BOARD OF PUBLIC WORKS

AUTHORIZED BY AN ACT OF THE GENERAL ASSEMBLY MARCH 15th, 1901
TO ESTABLISH, CONTROL AND REGULATE AN ELECTRIC LIGHT PLANT
WATER WORKS AND A SEWER SYSTEM FOR THE TOWN OF LEWES

107 FRANKLIN AVE
LEWES, DELAWARE 19958

ELECTRICAL UTILITY SPECIFICATION FOR DEVELOPERS

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BOARD OF PUBLIC WORKS

LEWES, DELAWARE

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001 - STANDARD DRAWING PROCEDURES

1. SPECIAL INSTRUCTIONS TO DRAFTSMAN SHALL BE AS FOLLOWS:

   - DELETIONS FROM DRAWINGS SHALL BE YELLOW.

   - ADDITIONS TO DRAWINGS SHALL BE RED OR BLACK OVER YELLOW BASE.

   - INSTRUCTIONS TO CHANGE DRAWINGS SHALL BE BLUE (INK) OR BLACK (PENCIL).

2. DRAWING NUMBERS AND REVISION NUMBERS SHALL BE SHOWN IN BOTH LOCATIONS ON DRAWING USING KOH-I-NOOR 1/4 INCH LETTERING GUIDE AND KOH-I-NOOR NO.2 NIB. OR EQUIVALENT.

3. ALL HAND-LETTERING TO BE 1/8 INCH.

4. HAND-LETTERING MAY BE IN PENCIL.

5. DRAWING NOTES MAY BE HAND-LETTERED.

6. DRAWING TITLE SHALL BE LETTERED USING KOH-I-NOOR 1/8 INCH LETTERING GUIDE OR EQUIVALENT.

7. DRAFTSMAN MUST SIGN OR INITIAL AND DATE FORM IN APPROPRIATE SPACE.

8. ENGINEER MUST APPROVE DRAWING BY SIGNING OR INITIALING AND DATING IN APPROPRIATE SPACE.

100 - SPECIFICATIONS TO DEVELOPERS

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STATEMENT OF STANDARDS

THE BOARD OF PUBLIC WORKS, CITY OF LEWES, SHALL REQUIRE THAT ALL ELECTRICAL EQUIPMENT WHICH SHALL IMMEDIATELY OR AT SOME FUTURE TIME, BE OWNED COMPLETELY OR IN PART BY THE BOARD OF PUBLIC WORKS, MEET THE REQUIREMENTS SET FORTH IN THIS SPECIFICATION.

THE REQUIREMENTS OF THIS SPECIFICATION REPRESENT THE MINIMUM ACCEPTABLE STANDARDS TO THE BOARD OF PUBLIC WORKS. ALL EXCEPTIONS TO THESE REQUIREMENTS SHALL REQUIRE WRITTEN APPROVAL BY THE BOARD OF PUBLIC WORKS PRIOR TO IMPLEMENTATION.

SPECIFICATIONS AND REQUIREMENTS SET FORTH IN THE LATEST EDITION OF THE NATIONAL ELECTRIC CODE (NEC) AND THE NATIONAL ELECTRIC SAFETY CODE (NESC) SHALL BE APPLICABLE.

EXCEPTIONS TO THE NATIONAL ELECTRIC CODE OR THE NATIONAL ELECTRIC SAFETY CODE SHALL BE CONSIDERED ONLY WHEN SUCH EXCEPTIONS ARE MORE STRINGENT AND INTENDED TO IMPROVE THE INTEGRITY OF THE ELECTRICAL SYSTEM CONTROLLED BY THE BOARD OF PUBLIC WORKS. ALL EXCEPTIONS REQUIRE WRITTEN APPROVAL BY THE BOARD OF PUBLIC WORKS PRIOR TO IMPLEMENTATION.

102 - NOTIFICATION

IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE CITY OF LEWES, BOARD OF PUBLIC WORKS, TWENTY-FOUR (24) HOURS IN ADVANCE OF PERFORMING THE FOLLOWING WORK SO THAT A CITY INSPECTOR MAY BE PRESENT TO WITNESS THE WORK.

- BACKFILL CABLE TRENCHES.

- ACCEPTANCE TEST OF LOW VOLTAGE CABLES.

- ACCEPTANCE TEST OF HIGH VOLTAGE CABLES.

103 - GUARANTEE

THE DEVELOPER SHALL GUARANTEE THE ENTIRE ELECTRICAL INSTALLATION TO BE FREE OF ALL MECHANICAL AND ELECTRICAL DEFECTS FOR THE PERIOD OF ONE (1) YEAR FROM THE TIME OF FINAL ACCEPTANCE AND SUBSTANTIAL OPERATION BY THE OWNER.

THE DEVELOPER SHALL, DURING THE ONE-YEAR GUARANTEE PERIOD, ALSO BE RESPONSIBLE FOR THE PROPER ADJUSTMENT AND OPERATION OF ALL ELECTRICAL SYSTEMS AND EQUIPMENTS, APPARATUS, OR DEVICES INSTALLED BY HIM/HER AND DO ALL WORK NECESSARY TO INSURE THE PROPER FUNCTIONING OF THE SYSTEMS.

400 - GROUNDING/BONDING

GROUND RODS SHALL BE COPPER-CLAD STEEL WITH A MINIMUM DIMENSION OF 5/8 INCH DIAMETER BY 10 FEET LONG UNLESS OTHERWISE NOTED.

ALL GROUND SHALL HAVE A RESISTANCE TO SOLID EARTH NOT-TO-EXCEED 10 OHMS. ADDITIONAL GROUND ROD SECTIONS SHALL BE INSTALLED UNTIL THIS IS ACHIEVED, OR UNTIL A MAXIMUM OF FOUR (4) GROUND ROD SECTIONS HAVE BEEN INSTALLED AT A GIVEN LOCATION.

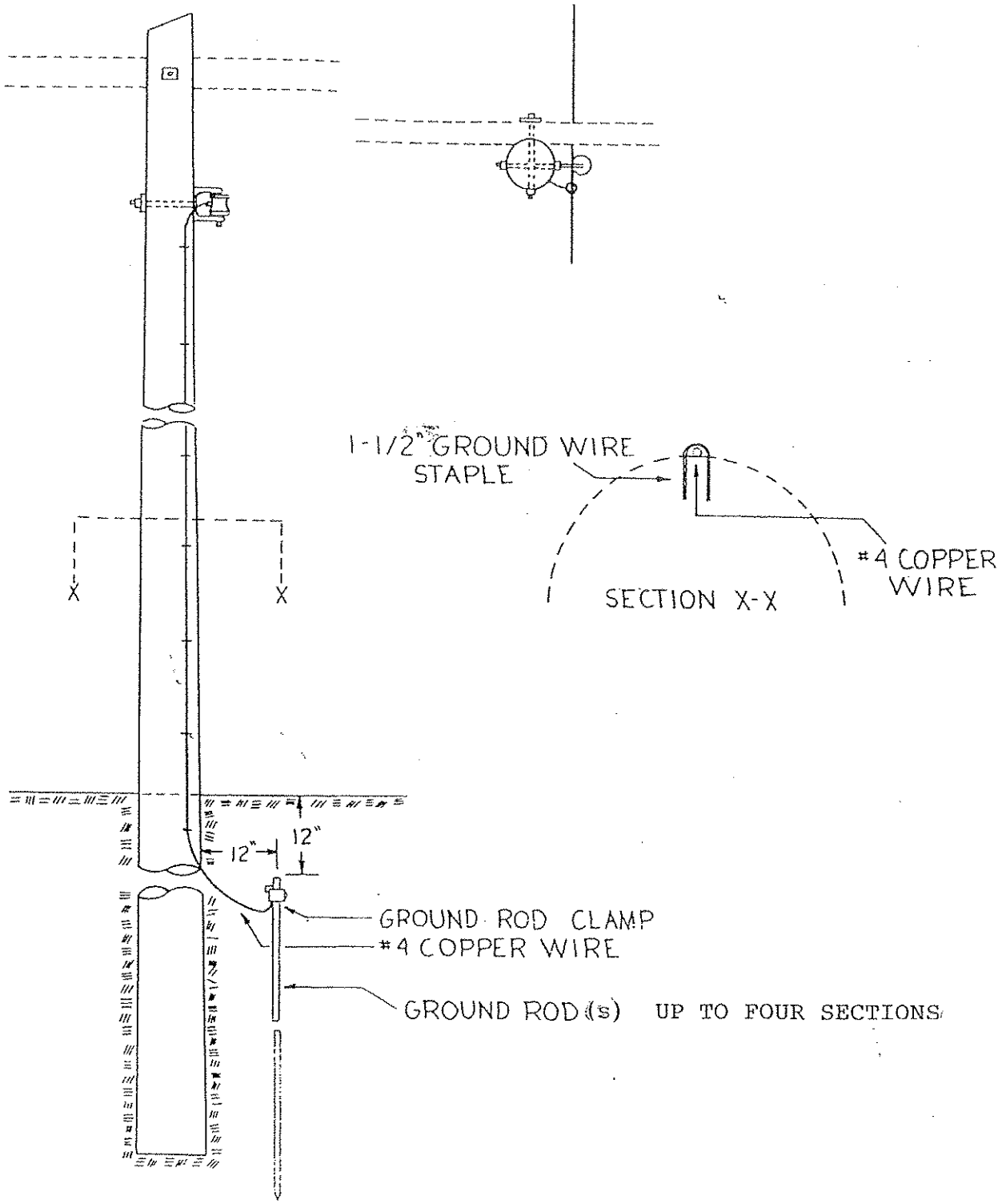
GROUND RODS SHALL BE DRIVEN FULL LENGTH IN UNDISTURBED EARTH IN ACCORDANCE WITH THE DRAWINGS. THE TOP SHALL BE AT LEAST TWELVE (12) INCHES BELOW THE SURFACE OF THE EARTH. THE GROUND WIRE SHALL BE ATTACHED SECURELY TO THE ROD AND SECURED TO THE POLE WITH APPROPRIATE GROUND CLAMPS.

ALL BARE GROUNDING CONDUCTORS SHALL BE NOT SMALLER THAN NO. 4 AWG. ALL GROUNDING CONDUCTORS SHALL BE COPPER.

ALL GROUND TERMINATIONS, SPLICES, OR CONNECTIONS SHALL BE MADE WITH COPPER DEVICES SUITABLE FOR DIRECT BURIAL IN EARTH.

MINIMUM ACCEPTABLE GROUNDING PRODUCTS ARE PRESENTED IN SECTION 402.1 OF THIS SPECIFICATION.

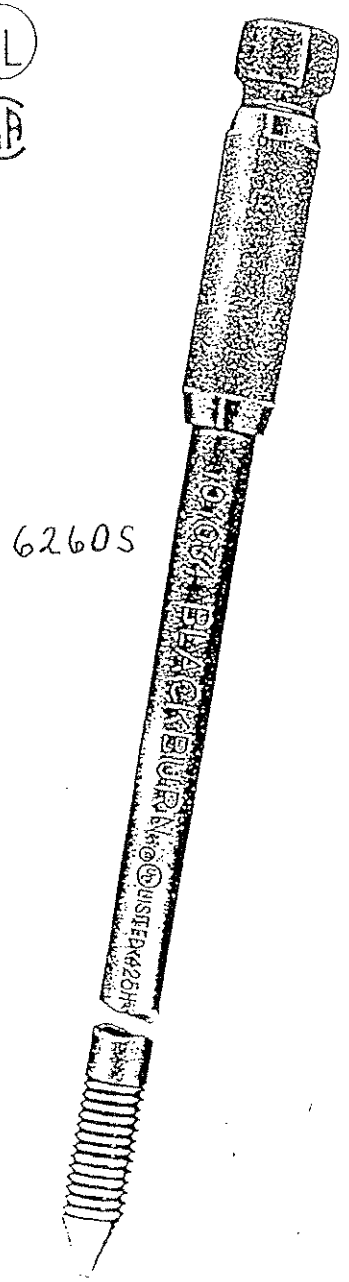
401 - POLE GROUNDING



SECTIONAL TYPE GROUND RODS AND FITTINGS

Price Schedule 8A-1

- Sectional type ground rods have the same high quality as regular type ground rods, only threaded top and bottom. Threads are rolled after copper bonding, and both steel and copper are rolled into the thread, making it exceptionally strong.
- Threaded couplings are of high strength, corrosion-resistant alloy. Streamlined design reduces driving friction. Couplings are tapped so that they may be used on all standard threaded sectional rods.
- Driving Studs of high strength steel may be used with all standard couplings.



SECTIONAL RODS

CATALOG NUMBER	ROD SIZE (NOMINAL DIAMETER x LENGTH)		THREAD SIZE	WT. PER 100 (lbs.)	WT. PER 100 (kgs.)
5006S	½" x 6'	12.7mm x 1.8m	½"-13	316	143
5008S	½" x 8'	12.7mm x 2.4m	½"-13	421	191
5010S	½" x 10'	12.7mm x 3.0m	½"-13	527	239
5006LS*	½" ★ x 6'	12.7mm x 1.8m	9/16"-12	410	189
5008LS*	½" ★ x 8'	12.7mm x 2.4m	9/16"-12	546	248
5010LS*	½" ★ x 10'	12.7mm x 3.0m	9/16"-12	682	309
6256S*	⅝" x 6'	15.8mm x 1.8m	⅝"-11	508	230
6258S*	⅝" x 6'	15.8mm x 2.4m	⅝"-11	678	308
6260S*	⅝" x 10'	15.8mm x 3.0m	⅝"-11	847	384
7506S*	¾" x 6'	19.0mm x 1.8m	¾"-10	774	160
7508S*	¾" x 8'	19.0mm x 2.4m	¾"-10	992	450
7510S*	¾" x 10'	19.0mm x 3.0m	¾"-10	1040	562
1010S*	1" x 10'	25.4mm x 3.0m	1"-8	2248	1020

*U.L Listed (425H). CSA lists rods ½" ★ and larger, 10' and longer.

