

HUBBELL[®] TIPS & NEWS

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Upgrade quadruples 230kV line capacity

Critical line for Northwest supply and reliability
using Hubbell hardware and insulators

On the cover: Workman in bucket prepares Anderson ACSS high temperature rated suspension clamp to accept the Ohio Brass polymer 230kV insulator.

Below: Anderson shackle hardware used to fasten polymer insulator to davit arm plate.



*By:
Ken Sweigart, Senior Transmission Design Engineer
and
Dave James, Project Manager, Avista Utilities*

A newly reconstructed 230kV transmission line, the Beacon-Rathdrum line, being built by Avista Utilities, Spokane, will not only benefit Avista customers, but is also a critical component to regional supply and reliability in the Pacific Northwest. The line supports a transmission path jointly owned by Avista and Bonneville Power Administration (BPA). BPA is the “West of Hatwai” path operator and owns 500kV lines that run east-west from Montana generation sources to urban load centers in Avista’s service territory and those on the I-5 corridor. Increasing capacity of the “West of Hatwai” cutplane will mitigate a known transmission constraint, improve service reliability and support economic development in the region.

For the past 20 years or so the lines through this path have been recognized as a constraint in the northwest power delivery system: The 1996 outages on the west coast and

the energy crisis of 2001 pointed to the need for increased transmission. BPA is building a new 500-kV line; but without upgrades to the Avista system, BPA will not realize any additional capacity on its system. Several upgrade projects are planned for Avista's power system, including the Beacon-Rathdrum line project which will reconstruct the Rathdrum substation as a fully redundant, double bus, double breaker facility.

This line will both contribute to a regional solution and enhance the ability of Avista to serve its customers. Expected to be the most significant line from a mechanical and electrical capacity standpoint that Avista has ever constructed in its history, the line is being upgraded from a 300-MW single circuit to a 2000-MW double circuit system.

Line parameters

Existing wood H-frame structures support a single circuit 230kV line between Beacon and Rathdrum

substations. Reconstruction of this 26-mi line called for these structures to be removed and replaced by self-supporting single steel poles on caisson foundations. Ranging in height from 95 to 130 ft, the steel poles create an average span length of 800 ft. The conductors are vertically configured with two shield wires on top, one of which will contain an optical fiber for SCADA communications. The structures were designed with additional length of arms and permanent climbing ladders allowing one circuit to be worked on while the other one remains energized.

The 1590 kcmil ACSS (Aluminum Conductor Steel Supported) "Lapwing" conductor was chosen because Avista currently uses the Aluminum Conductor Steel Reinforced (ACSR) version of "Lapwing" on its system. The ACSS will allow the circuit to be operated at 392°F (200°C) and achieve the 1000-MW transfer capability per circuit that was required; almost quadruple the typical Avista 230kV circuit capacity.

continued . . .



Below: Close-up view of polymer insulator string attached to Anderson ACSS suspension clamp.



Construction

Construction started on the foundations in early summer 2003, taking daily line outages only as needed. Annual reduction in Avista's system loads allowed for the existing line to be taken out of service permanently in September 2003 to allow the poles and wires to be installed. The scheduled completion date is March 2004. As this is the first in a series of planned upgrade projects for Avista, it was critical that this project be completed on, or ahead of schedule.

Hubbell products key to success

The high operating temperature of the line is an ideal application of the Anderson ACSS suspension clamp. Avista has ordered 1000 of these clamps, designated CFSHT (Corona Free Suspension, High-Temperature). Designed with an aluminum alloy which retains its strength at temperatures well above the 93°C anneal temperature limit for standard alloy (A356-T6) aluminum clamps, CFSHT clamps are rated for operation on ACSS and similar high capacity conductors with continuous operating temperatures up to 250°C. Anderson hardware items such as jumper post clamps, turnbuckles and clevises are also being used.

