



Westinghouse Electric Corporation
Switchgear Division
East Pittsburgh, Pa. 15112

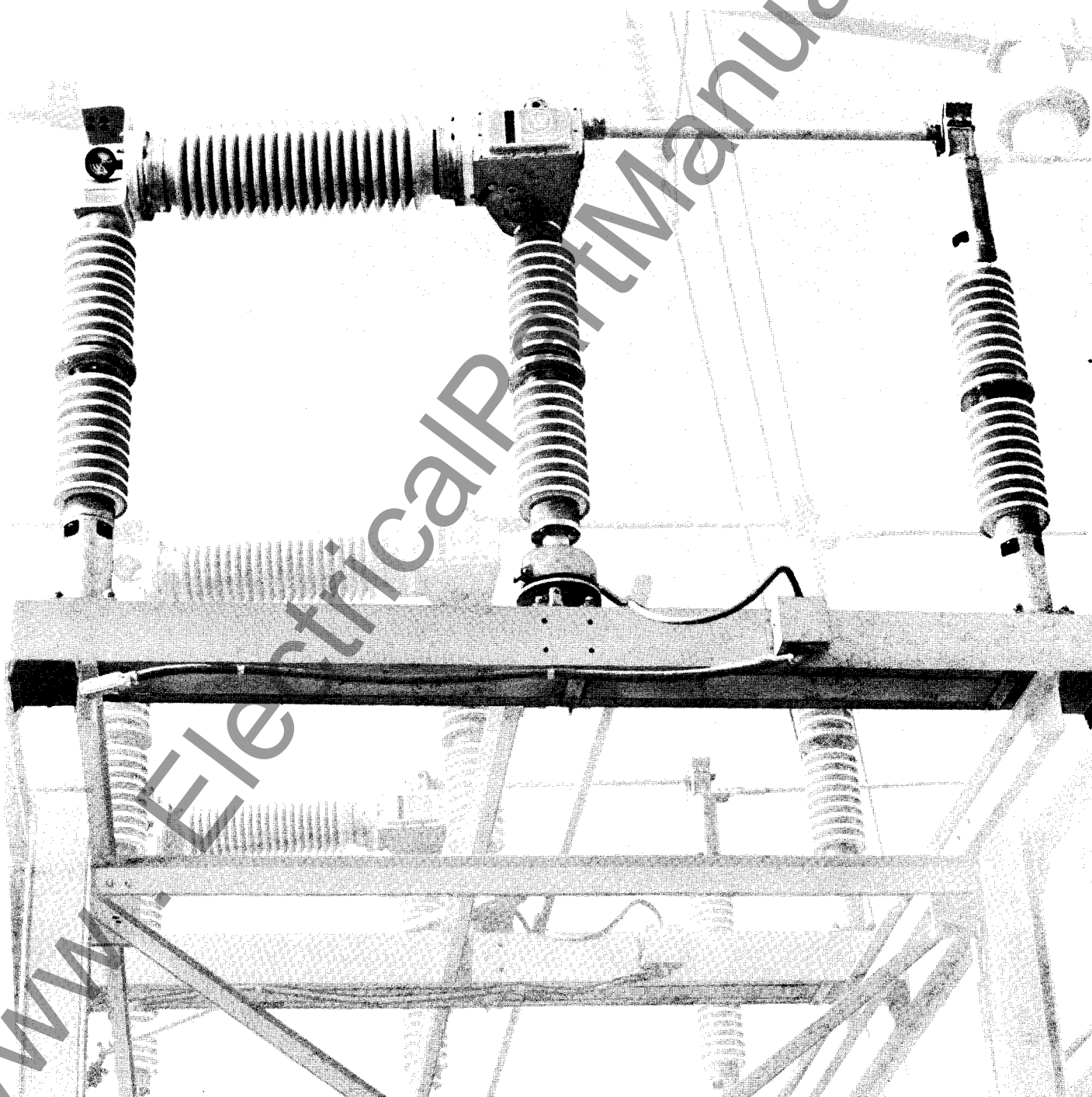
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Descriptive Bulletin

Page 1

December, 1975
New Information
E,C/2097/DB

For Fault Protection
and Switching Operations

Type MFB and CP Line Backer™



In outdoor substations, the most commonly used interrupting and switching device has been the high-voltage power circuit breaker. This device normally employs disconnect switches to provide visual isolating, bypassing and tying functions.

In recent years, attempts have been made to combine the breaker and switch functions into one unit. However, the use of the available devices has been limited by many application restrictions. Line Backer removes these restrictions with its new features and ratings, and broadens the scope of breaker and switching applications. Furthermore, Line Backer's fundamentally new kinematics and advanced interrupter extend reliability and performance closer to that of circuit breakers.

The Line Backer interrupter design is a result of 20 years experience with SF₆, coupled with the most recent puffer technology. It has unmatched reliability, capability, simplicity... and, is the first in the electric industry to interrupt full voltage and current on one break without the use of shunt resistors or capacitors.

The Westinghouse Line Backer provides the backup protection you need for vital equipment on transmission lines.

Applications

- Fault protection of transformers and bus
- Transformer switching
- Capacitor switching
- Line and cable switching
- Reactor switching

General Description

The Line Backer is a three-pole, group operated device usually mounted on a disconnect switch structure. The center insulators of each phase are linked mechanically with an interphase pipe which rotates all three insulators together in the same manner as a disconnect switch. Power to rotate the insulators comes from a ground-level motor or hand crank.

