figure 5


# Metal-Enclosed Load Interrupter Switchgear Application Data

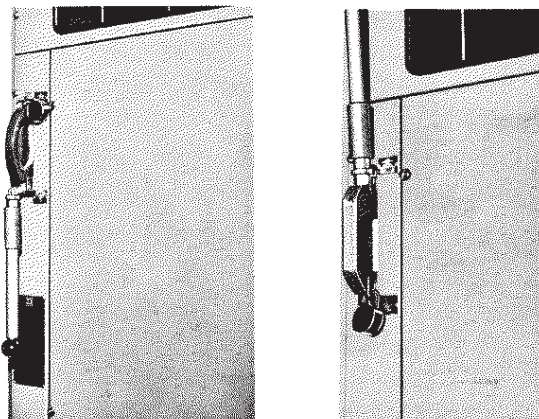


- Permanently mounted switch handle is ready for immediate use. Handle gives positive indication of the switch position (up - closed; down - open). The spring-loaded sleeve permits the handle to fold down when the switch is in the open position. A handle stop prevents movement of the handle sleeve and folding the handle when the switch is in the closed position.



- Motor operated HVL switches are available for applications requiring remote operation. Used in conjunction with SY MAX Programmable Controllers, or electromechanical relays, motor operated switches may be used in automatic load transfer applications.

HVL	
LOAD CURRENT INTERRUPTER SWITCH	
FACTORY ORDER NO.	<input type="text"/>
SWITCH PART NO.	<input type="text"/>
MANUFACTURE DATE	<input type="text"/>
RATED MAXIMUM VOLTAGE	kV <input type="text"/>
IMPULSE WITHSTAND (BIL)	kV <input type="text"/>
NORM. FREQ. WITHSTAND	kV <input type="text"/>
FREQUENCY	HZ <input type="text"/>
CONTINUOUS CURRENT	A SYM <input type="text"/>
LOAD INTERRUPTING CURRENT	A SYM <input type="text"/>
MOMENTARY CURRENT	KA ASYM <input type="text"/>
SHORT TIME - CURRENT	KA SYM <input type="text"/>
- TIME	SEC <input type="text"/>
FAULT CLOSING CURRENT	KA ASYM <input type="text"/>
FUSE/RATING	<input type="text"/>
FUSE CATALOG NO.	<input type="text"/>
INTEGRATED SWITCH & FUSE	KA SYM <input type="text"/>
SHORT CIRCUIT CURRENT	<input type="text"/>
METAL ENCLOSED SWITCHGEAR	
MAIN BUS AMPACITY	A <input type="text"/>
MAIN BUS BRACING	KA ASYM <input type="text"/>
 <b>SQUARE D COMPANY</b> <small>518 YRMA, TN USA</small> <small>44036-437-01</small>	



- Provisions for padlocking in the open and closed position.

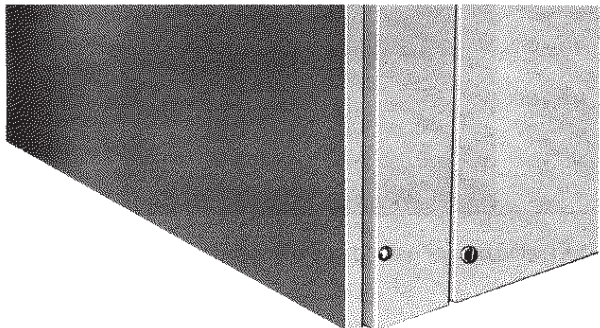
- Switch nameplate prominently lists performance ratings, fuse supplied and equipment identification.



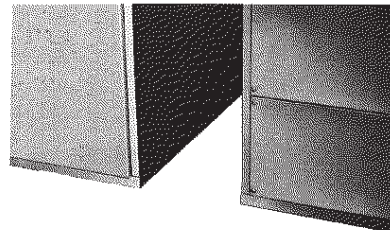


# Metal-Enclosed Load Interrupter Switchgear Application Data

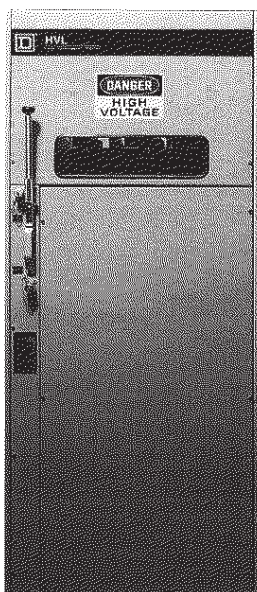
## Construction Features of Indoor Equipment



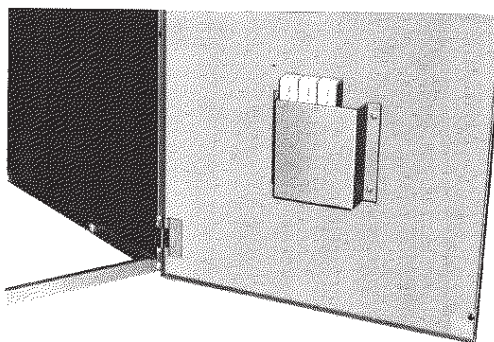
- Strong 11-gauge steel enclosure is completely grounded.
- Paint finish is a TGIC polyester powder applied electrostatically to yield a rugged, durable surface coating.



- Sectionalized shipment when required.



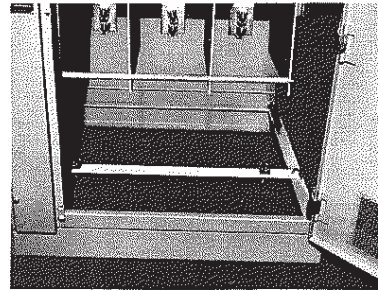
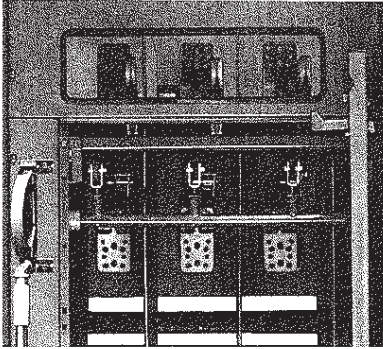
- Prominently displayed DANGER sign.
- Shatter resistant safety glass inspection window for visual assurance of switch blade position.
- Bolted removable front and rear panels.



- Spare fuse holder available when required (not available with some fuses and configurations).

# Metal-Enclosed Load Interrupter Switchgear Application Data

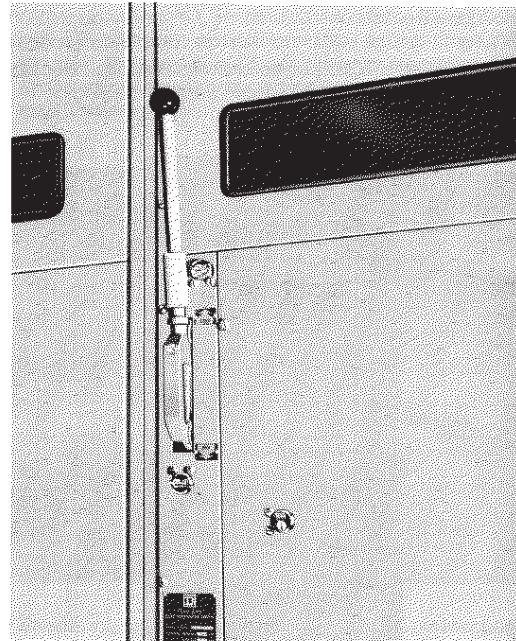
## Construction Features of Indoor Equipment



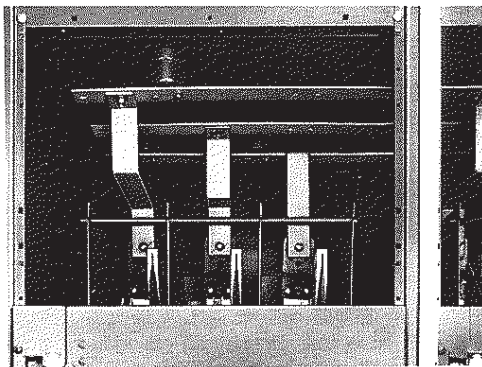
- Plated copper ground bus is bonded to equipment frame.



- Mechanically interlocked fuse access door permitting entry to fuses only when switch is open. (This is also true on unfused applications.) Mechanical interlock also functions for unfused applications.



- Key interlocking is available when required.



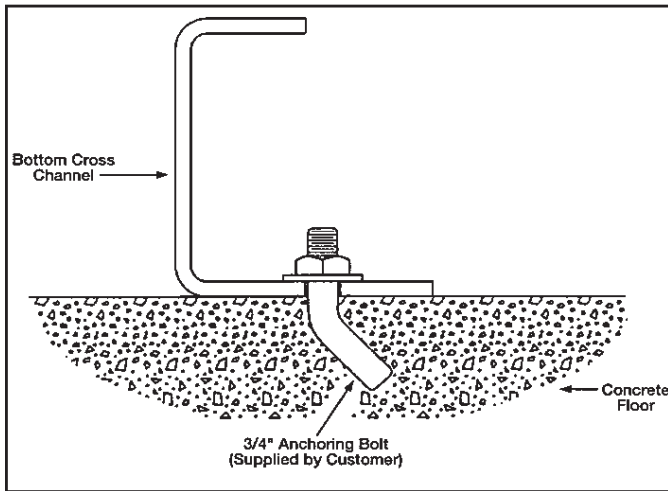
- Plated main cross-over bus supported on NEMA class insulators.