COUPLINGS

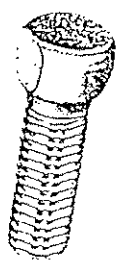
CATALOG NUMBER	SIZE (NOMINAL DIAMETER)	THREAD SIZE
50C	½"	½"-13 UNS
50LC*	½" ★	9/16"-12 UNS
60C*	⅝"	⅝"-11 UNS
70C*	¾"	¾"-10 UNS
80C*	1"	1"-8 UNS

*U.L. Listed (425H)

DRIVING STUDS

CATALOG NUMBER	SIZE (NOMINAL DIAMETER)	THREAD SIZE
50DS	½"	½"-13
50LDS*	½" ★	9/16"-12
60DS*	⅝"	⅝"-11
70DS*	¾"	¾"-10
80DS*	1"	1"-8

*U.L. Listed (425H)



Blackburn

FARGO®

GROUNDING CONNECTORS

Fargo grounding connectors are provided with standard 1/2-13 thread studs and flat surfaces for easy one wrench installation to ground distribution transformer tanks and other apparatus.

The GC-204 is machined from solid high strength hexagon bronze. The locking bolt is formed from specially drawn silicon bronze providing the optimum in corrosion resistance.

The GC-207, 208, 209 and GA-220 utilize the familiar Fargo vise type design and may be easily installed with a ratchet wrench on an unbroken ground wire eliminating any possibility of a loose ground connection due to "splicing" of the ground wire.

GC-209 is furnished with bronze jam nut on stud.

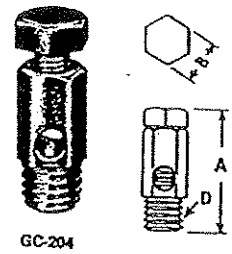
Cat. No.	Conductor Range	Approx. Dimensions, Inches A	B	C	D	E
BRONZE GROUNDING CONNECTOR						
GC-204	10 Sol. to 2 Str.	1⅜	9/16	—	½	—
GC-207	6 Sol. to 1/0 Str.	1¼	¾	1⅜	½	5/16
GC-208	4 Str. to 2/0 Str.	1 5/16	13/16	1⅞	½	5/16
GC-209	3 Sol. to 4/0 Str.	1½	1⅛	1¾	½	5/16
ALUMINUM GROUNDING CONNECTOR						
GA-220	6 Sol. to 1/0 Str.	1¼	¾	2⅛	½	¾

Fargo recommends bronze connectors (GC-204 through GC-209) for copper ground conductors, and aluminum connectors (GA-220) for aluminum ground conductors.

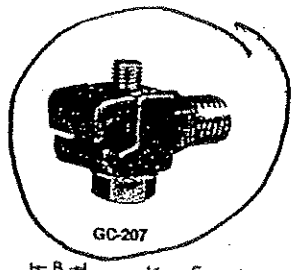
The Fargo GC-177 Connector is specifically designed for grounding flat surfaces that require a ground connection for safety purposes.

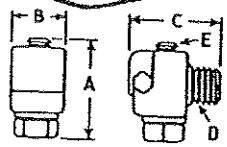
This vise type connector, fabricated from high strength electrical bronze, provides a permanent vibration proof connection. The large flat surface of the male casting provides secure mounting, while the "V" shaped conductor groove assures alignment of grounding connector.

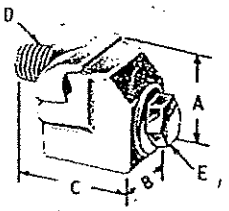
Cat. No.	Plate/Bar Thickness	Conductor Range	Approx. Dimensions, Inches A	B	C
GROUNDING CONNECTOR: Flat Surface to Conductor					



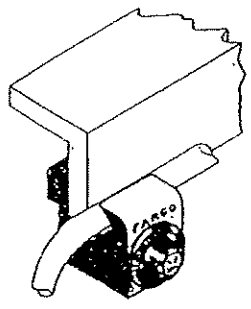
GC-204


GC-207





GA-220

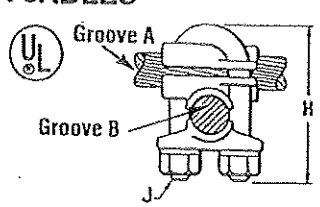

GC-177

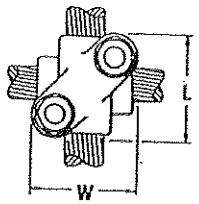
BURNDY
an FCI Company

GROUNDING

TYPE GX
GROUND CONNECTOR
FOR COPPER CABLES

High copper alloy ground connector for cross connecting a wide range of cable. The high copper alloy cast body, DURIUM U-bolts, nuts, and lockwashers make the GX suitable for burial in soil or concrete. One wrench installation. UL467 listed. Acceptable for direct burial.





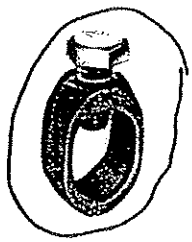
Catalog Number	Conductor		H	J	L	W
	Groove A	Groove B				
GX4C4C	8 Sol.-4 Str.	8 Sol.-4 Str.	1⅞	⅜	1⅝	1⅝
GX264C	4 Sol.-2/0 Str.	8 Sol.-4 Str.	2½		1¾	1¾
GX2626		4 Sol.-2/0 Str.				
GX294C	2/0 Sol.-250	8 Sol.-4 Str.	2¾		1⅞	1⅞
GX2926		4 Sol.-2/0 Str.				
GX2929		2/0 Sol.-250				
GX344C	300-500	8 Sol.-4 Str.			2⅛	
GX3426		4 Sol.-2/0 Str.				
GX3429		2/0 Sol.-250				
GX3434		300-500	4¼	½	2⅝	2⅝

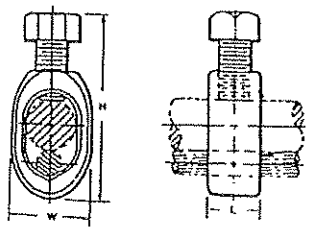
C-19

TYPE GRC
HIGH STRENGTH GROUND ROD CLAMP
FOR COPPER CABLE TO ROD

High copper alloy ground connector for joining a range of cable to rod. Slips over end of rod, one wrench installation. UL467 listed. Acceptable for direct burial.

REA LISTED

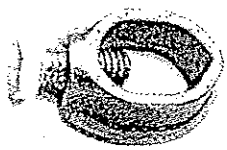




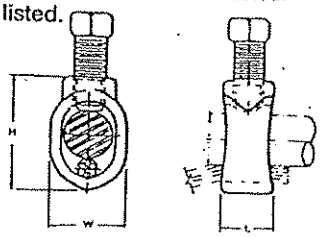
Catalog Number	Driven Rod	Conductor Range		H	W	L
		Min.	Max.			
GRC12	½	10 Sol.	2 Str.	2.00	.89	.63
GRC58	⅝		1 Str.	2.19	.95	.63
GRC34	¾	8 Sol.	1/0 Str.	2.47	1.09	.65

TYPE GRD
GROUNDIT GROUND ROD CLAMP
FOR COPPER CABLE TO ROD

REA LISTED



High copper alloy ground connector for joining a wide range of cable to copper clad, galvanized steel, and stainless steel ground rods. Slips over end of rod, one wrench installation. UL listed. Acceptable for direct burial. UL467 listed.



Catalog Number	Nominal Rod. Dia.	Conductor Range	H	W	L
GRD12	½	8 Sol. - 1/0	1.22	.79	.62
GRD58	⅝		1.35	.90	.62
GRD34	¾		1.46	1.03	.62

500 - PRIMARY UNDERGROUND DISTRIBUTION

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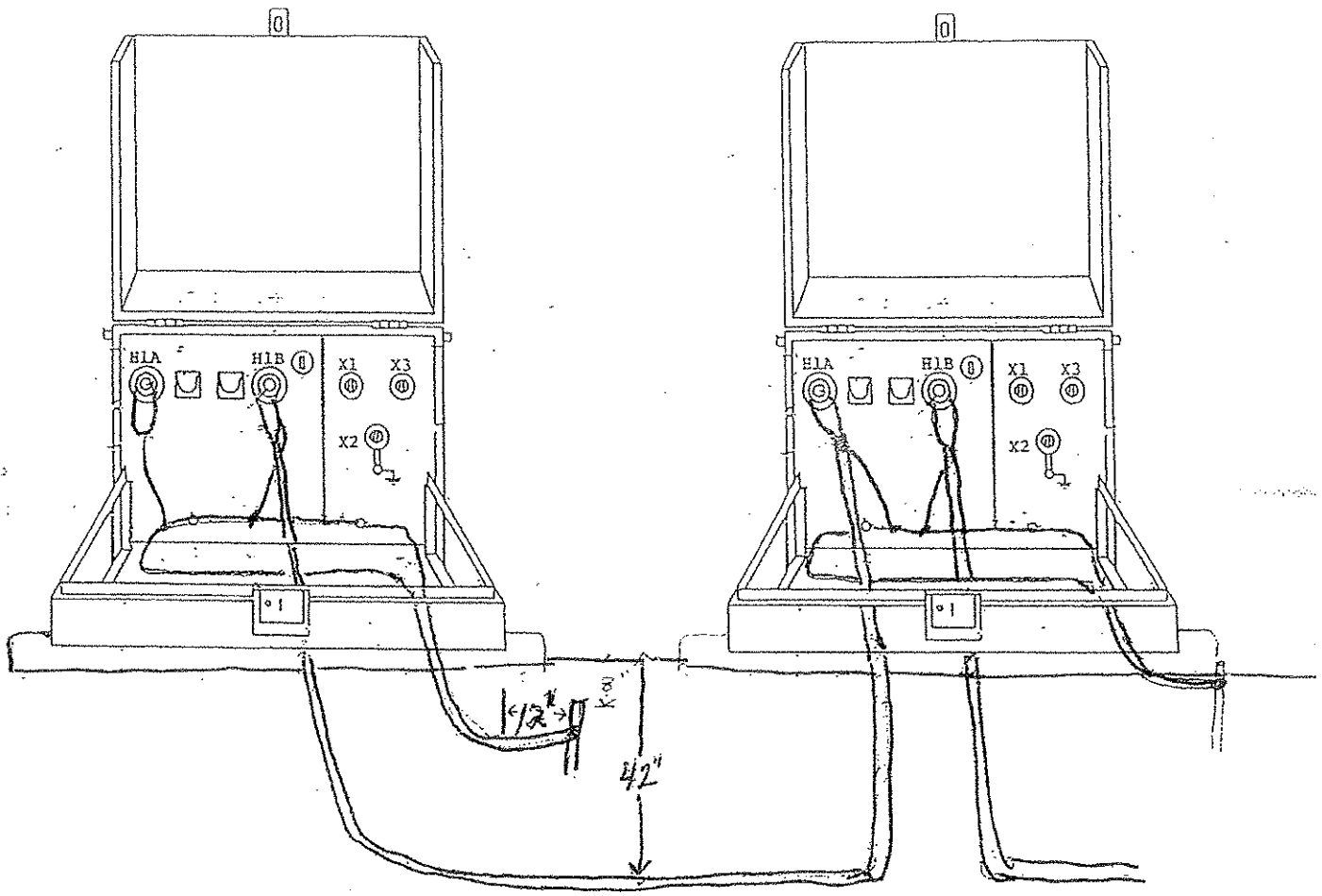
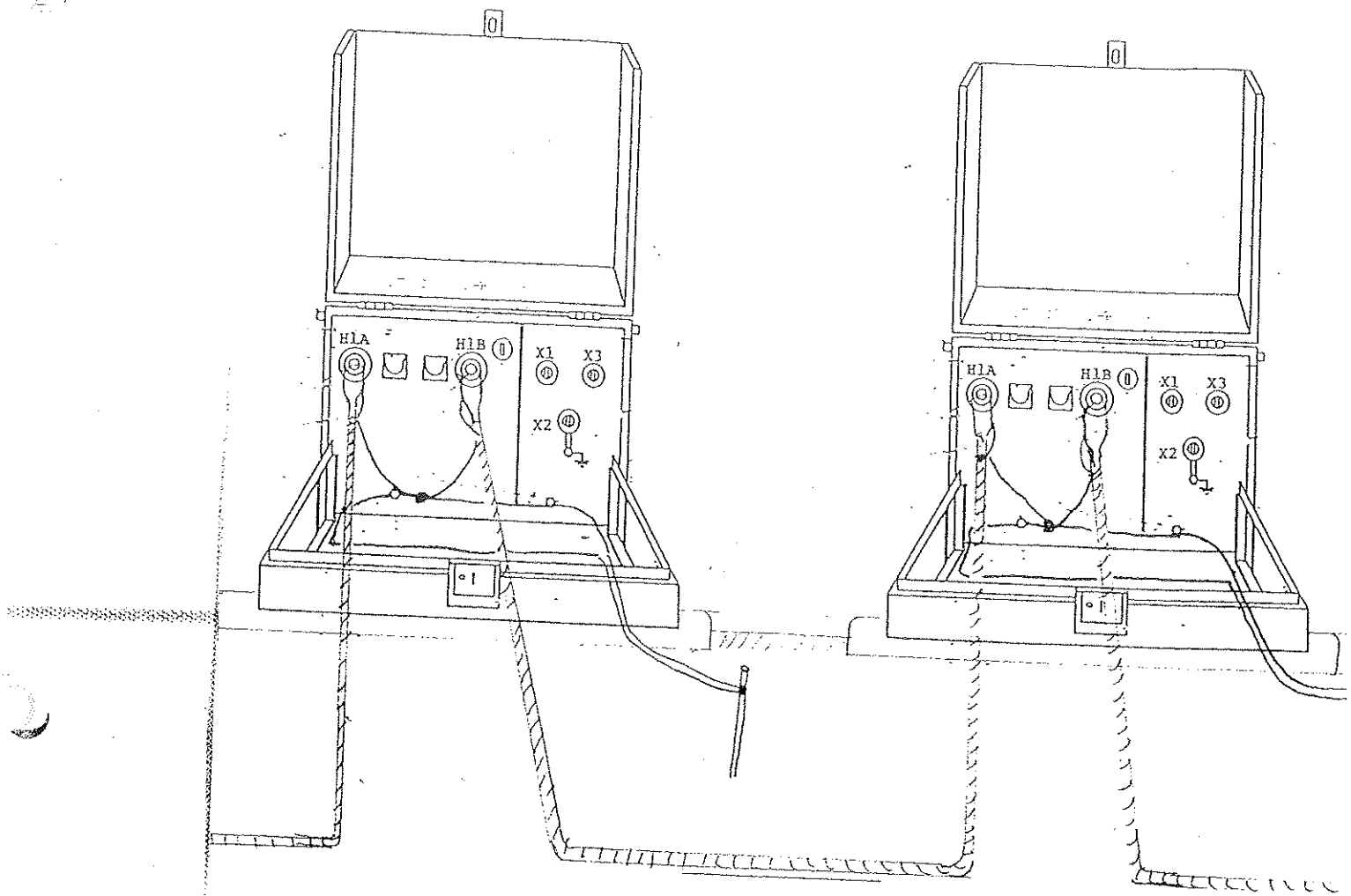
511.1	PRIMARY CABLE IDENTIFICATION ILLUSTRATION
511.2	CABLE LABEL SYSTEM