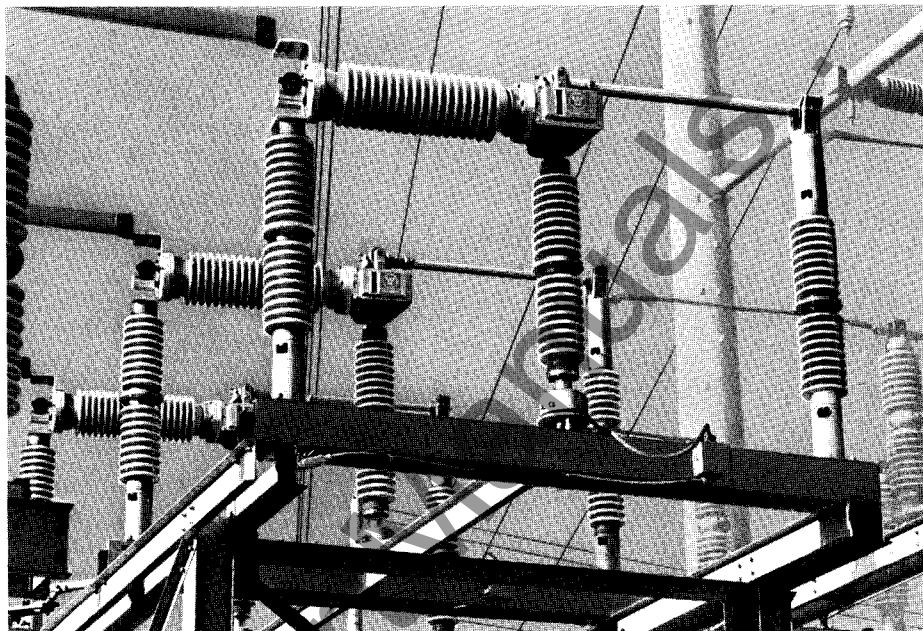
Line Backer is available in two basic types:

Type MFB

- Incorporates a high-capacity interrupter unit mounted in series with an isolating switch blade, combining interrupter and switch functions into one economical unit.

Type CP

- Features the same high-capacity interrupter unit as the type MFB, but without the isolating switch blade. It is used where a disconnect switch already is in use, where there are space limitations or where it is desirable to keep the disconnect separate.



Design Features

- To maintain level bus runs, source and load terminals are located on the same level.
- Mounts on conventional disconnect switch base.
- The driver is vented to prevent the accumulation of condensation.
- The driver features a window showing the position of the interrupter. The colored indicator is directly connected to the moving contact to visually show its true position.
- The interrupter is gasket-sealed to allow field maintenance.
- The interrupter has a pressure gauge visible from the ground, a filling valve and an ASME approved overpressure relief device.
- A single rotating insulator trips the interrupter and then raises the blade, permitting the use of either station post or cap-and-pin insulators.
- A shunt trip device can be added at the base of the rotating insulator for high-speed tripping.

Ratings

- Nominal Voltage: 69, 115, 138, 161 kV
- BIL 550, 650, 750 kV (Blade and Insulator)
- BIL 550 kV (Interrupter)
- Continuous current: 1200 A
- Momentary current: 61 kA
- Closing current: 30 kA
- Maximum interrupting time: 5 cycles (using shunt trip)
- Minimum operating temperature without derating: -30° F

The following table lists the Line Backer ratings for typical applications:

Line Switching

Continuous current	1200 A
Charging current	300 miles
Fault current	10,000 A

Cable Switching

Continuous current	1200 A
Charging current	27 miles
Fault current	10,000 A

Reactor Switching

Load current	1200 A
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Shunt Capacitor Switching

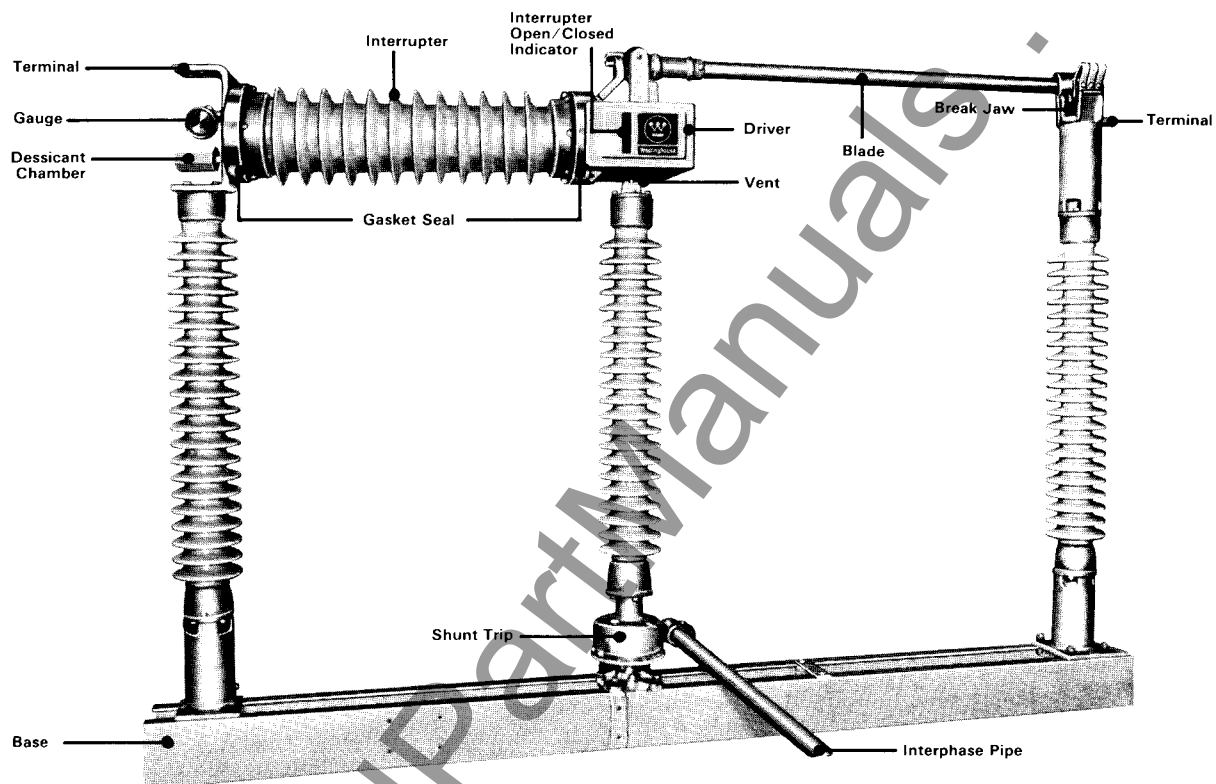
Isolated and back-to-back current	550 A
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Transformer Switching

