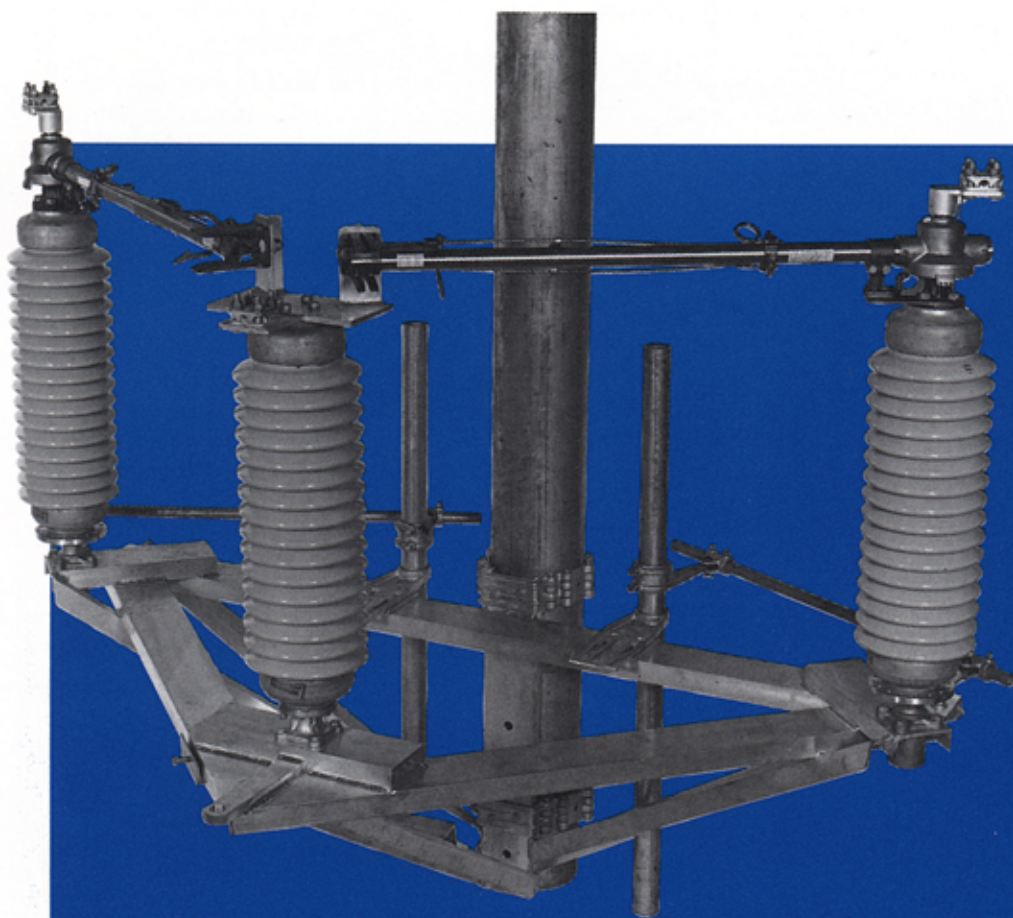


## Type "2D" Side Break Switches

15 kV-161 kV

600/1200/2000 Amperes



Require  
Greater  
Switching  
*Ability?*

Specify "2D"  
*by Turner*

- ☐ Flexibility
- ☐ Reliability
- ☐ Economic  
Sensibility

**te** Turner Electric Corporation  
Providing Customer Service Since 1953

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# Design and Operating Features

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### "2D" = Switch Ability

With their heritage firmly entrenched in similar lines of Transmission switches, Turner "2D" switches are one of the most versatile, severe-duty, pole mounted switching products available. Referred to as "Substation-in-the-Sky" switches, two way switches eliminate many problems for system designers, and reduce construction costs by as much as 50 per cent over conventional ground station costs.

