HUBBELL TIPS & NEWS

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FAST-INSTALLING, LONG-LASTING AUTOMATION READY SWITCH

Time-saving installation, smooth-operating design for now and the future

The future of overhead distribution systems is one of change. Among the realities: Ever greater load densities (more load per mile of line), more interconnections, more laterals and branches. And, in the new competitive environment, a continuing demand for higher degrees of system reliability. Along with this, the continuing expansion of Distribution Automation.

Utility engineers must be confident that the products being installed now will meet the needs of their future distribution systems.

CUTS UP TO AN HOUR OFF HANG TIME

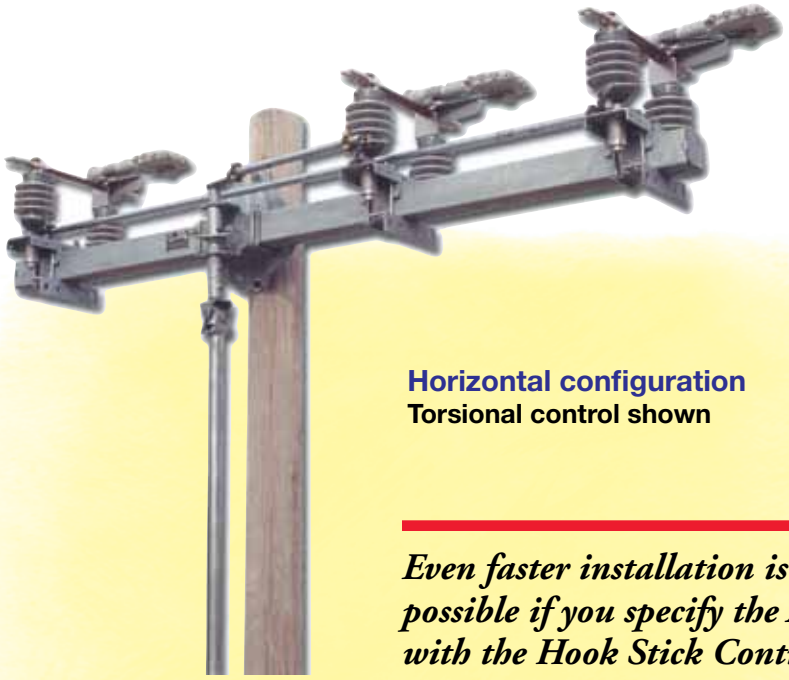
AR switch advantages begin by minimizing your field installation time. One utility reports the AR switch saves $^{1}/_{2}$ to 1 hour off a crew's installation of a typical unitized three-phase switch.

Until now, the most time consuming aspect of gang operated switch installation has been the installation and adjustment of control pipe. Once the switch and control pipe were installed, adjustments had to be made to ensure proper blade opening and closing. Typically, a certain amount of "wrap-up" had to be set in the operating handle/lock segment. Periodic inspection was recommended to see that the switch had not lost its adjustment due to such factors as pole twist.

The AR Switch is preassembled and factory adjusted to simplify field installation. Key to this is the AR Switch's unique overtoggle operating mechanism which is factory preset. This Four-Link Overtoggle Mechanism reduces installation time by eliminating any need to adjust the control assembly. No "wrap-up" is required.

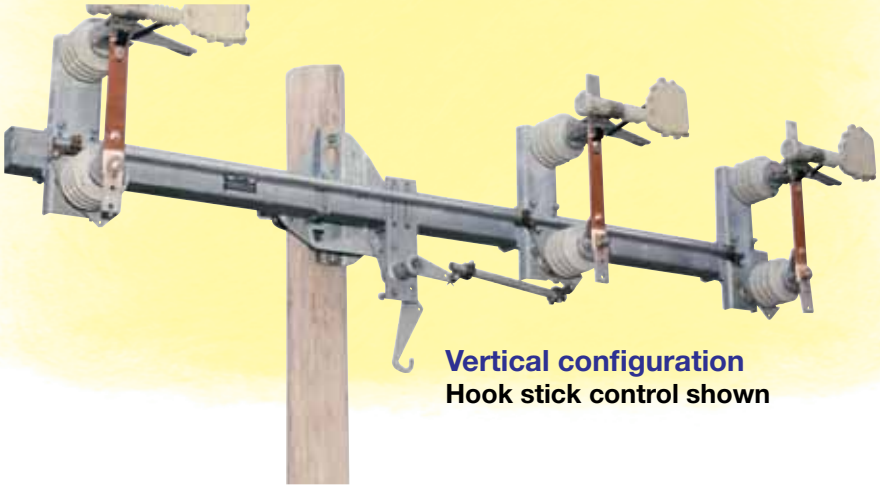
Even faster installation is possible if you specify the AR with the Hook Stick Control which eliminates down-the-pole controls.

And the forgiving nature of the overtoggle mechanism greatly reduces the possibility of any AR Switch coming out of adjustment due to pole twist over time.



Horizontal configuration
Torsional control shown

Even faster installation is possible if you specify the AR with the Hook Stick Control.



Vertical configuration
Hook stick control shown

EASIEST TO OPERATE, SURE LATCHING

The AR Switch is the easiest to operate switch of its kind. It takes the least force to open and close of any three-phase gang-operated switch in

the industry (no more than 50 ft.-lb. for a torsional operating switch). That's a significant mechanical advantage to either manual or motorized operation, now and in the future.

During manual operation, the AR's overtoggle mechanism delivers a "snap" feedback to the operator. This positive latching action gives assurance of switch blade closing.

Delta configuration
Hook stick control shown

Phase-over-phase configuration
Reciprocating control shown

Distribution Automation: Sooner or Later

You can stay ahead of the DA game no matter where your system is today. The AR switch can get you up to speed now so you won't be playing catch up later.

Today you get the immediate benefits of the AR switch:
• Fastest hang time in the industry, especially for the Hook Stick Control;
• Easiest operation in the industry, a result of the Overtoggle Mechanism;
• 900-amp current-carrying/interrupt, by design and exclusive interrupter.