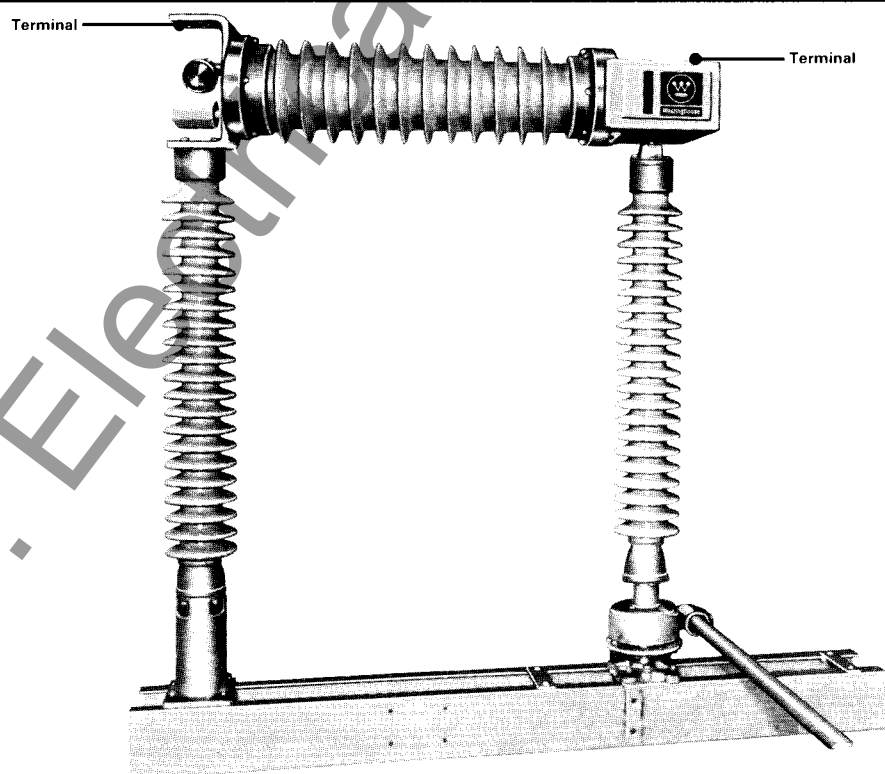
Continuous current	1200 A
Primary fault currents	10,000 A
Secondary fault currents	4000 A



Type MFB



Type CP



Advantages

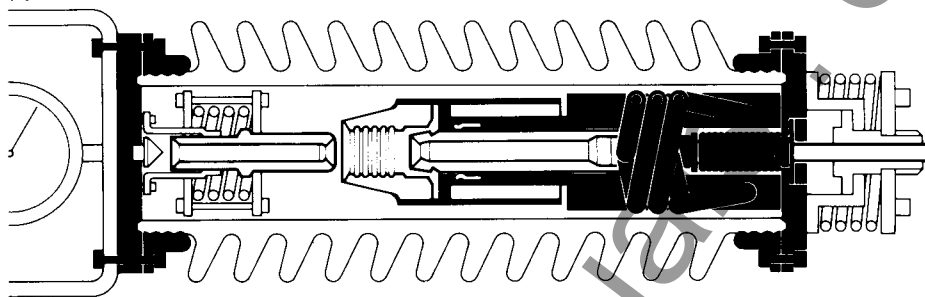
- **Full BIL.** Full BIL across the open interrupter permits the switch blade to be left closed indefinitely. There are no dividing resistors since Line Backer is a single-break device.

- **Contained Closing.** The closing takes place inside the interrupter... not on the blade. With contained closing there is no erosion of the switch blade or jaw, minimizing the need for maintenance. The low noise level permits residential installations. There are no arc products in the atmosphere... no prestrike arcing on the switch jaws which cause system disturbances. Closing in SF_6 generally eliminates the need for closing resistors.

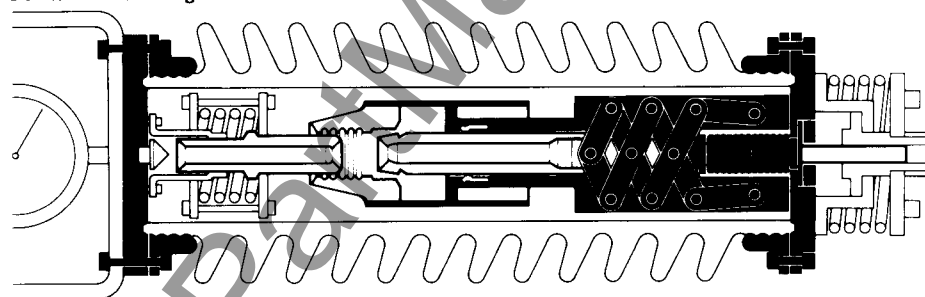
- **Fast Interruption.** Maximum interrupting time is 5 cycles from initiation of the trip coil to the clearing of the fault.

- **Bladeless Model Offers Design Flexibility.** The bladeless Type CP Line Backer can be installed in existing substations where a disconnect already exists. In many cases the Type CP is small enough to fit into your substation without moving the transformer or structure. It saves the cost of the blades, jaws, and insulators. And it keeps the disconnect separate for true isolation of the Line Backer.