Fargo compression deadends and full-tension splices were selected and are installed using Hubbell's new high-temperature joint compound, designated HTJC. Use of this synthetic-based, conductive-grit compound reduces the connection resistance and connector temperatures by up to 18% compared to traditional joint compounds.

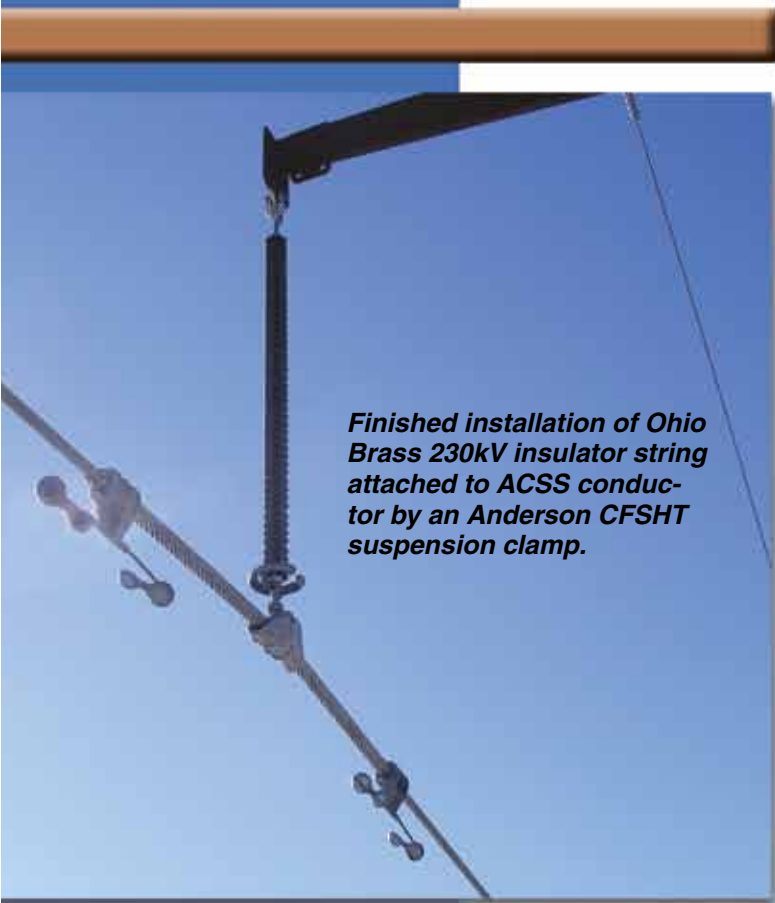
And Ohio Brass polymer 230-kV insulators will be used on tangent and suspension poles, hanging vertically. The same insulators will be used in the deadend configuration as for the suspension configuration. For deadends, insulators will be doubled up and separated with a yoke plate.

