

TIPS & NEWS

Vol. 4 No. 2 APRIL 1998

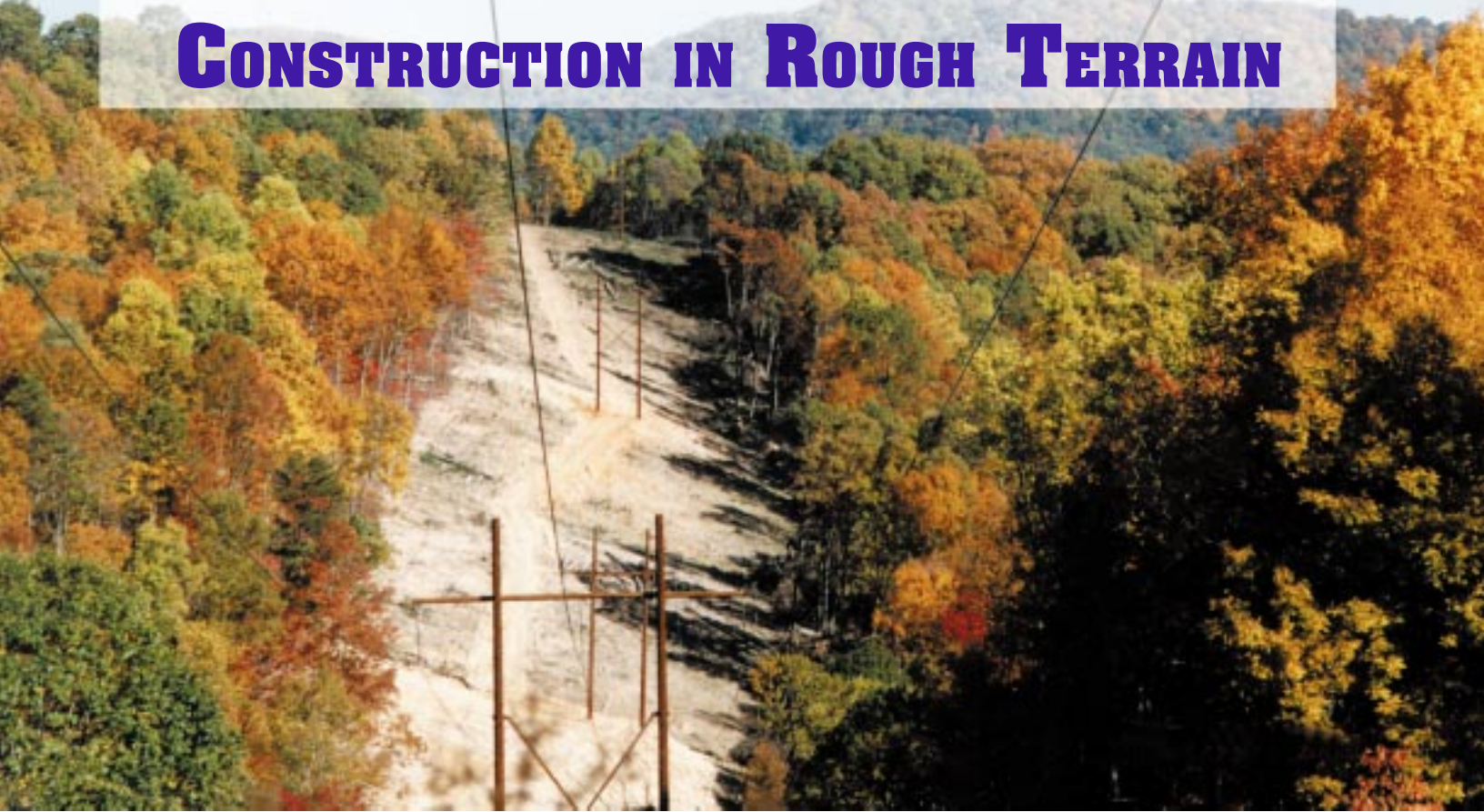
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Anderson • Chance • Fargo • Hipotronics • Kerite • Ohio Brass



**Co-op Installs
Hi*Lite® Insulator
at 161kV**

Hi*LITE INSULATORS EASE LINE CONSTRUCTION IN ROUGH TERRAIN



Left to right: Virgil Mathews, TVESCO; Author, Randall Meyers, Powell Valley Electric Coop; Chuck Pedigo, TVESCO.

