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pages 1-8, dated December, 1973
E, D, C/1949, 1994, 1996/PL

Ratings: 2.4 to 38 KV
Interrupting Capacity up to 25,000 Amps
Symmetrical
Continuous current up to 2000 amps

Pad Mounted Vacuum Breakers

General

This bulletin describes the general features of the types PMV 1 to PMV 9 padmounted enclosures and shows photos or outline drawings of typical breakers mounted in each enclosure type.

These designs are low profile, enclosed and have provisions for pad locking access doors.

Each breaker mounted in the enclosure is ready for installation when received with all controls in one location. In most cases the need for external fencing is eliminated.

Standard Bill-of-Material

Standard Bill-of-Material for Types PMV 1 – 9 padmounted vacuum circuit breakers:

- Free-standing metal enclosure, painted inside with ASA-70 grey and outside with telephone equipment green Munsell color 7GY 3.29/1.5.
- Three incoming and three outgoing bushings or terminations per applicable outline drawing.
- Two 3-hole NEMA ground pads with two .50-13 inch tapped holes.

- Cable compartment access door with provisions for padlocking.
- Hinged control access door with provisions for padlocking.
- Westinghouse type R vacuum circuit breaker tray.
- Disconnect switch or switches as shown on applicable outline drawings.
- Stored-energy trip and close mechanism with manual changing device and maintenance closing lever.
- Two fused or unfused superior knife switches for control power and heater circuits.
- One 10-Pole auxiliary switch.
- High-voltage barrier.
- Necessary terminal blocks and wiring.
- X-Y anti-pump relays.
- Main contact position indicator and operations counter.

Enclosure Selection Guide

This table describes the general features of each of the enclosures described in this application data.

Some modifications to each enclosure are possible, particularly with the cable entrance and exit compartments. They can be determined by reviewing the listing for each enclosure as well as Section 5 of PL 38-900.

Type	Maximum Voltage KV	Cable Connection	Dead Front	Disconnect Switch	Vacuum Breaker Tray Design	Hinged Control Panel
PMV 1	38	Underground	No	No	Fixed Position	Yes
PMV 2	15	Underground	Yes	No	Fixed Position	Yes
PMV 3	15	Underground	Yes	No	Rollout	Yes
PMV 4	38	Underground	No	Yes	Rollout	Yes
PMV 5	38	Overhead	No	Yes	Rollout	Yes
PMV 6	38	Overhead	No	No	Fixed Position	No
PMV 7	15	Overhead	No	Yes	Rollout	Yes
PMV 8	38	Overhead	No	No	Rollout	Yes
PMV 9	15	Underground	No	Yes	Fixed Position	Yes

Available Ratings

Table 1

The following table lists the tray ratings that are available. Not all trays can be used in all enclosures. Consult each enclosure description on the following pages to determine which trays are applicable to each enclosure.

Max KV Class	KV BIL	Continuous Amps	Interrupting ^③ Capacity Amperes Symmetrical
5.0 ^①	60	600	6000
		600	12000
		800	16000
		1200	6000
		1200	20000
15.5 ^②	95	2000	25000
		600	2000
		600	4000
		600	6000
		600	12000
		600	16000
		600	20000
		800	16000
		800	20000
		1200	4000
27.0	125	1200	6000
		1200	20000
		2000	25000
		600	8000
		600	12000
		600	16000
38.0	150	1200	8000
		1200	12000
		1200	16000
		1200	16000

① These trays go in 2.4 Kv enclosures also.

② These trays go in 7.5 Kv enclosures also.

③ Trays rated above 15 KV as well as trays rated 25,000 IAC are not rated for capacitor switching or switching of unloaded cables. Refer special applications to Westinghouse.

Type PMV 1 Enclosure

General Description
This breaker using the PMV1 enclosure was designed for fault protection of a three phase underground distribution feeder.

Hinged double doors provide access on three sides. This design uses a fixed position vacuum breaker tray.

Line and load connections are cable termination on NEMA four hole pads mounted at the base of porcelain bushings. Either set of bushings provide mounting space for bushing current transformers.

A fused control power transformer can be mounted in the cable entrance compartment.

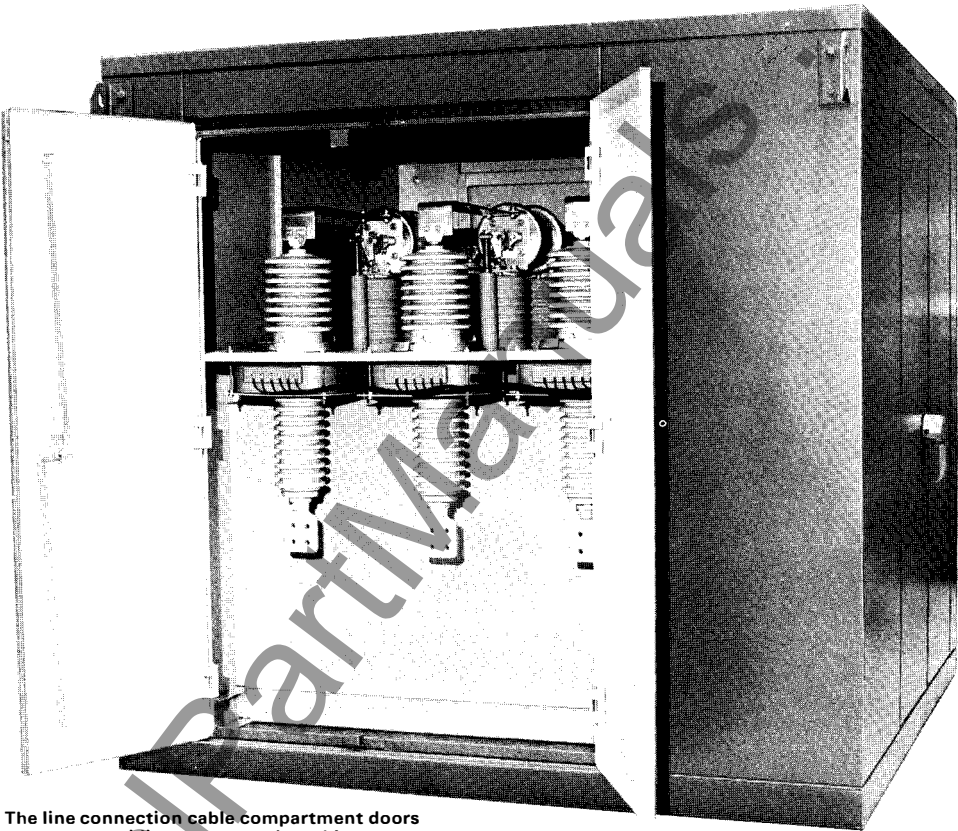
Available PMV 1 Breaker Ratings
The rating of breakers in the PMV1 enclosure can be any continuous current and interrupting capacity shown in Table 1 for 15.5, 27.0 and 38.0 Kv equipment.

- Optional Accessories and Modifications**
- Control accessories as required from Section 3, PL 38-900.
 - Roof bushings
 - Ground wire monitoring
 - Undervoltage release
 - Stress cones
 - Undercoat
 - External mounted indicating lights
 - Special painting
 - Limit switch, door mounted and interlocked with trip coil
 - Potential Transformer
 - 24" sub base to increase terminal height above ground to 48 inches.

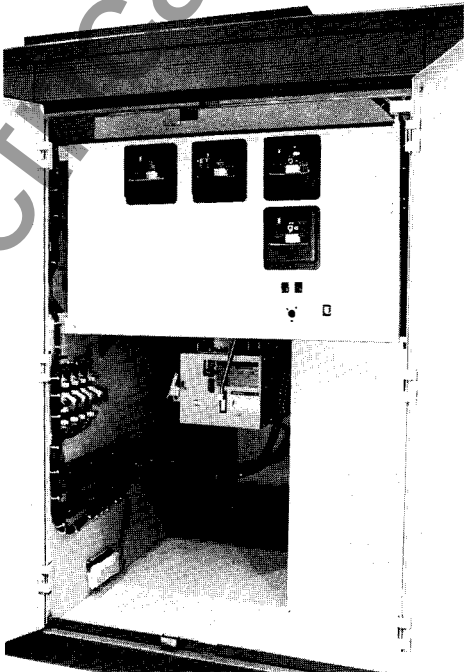
Available PMV 1 Types and Sizes

Type	Voltage KV	Approximate Dimensions Inches		
		A	B	C
PMV1-155	15.5①	48.00	72.25	14.50
PMV1-270	27.0	53.00	80.25	16.50
PMV1-380	38.0	53.00	80.25	16.50

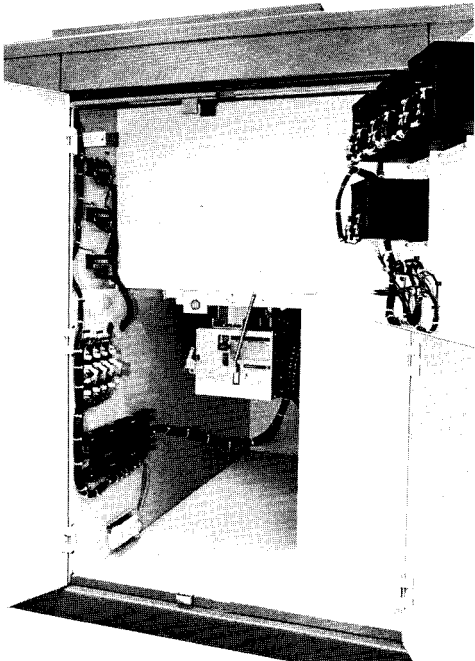
① 2000 amp continuous current rating at 15 KV uses the PMV1-380 enclosure.



The line connection cable compartment doors are open providing access to the cable connections, bushing current transformers, and the vacuum breaker tray.