Unlike many so-called transmission switches that are just substation switches modified for use on a pole, Turner's type 2D is a true transmission switch. Designed and built for the harsh environmental conditions, galloping conductors and constant pole flexing inherent in severe aerial applications, 2D switches employ a specially designed, light weight, 6061-T6 Aluminum frame as a mounting structure. The frame

eliminates the need for pole cross arms or braces.

These switches eliminate Right-of-Way and real estate issues, as well as the associated legal considerations. Also eliminated are costly ground structures and several insulator stacks. Turner's unique design requires just 9 insulators versus the 12 required for competitive switch units.

Their flexible mounting ability makes it ideal in phase-over-phase and phase-next-to-phase configurations on transmission poles. Switches rated 69kV and below will mount on any suitable structure; 115kv and above will mount on steel, concrete or laminated wood poles.

Loadbreak vacuum interruption capability is also more affordable on 2D switch designs, with a "shared" centrally located vacuum bottle stack, instead of one per switching direction.

Transmission switches are extremely

difficult and costly to remove from service, so Turner's philosophy is to design in reliability, eliminating the need for constant maintenance.

A rigid, hard drawn copper blade with patented locking device, silver-to-copper contacts, double spring arcing horns and sealed hinge contacts provides heavy-duty construction.

Add to this Turner's more than 40 years of field proven experience in air break switches and you have maximum switching reliability.

This all adds up to what we call Switch-Ability!

Turner Type "2D" switches can be used for station isolating and bypassing, transmission line sectionalizing or preferred alternate throwovers. Switches are easily upgraded for automatic operation and load breaking.

**Quality may cost more to buy, but it always costs less to own.**

### "2D" Operating Features

Type "2D" switches are operated from ground level with a standard 2" IPS steel verticle operating pipe assembly with a manual swing handle lever. The control lever incorporates a ground shunt, is padlockable and can be supplied for clockwise or counterclockwise operation. A steel shaft with self-piercing set screw clevises is used for coupling and pinning the switch gang control pipe. Electrohydraulic motor operators are available for

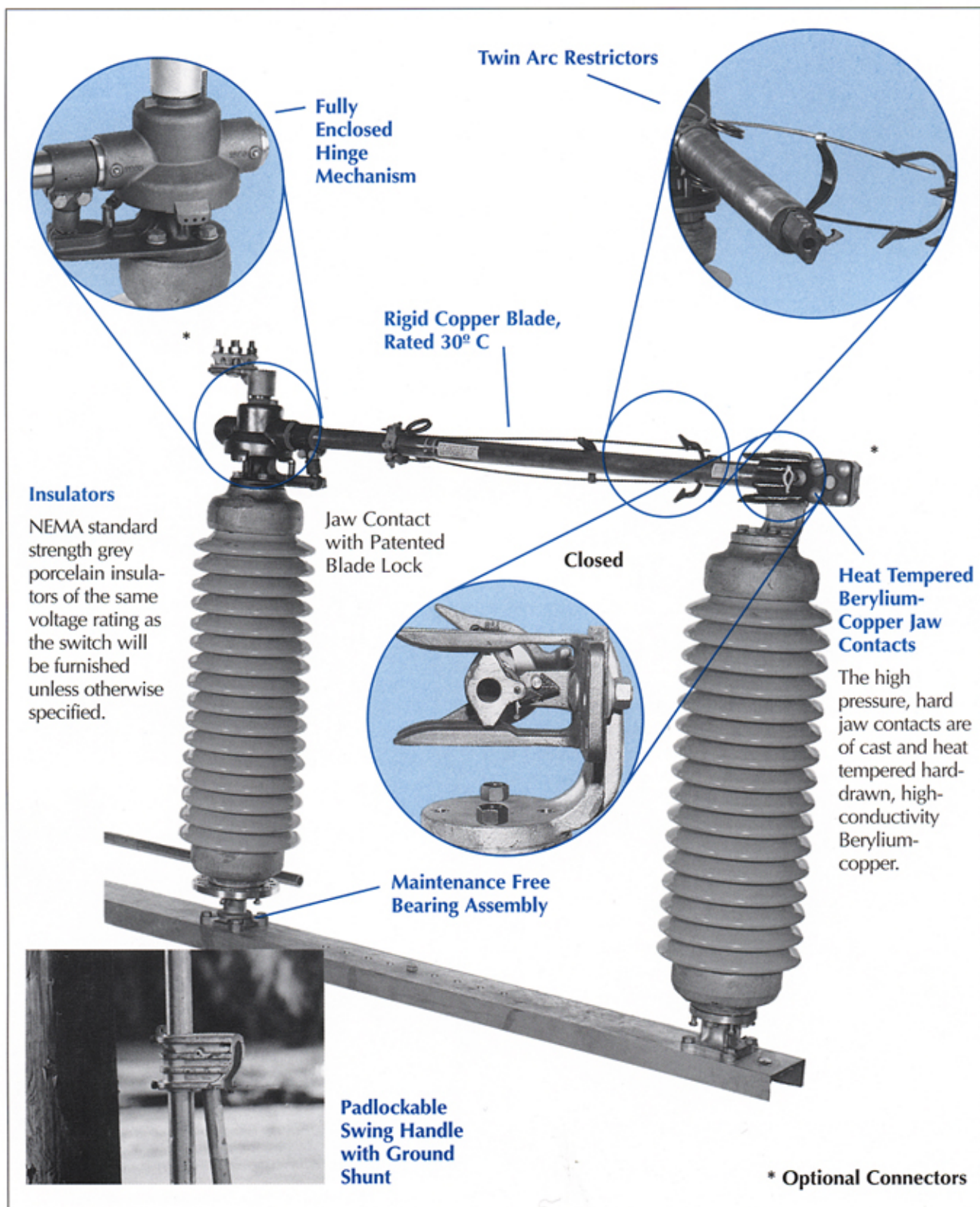
remote, automatic or SCADA control.