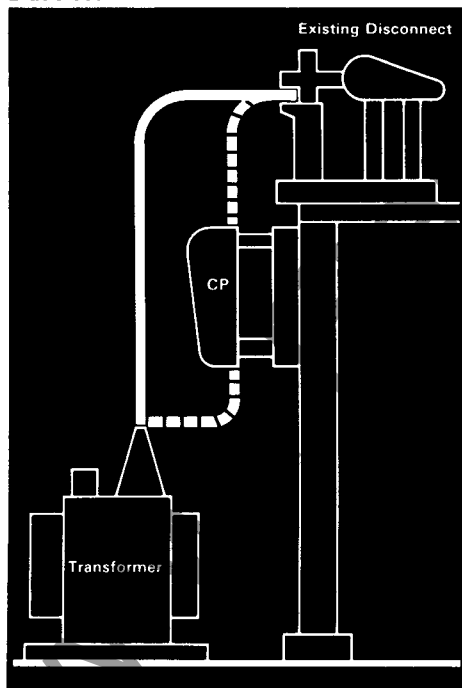
Full BIL



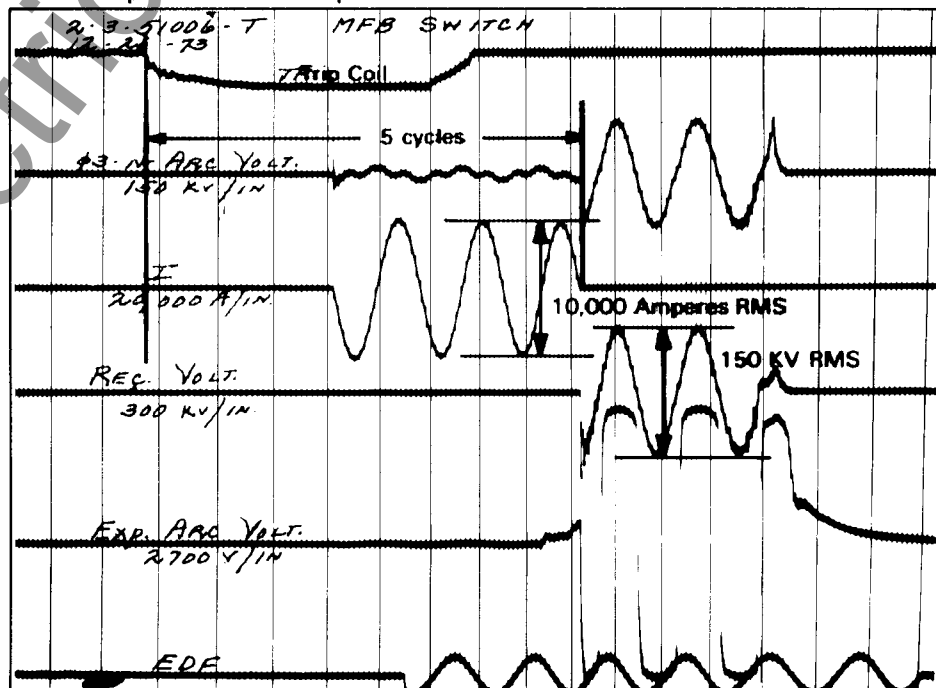
Contained Closing



Bladeless Model



Fast Interruption with Shunt Trip





Advantages

- **Greater Reliability.** The interrupter is not dependent upon the performance of a blade. It does not depend on dividing resistors, pre-insertion resistors or a motor operator.

- **SF₆.** With SF₆ as the interrupting medium there is no oil maintenance...no danger of fire...no current chopping...no power restrike.

- **Higher Fault Protection.** 10,000 amps of interrupting capability provides transformer protection from faults on the high side. Line Backer also can handle secondary faults with a 4000 A rating, which exceeds the current produced by most secondary faults. Additionally, it switches magnetizing currents without restrikes.

- **Capacitor Switching Capability.** Line Backer's capacitor switching capability exceeds circuit breaker standards. It can switch more than 80 MVAC banks without restrikes.

- **Manual Operation.** Fault closing and high speed interruption applications can be handled manually with complete safety. The shunt trip quickly opens the interrupter and full BIL strength is established. *A motor is not needed* to quickly open a blade—only a hand crank. On closing, the blade need not be moved quickly because the prestrike is not on the blade. Manual operation saves the cost of a motor operator and additional expenses for operator control wiring.

- **Long-Life Contacts.** Under normal operating conditions, no contact maintenance is required.

Opening and Closing Operation.

Opening and Closing of the circuit is accomplished totally within the interrupter.

- No erosion of the switch blade or jaw.
- Low noise level.
- No arc products in the atmosphere.
- No prestrike arcing on the switch jaws.

All three phases are electrically shunt tripped together by energizing the coils in parallel, which results in opening coordination within a few milliseconds. Three-phase closing coordination is accomplished by adjusting the length of the interphase pipe. All three phases will typically coordinate within one cycle.

Sequence of Operation:

1. The blade and interrupter are closed carrying continuous or fault current.

2. When center insulator is rotated 12° by the shunt trip, motor or hand crank, the driver springs snap the interrupter open, providing full BIL across the open contacts with the blade still closed.