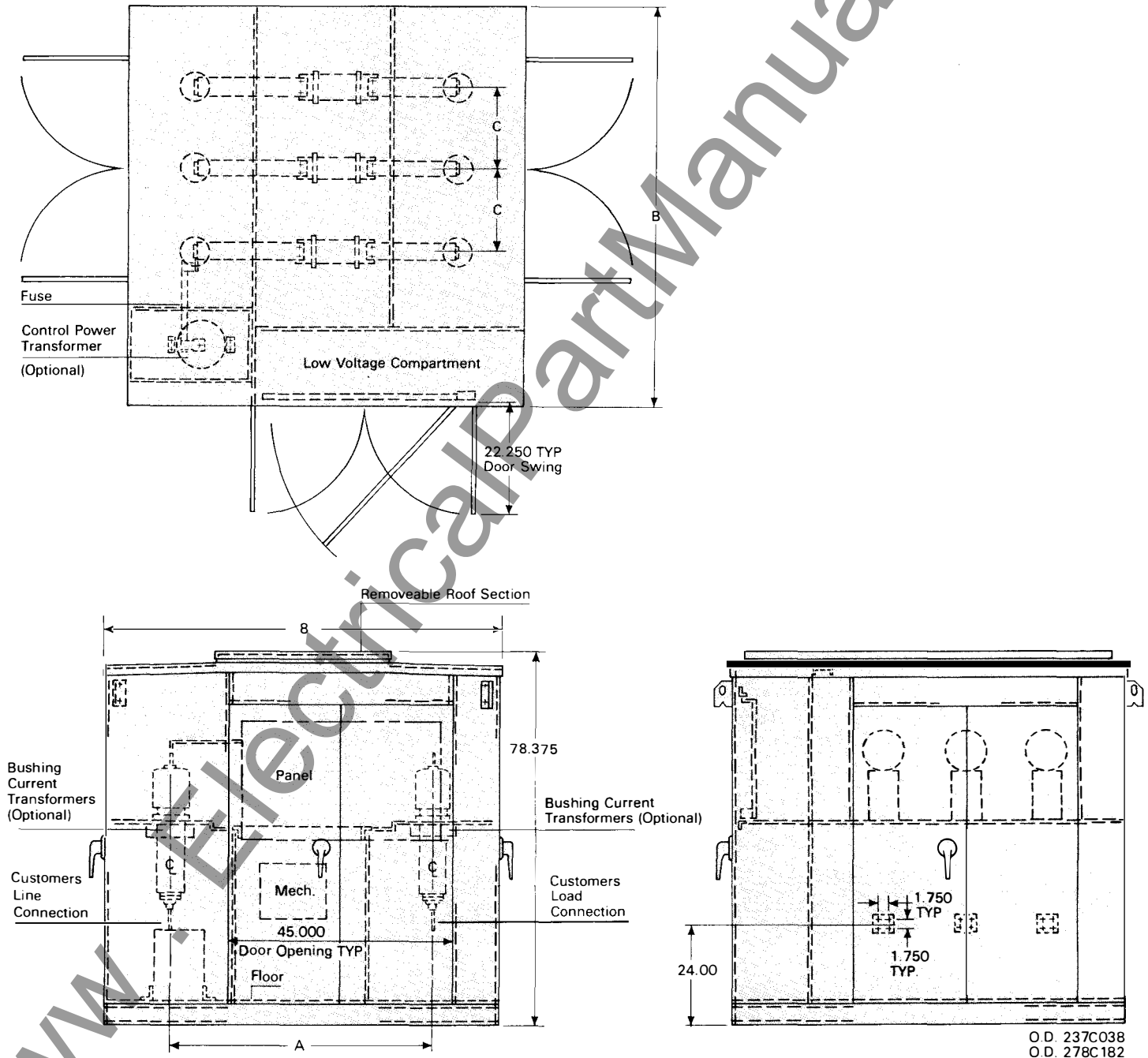
The hinged control panel, control wiring and operating mechanism are readily accessible through the front doors.



Located behind the hinged panel is a removable bolted panel that provides access to the H.V. compartment.



Type PMV 1 Enclosure



Type PMV 2 Enclosure

General Description

This breaker was designed for use on underground distribution feeders using the PMV 2 enclosure.

Access to the cable compartment is provided through double wrap-around doors. Both the line and load 600 A epoxy bushings suitable for use with ESNA-type elbows are located in this compartment.

The middle compartment of this three compartment design contains the HV vacuum breaker. The bushing current transformers and a control power transformer are also located in the compartment, if required.

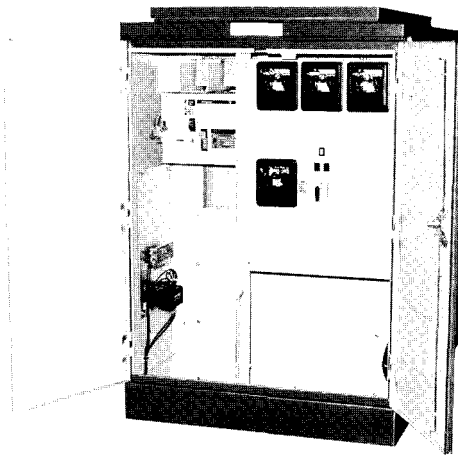
Entrance to the HV compartment is through a bolted access panel located at the base of the low voltage compartment.

The low voltage compartment includes the breaker control wiring, mechanism and a hinged control panel.

Basic Rating

The basic rating of the breaker in this type PMV 2-155 is 600A, 15 KV, with a maximum interrupting rating of 20,000 amps symmetrical.

Any interrupting rating below 20,000 amps is



Low voltage compartment doors open showing the hinged relay panel, mechanism and access panel to H.V. compartment.



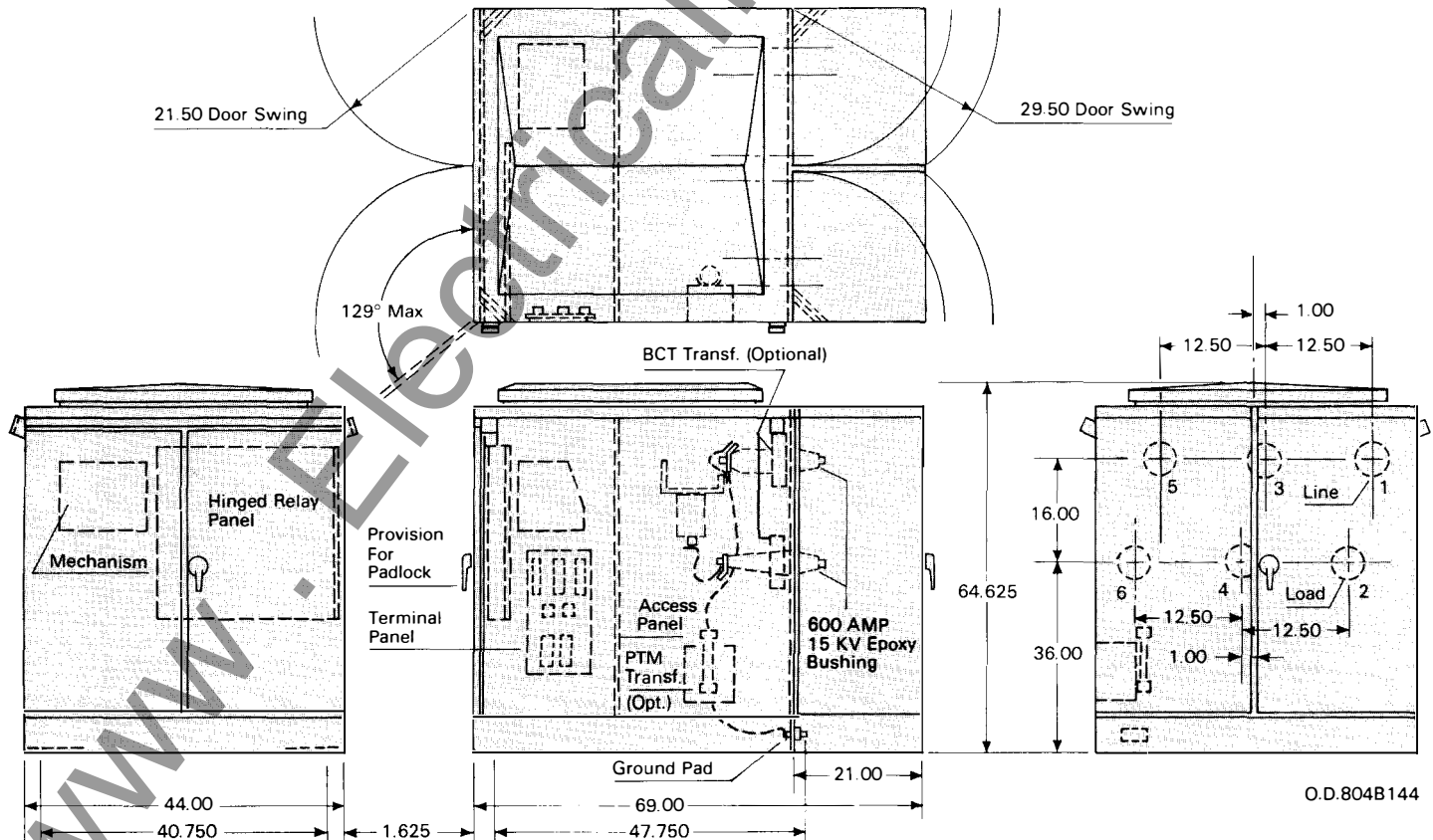
View of the cable compartment with one of the wide angle doors open.

available for 600 amp, 15.5 Kv breakers as specified in Table 1.

Optional Accessories and Modifications

- Control accessories as required from Section 3, PL 38-900.
- Up to two PTM transformers for metering and control power.
- 6-200 amp load break bushing wells on load side instead of 3-600 amp bushings.
- BCT's on load side when 600 amp bushings are specified.

- Sub base
- Loop thru bushings, 600A
- Extra set of 600A outgoing bushings
- Ground wire monitoring
- External mounted indicating lights
- Undervoltage release
- Undercoat
- Special paint
- Limit switch, door mounted and interlock with trip coil



O.D.804B144



Type PMV 3 Enclosure

General Description

This breaker was designed for use in outdoor substations using the PMV 3 enclosure where improved appearance is desirable.

The PMV 3 is a three-compartment, free-standing, tamper-resistant metal enclosure.

Incoming and outgoing high-voltage cables are accessed through a door on the left side of the unit. The "Dead" front high-voltage panel is equipped with three incoming and three outgoing 600-amp epoxy bushings suitable for use with Esna-type elbows. Each panel has two 2-hole NEMA copper ground pads.

The relay compartment is accessed through a door in the front of the unit. The hinged relay panel located immediately inside the front door permits easy access to the overcurrent relays and the breaker control switch when supplied.

Located immediately behind the hinged relay panel is a high-voltage barrier and the component back panel. The high-voltage barrier must be removed to gain access to the high-voltage portion of the breaker.

The component back panel contains the bushing current transformer shorting-type terminal blocks, fused knife switches for the control power circuit, heaters, and the terminal blocks required for connecting the relays to the circuit breaker when relaying is specified.