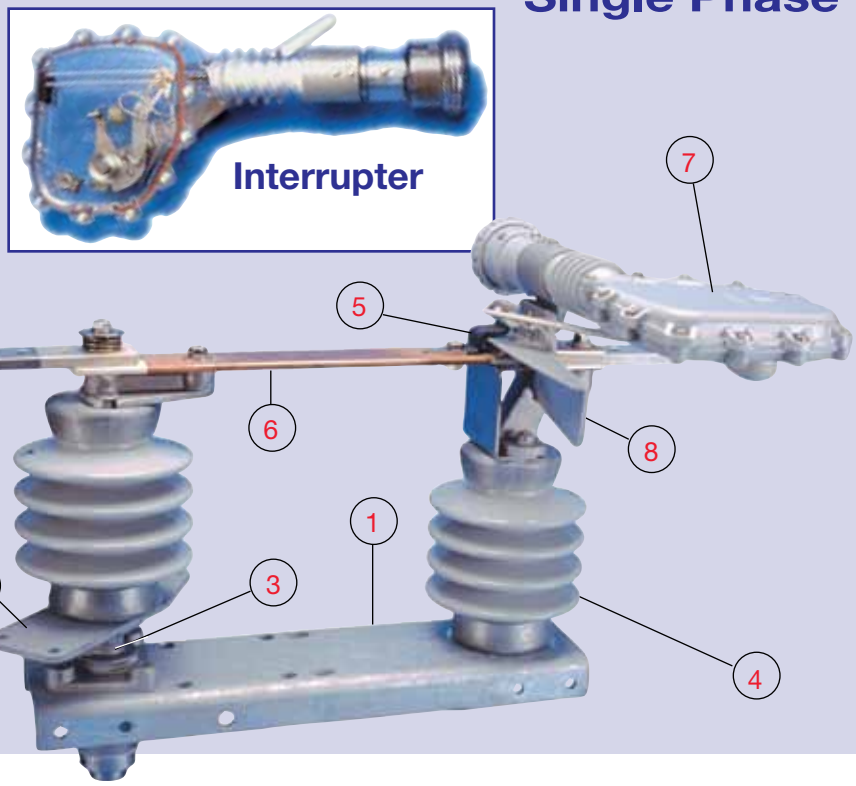
Then you're set for the AR to deliver its DA promise. Tomorrow, next month, next year – whenever your system is ready for motor-operated, remote control. The AR switch now . . . because it's just a matter of time.

Application Flexibility

The Hubbell AR Switch was designed with these factors in mind. It's a switch to meet today's needs, and those of the known, anticipated future of your distribution system, including the growth of Distribution Automation.

continued . .

Single Phase Details of AR Switch



1 Hot-rolled steel base formed into a channel and galvanized per ASTM A153.

2 Hot-rolled crank lever provides high strength and corrosion resistance. Galvanized per ASTM A153.

3 Delrin® bushing coupled with a cast aluminum rotating shaft eliminates the need for lubrication during the life of the switch.

4 Insulators available in 2.25" bolt circle, porcelain or polymer.

5 High-conductivity copper with phosphorous-bronze back-up springs and copper-tungsten fault-closing tips provide reliable contact areas. Silver-to-silver current-transfer points.

6 Blade formed from hard-drawn, high-conductivity copper for maximum current carrying capability.

7 Bolted tongue-in-groove interrupter mounting ensures positive alignment of the interrupter.

8 Polycarbonate ice shield helps protect contacts from ice build up.

First the basics: The AR Switch is available for 14.4kV, 25kV and 34.5kV (grounded wye) systems. And in four mounting configurations: Horizontal, vertical, phase-over-phase and delta, to meet a variety of distribution feeder line configurations. All AR Switches are fully rated for 900 ampere continuous current and 900 ampere interrupting current, a definite benefit as distribution system load densities increase.

AR Switches have a one-time and three-time duty cycle fault-closing capability of 25,000 amperes rms asymmetrical and 20,000 amperes rms asymmetrical, respectively. This again is a substantial benefit for increasing distribution system load densities, and as distribution feeders are automated in the future.

For switches installed in icy weather conditions, AR Switch mechanical and electrical operation is ensured, even with ice buildup of up to $\frac{3}{8}$ inch.

installed and tested. For more information, refer to Chance catalog section 14C.

Variations and Configurations

The AR switch is available in four basic configurations:

- Horizontal
- Vertical
- Phase-over-Phase
- Delta

All feature clockwise opening and are operable by standard torsional or reciprocating controls as well as the optional Hook Stick Control.