## Metal-Enclosed Load Interrupter Switchgear Application Data

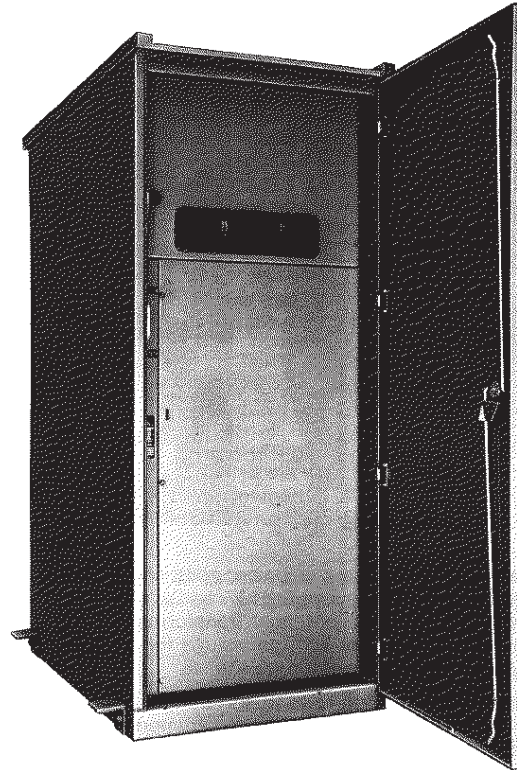
### Construction Features of Outdoor Equipment

In addition to the construction features of the indoor equipment, the following outdoor features are furnished:

- Roof sloped to rear for precipitation run-off.
- Enclosed operating handle prohibits tampering, and vandalism.
- Front bulkhead door with 3-point latch and vault-type handle with provisions for padlocking.
- Easily removable flanged full height rear panel.



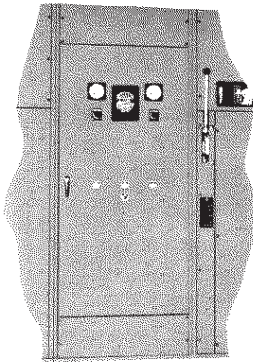
Anchoring method for outdoor enclosures



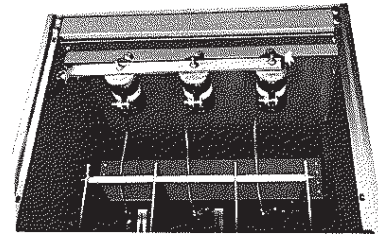
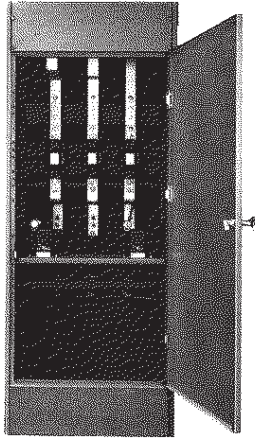
- Formed Steel Welded Base
- Wind Latch Door Bracket
- Space Heaters
- Lifting Angles

# Metal-Enclosed Load Interrupter Switchgear Application Data

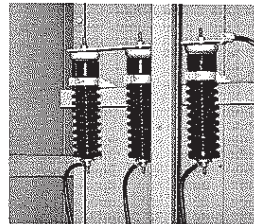
## Additional Components



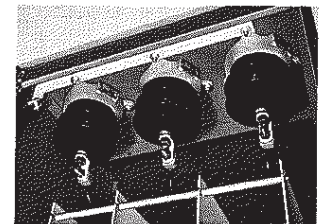
User Metering



Distribution Class



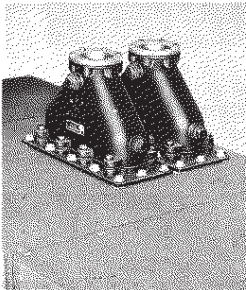
Intermediate Class



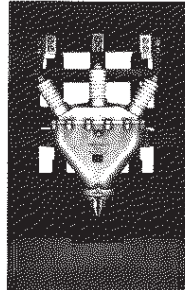
Station Class

**Metering bays** for user or power company equipment are available. They may be supplied fully equipped with necessary current transformers, potential transformers, meters, and associated devices or with provisions for installing power company components at the job site.

Standardized metering bays match the adjacent switchgear and incorporate all the special requirements of the power company.

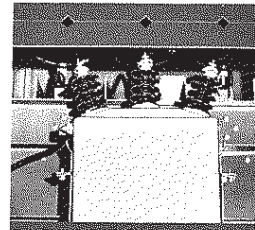


Flange Mounted



Internally Mounted

**Potheads** are available for all types of single or multiple conductor cable. They may be supplied for top or bottom cable entrance to interrupter switches, fuses and main bus. While potheads are more expensive, time consuming termination means, and may necessitate larger equipment enclosures, they are desirable in many applications. Cable manufacturers' recommendations should guide the decision as to whether they should be used.



Surge Capacitor

**Metal oxide surge arresters** are available to protect the equipment and cable from high-voltage lightning and switching surges. Distribution type arresters are usually adequate, but larger more expensive, intermediate and station type arresters can be provided if specified. **Surge capacitors** also may be supplied with the surge arresters to offer additional protection. Due to the peculiar nature of voltage surges, one set of surge arresters often will not protect the entire system. It is usually desirable to place a set of surge arresters near the terminals of all major equipment on the medium-voltage system.



# Metal-Enclosed Load Interrupter Switchgear Application Ratings and Selection

## Integrated Equipment Ratings

Medium-voltage metal-enclosed load interrupter switchgear is an integrated assembly of many components, properly selected and coordinated to provide safe and reliable operation of the over-all equipment. Each component has its own ratings defined by its own industry standards (usually ANSI). In the past, these individual component ratings have been emphasized, since they often appear to be quite impressive but may be irrelevant to the component's application. The result has is confusion and a shifting of the burden for analysis, selection and coordination of specific components from the equipment manufacturer to the purchaser, who would rather evaluate over-all equipment performance. Integrated ratings of the complete equipment are the natural solution, and Square D switchgear is rated in this manner. Integral equipment ratings are readily comparable with the anticipated voltage, short-circuit and continuous current values obtained when designing a distribution system. The major ratings of complete Square D switchgear are arranged in Table A: Equipment Ratings without Fusing. This table covers all ratings of the switchgear and the HVL load interrupter switches when applied without fuses. Integrated Short Circuit Ratings may change with various types and brands of fuses; Consult Table B: Integrated Ratings, for 600 and 1200 Ampere Switches with Current-Limiting Fuses, Table C: Integrated Ratings for 600 Ampere Switches with Boric Acid Expulsion Fuses, or Table D: Integrated Ratings for 1200 Ampere Switches with Boric Acid Expulsion Fuses.

Integrated equipment *short circuit* rating at a given voltage defines the maximum short circuit to which the entire equipment may be subjected without damage to the equipment or endangering the safety of operating personnel. Because all current ANSI standards for metal-enclosed switchgear and the components are rated individually in rms symmetrical amperes, the integrated rating is also expressed this way (the asymmetric rating is obtained by multiplying the symmetrical value by 1.6). For convenience when comparing to older equipment, the integrated rating is also expressed in "MVA". The MVA ratings are calculated at the nominal system voltage and with the rms symmetrical amperes, e.g.: MVA = Nominal System Voltage x Amperes, rms, sym. x  $\sqrt{3}$ . The integrated equipment rating combines the following ratings:

1. Switchgear — momentary and short time (bus bracing)
2. Load Interrupter Switch — momentary, fault closing and short time.
3. Fuses — interrupting and energy let-through characteristics (current-limiting fuses limit the energy during a short circuit thereby allowing higher integrated ratings than the switches and switchgear would have if unfused or with boric-acid fuses).
4. Other components such as bar-type current transformers that may have limited capabilities.

**Table A: Equipment Ratings without Fusing**

Switch (kV) — Max. Design	4.76				15.0				17.0	25.8	29	38		
B.I.L. (kV)	60				95				95	125	125	150		
Frequency (Hertz)	50/60				50/60				50/60	50/60	50/60	50/60		
Withstand (kV)	19				36				36	60	60	80		
Capacitor Switching (kVAR) Single Bank Only	2400				2400				—	—	—	—		
Continuous Current (Amps)	600		1200		600		1200		600	600	1200	600	1200	600
Interrupting Current (Amps)	600		1200		600		1200		600	600	600	400	400	400
Fault Close (kA ASYM)	40	40★	61	61★	40	40★	61	61★	40	28★	28★	28★	28★	20★
Momentary Current (kA ASYM)	40	61	61	80	40	61	61	80	40	40	61	40	61	40
Short Time Current (kA)	25	25	38	48	25	25	38	48	25	25	25	25	25	25
Electrical Endurance (No. of Operations at 80% P.F.)	50	50	20	20	30	30	10	10	30	10	10	10	10	5★
Mechanical Endurance (No. of Operations)	600	600	250	150	600	600	250	150	600	250	150	250	150	250

★ Non-ANSI rated to proposed ANSI C37.20.4

## Explanation of Ratings

### A. Voltage Ratings:

The voltage for a given system is normally expressed in nominal volts and is operated in a range that fluctuates based on a number of operating factors. ANSI standards generally recog-

nize a tolerance of plus or minus 5%. For switchgear, the maximum design voltage should not be exceeded. When operated below this maximum the equipment will withstand the 50 or 60 Hz voltage continuously, the low frequency withstand for one minute, and impulse voltages applied in accordance with ANSI design test procedures.