Delivery critical

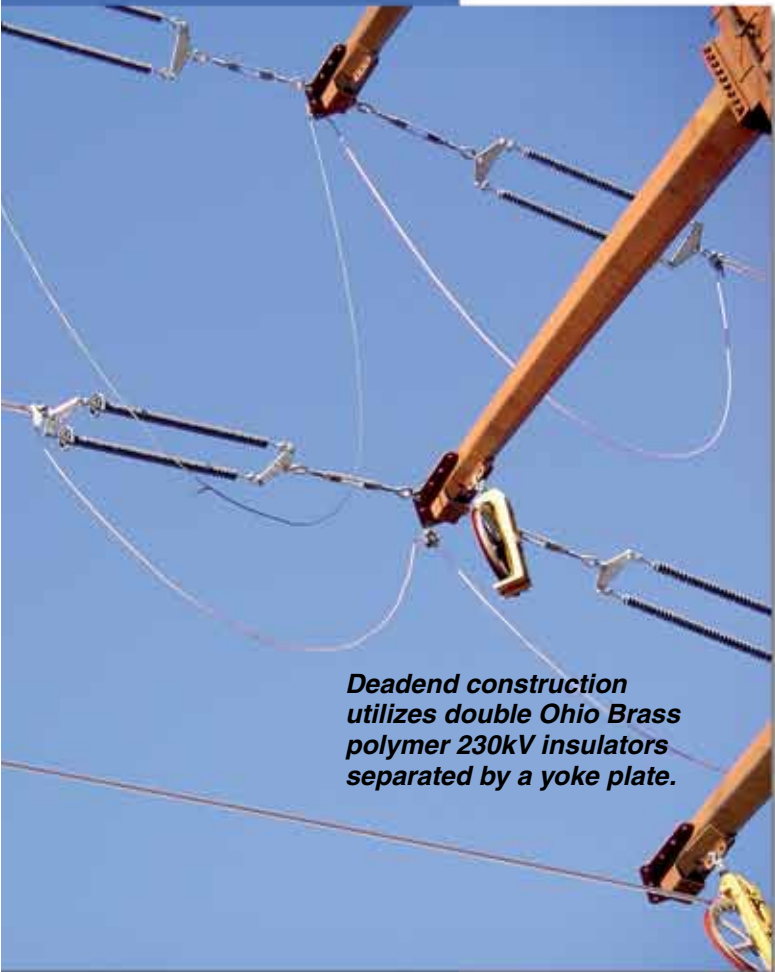
This project is just the first of many that Avista is undertaking for part of an overall solution for capacity and reliability of power delivery for the Pacific Northwest. So, it was important to Avista to get this first project out of the gate without any delays. Hubbell and its distributor partner, Western States Electric Supply, contributed to that goal by producing, staging and delivering material in time to support the critical construction schedule. ■

For more information, contact your Hubbell Power Systems representative, fax 573-682-8714 or e-mail hpsliterature@hps.hubbell.com.

*... a
critical
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to regional
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in the
Pacific
Northwest.*



Finished installation of Ohio Brass 230kV insulator string attached to ACSS conductor by an Anderson CFSHT suspension clamp.



Deadend construction utilizes double Ohio Brass polymer 230kV insulators separated by a yoke plate.

UPDATED LOADBREAK BUSHING



Previous Design



Updated Design



The Hubbell 15kV loadbreak bushing insert has been updated to reduce the overall height, improve the grounding tabs, and make it consistent with other manufacturer's products. Although the exterior has changed, the internal loadbreak components have remained the same and do not require re-certification for interchangeability. It still contains the 5/16" hex broach for torque-controlled installation and has substantially more copper than any design on the market. The insert meets all the requirements of industry standard ANSI/IEEE 386. The revised catalog number is 9U02AAB001-1.

For more information, contact your Hubbell Power Systems representative, fax 573-682-8714 or e-mail hpsliterature@hps.hubbell.com.

HI*^{*}LITE[®] POLYMER INSULATORS

Since 1976, utilities have installed more miles of line using Ohio Brass (OB) polymer insulators for transmission and distribution applications than polymer insulators supplied by any other manufacturer. OB Hi*Lite Insulators were the first transmission polymer insulators commercially available. These suspension, station and line post designs are durable, light and vandal resistant. They offer utilities quality, longevity and ease in handling. What you may not know is that Hi*Lite Polymer Insulators also have an outstanding record of high performance in substation applications.

Hi*Lite Polymer Station Posts offer many unique advantages that improve substation design and operation. The most impressive benefit is their superior cantilever strength compared to porcelain posts. In fact, Hi*Lite Station Posts are stronger than their electrically equivalent extra-high-strength porcelain posts. Deflection, not strength, may be the limitation. Polymer insulators are highly resistant to the antics of gun-toting vandals. Unlike porcelain susceptibility to damage, OB polymers can practically remove the worry of breakage during installation or by vandals. Polymer insulators offer a substantial improvement in alignment procedures during installation because of their ease of maneuverability. Because Hi*Lite Station Posts are installed as a single unit, workers do not waste valuable time bolting porcelain posts into stacks. During transportation to the work site, workers can get more insulators on smaller trucks because of the compact design of the product.