Turning the operating lever rotates the main vertical operating shaft which moves the insulator stack with the main contact. The turning motion rotates the contact to facilitate a smooth, effortless positive opening motion. This action releases contact pressure within the spring jaw assembly which helps maintain a clean contact surface, and enhances ice- or contamination-breaking action.

During closing, the main blade contacts remain in the straight or "cammed up" position, allowing effective contact cleaning action. A patented locking device holds the blade securely in the jaw.

Double spring quick-whips interrupt limit amounts of charging or load currents when opening. Arcing is kept away from main contact surfaces. If the magnitude of the current exceeds the quick-whip capability, a TECOrupter full load break vacuum interrupter is available.







# Design and Operation

## Hinge Mechanism

The current carrying path on the hinge end of the switch is continuous and enclosed to permanently protect it from the elements. The terminal pad is threaded to a stationary contact block; the connection is spring loaded, silver to silver. As the switch rotates during the opening and closing cycle, the terminal pad is held in place by the conductor and the switch can move without restriction. Inside the hinge housing, current transfer from the stationary block to the moveable blade is through a series of silver contact fingers. Beryllium copper backing springs apply continuous pressure around the contact shoes.

This hinge configuration assures maximum service life and minimizes maintenance.

## Jaw Contacts - Blade

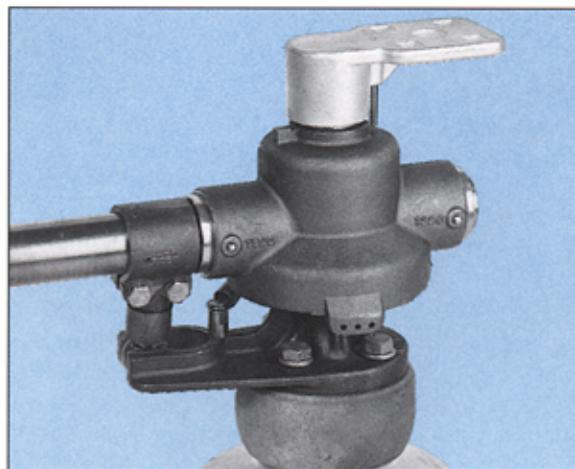
The high pressure contact shoes are of cast, heat-treated, high-conductivity beryllium-copper. Although contact pressure is factory-adjusted, should field adjustment ever be necessary, it can easily be made. In addition, contact changeout is fast and easy.

