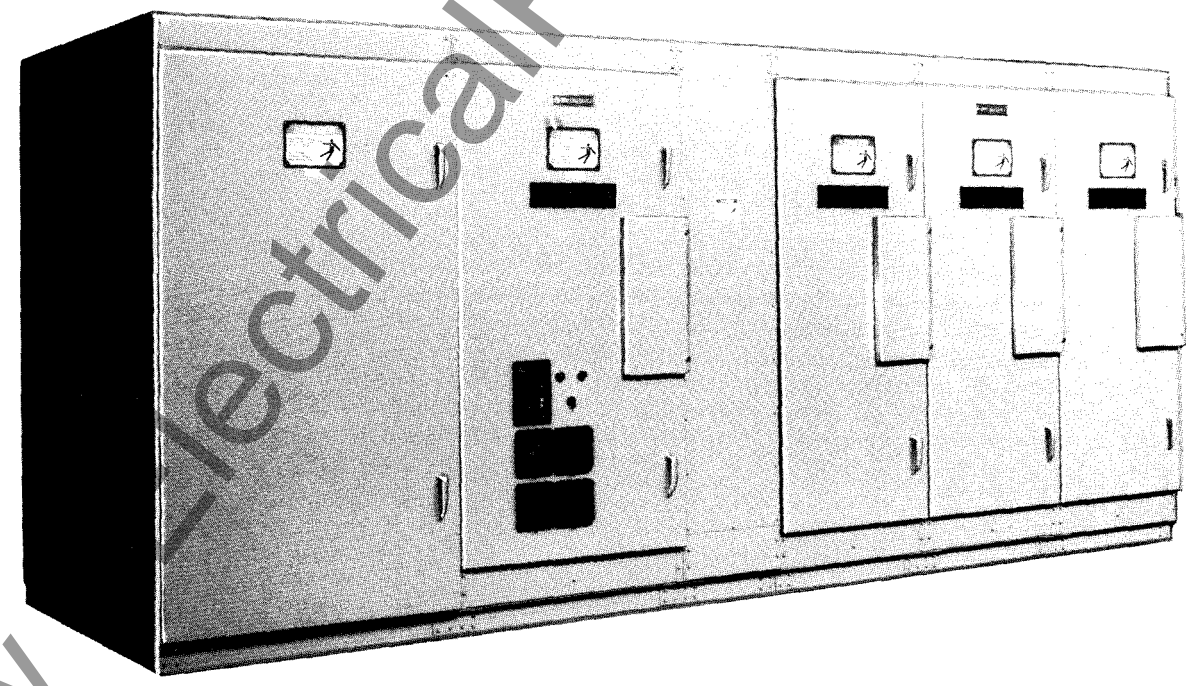
# WVB Vacuum Breaker Metal Enclosed Switchgear

***In this publication***





## Description

WVB switchgear is an integrated assembly of a visible disconnect switch, bus, fixed mounted vacuum circuit breaker, and control devices which are coordinated electrically and mechanically for high voltage circuit protection. All major components are manufactured by Westinghouse, establishing one source of responsibility for the equipment and assuring high standards in quality, coordination, reliability, and service. WVB would be typically used where both cost and protection are important design parameters. Excellent applications include ground fault protection, single ended substations, and high voltage automatic transfer schemes.

A complete line of Westinghouse WVB assemblies are available, as follows:

5, 15, and 27 KV voltage classes.

600, 1200, or 2000 continuous ampere ratings.

Interrupting Ratings –

| | |
|---|---|
| 4.76 kV: | 250 MVA (29kA) |
| : | 350 MVA (41kA) |
| 15 kV: | 500 MVA (18kA) |
| | 750 MVA (28kA) |
| | 1000 MVA (37kA) |
| 27 kV: | 25 kA |

Indoor, outdoor, or outdoor walk-in enclosures

Single unit and transformer primary units

Lineups combining WVB and WLI units with main bus.

## Application

Westinghouse Vacuum Breaker (WVB) metal enclosed switchgear provides economic and reliable circuit interruption and fault protection for high voltage circuits 2.4 KV thru 27 KV. WVB is ideal for applications where load interrupter switches should not be applied, such as ground fault protection, high duty cycle applications, or high speed automatic transfers.

It is also a better engineering alternative than load interrupter switches for applications involving shunt trips, motor operators, single phase protection, capacitor switching, and ground fault protection.

WVB can also be an economic benefit in single ended substations since it may allow the customer to eliminate the secondary main breaker.

## Benefits

**Visible Isolation** – The load interrupter switch above the fixed mounted breaker provides visible isolation.

**Full Rated Vacuum Circuit Breaker** – WVB metal enclosed switchgear uses the industry leader in vacuum circuit breakers – the Westinghouse VCP-W world class circuit breaker.

**Electrical Operation** – The VCP-W circuit breaker can be operated manually or electrically. Control power will be required for electrical operation.

**Endurance** – ANSI C37.20 requires that a load interrupter switch endure 30 full load operations and 500 no load operations over the life of the switch. ANSI C37.20 requires that a vacuum circuit breaker endure 1,000 full load operations and 5,000 to 10,000 no load operations. A vacuum interrupter can in addition interrupt full fault currents on up to 100 occasions. That would be 100 fuse replacements.

**Safety** – By using a breaker in lieu of fuses, the customer can eliminate safety concerns associated with entering medium voltage equipment for fuse replacements. A circuit breaker can be opened or closed without opening the door of the equipment, or from a remote location. No external arcing occurs since the arc is interrupted within the vacuum interrupters of the circuit breaker.

**No Spare Fuses Required** – Eliminate downtime associated with locating and replacing fuses as well as stocking costs.

**Inherent Blown Fuse Protection** – When a breaker trips, all three phases open AUTOMATICALLY, no need to have any elaborate systems devised to tell if a fuse blows. If incoming phase loss is a concern, a simple phase loss relay can be provided.

**Better Coordination** – Using reliable electromechanical or solid state relays gives the customer more flexibility in coordinating with up or downstream devices. Unlike fuses, relays can be adjusted and tested in the field giving the customer flexibility and verification of performance.

**Transformer Protection** – Fusible load interrupters offer short circuit protection but do not offer the low-level overcurrent protection that overcurrent relays can. Transformer differential relays can easily be provided to give additional transformer protection. The breaker can also be tripped by a transformer sudden pressure relay if desired.

**Ground Fault Protection** – Not recommended with load interrupter switches. Ground fault applications offer no concerns when using a vacuum circuit breaker. In single unit substation applications a secondary ground fault scheme can be tied into the primary breaker allowing the elimination of a secondary main circuit breaker if it is used for ground and overload protection.

**Reduce Overall Space and Cost** – In single unit substation applications, using WVB switchgear may allow the customer to eliminate the secondary main circuit breaker which may reduce overall substation space requirements along with overall substation costs.

## Construction

WVB metal enclosed switchgear meets or exceeds ANSI C37.20, NEMA SG-6, and IEEE standards as they apply to metal enclosed switchgear. WVB uses the same proven enclosure and air switch mechanism as WLI switchgear. It differs in the addition of the fixed mounted Westinghouse VCP-W vacuum breaker in place of fuses. Current and voltage transformers with associated protection devices are applied using the same parameters as draw-out metal clad switchgear. Devices are mounted on the single front hinged door and barriered from high voltage.

IQ Data and Data Plus II solid state metering devices can be provided when customer metering is required.

The breaker is bolted into position but can be unbolted and removed from the enclosure if required for maintenance. Breaker and switch insulators are NEMA rated glass polyester.①

Control power will be required as detailed below. AC can be supplied integrally if specified. DC control power, if required, normally is furnished by others.

If AC control is used, a capacitor trip device is supplied standard.

Once the breaker is closed and the closing spring is recharged, the breaker can open, close, and open without spring recharge. For electrical operation control power is required.

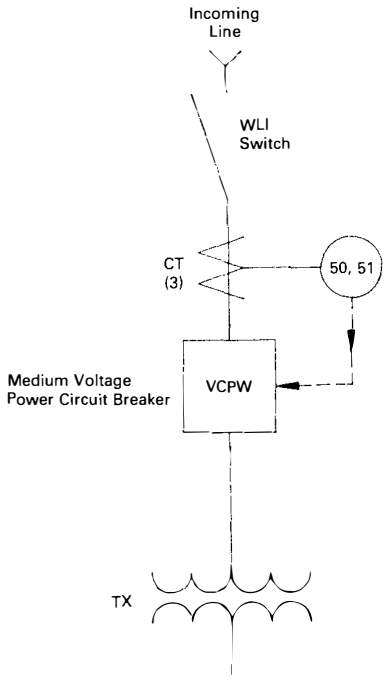
## Further Information

Catalog 55-000
Sales Aid SA-11797
Instruction Book IB 32-255-1

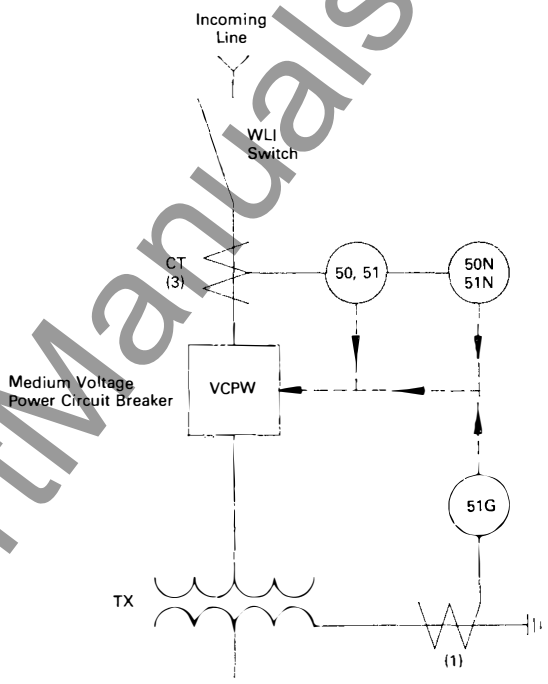
① 27 kV class uses cyclaliphatic epoxy insulators for breaker and porcelain insulators for switch.