Construction and operation

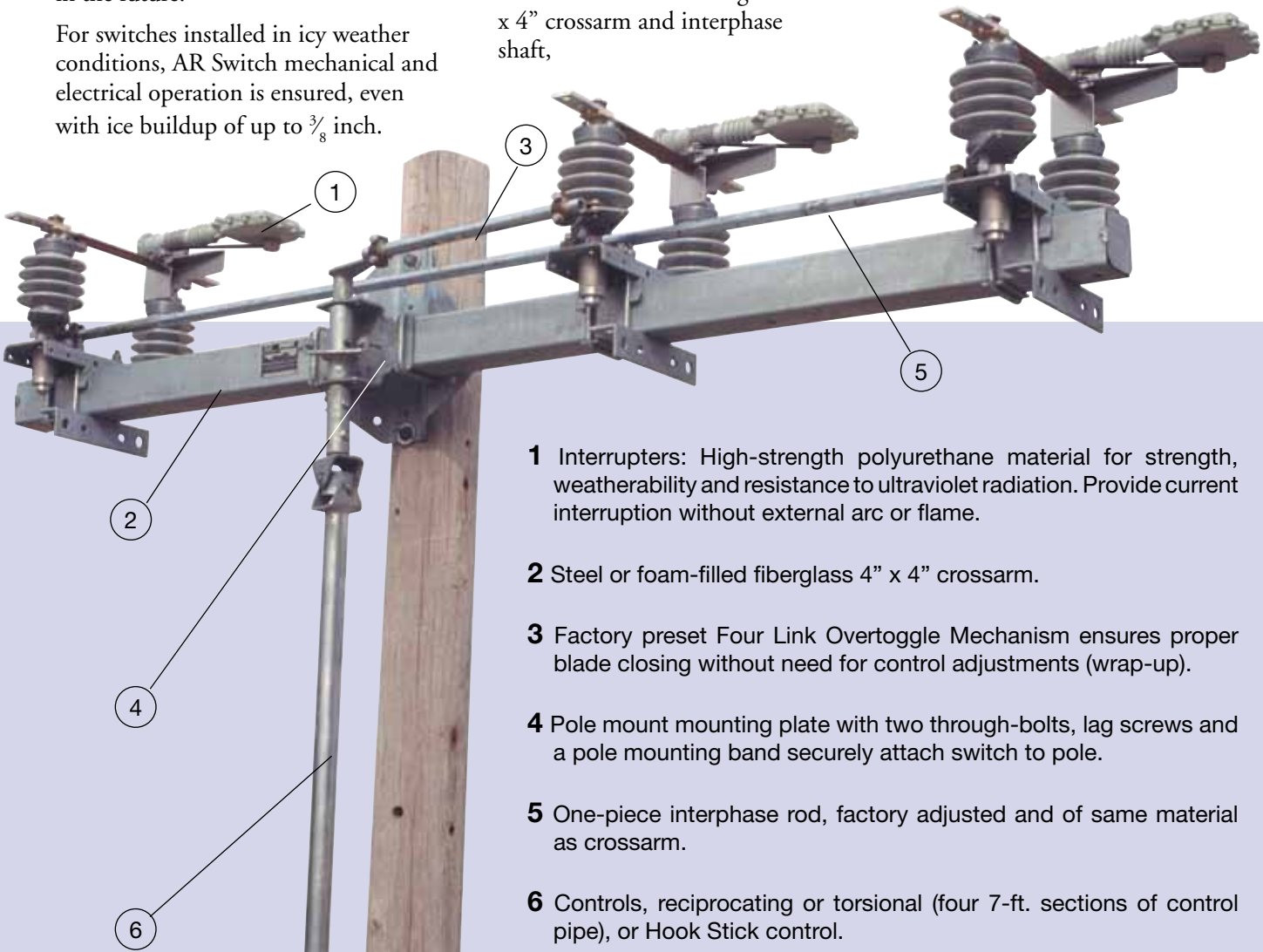
AR Switches are unitized, preassembled switches available with such basic design options as:

- Polymer or porcelain insulators
- Steel or foam-filled fiberglass 4" x 4" crossarm and interphase shaft,

Automation-ready design

The AR Switch can be purchased as a standard switch and upgraded for Distribution Automation in the future, or ordered as a complete automated switch today. Bracket extensions are available for mounting line sensors (sensors can be provided as specified by the user) as is the Chance Motor Operator, with or without an RTU and communication package.

The Chance Motor Operator is available in rotating and reciprocating models. It can be provided with a mounting panel for an RTU and communication package or complete with the user-specified RTU/communication package, fully



1 Interrupters: High-strength polyurethane material for strength, weatherability and resistance to ultraviolet radiation. Provide current interruption without external arc or flame.

2 Steel or foam-filled fiberglass 4" x 4" crossarm.

3 Factory preset Four Link Overtoggle Mechanism ensures proper blade closing without need for control adjustments (wrap-up).

4 Pole mount mounting plate with two through-bolts, lag screws and a pole mounting band securely attach switch to pole.

5 One-piece interphase rod, factory adjusted and of same material as crossarm.

6 Controls, reciprocating or torsional (four 7-ft. sections of control pipe), or Hook Stick control.

AR Switch Ratings

Nominal Voltage/Lightning Impulse Withstand .....14.4 kV/110 kV, 25 kV/150 kV or 34.5 kV grounded-wye/150 kV
Continuous Current .....900 amperes
Interrupting Current ..... 900 amperes
Peak Withstand Current.....65,000 amperes peak
Short Time Withstand Current.....3 sec.....25,000 amperes, symmetrical
Fault Making: 1 time.....25,000 amperes, asymmetrical
3 time .....20,000 amperes, asymmetrical
Dead-ending: .....8,000-lb. working load
Ice Breaking: .....$^{3}/_{8}$-in. thick, opening and closing

each providing 8,000-lb. working load dead-ending capability

- Steel control sections, one fiberglass control section (four 7-ft. steel sections, or one 7-ft. fiberglass and three 7-ft. steel sections provided) or Hook Stick Control.

Ease of operation and effortless movement of the rotating insulators is ensured with the factory preset Four-Link Overtoggle Mechanism and Delrin®* bushings coupled with a cast aluminum rotating shaft that never needs lubrication during the life of the switch. Under extensive testing, the AR Switch withstood forces and numbers of operations far greater than would be expected in service, with no significant increase in required operating force.

Interrupter Design and Function

The AR Switch interrupter provides circuit interruption without external arc or flame. It is designed with a unique trailer, liner and muffler, to create the necessary de-ionizing gases for efficient circuit interruption.

AR Switch interrupter housings are manufactured from a high strength polyurethane material for strength, weatherability and resistance to ultraviolet radiation. The housing is a two-part housing which is fully gasketed to prevent water entry. The interrupter incorporates a self resetting mechanism, to ensure that the interrupter is in the circuit and ready to operate for each switch opening.

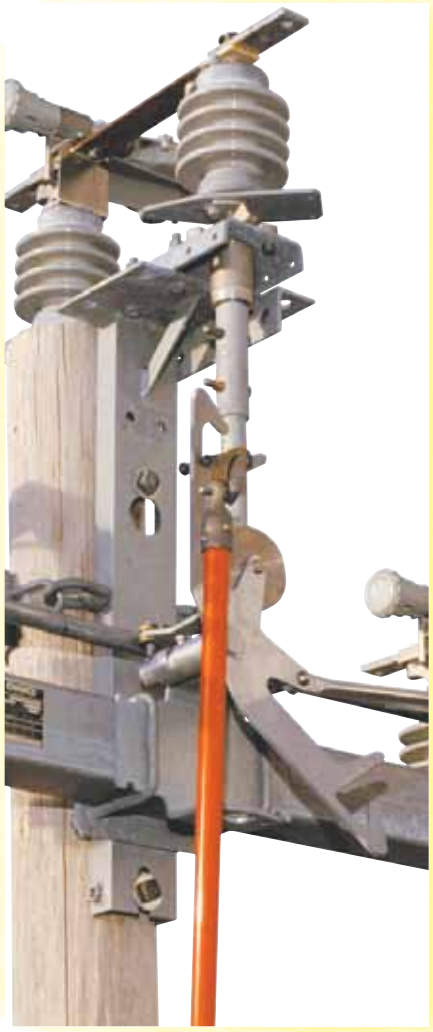
Extensive testing has been conducted to ensure proper operation under a variety of current conditions (magnitude and varying duties), as well as varying environmental conditions.