501. - TRANSFORMER CONNECTIONS

RADIAL FEED WITH SURGE ARRESTER

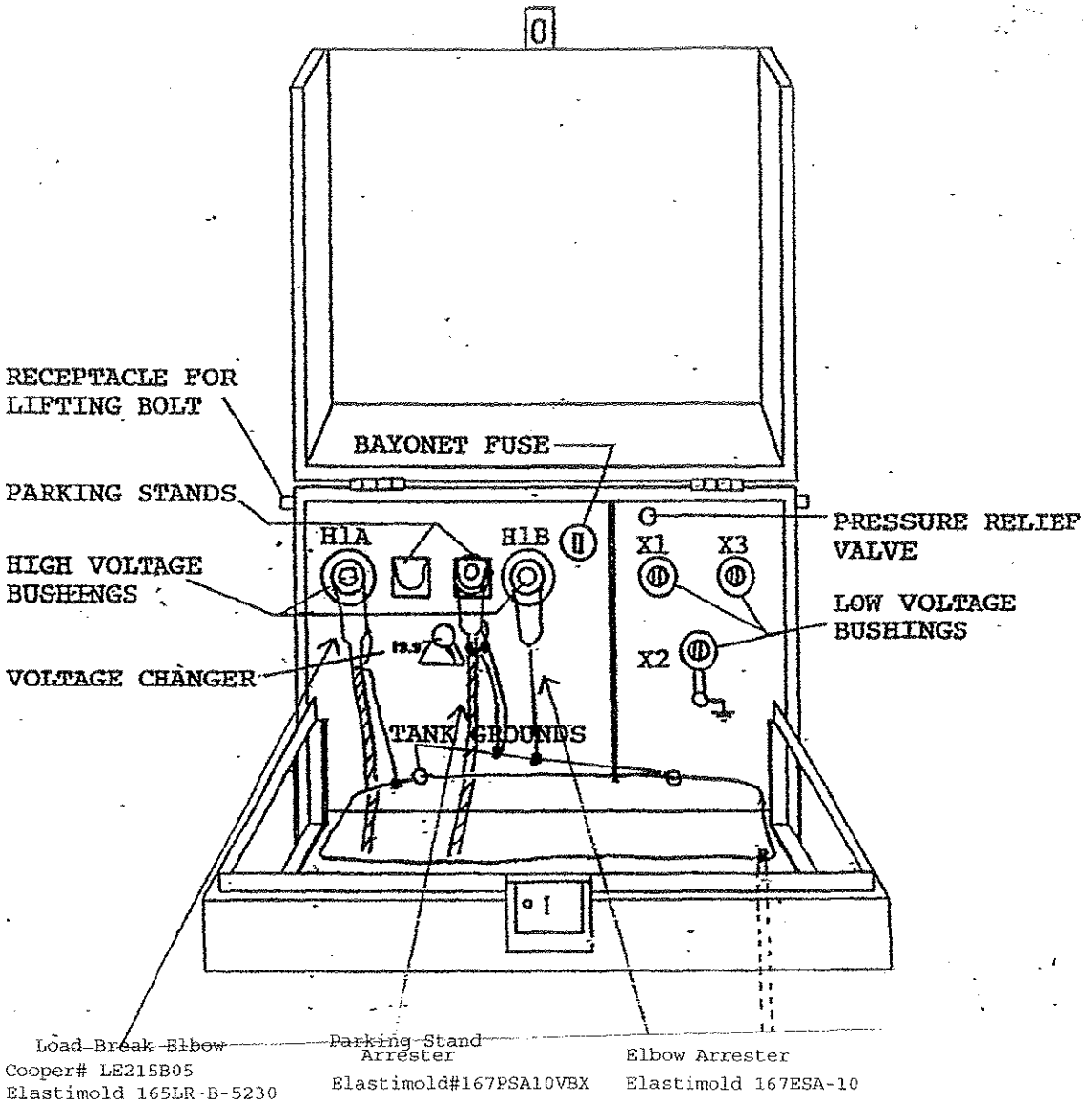


502 - TRANSFORMER CONNECTIONS LOOP FEED



502.1 - TRANSFORMER CONNECTIONS

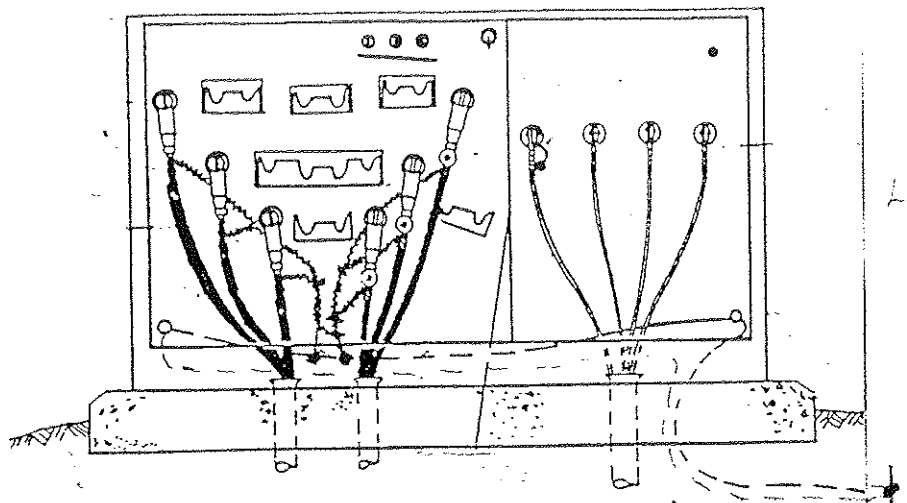
LOOP FEED OPEN POINT WITH SURGE ARRESTERS