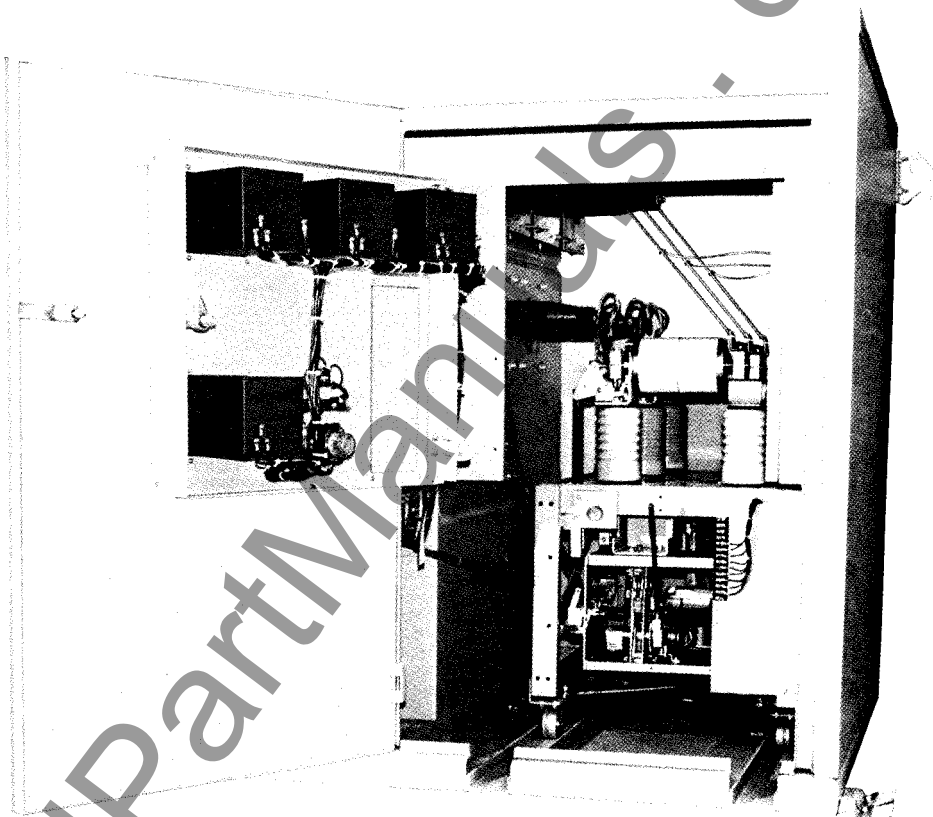
Basic Rating

The basic rating of the breaker in the PMV 3-155 enclosure is 600 A, 15 Kv, with a maximum interrupting capacity of 20,000 amps symmetrical.

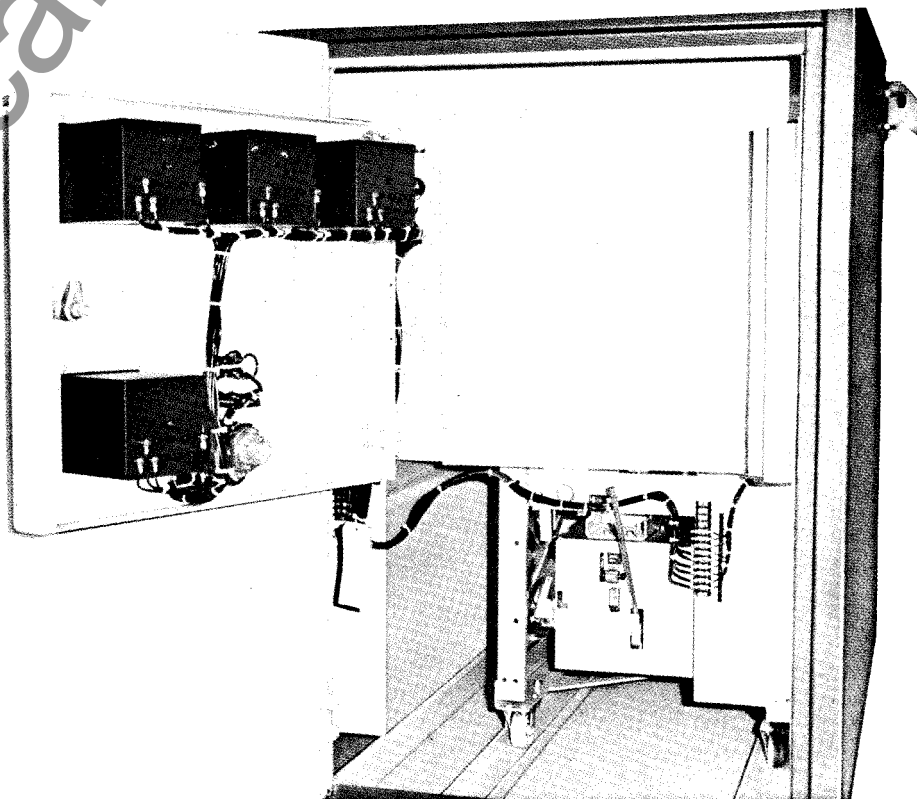
Interrupting ratings below 20,000 amps are available as shown in Table 1 for 15.5 Kv, 600 amp designs.

Optional Accessories and Modifications

- Control accessories as required from Section 3, PL 38-900.
- Loop thru bushings, 600 A.
- Sub base
- Ground wire monitoring
- Undervoltage release
- Undercoat
- Special painting
- Fused or non-fused potential transformers in H.V. compartment. (total of two).
- Extra set of 600 amp outgoing bushings.
- Replace 3-600 amp outgoing bushings with 6-200 amp load break bushings.
- Bushing Current transformers on outgoing bushings when 600 amp bushings are specified.
- External mounted indicating lights
- Limit switch, door mounted and interlocked with trip coil

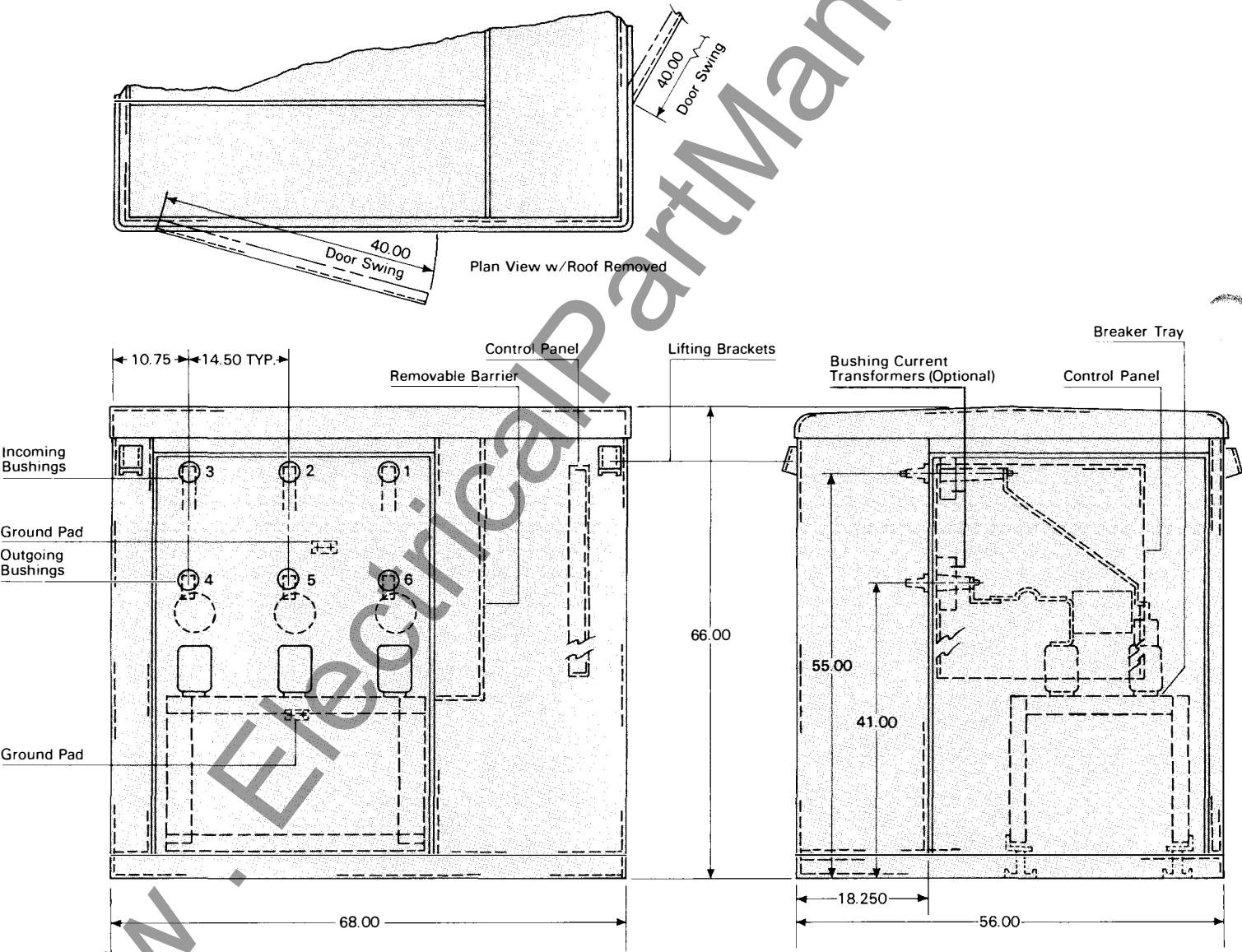


Hinged relay panel open and high-voltage barrier removed showing vacuum breaker tray, bus connections, and bushing current transformers.



Relay compartment door and hinged relay panel open showing high-voltage barrier and low-voltage mechanism panel front.

PMV 3 Enclosure



O.D. 803B986



Type PMV 4 Enclosure

General Description

This breaker was designed to be used in a PMV4 enclosure as a distribution substation breaker with cable entrance and exit.

Doors are provided on both sides of the breaker enclosure for access to the cable compartments.

The door on the front, when opened, provides access to the low voltage compartment, breaker mechanism and the gang operated disconnect switch handles. These handles are key interlocked with the vacuum breaker.

The pentahead bolted high voltage doors must be removed to expose the high voltage compartment.

The vacuum breaker can be removed from the metal enclosure for inspection once the disconnect switches are opened and the barrier is removed. A safety barrier trails the breaker as it is removed so that the HV compartment is covered. In addition, spring return wire mesh doors close over the entire high voltage compartment once the breaker is removed.