The tubular blade is designed of hard-drawn copper to provide the proper combination of current-carrying capacity and rigidity. The blade tip is beryllium-copper, heat treated and strato-milled to provide a machined current transfer surface. The coin silver overlays provide high pressure, silver-to-copper contact with the Beryllium-copper jaw surfaces when the tip is in the jaw.

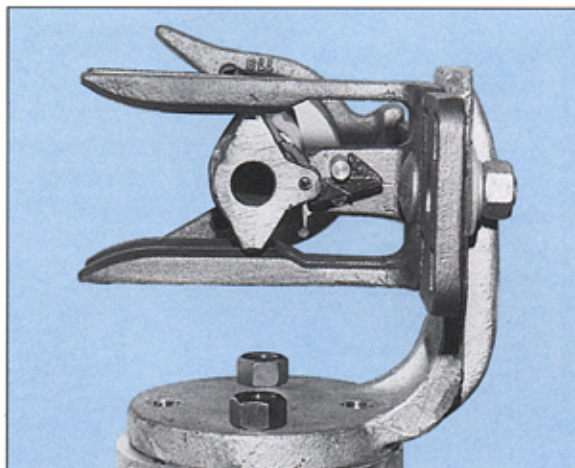
The blade tip engages the jaw contacts in an upright condition to form a high-pressure contact. The blade and jaw contacts are wiped clean during the closing action to assure a low resistance current transfer. A patented blade locking device keeps the blade closed despite temporary faults, surge currents, twisting structures or galloping conductors. Double spring type quick whips provide time-proven interruption of limited amounts of charging and load currents.

The opening action of the Turner switch is unique. Prior to the blade disengaging from the jaw contact, the blade contact rotates 22 degrees in the jaw. This exclusive Turner action releases all contact friction and breaks any ice or contamination in the jaw area which may impede an easy opening procedure. The Turner switch provides effortless opening regardless of environmental or time effects.

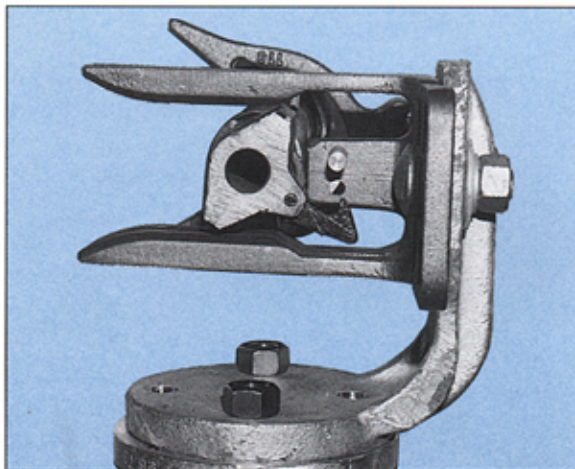
**The high pressure wiping action of silver to beryllium-copper during closing gives new equipment conductivity even after years of service.**



Enclosed Hinge Mechanism. ▲



Contacts spread on closing, as the blade latches. ▲



Contacts relax when blade rotates for opening. ▲



## Main Bearing Assembly

The main pivot bearing assembly consists of two tapered Timken roller bearings, which are adjusted and lubricated at the factory and require no further attention for the life of the switch. These bearings are protected with a Neoprene seal and permanently sealed at the bottom with a Welch-type expansion plug. This unit will accommodate cap-and-pin or post-type insulators without the use of an extra casting.