## Typical Relaying Schemes for Transformers

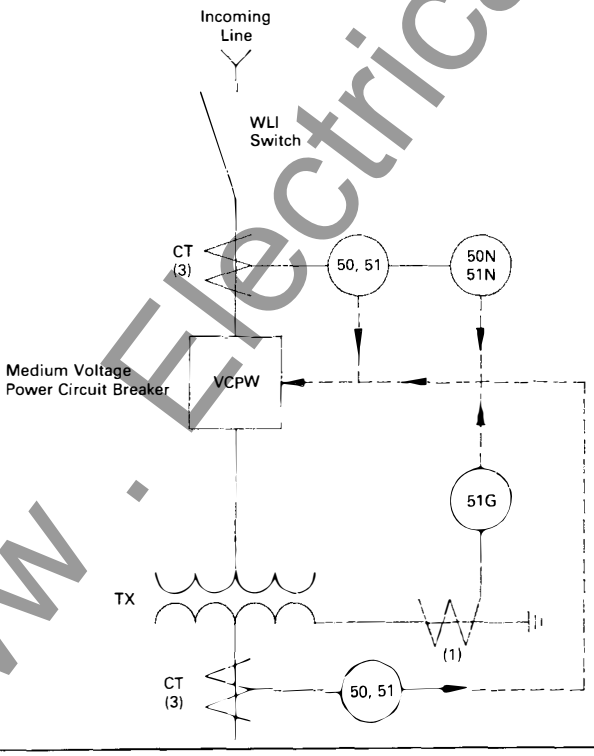
**Transformer Overcurrent Protection**



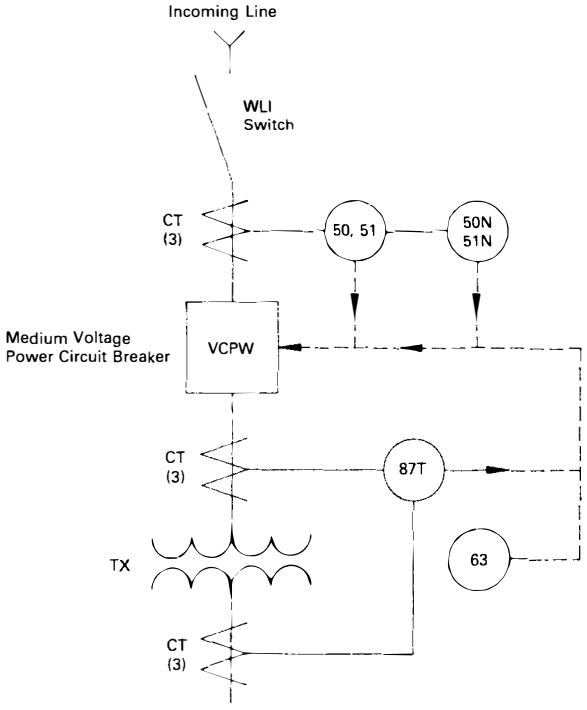

**Primary Overcurrent and Secondary Ground Fault Protection**



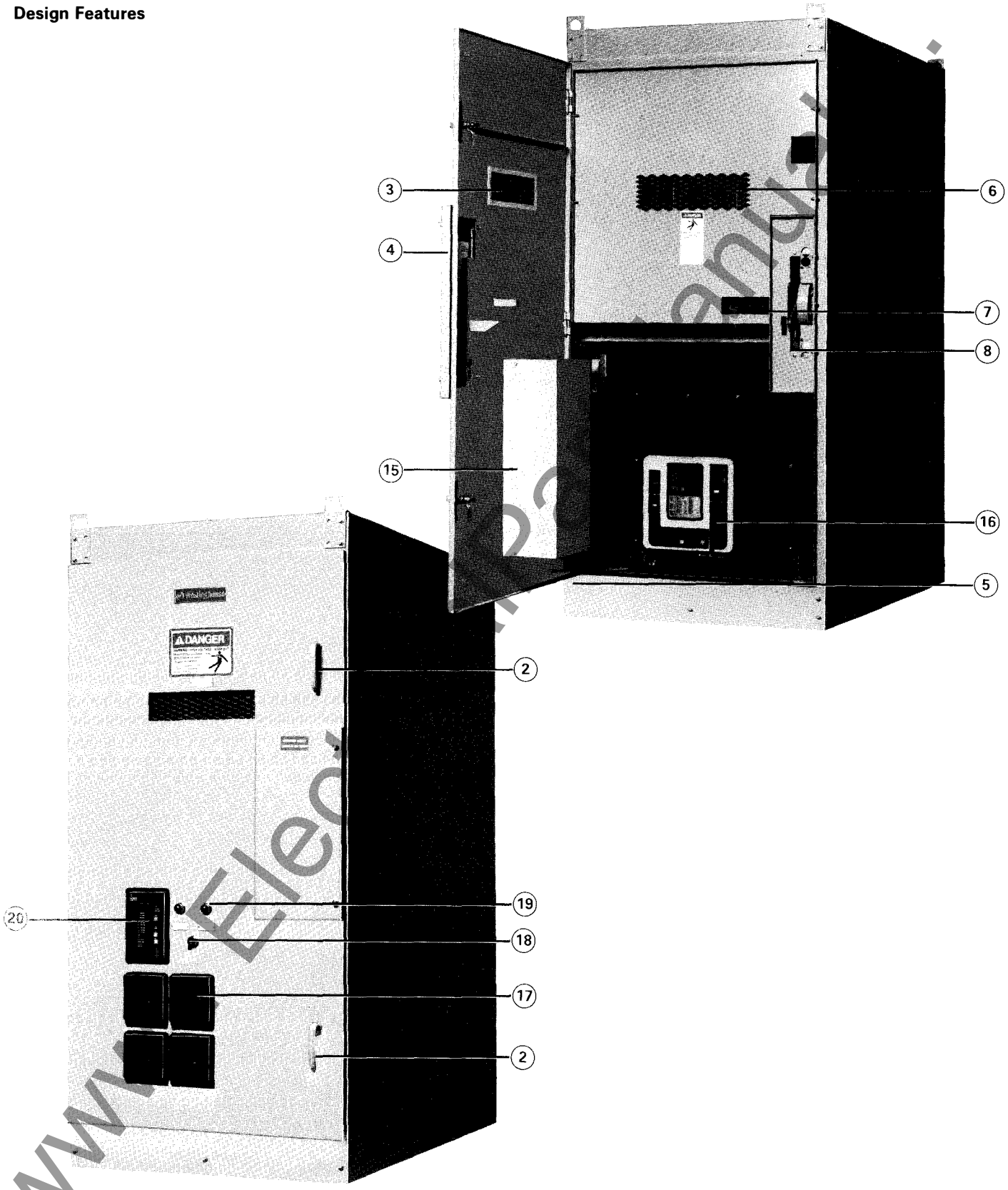

**Primary and Secondary Overcurrent and Ground Fault Protection**



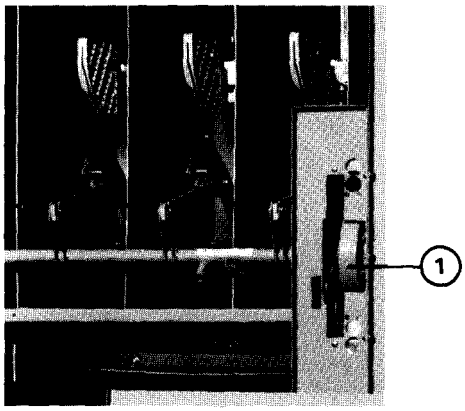

**Additional Transformer Protection**
① Transformer Differential Protection (87T)
② Sudden Pressure or Rapid Rate of Rise Relay (63)



## Design Features



**Design Features,** *Continued*




**① Switch Mechanism Features**

Quick-make, quick-break stored energy operation.

The speed and force of opening and closing the switch blades is constant and independent of the operator.

The switch blades cannot be teased to any intermediate positions. During the closing operation, full clearance between blades and Stationary Contacts is maintained until the switch mechanism goes over toggle.

The switch mechanism has only metal-to-metal linkage – no chains or cables to adjust or fail.

Arc interruption takes place between silver-tungsten tipped auxiliary (flicker) blades and high pressure contacts within a DE-ION® arc chute; no arcing takes place between the main blades and the stationary contacts.

Blow out forces cannot be transmitted to the operating handle.

**② Provisions for Padlocking Door**

**③ Inspection Window**

A single gasketed, rectangular, high impact viewing window permits full view of the position of all three switch blades through the closed door.

**④ Full Height Main Door**

The door has a return flange, is re-inforced and has two rotary latch-type handles to provide four latching members held in shear. It closes over a projecting frame and has concealed hinges.

**⑤ Foot Operated Door Stop**

**⑥ Grounded Metal Safety Barrier**

A steel barrier punched with a diamond pattern is provided in front of every switch. This barrier prevents inadvertent contact with any live part, yet allows for a full-view inspection of the switch blade position on all three phases.

**⑦ Door Interlock**

This interlock prevents the door of the enclosure from being opened when the switch is closed. On opening the switch, the interlock disengages automatically from a bracket provided on the back of the door, so that the door can be opened.

**⑧ Switch Interlock**

This interlock prevents inadvertent closure of the switch if the door of the enclosure is open. When the door is closed, the interlock is automatically defeated and the switch is free to be closed.

**⑨ High Quality Insulation**

Bus and switch insulators, switch drive rods, barriers between phases, and barriers between outer phases and the housing, are of high strength, non-hygroscopic, track resistant glass polyester.

**⑩ Permanent Switch Position Indicators**

**⑪ Provisions for Padlocking Switch**

The load interrupter switch may be padlocked in either the open or closed position.

**⑫ Provisions for Kirk Key Interlocks**

**⑬ Operating Handle**

The switch operating handle is conveniently located behind the small access door. Because the handle is not in plain sight, the structure has a smooth homogenous appearance and does not provide a challenge to the curious.

**⑭ Permanent Nameplates**

**⑮ Protective Relay Cabinet**

Semi-flush mounted relay and metering devices are mounted on the front hinged door and are completely barriered off in a steel screen compartment to prevent accidental contact with wiring terminations and to isolate from high voltage.

**⑯ Fixed Mounted VCP-W Circuit Breaker**

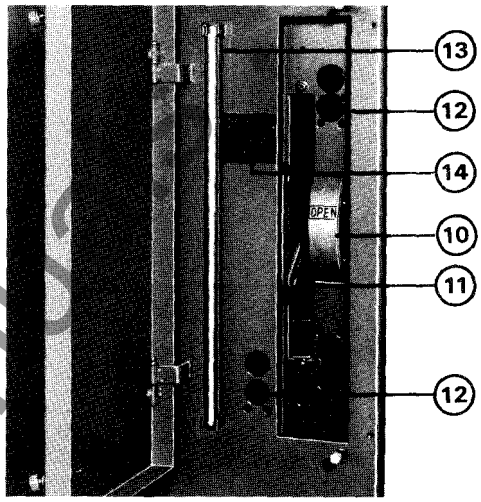
WVB switchgear uses the industry leader in vacuum circuit breaker technology – the Westinghouse VCP-W world class circuit breaker.