# Metal-Enclosed Load Interrupter Switchgear Application Ratings and Selection

## B. Continuous Current Rating:

The over-all continuous current is determined by the component with the smallest capacity – bussing, load interrupter switch, fuses, fuse mountings, connections, etc. Unfused equipment is normally rated by the main bus which is available in ratings of 600, 1200, or 2000 Amperes continuous. The continuous current rating of fused equipment is generally determined by the fuses since the other components have greater current carrying capacities than the fuses. When the fuse ratings exceed 600 Amperes, 1200 Ampere bus and switches are required.

## C. HVL Switch Interrupting Current Rating:

The HVL switch is designed and tested in accordance with ANSI standards as a “load interrupter,” switch, capable of interrupting load currents up to its continuous current rating. However, per ANSI, this switch is not intended to be the main switching device. Load Interrupter switches are not designed or tested for interrupting currents above their continuous currents. Note that the interrupting ratings at 29.0 and 38.0 kV are limited to 400 Amperes.

## D. Full Load Current Switching Endurance:

The number of full load current interruptions at maximum design voltage which the switch can make is established through tests on “a circuit having a 0.8 power factor lagging,” and “requiring no maintenance for the number of operations stated”. These numbers are taken from proposed ANSI C37.20.4 19xx.

## E. Short Circuit Ratings:

An integrated short circuit rating is normally established based on the Momentary, 2-second short time, and fault close capabilities of the equipment as explained in the section above on “Integrated Equipment Ratings”. The most important number is the Integrated Short Circuit Rating which establishes overall rating for the equipment. This number is normally based on either unfused switches or applications using boric acid fuses. Current-limiting fuses can be used to increase the integrated rating. Use Tables B, C, or D to select the proper fuse and associated integrated short circuit rating.

## G. Mechanical Endurance:

These numbers represent actual test values that the given switch rating has been subjected to. ANSI Standard C37.20.3 and proposed standard C37.20.4 do not require a “rating,” only testing to a specified minimum number of operations without repair, component replacement, or maintenance. In all cases the switch rating shown has been tested to many more than the minimum number of operations shown here.

## Medium Voltage Fuse Selection

Fuses are usually used in conjunction with the medium-voltage switch to provide overcurrent protection. They are normally mounted vertically below the switch to prevent the possibility of their falling into the mechanism during replacement; and when an inverted arrangement with fuses above is required, barriers provide the same safety. Unless user job requirements demand otherwise, fuses are always connected to the load-

side of the switch and are de-energized when the switch is open. When mounted in the switchgear, the fuses are visible through an inspection window and readily accessible through an interlocked door for easy removal. Fuses also may be supplied without an associated switch when the application requires, and special construction can be employed when unusual switch and fuse arrangements are necessary.

Square D current limiting fuses or Westinghouse boric acid type fuses can be provided in Square D Metal-Enclosed Switchgear. These provide short-circuit interrupting protection equal to or greater than the short-circuit rating of the equipment in accordance with their nominal current ratings and characteristic curves.

Current limiting type fuses offer the maximum short-circuit rating and are most economical in the majority of “E” ratings in which they are available.

Fuses supplied provide the following conditions when properly selected:

1. Fuse interrupting capacity will be in accordance with the integrated equipment short-circuit current rating.
2. Fuse continuous current “E” rating will be as required up to the maximum continuous current rating of the fuse.
3. Most applications seem to favor fast acting current limiting fuses. These fuses limit the let through current and minimize the short circuit damage to a system. The fuses, completely factory assembled and sealed, keep out dust or foreign material, and operate without any noise, pressure or expulsion of gas, flame and extinguishing material, even at maximum capacity.

Boric acid fuses employ the use of refill units for replacement in the holder. These fuses can expel gas and can develop pressure within the enclosure during an interruption.



## Metal-Enclosed Load Interrupter Switchgear Application Ratings and Selection

### Fuse Ratings

"E" rated Square D current limiting fuses function as follows:

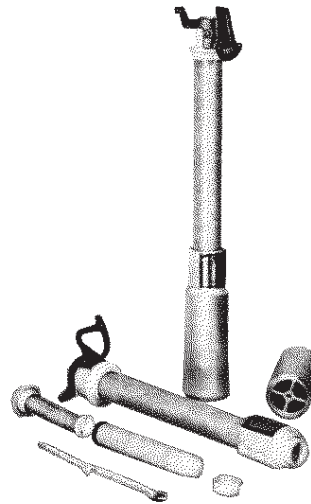
100E or less – must melt in 300 seconds (5 minutes) on 200-240% of E (ampere) rating.

Over 100E – must melt in 600 seconds (10 minutes) on 220-264% of E (ampere) rating.



Boric acid "X" ratings define fuses where:

1. The minimum melting current is from two to three times the full load current.
2. The temperature rise on the plated, copper fuse ferrules may exceed recommended ANSI and IEC standards under full load conditions.



### Current Limiting Fuses:

- Positive *extended travel blown fuse indicator pin* on Square D fuses only
- UL Listed
- Fast acting to limit available fault current stresses on the system and minimize damage to system components
- Silent non-venting interruption
- Completely factory assembled and sealed for consistent characteristics
- High-interrupting capacity
- No refills to replace or parts to clean
- Requires minimal electrical clearance; no exhaust clearance required
- Controlled arc voltages
- Standard travel blown fuse indicator pin on fuses other than Square D (cannot be used with Square D FUSELOGIC)

### Boric Acid Fuses

- Low cost refill units
- Available for high continuous current ratings
- Silencer and snuffler type
- Discharge filter type



# Metal-Enclosed Load Interrupter Switchgear Application Ratings and Selection

## Ratings and Selection

**Table B: Integrated Ratings for 600 and 1200 Ampere Switches with Current Limiting Fuses★**

Note: Current limiting fuses increase the integrated short circuit rating because of their energy limiting capabilities. To increase the short circuit rating of the entire line-up of switchgear, current limiting fuses must be used in the entrance bays.

Current ratings are shown in rms symmetrical amperes.

- Symmetrical amperes = asymmetrical amperes ÷ 1.6
- Nominal 3Ø symmetrical MVA = system voltage, kV x sym. amps kA x  $\sqrt{3}$ .

Manufacturer		Square D	Goold Shawmut	Goold Shawmut	GE	GE
Fuse Type			CL-14	BOLT-IN	9F62/9F60▼	BOLT-IN
Nominal System Voltage (kV)	Max Design Voltage (kV)	Integrated Short Circuit Rating in rms Symmetrical Amperes Integrated Short Circuit Rating in MVA Maximum Continuous Fuse Current				
2.4	5.5	63,000A 261 MVA 450E◆	63,000A 261 MVA 500-600E	63,000A 261 MVA 750-900E	50,000A 207 MVA 450E	Not Available
4.16	5.5	63,000A 453 MVA 450E◆	63,000A 453 MVA 500-600E	63,000A 453 MVA 750-900E	50,000A 360 MVA 450E	Not Available
4.8	5.5	63,000A 523 MVA 450E◆	63,000A 523 MVA 500-600E	63,000A 523 MVA 750-900E	50,000A 415 MVA 450E	Not Available
7.2	8.25	50,000A 623 MVA 200E	50,000A 623 MVA 250-300E	Not Available	50,000A 623 MVA 200E	50,000A 623 MVA 300E
12.0	15.0	50,000A 1039 MVA 200E	50,000A 1039 MVA 250-300E	Not Available	50,000A 1039 MVA 200E	50,000A 1039 MVA 300E
12.47	15.0	50,000A 1079 MVA 200E	50,000A 1079 MVA 250-300E	Not Available	50,000A 1079 MVA 200E	50,000A 1079 MVA 300E
13.2	15.0	50,000A 1143 MVA 200E	50,000A 1143 MVA 250-300E	Not Available	50,000A 1143 MVA 200E	50,000A 1143 MVA 300E
13.8	15.0	50,000A 1195 MVA 200E	50,000A 1195 MVA 250-300E	Not Available	50,000A 1195 MVA 200E	50,000A 1195 MVA 300E
16.5	17.0	Not Available	Not Available	Not Available	25,000A◆ 736 MVA 100E	Not Available
22.9	25.8	Not Available	Not Available	Not Available	25,000A 992 MVA 100E	Not Available
24.9	25.8	Not Available	Not Available	Not Available	25,000A 1078 MVA 100E	Not Available
26.4	29.0	Not Available	Not Available	Not Available	12,500A 572 MVA 80E	Not Available
34.5	38.0	Not Available	Not Available	Not Available	12,500A 747 MVA 80E	Not Available

★ Ratings shown in these tables are based on combining with either 600 or 1200 Ampere switches. Fuses with continuous current over 600 Amperes will only be supplied with 1200 Ampere switches.

◆ If a 600 Ampere switch is selected, the largest fuse size that will be provided is 600 Amperes.

● Ratings are based only on use with 600 Ampere switches which are rated for application at 17.0 kV maximum, and fuses which are rated for application for 25.8 kV maximum.

▼ 9F62 fuses 5-15 kV; 9F60 fuses 17-38 kV.