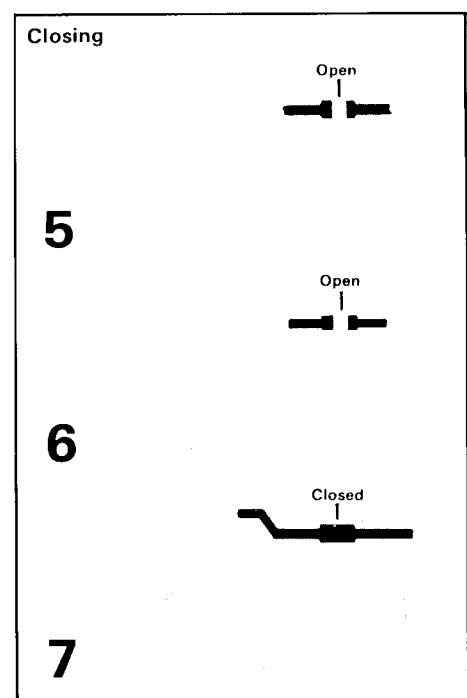
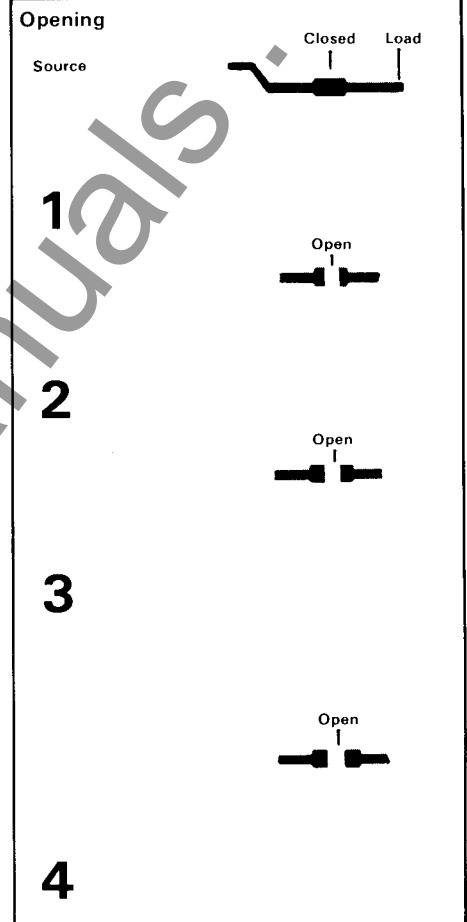
3. Continued rotation (114°) raises the blade for visual isolation and recharges the shunt trip springs.

4. The blade is fully open and interrupter contacts remain open.

5. To close, the insulator rotation is reversed. As the blade closes, the closing springs are charged.

6. The disconnect blade is fully engaged in the jaw. The interrupter is still open. Closing springs are fully charged.

7. The last few degrees of rotation release the charged closing springs, closing the interrupter and charging the opening springs. (Note: The circuit is made in an SF₆ atmosphere).



Interrupter Operation

Our 20 years of field experience with SF₆ devices has provided us with the practical knowledge required to produce the Line Backer with built-in safeguards.

This step-by-step cut-away of an interrupter explains how this is accomplished.

1. Interrupter trips with contacts 'A' and 'B' in the closed position.

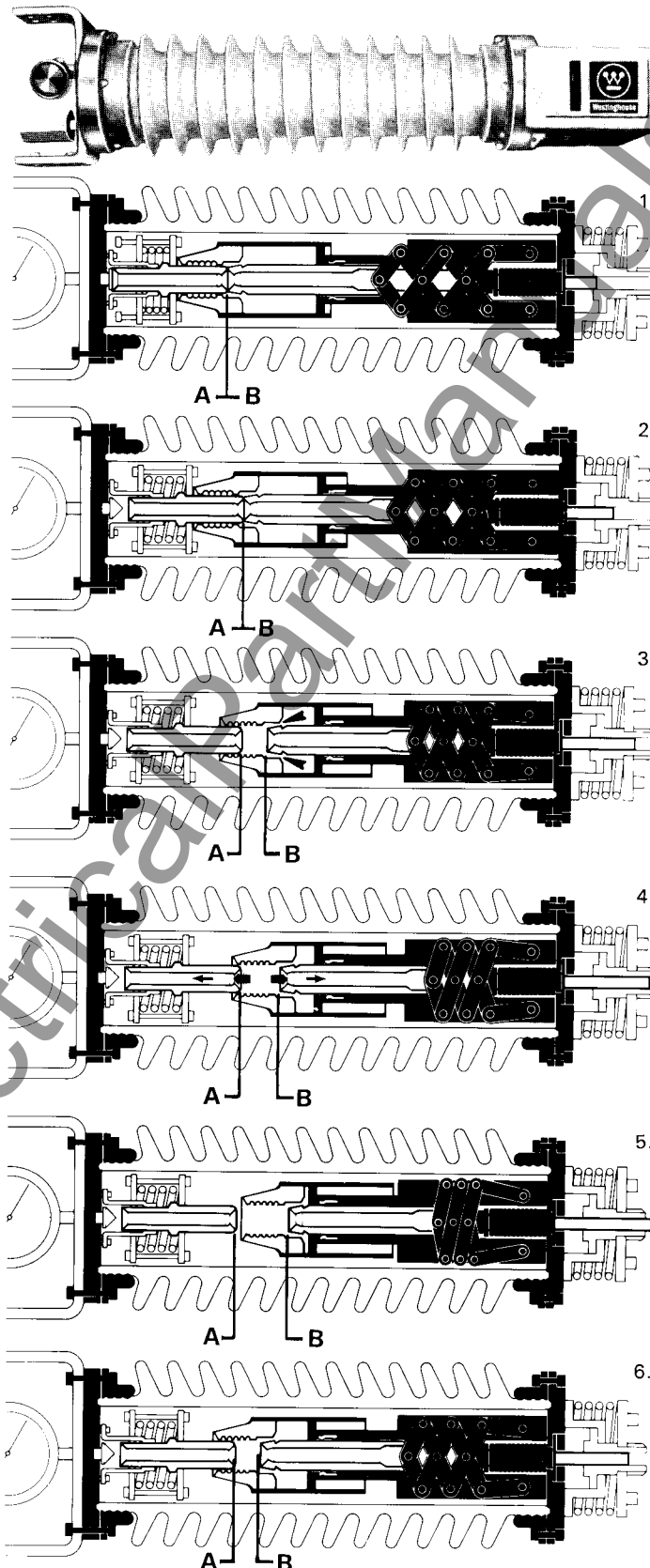
2. Contacts 'A' and 'B' remain closed and move together as gas is compressed. Gas is ready to flow when contacts part.