Current-Carrying Parts

The AR Switch blades are formed from hard-drawn, high-conductivity copper for maximum current carrying capability. The leading edge of the Blade incorporates a copper-tungsten inlay, for fault closing performance. The stationary contacts are high-conductivity copper with phosphorous-bronze back-up springs to maintain optimum contact pressure and operating ease. The stationary contact also includes a copper tungsten fault close tip. All current transfer points are silver to silver.

The hinged contact includes a stainless steel compression spring for optimum contact pressure, operating

Hook Stick Control option opening(at left) and closing switch (at right).



* Delrin® is a registered trademark of the DuPont Company

ease and terminal pad stability. All current transfer points are silver to silver.

Operating Sequence

When the AR Switch is in the closed position, current flow is through the copper switch blade and the silver to silver contacts. There is no current flow through the interrupter.

As the switch is opened, current is transferred to the interrupter. This transfer is accomplished before the main contacts fully separate. As the switch continues to be opened, the interrupter contacts are driven apart. Arc interruption is accomplished by thermal interaction of the arc on the specifically designed arc trailer and liner within the interrupter. This interaction creates de-ionizing gases, that along with the unique interrupter housing design ensures a high rate of recovery of the internal dielectric strength for rapid, positive, circuit interruption. The exhaust following current interruption is quietly and without flame, vented through the specially designed muffler exhaust cap.

When closing the AR Switch, blade and interrupter closing is sequenced to assure that current is picked up by the copper-tungsten fault closing contacts on the blade and stationary contacts. Current is never picked up by the main current carrying contacts, or by the interrupter. The interrupter is self re-setting and the interrupter pick up arm is simply moved into proper position during blade closing. ■

Opening Sequence: Switch Blade and Interrupter

1 Switch blade in closed position

2 As switch blade is opened, current is transferred to the Interrupter before the main contacts fully separate

3 Current is fully transferred to the Interrupter and arc interruption is accomplished by thermal interaction of the arc on the specifically designed arc trailer and liner within the interrupter

4 Switch is fully opened and the Interrupter self-resets

For more information, contact your Hubbell Power Systems representative or fax 573-682-8714.

SURGE ARRESTERS FOR HIGH VOLTAGE NEEDS

The world of surge protection is rapidly evolving and Ohio Brass is changing to keep pace with it. Through the years, Ohio Brass has led the industry with arrester offerings and innovation.

In this article we are familiarizing the reader with how to select the proper types of arresters. We are assuming the correct arrester rating (size of arrester) has already been determined. If additional help is needed, contact your local Hubbell Power Systems account representative.

Selection Criteria

How do you know what type of surge arrester is best for a given application? The list of products on page 9 seems overwhelming at first glance, but the selection of the right type of arrester is quite simple.

A surge arrester is purchased as a safeguard against damage done by voltage surges. These surges can come from various sources, but they primarily result from lightning and switching surges.

Selection of the surge arrester is based on the following consideration assuming the user has previously determined the appropriate arrester MCOV:

1. Protective Level
2. Energy Capability
3. Pressure Relief Rating
4. Housing Material
5. Other considerations

Protective Level

The protective level measures the voltage the surge arrester clamps the incoming surge to during an operation. Ohio Brass catalogs the protective level (also called the discharge voltage) for each rating of arrester being offered for various surge current levels.

Table I (page 10) shows the relative protective levels of Ohio Brass arresters. These levels are also known as

discharge voltage levels. They are the amount of voltage stress that an arrester imposes on the equipment while discharging an 8/20 industry standard 10kA lightning surge wave. In many ways, this number is similar to a blood pressure rating, the lower the better. The arresters in the table are ranked in order of improved protective levels. Improved protective levels primarily result from larger diameter arrester MOV blocks.

Ohio Brass has several publications available to help in calculating the margin of protection of arresters used to protect equipment insulation. Refer to Bulletins EU1091-HR, Application Guide; EU1136-H, MOV Protection of Distribution Systems; 2932-H, MOV Insulation Coordination.

Energy Capability

Surge arresters absorb energy while discharging surges. This energy causes an increase in the temperature of the MOV elements, which in turn causes the MOV blocks to conduct a higher level of power frequency current. If this temperature rise is too high, the blocks can conduct too much current and the arrester will fail. The amount of kJ (kilojoules) of energy an arrester can handle is a function of the volume of MOV block in the arrester. The larger the disc volume, the higher the arrester energy capability.

It is important to recognize current industry standards do not define how energy capability of arresters is determined. If not careful, it is possible to specify an arrester that has far too much energy capability when compared to the amount the system can deliver to the arrester. Again, Ohio Brass has several publications dealing with calculating the amount of energy that an arrester can discharge.

Pressure Relief Rating

If a surge arrester sees duty in excess of what it can handle, it will fail. Arresters nearly always fail as a short circuit. Therefore, when they fail, they become a line-to-ground short. With full system fault current flowing through the arrester, it may explode. Arresters have pressure relief devices built into them to prevent explosions.

Porcelain Station Arrester

Table I shows the pressure relief ratings of various Ohio Brass designs. The higher the rating the more available short circuit current the arrester can handle. These values are determined by actual tests of surge arrester venting. These tests are performed on samples using a single fault event.

In the real world though, most utilities will reclose on a fault at least once prior to locking out. The pressure relief rating of porcelain arresters are valid for only the first fault event. System reclose on a failed porcelain arrester can cause fracture of the weathered porcelain housing being subjected to a second discharge of system fault current. Polymer arresters have the advantage of being able to withstand multiple system reclose events without exploding. Therefore, polymer arresters offer a distinct advantage over porcelain.