# Metal-Enclosed Load Interrupter Switchgear Application Ratings and Selection

**Table C: Integrated Ratings for 600 Ampere Switches with Boric Acid Expulsion Fuses★**

Manufacturer		Westinghouse			S & C		
Fuse Type →		RBA-200 with Discharge Filter	RBA-400 with Discharge Filter	RBA-800 with Discharge Filter	SM-4Z	SM-5S	SM-5SS
Nominal System Voltage (kV)↓	Max Design Voltage (kV)↓	Integrated Short Circuit Rating in RMS Symmetrical Amperes Integrated Short Circuit Rating in MVA Maximum Continuous Fuse Current					
2.4	5.5	19,000A 80 MVA 200E	25,000A♦ 103 MVA 400E	25,000A♦ 103 MVA 540E	17,200A 70 MVA 200E	25,000A♦ 103 MVA 400E	Not Available
4.16	5.5	19,000A 137 MVA 200E	25,000A♦ 180 MVA 400E	25,000A♦ 180 MVA 540E	17,200A 125 MVA 200E	25,000A♦ 180 MVA 400E	Not Available
4.8	5.5	19,000A 158 MVA 200E	25,000A♦ 208 MVA 400E	25,000A♦ 208 MVA 540E	17,200A 145 MVA 200E	25,000A♦ 208 MVA 400E	Not Available
7.2	8.25	16,600A 205 MVA 200E	25,000A♦ 312 MVA 400E	25,000A♦ 312 MVA 540E	15,600A 195 MVA 200E	25,000A 312 MVA 400E	SEE TABLE D
12.0	15.0	14,400A 299 MVA 200E	25,000A♦ 519 MVA 400E	25,000A♦ 519 MVA 540E	12,500A 260 MVA 200E	25,000A 520 MVA 400E	SEE TABLE D
12.47	15.0	14,400A 311 MVA 200E	25,000A♦ 540 MVA 400E	25,000A♦ 540 MVA 540E	12,500A 270 MVA 200E	25,000A 540 MVA 400E	SEE TABLE D
13.2	15.0	14,400A 329 MVA 200E	25,000A♦ 571 MVA 400E	25,000A♦ 571 MVA 540E	12,500A 285 MVA 200E	25,000A 570 MVA 400E	SEE TABLE D
13.8	15.0	14,400A 345 MVA 200E	25,000A♦ 597 MVA 400E	25,000A♦ 597 MVA 540E	12,500A 300 MVA 200E	25,000A 600 MVA 400E	SEE TABLE D
16.5	17.0	Not Available	Not Available	Not Available	12,500A● 355 MVA 200E	25,000A● 715 MVA 400E	Not Available
22.9	25.8	10,500A 416 MVA 200E	17,500A♦ 694 MVA 300E	Not Available	9,400A 375 MVA 200E	17,500A♦ 694 MVA 300E	Not Available
24.9	25.8	10,500A 453 MVA 200E	17,500A♦ 754 MVA 300E	Not Available	9,400A 405 MVA 200E	17,500A♦ 755 MVA 300E	Not Available
26.4	29.0	6,900A 316 MVA 200E	16,800A 768 MVA 300E	Not Available	7,800A 356 MVA 200E	17,500A 800 MVA 300E	Not Available
34.5	38.0	6,900A 410 MVA 200 E	12,500A♦ 746 MVA 300E	Not Available	6,250A 375 MVA 200E	12,500A♦ 746 MVA 300E	Not Available

★ Ratings shown in this table are based on combining boric acid fuses with 600 Ampere switches that have a fault close rating of 40 kA Asymmetrical up to 17.0 kV, 28 kA Asymmetrical at 24.9 and 29.0 kV, and 20 kA Asymmetrical at 38.0 kV.  
 ♦ The integrated rating shown is limited by the switch to less than the full interrupting capability of the fuse. Higher ratings can be achieved in some cases by combining with 1200 Ampere switches (see Table D).  
 ● Ratings are based only on use with 600 Ampere switches rated for application at 17.0 kV maximum. Fuses used for this voltage class are S & C fuses rated 17.0 kV maximum.



## Metal-Enclosed Load Interrupter Switchgear Application Ratings and Selection

**Table D: Integrated Ratings for 1200 Ampere Switches with Boric Acid Expulsion Fuses\***

Manufacturer		Westinghouse			S & C		
Fuse Type →		RBA-200 with Discharge Filter	RBA-400 with Discharge Filter	RBA-800 with Discharge Filter	SM-4Z	SM-5S	SM-5SS
Nominal System Voltage (kV)↓	Max Design Voltage (kV)↓	Integrated Short Circuit Rating in RMS Symmetrical Amperes Integrated Short Circuit Rating in MVA Maximum Continuous Fuse Current					
2.4	5.5	19,000A 80 MVA 200E	37,500A 155 MVA 400E	37,500A 150 MVA 720E	17,200A 70 MVA 200E	37,500A 155 MVA 400E	Not Available
4.16	5.5	19,000A 137 MVA 200E	37,500A 270 MVA 400E	37,500A 270 MVA 720E	17,200A 125 MVA 200E	37,500A 270 MVA 400E	Not Available
4.8	5.5	19,000A 158 MVA 200E	37,500A 312 MVA 400E	37,500A 310 MVA 720E	17,200A 145 MVA 200E	27,000A 225 MVA 400E	Not Available
7.2	8.25	16,600A 205 MVA 200E	29,400A♦ 367 MVA 400E	29,400A♦ 365 MVA 720E	15,600A 195 MVA 200E	25,000A 310 MVA 400E	34,600A 430 MVA 400E
12.0	15.0	14,400A 299 MVA 200E	29,400A♦ 611 MVA 400E	29,400A♦ 611 MVA 720E	12,500A 260 MVA 200E	25,000A 520 MVA 400E	34,600A 720 MVA 400E
12.47	15.0	14,400A 311 MVA 200E	29,400A♦ 635 MVA 400E	29,400A♦ 635 MVA 720E	12,500A 270 MVA 200E	25,000A 540 MVA 400E	34,600A 750 MVA 400E
13.2	15.0	14,400A 329 MVA 200E	29,400A♦ 672 MVA 400E	29,400A♦ 672 MVA 720E	12,500A 285 MVA 200E	25,000A 570 MVA 400E	34,000A 780 MVA 400E
13.8	15.0	14,400A 345 MVA 200E	29,400A♦ 703 MVA 400E	29,400A♦ 700 MVA 720E	12,500A 300 MVA 200E	25,000A 600 MVA 400E	34,000A 815 MVA 400E
16.5	17.0	•	•	•	•	•	Not Available
22.9	25.8	10,500A 416 MVA 200E	17,500A▲ 694 MVA 300E	Not Available	9,400A 375 MVA 200E	17,500A▲ 694 MVA 300E	Not Available
24.9	25.8	10,500A 453 MVA 200E	17,500A▲ 754 MVA 300E	Not Available	9,400A 405 MVA 200E	17,500A▲ 754 MVA 300E	Not Available
26.4	29.0	6,900A 316 MVA 200E	16,800A 768 MVA 300E	Not Available	7,800A 356 MVA 200E	17,500A 800 MVA 300E	Not Available

★ Ratings shown in this tables are based on combining boric acid fuses with 1200 Ampere switches that have a minimum fault close rating of 61 kA asymmetrical up to 17.0 kV and 28,000 kA asymmetrical at 25.8 and 29.0 kV.









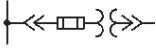



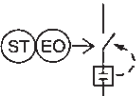











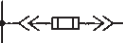























♦ The interrupting rating can be increased to 37,800 symmetrical amperes at voltage ratings below 14.5 kV with an available "High Capacity Discharge Filter". (MVA can be calculated from the formula: nominal system (kV) x √3 x 37.8 kA)

● Switches rated for application at 17.0 kV maximum are available only at 600 Amperes (see Table C).

▲ The integrated rating shown is limited by the switch to less than the full interrupting capability of the fuse.

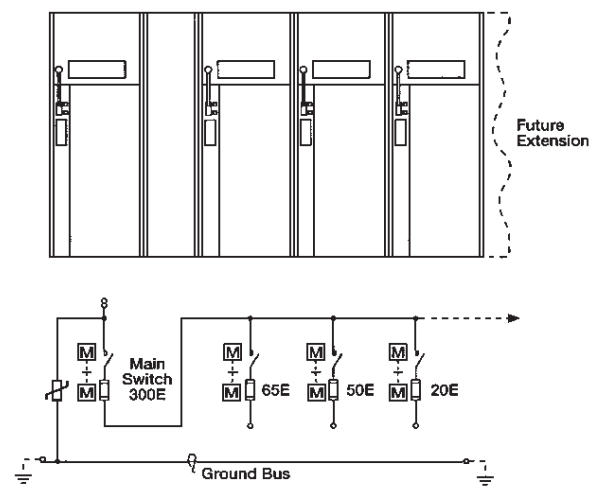
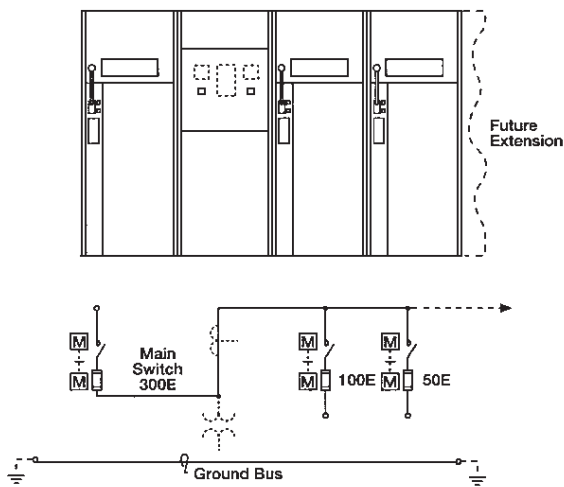
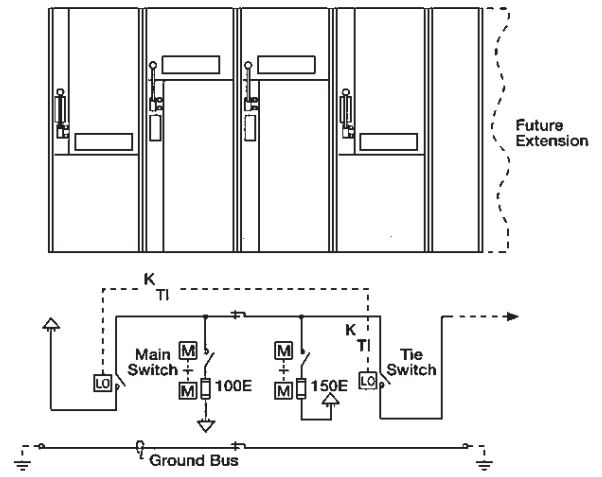
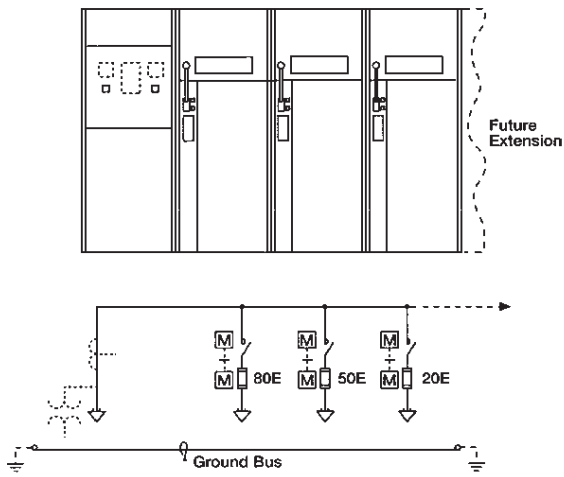