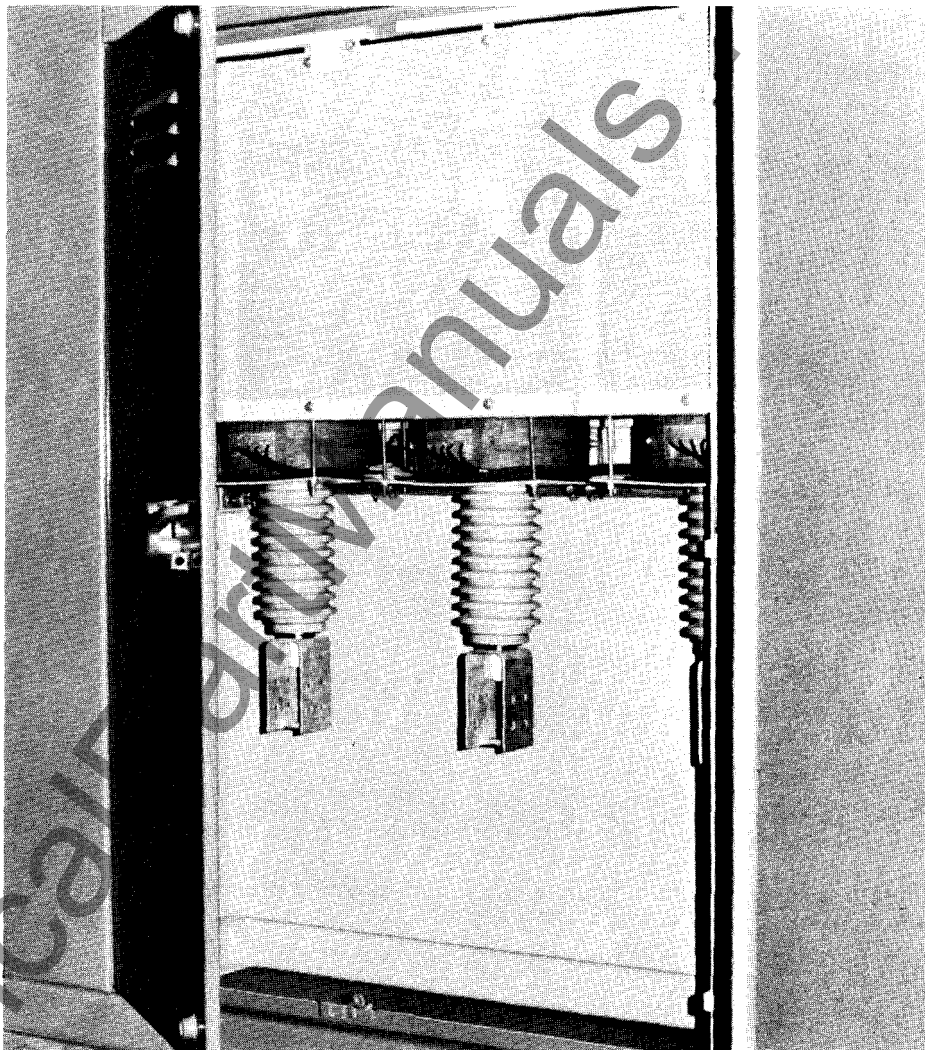
Ground pads are provided in each compartment.

A hinged control panel for relays and other control devices is located in the low voltage compartment in the front of the breaker and is exposed once the front doors are opened.

Each bushing terminal is a double, NEMA 4-hole pad. A 6 x 10 inch hole is provided in the low voltage compartment floor for control wire entrance.

Basic Rating

Any breaker tray from Table 1 for 15.5, 27.0 or 38.0 Kv can be mounted in this enclosure as long as the continuous current rating is 1200 amps or less.



Cable compartment doors open showing the bushing current transformers and high voltage cable terminals

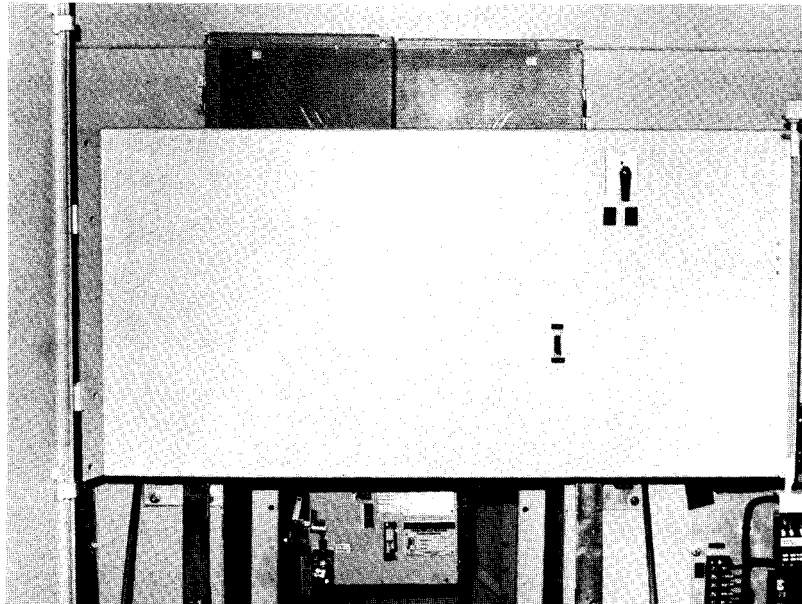
Optional Accessories and Modifications

- Control accessories as required from Section 3, PL 38-900.
- Sub base
- Ground wire monitoring
- Undervoltage release
- Stress cones
- Undercoat
- Special painting
- Surge arresters up to 6 (max.)
- Roof bushings on one or both sides
- Key interlocks
- External mounted indicating lights
- Limit switch, door mounted and interlocked with trip coil

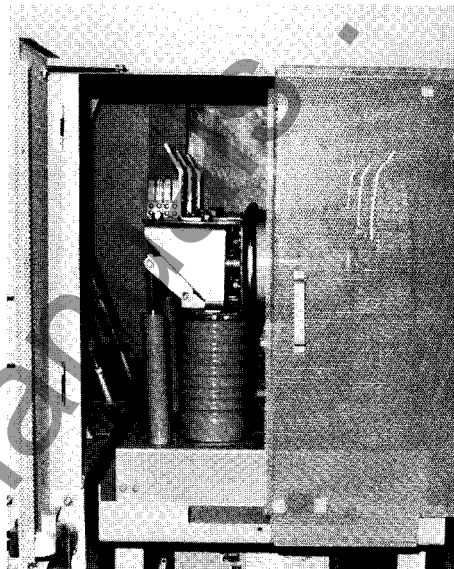
Available PMV 4 Types and Sizes

Type	Voltage KV	Approximate Dimensions Inches	
		A	B
PMV4-155	15.5	48.00	72.25
PMV4-270	27.0	53.00	80.25
PMV4-380	38.0	53.00	80.25

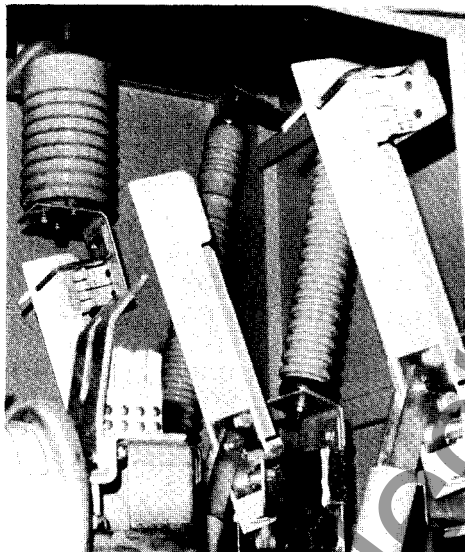
PMV 4 Enclosure



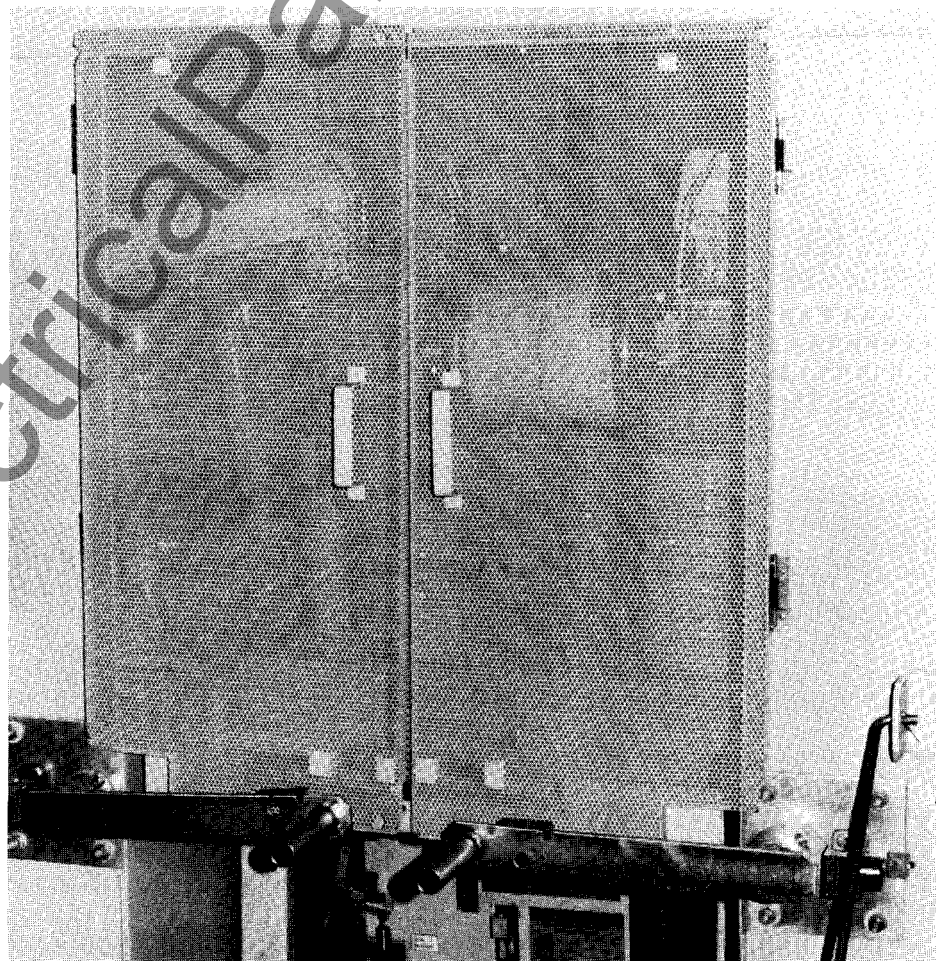
Low voltage compartment door open showing hinged control panel.