**⑰ Door Mounted Protective Relays**

Specified electromechanical or solid state relays are mounted on the lower half of front hinged door for convenient access.

**⑱ External Circuit Breaker Control**

A control switch is provided to allow customer to open or close the vacuum circuit breaker with full height main door closed. Optional key interlocking can also be provided to force circuit breaker to be opened prior to WLI switch being operated with the full height main door closed.




**⑲ Visual Indication**

Red and green indicating lights are provided to give visual indication of circuit breaker status (open/close positions).

**⑳ Optional IQ Metering**

The entire family of compact electronic IQ metering and communication devices can be provided to perform metering of amperes, voltage, watts, vars, powerfactor, frequency, and watthours. Optional communications capability into networks such as Westinghouse IMPACC are also available.

**Bus Bar**

Aluminum tin-plated bare bus is standard. Silver or tin-plated copper bus and insulated bus are optional.

**Enclosure**

Construction is of a universal frame type design using die-formed welded and bolted members. Each unit is substantially braced to prevent cubicle distortion under normal conditions as well as during interruption of short circuit currents. The enclosure material is not less than 11 gage sheet steel. Steel surfaces are chemically cleaned and phosphorized, followed by a clear nonchromate rinse and sealer. Parts are dried prior to the application of powder coating which is then fused to the parts in a curing oven.

Outdoor enclosures are provided with a 120 volt 250 watt space heater as standard. Control power for these can be supplied as an option.

**Generous Cable Termination Area**

Because the WLI switch is supported by channel steel uprights (instead of mounting on the rear panel), cable termination can be accomplished easily and conveniently in the rear of the enclosure. Also, appropriate bus and lugs are provided to facilitate cable terminations (as specified) without the necessity of extensive cable training or severe cable bends.

## Design Details – WLI Switch

**Switch Mechanism**
The quick-make, quick-break mechanism utilizes a heavy duty coil spring which provides powerful opening and closing action. To close the switch, the handle is inserted into the spring charging cam which is then rotated upward through an angle of 120°. This charges the compression spring which is held by a spring lever. As the spring lever goes over toggle, the stored energy of the spring is released and transferred to the shaft which snaps the switch closed.

As a result of this over-toggle action, the blades move at a predetermined speed which is independent of the operator. It is impossible to tease the switch into any intermediate position.

To open the switch, the spring charging cam is rotated downward resulting in compression of the spring and releasing its stored energy in a similar sequence.

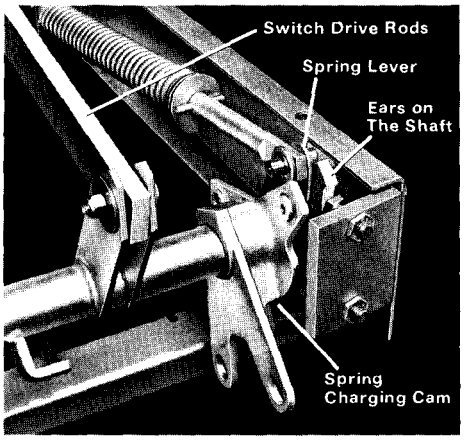



**Fig. 1: Switch in Open Position**

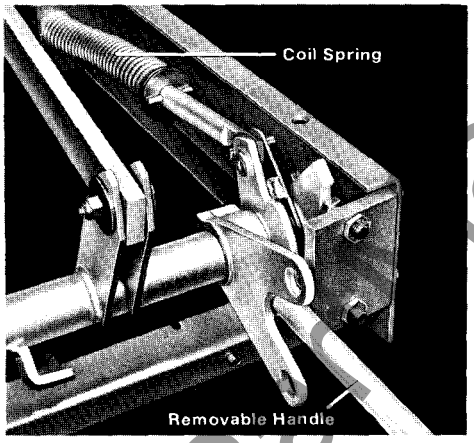



**Fig. 2: Spring Being Charged**

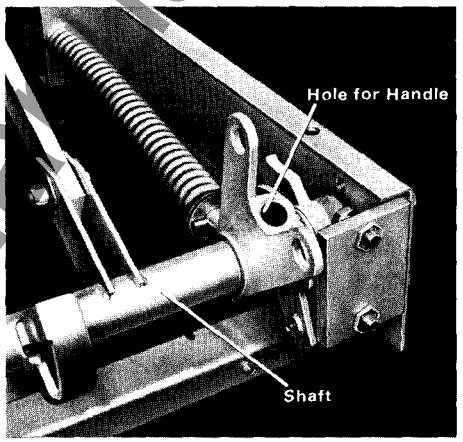


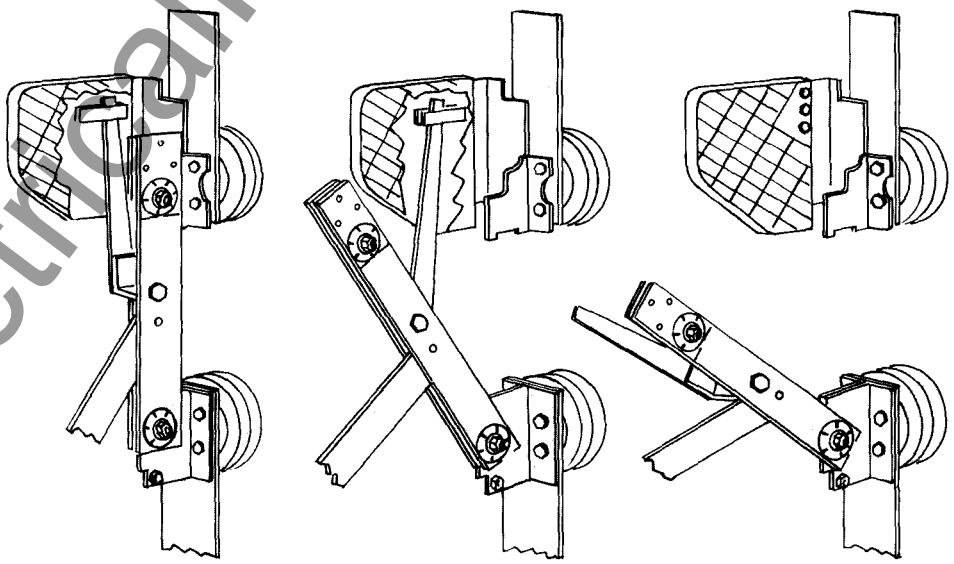

**Fig. 3: Switch in Closed Position**

**Quick-Break DE-ION® Arc Interruption**
With the switch closed, both main and auxiliary (flicker) blades are closed, and practically all of the current flows through the main blades.

As the main blades open, current is transferred momentarily to the flicker blade, which is held in the arc chute by high pressure contact fingers. There is no arcing at the main blades.

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

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

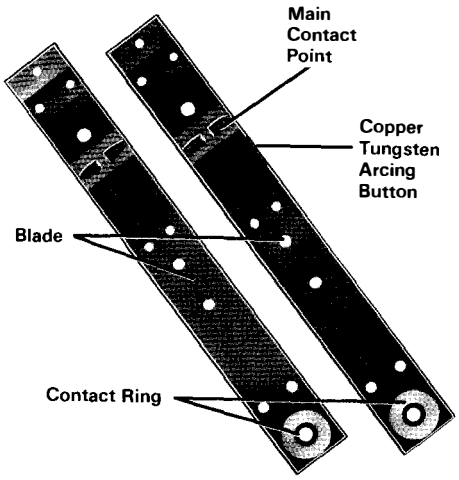


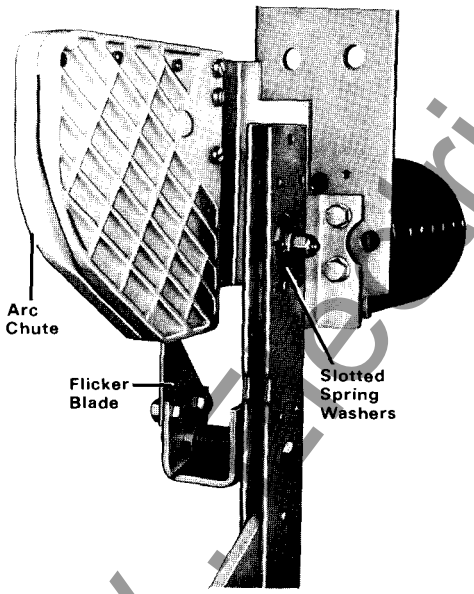
**Main, Flicker Blade Engaged**

**Main Blade Disengaged, Flicker Blade Engaged**

**Both Blades Disengaged**

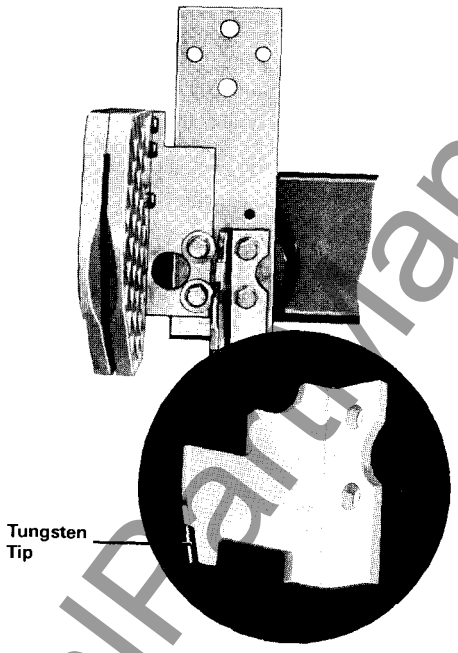
**Main Blades**
The blade consists of two high conductivity hard drawn copper bars in parallel. The blades are provided with a silver contact ring at the hinged end and a silver plated embossed main contact point. Copper tungsten alloy arcing buttons are provided to prevent damage to main break contacts during fault close.