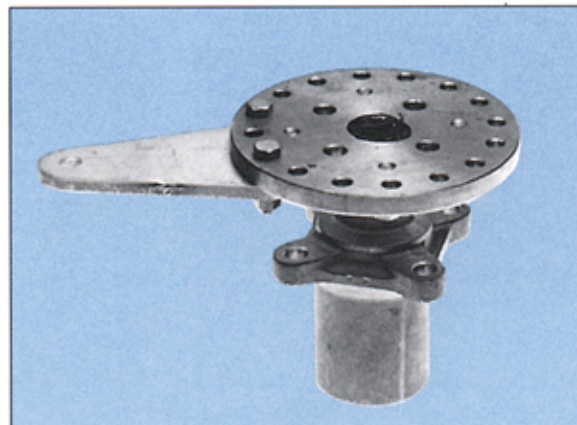
Four leveling screws are provided on the sub-base of each insulator stack, to facilitate easy alignment after assembling the insulators on the switch. Adjusting the screws raises or lowers the end of the switch blade and orients the blade to contact interface correctly.

Tightening the insulator bolts holds the alignment fast. Leveling screws are also provided on all stationary insulator pedestals.

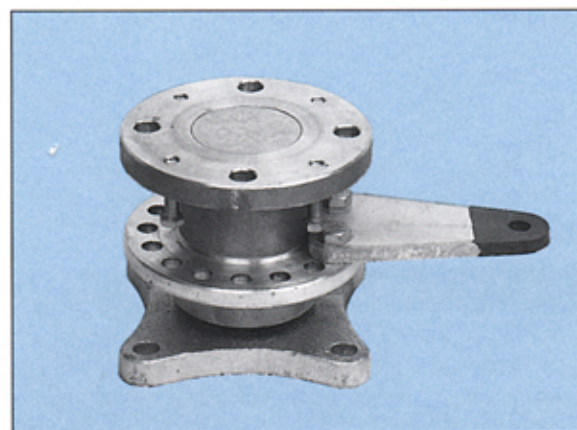
## Mounting Flexibility

To accommodate the variety of transmission structures and locations, Turner offers a similar variety of operating and mounting configurations. Controls can be supplied for clockwise or counterclockwise opening if requested, or may be changed in the field as necessary.

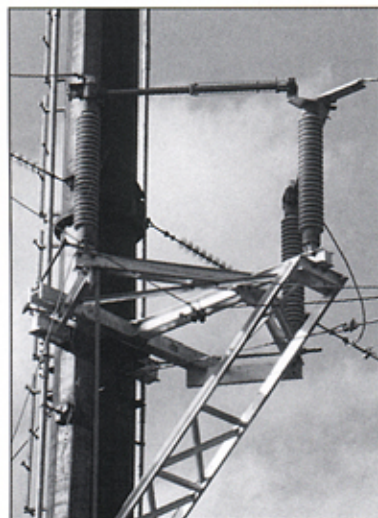
Turner's standard operating mechanisms for side-break switches consist of vertical steel operating pipe, with or without an 8-foot fiberglass insulating section; a steel or fiberglass interphase shaft, with self-piercing set screw clevises for coupling and pinning to switch crank arm and vertical pipe guides.



15-69 kV Bearing Assembly. ▲



115 kV Bearing Assembly. ▲



Special angle takeoff configuration. ▲



Unique Horizontal Phase-next-to-Phase base and frame construction. ▲



## Full Load Vacuum Interrupters

The Turner TECO-Rupter is a vacuum circuit interrupter that is offered as an attachment to the Turner switch as well as designs of other switch manufacturers. It is offered in three (3) basic configurations and can be attached to vertical break, side break, hookstick and some center break switch designs. The configurations are as follows:

**A) Loop or parallel break** - Normally these are single vacuum contact devices which can interrupt up to 2000 Amps, up to 230 kV, under paralleled conditions (i.e., rated voltage exists on both the hinge and jaw of the switch immediately after the interrupter is opened.) The transient recovery voltage must not exceed 30 kV for the single contact. More contacts can be added to address higher recovery voltages; consult factory.