As a former lineman, I knew the construction of a 37-mile, 161kV line through the hills of Tennessee would be difficult. By adding a tight deadline and a tight budget to the picture, our team knew we had a challenge.

We looked to the experience of Tennessee Valley Electric Supply Co. of Knoxville and Virgil Mathews. Virgil handled the procurement, expediting of materials, and contact with consulting engineers to get material approval. Ninety percent of the construction work was done by Powell Valley Co-op personnel. Only the right-of-way clearing and wire stringing were contracted.

The line was built on direct bury weathering steel poles with horizontal line post, braced horizontal line post and suspension type construction. All three were necessary due to the terrain and because of right-of-way considerations. We used Ohio Brass insulators, A. B. Chance anchors and hardware, and Anderson connectors. Anderson line hardware was also used.



We realized great cost savings by using polymer insulators rather than porcelain. The cost savings were contributed to the lighter weight, ease in handling and transporting, and ease in installation. Because of the Ohio Brass insulator strength, we were able to make longer spans. This meant fewer poles which increased our savings. The Chance anchors worked very well.

We are planning a 14-mile 69kV line. It, too, will be built on steel poles with Hubbell products. We plan to incorporate Protecta*Lite arresters instead of an overhead shield wire for lightning protection at a much reduced cost while improving performance due to a shorter line.

Powell Valley Co-op has purchased Ohio Brass, Chance and Anderson distribution materials from TVESCO for many years. We have always been pleased with their performance. It was natural that we turn to them when we started working on the 161kV line. We were not disappointed. Not only was the project completed on time, it was energized well ahead of schedule. The performance of the materials and the personnel we worked with were excellent. We recommend Hubbell and TVESCO to anyone planning to build a power line. ■



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

Hi*Lite XL Insulators for Contaminated Environments



Tracking test



Major/Minor sheds



If you have a contamination problem, Ohio Brass has the insulator solution. Now available is the Hi*Lite XL insulator with higher leakage distance.

What's New?

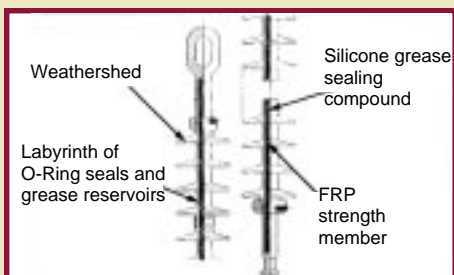
The Hi*Lite XL has 2.5 inches (64 mm) of leak per inch of dry arc. The new options available are 2.9 in. (74 mm), 3.3 in. (84 mm) and 3.8 in. (97 mm).

The alternating major/minor shed diameter design allows for the new increase in leakage. The increases were selected for contaminated environments where more leakage distance is specified for the same insulator length.

Hi*Lite XL meets the contamination levels of all industry recognized standards.

What's the Same?

Hi*Lite XL has retained the same design concepts that have made Hi*Lite a superior insulator for over 22 years and one million units in service.



- **Quality Fiberglass Rod** — Produced from the highest quality materials, strands are aligned for maximum tensile strength. The rod is more than 50 percent fiber in cross section.

- **Most dependable “live” silicone interface** — Hi*Lite insulators use Ohio Brass’ patented live silicone interface. This feature prevents intrusion of moisture and contaminating elements. If the exterior seal is damaged, redundant O-ring seals within the live silicone interface prohibit the lengthwise migration of intrusive elements between shed and rod.