# Metal-Enclosed Load Interrupter Switchgear Standard Symbols

	Upright HVL Switch (Manually Operated)		POWERLOGIC® Circuit Monitor		Fixed Mounted Potential Transformer with Primary Fuse
	Inverted HVL Switch (Manually Operated)		POWERLOGIC® System Display		Provisions for Fixed Mounted Potential Transformer
	Upright HVL Switch (Electrically Operated)		27 Undervoltage Relay		Drawout Mounted Potential Transformer with Primary Fuse
	Inverted HVL Switch (Electrically Operated)		27/47 Undervoltage Phase Sequence Relay		Control Power Transformer with Disconnect Primary Fuses
	VISI/VAC® Circuit Interrupter (Shunt Trip; Electrically Operated)		46 Phase Loss/Balance Current Relay		Bar Type Current Transformer
	Capacitor Trip Unit; 20 sec. or 72 hr.		50/51 Instantaneous and Time Overcurrent Relay		Provisions for Bar Type Current Transformer
	Non-Disconnect Type Fuse Assembly		50/51 GS Ground Sensor Instantaneous and Time Overcurrent Relay		Donut Type Current Transformer
	Disconnect Type Fuse Assembly		50/ 51N Residual Ground Instantaneous and Time Overcurrent Relay		Ammeter
	Drawout Mounted Primary Fuse		59/27 Over/Undervoltage Relay		Thermal Demand Ammeter
	Key Interlock		86 Lockout Relay		Voltmeter
	Mechanical Interlock		87T Transformer Differential Relay		Ammeter Selector Switch
	(1) Cable Lug Per Phase		Bus Shipping Split		Voltmeter Selector Switch
	Provisions Only for (1) Cable Lug Per Phase		Roof Bushing		Line Selector Switch
	(1) 3 Conductor Pothead		Surge Capacitor		Watt-hour Meter
	(3) 1 Conductor Potheads		Surge (Lightning) Arrester		Watt-hour Meter with Demand Attachment
					Power Factor Meter
					Varmeter
					Test Block



## Typical Multiple Bay Switchgear Arrangements with Rear Access



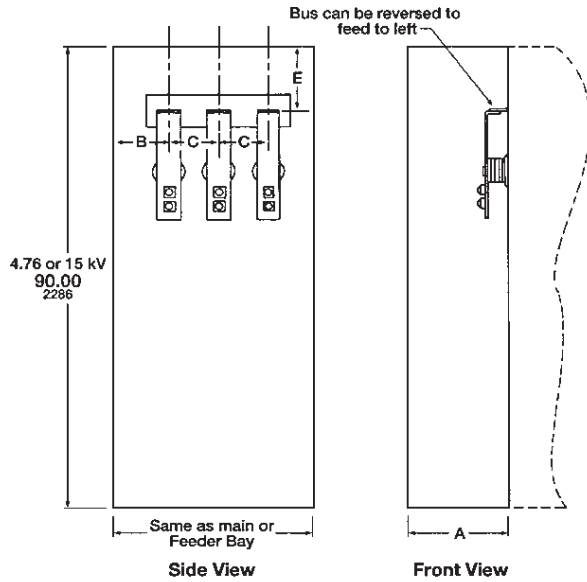
# Metal-Enclosed Load Interrupter Switchgear

## Typical Switchgear Arrangements

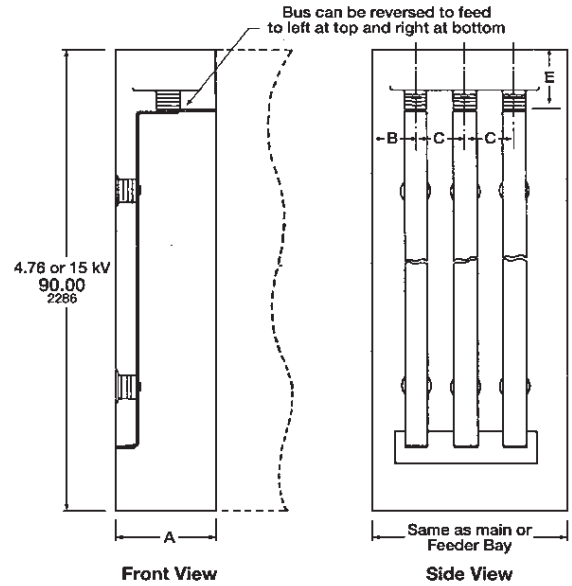
**Incoming Line and Bus Bar  
Transition Bay Dimensions**

Equipment Nominal	A		B		C		E	
	IN	mm	IN	mm	IN	mm	IN	mm
4.76 and 15.0	22	559	9.88	251	9.25	235	8.38	213

**Incoming Line Bay**



**Bus Bar Transition Bay**



NOTE: See page 26 for floor detail.

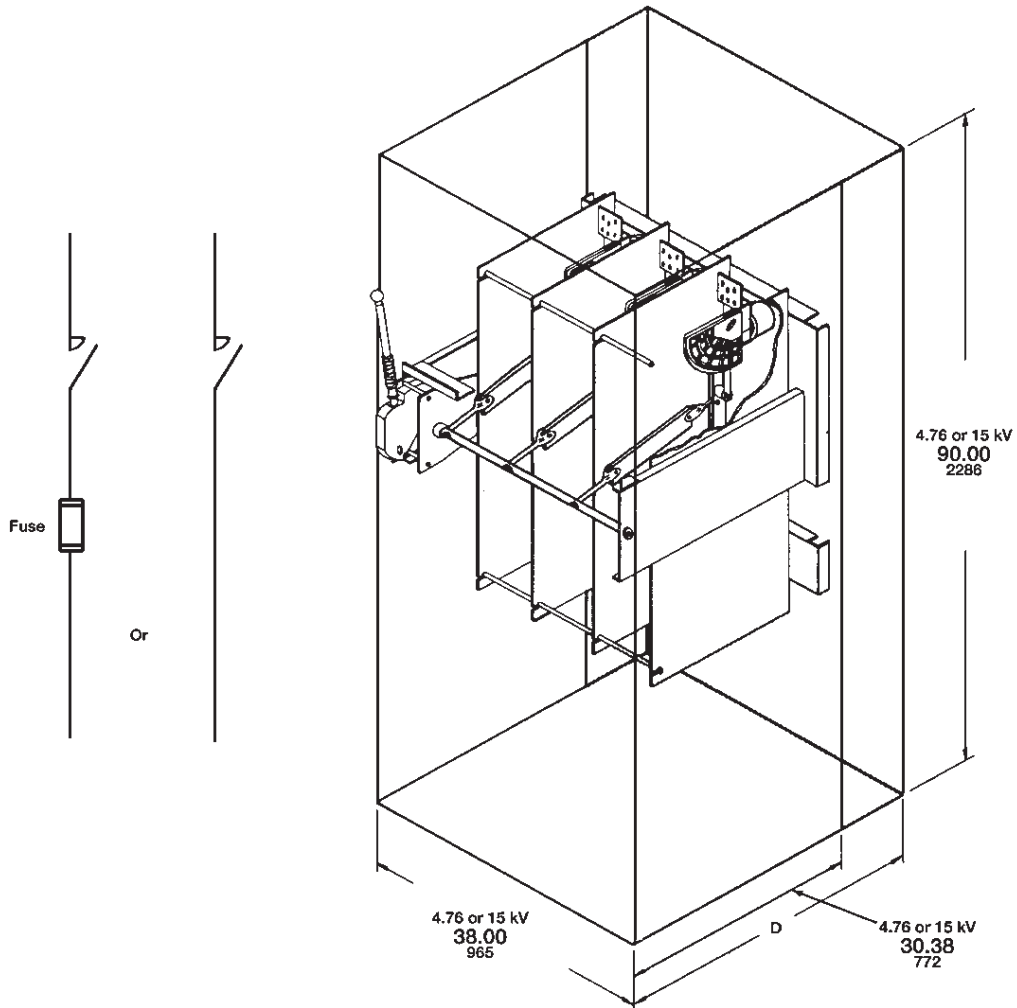
Approximate Shipping Weight Per Bay: Indoor - 550 Lbs.  
250 Kilograms  
Outdoor - 600 Lbs.  
273 Kilograms