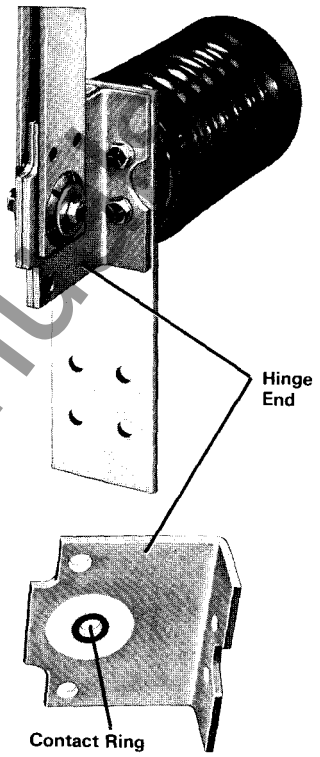



The two bars are fastened together at the hinge and break end to form a single blade. To assure permanent high contact pressure, self-adjusting slotted spring washers of phosphorus bronze are drawn tight over machined spacers to provide flexibility to maintain proper contact pressure and blade alignment.

**Stationary Contacts**
The stationary contact points are called the break jaw and hinged end. Both are made of high conductivity hard drawn copper. The break is jaw provided with a copper tungsten alloy arcing tip.

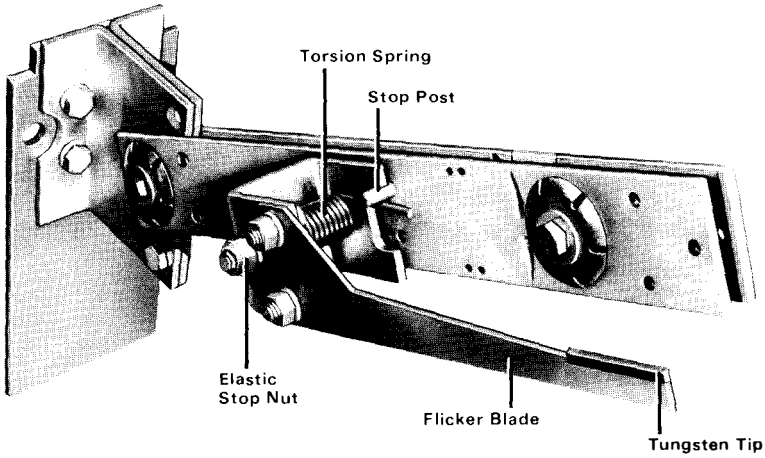



The stationary hinge end consists of two pieces of copper fastened together and proper electrical contact is maintained where the blade is attached to the hinge contact with a bolt and spring washers. To further assure good electrical contact at 1200 amperes, the hinge end is provided with plated contact rings at the moving point.

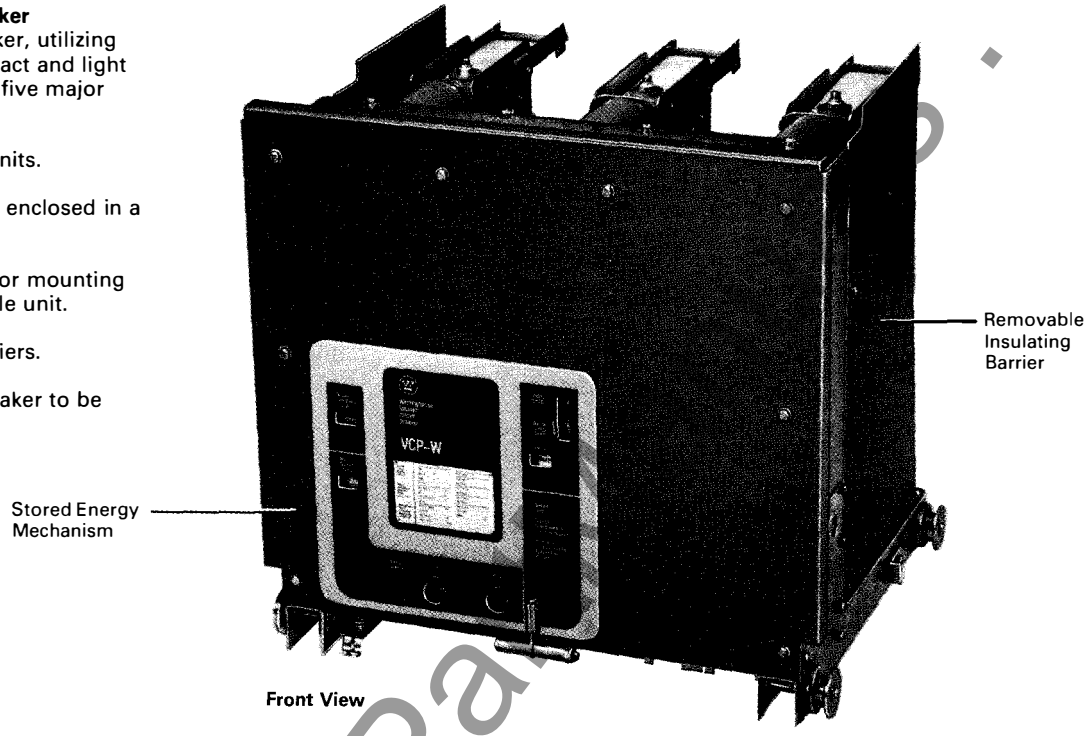
**Arc Chutes**
The arc chutes are molded of urea formaldehyde which, under high current conditions, produces de-ionizing gas to extinguish the arc. Contacts within the arc chute restrain the flicker blade assembly until the torsion spring is charged prior to opening.

**Flicker Blades**
The flicker blade is connected to the side and parallel to the main blade. It is constructed of hard drawn copper with an arc resisting tungsten alloy tip.



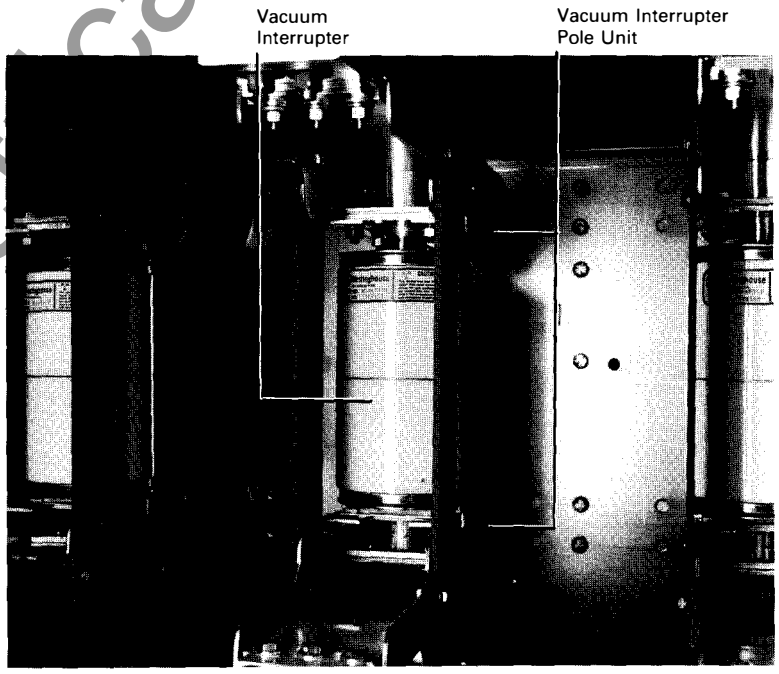
**Design Details – VCP-W Breaker**
The Type VCP-W circuit breaker, utilizing vacuum interrupters, is compact and light weight. The breaker includes five major components.

1. Vacuum interrupter pole units.
2. Stored energy mechanism enclosed in a metal housing.
3. Glass polyester supports for mounting the vacuum interrupter pole unit.
4. Removable insulating barriers.
5. Breaker wheels permit breaker to be rolled on floor.



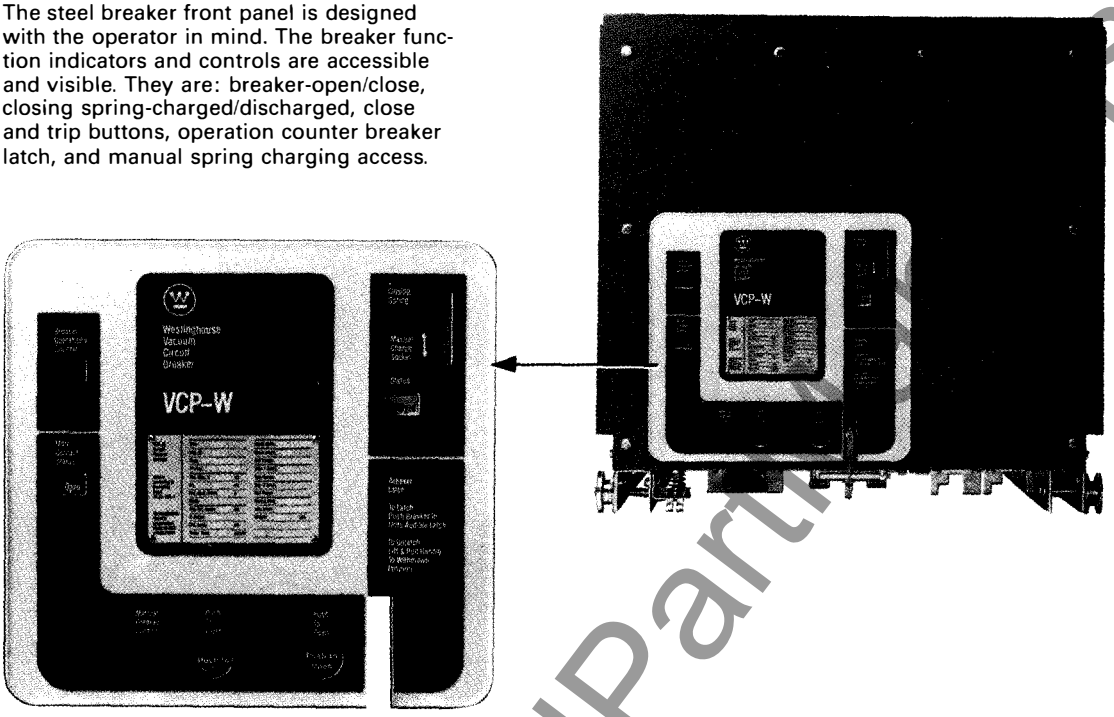

**Front View**

**VCP-W Breaker**
Breaker poles are complete units that are removable. Since the support system is self-aligning, no special tools are required for replacement.