- **ESP Silicone Alloy Housing**: — With the contamination performance and hydrophobicity of chemically alloyed silicone added to the mechanical strength and electrical resistance of EPDM, ESP is an excellent insulating material. All material will lose hydrophobicity for some amount of time while under electrical stress. ESP silicone alloy is formulated to be resistant to this stress when the polymer is most vulnerable.

This new Hi*Lite XL with variable leakage distance makes it possible for you to install an Ohio Brass quality insulator in any environment in the world.

- **End Fittings** — End fittings are steel or ductile iron. They are crimped directly to the rod, developing a high percentage of the rod’s inherent tensile strength. It requires no inter-movement of the parts to achieve high strength, nor does it introduce potting compounds or adhesives.

Mechanical Ratings

Hi*Lite XL insulators are rated and tested in accordance with the latest ANSI Standard C29.11, C29.12 and IEC 1109.

SML Ratings are 25k, 30k and 50k ANSI, as well as 120kN, 160kN and 210kN (IEC).

RTL Ratings are consistent with ANSI and IEC Standards. Actual factory routine tests are conducted at loads equal to or greater than the RTL rating.

RTL and SML Ratings are permanently embossed on the insulator ground end corona shield ring. ■

For more information, contact your Hubbell representative or fax (573) 682-8714.

AN OPTION TO LEAD THREAD INSULATOR PINS

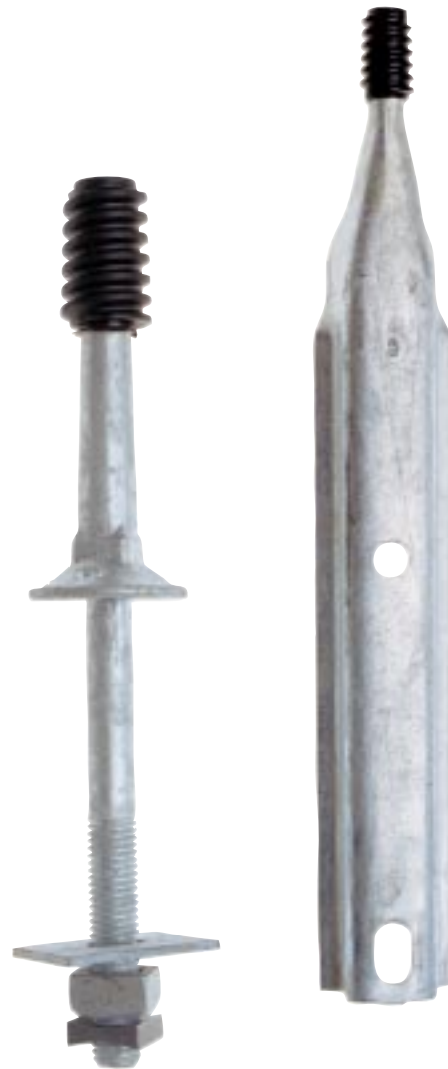
Look at the nylon thread advantages

Look at the advantages of specifying nylon threads over lead threads. Chance now offers both nylon or lead threads on insulator pins:

- Improved impact resistance
- More resilient, firmer insulator fit
- No lead disposal worries
- Environmentally friendly

In our testing, the nylon threads meet or exceed all ANSI requirements and performance is equal or superior to lead threads. Test information is available to you upon request.