High Voltage compartment view from Low Voltage compartment with barrier open

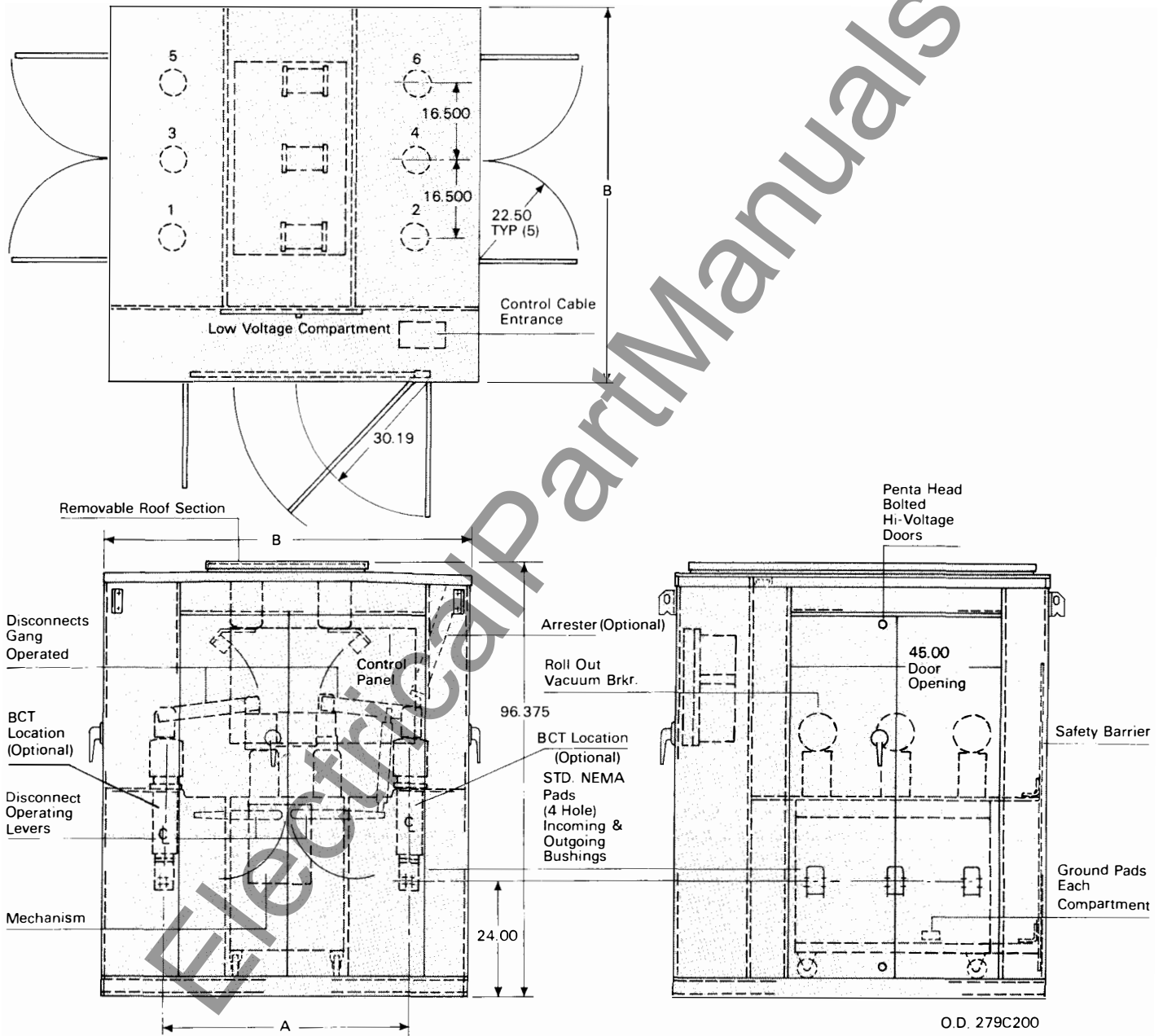


Disconnect switches shown open



With hinged panel open, the high voltage compartment, disconnect switch operating handle and the mechanism are readily accessible.

PMV 4 Enclosure



Type PMV 5 Enclosure

General Description

The breaker designed for use in this PMV5 enclosure serves as a primary breaker on an indoor power center. The 20 x 30 inch throat is designed to mate with the transformer providing a metal enclosed connection.

Bushing current transformers can be mounted in the HV compartment.

The vacuum breaker can be removed from service and rolled out of the house by opening the 3 phase, gang operated disconnect switch, after the breaker has been opened, and then disconnecting the cable at location "Z".

Access to the disconnect switch, mechanism, and control panel is provided through a hinged door equipped with a handle.

After opening the door, a barrier can be removed to gain access to the HV compartment.

The 12 x 24 inch opening for power entrance is provided with a cover plate that is to be drilled by customer to match the power cable size.

Lifting lugs and a ground pad are also provided as standard.

Basic Rating

The basic rating of the enclosure is 1200 A. Any interrupting capacity for 15.5, 27.0, or 38.0 KV breaker trays can be selected from Table 1 for continuous current ratings of 1200 A or below.

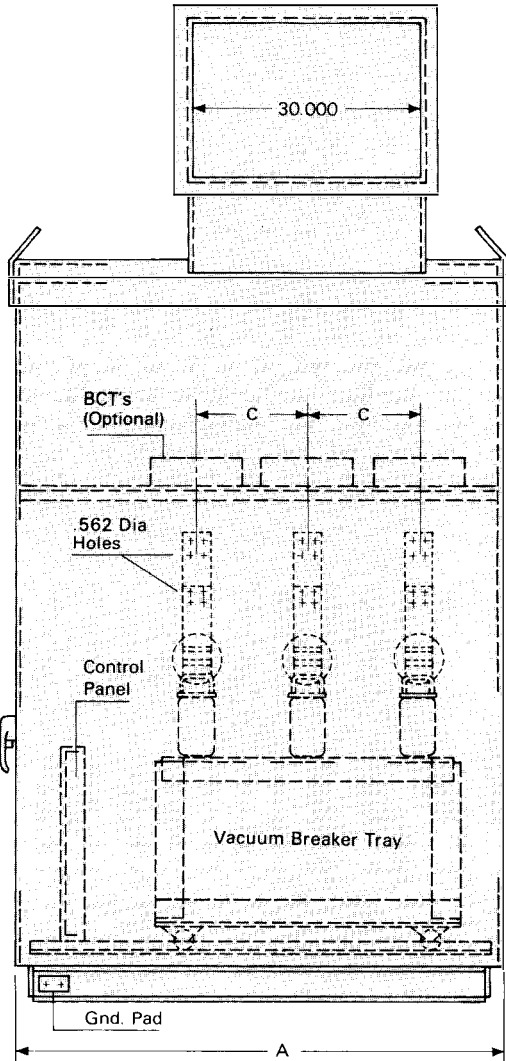
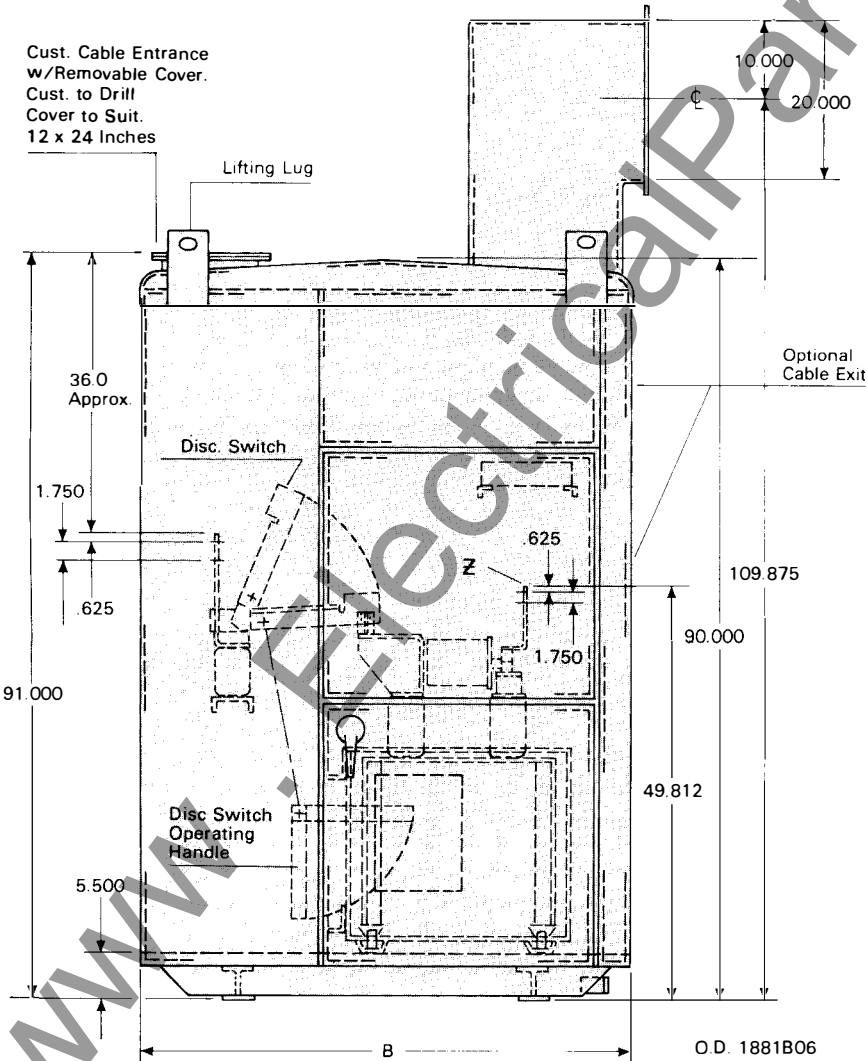
Optional Accessories and Modifications

- Control accessories as required from Section 3, PL 38-900.
- Key interlock of disconnect switch and breaker
- Removable cover on side of breaker house for cable entrance to lower height transformers in lieu of throat
- Roof bushings for cable entrance. Exit also

- possible. (OD1882B62) See pages 11 and 12.
- Cable exit compartment, through bottom. (OD1882B62) See pages 11 and 12.
 - Ground wire monitoring
 - Undervoltage release
 - Stress cones
 - Undercoat
 - Special painting
 - Potential transformer
 - External mounted indicating lights
 - Limit switch, door mounted and interlocked with trip coil.
 - Surge protection compartment.