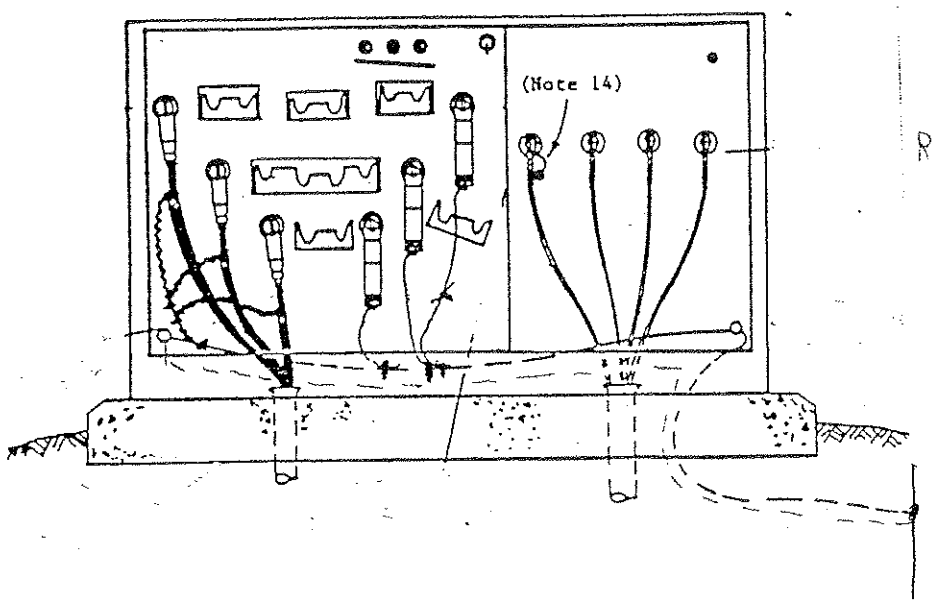
REV 2/11

502.2 - TRANSFORMER CONNECTIONS

THREE PHASE



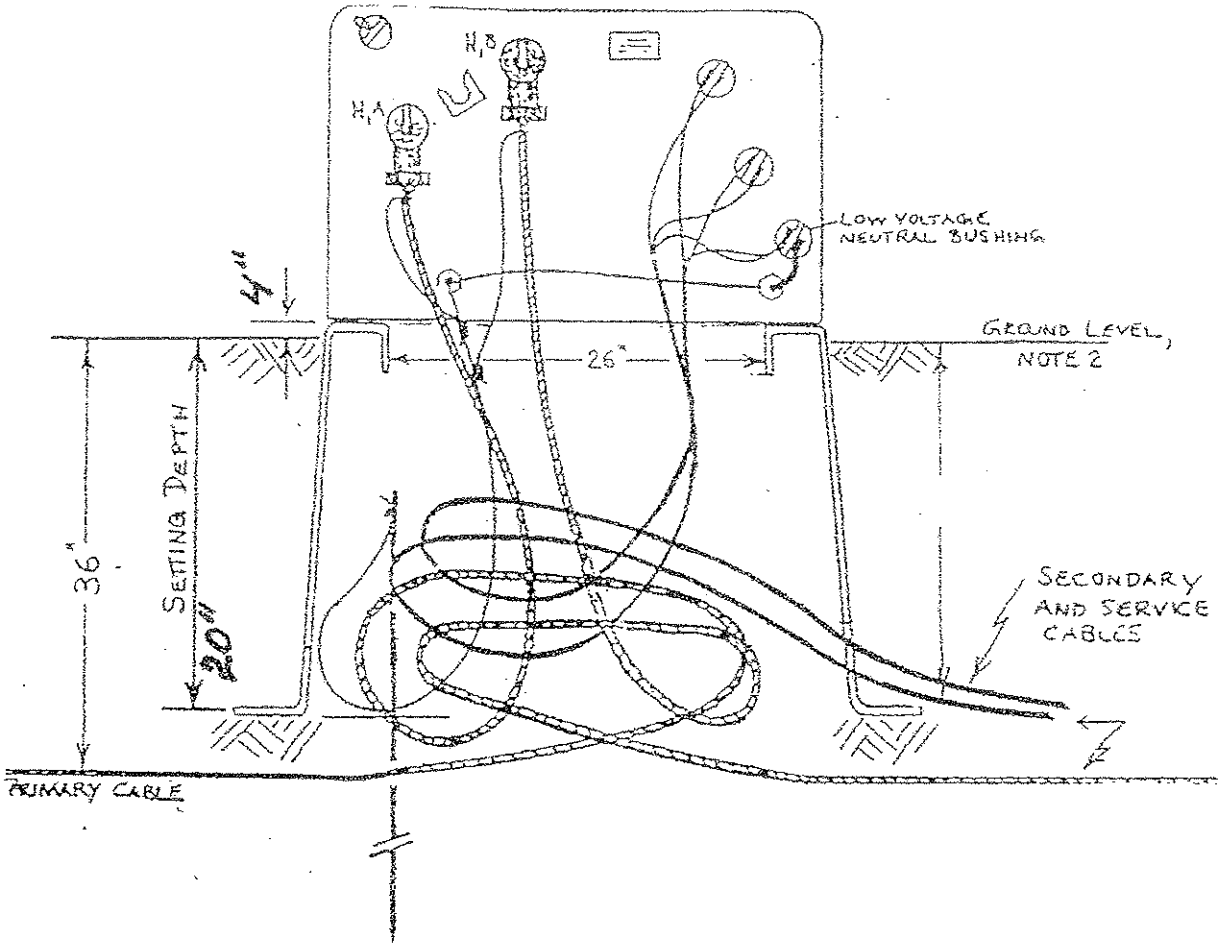
Loop Feed

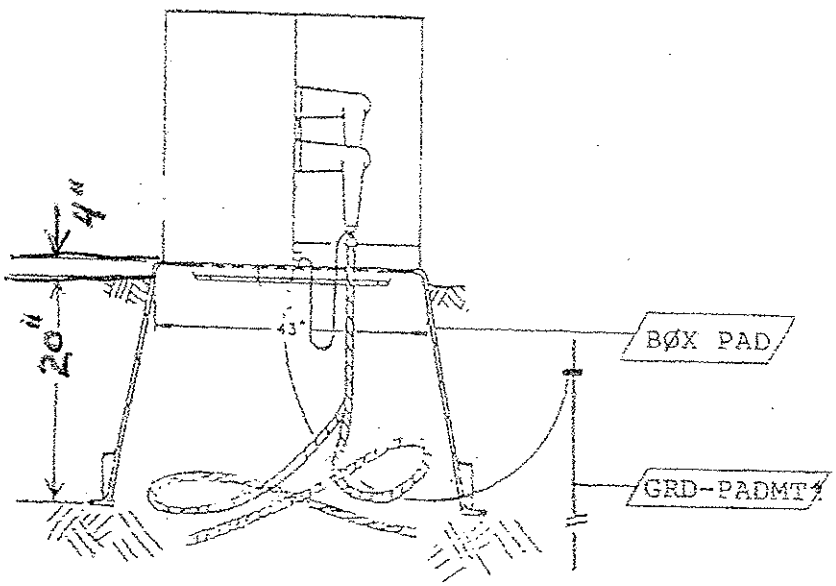


Radial Feed

502.3 - TRANSFORMER CONNECTIONS

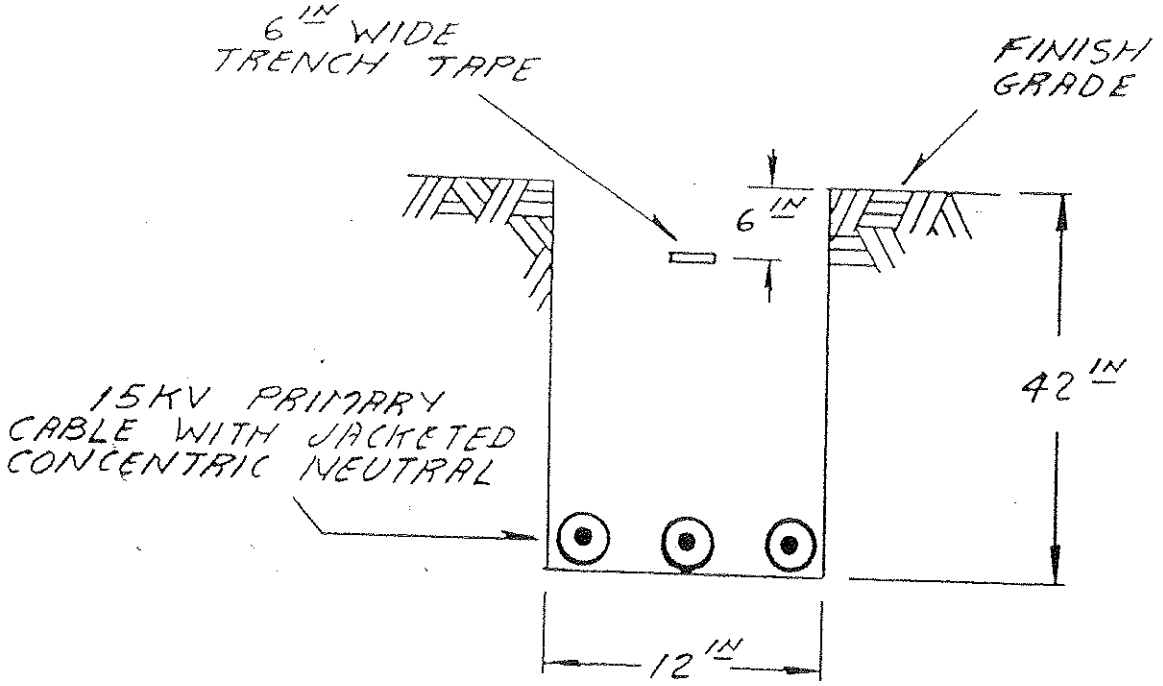
BOX PAD FOUNDATION



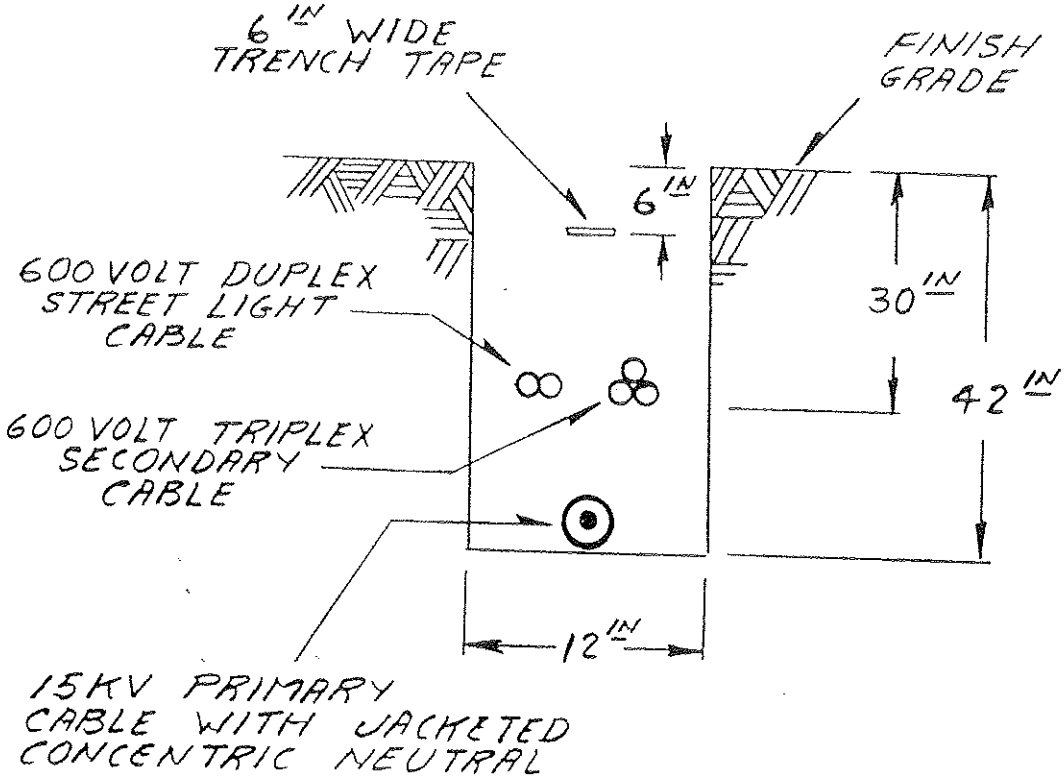


Revised 1/01

503 CABLE TRENCH SECTION 15 KV THREE PHASE DISTRIBUTION



504 - 15 KV, 1 PHASE, CABLE TRENCH WITH L.V. DISTRIBUTION



ALL PRIMARY CABLE INTENDED FOR UNDERGROUND USE SHALL HAVE THE FOLLING MINIMUM ACCEPTABLE CHARACTERISTICS AND PERFORMANCE PER PRODUCT DATA SHEET 505.1 OF THIS SPECIFICATION.

Specifications

Central Conductor: Aluminum per ASTM B-609 #0 Solid

Conductor Screen: Extruded semiconducting ethylene-propylene rubber meets or exceeds the requirements of ICEA S-68-516 and AEIC CS6.

Insulation: Extruded Okoguard meets or exceeds the requirements of ICEA S-68-516 for ethylene-propylene rubber and AEIC CS6.

Insulation Screen: Extruded semiconducting ethylene-propylene rubber meets or exceeds the requirements of ICEA S-68-516 and AEIC CS6.

Concentric Conductor: Bare copper wires.

Jacket: Black Okolene with red extruded stripes meets or exceeds the requirements of ICEA S-68-516 for polyethylene jackets. Complies with UL 1072 for Type MV-90 cables. CSA Listed to C68.3.

Product Features Okoguard cables meet or exceed NEMA/ICEA and REA U-1 standards. 90°C continuous operating temperature. 130°C emergency rating. 250°C short circuit rating. Excellent corona resistance. Low dielectric constant and power factor. Screens are clean stripping. Exceptional resistance to "treeing". Moisture resistant. Overall jacket provides extended life. Red extruded stripes. Excellent resistance to most chemicals. Listed as Type MV-90 for use in accordance with Article 326 of the NEC. Design Options: Yellow Stripes Additional conductor sizes Filled strand Copper central conductor Copper flat strap concentric neutral Semiconducting jacket Improved Temperature Rating.

Okoguard insulation system has been tested and qualified for operation at 105°C continuous and 140°C emergency operating temperature.

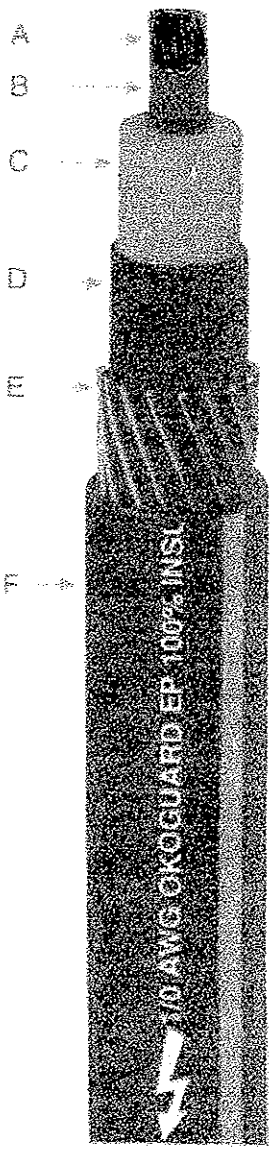
THE OKONITE COMPANY

Product Data
Section 2: Sheet 31

Okoguard® URO-J

15kV Underground Primary Distribution Cable-Jacketed
Red Identification Stripes

Aluminum Conductor/90°C Rating
133% Insulation Levels



A Conductor- Solid Aluminum

B Strand Screen- Extruded Semiconducting EPR

C Insulation-Okoguard

D Insulation Screen- Extruded Semiconducting EPR

E Concentric Conductor-Bare Copper Wires

F Encapsulating Jacket-Okolene with 3 extruded red ID stripes

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Insulation

Okoguard is Okonite's registered trade name for its exclusive ethylene-propylene rubber (EPR) based, thermosetting compound, whose optimum balance of electrical and physical properties is unequalled in other solid dielectrics. Okoguard insulation, with the distinctive red color and a totally integrated EPR system, provides the optimum balance of electrical and physical properties for long, problem free service.

The triple tandem extrusion of the screens with the insulation provides optimum electrical characteristics.

An insulation screen of ethylene-propylene rubber is extruded over the insulation. The copper concentric wires are uniformly spaced around the insulation screen. The overall polyethylene jacket provides protection against mechanical damage and corrosion.

Product identification is provided through the use of three red stripes placed 120° apart in the black jacket.

Applications

Okoguard Insulation: 220 mils 133% Insulation Level

1-Catalog Number	06-Nominal O.D. - Inches
2-Conductor Size - AWG or kcmil	07-Approx. Net Weight - lbs./1000'
3-Nominal Dia. over Insulation	08-Approx. Ship Weight - lbs./1000'
4-Nominal Dia. over Insulation Screen	09-Ampacity Direct Burial(1)
5-Copper Neutral - No. x AWG	10-Ampacity Duct(1)

1	2	3	4	5	6	7	8	9	10
FULL NEUTRAL									
▲161-23-3057	2(1x)	0.75	0.82	10 x 14	1.06	591	681	165	120
▲161-23-3060	2(7x)	0.78	0.85	10 x 14	1.09	615	705	165	120
161-23-3066	1(19x)	0.81	0.89	13 x 14	1.13	691	781	185	135
▲161-23-3269	1/0(1x)	0.82	0.89	16 x 14	1.13	740	830	210	155
▲161-23-3072	1/0(19x)	0.85	0.93	16 x 14	1.17	774	864	210	155
161-23-3075	2/0(19x)	0.90	0.97	13 x 12	1.24	912	1012	240	175
161-23-3078	3/0(19x)	0.95	1.02	16 x 12	1.29	1036	1136	270	200
161-23-3081	4/0(19x)	1.01	1.08	13 x 10	1.39	1241	1357	310	230
161-23-3084	250(37x)	1.06	1.16	16 x 10	1.48	1441	1619	340	255
161-23-3090	350(37x)	1.17	1.27	20 x 10	1.58	1734	1912	405	300
1/3 NEUTRAL									
160-23-3057	2(1x)	0.75	0.82	6 x 14	1.06	544	621	155	135
160-23-3060	2(7x)	0.78	0.85	6 x 14	1.09	569	659	155	135
160-23-3066	1(19x)	0.81	0.89	6 x 14	1.13	610	700	175	155
~~160-23-3069~~	1/0(1x)	0.82	0.89	6 x 14	1.13	625	715	200	175
160-23-3072	1/0(19x)	0.85	0.93	6 x 14	1.17	658	748	200	175
160-23-3075	2/0(19x)	0.90	0.97	7 x 14	1.21	726	826	230	200
160-23-3078	3/0(19x)	0.95	1.02	9 x 14	1.26	816	916	260	230
▲160-23-3281	4/0(19x)	1.01	1.08	11 x 14	1.32	921	1037	290	240
160-23-3084	250(37x)	1.06	1.16	13 x 14	1.40	1052	1168	320	260
160-23-3090	350(37x)	1.17	1.27	18 x 14	1.50	1280	1458	380	320
160-23-3093	500(37x)	1.29	1.39	16 x 12	1.73	1709	1959	455	385
▲160-23-3096	750(61x)	1.49	1.59	15 x 10	1.96	2301	2649	555	470
160-23-3099	1000(61x)	1.64	1.77	20 x 10	2.15	2875	3223	645	550

▲**Authorized Stock Item** - Available from Customer Service Centers

(1) **Ampacities**

Full neutral, single phase ampacities are based on ICEA S-68-516, Appendix F for 90°C conductor temperature, 20°C ambient temperature, 100% load factor, an earth thermal resistivity of RHO 90 and modified for jacketed cable.