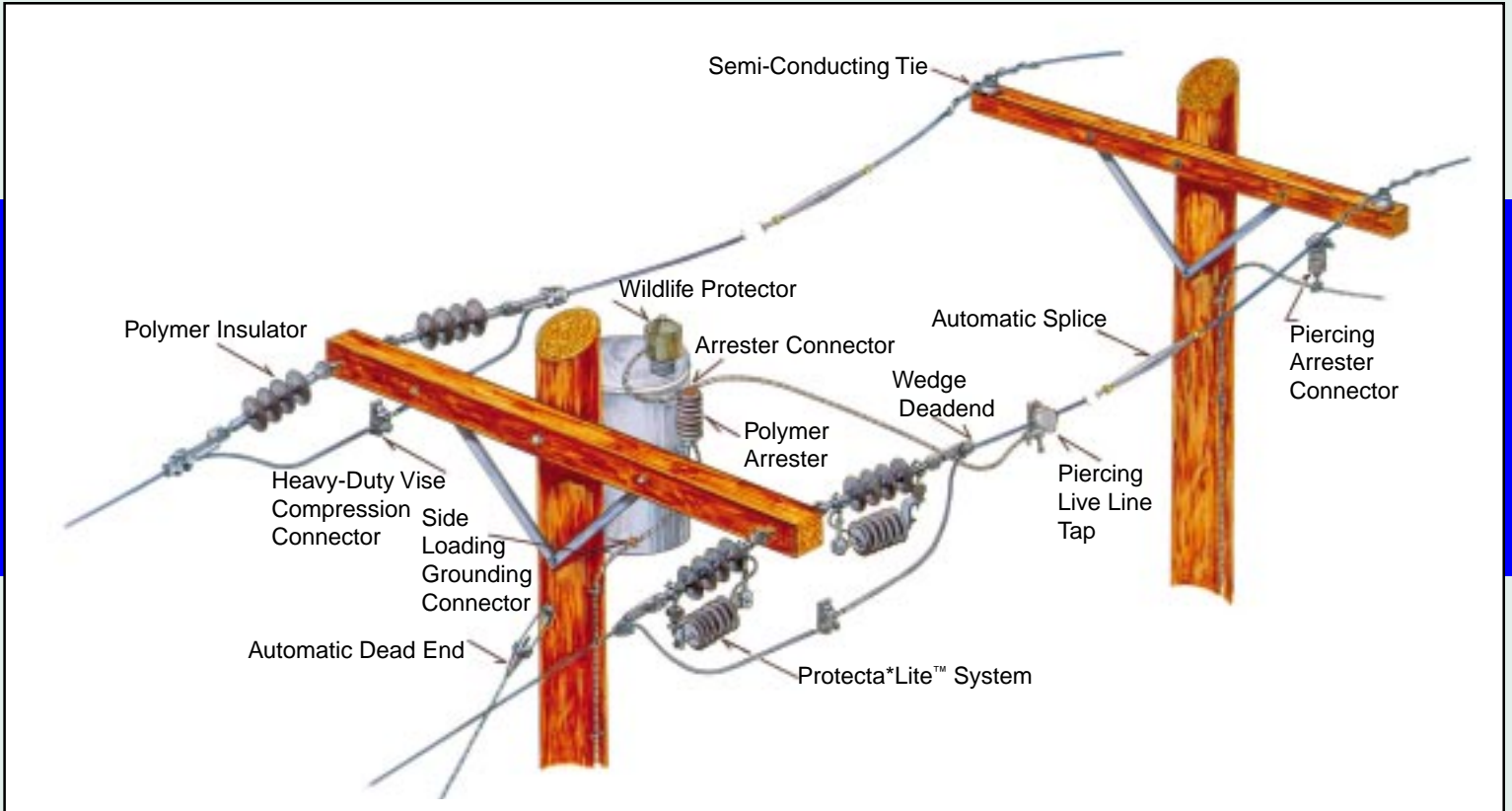
Nylon threads may not be a factor in your evaluation of requirements, but it's good to know Chance has the ability to meet your needs if required. ■



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

COVERED CONDUCTOR SYSTEMS

improve dependability



The Fargo 10 step CoverTec System is designed to improve and protect the performance and dependability of your covered conductor system upfront while minimizing repair and maintenance costs later. The CoverTec system is truly preventive maintenance.

Using the Fargo approach, each component of the CoverTec system works with the others to enhance your system and ward off problems that can arise over time. For example, Fargo arrester connectors save the cost of mounting hardware. Conserves pole space, too. Threads onto the arrester stud and allows arrester changeout without service interruption. Or, take the

SYSTEMS NEED COVERTEC

reliability and performance



Fargo wedge deadend. It creates a permanent connection. A connection that will last. The wedge action develops the full rated strength of the conductor. You reduce deadend inventory because Fargo wedge deadends accept a wide range of conductor sizes. It's the superior way to deadend.