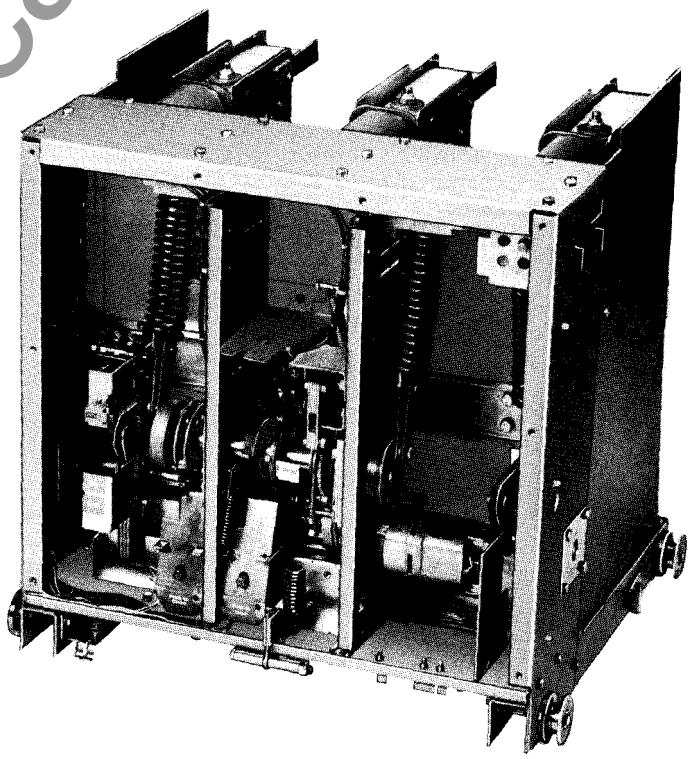
## VCP-W Breaker

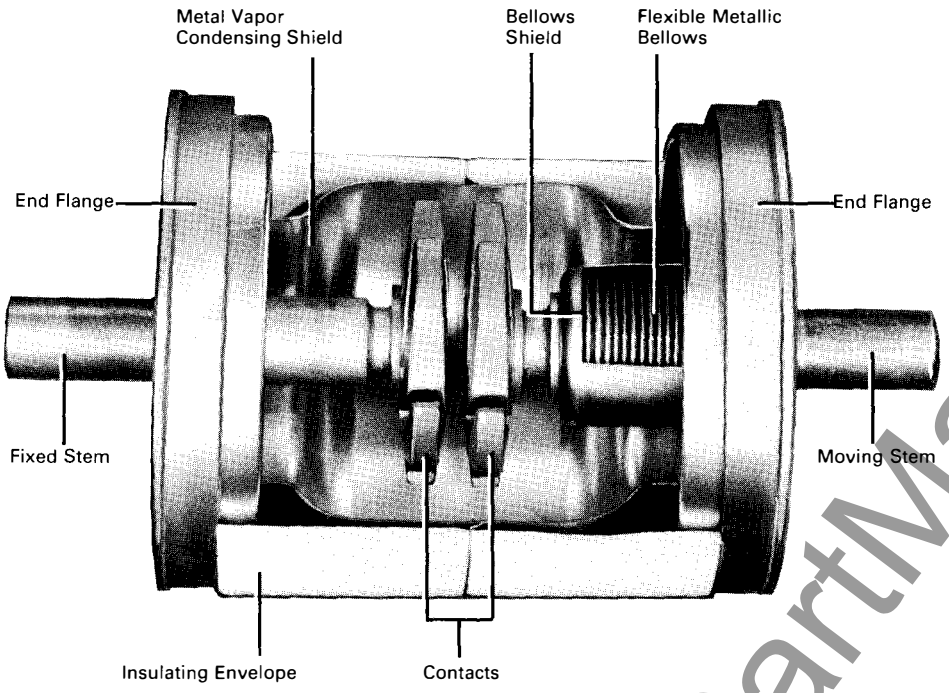
**VCP-W Breaker Front Panel**
The steel breaker front panel is designed with the operator in mind. The breaker function indicators and controls are accessible and visible. They are: breaker-open/close, closing spring-charged/discharged, close and trip buttons, operation counter breaker latch, and manual spring charging access.

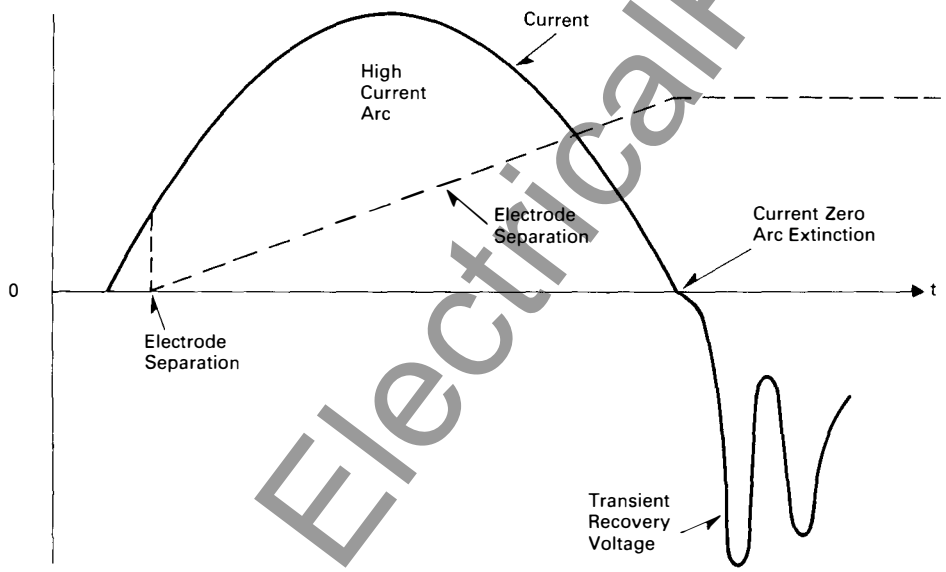



**Stored Energy Mechanism**
Breaker front panel removed exposing the stored energy mechanism.

The stored energy mechanism is vertically mounted on the front of the breaker for easy access. There is one basic mechanism for all ratings and is of rugged fabricated steel construction for reliable operation and long life. It is available for either DC or AC operation.






The current, voltage, and contact separation interrelationship is illustrated above.

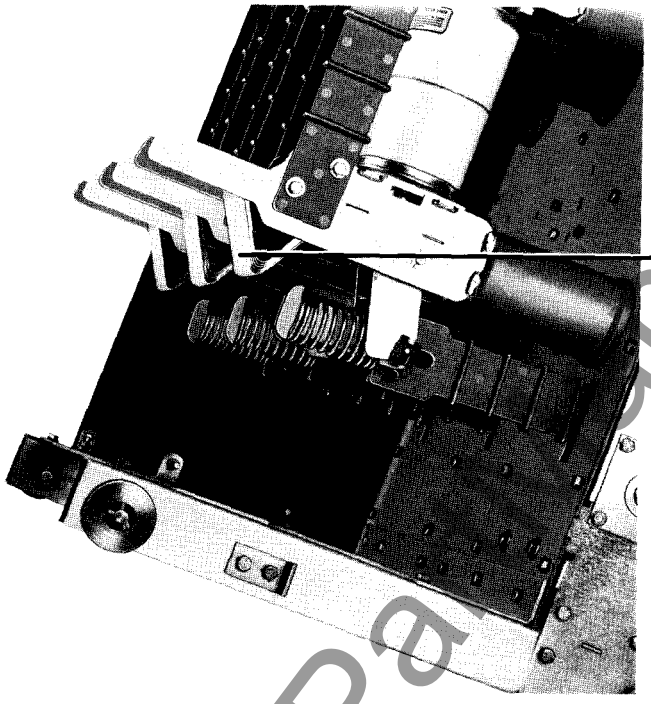
## Design Details – Vacuum Interrupter

**Vacuum Interrupter**
The Type VCP-W breaker utilizes vacuum interrupters for interruption and switching functions. Vacuum interrupters provide enclosed interrupter, small size and weight, interrupting time (high speed), long life, reduced maintenance, and environmental compatibility (low noise, no arc by-products, and minimum mechanical shock).

Arc interruption is simple and fast. The vacuum interrupter is shown. In the closed position normal current flows thru the interrupter. When a fault occurs and interruption is required, the contacts are quickly separated. An arc is drawn between the contact surfaces and is rapidly moved around the slotted electrode surface by self-induced magnetic effects, which prevents gross electrode erosion and the formation of hot spots on the surface. The arc burns in an ionized metal vapor, which continually leaves the contact area and condenses on the surrounding metal shield.

At current zero, the arc extinguishes, vapor production ceases; and very rapid dispersion, cooling, recombination, and deionization of the metal vapor plasma, together with the fast condensation of metal vapor products, cause the vacuum condition to be quickly restored – hence the separated contacts withstand the transient recovery voltage.

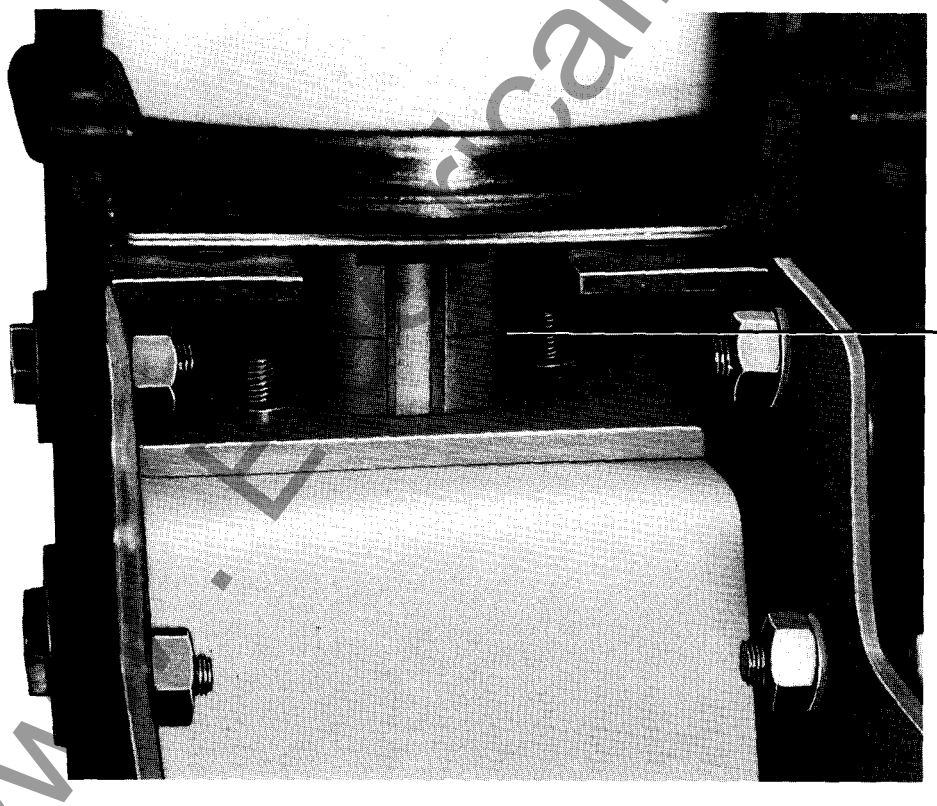
## Breaker Features



**Vacuum Interrupter Current Transfer Conductor**

The stiff-flexible current transfer from the vacuum interrupter moving stem to the breaker main conductor is a non-sliding design – thus eliminating the maintenance required with sliding type transfer arrangements.