Dual Dimensions: INCHES  
Millimeters



# Metal-Enclosed Load Interrupter Switchgear

## Main Switch 4.76 or 15 kV



Outdoor Construction:  
Add 7.50 to the total height and increase the base to the depth dimension of 60.  
191 1524

Approximate Shipping Weight Per Bay: Indoor – 1350 Lbs.  
613 Kilograms  
Outdoor – 1850 Lbs.  
840 Kilograms

Dual Dimensions: INCHES  
Millimeters

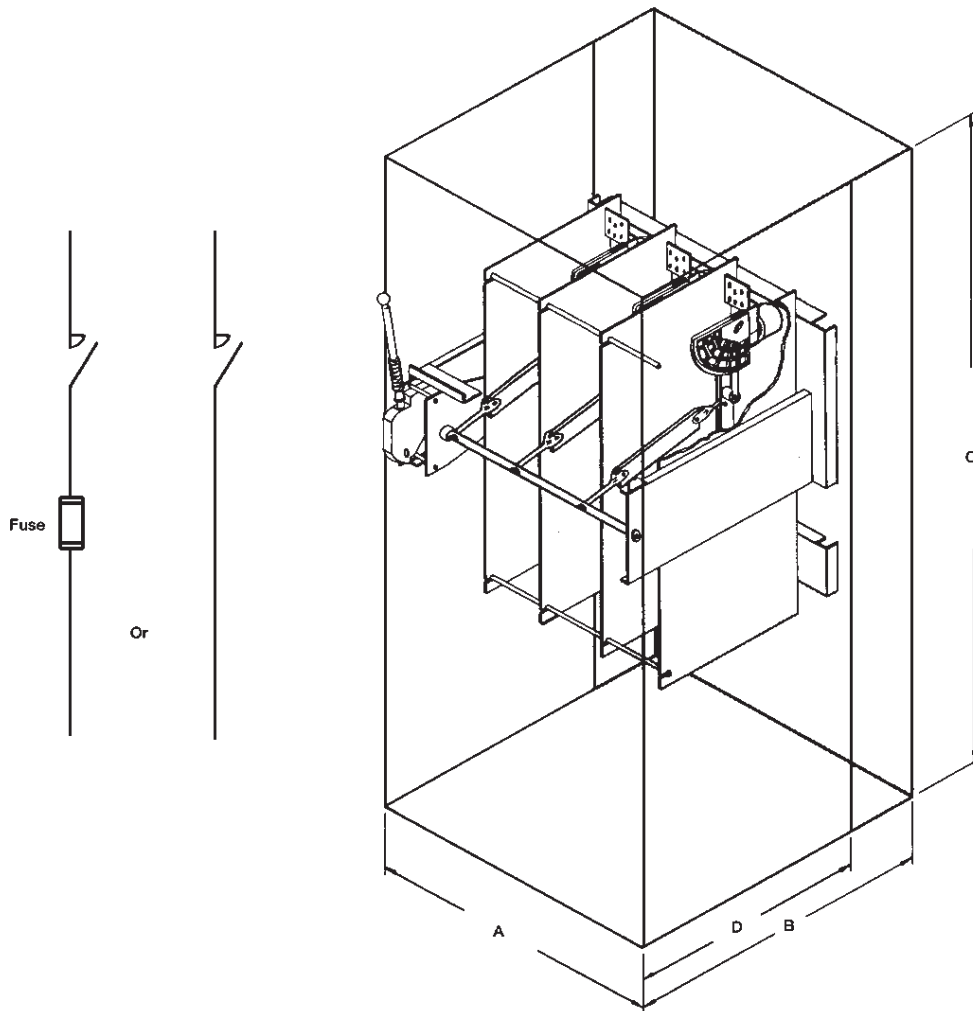
### Depth Dimension of Main Switch Bay (Indoor)

Type	Equipment Nominal kV	Cable Lugs Top or Bottom Entrance								Roof Bushings or Pothead Top Entrance								Pothead Bottom Entrance							
		Without CT's, PT's or L.A.		With L.A.		With CT's and PT's		With CT's, PT's and L.A.		Without CT's, PT's or L.A.		With L.A.		With CT's and PT's		With CT's, PT's and L.A.		Without CT's, PT's or L.A.		With L.A.		With CT's and PT's		With CT's, PT's and L.A.	
		IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm
Fused or Unfused	4.76 15	54.50	1384	54.50	1384	54.50	1384	54.50	1384	54.50	1384	54.50	1384	54.50	1384	54.50	1384	54.50	1384	54.50	1384	54.50	1384	54.50	1384



# Metal-Enclosed Load Interrupter Switchgear

## Main Switch or Feeder Bay 25 and 38 kV



Approximate Shipping Weight Per Bay: Indoor – 2200 Lbs.  
998 Kilograms  
Outdoor – 2600 Lbs.  
1180 Kilograms

Dual Dimensions: **INCHES**  
Millimeters

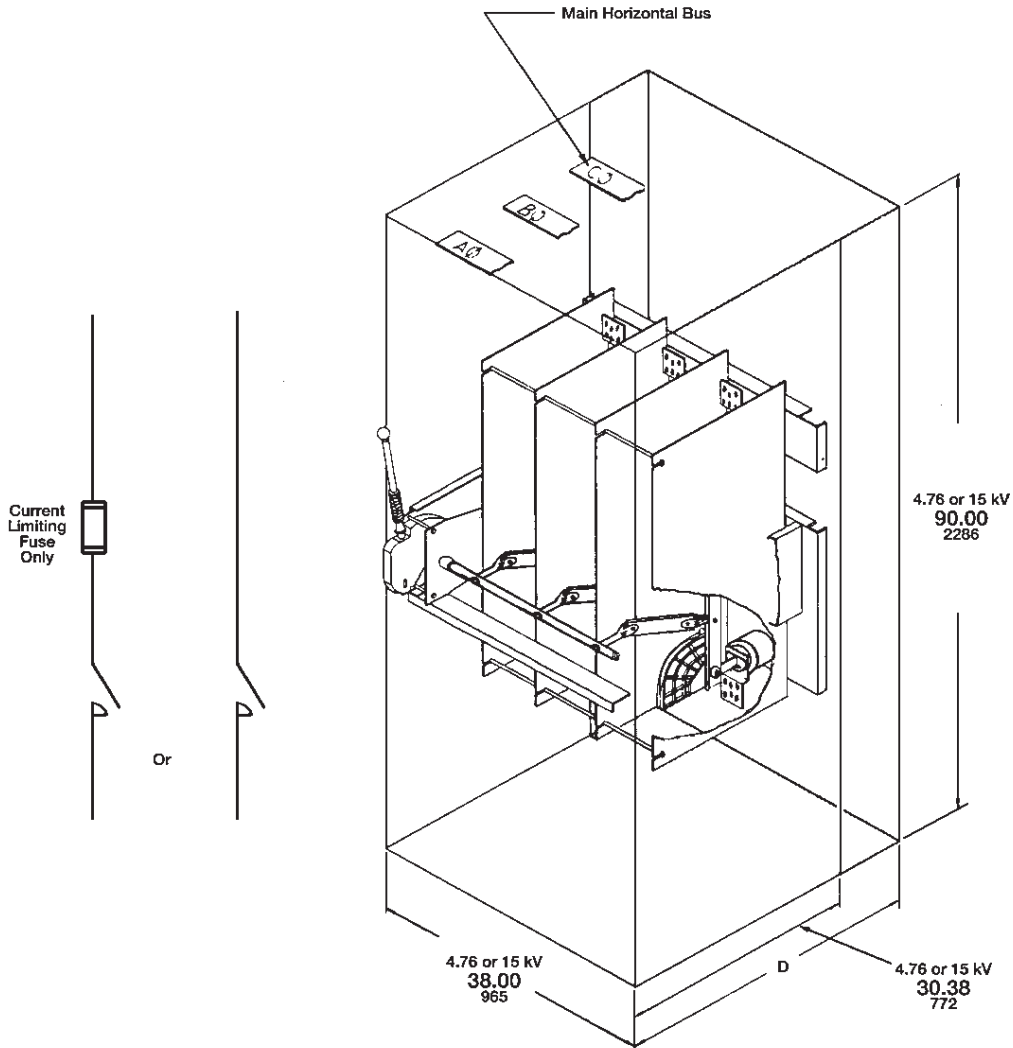
### Dimensions of Main or Feeder Switch Bay (Indoor)

Type	Equipment Nominal kV	Single Switch								Line-up							
		A		B		C		D		A		B		C		D	
Fused or Unfused		IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm
	25.8/29	48	1219	60	1524	105	2667	37.14	943	48	1219	72	1829	114	2896	37.14	943
	38	60	1524	72	1829	105	2667	40.14	1020	60	1524	80	2032	120	3048	40.14	1020



# Metal-Enclosed Load Interrupter Switchgear

## Inverted Main Switch Bay 4.76 or 15kV



Outdoor Construction:  
Add 7.50 to the total height and increase the base to the depth dimension of 60  
191 1524

Approximate Shipping Weight Per Bay: Indoor – 1350 Lbs.  
613 Kilograms  
Outdoor – 1850 Lbs.  
840 Kilograms