Wildlife! Great to observe and enjoy, but potential disaster for the critters and your system. Using Fargo wildlife protectors, live parts are covered and insulated, thus protecting from faults caused by accidental contact. All the components of the CoverTec System require minimal stripping. No special installing tools.

Ever. Install with gloves or liveline tools. And, all the components accept a wide range of conductor sizes. You cut inventory.

If disaster strikes and time is everything, Fargo automatic splices and deadends for securing conductors and guys are about as quick, proven and dependable as you can get. Brush the oxide from the conductor; cut to the proper length; insert in the automatic. You're done. Jaws will automatically grip when tension is applied. Whether used on new construction or to repair a system in distress, the Fargo CoverTec System will save you money and buy you time when it's most needed. ■

For more information, contact your Hubbell representative or fax (573) 682-8714.

LAKELAND, FLORIDA'S “EPC” PROJECT

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One of the authors, Jason Handley and crew.

When the City of Lakeland, Florida put its new 69kV substation project out for bid as an “EPC” or “total turnkey” project there were two important considerations: time and water.

It was critical that the new substation be completed on time to carry the winter peak load. In addition to the time factor, the water table at the City’s new substation site was within two to three feet of existing grade. Thus it was imperative that the distribution cable be able to withstand water intrusion.

As a “total turnkey” or “EPC” project, the successful bidder was expected to be responsible for everything from design to bidding out materials to actual construction (the only item that the City of Lakeland provided was the transformer).

Florida Power Corporation provides electric service to approximately 20,000 square miles in 32 Florida counties. This was the second time that Florida Power Corporation, an investor-owned electric utility, had bid on a project outside of their core business and the first time they had won a bid.

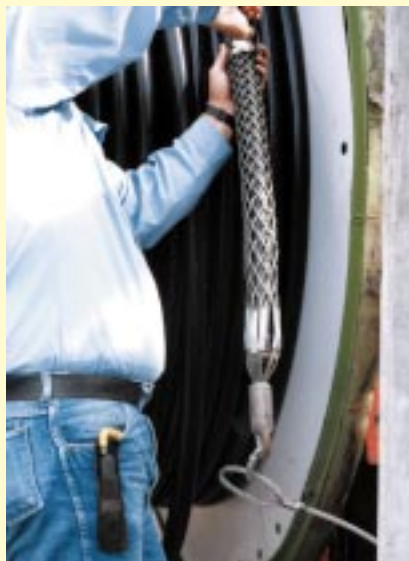
The new substation consisted of a 18/24/30MVA 69-12.47kV transformer and three 12.27kV feeder positions with regulators to the 1000MCM copper underground feeder circuits. There was a total of four cable manufacturers that met the City of Lakeland’s specifications for the underground distribution cable. Kerite was one of them.

Kerite’s service record, competitive pricing, and ease of termination were factors that lead to the selection of the Kerite cable for the project.

Since the scheduled in service of the project was very important, on time



Starting to unreel cable for pull.



Completing pulling grip for cable pull.



Pull completed.

delivery of materials was imperative. Kerite met its promised delivery and the cable arrived in good condition. Throughout the project, Kerite's technical support was helpful and timely.

The Kerite cable used for the project was 15kV, 220 mil double Permashield® insulation system, 9-16 AWG Concentric copper wires, with an 80 mil PE jacket. Because this cable was not the triplexed three-phase that Florida Power Corporation normally used, each of the cables was placed on separate reels. The lengths ordered were 1400, 1800 and 2300 feet respectively (the weight of the reels ranged from 7070 lb. to 10,920 lb.).

Because the water table at the substation's site was so close to the surface, well points were utilized to remove ground water before the duct bank could be installed. The technical specifications required a minimum cover of 48 inches to finished grade. The bank, which

consisted of 17 four-inch PVC conduits (15 for the three feeders and two for fiber optic), is more than eight feet in the ground at the lowest point. This puts the cable below the water table.