**B) Line/bus charging/line sectionalizing interruption/transformer magnetizing current interruption:** A full voltage multiple stack interrupter may be utilized from 15 kV through 230 kV for interruption of line or bus charging currents and transformer magnetizing currents up to a value of 70 Amps at 0% power factor, capacitive or inductive. The nameplate operating current of the switch is not a factor in the application of this device.

**C) Load interruption** - A full voltage multiple stack interrupter may be applied from 15 kV through 230 kV for interruption of actual current at 70% power factor.

The TECO-Rupter is only in the circuit during the opening sequence, (normally one [1] to [2] seconds in duration.) Also, contact test studs on the exterior of the enclosure allow you to independently Hi-Pot each vacuum contact when the actuating arm is in the open position at 30 kV.

kV Rating	Interrupter Contact /Phase	70% PF Load Amp.*
14.4	1	2000
23	1	1600
34.5	2	2000
46	2	2000
69	3	2000
115	5	2000
138	6	2000
161	7	2000

\*For capacitor bank applications, consult factory.



1. Switch/Interrupter closed. ▲



2. Switch starts opening, Bypass engaged. ▲



3. Bypass disengaged, circuit interrupted. ▲



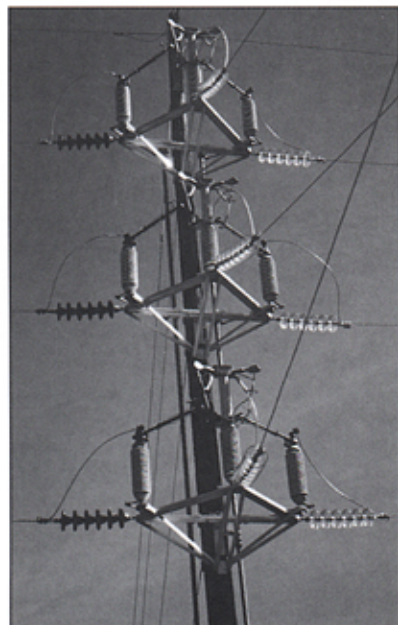
4. Switch fully open. ▲



Switch Rating			Station Post	Catalog Number	Approx. Wt. Lbs.
Voltage	Amperes		Technical Ref. No.	3 Phase Switch	Shipping Weight
	Cont.	Momen.			
15kV	600	40,000	205	2D01506/2113	1026
	1200	61,000	205	2D01512/2113	1076
23kV	600	40,000	208	2D02306/2115	1130
	1200	61,000	208	2D02312/2115	1175
34kV	600	40,000	210	2D03406/2116	1307
	1200	61,000	210	2D03412/2116	1358
46kV	600	40,000	214	2D04606/2118	1646
	1200	61,000	214	2D04612/2118	1699
69kV	600	40,000	216	2D06906/2120	2054
	1200	61,000	216	2D06912/2120	2109
	2000	100,000	216	2D06920/2179	2385
115kV	600	40,000	286	2D11506/2137	4272
	1200	61,000	286	2D11512/2137	4332
	2000	100,000	286	2D11520/2163	4722
138kV	600	40,000	288	2D13806/2152	4821
	1200	61,000	288	2D13812/2152	4885
	2000	100,000	288	2D13820/2174	5335
161kV	600	40,000	291	2D16106/2145	5172
	1200	61,000	291	2D16112/2145	5235
	2000	100,000	291	2D16120/2170	5685

69kV and below - part numbers indicate wood pole mount. Concrete and steel designs are available. For 115 kV and above, part numbers indicate steel pole mount. Laminated wood and concrete mounts available.