Design engineers can increase spans between bus supports using these insulators. This reduces the number of insulators, structures and foundations needed for substations thereby cutting costs and

contributing to low-profile designs that are more aesthetic. Elimination of extra substation support structures save many times the cost of the polymer insulators.

Polymer station posts can absorb flexing of the buswork that porcelain posts can't tolerate. There's no worry about sliding of the bus in the joint because Hi*Lite Station Posts are not damaged by thermal expansion of bus contraction. Because of their different mechanical characteristics, Hi*Lite and porcelain station posts should not be used in the same bus run. Hi*Lite Polymers allow porcelain posts to resist the load first, possibly resulting in porcelain failure.

Another important advantage of these station posts flexure strength is that costly expansion joints can be eliminated in long bus runs. Exceptional electrical reliability should also be noted. OB tests show that Hi*Lite Insulators offer electrical characteristics superior to porcelain.

Hi*Lite Polymers offer excellent performance in extreme cold environments. No deration needed in colder climates. Resistance to ultraviolet deterioration is superior. Accelerated testing leads to the conclusion that UV exposure can be withstood for at least 35 years.

Using Hi*Lite Polymer Insulators, there are many opportunities for design improvements and cost savings in substations. Opportunities not available with porcelain.

Hi*Lite Station Posts' most noticeable benefits and much of their cost-saving potential show up during substation construction. Light weight allows crews to handle the polymer posts without cranes or rigging. Crews are more efficient and complete the installation job faster. Alignment procedures are easier, too,

FOR SUBSTATION APPLICATIONS



thanks to maneuverability. There's no worry about breakage. They are installed as a single unit so no time is wasted bolting porcelain posts into stacks.

Using Ohio Brass Hi*Lite Station Posts, there are

many opportunities for design improvements and cost savings in substations, opportunities not available with porcelain. Talk with your Hubbell Power Systems' account representative about polymer station post substation advantages. ■

For more information, contact your Hubbell Power Systems representative, fax 573-682-8714 or e-mail hpliterature@hps.hubbell.com.

Hot-line cargo booms for transmission maintenance

Special tools for horizontal-vee construction



by: **J.D. (Jim) Handley**
Senior Transmission Specialist
Southern Company,
Georgia Power Company
Maintenance and Reliability

The author: 41 years electric-utility work; has trained transmission crews in hot-stick and barehand methods at several utilities in the U.S. and abroad; published a live-line maintenance manual; helped develop and implement hot-line-tool and barehand methods used at Georgia Power, Alabama Power and Mississippi Power Companies.

For hot-line maintenance on 115kV single-conductor and 230kV single- and bundle-conductor circuits, we have adopted a method using insulated cargo booms. Actual field trials (and errors) helped perfect the method we use on our system today.

Key to the method's success is a special base plate that can mount either one or two cargo booms, depending on job requirements. This base has been tested for 6,000-lb. load. It lets us adapt the cargo-boom method to our horizontal-vee construction on steel, concrete or wood structures.

Depending on the job, a crew of four to eight (including a foreman) performs the work using hot sticks. Heavy-duty (3"-diameter poles) wire tongs also can be used on some types of horizontal-vee.

All hot-line tools used for our cargo-boom method are from Chance. To make the method work, several modifications had to be made. Chance personnel worked hand-in-hand with us to develop and perfect these tools for our special needs. ■



Installing two adjustable strain poles on a running angle, horizontal-vee construction. The cold end yoke chains to the steel pole. The hot end attaches to the conductor by clamps on the adjustable strain poles. (Single steel pole, 230kV energized 1351 ACSR conductor.)