Kerite power cable's EPR (ethylene propylene rubber) insulation with a proven performance record (including submarine applications) is testimony that the cable will perform well under these conditions.

Kerite's reputation for reliability is expected to allow Lakeland to realize maintenance and replacement cost savings over the life of the cable (more than 40 years).

The entire project was put in service on December 19, 1997 on time and within budget — approximately eight months after the City of Lakeland initiated their first "EPC" project with Florida Power Corporation. ■

... two important considerations: time and water.

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

Arrester

LIFETIME & REPLACEMENT SCHEDULE

A common question is how long should a distribution class arrester be in service before it needs to be replaced. There are several factors that will influence this decision. The first concern is if the arrester can still do the job of protecting equipment from overvoltage surges. A second concern is the ability of the arrester to withstand the system line-to-ground operating voltage.

Protective Level

The condition of a surge arrester relative to its protective levels is almost impossible to determine in the field. The proper way to check the performance of the arrester is to bring it into a laboratory environment and measure its sparkover if it is a gapped type arrester (i.e., Silicon Carbide or gapped MOV). The sparkover voltage of these arresters is often the limiting factor as to the arrester's level of protection.

For gapless MOV arresters, the appropriate property to measure is the discharge voltage (clamping voltage) of the

arrester while discharging a current of a specified level. This is usually measured with a 10 kA surge current. This value is then compared to the



Due to internal airspace and threat of moisture ingress, polymer arresters should replace porcelain.

manufacturer's catalog discharge voltage to make sure the arrester is still clamping below this level.

You can appreciate the difficulty in measuring these values in the field. A good indication might be to look at the maximum change in these properties allowed

by industry standards after the set of standard design tests. For MOV arresters, the maximum increase in discharge voltage permitted is 10% and for SiC type arresters, it is 20%. This means that after having seen duty, an in service SiC arrester may have experienced a larger degradation in its protective properties compared to MOV designs.

Power Frequency Voltage

The ability of the arrester to withstand the system voltage lies with the arrester being at high resistance at normal line-to-ground voltages. When this ability is compromised from things such as MOV or SiC block failure, moisture ingress or other causes the arrester may fail. The dielectric integrity of the arrester can be measured by the use of a simple

megger, meters made by Hi-Test Detection, Inc. or Doble type test equipment. The arrester should appear electrically as an open circuit since its impedance is so high. If the arrester appears as a low resistance, it should be replaced.



The cost of performing field tests on distribution arresters may at first seem to be cost prohibitive compared to the cost of the product itself. However, because these arresters are installed in areas that are in direct contact with the general public, a failure of one of these arresters could pose a safety hazard. Therefore, the industry needs some general guidelines, especially in regard to the large number of porcelain-housed SiC arresters in service.