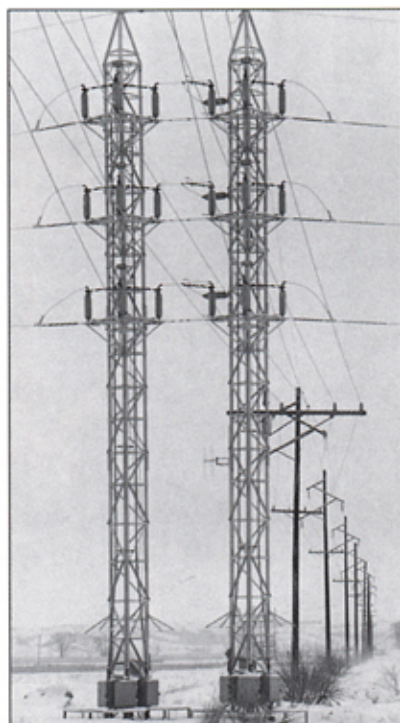
69 kV "2D" switch on concrete pole. ▼



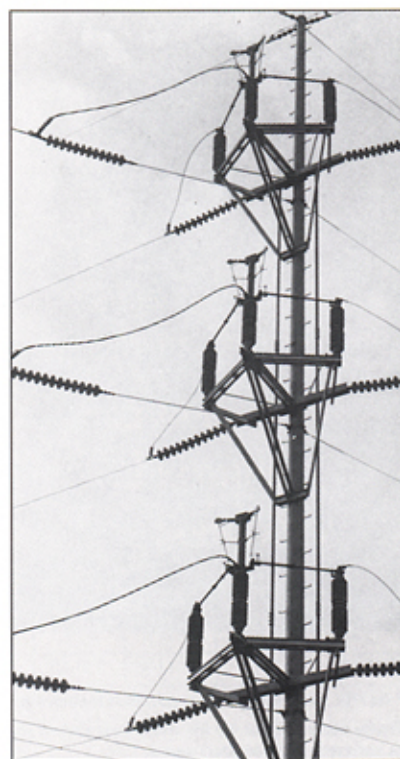
Line tap 69 kV "2D" switch on wood pole. ▼