Housing Material

Polymer arresters have many benefits that are recognized throughout the industry. Polymer housed surge arresters are much lighter than their porcelain counterparts. Polymer arresters also are much more resistant to breakage than porcelain housed arresters. Polymer arresters lend themselves to being manufactured with much more leakage distance than porcelain housed units. Polymer arresters offer enhanced contamination performance when compared to multiple unit porcelain units.

continued

Ohio Brass Arrester Product Offerings

Application	Product	ANSI Type/ Class	IEC Type/ Class	Housing Material	MCOV Voltage Range (kV)
URD Equipment	PDE	Deadfront	N/A	EPDM	2.55 - 29.0
URD Equipment	PVR	Riser Pole	N/A	Polymer -ESP*	2.55 - 29.0
Overhead Distribution Equipment	PDV - 65	Normal Duty	5kA	Polymer - ESP	2.55 - 29.0
Overhead Distribution Equipment	PDV-100	Heavy Duty	10kA - Class 1	Polymer - ESP	2.55 - 29.0
Substation Equipment	PVI	Intermediate	2	Polymer - ESP	2.55 - 115
Substation Equipment	PVI - LP	Intermediate	2	Polymer - ESP	2.55 - 57
Substation Equipment	VL	Station	3	Porcelain	2.55 - 39
Substation Equipment	PVN	Station	3	Polymer - ESP	2.55 - 180
Substation Equipment	VN	Station	4	Porcelain	42 - 245
Substation Equipment	VNX	Station	5	Porcelain	318 - 440
Line Protection	Protecta*Lite	n/a	1, 2	Polymer - ESP	2.55 - 180

Polymer Arrester

Table I

SUMMARY TABLE OF OHIO BRASS ARRESTER KEY CRITERIA

Arrester Type	Discharge Voltage 15.3 kV MCOV Arrester w/ 10kA Surge Applied	Energy Capability kJ/kV MCOV	Pressure Relief Rating (kA)	Housing Material
PDE	66.0	1.4	10*	EPDM
PDV - 65	66.0	1.4	10*	Polymer - ESP
PDV -100	57.5	2.2	20*	Polymer - ESP
Protecta*Lite	57.5	2.2	40*	Polymer - ESP
PVR	48.0	3.4	20*	Polymer - ESP
PVI	48.4	3.4	25*	Polymer - ESP
PVI - LP	48.0	3.4	17.7*	Polymer - ESP
VL	47.1	4.9	65	Porcelain
PVN	45.5	4.9	80*	Polymer - ESP
VN	44.2	8.9	93	Porcelain
VNX	41.8	17.0	65	Porcelain

Cost of the surge arrester increases as you progress down the list to larger diameter MOV blocks. In the world of surge protection you truly get what you pay for.

** These polymer housed surge arresters have the ability to withstand multiple reclose operations without exploding.*

General Information

- Hubbell has recently introduced the polymer distribution elbow (PDE™) arrester for URD protection.
- Ohio Brass has a full line of IEC and ANSI surge arresters.
- Ohio Brass offers surge arresters for protection of series capacitors.
- Ohio Brass has application software assistance to optimize line lightning protection.

Other Considerations

A supplier's long term reputation for quality and service is a major factor. The TOV (Temporary Over Voltage) capability of the arrester and how critical the equipment is that is being protected also must be taken into account. All of these factors should be considered as part of the total arrester selection process.

Conclusion

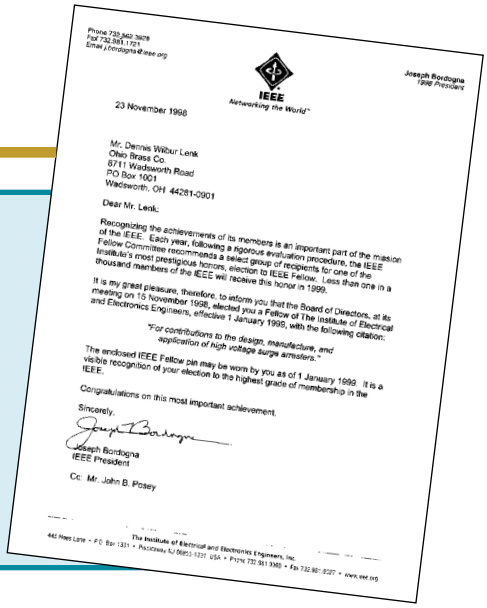
With this information it is a relatively simple matter to determine cost effective solutions to your surge protection needs.

We conduct training seminars on an ongoing basis. Contact your Hubbell account representative for additional information.

For more information, contact your Hubbell Power Systems representative or fax 573-682-8714.

OHIO BRASS VETERAN HONORED BY IEEE

Dennis Lenk, 30 year Ohio Brass veteran and principal engineer at the Ohio Brass facility, has been named an IEEE Fellow. Lenk is a registered professional engineer and is actively involved in the development of industry design and testing of arresters. He has been a member of the IEEE Surge Protective Devices Committee for the last 17 years and is currently the vice-chairman of the committee. He is also chairman of the NEMA High Voltage Surge Arrester Technical Committee. As an industry leader, Lenk is also a member of the ANSI Technical Advisory Group to IEC TC 37, which writes the (IEC) International design and testing standards for surge arresters.



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Joseph Bordogna
Vice President

IEEE
Advancing the World

23 November 1998

Mr. Dennis Wilbur Lenk
Ohio Brass Co.
8711 Wadsworth Road
PO Box 1001
Wadsworth, OH 44281-0901

Dear Mr. Lenk:

Recognizing the achievements of its members is an important part of the mission of the IEEE. Each year, following a rigorous evaluation procedure, the IEEE Fellow Committee recommends a select group of recipients for one of the Institute's most prestigious honors, election to IEEE Fellow. Less than one in a thousand members of the IEEE will receive this honor in 1999.

It is my great pleasure, therefore, to inform you that the Board of Directors, at its meeting on 16 November 1998, elected you a Fellow of The Institute of Electrical and Electronics Engineers, effective 1 January 1999, with the following citation:

"For contributions to the design, manufacture, and application of high voltage surge arresters."

The enclosed IEEE Fellow pin may be worn by you as of 1 January 1999. It is a visible recognition of your election to the highest grade of membership in the IEEE.

Congratulations on this most important achievement.