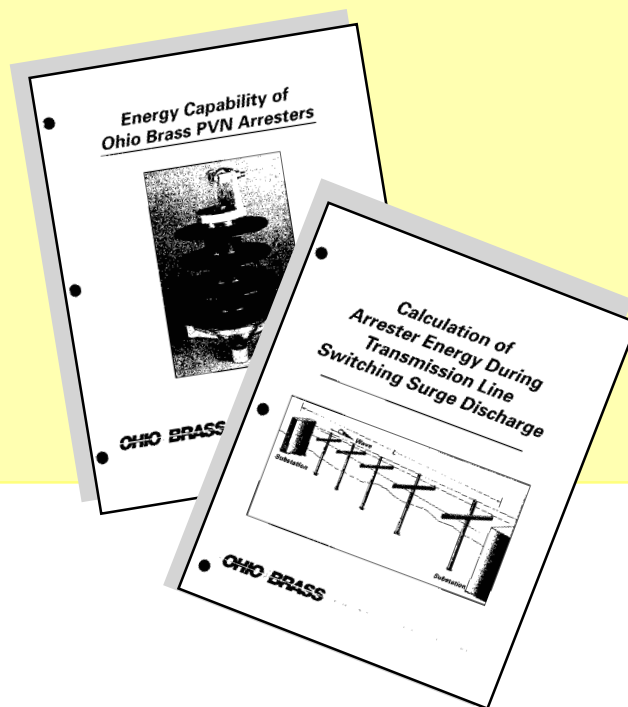
Recommendations

A recently published IEEE paper gives some guidance in this issue. This paper by Dr. M. Darveniza appeared in the October 1996 issue of the IEEE Transactions on Power Delivery. Due to concerns over possible moisture ingress, this paper recommends that all silicon carbide porcelain arresters that have been in service for over 13 years be replaced. He concluded that degradation was evident in 75% of arresters tested.

Competitive Pressure Got You Down?

It seems that every other article in industry trade magazines deals with competitive and deregulation issues. The utility landscape is changing more rapidly today than ever in the past. One of the ways that utility companies can reduce costs is by using less expensive surge protection. Ohio Brass can help with this evaluation by providing information on the amount of energy that a transmission line can deliver to the surge arrester. This information will allow the utility to determine if a station or intermediate class surge arrester is needed.

You can get additional information on this by ordering Ohio Brass publication EU1426-H "Calculation of Arrester Energy During Transmission Line Switching Surge Discharge" and EU1427-H "Energy Capability of Ohio Brass PVN Arresters". ■



For more information, contact your Hubbell representative or fax (573) 682-8714.

If you're going with fiber optics, *Anderson fiber optic clamps* go there with us. . .

With today's emphasis on energy management and communications becoming more important and faster than ever, Anderson fiber optic clamps offer a unique clamping action that will help you obtain the dependable service levels you require.

With Anderson clamps, the clamping force is equally distributed around the circumference of the fiber optic cable, thus allowing maximum frictional forces to be applied to the cable without damage to the fiber optic strands.

Fiber optic cables are completely protected while installers can apply torque without damage to the optical fibers. But, Anderson doesn't stop there. These clamps are range-taking. That means one clamp accommodates a range of cable designs and sizes. You reduce inventory. Avoid confusion. A handful of clamps are all you need to give you the versatility you require.

Accommodate cable configurations from .450 to .625 inches. Fast installation. No armor rods needed. Optional ground feature. All three designs have an ultimate body strength of 15,000 pounds and will withstand an unbalanced load of 5,000 pounds. Other features include a 20° sag angle on each clamp end, a ground attachment point and swing away keepers for easy installation of *Optical Ground Wire (OPGW). Made from constructed cast and extruded aluminum.

Because of the efficient transfer of friction forces to the OPGW by our patented clamping mechanism, we are



able to reduce the length of the clamping area along with the number of bolts used when compared to other bolted designs. We feature three and four member clamping mechanisms.

While the three-member clamping design does not provide as much clamping force and does not transfer as much frictional force to the OPGW as the four member clamping design, it allows us to build a more compact clamp using the three member clamping design. Because the tower guide clamp and the ground clamp are not required to resist the high levels of tension on the OPGW, as the deadend and suspension

**Fiber optic composite cable (or optical ground wire - OPGW) is used in the construction of utility transmission lines. It replaces overhead ground wire and serves dual purposes: 1. Protection to phase conductor on the transmission line from lightning damages and short circuit conditions. 2. Communications applications. The optical fibers are housed in a cavity within the central core of the cable. The core provides protection to the delicate optical fibers. On the outer surface of the cable, smaller wire strands are spirally wound around the core to form the cable.*