Available PMV 5 Types and Sizes

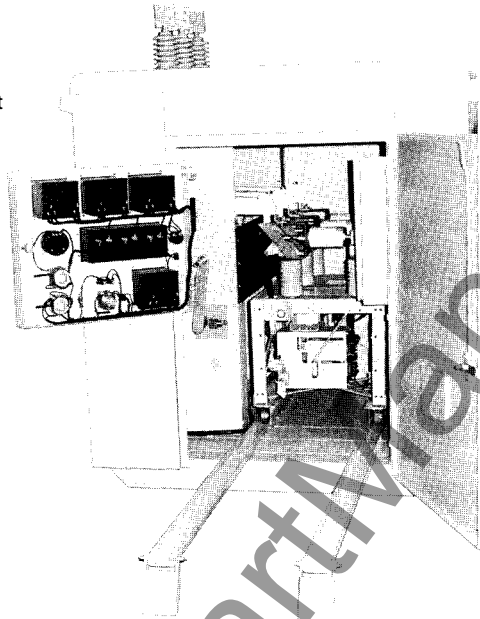
Type	Voltage KV	Approximate Dimensions Inches		
		A	B	C
PMV5-155	15.5	60.00	60.00	14.50
PMV5-270	27.0	80.00	70.00	16.50
PMV5-380	38.0	80.00	70.00	16.50



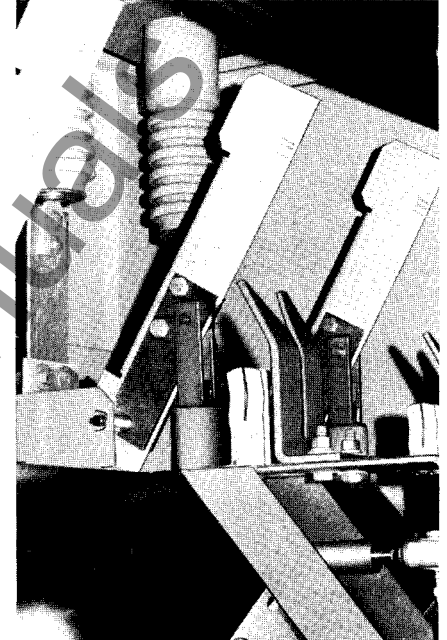


Type PMV 5 Enclosure

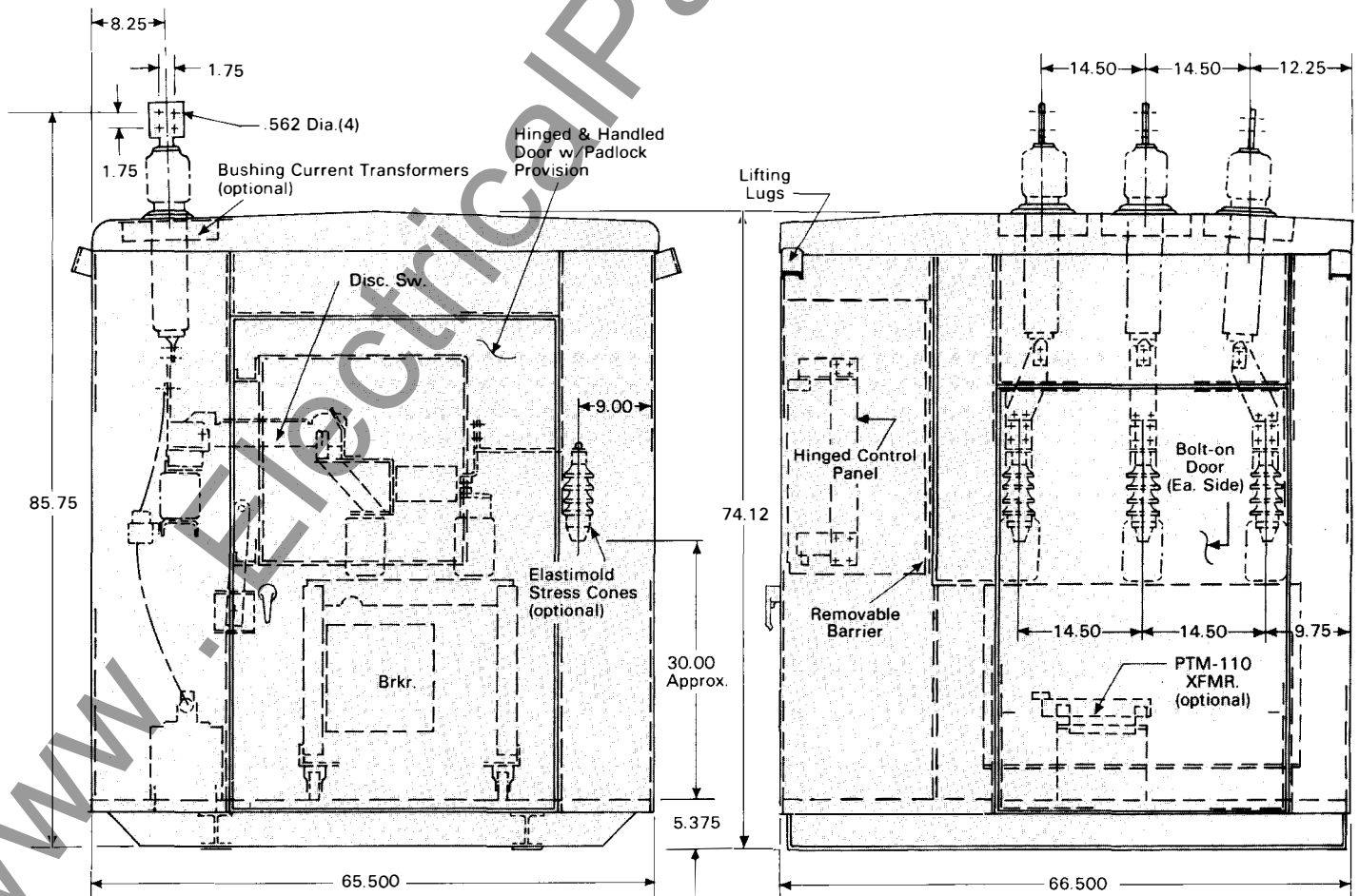
The photos and outline drawings on pages 11 and 12 show one available modification of the basic PMV-9 construction with roof bushings in the cable entrance compartment and a cable exit compartment in lieu of a throat connection.



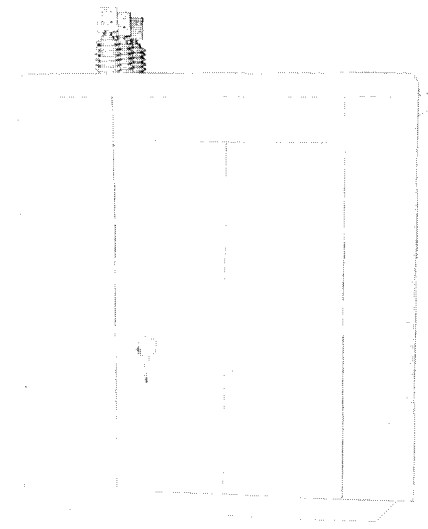
Hinged control panel open showing high voltage compartment, tray rails, and disconnect switch.



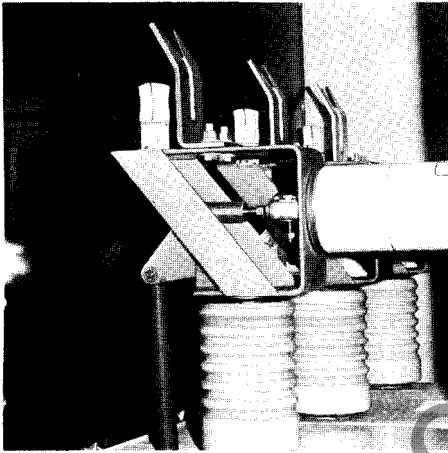
Disconnect switch shown open on PMV-9 enclosure.



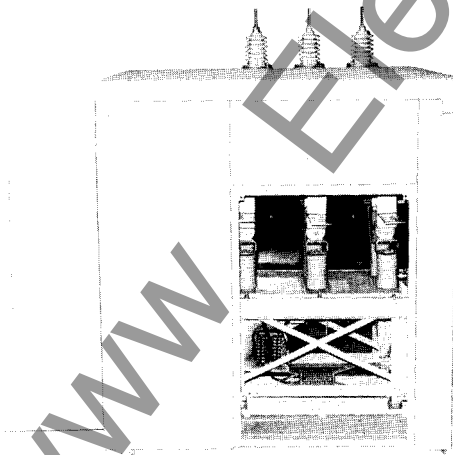
Type PMV 5 Enclosure



PMV enclosure with cable exit compartment in lieu of throat connection



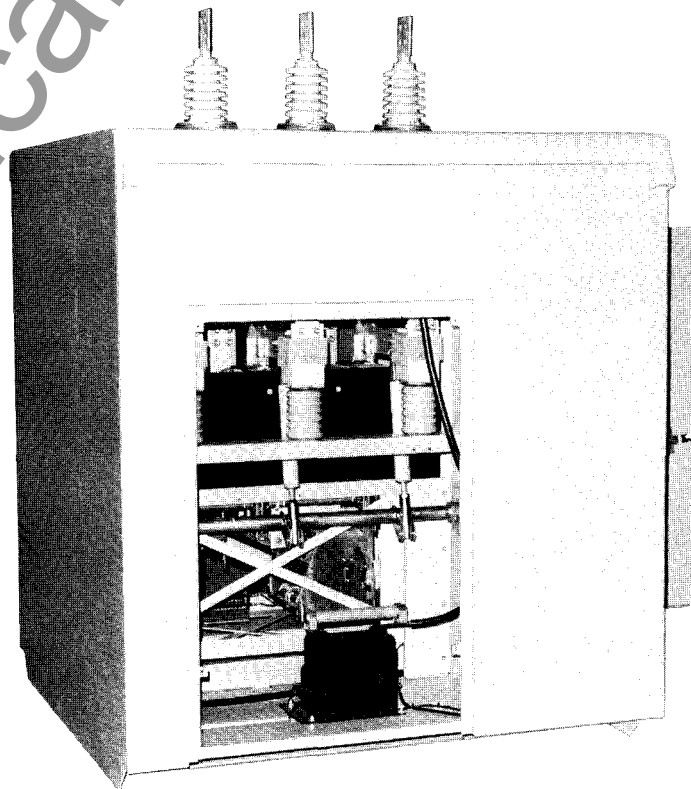
Barrier in place with disconnect switch open.



Cable exit compartment on PMV-9 enclosure showing connection for underground cable



Typical PMV-9 enclosure with hinged panel, tray and disconnect switch operating handle visible through open control compartment door.



Overhead cable entrance compartment shown open with fused control power transformer located in base.



Type PMV 6 Enclosure

General Description

This breaker was designed in a PMV6 enclosure for starting M-G sets on large walking draglines; however, it can be used on any application that can be accommodated by the bill of material and rating.

A hinged front door provides access to the breaker mechanism. Bolted panels on each side provide access to the high voltage compartment.

Feed thru bushings are provided for bringing cables directly to the NEMA 2-hole terminal pads.

Bushing current transformers can be supplied on the line and load bushings.

Although this unit was designed for indoor use, by adding roof bushings in place of the feed thru bushings the breaker is suitable for outdoor application.

Basic Rating

The basic rating of this breaker is 1200 Amperes with a maximum interrupting capacity of 20,000 amps symmetrical. Any continuous current and interrupting rating below these values can be selected from Table 1.