**Reduced Maintenance**
Due to the inherent long life characteristics of the vacuum interrupter and the reliable stored-energy mechanism, the type VCP-W breaker requires minimum maintenance.



Vacuum interrupter contact wear indicator. Clearly visible, wear-gap (contact erosion) indicators require only an occasional check.

## Typical Arrangements

***Not to be used for construction purposes unless approved.***

**Dimensions in Inches**
The sketches in this section represent the most common arrangements. Many other configurations and combinations are available. **Depth of units will vary** due to cable entrance and exit requirements, the addition of lightning arresters, instrument transformers, special cable terminators, etc. Cables are shown out top and bottom for layout only. Top or bottom must be selected for incoming and for outgoing cables.

**Figure A1:**
**Single Breaker, 5 or 15 Kv**
**Top or Bottom Entrance**
**Top or Bottom Exit**

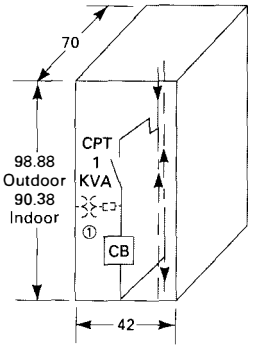



**Figure A2:**
**Multiple Feeder Breaker, 5 or 15 Kv**
**Top or Bottom Entrance**
**Top or Bottom Exit**

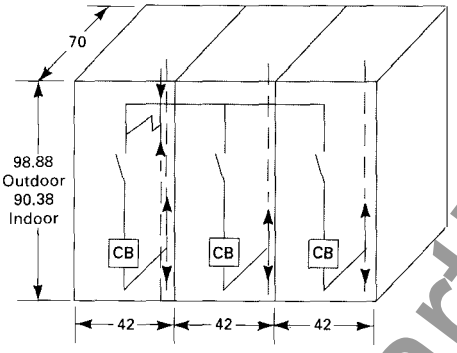



**Figure A3:**
**Hot Sequence Metering, Main Breaker, 5 or 15 Kv, and Feeder Breakers.**
**Top or Bottom Entrance**
**Top or Bottom Exit**

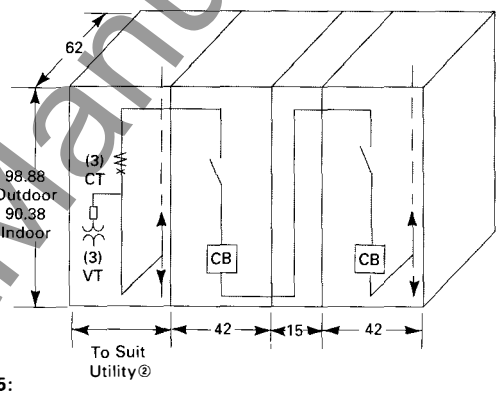
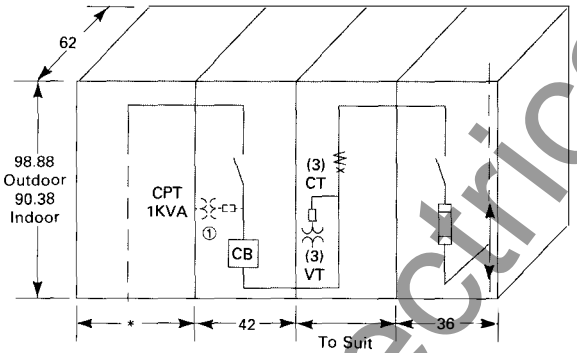
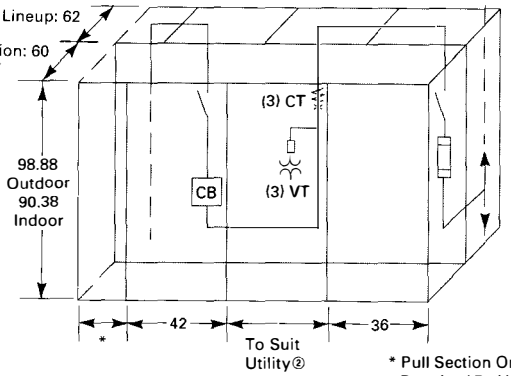



**Figure A4:**
**Optional Pull Section, Main Breaker, 5 or 15 Kv, Cold Sequence Metering, and Feeder Switch.**
**Top or Bottom Entrance**
**Top or Bottom Exit**



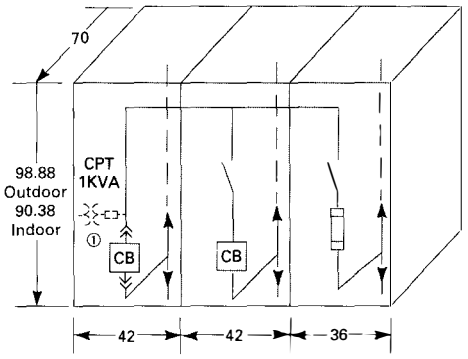

* Pull Section Only if Required By Utility or Customer, (Minimum 20")

**Figure A5:**
**Same as Figure A4 Except Outdoor Walk-In Enclosure**




* Pull Section Only if Required By Utility or Customer, (Minimum 20")

**Figure A6:**
**Draw-Out Main Breaker, 5 or 15 Kv, Top or Bottom Entrance and Feeder Breaker and Switch.**




● Optional CPT, 1KVA Transformer @ 15kV, Larger KVA May Increase Total Depth.
② Customers Metering (normally Westinghouse IQ Data Plus II) with associated fixed VT's and CT's can usually be accommodated in standard dimensions. Verify with Westinghouse specific space limitations exist.

## Typical Arrangements for Close Couple Equipment

***Not to be used for construction purposes unless approved.***

**Dimensions in Inches**
The sketches in this section represent the most common switch arrangements. Many other configurations and combinations are available. **Depth of units will vary** due to cable entrance and exit requirements, the addition of lightning arresters, instrument transformers, special cable terminators, etc. Cables are shown out top and bottom for layout only. Top or bottom must be selected for incoming and for outgoing cables. All necessary cable, lugs, bus and hardware for close coupling to the transformer are supplied with the switch.

**Figure B1:**
**Indoor Breaker, 5 or 15 Kv**
**Cable Connected to Dry Type Transformer**
**Top or Bottom Entry**

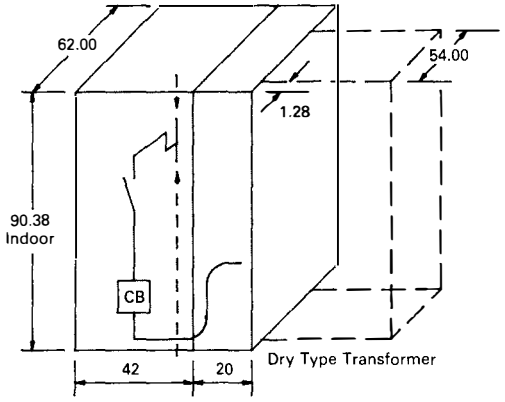



**Figure B2:**
**Indoor Breaker, 5 or 15 Kv**
**Cable Connected to Liquid Filled Transformer**
**Top or Bottom Entry**

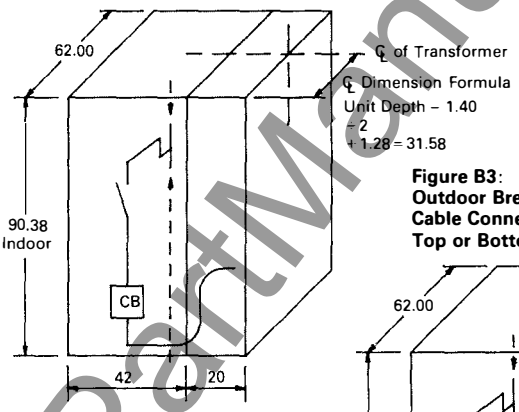



**Figure B3:**
**Outdoor Breaker, 5 or 15 Kv**
**Cable Connected to Liquid Filled Transformer**
**Top or Bottom Entry**

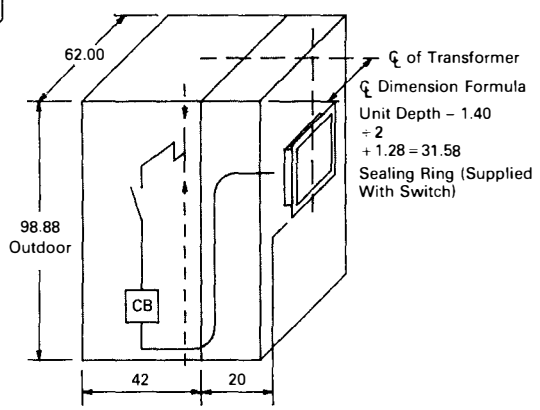



**Figure B4:**
**Indoor Breaker, 27 Kv**
**Bus Connected to Dry Type or Liquid Filled Transformer**
**Top or Bottom Entry**