One third neutral, three phase ampacities are based on ICEA P-53-426 triplexed or triangular configuration for the same conditions stated above.

506 - PRIMARY CABLE ACCEPTANCE TEST

ACCEPTANCE TESTING OF ANY CABLE SHALL BE PERFORMED WITH ALL CABLE TERMINATIONS INPLACE BUT DISCONNECTED FROM THE SYSTEM.

CABLE TESTING SHALL BE PERFORMED BY A CERTIFIED TESTING AGENCY APPROVED BY THE CITY OF LEWES, BOARD OF PUBLIC WORKS.

CABLE RATED 600 VOLTS OR LESS SHALL NOT BE HIGH POTENTIAL TESTED, BUT SHALL BE ACCEPTANCE TESTED AT 1000 VOLTS DC FOR ONE (1) MINUTE.

PRIMARY HIGH VOLTAGE CABLES FOR 15 KV DISTRIBUTION SHALL BE ACCEPTANCE TESTED AT 40.0 KVDC FOR FIVE (5) MINUTES.

THE TEST VOLTAGE SHALL BE APPLIED IN FOUR (4) STEPS OF 10.0 KVDC AND HELD FOR FIVE (5) MINUTES AT EACH STEP UNTIL THE MAXIMUM TEST VALUE OF 40.0 KVDC IS REACHED.

A LEAKAGE CURRENT READING SHALL BE RECORDED AT THE END OF EACH FIVE (5) MINUTE STEP.

THE 40.0 KVDC TEST VOLTAGE SHALL BE MAINTAINED FOR FIVE (5) MINUTES AND A LEAKAGE CURRENT READING SHALL BE RECORDED AT ONE (1) MINUTE INTERVALS THROUGHOUT THE FIVE (5) MINUTE TEST AT 40.0 KVDC.

WARNING

THE APPLICATION OF SERVICE VOLTAGE OR TEST VOLTAGE TO A CABLE MAY CAUSE A VOLTAGE RECOVERY OF SUFFICIENT MAGNITUDE TO CREATE A HAZARD. EXTREME CARE MUST BE TAKEN TO PROPERLY AND COMPLETELY DISCHARGE THE CABLE AFTER COMPLETION OF TESTING.

507 - PRIMARY BUSHINGS

UNDERGROUND DISTRIBUTION TRANSFORMER

PRIMARY BUSHING INSERT:

- LOAD BREAK PRIMARY BUSHING INSERT SHALL BE PROVIDED TO MATCH UNIVERSAL BUSHING WELL ON TRANSFORMERS.
- BUSHING INSERT SHALL BE 15 KV, 200 AMPERE CONSTRUCTION.
- THE MINIMUM ACCEPTABLE PRIMARY BUSHING INSERT SHALL BE ELASTIMOLD, CATALOG NO. 1601A3R., PER SECTION 507.1.

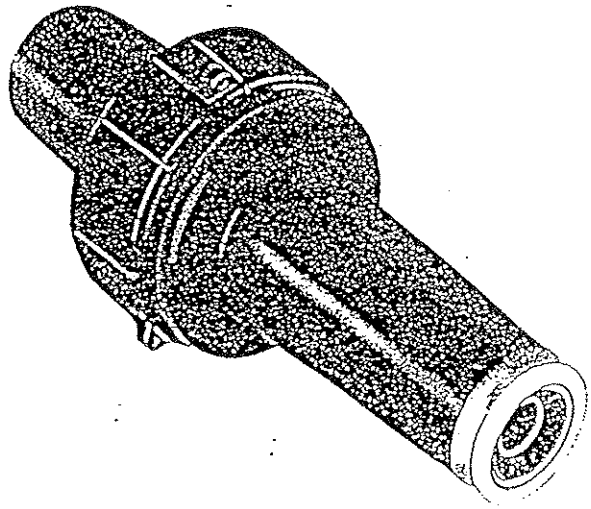
PRIMARY INSULATED STAND-OFF PLUG:

- PRIMARY INSULATED STAND-OFF PLUG SHALL BE PROVIDED IN THE PARKING STANDS OF EACH TRANSFORMER AT AN OPEN POINT, FOR PERMANENT PARKING OF ENERGIZED LOADBREAK ELBOWS.
- INSULATED STAND-OFF PLUGS SHALL BE OF 15 KV, 200 AMPERE CONSTRUCTION.
- INSULATED STAND-OFF PLUGS SHALL HAVE A SCREW CLAMP ADJUSTMENT FOR RIGID MOUNTING IN THE TRANSFORMER PARKING STAND.
- THE MINIMUM ACCEPTABLE INSULATED STAND-OFF PLUGS SHALL BE ELASTIMOLD, CATALOG NO. 160SOP, PER SECTION 507.1.

PRIMARY BUSHING INSULATING CAP:

- ALL UNOCCUPIED PRIMARY BUSHINGS SHALL BE PROTECTED WITH INSULATED BUSHING CAPS.
- BUSHING INSULATING CAPS SHALL BE OF 15 KV, 200 AMPERE CONSTRUCTION.
- BUSHING INSULATING CAP SHALL BE PROVIDED WITH A BRAIDED LEAD FOR GROUNDING OF THE CAP TO PREVENT LOW ENERGY DISCHARGE.
- BUSHING INSULATING CAP SHALL BE PROVIDED WITH HOT-STICK OPERATING EYE.
- THE MINIMUM ACCEPTABLE BUSHING INSULATING CAP SHALL BE ELASTIMOLD, CATALOG NO. 160DRG, PER SECTION 507.1.

1601A3R Loadbreak Bushing Insert



ELECTRICAL RATINGS*

Voltage—

This product is designed for use on:

a. Three-phase systems, either 3-wire or 4-wire, ungrounded or grounded, which have a maximum phase-to-ground voltage of 8.3 kv and which are nominally designated 15-kv class.

b. Single-phase laterals of three-phase systems described above.

c. Systems not exceeding 14.4 kv across the contacts during the switching operation (loadmake, loadbreak, or fault close).

BIL: 95 kv, 1.2 x 50-microsecond wave

Withstand:

35 kv, 60 Hz, 1 minute

55 kv, dc, 15 minutes

Corona voltage level: 11 kv

Current—

Continuous operation: 200 amps, rms

Short-time: 10,000 amps, rms, sym, 0.2 sec 1.3 max asym factor

Switching Operation**—

At 8.3 kv—10 loadmake, 10 loadbreak at 200 amps max, 70 to 100% lagging PF

or

At 14.4 kv—10 loadmake, 10 loadbreak at 200 amps max, 70 to 100% lagging PF

Fault Close—

After designated loadmake-loadbreak operations, 1 fault-close operation

At 8.3 kv—10,000 amps, rms, sym, 12 cycles (0.2 sec) 1.3 max asym factor

or

At 14.4 kv—10,000 amps, rms, asym, 12 cycles (0.2 sec) 1.3 max asym factor

Production Tests—

Applied potential: ac withstand—35 kv, 60 Hz, 1 minute

or

BIL—95 kv, 1.2 x 50-microsecond wave

Corona voltage level: 11 kv

*Ratings are based on United States standards. For compliance with international standards, contact the nearest Elastimold office.

APPLICATION

The ELASTIMOLD 1601A3R loadbreak bushing insert, when mated with the appropriate ELASTIMOLD products, is a fully-shielded, fully-submersible, separable insulated connector designed for energized operation. The 1601A3R is suitable for use on 15-kv class, 4-wire multi-grounded systems or 3-wire, ungrounded systems. It is rated for 200-ampere loadmake/break operation at 8.3 kv phase-to-ground and 14.4 kv phase-to-phase. It may be used as the bushing interface for connecting shielded cable to the following:

- Sub-surface transformers
- Pad-mounted transformers
- Regulators
- Switchgear
- Generators
- Reclosers

The insulation system of the 1601A3R meets the full requirements of ANSI/IEEE standard 386-1977 for 8.3/14.4 kv loadbreak connectors.

Designed for use as an apparatus bushing interface, the 1601A3R is easily installed in an ELASTIMOLD universal bushing well and mated with an appropriate Elastimold product. The apparatus should be supplied with ELASTIMOLD universal bushing wells (Section 510).

INSTALLATION

Installation does not require the use of special tools or the taping of any part of the product. The 1601A3R is threaded onto the male stud of a universal bushing well and is tightened by hand. The appropriate Elastimold mating product is installed on the bushing interface completing the process.

ELASTIMOLD DIVISION
AMERACE CORPORATION, ESNA PARK
HACKETTSTOWN, NEW JERSEY, U.S.A. 07840, (201) 852-1122

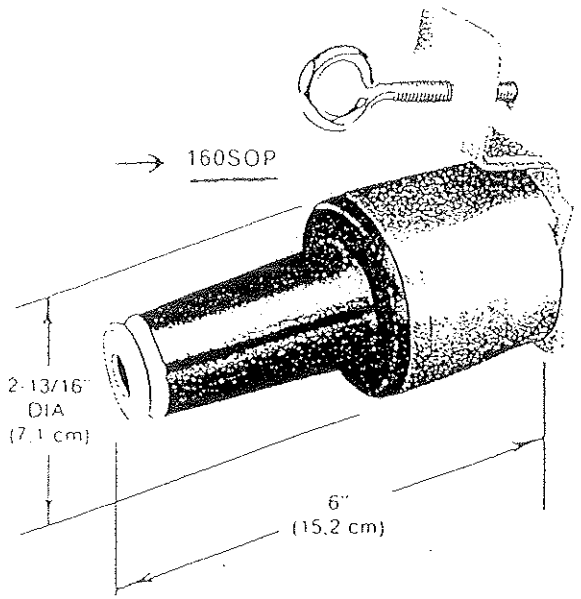
160SOP Stand-Off Plug

APPLICATION—The ELASTIMOLD 160SOP stand-off plug, when used with the proper ELASTIMOLD mating products, is a fully-shielded, fully-submersible, separable insulated connector designed for energized operation. It is suitable for use with 15-kv class loadbreak connectors on systems specified in the electrical ratings for this product. The 160SOP is used to isolate and "dead-end" an ELASTIMOLD elbow connector.

The 160SOP is designed to mate with the following ELASTIMOLD products:

165LRR elbow connector
166LRR elbow connector
160DR dead-end receptacle
160DRG dead-end receptacle with ground lead

INSTALLATION—Installation does not require the use of special tools or the taping of any part of the product. A hot-stick tool is used to insert the 160SOP into the parking stand which must be provided on the apparatus. The ELASTIMOLD elbow connector is removed from the apparatus bushing and placed on the 160SOP to complete the process.



ORDERING INSTRUCTIONS

The 160SOP stand-off plug kit contains the following:
1—Stand-off plug complete with mounting hardware. 1—Tube, lubricant. 1—Wiping cloth. 1—Installation instruction.

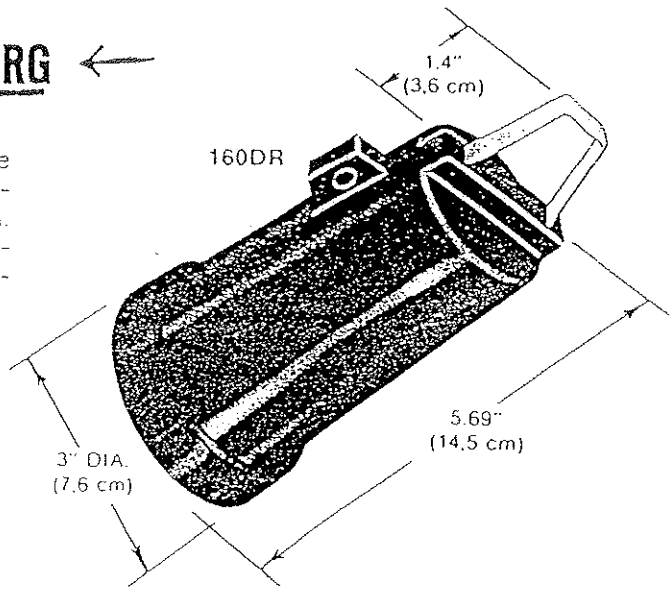
To order, specify a 160SOP.