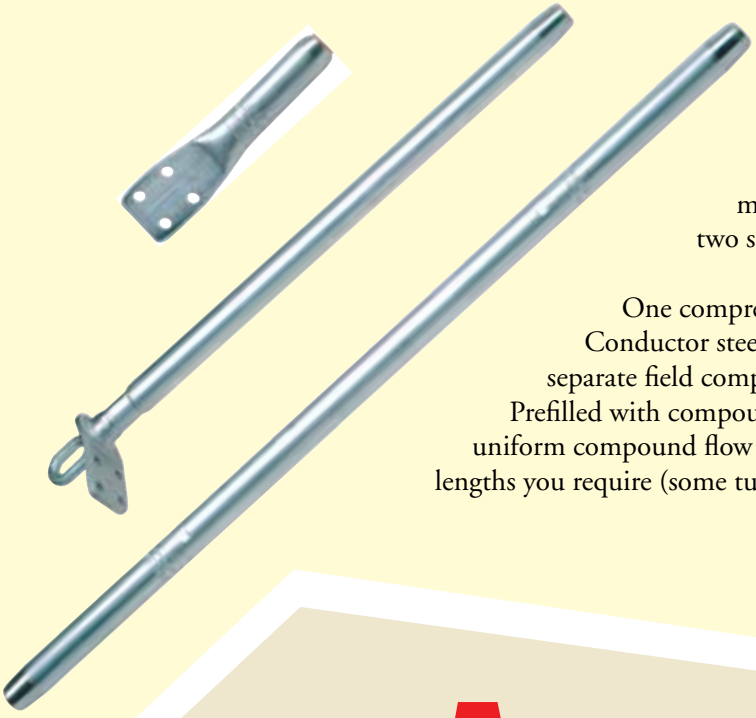
Sincerely,

Joseph Bordogna
IEEE President

Cc: Mr. John B. Posey

Transmission Line Repair

Look to Fargo Uni-Grip® Repair Deadends & Splices



Replace damaged transmission conductor or fittings on transmission lines using Fargo Extra Long SL Deadends and Splices. Quick. Install in minutes. No retensioning. No need for multiple fittings. Eliminate "bird caging" when using two splices in close proximity.

One compression die unites conductor and deadend/splice. Conductor steel core wires are held at full strength. No need for separate field compression of steel eyes, clevises and splice sleeves. Prefilled with compound. No field filling required. Center stops allow uniform compound flow around conductor during compression. Order in lengths you require (some tubes up to 70 inches) to fit specific applications.

Make it easy.

Anderson Versa-Crimp® Tool Repair

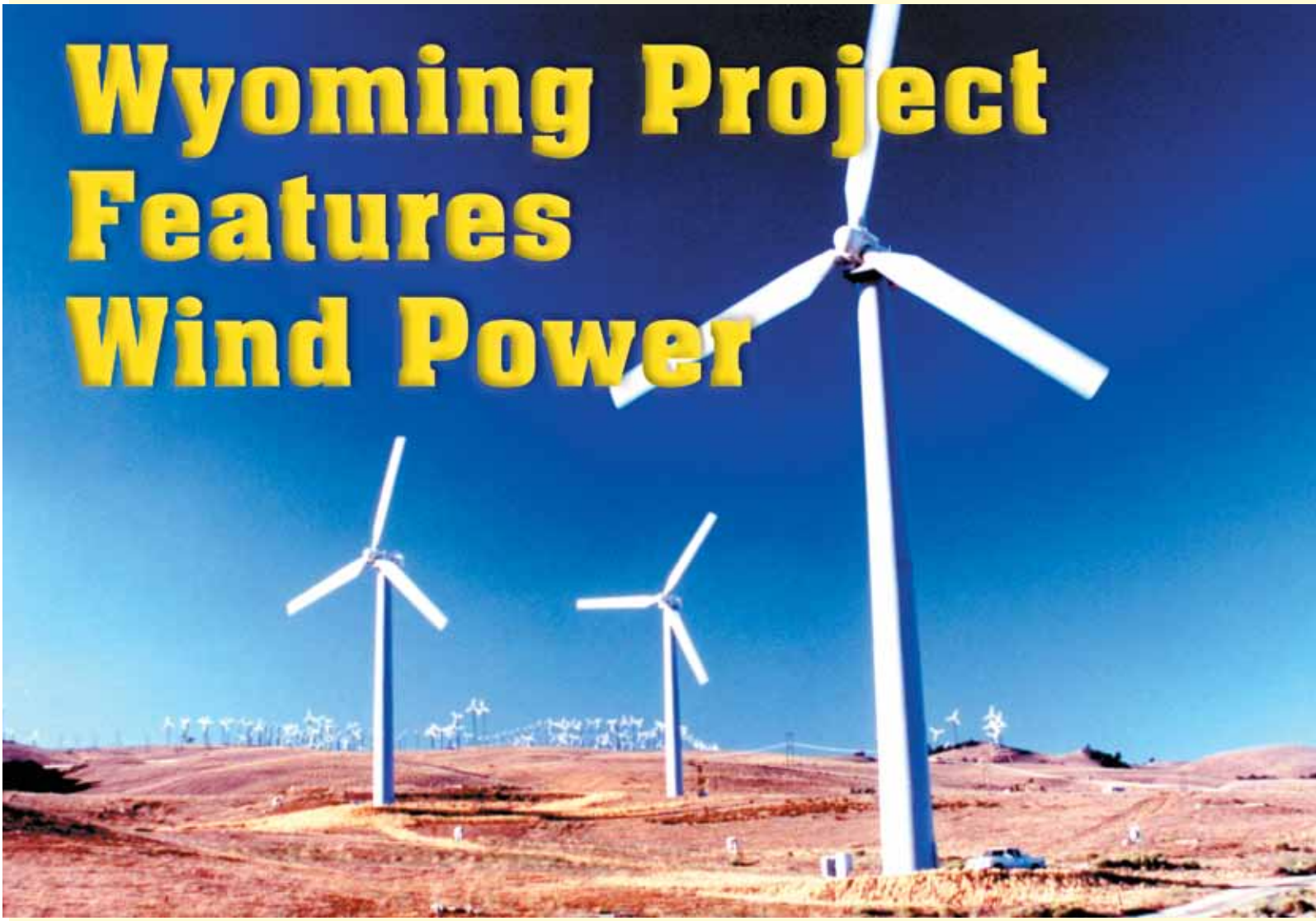
Here's the quick, efficient way to get Anderson crimping and cutting tools repaired:

1. Ship the tool to:
   Southern Assembly Service
   201-East Relief Street
   Poplar Bluff, MO 63901
   Attn: Gene Crawford.
2. Fax a copy of the packing slip with the following information to:
   Bob Levings, FAX 573-682-8647

   Include model number, serial number, your contact person for our estimate of repair cost, your phone number, shipping address and invoice address.