Dual Dimensions: INCHES  
Millimeters

### Depth Dimension of Main Switch Bay (Indoor)

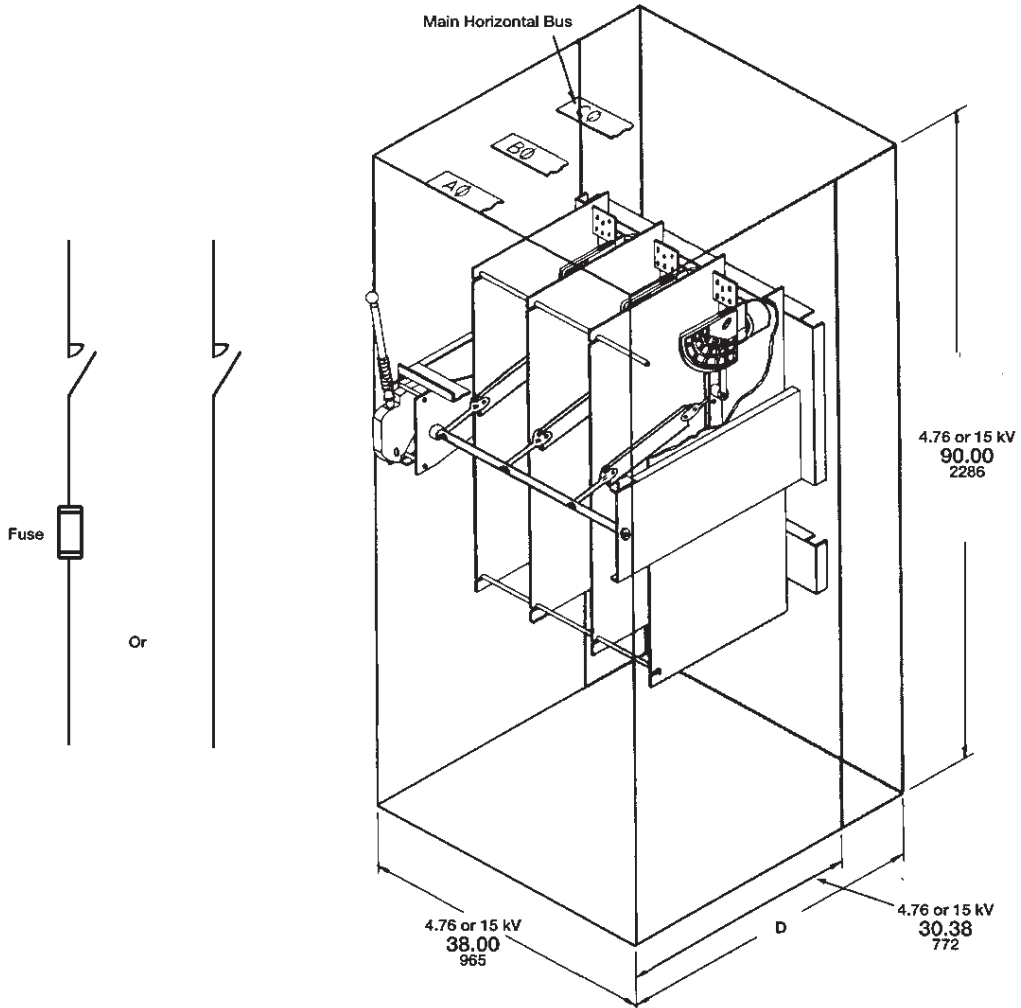
Type	Equipment Nominal kV	Cable Lugs Top or Bottom Entrance								Roof Bushings or Pothead Top Entrance				Pothead Bottom Entrance						
		Without CT's, PT's or L.A.		With L.A.		With CT's and PT's		With CT's, PT's and L.A.		Without CT's, PT's or L.A.		With L.A.		With CT's and PT's		With CT's, PT's and L.A.				
		IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm			
Fused or Unfused	4.76	54.50	1384	54.50	1384	54.50	1384	54.50	1384	54.50	1384	54.50	1384	NA	54.50	1384	54.50	1384	NA	NA
	15	54.50	1384	54.50	1384	54.50	1384	54.50	1384	54.50	1384	54.50	1384	NA	54.50	1384	54.50	1384	NA	NA





# Metal-Enclosed Load Interrupter Switchgear

## Feeder Switch Bay and Single Bay 4.76 or 15 kV



Outdoor Construction:  
Add 7.50 to the total height and increase the base to the depth dimension of 60  
191 1524

Approximate Shipping Weight Per Bay: Indoor - 1350 Lbs.  
613 Kilograms  
Outdoor - 1850 Lbs.  
840 Kilograms

Dual Dimensions: INCHES  
Millimeters

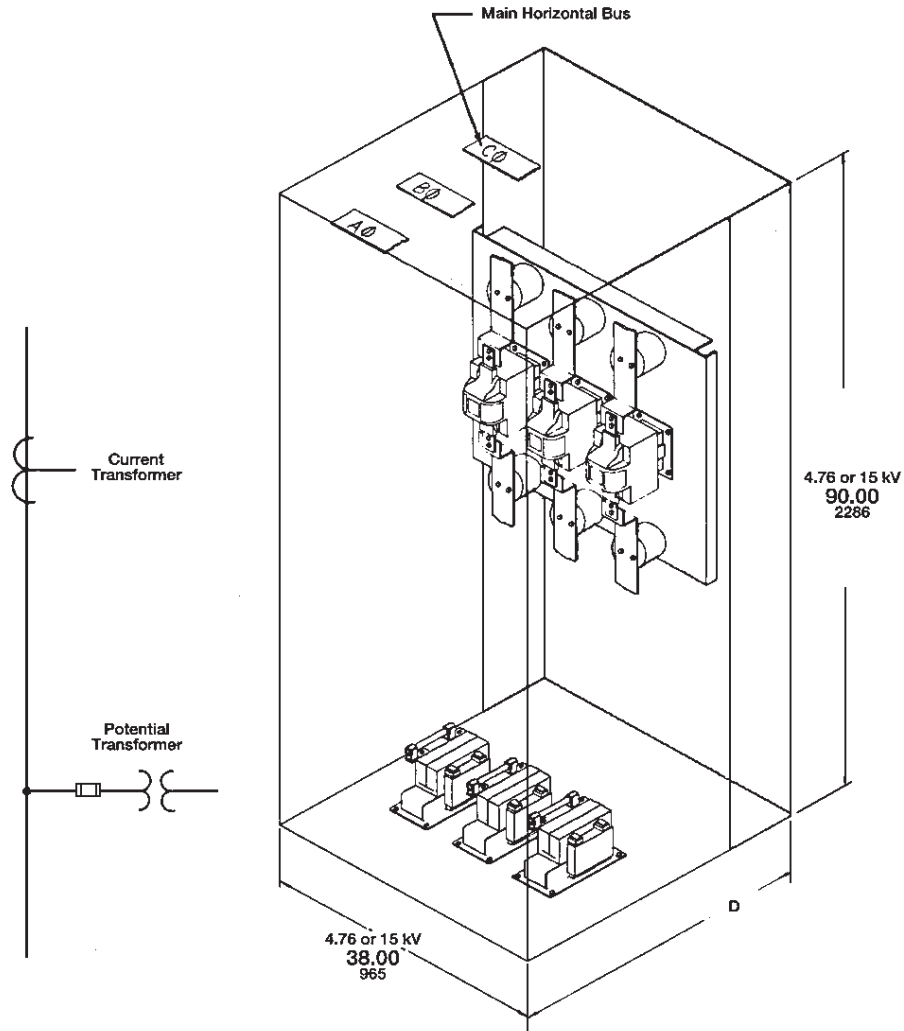
### Depth Dimension of Feeder Switch Bay (Indoor)

Type	Equipment Nominal kV	Cable Lugs Top or Bottom Entrance				Roof Bushings or Pothead Top Entrance				Pothead Bottom Entrance			
		Without CT's		With CT's		Without CT's		With CT's		Without CT's		With CT's	
		D		D		D		D		D		D	
		IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm
Fused	4.76 or 15	54.50	1384	54.50	1384	54.50	1384	54.50	1384	54.50	1384	54.50	1384
Unfused	4.76 or 15	54.50	1384	54.50	1384	54.50	1384	54.50	1384	54.50	1384	54.50	1384



# Metal-Enclosed Load Interrupter Switchgear

## User Metering Bay 4.76 or 15 kV



Outdoor Construction:  
Add 7.50 to the total height and increase the base to the depth dimension of 60  
181 1524

Approximate Shipping Weight Per Bay: Indoor - 1500 Lbs.  
681 Kilograms  
Outdoor - 2050 Lbs.  
930 Kilograms

Dual Dimensions: INCHES  
Millimeters

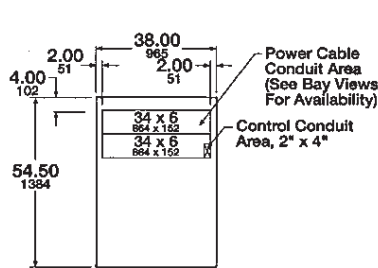
### Depth Dimension of Metering Bay (Indoor)

Equipment Nominal kV	Cable Lugs Only Top or Bottom Entrance				Roof Bushings or Pothead Top Entrance				Pothead Bottom Entrance			
	With CT's & PT's		With CT's, PT's & L.A.		With CT's & PT's		With CT's, PT's & L.A.		With CT's & PT's		With CT's, PT's & L.A.	
	D		D		D		D		D		D	
	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm
4.76 or 15	54.50	1384	54.50	1384	54.50	1384	54.50	1384	54.50	1384	54.50	1384