160DR Dead-End Receptacle and 160DRG Dead-End Receptacle with Ground

APPLICATION—ELASTIMOLD dead-end receptacles are fully-shielded, fully-submersible, hot-stick operable, separable insulated connectors designed for energized operation. They are suitable for use with 15-kv class loadbreak connectors on systems specified in the electrical ratings for this product. The 160DRG has an integral ground lead as part of the assembly. The 160DR and 160DRG are used to "dead-end" the following ELASTIMOLD mating products:

1601A3R bushing insert
163 series junctions
163FTR feed-thru, 160SOP stand-off plug

INSTALLATION—Installation does not require the use of special tools or the taping of any part of the product. The 160DR or 160DRG is mated to the appropriate Elastimold product desired to be "dead-ended".



ORDERING INSTRUCTIONS

The 160DR or 160DRG dead-end receptacle kit contains the following:
1—Dead-end receptacle. 1—Tube, lubricant. 1—Wiping cloth. 1—Installation instruction.

To order, specify a 160DR or 160DRG, as required.

ELECTRICAL RATINGS* (For 160SOP, 160DR, 160DRG)

Voltage—
This product is designed for use on
a. Three-phase systems, either 3-wire or 4-wire, ungrounded or grounded, which have a maximum phase-to-ground voltage of 8.3 kv and which are nominally designated 15-kv class.
b. Single-phase laterals of three-phase systems described above.

BIL 95 kv 1.2 x 50-microsecond wave
Withstand
35 kv 60 Hz 1 minute
55 kv dc 15 minutes
Corona voltage level 11 kv

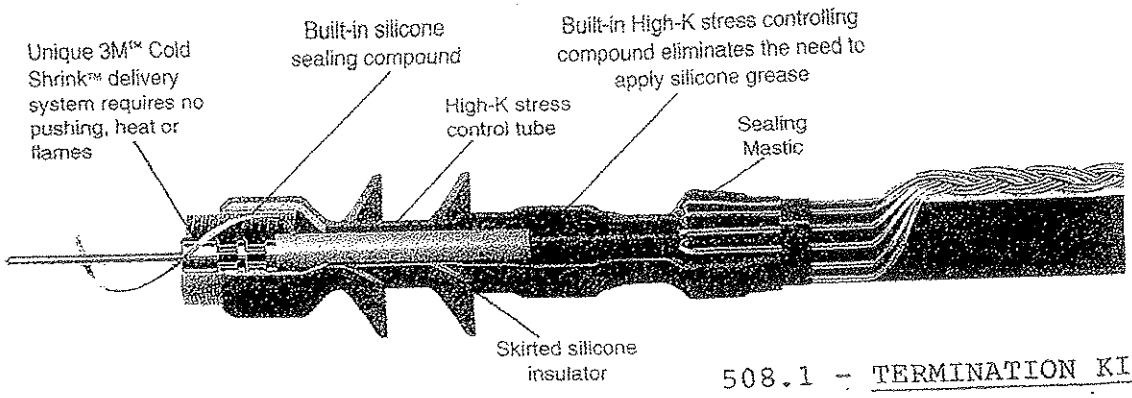
Production Tests—
Applied potential ac withstand 35 kv, 60 Hz, 1 minute
or
BIL 95 kv 1.2 x 50-microsecond wave
Corona voltage level 11 kv

Ratings are based on United States standards. For compliance with international standards [illegible]

15 KV PRIMARY CABLE

15 KV PRIMARY CABLE SHALL BE TERMINATED AT THE LOAD SIDE OF POLE MOUNTED FUSED CUTOUTS WITH PREFABRICATED TERMINATION KITS.

TERMINATORS SHALL BE 3M QT-III SILICONE RUBBER TERMINATION KIT NO. 7652-S-4-2 AS PRESENTED IN SECTION 508.1 OF THIS SPECIFICATION. NO EXCEPTIONS.



Cold Shrink™ QT-III Outdoor Termination

Kit number	BIL	Cable insulation O.D. range in. (mm)	Conductor size range AWG and kcmil (mm²) 5kV	8.7kV	15kV	25/28kV	35kV
Shielded Cable Kits*							
7620-S-2	95kV	0.32-0.59 (8,2-15,0)	8-4	8-6	-	-	-
7621-S-2	95kV	0.44-0.89 (11,2-22,7)	2-3/0	4-2/0	-	-	-
7622-S-2	110kV	0.64-1.08 (16,3-27,4)	4/0-400	3/0-300	2-4/0 (35-120)	-	-
7692-S-4	150kV	0.64-1.08 (16,3-27,4)	4/0-400	3/0-300	2-4/0 (35-120)	2-1/0 (35-50)	-
7693-S-4	150kV	0.72-1.29 (18,3-32,8)	300-500	250-500	2/0-300 (70-150)	2-4/0 (35-120)	-
7694-S-4	150kV	0.83-1.53 (21,1-38,9)	500 -750	350-700	4/0-500 (120-240)	2/0-250 (70-150)	
7695-S-4	150kV	1.05-1.80 (26,7-45,7)	700-1500	600-1250	500-1000 (240-500)	250-800 (125-400)	-
7696-S-4	150kV	1.53-2.32 (38,9-58,9)	1750-2000	1500-2000	1250-2000 (625-1000)	900-1750 (500-800)	-
7683-S-8	200kV	0.72-1.29 (18,3-32,8)	300-500	250-500	2/0-300 (70-150)	2-4/0 (35-120)	2-2/0 (35-70)
7684-S-8	200kV	0.83-1.53 (21,1-38,9)	500 -750	350-700	4/0-500 (120-240)	2/0-250 (70-150)	2-4/0 (35-120)
7685-S-8	200kV	1.05-1.80 (26,7-45,7)	700-1500	600-1250	500-1000 (240-500)	250-800 (125-400)	3/0-600 (95-325)
7686-S-8	200kV	1.53-2.32 (38,9-58,9)	1750-2000	1500-2000	1250-2000 (625-1000)	900-1750 (500-800)	700-1500 (400-725)
Concentric and Jacketed Concentric Cable Kits**							
7642-S-2	110kV	0.64-1.08 (16,3-27,4)	4/0-400	3/0-300	2-4/0 (35-120)	-	-
7652-S-4	150kV	0.64-1.08 (16,3-27,4)	4/0-400	3/0-300	2-4/0 (35-120)	2-1/0 (35-50)	-
7653-S-4	150kV	0.72-1.29 (18,3-32,8)	300-500	250-500	2/0-300 (70-150)	2-4/0 (35-120)	-
7654-S-4	150kV	0.83-1.53 (21,1-38,9)	500 -750	350-700	4/0-500 (120-240)	2/0-250 (70-150)	
7655-S-4	150kV	1.05-1.80 (26,7-45,7)	700-1500	600-1250	500-1000 (240-500)	250-800 (125-400)	-
7656-S-4	150kV	1.53-2.32 (38,9-58,9)	1750-2000	1500-2000	1250-2000 (625-1000)	900-1750 (500-800)	-
7663-S-8	200kV	0.72-1.29 (18,3-32,8)	300-500	250-500	2/0-300 (70-150)	2-4/0 (35-120)	2-2/0 (35-70)
7664-S-8	200kV	0.83-1.53 (21,1-38,9)	500 -750	350-700	4/0-500 (120-240)	2/0-250 (70-150)	2-4/0 (35-120)
7665-S-8	200kV	1.05-1.80 (26,7-45,7)	700-1500	600-1250	500-1000 (240-500)	250-800 (125-400)	3/0-600 (95-325)
7666-S-8	200kV	1.53-2.32 (38,9-58,9)	1750-2000	1500-2000	1250-2000 (625-1000)	900-1750 (500-800)	700-1500 (400-725)
High Fault Current Cable Kits***							
7652-S-HSG-4	150kV	0.64-1.08 (16,3-27,4)	4/0-400	3/0-300	2-4/0 (35-120)	2-1/0 (35-50)	-
7653-S-HSG-4	150kV	0.72-1.29 (18,3-32,8)	300-500	250-500	2/0-300 (70-150)	2-4/0 (35-120)	-
7654-S-HSG-4	150kV	0.83-1.53 (21,1-38,9)	500-750	350-700	4/0-500 (120-240)	2/0-250 (70-150)	
7655-S-HSG-4	150kV	1.05-1.80 (26,7-45,7)	700-1500	600-1250	500-1000 (240-500)	250-800 (125-400)	-
7656-S-HSG-4	150kV	1.53-2.32 (38,9-58,9)	1750-2000	1500-2000	1250-2000 (625-1000)	900-1750 (500-800)	-
7663-S-HSG-8	200kV	0.72-1.29 (18,3-32,8)	300-500	250-500	2/0-300 (70-150)	2-4/0 (35-120)	2-2/0 (35-70)
7664-S-HSG-8	200kV	0.83-1.53 (21,1-38,9)	500-750	350-700	4/0-500 (120-240)	2/0-250 (70-150)	2-4/0 (35-120)
7665-S-HSG-8	200kV	1.05-1.80 (26,7-45,7)	700-1500	600-1250	500-1000 (240-500)	250-800 (125-400)	3/0-600 (95-325)
7666-S-HSG-8	200kV	1.53-2.32 (38,9-58,9)	1750-2000	1500-2000	1250-2000 (625-1000)	900-1750 (500-800)	700-1500 (400-725)

*Each Shielded Cable Kit makes three terminations.
**Each Concentric and Jacketed Concentric Cable Kit makes one termination.
***Each High Fault Current Cable Kit makes one termination.

Revised 1/01

Please contact your local 3M representative for more information.

509- TERMINATIONS- LOAD SIDE

15 KV PRIMARY CABLE

LOAD SIDE TERMINATIONS:

15 KV PRIMARY CABLE SHALL BE TERMINATED AT THE HIGH VOLTAGE COMPARTMENT OF THE DESIGNATED EQUIPMENT, USING LOAD BREAK ELBOWS.

PRIMARY CABLE ELBOWS SHALL BE OF 15 KV 200 AMPERE, LOAD BREAK CONTSTRUCTION.

ELBOWS SHALL BE CONSTRUCTED OF EPDM RUBBER COMPATIBLE WITH ETHYLENE-PROPYLENE RUBBER (EPR) URD PRIMARY CABLE.

ELBOWS SHALL BE CONSTRUCTED WITH HOT- STICK OPERATING EYE, CAPACITANCE TAP, GROUNDING TAP.

ELBOWS SHALL BE SUPPLIED WITH CRIP CONNECTORS FOR NO. 1/0 SOLID ALUM. CONDUCTOR.

THE MINIMUM ACCEPTABLE STANDARD FOR ELBOWS SHALL BE COOPER, CATALOG NO. LE215BO5T, AS PRESENTED IN SECTION 509.2 OF THIS SPECIFICATION.

509.1 - TERMINATIONS

ELBOW ARRESTERS AT OPEN POINTS

- ELBOW TYPE ARRESTER SHALL BE LOCATED AT "OPEN POINTS" IN THE LOOP - (1) ONE COOPER CATALOG #3238018C09M SURGE ARRESTER. (1) ONE COOPER CATALOG #3237686C09M PARKING STAND SURGE ARRESTER.

- ALL LOAD BREAK ELBOWS SHALL BE EQUIPPED WITH FAULT INDICATORS, AND INSTALLED PER MANUFACTURER'S DIRECTIONS.

THE MINIMUM ACCEPTABLE STANDARD FOR THE SURGE ARRESTERS AND FAULT INDICATORS (AS NOTED ABOVE) ARE PRESENTED IN SECTION 509.2 OF THIS SPECIFICATION.

Surge Arresters

Metal Oxide Parking Stand Surge Arrester

GENERAL

The RTE® Parking Stand Arrester combines metal (zinc) oxide varistor technology with a premolded rubber insulated standoff bushing. The arrester provides overvoltage system protection in an insulated, fully shielded, submersible, deadfront device. The standoff bushing interface conforms to ANSI/IEEE Standard 386—Separable Insulated Connector Systems. The arrester housing provides necessary deadfront safety.

Parking Stand Arresters are used on underground systems in pad-mounted transformers and entry cabinets, vaults, switching enclosures and other installations to provide shielded deadfront arrester protection.

They are designed for use with RTE 200 A loadbreak elbows and other accessories with 200 A loadbreak interfaces per ANSI/IEEE Standard 386 to limit overvoltages to acceptable levels, protect equipment and extend cable life. Parking Stand Arresters provide an economical means of overvoltage protection for energized but parked open point cable runs.

Installation time is reduced as the parking stand arrester replaces a "MOVE" elbow arrester and portable feedthru in this application. See Catalog Section 235-65, for information on the "MOVE" elbow arrester for protection of the other side of loop, radial applications and mid-line protection.

The Parking Stand Arrester is designed to be installed in the parking stand bracket found on the frontplate of a transformer or other apparatus. The molded EPDM rubber body is held in a stainless steel bracket assembly. A stainless steel eyebolt is used to secure the Parking Stand Arrester in the parking stand bracket.