For more information, contact your Hubbell Power Systems representative or fax 573-682-8714.

Wyoming Project Features Wind Power



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SeaWest Energy Systems of San Diego, Ca. recently completed an ambitious turn key project for PacifiCorp and Eugene Water and Electric Board of Oregon — a $60 million wind plant located on 2,156 acres between Laramie and Rawlins, WY The plant on Foote Creek Rim, one of the windiest sites in the country, will use 69 wind turbines to generate 41.4 megawatts of electricity, or enough renewable energy for 15,000 to 25,000 customers.

The turbines, which are rated at 600 kW each, generate power at wind speeds ranging from 11 to 63 mph. The three fiberglass composite blades provide a rotor diameter of approximately 137 feet for a total swept area of approximately 46,300 square feet. The project is the largest wind

energy plant in the West (with the exception of California).

From the standpoint of wind the site is ideal (the Foote Creek Rim has average winds of 25 mph). However, PacifiCorp's interest in preserving the visual appeal of the landscape, and ensuring reliability during all weather dictated the use of underground distribution cable — a challenge to crews working at 7800 feet with temperatures as low as 30 below.

For this project we used Kerite® 35kV power cables, 35,000 feet of 1000MCM, AL, and 98,000 feet of 1/0 AWG AL cable. Kerite personnel assisted us in providing the calculations needed to configure the capabilities of putting two cables in one trench. Kerite's technical assistance was helpful to us on this project.

Kerite power cable's EPR (ethylene propylene rubber) insulation was an advantage in the cold weather because it made the cable more pliable during installation in the trenches. We also found this attribute made it easier to make a "service loop" of the cable above the transformer bushings. The service loop provides enough cable length to replace the end of the cable without having to add cable splices or pull new cable.

The Foote Creek Project enables PacifiCorp, Eugene Water and Electric Board and Bonneville Power Administration (another power purchaser) to diversify their resource mix. As suppliers, the companies can offer their customers the benefits of electricity generated by renewable energy. ■

Wind power is emerging as an attractive source of alternative energy. Since the first comercial projects in the early 1980s, firms such as SeaWest Energy Systems, have led in technology development that has positioned wind energy as a leading source of "Green Power." The idea of environmentally friendly renewable resources is appealing to a broad enough segment of the population that utilities in several states offer consumers the option of paying a premium for Green Power.

For more information, contact your Hubbell Power Systems representative or fax 573-682-8714.

Cover Up Equipment Update

Steel poles and crossarms now covered by new devices for hot-line work

Considered conductive for energized work, distribution crossarms and poles must be covered to help prevent accidental contact. Now, new Chance items developed for that job merit your consideration.

New size covers for steel poles

To fit steel poles, a new 6" diameter joins the line of Chance pole covers for up to 36 kV phase-to-phase. All meet Class 4 requirements, are made per ASTM F968 and are tested to ASTM F712.

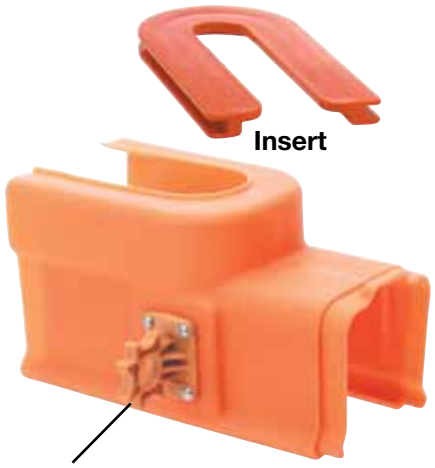
Device to help hold pole covers

To help keep pole covers in place, especially on smooth surfaces, a new Rope Lock device is easy to place and remove. It may be applied midway or as a lower support on 6", 9" or 12" diameter pole covers. Instructions are included for simple installation by hand and removal from ground level with a hot stick.

Rope Lock Assembly
Catalog No. C406-0547

Adjustable crossarm cover

A new rigid cover up fits wood or steel crossarm sizes up to 3¾" x 4¾". The two-piece design telescopes from 13.1 to 20.9 inches for easy adjustment to various lengths. With its removable insert in place, the cover fits close on pin insulator construction. For a similar fit on post insulators, the insert simply is not used. A hotstick adapter allows easy placement and removal by a Grip-All clampstick from most access angles. ■



Insert

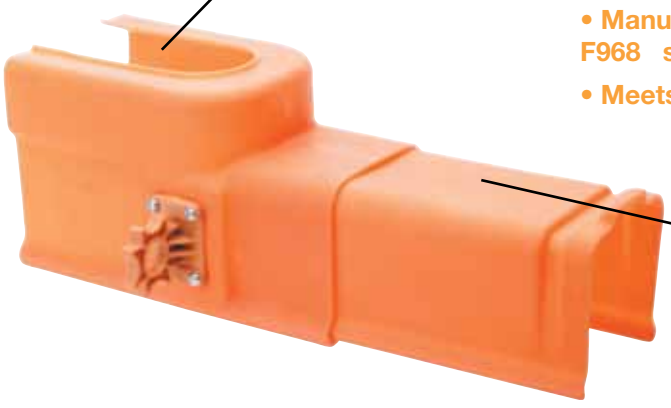
Grip-All adapter permits handling with clampstick.