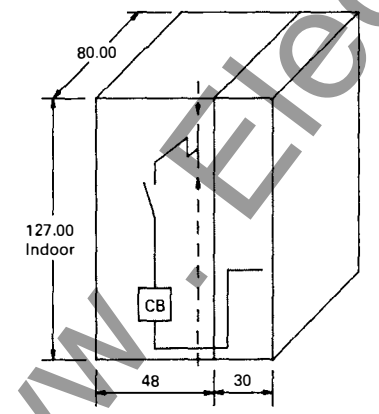



**Figure B5:**
**Outdoor Breaker, 27 Kv**
**Bus Connected to Liquid Filled Transformer**
**Top or Bottom Entry**

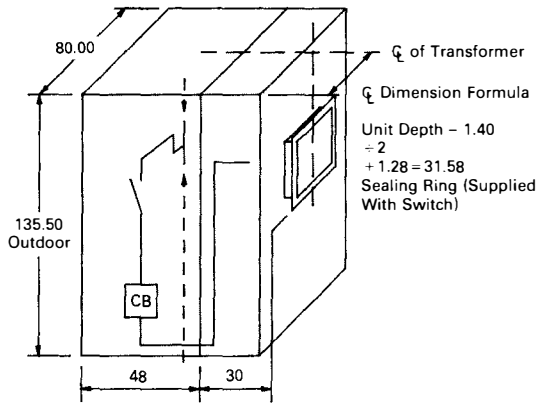
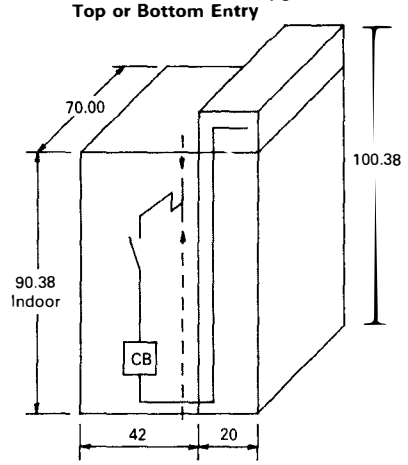


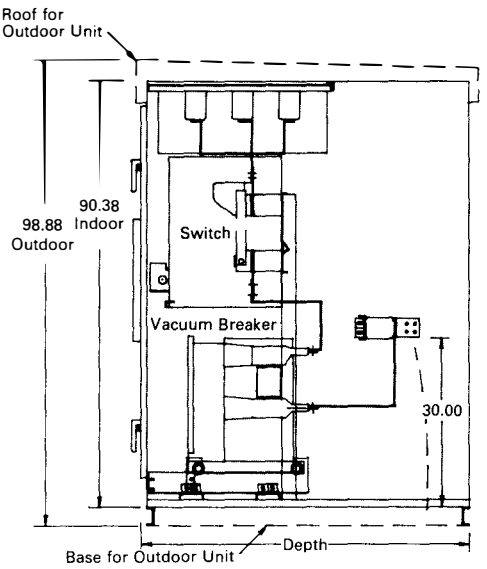

**Figure C1:**
**Indoor Breaker, 5 Kv**
**Bus Connected to Ampgard Starter**
**Top or Bottom Entry**



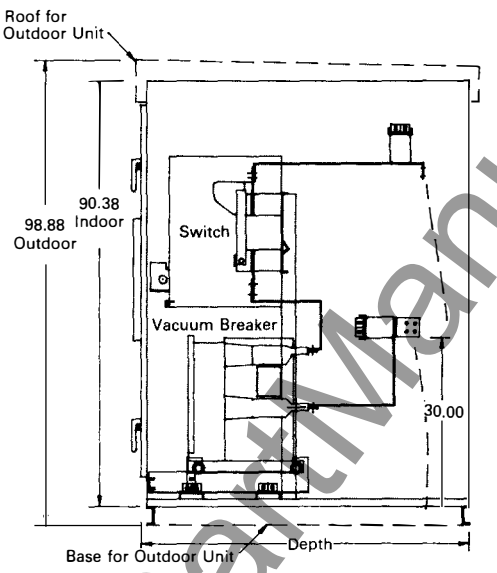

① The above represent the usual cases. Occasionally a particular transformer will require a transition where none is shown or a transition is not required.

**Dimensions in Inches,** *Not to be used for construction purposes unless approved.*

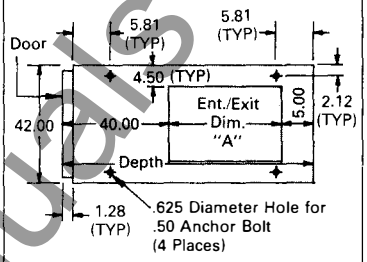
### 5, 15 Kv Switches With Main Bus



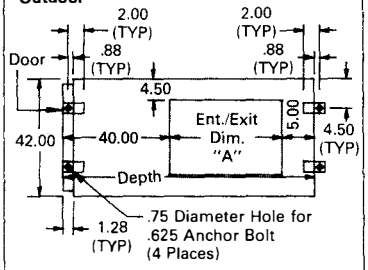

### 5, 15 Kv Switches Without Main Bus




### Floor Plans, 5 and 15 Kv (Dimensions) Indoor

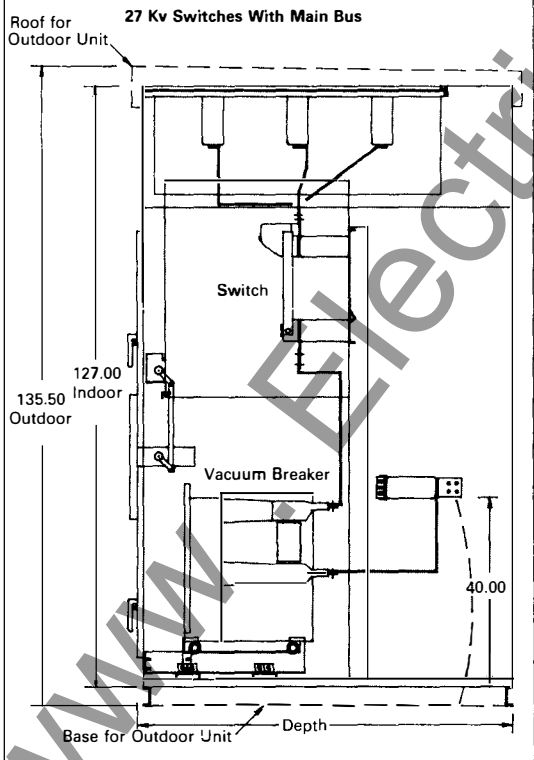



**Outdoor**

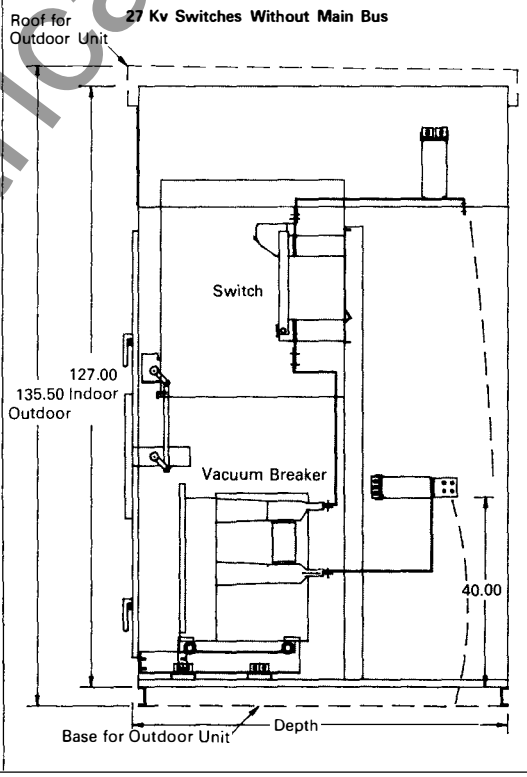



| Width | Depth | Dim. A |
|---|---|---|
| 42 | 62.00 | 17.00 |
| 42 | 70.00 | 25.00 |

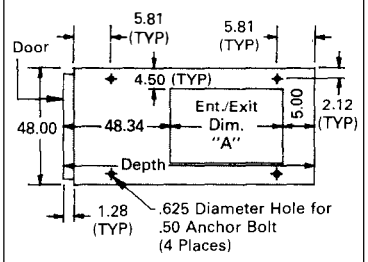
### 27 Kv Switches With Main Bus



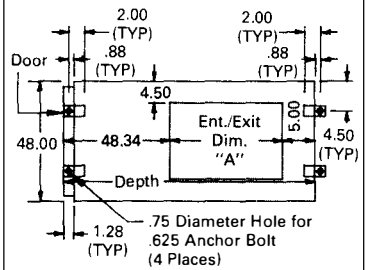

### 27 Kv Switches Without Main Bus




### Floor Plans, 27 Kv (Dimensions) Indoor




**Outdoor**




| Width | Depth | Dim. A |
|---|---|---|
| 48 | 80.00 | 26.66 |

### Test Data

All WLI switch ratings have been thoroughly tested in the Westinghouse High Power Laboratory. Tests were performed to substantiate all published ratings in accordance with ANSI and NEMA standards.

The testing program included tests of:

Basic Impulse Levels
Momentary Withstand
Short Time Withstand
Fault Closing
Load Interrupting at various loads, various power factors
Mechanical Life Tests

The mechanical life test subjected the WLI switch mechanism to more than 500 mechanical operating cycles under no load conditions. No failures resulted to the moving or current carrying parts.

### Switch Ratings

| Max. KV | Nom. KV | Impulse Withstand KV | Amperes Continuous | Amperes Interrupting | Momentary (Switch Closed) Asym. (10 Cy.)① | Fault Close Asym. |
|---|---|---|---|---|---|---|
| 5.0 | 4.8 | 60 | 600 | 600 | 40,000 | 40,000 |
| | | | 600 | 600 | 80,000 | 61,000 |
| | | | 1200 | 1200 | 80,000 | 61,000 |
| 15.0 | 13.8 | 95 | 600 | 600 | 40,000 | 40,000 |
| | | | 600 | 600 | 80,000 | 40,000 |
| | | | 1200 | 1200 | 80,000 | 40,000 |
| | | | 600 | 600 | 80,000 | 61,000 |
| | | | 1200 | 1200 | 80,000 | 61,000 |
| | | | 600 | 600 | 40,000 | 20,000 |
| 27.0 | 27.0 | 150 | 600 | 600 | 40,000 | 30,000 |
| | | | 1200⑨ | 600 | 40,000 | 30,000 |
| | | | 1200⑨ | 600 | 60,000 | 30,000 |

● Two second symmetrical KA ratings:
40 KA momentary switch is 25 KA;
60 and 80 KA momentary switches are 38 KA.