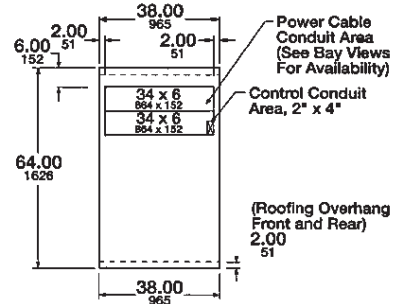


# Metal-Enclosed Load Interrupter Switchgear

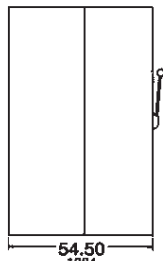
## Standard Dimensions (Approximate Dimensions – Not for Construction) 4.76 or 15 kV



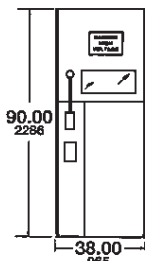
Standard Indoor Top Detail



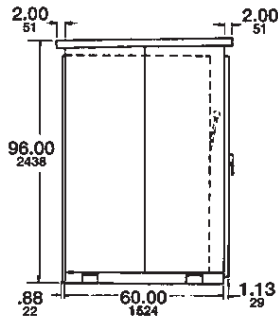
Standard Outdoor Top Detail



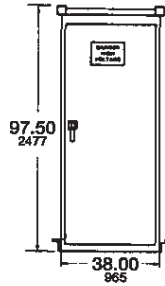
Left End Elevation



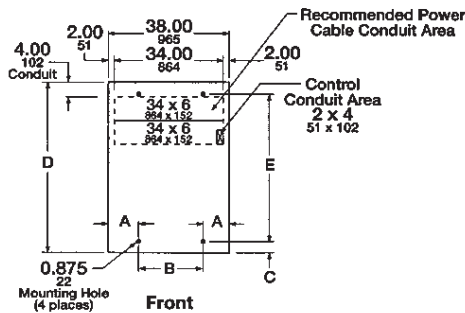
Front Elevation



Left End Elevation



Front Elevation



Standard Indoor/Outdoor Floor Detail  
(Top View, Looking Down)

Dual Dimensions: **INCHES**  
Millimeters

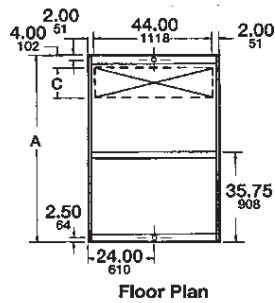
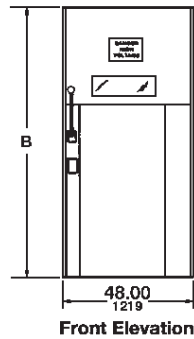
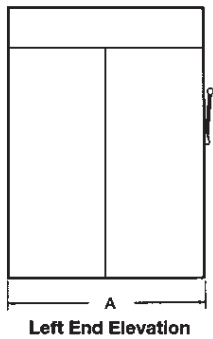
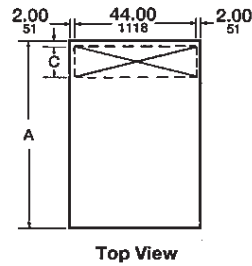
Enclosure Type	A		B		C		D		E		HVL Weight	
	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	Pounds	Kilograms
Indoor (standard)	1.00	25	36.00	914	6.50	165	54.50	1384	43.50	1105	1200	545
Indoor (special)	1.00	25	36.00	914	6.50	165	46.50	1181	43.50	1105	1000	454
Outdoor	8.00	203	22.00	559	3.25	83	60.00	1524	53.50	1359	1400	636
Incoming Line Bay Indoor	1.00	25	20.00	508	6.50	165	54.50	1384	43.50	1105	550	250



# Metal-Enclosed Load Interrupter Switchgear

## Standard Dimensions (Approximate Dimensions – Not for Construction) 25.8/29 kV

### Indoor Equipment

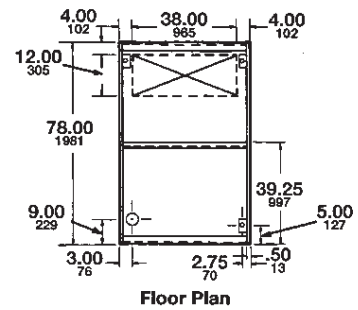
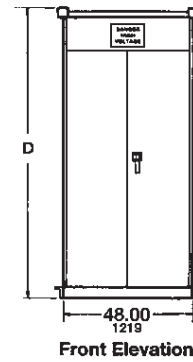
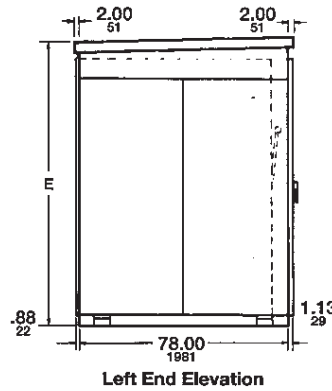
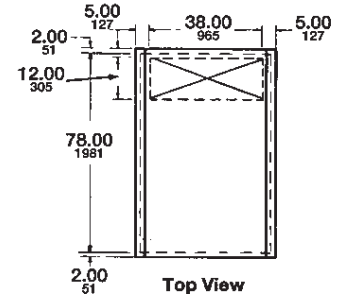


Dimensions subject to change without notice.



Represents Suggested Conduit Entrance Area

### Outdoor Equipment



Approximate Weight: Indoor – 2000 Lbs.  
908 Kilograms  
Outdoor – 2500 Lbs.  
1134 Kilograms

Dual Dimensions: INCHES  
Millimeters

### Dimensions for 25.8/29 kV Enclosures

Cubicle	Indoor						Outdoor			
	A		B		C		D		E	
	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm
Single	72	1829	114	2896	16	406	122	3073	120	3023
Line-up	72	1829	114	2896	16	406	122	3073	120	3023



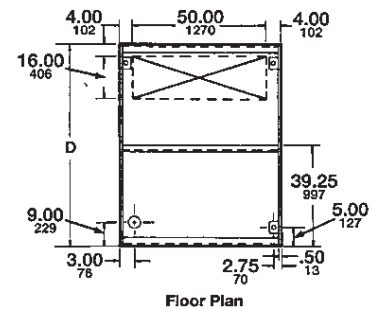
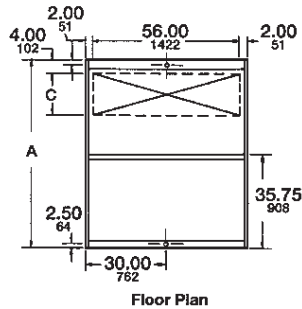
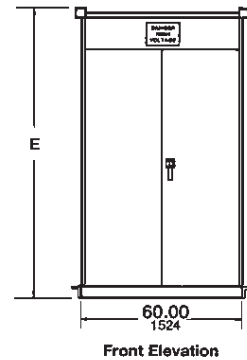
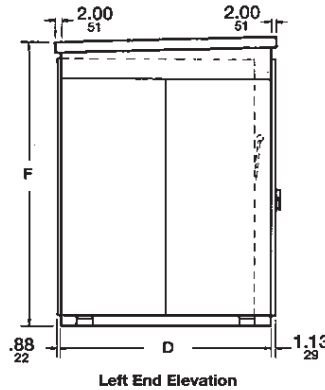
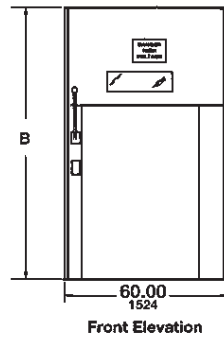
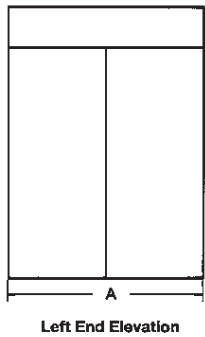
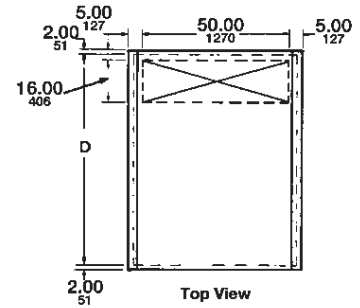
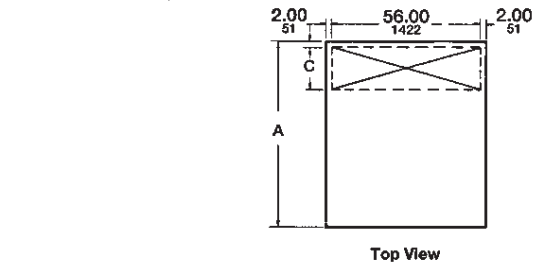
SQUARE D

# Metal-Enclosed Load Interrupter Switchgear

## Standard Dimensions (Approximate Dimensions – Not for Construction) 38 kV

### Indoor Equipment

### Outdoor Equipment



Dimensions subject to change without notice.



Represents Suggested Conduit Entrance Area


Approximate Weight: Indoor – 2200 Lbs.  
998 Kilograms  
Outdoor – 2700 Lbs.  
1225 Kilograms

Dual Dimensions: INCHES  
Millimeters

### Dimensions for 38 kV Enclosures

Cubicle	Indoor						Outdoor					
	A		B		C		D		E		F	
	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm
Single	80	2032	120	3048	16	406	86	2184	128	3251	126	3200
Line-up	80	2032	120	3048	16	406	86	2184	128	3251	126	3200



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Order No. 6040CT9201R12/94 Sept 95 Printed in U.S.A.  
(Replaces Catalog 6040 dated 3/92)



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