INSTALLATION

No special tools are required. The arrester is placed in a parking stand bracket with a shotgun stick. Refer to Installation Instruction Sheet 5000050704 for details.

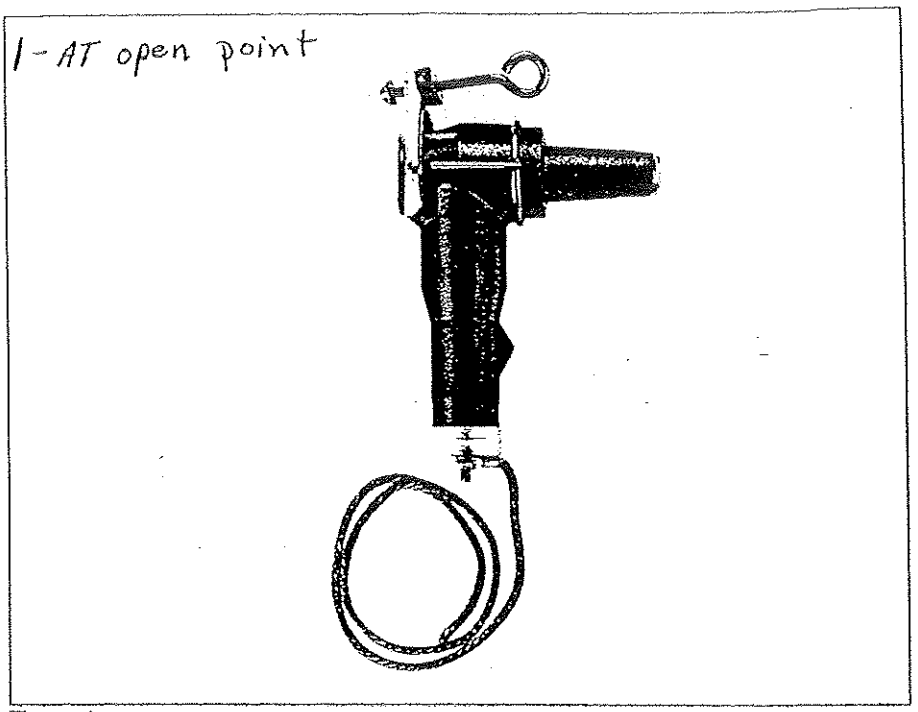


Figure 1.
15 kV Metal Oxide Parking Stand Surge Arrester.

PRODUCTION TESTS

Tests are conducted in accordance with ANSI/IEEE Standard 386.

- Corona Extinction Voltage Level (both on molded rubber body and complete assembly)
- ac 60 Hz 1 Minute Withstand (on molded rubber body only)

Tests are conducted in accordance with RTE requirements.

- Physical Inspection
- Periodic Dissection
- MOV Blocks:
  - Voltage at 1 mA
  - Batch Life Test
- Arrester Assembly: Voltage at 1 mA
- Periodic Fluoroscopic Analysis

TABLE 1
Electrical Ratings and Characteristics

Duty Cycle Voltage Rating (kV)	MCOV (kV)	Equivalent Front-of-Wave (kV)*	Discharge Voltage (kV)**				
			1.5 kA	3 kA	5 kA	10 kA	20 kA
3	2.55	13.7	10.7	12.0	12.8	13.4	15.7
6	5.1	27.4	21.9	24.5	26.2	28.6	34.9
9	7.65	37.4	27.4	29.9	31.4	34.7	38.4
10	8.4	39.7	28.4	30.6	32.9	36.7	40.4
12	10.2	56.1	41.1	44.8	47.1	52.0	57.6
15	12.7	63.0	45.0	49.2	52.5	57.8	66.0
18	15.3	74.8	54.7	59.7	62.7	69.3	76.8
21	17.0	81.7	58.7	64.2	68.2	75.2	85.2

* Equivalent front-of-wave voltage is the expected discharge voltage of the arrester when tested with a 5 kA current surge cresting in 0.5 µs.

** Maximum discharge voltage for an 8/20 µs surge current.

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Surge Arresters

Electrical Apparatus
235-65

Metal Oxide Elbow Surge Arrester

GENERAL

The RTE® M.O.V.E. Surge Arrester combines metal (zinc) oxide varistor technology in a premolded rubber elbow to provide overvoltage system protection in an insulated, fully shielded, submersible, deadfront device.

The arrester housing interface conforms to ANSI/IEEE Standard 386—Separable Insulated Connector Systems. The arrester housing is molded of RTE EPDM insulating rubber, which provides deadfront safety in a small, shotgun stick operable unit.

M.O.V.E. arresters are used on underground systems in pad-mounted transformer and entry cabinets, vaults, switching enclosures and other installations to provide shielded deadfront arrester protection. They are designed for use with RTE 200 A loadbreak bushings and other accessories with 200 A loadbreak interfaces that conform to ANSI/IEEE Standard 386 to limit overvoltages to acceptable levels, protect equipment and extend cable life.

Installing a M.O.V.E arrester at the end of a radial system or at both ends of an open point on a loop system provides excellent overvoltage protection. The addition of a second "MOVE" Arrester at the next point upstream provides optimum protection. See Catalog Section 235-68 for information on the "MOV" "Parking Stand Arrester".

INSTALLATION

No special tools are required. The arrester is placed on a 200 A interface by using a shotgun stick. Refer to Installation Instruction Sheet 5000050052 for details.

PRODUCTION TESTS

Tests are conducted in accordance with ANSI/IEEE Standard 386.

- Corona Extinction Voltage Level (both on molded rubber body and complete assembly)
- ac 60 Hz 1 Minute Withstand (on molded rubber body only.)

3238018C09M
1- AT open point

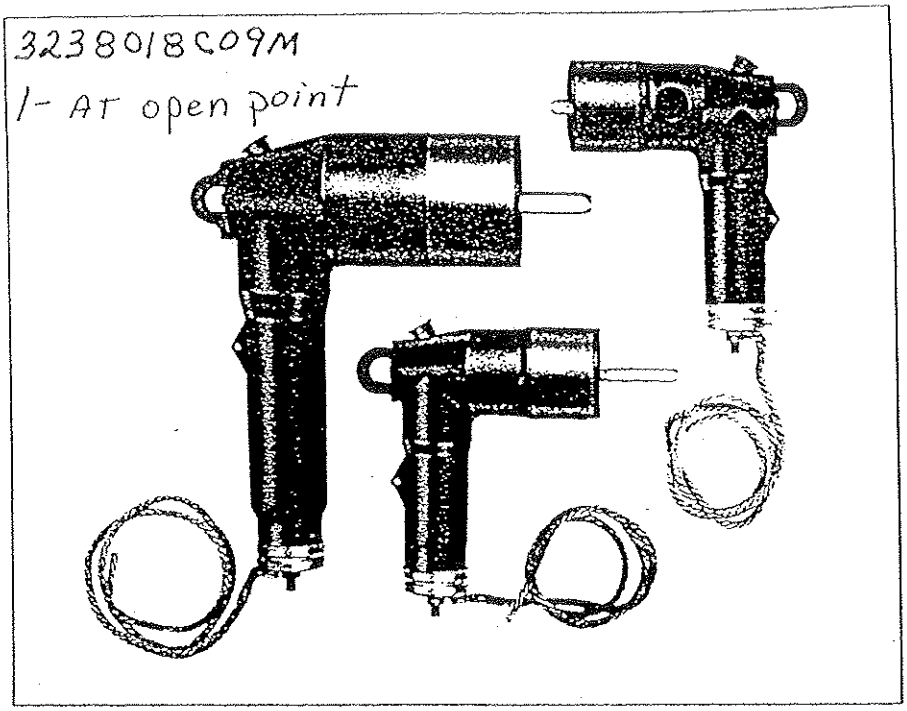


Figure 1.
Metal Oxide Elbow Surge Arresters shown from left to right: 35 kV, 25 kV and 15 kV.

TABLE 1
Electrical Ratings and Characteristics

Duty Cycle Voltage Rating (kV)	MCOV (kV)	Equivalent Front-of-Wave (kV)*	Discharge Voltage (kV)**				
			1.5 kA	3 kA	5 kA	10 kA	20 kA
3	2.55	13.7	10.7	12.0	12.8	13.4	15.7
6	5.1	27.4	21.9	24.5	26.2	28.6	34.9
9	7.65	37.4	27.4	29.9	31.4	34.7	38.4
10	8.4	39.7	28.4	30.6	32.9	36.7	40.4
12	10.2	56.1	41.1	44.8	47.1	52.0	57.6
15	12.7	63.0	45.0	49.2	52.5	57.8	66.0
18	15.3	74.8	54.7	59.7	62.7	69.3	76.8
21	17.0	81.7	58.7	64.2	68.2	75.2	85.2
24	19.5	95.8	69.7	76.1	80.2	88.6	98.8
27	22.0	105.0	75.0	82.0	87.4	96.2	110.0

* Equivalent front-of-wave voltage is the expected discharge voltage of the arrester when tested with a 5 kA current surge cresting in 0.5 µs.

** Maximum discharge voltage for an 8/20 µs surge current.

Tests are conducted in accordance with RTE requirements.

- Physical Inspection
- Periodic Dissection
- MOV Blocks:
  - Voltage at 1 mA
  - Batch Life Test
- Arrester Assembly: Voltage at 1 mA
- Periodic Fluoroscopic Analysis

TABLE 2
Performance Test Characteristics*

Description	Characteristics
High Current Short Duration	2 discharges of 40 kA crest
Low Current Long Duration	20 surges of 75 A-2000 microsecond duration
Duty Cycle	22 operations of 5 kA crest 8 x 20 microsecond duration
Thermal Recovery at MCOV	

* Tests were performed in accordance with applicable sections of ANSI C62.11-1987 (Metal Oxide Surge Arresters for Alternating Current Power Circuits) with test levels chosen in accordance with levels found in underground distribution systems.

Loadbreak Apparatus Connectors

COOPER
Cooper Power Systems

Electrical Apparatus
500-10

200 A 15 kV Class Loadbreak Elbow Connector

LE 215 A05 T

GENERAL

The Cooper Power Systems RTE® Loadbreak Elbow connector is a fully-shielded and insulated plug-in termination for connecting underground cable to transformers, switching cabinets and junctions equipped with loadbreak bushings. The elbow connector and bushing insert comprise the essential components of all loadbreak connections.

RTE loadbreak elbows are molded using high quality peroxide-cured EPDM insulation. Standard features include a coppertop connector, tin plated copper loadbreak probe with an ablative arc-follower tip and stainless steel reinforced pulling-eye. An optional capacitive test point, made of corrosion resistant plastic, is available for use with fault indicators (see Catalog Section 320-10).

Wide cable ranges are sized to accept cables insulated at either 175 mil or 220 mil within a given conductor size. The wider cable ranges increase installation flexibility.

The coppertop compression connector is a standard item to transition from the cable to the loadbreak probe. An aluminum crimp barrel is inertia-welded to a copper lug. The aluminum barrel makes the connector easy to crimp and the copper lug ensures a reliable, tight, cool operating connection with the loadbreak probe.

INSTALLATION

Cable stripping and scoring tools, available from various tool manufacturers, are recommended for use when installing loadbreak elbows. After preparing the cable, the elbow housing is pushed onto the cable. The loadbreak probe is threaded into the coppertop connector using the supplied installation tool or an approved equivalent. Use a shotgun stick to perform loadmake and loadbreak operations. See Installation Sheet S500-10-1 for details.

Figure 1.
Loadbreak Elbow Connector with test point; also available without test point.

PRODUCTION TESTS

Tests conducted in accordance with ANSI/IEEE Standard 386:

- ac 60 Hz 1 Minute Withstand –34 kV
- Minimum Corona Voltage Level –11 kV
- Test Point Voltage Test

TABLE 1
Voltage Ratings and Characteristics

Description	kV
Standard Voltage Class	15
Maximum Rating Phase-to-Phase	14.4
Maximum Rating Phase-to-Ground	8.3
ac 60 Hz 1 Minute Withstand	34
dc 15 Minute Withstand	53
BIL and Full Wave Crest	95
Minimum Corona Voltage Level	11

Voltage ratings and characteristics are in accordance with ANSI/IEEE Standard 386.