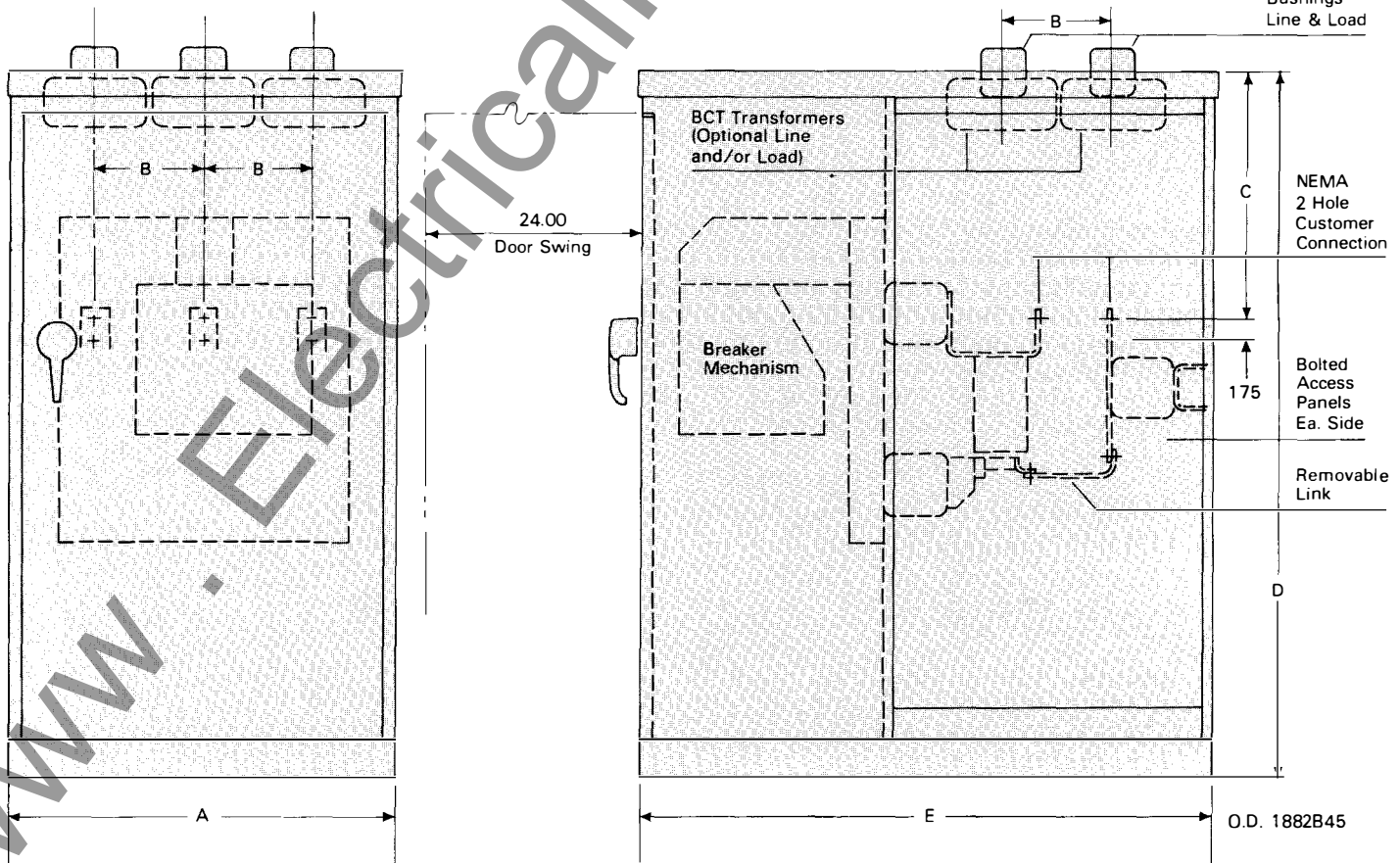
Optional Accessories and Modifications

- Control switch and indicating lights
- Control power transformer in HV compartment
- Roof bushings
- Cable entrance and exit from bottom
- Undervoltage release
- Stress cones
- Undercoat
- Special painting
- External mounted indicating lights
- Limit switch, door mounted and interlocked with trip coil
- Surge protection compartment.

Available PMV 6 Types and Sizes

Type	Volt- age KV	Approximate Dimensions Inches				
		A	B	C	D	E
PMV6-075	7.5	29.00	8.00	18.00	52.00	42.00
PMV6-155	15.5	41.50	8.75	24.63	62.00	52.13
PMV6-270	27.0	58.00	14.50	①	①	65.00
PMV6-380	38.0	63.00	16.50	①	①	75.00

① Function of cable, cable termination or roof bushings specified. Consult Westinghouse for specific requirement.



Type PMV 7 Enclosure

General Description

This unit was designed in a PMV7 enclosure as a replacement unit for indoor oil breakers that need to be up-rated.

A hinged door on the front provides access to the mechanism and relay control panel. Lights located on the front of the door indicate the breaker position. Once the door is open, the front hinged panel can be removed to gain access to the HV compartment.

A set of single phase non-loadbreak disconnect switches are located in the HV compartment. These switches provide a visible disconnect once the breaker has been opened and also facilitates removal of the breaker tray.

The tray can be withdrawn by removing the bolts at location "Z", the barrier, and opening the disconnect switches. Access to the bolts at location "Z" is through a removable panel located on the panel opposite the hinged door.

Roof mounted bushings that will accommodate bushing current transformers are standard.

A ground pad is located on the rear of the enclosure.

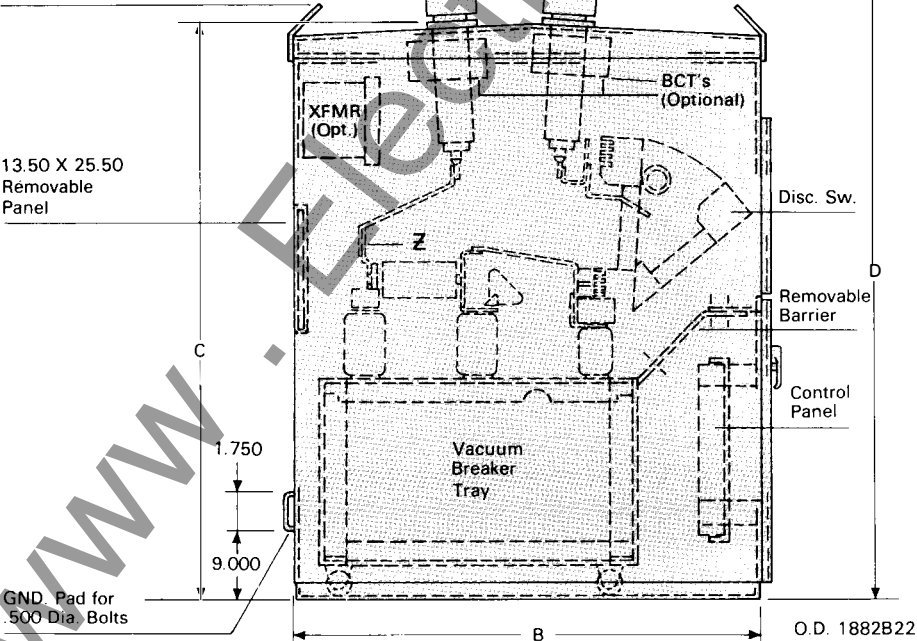
Basic Rating

The basic rating of this breaker is 20,000 Amperes symmetrical interrupting capacity, 1200 amps continuous.

Optional Accessories

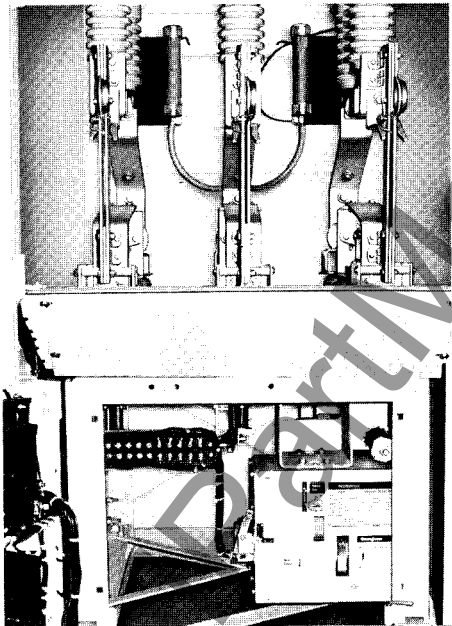
- Control accessories as required from Section 3, PL 38-900.
- Potential transformer
- Key interlock
- Ground wire monitoring
- Undervoltage release
- Undercoat
- Special painting
- External mounted indicating lights
- Limit switch, door mounted and interlocked with trip coil
- Surge protection compartment.

Lifting Lugs

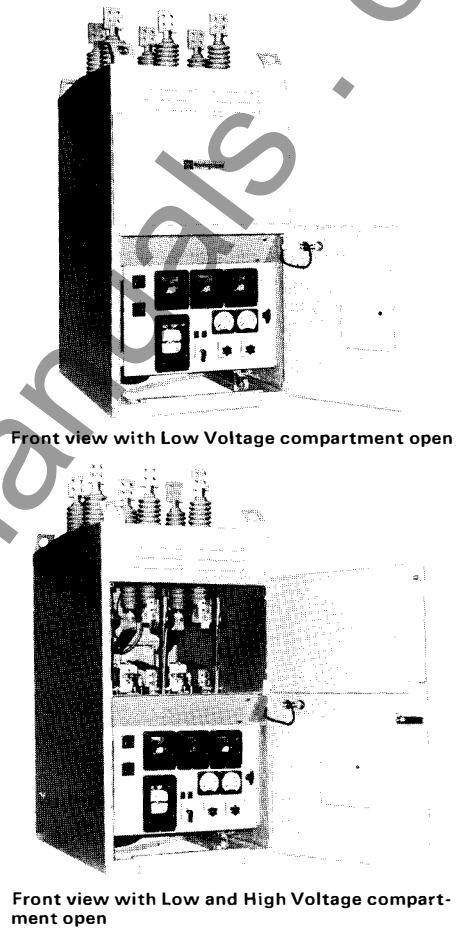


Optional Ratings and Sizes

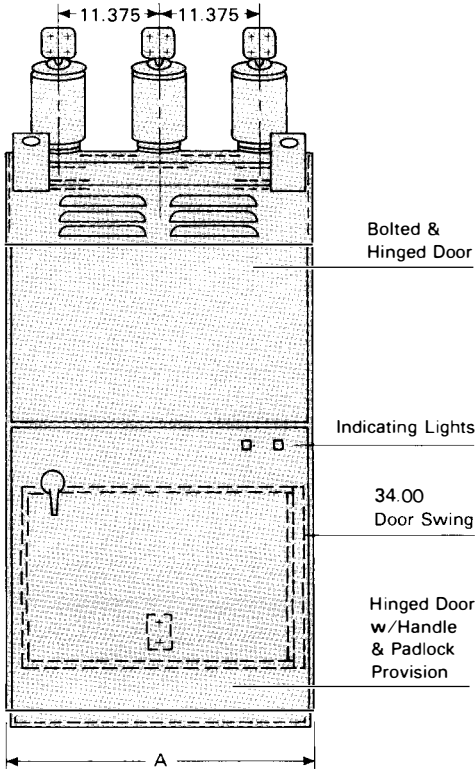
Type	Voltage KV	Approximate Dimensions Inches			
		A	B	C	D
PMV7-024	2.4	34.00	52.00	64.75	78.75
PMV7-075	7.5	44.00	52.00	64.75	78.75
PMV7-155	15.5	50.00	57.00	72.00	86.00



Front view of High and Low Voltage compartments with hinged relay panel open.