Insulator cradle being installed using two chain-type pole binders and two 2"-diameter wire tongs. The strain poles pick up the mechanical load and the conductor cradle holds the slack insulators for removal.

Both the horizontal-strut insulator and the suspension string are changed during the same procedure. The strut insulator is removed first and moved into the structure. It is disconnected and sent to the ground on a handline using an electric capstan hoist. Then the suspension units are removed and sent down. New units are installed in the reverse order.



Single Cargo-Boom Method
 For short spans with light loading, only one cargo boom is installed. A suspension link stick that comes fitted with a conductor hook raises and lowers the conductor.

Double Cargo-Boom Method
 Taking a measurement for placing and installing the special Chance double cargo boom attachment with double chains.



Steel H-frame, 230kV Horizontal-Vee, Bundle Conductor 795 ACSR

- Ruling span of 1,200-ft. requires two-cargo boom method.

Note: On large steel, concrete and wood poles, we must have 3- to 4-foot chain extensions for use up the structures and at ground level for securing hoists, snubbing brackets and other such equipment.



Handline hung at top of the structure lets us hoist the cargo booms preassembled to the other poles. A special steel yoke attaches at the top of the structure, at the same point as the overhead ground wire. This yoke anchors two chain-hoist/strain-pole sets to control the cargo booms.



All insulators have been removed and replaced.



Insulators being lowered using hand-line, electric capstan hoist and Pengo insulator lifter. Insulator cradle, cargo booms, fixed strain poles, conductor yoke with tower yoke installed.



Both cargo booms are installed. Two fixed-length strain poles above and below the cargo booms are attached. The top strain poles are for the chain hoists. The bottom two strain poles attach to a special suspension yoke. An adapter on the suspension yoke helps it stay centered under the hot-end yoke to keep the conductor bundle level.

For more information, contact your Hubbell Power Systems representative, fax 573-682-8714 or e-mail hpsliterature@hps.hubbell.com.

TOUGH ONE® Anchors

The best all around guy anchors for tough soils, most others, too!

You could be standardized on one guy anchor style and installing wrench for your entire system. For 15 years now, the Chance TOUGH ONE® Anchor series has made that possible as the supreme design to date.

Simplify your anchoring system

For 30 years prior to the TOUGH ONE Anchor, the Chance PISA® Anchor series set the standard. Many utilities still employ this design for its proven performance.

A growing number of utilities are upgrading to the economic and application advantages of TOUGH ONE Anchors. The switch is almost “painless” because both series use the same type anchor rods and often the same installing wrenches already on board.

Nearly always, the number of anchor sizes required shrinks and the range of applicable soils grows. This is due to the namesake feature of TOUGH ONE Anchors . . . by design, the World’s toughest wrench-driven power-installed screw anchors.



• 8,000 ft.-lb. Capacity for Soft and Medium-Hard Soils

2 1/4" Square Inside-Drive Anchor Hub

	Anchor Size and Catalog Number				Installation Wrench
	8" dia. Helix	10" dia. Helix	12" dia. Helix	14" dia. Helix	
For 5/8" dia. Rod	C102-5208	C102-5209	C102-5210	—	Chance Standard 10,000 ft-lb
For 3/4" & 1" dia. Rods	C102-5204	C102-5205	C102-5206	C102-5207	

2 1/2" Square Inside-Drive Anchor Hub

For 5/8" dia. Rod	C102-5008	C102-5009	C102-5010	—	Chance HYBRID* or TOUGH ONE® Wrench
For 3/4" & 1" dia. Rods	C102-5004	C102-5005	C102-5006	C102-5007	

*Do not use old-style HYBRID wrenches with collar welded around drive end.