Figure 1

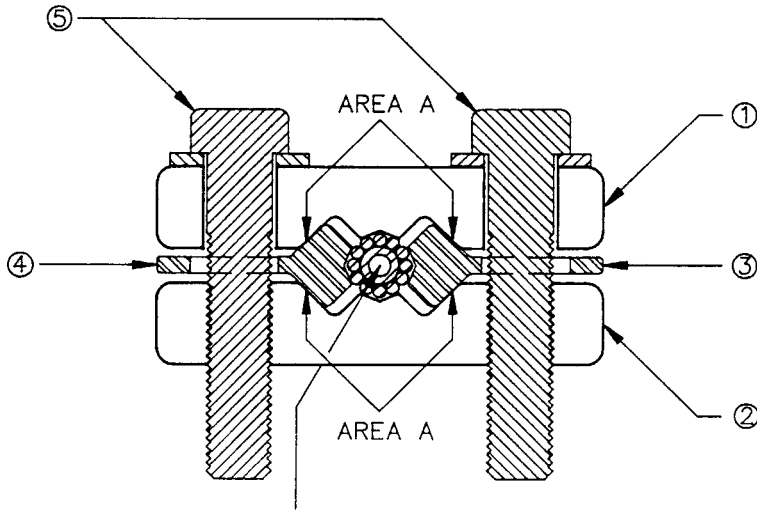


Figure 1 shows a cross-sectional view of the range-taking clamping mechanism which is used in our Fiber Optic Dead End and suspension Clamps. Four clamping members (1,2,3 & 4) are secured with bolts (5). As the bolts are tightened, clamping members (1) and (2) move closer together in the direction parallel to the center line of the bolts.

Clamping members (3) and (4) have sliding contact with clamping members (1) and (2) at the areas designated (area A). These sliding contact areas force clamping members (3) and (4) to move in a direction perpendicular to the center line of the bolts. The movement of these clamping members (1,2,3 & 4) is equal in magnitude and toward a common point which coincides with the center line of the cable being clamped. The grooves which contact the cable are "V" shaped. This allows each groove to contact the cable at two points and provides a total of eight contacts around the circumference of the cable. This results in equally distributed clamping forces and minimal damage to the cable, and the ability to clamp various cable sizes with the same clamp.



clamps are, the three-member clamping design was incorporated into these clamps, so they would be as compact as possible.

The ground clamp is used where additional ground attachment points are required in addition to those supplied on the deadend and suspension clamps. The ground clamp differs from the tower guide clamp in that it has one groove which incorporates the three member clamping mechanism for clamping OPGW and one circular groove for accepting a standard ground wire.

The tower guide clamp is used to train the OPGW down and back up the leg of a tower when splices or connections to equipment are made. The bolt provided in the clamp is long enough to pass through a hole in the tower leg with the nut being secured on the back side of the leg. An optional "C" clamp can be provided with the tower guide clamps which attaches to the tower leg without punching or drilling any holes. ■

Fiber Optic Deadend Clamp (top)
Accommodates different cable configurations from .450 to .625 inches. Used to deadend optical ground wire and provide additional grounding points. Eliminates the need for special testing on various cables. No armor rod required. Sagging eye feature allows cable tensioning during installation. Made of cast and extruded aluminum with stainless steel hardware.

Fiber Optic Ground and Tower Clamps (bottom)
Accommodates conductor ranges .450 to .625 inches. Allows different brands of fiber optic cable to be used in a single clamp without damage to the fibers. Gives range-taking options to utilities installing fiber optic conductor. The ground clamp provides connections between optical ground wire and standard ground wire. The tower clamp helps secure optical ground wire down the leg of the tower. Made from extruded aluminum.

For additional information, contact your Hubbell representative or fax (573) 682-8714.

HIPOTRONICS FIELD AND TEST MEASUREMENT CATALOG

This recently revised 52-page catalog from Hipotronics includes information on Oil Dielectric, DC Dielectric, High Current, Portable AC Test Sets, Vacuum Bottle, Aerial Lift and Turns Ratio Test Sets; Cable Fault Location Equipment, TDRs and Accessories. For rugged, portable equipment for laboratory or field, look to us. ■



Hipotronics is the industry leader in cable fault location equipment with a complete family of fault locators.

For additional information fax (573) 682-8714.

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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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