Front view with Low and High Voltage compartment open





Type PMV 8 Enclosure

General Description

This metal enclosed breaker was designed in a PMV8 enclosure to connect to a horizontal bus run at the back of the breaker. It is ideally suited for multiple breaker positions off of the horizontal bus.

A hinged door provides access to the low voltage compartment including the breaker mechanism and a hinged control panel.

A removable barrier separates the high voltage compartment from the low voltage compartment.

Basic Rating

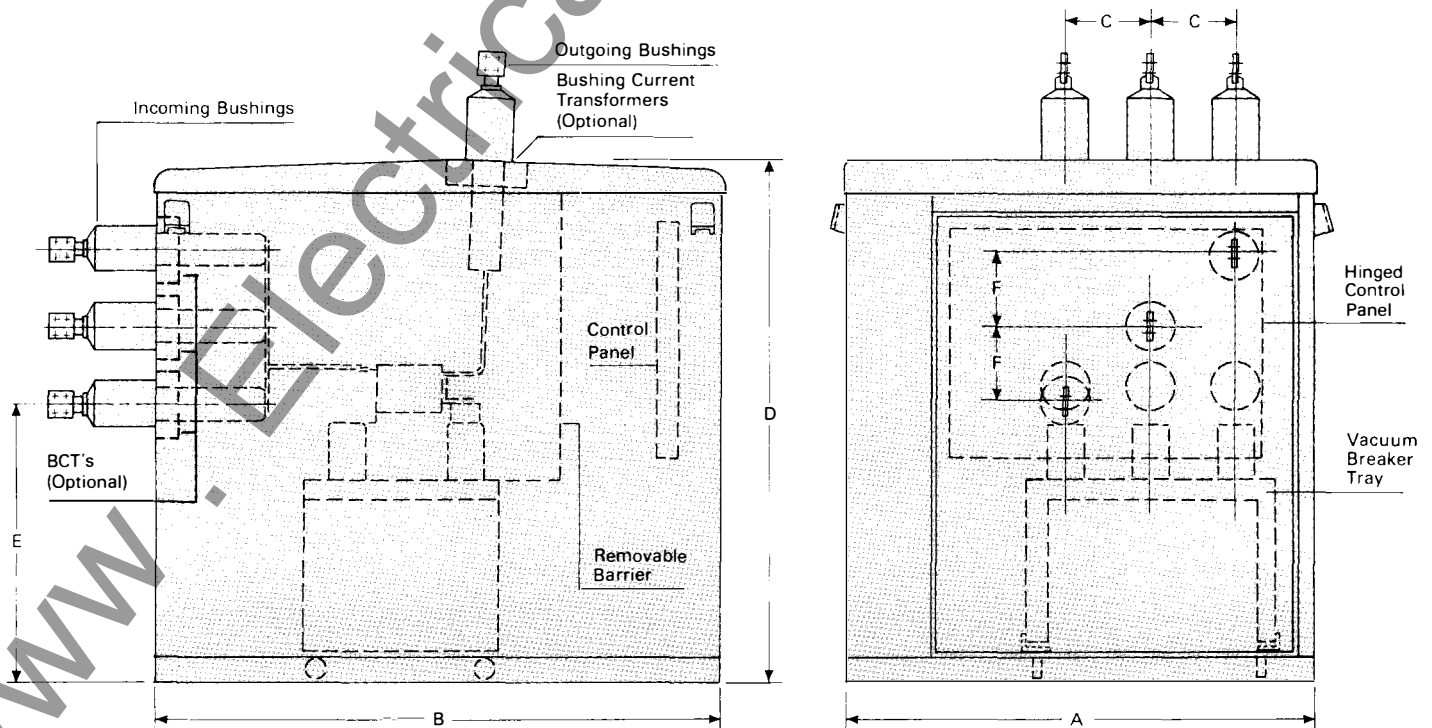
The basic rating of this breaker is 1200 amps, with a maximum interrupting capacity of 20,000 amps symmetrical.

Optional Accessories

- Control accessories as required from Section 3, PL 38-900.
- Potential transformer.
- Undervoltage release.
- Undercoat
- Special painting
- Limit switch, door mounted and interlocked with trip coil
- External mounted indicating lights
- Surge protection compartment.

Optional Ratings and Sizes

Type	Voltage KV	Approximate Dimensions Inches					
		A	B	C	D	E	F
PMV8-155	15.5	56.00	68.00	11.38	66.00	32.00	12.00
PMV8-270	27.0	66.00	78.00	14.50	84.00	37.00	16.50
PMV8-380	38.0	66.00	78.00	16.50	84.00	37.00	16.50





Type PMV 9 Enclosure

This enclosure was designed to house vacuum breakers for outdoor switch house applications. Cable entrance and exit is through conduit or cable blocks. Access to the three separate compartments is provided by hinged doors.

A disconnect switch with a viewing window is provided in the cable entrance compartment. Optional current, potential, or control power transformers are mounted in the high voltage vacuum breaker tray compartment. The hinged relay panel is also located in the middle compartment of the PMV9 enclosure.

The cable exit compartment provides for two outgoing circuits or cable blocks that can be fused or switched with Type EU cutouts.

Cable is used to bus through the three

compartments from the incoming to the outgoing terminals.

Basic Rating

The basic rating of the breaker is 400 amperes with a maximum interrupting rating of 20,000 amps symmetrical.

Optional Accessories and Modifications

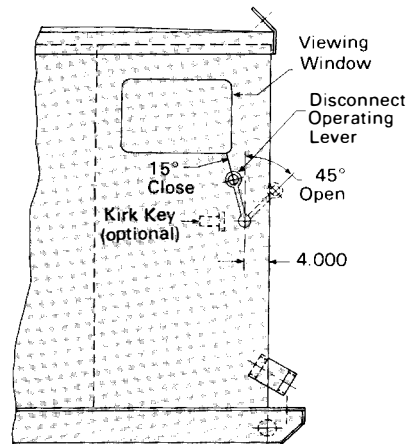
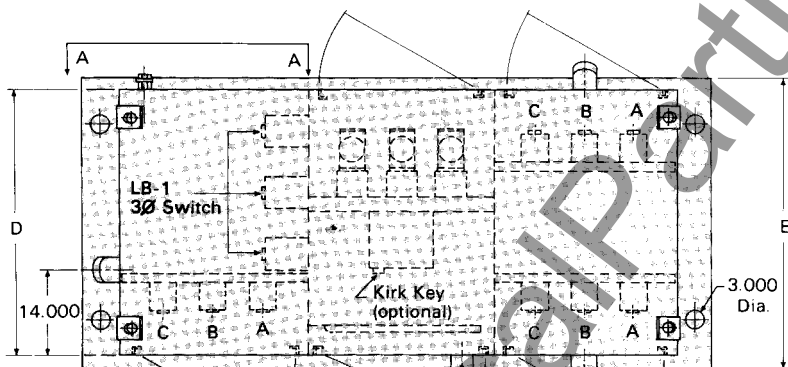
- Control accessories as required from Section 3, PL 38-900
- Potential transformer
- Key interlocks
- Enclosure modification for higher voltage

tray without increasing enclosure size

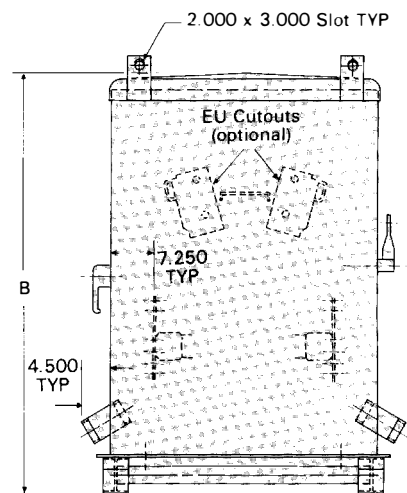
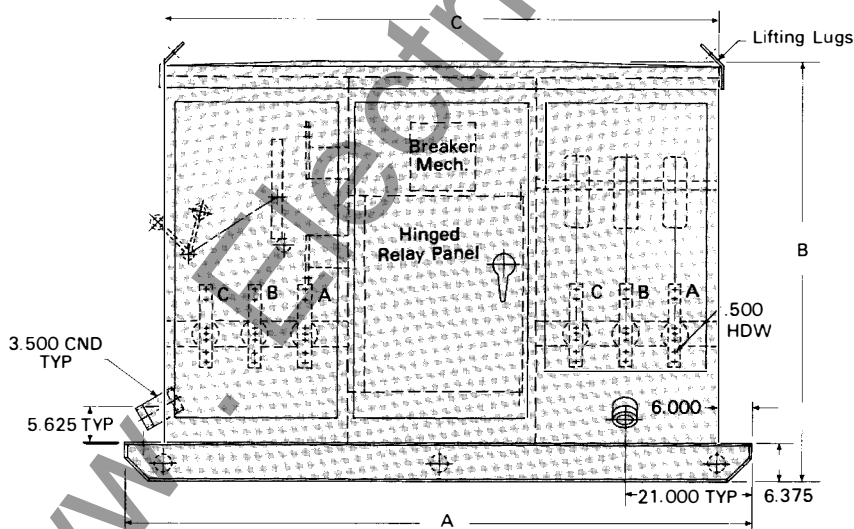
- Ground wire monitoring
- Cutouts on cable exit circuits
- Limit switch, door mounted and interlocked with trip coil
- Undercoating
- Wear plates on I beams
- Special paint
- Cable couplers or cable block assembly
- Cable termination, ground conductor
- Zero sequence transformers
- External mounted indicating lights
- Surge protection compartment.

Optional Ratings and Sizes

Type	Voltage KV	Approximate Dimensions Inches				
		A	B	C	D	E
PMV 9-050	5.0	102.00	69.00	90.00	44.00	48.00
PMV 9-155	15.5	134.00	73.00	122.00	52.00	55.00



View A-A



O.D. 279C710