3. Contacts part... arcing occurs... gas flows to extinguish arc.

4. Gas divides the arc and forces it down each nozzle. Interruption is accomplished.

5. Full BIL is established in the full open position.

6. On closing, the prestrike occurs inside the interrupter.





Optional Accessories

Shunt Trip.

For fault protection of transformers and bus, where high speed tripping is necessary, the use of a shunt trip is required. The shunt trip unit is located at the base of the rotating insulator column.

Each phase has a shunt trip unit that consists of a spring, latch and solenoid within a heated housing. When the system relay senses a fault, the solenoid is energized and the spring unlatched, giving the insulator a high speed rotational kick, sufficient to break $\frac{3}{4}$ inch ice without difficulty. Trip coil voltages can be 48 V. dc, 125 V. dc or 250 V. dc, with either voltage coil drawing only 8.33 A., 3 coils in parallel draw a total 25 A. from the time the solenoid is energized until the interrupter clears the fault thus minimizing the power required.

Gear Crank.

The gear crank operator is a corrosion-free mechanism consisting of a 15-inch crank handle and weather-sealed gear box. When used in conjunction with a shunt trip, it offers maximum economy for fault protection applications. The gear crank operator has the same mounting hole plan as the motor operator.

Structures.

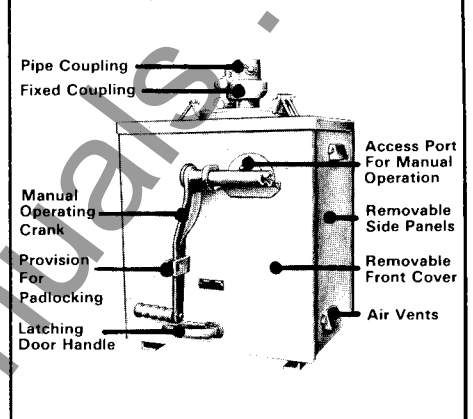
Types MFB and CP Line Backers do not require a special support structure. Standard outdoor disconnect switch structures are suitable and are available as an optional item. See Pages 10 and 11

Motorized Operator

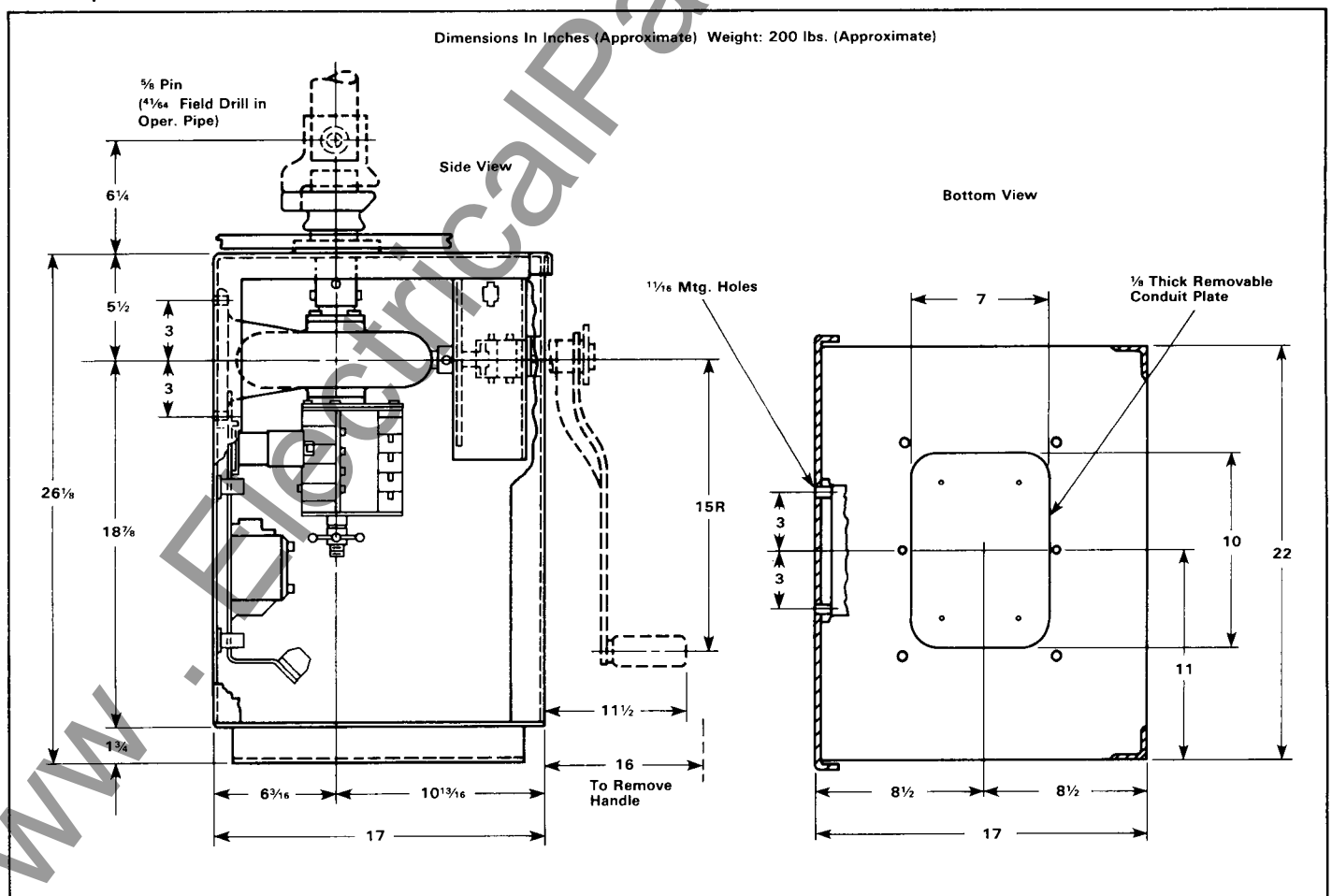
A motorized operator is only required when remote or supervisory control is desired. The device is in an aluminum housing, and has an internal heater to prevent condensation.