• 10,000 ft.-lb. Capacity for Hard Soils

2 1/4" Square Inside-Drive Anchor Hub

For 3/4" & 1" dia. Rods	C102-5200	C102-5201	C102-5202	C102-5203	Chance Standard 10,000 ft-lb
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• 15,000 ft.-lb. Capacity for Very Hard Soils (short of solid rock)

2 1/2" Square Inside-Drive Anchor Hub

For 3/4" & 1" dia. Rods	C102-5000	C102-5001	C102-5002	C102-5003	Chance TOUGH ONE® Wrench
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TOUGH ONE® Anchors

• Design Improvements

- Sloped leading point design increases penetration, and soil flow over hub
- Internal-drive hub for high installing torque
- Smaller hub size keeps more wrenches in service



• Benefits

- Work in all soils except solid rock or swamps
- Easiest to install
- Longer tool life span
- Most resistant to installation breakage
- Use PISA® rods
- Common wrench

**Superior to our
external-wrench
PISA® Anchors**



Anchor your *entire system with one or two wrenches

TOUGH ONE Anchors can solve all your guy-anchoring needs, *except swamp and solid-rock applications. You may be able to use wrenches you already own for PISA® Anchors. At the most, you'll need only two wrenches. Often, utilities need fewer anchor sizes using TOUGH ONE Anchors.

Bottom line, you get a better anchor at an economical price. Let us show you how easy it is to upgrade your entire guy-anchoring program to the highest advantages available with TOUGH ONE Anchors. ■

For more information, contact your Hubbell Power Systems representative, fax 573-682-8714 or e-mail hpsliterature@hps.hubbell.com.