**Table 1: Available VCP-W vacuum circuit breaker types rated on symmetrical current rating basis, per ANSI Standard C37.06**

| Identification | | | Rated Values | | | | | | | | Related Required Capabilities③ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Nominal Voltage Class | Nominal 3-Phase MVA Class | Voltage | | Insulation Level | | Current | | Rated Interrupting Time | Rated Permissible Tripping Delay | Rated Max. Voltage Divided By K | Current Values | | | |
| | | | Rated Max. Voltage | Rated Voltage Range Factor | Rated Withstand Test Voltage | | Rated Continuous Current at 60 Hz | Rated Short Circuit Current (at rated Max. kV)② | | | | Maximum Sym. Interrupting Capability | 3 Sec. Short-Time Current Carrying Capability | Closing and Latching Capability (Momentary)① | |
| | | | | | | | | | | | | K Times Rated Short Circuit Current② K! | | 1.6 K Times Rated Short Circuit Current⑤ | 2.7 K Times Rated Short Circuit Current⑥ |
| | | | | ② | Low Frequency | Impulse | | | | ④ | | | | | |
| Circuit Breaker Type | kV Class | MVA Class | V kV rms | K | kV rms | kV Crest | I Amperes | kA rms | Y Cycles | Sec. | V/K kV rms | kA rms | kA rms | kA rms | kA Crest |
| 50 VCP-W 250 | 4.16 | 250 | 4.76 | 1.24 | 19 | 60 | 1200<br>2000⑦ | 29 | 5 | 2 | 3.85 | 36 | 36 | 58<br>78⑧ | 97<br>132① |
| 50 VCP-W 350 | 4.16 | 350 | 4.76 | 1.19 | 19 | 60 | 1200<br>2000⑦ | 41 | 5 | 2 | 4.0 | 49 | 49 | 78⑧ | 132 |
| 75 VCP-W 500 | 7.2 | 500 | 8.25 | 1.25 | 36 | 95 | 1200<br>2000⑦ | 33 | 5 | 2 | 6.6 | 41 | 41 | 66⑧ | 111 |
| 150 VCP-W 500 | 13.8 | 500 | 15 | 1.30 | 36 | 95 | 1200<br>2000⑦ | 18 | 5 | 2 | 11.5 | 23 | 23 | 37<br>58● | 62<br>97① |
| 150 VCP-W 750 | 13.8 | 750 | 15 | 1.30 | 36 | 95 | 1200<br>2000⑦ | 28 | 5 | 2 | 11.5 | 36 | 36 | 58<br>77①⑧ | 97<br>130① |
| 150 VCP-W 1000 | 13.8 | 1000 | 15 | 1.30 | 36 | 95 | 1200<br>2000⑦ | 37 | 5 | 2 | 11.5 | 48 | 48 | 77⑧ | 130 |
| 270 VCP-W 25 | | | 27 | 1.0 | 60 | 125 | 1200 | 25 | 5 | 2 | 27 | 25 | 25 | 40 | 67.5 |

● Non-Standard Breakers with High Momentary Rating available for Special Applications.

② For 3 phase and line to line faults, the Sym. Interrupting Capability at an operating voltage, Vo

$= \frac{V}{Vo}$ (Rated Short-Circuit Current)

**But not to exceed KI.**

Single line to ground fault capability at an operating voltage

$= 1.15 \frac{V}{Vo}$ (Rated Short-Circuit Current)

**But not to exceed KI.**

The above apply on predominately inductive or resistive 3-phase circuits with normal-frequency line to line recovery voltage equal to the operating voltage.

③ For reclosing service, there is **No De-Rating** necessary for the Westinghouse Type VCP-W family of circuit breakers. **R = 100%.**

Type VCP-W breaker can perform the O-C-O per ANSI C37.09; O-0.3s-CO-15s-CO per IEC 56; and some VCP-W's have performed O-0.3s-CO-15s-CO-15s-CO-15s-CO; **all with no derating.**

Please contact your Westinghouse representative if you have special reclosing requirement.

④ Tripping may be delayed beyond the rated permissible tripping delay at lower values of current in accordance with the following formula:

$$T \text{ (seconds)} = Y \left[ \frac{KI \text{ (K Times Rated Short-Circuit Current)}}{\text{Short-Circuit Current Through Breaker}} \right]^2$$

The aggregate tripping delay on all operations within any 30 minute period must not exceed the time obtained from the above formula.

⑤ Included for reference only.

⑥ Preferred rating.

● Only available in drawout construction.

⑧ Requires use of 80kA momentary switch and key interlocking between breaker and switch.

⑨ Requires key interlocking between breaker and switch.

## Typical Specifications

The metal enclosed switchgear assembly(ies) shall consist of deadfront, completely metal enclosed vertical sections each containing a load interrupter switch and a vacuum circuit breaker. Where shown, furnish additional vertical sections containing load interrupter switches and fuses or miscellaneous auxiliary apparatus of the number, rating and type noted on the drawings or specified herein. The metal enclosed switchgear assembly(ies) shall meet the requirements of ANSI Standard C37.20.3, and NEMA Standard SG5, and shall have the following minimum ratings:

| | |
|---|---|
| Nominal System Voltage | ____ kV three phase [three] [four] wire |
| Maximum Design Voltage | ____ kV [5.00] [15] [25.8] |
| System Grounding | ____ [solid] [low resistance] [high resistance] [ungrounded] |
| Basic Impulse Level | ____ kV [60] [95] [125] [150] |
| Bus Continuous Current | ____ Amperes [600] [1200] [2000] |
| Momentary Current | ____ kA [30] [40] [60] [80] |
| Three Second Current | ____ kA [25] [38] |

Each circuit breaker shall be operated by a motor-charged spring stored energy mechanism. The spring may be charged manually in an emergency or during maintenance procedures.

Each circuit breaker shall have three vacuum interrupter assemblies that are separately mounted on glass polyester insulators. Each vacuum interrupter assembly shall have a contact wear indicator which does not require any tools to indicate the contact wear. The current transfer from the vacuum interrupter moving stem to the breaker main conductor shall be a non-sliding design. The breaker front panel shall be removable when the compartment door is open for ease of inspection and maintenance of the mechanism. The circuit breaker shall not utilize air or oil dash pots for minimizing vacuum interrupter contact "bounce" upon opening.

Each vacuum circuit breaker shall be interlocked with an associated line side connected load interrupter switch mounted in the same cubicle. Interlocking shall prevent access to circuit breaker unless the switch is open.

The switchgear manufacturer shall furnish a maintenance tool for manually charging the breaker closing spring.

Each circuit breaker shall meet the requirements of ANSI Standards, C37.010, C37.100, C37.04, C37.06, C37.07, C37.09, and C37.11, and shall have the following ratings:

| | |
|---|---|
| Maximum Design Voltage | ____ kV [4.76] [8.25] [15] [27] |
| Continuous Current | 1200 Amperes |
| Short Circuit Current at Rated Maximum kV | ____ kA [18] [25] [28] [29] [33] [37] [41] |
| Closing and Latching Capability | ____ kA [62] [67] [97] [111] [130] [132] |
| Three Second Rating | ____ kV [23] [25] [36] [41] [48] [49] |
| Nominal 3 Phase MVA Class | ____ MVA |

| Line | Maximum Design kV | BIL | Momentary Current kA Asym. | 2 Second Current kA Sym. |
|---|---|---|---|---|
| 1 | 5 | 60 | 40 | 25 |
| 2 | 5 | 60 | 40 | 38 |
| 3 | 15 | 95 | 40 | 25 |
| 4 | 15 | 95 | 80 | 38 |
| 5 | 27 | 125 | 40 | 25 |
| 6 | 27 | 125 | 60 | 38 |

| Rated Control Voltage | Spring Charge Motor | | Coil | | |
|---|---|---|---|---|---|
| | Run Amperes | Time Sec. | Close or Trip Amperes | Voltage Range | |
| | | | | Close | Trip |
| 48 Vdc | 9.0 | 6 | 16 | 38-56 | 28-56 |
| 125 Vdc | 4.0 | 6 | 7 | 100-140 | 70-140 |
| 250 Vdc | 2.0 | 6 | 4 | 200-280 | 140-180 |
| 120 Vac | 4.0 | 6 | 6 | 104-127 | 104-127 |
| 240 Vac | 2.0 | 6 | 3 | 208-254 | 208-254 |

The breakers shall be electrically operated by the following control voltages:

[115] [230] volt AC CLOSE and AC Capacitor TRIP, or; [48] [125] volt DC CLOSE, and volt DC TRIP.

The control voltage shall be [derived from a control power transformer mounted for the switchgear] [supplied by the purchaser].

Current sensing devices and electronic fault detector devices shall be furnished for overcurrent detection, timing and providing a trip signal on vertical sections containing circuit breakers. Where necessary, as indicated on the drawings, provide additional protective relays and instrument transformers of the quantity, types and ratings described hereafter in this specification. Electronic fault detector devices shall be Westinghouse microprocessor type or approved equal.

All bus shall be [tin plated aluminum] [silver plated copper] and be mounted on NEMA class insulators.

One terminal pad per phase shall be provided for attaching contractor supplied cable terminal lugs for a maximum of two conductors per phase of the sizes indicated on the drawings. Sufficient vertical space shall be supplied for contractor supplied electrical stress relief termination devices.

Small wiring, fuse blocks, and terminal blocks within the vertical section shall be furnished as indicated on the drawings. Each control wire shall be labeled with wire markers. Terminal blocks shall be provided for customer connections to other apparatus.

Specification data for the WLI air load interrupter switch can be found in Westinghouse Catalog 55-000. Expanded specifications for the WVB can be found in the Westinghouse Spec. Guide, section 3a, including metering, communication equipment, and automatic transfer.

### Approximate Weights

| Switch Description | Indoor | | Outdoor | |
|---|---|---|---|---|
| | Lbs. | Kg. | Lbs. | Kg. |
| **5 or 15 KV Class** | | | | |
| Non-fused Switch | 1500 | 675 | 1800 | 815 |
| Breaker, Add | 460 | 210 | 460 | 210 |
| Indoor Transition | 300 | 135 | .... | .... |
| Outdoor Throat | .... | ... | 200 | 90 |
| **27 KV Class** | | | | |
| Non-fused Switch | 2000 | 900 | 2400 | 1080 |
| Breaker, Add | 415 | 210 | 415 | 210 |
| Indoor Transition | 1100 | 495 | .... | .... |
| Outdoor Throat | .... | ... | 900 | 405 |

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Printed in U.S.A.

**April 1992**