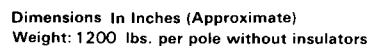
The operator can be manually operated by inserting the handle through an access port on the front cover. Inserting the handle actuates a cut-off switch which electrically disconnects the motor.

Motorized Operator



Motor Operator Dimensions

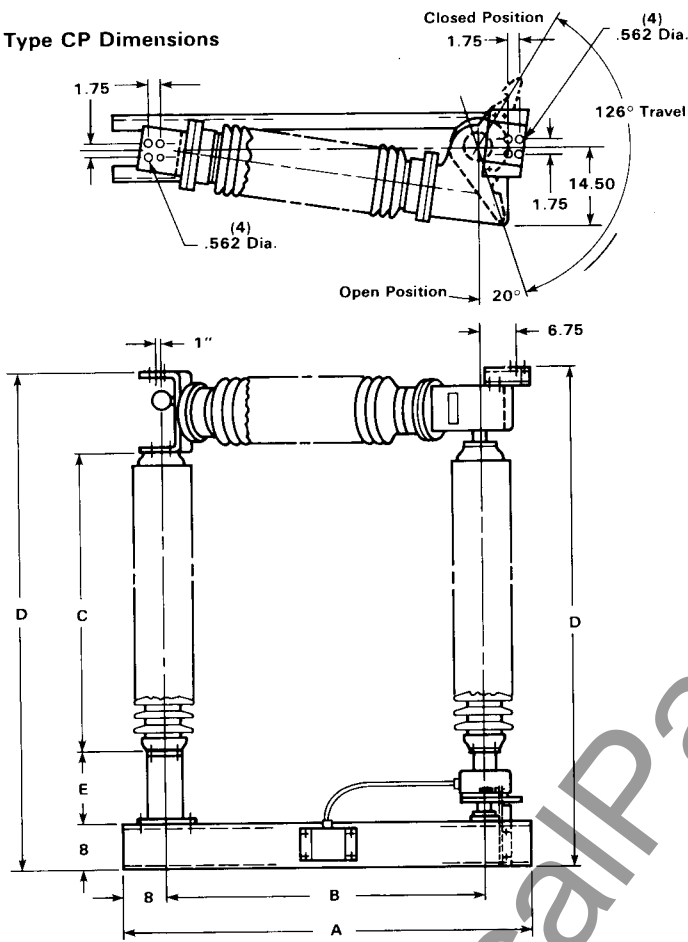




Kv	Blade Kv BIL	Interrupter Kv BIL	Type	Style Number	Insulator Type	Dimensions								
						A	B	C	D	E	F	G	H	J
69	550	550	WITH SHUNT TRIP	3705A18H06	STA. POST.	133.25	63.25	57.34	60	30	67.38	132.87	12.75	52.75
				3598A78H06	CAP and PIN					29	66.38	131.87		
			WITHOUT SHUNT TRIP	3598A77H06	STA. POST.					30	58	123.50	3.38	
				3598A79H06	CAP and PIN					29	57	122.50		
115	550	550	WITH SHUNT TRIP	3705A18H01	STA. POST.	133.25	63.25	57.34	60	45	82.38	147.87	12.75	52.75
				3598A78H01	CAP and PIN					43.50	80.87	146.37		
			WITHOUT SHUNT TRIP	3598A77H01	STA. POST.					45	73	138.50	3.38	
				3598A79H01	CAP and PIN					43.50	71.50	137		
138	650	550	WITH SHUNT TRIP	3705A18H02	STA. POST.	145.25	75.25	57.34	72	54	91.38	168.87	12.75	64.75
				3598A78H02	CAP and PIN					49	86.38	163.87		
			WITHOUT SHUNT TRIP	3598A77H02	STA. POST.					54	82	159.50	3.38	
				3598A79H02	CAP and PIN					49	77	154.50		
161	750	550	WITH SHUNT TRIP	3705A18H04	STA. POST.	157.25	87.25	57.34	84	62	99.38	188.87	12.75	76.75
				3598A78H04	CAP and PIN					58	95.38	184.87		
			WITHOUT SHUNT TRIP	3598A77H04	STA. POST.					62	90	179.50	3.38	
				3598A79H04	CAP and PIN					58	86	175.50		