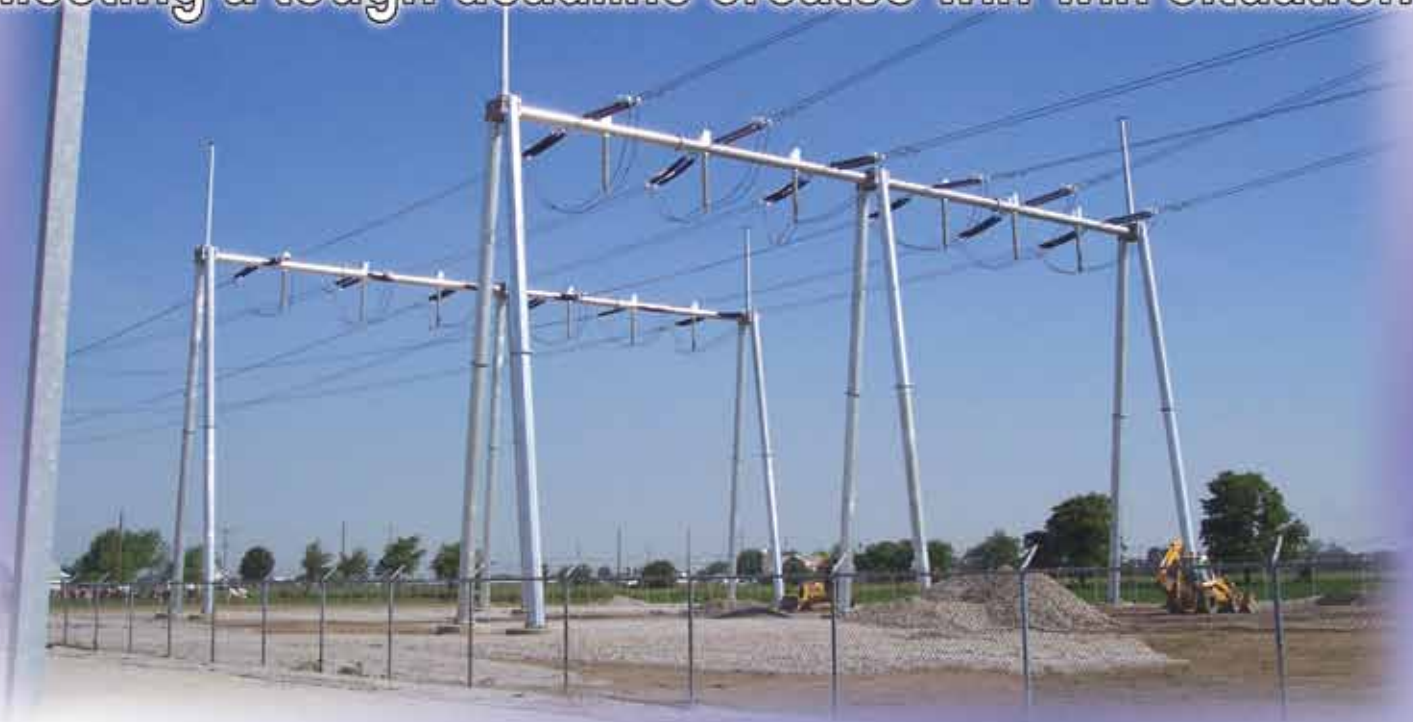
NYLON SPOOL INSULATOR

With our new lightweight Chance spool insulators, you have direct replacements for ANSI 53-2 spool insulators. Install just as you would the porcelain unit. The shape of the nylon insulator is consistent with porcelain to ensure compatibility with standard hardware. Rugged construction protects against chipping, cracking or breaking problems common to porcelain. Satisfies the electrical and mechanical requirements for ANSI 53-2 spool insulators. Mechanical strength is 3,000 lbs ultimate tensile strength. Low frequency flashover is Dry 25kV, Wet 15 kV. Molded from specially blended, UV stable polymers for high compressive strength. ■

For more information, contact your Hubbell Power Systems representative, fax 573-682-8714 or e-mail hpsliterature@hps.hubbell.com.

Hardware delivery meets very short lead-time schedule

Meeting a tough deadline creates win-win situation



Deadend structures under AEP's 345-kV lines. Customer's substation equipment will be under these structures when completed.

American Electric Power had a customer that wanted to tap a double circuit 345kV line into a new customer-owned 345kV substation directly under the line. Due to customer imposed rigid time constraints, AEP imposed a penalty of \$10,000 per week for every week the material supplier was late in delivery. One of the circuits originated in the AEP Cook nuclear generating plant from which getting outages had always been difficult. When all agreements were signed and the order was placed, the supplier had only six weeks to manufacture and deliver 26 dead-end assemblies for two-bundle 954 kcmil ACSR conductor. Normal delivery time is usually 10 to 12 weeks. Hubbell Power Systems was the only supplier of those approached who

said it could meet the schedule for the order of 26 Anderson dead-end assemblies with corona rings which included two spare assemblies.

Project

The substation, near Topeka, IN, was directly under the AEP Robison Park-East Elkhart line about midway between two towers. Both circuits had to go into the station and come back out. However only one circuit was tapped. The other circuit went through without being tied to any customer equipment. Each circuit needed to be cut and deadended in the station bay.



Typical Uni-Grip® deadend assembly. Each complete assembly consists of a pre-filled aluminum body with pre-compressed eye or clevis. A steel core gripping unit and a pre-filled 15° jumper terminal with mounting hardware. The deadend tongue (terminal pad) is angled at 15°, which permits either a 30° or straight jumper take-off. Each fitting is marked with catalog number, conductor size and installation die size.

Delivery schedule met

Outages were scheduled for two consecutive weekends; and, the order required delivery of 13 complete assemblies by the first weekend and another delivery of 13 assemblies by the following weekend. But Hubbell was able to deliver all 26 assemblies on the first weekend, enabling AEP linemen to finish all the work well ahead of the required delivery date much to the delight of all involved. Teja Rao, AEP's Transmission Line Engineer for this project said, "Much to my surprise, all the dead-end assemblies were delivered on the first weekend. On Monday morning, after the first weekend outage, I called our crew

supervisor and asked whether everything went smoothly on the first 12 dead ends. He said 'We are completely done with all the dead ends!' Our customer was happy as were we." Since all the work was completed on the first weekend, AEP met its customer's needs and Hubbell satisfied AEP's requirements without penalty — a win-win situation for all concerned. □

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Deadend hardware assembled to deadend insulator strings prior to installation

WALK-IN TOOL TRAILERS

Ample access and optional accessories for any hot-line tool set

Line crews love the upright workspace and all-weather shelter of these units. Choose from 16- and 20-foot-length trailers to accommodate almost any hot-line tool set.