Insert in place for pin insulators

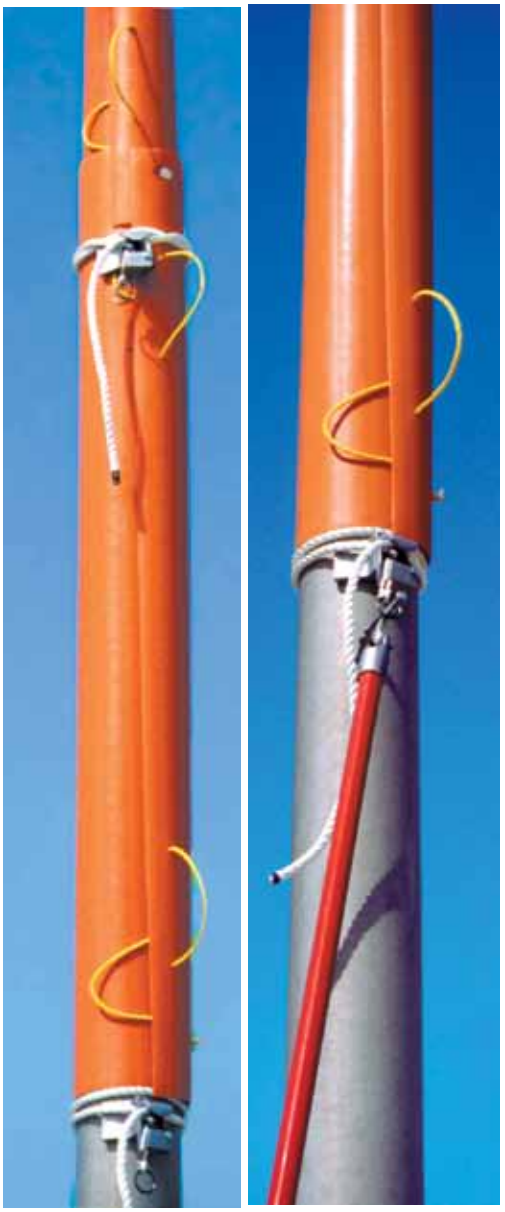
Crossarm Cover Up
Catalog No. C406-0504

- **Tested to ASTM F712**
- **Manufactured to ASTM F968 specifications**
- **Meets Class 3 requirements**

Insert removed for post insulators



Sliding sections extend or retract to cover exposed crossarm.



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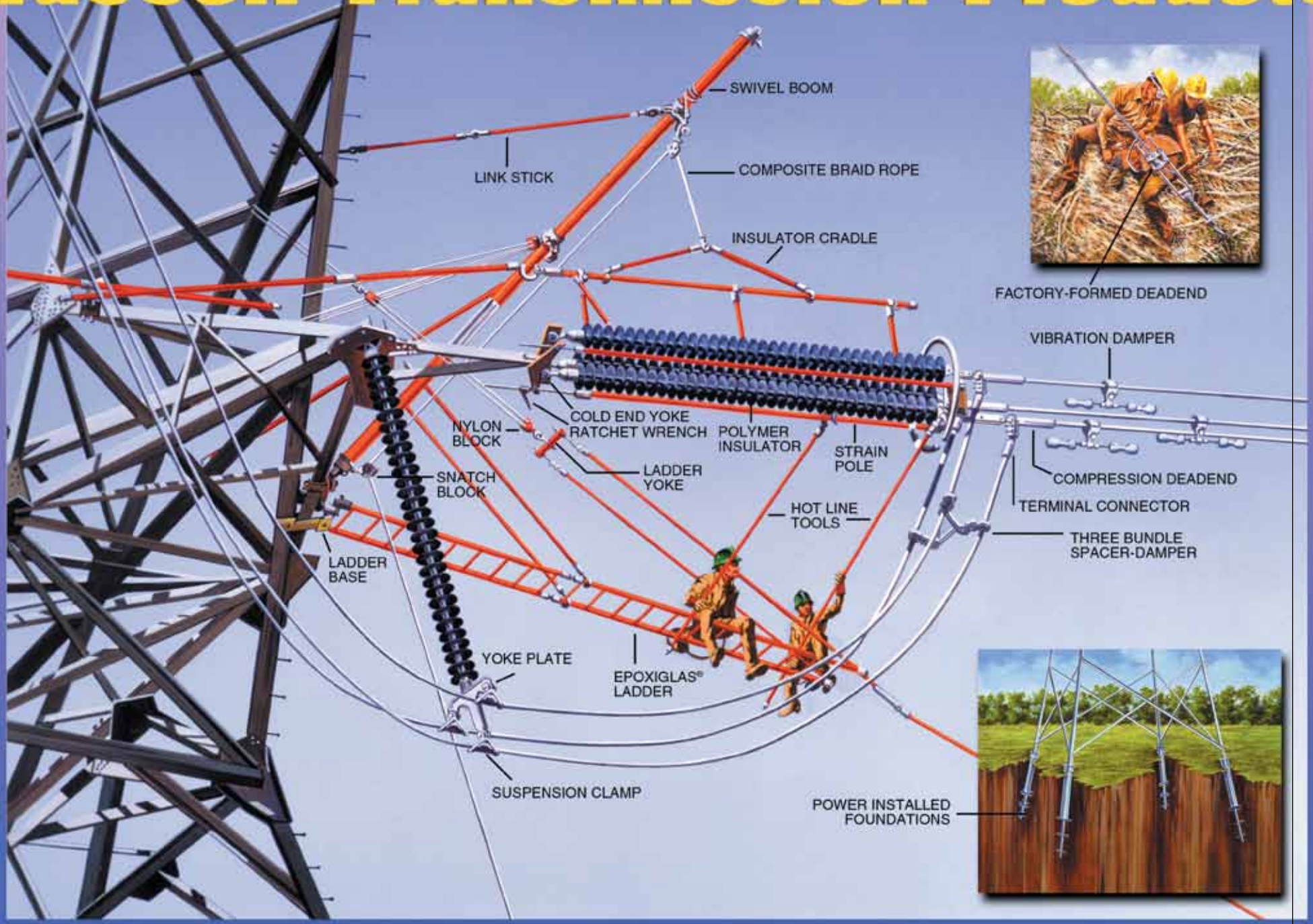
Hubbell Transmission Products



Connector Prevents Elbow Overheating

Chardon has the solution to elbow overheating. The new PROBELOK™ Connector Elbow has a special insert that holds the threaded connection tight, even if flexing causes it to turn. Conventional elbows use simple threaded connections between the cable connector and probe. When a lineman has to twist an elbow to put it on or pull it off, this connection loosens. Even a quarter turn can cause the connection to wobble ever so slightly. That wobble creates hot spots that can cause elbow overheating and failure. One service call to repair an overheating elbow can cost hundreds of dollars so preventive protection with PROBELOK™ Connector Elbows and reduced service calls directly improve the bottom line. PROBELOK™ Connectors are warranted for five years against overheating. ■

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Your suggestions and editorial or photographic contributions are invited and may be submitted to **Hubbell TIPS & NEWS.**

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