Automated four-way 69 kV switching. ▼

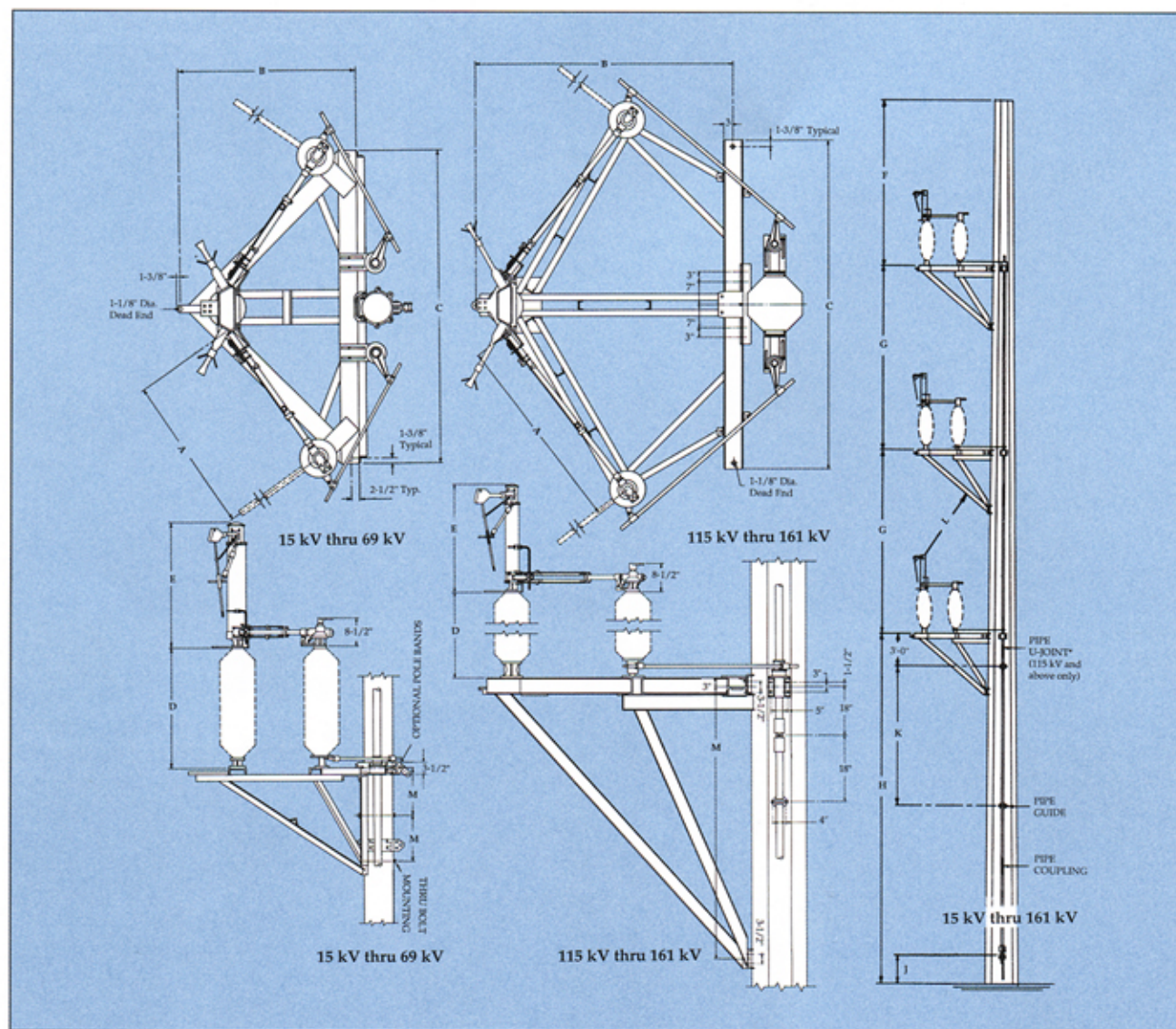


Three phase, 115 kV "2D" switch on steel pole. ▼





# Dimensional Data



Dimensions (With Post Insulators)													
kV	A	B	C	D	E	F	G	G*	H	J	K	L*	M
15	1'-6"	2'-10"	5'-4"	1'-1 1/4"	2'-8"	7'-0"	7'-0"	5'-2"	28'-0"	3'-6"	10'-15'	1'-0"	1'-0"
23	1'-6"	2'-10"	5'-4"	1'-5 1/4"	2'-8"	7'-0"	7'-0"	5'-7"	28'-0"	3'-6"	10'-15'	1'-3"	1'-0"
34	2'-0"	2'-4"	5'-5"	1'-9 1/4"	2'-8"	9'-0"	9'-0"	6'-7"	28'-0"	3'-6"	10'-15'	1'-6"	1'-4"
46	2'-6"	3'-9 1/2"	6'-1"	2'-1 1/4"	2'-8"	9'-0"	9'-0"	7'-7"	30'-0"	3'-6"	10'-15'	1'-9"	1'-1"
69	3'-6"	4'-0"	6'-11"	2'-9 1/4"	2'-8"	10'-0"	10'-0"	9'-2"	30'-0"	3'-6"	10'-15'	2'-7"	1'-1"
115	5'-0"	6'-6 1/2"	8'-4"	4'-2 1/2"	4'-3"	20'-0"	20'-0"	16'-2"	32'-0"	3'-6"	10'-15'	4'-5"	7'-0"
138	6'-0"	8'-11 1/2"	8'-4"	4'-11 1/2"	5'-0"	20'-0"	20'-0"	18'-3"	34'-0"	3'-6"	10'-15'	5'-2"	7'-0"
161	7'-0"	8'-11 1/2"	12'-6"	5'-7 1/2"	5'-10"	22'-0"	22'-0"	21'-5"	34'-0"	3'-6"	10'-15'	6'-0"	7'-0"

\* NOTE: Minimum phase separation includes provisions for TECOrupter.

Frame mounting for 69 kV and below shown for wood pole; 115 kV and above shown for steel pole. Contact factory for interfacing with any other pole such as concrete or laminated wood.