Type CP Dimensions



Dimensions In Inches (Approximate)
Weight: 1000 lbs. per pole without insulators

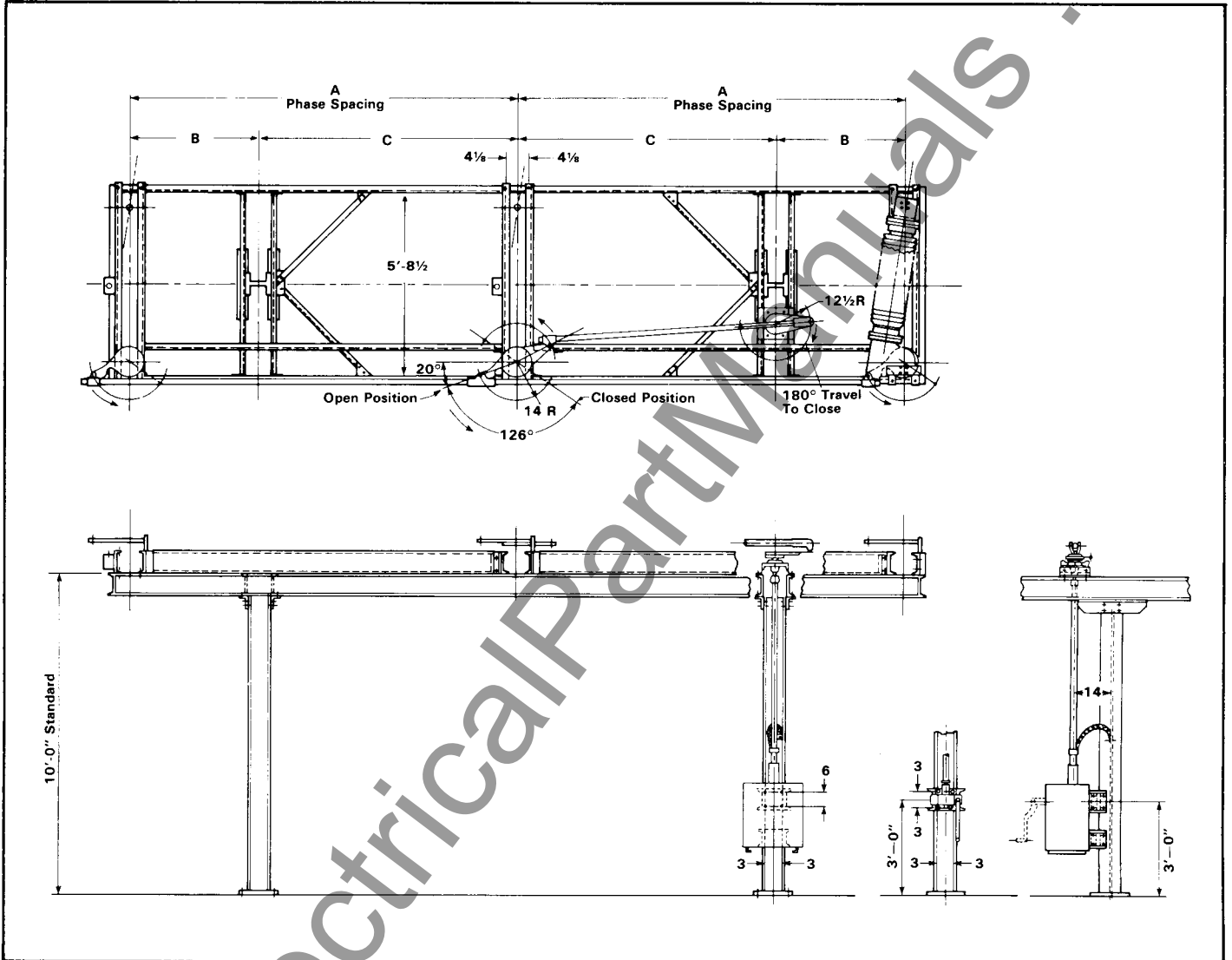
Kv	Interrupter Kv BIL	Type	Style Number	Insulator Type	Dimensions				
					A	B	C	D	E
69	550	WITH SHUNT TRIP	3706A73H06	STA. POST.	73.25	57.34	30	67.37	12.75
			3598A81H06	CAP and PIN			29	66.37	
		WITHOUT SHUNT TRIP	3598A80H06	STA. POST.			30	58	3.38
			3598A82H06	CAP and PIN			29	57	
115	550	WITH SHUNT TRIP	3706A73H01	STA. POST.	73.25	57.34	45	82.37	12.75
			3598A81H01	CAP and PIN			43.50	80.87	
		WITHOUT SHUNT TRIP	3598A80H01	STA. POST.			45	73	3.38
			3598A82H01	CAP and PIN			43.50	71.50	
138	550	WITH SHUNT TRIP	3706A73H02	STA. POST.	73.25	57.34	54	91.37	12.75
			3598A81H02	CAP and PIN			49	86.37	
		WITHOUT SHUNT TRIP	3598A80H02	STA. POST.			54	82	3.38
			3598A82H02	CAP and PIN			49	77	
161	550	WITH SHUNT TRIP	3706A73H04	STA. POST.	73.25	57.34	62	99.37	12.75
			3598A81H04	CAP and PIN			58	95.37	
		WITHOUT SHUNT TRIP	3598A80H04	STA. POST.			62	90	3.38
			3598A82H04	CAP and PIN			58	86	

Technical drawing of a 10'-0" Standard Overhead Door Opener. The drawing includes a top view showing the door frame, tracks, and opener mechanism with dimensions A (Phase Spacing), B, C, 4 1/8, 4 1/8, 180° Travel To Close, 20°, 126°, 14 R, 12 1/2 R, 9'-9 1/4, and an Alternate Position of Mechanism. It also includes side and end views showing the vertical travel of the door and the opener unit, with dimensions 10'-0" Standard, 14, 3'-0", and 3. The drawing is watermarked 'ElectricalPartManuals'.

Kv	Interrupter Kv BIL	Blade Kv BIL	A = Phase Spacing		
			Dimensions		
			A	B	C
69	550	550	7'-0"	2'-4"	4'-8"
			5'-0"	1'-8"	3'-4"
115	550	550	10'-0"	3'-4"	6'-8"
			7'-0"	2'-4"	4'-8"
138	550	650	12'-0"	4'-0"	8'-0"
			8'-0"	2'-8"	5'-4"
161	550	750	14'-0"	4'-8"	9'-4"
			9'-0"	3'-0"	6'-0"



Type CP Line Backer-10ft. Standard Structure



Kv	Interrupter Kv BIL	A = Phase Spacing		
		Dimensions		
		A	B	C
69	550	7'-0"	2'-4"	4'-8"
		5'-0"	1'-8"	3'-4"
115	550	10'-0"	3'-4"	6'-8"
		7'-0"	2'-4"	4'-8"
138	550	12'-0"	4'-0"	8'-0"
		8'-0"	2'-8"	5'-4"
161	550	14'-0"	4'-8"	9'-4"
		9'-0"	3'-0"	6'-0"

Further Information
Prices: Price List 36-820
Instructions: IB 21127

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