Standard and optional equipment serve all needs

Tandem axles rated for 7,000-lb. gross vehicle weight give both sizes easy roadhandling characteristics. Stock features include load-rated running gear, brakes and towing group. Electrical components meet applicable standards.

Aluminum 0.30"-gauge skin delivers rustproof advantage for a long service life and light weight for towing ease. Interior walls are lined with plywood to help resist rough use and floor is exterior-grade plywood for rugged linework-site conditions

Built-in tool racks and bins permit customized storage arrangements to suit crew preferences. And a full range of factory-installed accessories illustrated here lets you order each trailer to varying specifications. ■

Step-up (24") through 76 1/2"-wide opening gains access to 6ft.-6in. headroom. Storage bins with dividers are standard along both sides (12" wide x 14" deep) and across the front (29" x 20" deep).

A standard overhead rack on one interior side includes with thumbscrews for storing up to 30 Universal tools.

Double rear doors come complete with cam-lock latch and padlock eye. Exterior lights and reflectors comply with Interstate Commerce Commission requirements.



Demonstration Unit exhibits the high storage capacity. All tools, stands, tables and fixtures stow neatly inside this specially-out-fitted model. Production units come in only a solid -white finish. The side door at right front is available as an added-cost option on the 16-foot model. (Custom-made display boards for clamps on rear-door panels are not available.)





Standard provisions include: Side door on all models, two full-height racks down the center for hotsticks and poles with 100 plastic-coated adjustable supports and 29 elastic tiedowns; channel-type ladder rack on the floor between the tool racks.



Optional accessories include: Extra rack for sticks and poles mounted on a wall with additional 24 adjustable supports and eight elastic ties; a second overhead rack for 30 Universal tools; an extra ladder-rack channel above the standard one; two interior lights located midway overhead with wall switch near the doors; AC heater mounted on a front bin for "dry-room" effect in storage.



Optional power jack has a built-in area light. Optional spare tire comes on lockable bracket located above tongue. Optional heater's weather-covered AC receptacle is at lower front on trailer body exterior.

Adjustable hitch may be specified as either 2 5/16" ball-type or 3" pintle-eye. Height of either may be varied from 16" to 30" simply by two bolts; both include two safety chains. Standard towing group also includes a manual tongue jack. Optional breakaway-brake system's 12V battery comes mounted on left side of tongue; its lanyard and activator switch are attached to left side of hitch receiver. Multi-pin cable plug mates with socket furnished for towing vehicle to make DC connections for lights and brakes, including the recharging circuit for breakaway battery.



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Chance Cutout Cover helps line personnel safety



Catalog No. C406-0009

- Light in weight, only 4 pounds each
- Convenient nesting storage for quick access

This cover aids in the protection of lineworkers near most open-type cutouts rated up to 25kV by guarding against brush contact during hot line work. It will not fit over cutouts with linkbreak levers or similar devices.

It is simply placed over the cutout. Then it secures by a locking pin that slips through a hole behind the cutout insulator, over the hanger bracket and into a hole on the opposite side of the cover. Eyes on both the cover and the locking pin allow quick and easy installation with a Grip-All clampstick.

This cover is made of high-visibility-orange high-impact ABS plastic. Several units can be nested together for convenience and space saving on a line truck. ■

For more information, contact your Hubbell Power Systems representative, fax 573-682-8714 or e-mail hpsliterature@hps.hubbell.com.

NOTE: Because we have a policy of continuous product improvement, we reserve the right to change design and specifications without notice.

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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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