Tests are conducted in accordance with Cooper Power Systems requirements:

- Physical Inspection
- Periodic Dissection
- Periodic Fluoroscopic Analysis

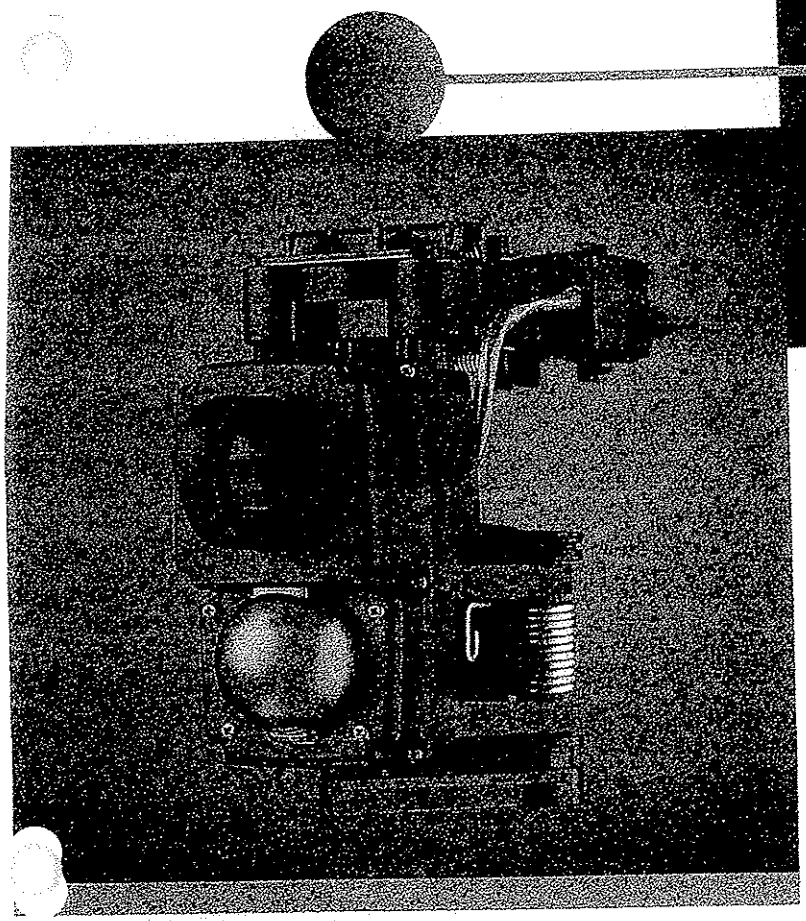
TABLE 2
Current Ratings and Characteristics

Description	Amperes
Continuous	200 A rms
Switching	10 operations at 200 A rms at 14.4 kV
Fault Closure	10,000 A rms symmetrical at 14.4 kV after 10 switching operations for 0.17 s
Short Time	10,000 A rms symmetrical for 0.17 s
	3,500 A rms symmetrical for 3.0 s

Current ratings and characteristics are in accordance with ANSI/IEEE Standard 386.

S.T.A.R.™ FAULTED CIRCUIT INDICATORS

CURRENT RESET TYPE



CAT # SCLO

THESE DESIGN FEATURES ARE STANDARD ON EVERY S.T.A.R. FAULTED CIRCUIT INDICATOR:

- **Inrush Restraint** – Eliminates false tripping due to recloser operations
- **Low Pass Filter** – Prevents tripping on high frequency transients
- **Temperature Compensation Circuitry** – Assures accurate, reliable performance over a wide temperature range
- **Reliable Closed Core CT Design** – Eliminates tripping due to adjacent magnetic fields
- **Quick Response Time** – Coordinates with all current-limiting fuses
- **Tough, Durable Construction** – Corrosion-proof, damage-resistant, display status cannot mechanically change
- **Exceeds ANSI/IEEE Standard 495-1986**
- **Quick and Easy Installation** – Only one hot stick is required

Cooper Power Systems' S.T.A.R. Current Reset (CR) faulted circuit indicators (FCIs) can be installed on padmounted distribution transformers, sector cabinets, switchgear and overhead bare conductors. The unit automatically resets back to the normal position when the continuous current exceeds the 2.4 A reset value.

The S.T.A.R. CR FCI is comprised of a closed core current transformer that is used for both sensing the fault current and providing power to operate the FCI. A patented clamping mechanism and unique spring action CT design makes it "a snap" to install on a wide range of cable diameters. Installation can be achieved with a single hot stick.

The unique FISHEYE™ display, with a highly visible orange reflective target, provides enhanced 180 degree visual indication. The display is black under normal conditions and turns to orange when a fault has been sensed.

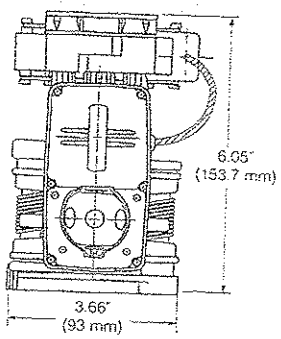
The selection of a CR faulted circuit indicator has never been easier! For conventional indicators, trip ratings are selected based on cable diameter, load current and minimum fault current levels. Trip rating selection for S.T.A.R. faulted circuit indicators has been reduced to two simple choices. For a 200 A URD circuit, select a "LO" trip rating. For a 600 A distribution system, select a "HI" trip rating. This approach to trip selection means that one indicator fits all cable diameters from 0.25" through 2.0".

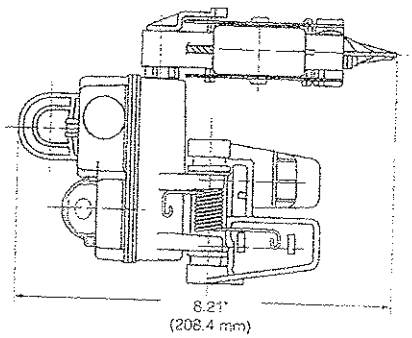
With this simplified approach to rating selection:

- Ordering is easier and reduces lead times.
- Inventory is reduced, eliminating the need to stock multiple designs.
- Pre-installation load surveys are not needed.
- FCI changeouts are not necessary as systems grow.
- Misapplication due to trip selection errors is eliminated.

For Superior Reliability Reach For The S.T.A.R.s

Cooper Power Systems manufactures a line of **S**uperior, **T**ough **A**nd **R**eliable faulted circuit indicators to fit your application.





Electrical Ratings and Characteristics

Description	Ratings and Characteristics
Power Requirements	Min. 2.4 A Continuous
Reset Time	5 Minutes at 2.4 A Max.
Trip Current	Factory Preset (High or Low)
Trip Accuracy	+/- 10%
Trip Response Speed	Response Curve, Figure 3, Sec. 320-75
Fault Withstand Capability	10 kA for 10 Cycles per ANSI/IEEE 495-1986
Temperature Range	-40° C to +85° C
Materials	Corrosion-resistant & submersible per ANSI/IEEE 495-1986
Weight	27.2 ounces (0.77 kg)
Conductor Size	0.25" through 2.0"

Because we've incorporated so many "custom" features into our standard design, we've drastically reduced the part numbers. This makes ordering easier and delivery faster. Use the diagram below to select the S.T.A.R. Current Reset Type faulted circuit indicator for your application. Contact your local Cooper Power Systems sales engineer for catalog section 320-75 and additional information.

S.T.A.R. Current Reset Type FCI Ordering Information

	← Standard →				← Options →		
Digits:	1	2	3	4	5	6	7
	S	C	H	I			

S.T.A.R. FCI Line

FCI Type

Trip Rating

Options

Example: A Current Reset FCI with a high trip rating would have a catalog number SCHI (as shown below).

Digit 2	Type
C	Current Reset

Digits 3	Digits 4	Trip Rating
L	O	Low
H	I	High

Digits 5	Digits 6	Digits 7	Descriptions

* Indicator with auxiliary contacts provided with 6 ft. length as standard.

Notes:
1. The S.T.A.R. FCI catalog number may vary in length from 4 digits to 7 digits.
2. The standard S.T.A.R. FCI catalog number may be truncated after entering digits 1-4. Options may be selected by adding the appropriate design code to digits 5, 6, and/or 7.

COOPER Power Systems

P.O. Box 1640, Waukesha, WI 53187

Bulletin Number 98025 • June 1998

Fault Indicators

COOPER Power Systems

Electrical Apparatus

Faulted Circuit Indicator Application Guide

320-05

Contents

GENERAL

Fault indicators are devices which indicate the passage of fault current. When properly applied, they can reduce operating costs and reduce service interruptions by identifying the section of cable that has failed. At the same time, fault indicators can increase safety and reduce equipment damage by reducing the need for hazardous fault chasing procedures. To provide the greatest benefit, the fault indicator must indicate reliably when fault current passes through the cable to which the fault indicator is mounted. Misapplication or improper selection of the fault indicator can reduce reliability.

Figure 1 illustrates a typical looped underground distribution system. The underground cable is looped into and out of each transformer to the open point. Typically one fault indicator is placed on each incoming phase of the transformer. Figure 1 shows the fault indicator target position after a cable fault caused the tap fuse to operate. If the line is followed from the source, the fault would be located between the last tripped indicator and the first non-tripped (normal) indicator. Visual inspection of the fault indicator eliminates the need for trial and error sectionalizing of the system, thus reducing service restoration time.

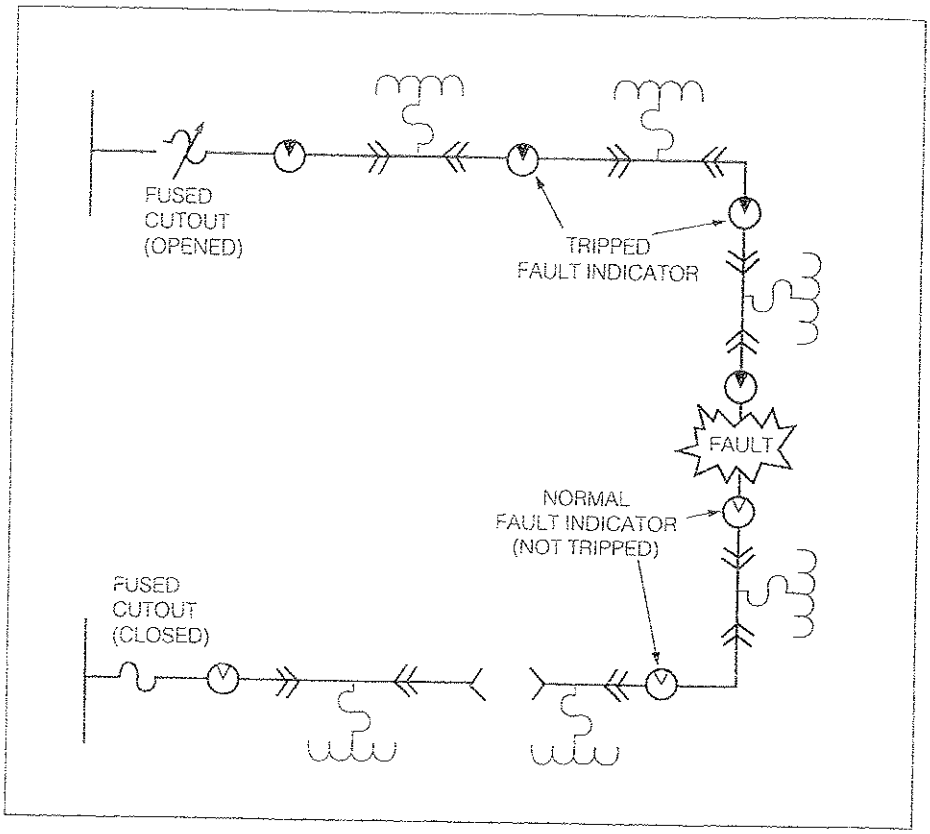


Figure 1.
Typical looped underground system application.

510 - CABLE TRENCH
EXCAVATION AND BACKFILL

EXCAVATION:

- NO CABLES SHALL BE INSTALLED WITH THE USE OF AN EARTH SLITTER OR PLOW.
- ALL CABLE TRENCHES FOR ALL CABLES SHALL BE EXCAVATED AND SHALL HAVE A MINIMUM WIDTH AND DEPTH AS SHOWN ON THE DRAWINGS AND SPECIFICATIONS.
- ALL TRENCHES SHALL BE KEPT FREE OF WATER BY AN APPROVED METHOD DURING INSTALLATION. IT SHALL BE THE DEVELOPER'S RESPONSIBILITY TO SUPPLY ALL PUMPS, HOSES, HARDWARE, ETC., WHICH SHALL BE REQUIRED TO PERFORM THIS FUNCTION.
- CARE SHALL BE TAKEN TO AVOID EXCESS EXCAVATION.
- ADVANCE TRENCHING SHALL BE PERMITTED ONLY TO THE EXTENT THAT ALL INSTALLATIONS AND BACKFILLING CAN BE COMPLETED IN THAT DAY'S OPERATION.

- WHERE ROCK IS ENCOUNTERED, EXCAVATION SHALL BE TO A DEPTH OF SIX (6) INCHES GREATER THAN THE DIMENSIONS SPECIFIED. THIS EXTRA DEPTH SHALL BE BACKFILLED WITH SELECT BORROW OR SAND AND COMPACTED BEFORE ANY CABLE IS INSTALLED IN THE TRENCH.

- THE DEVELOPER SHALL NOTIFY THE BOARD OF PUBLIC WORKS IMMEDIATELY IF SOFT OR SPRING CONDITIONS ARE DISCOVERED DURING EXCAVATION. WORK IN SUCH AREAS SHALL IMMEDIATELY TERMINATE UNTIL INSTRUCTIONS ARE RECEIVED FROM THE BOARD OF PUBLIC WORKS.

510 - CABLE TRENCH

EXCAVATION AND BACKFILL (CONTINUED)

BACKFILLING:

- ALL TRENCHES SHALL BE PROPERLY BACKFILLED PRIOR TO CESSATION OF DAILY WORK PERIODS.
- BACKFILLING OF CONDUCTOR TRENCHES SHALL BE IN ACCORDANCE WITH THE TRENCH DETAILS SHOWN ON THE DRAWINGS AND SPECIFICATIONS.
- ALL EXCAVATED MATERIALS NOT SUITABLE OR REQUIRED FOR BACKFILL SHALL BE DISPOSED OF BY THE DEVELOPER.
- ALL EXCAVATIONS SHALL BE BACKFILLED AND THOROUGHLY COMPACTED AT THE EXPENSE OF THE DEVELOPER.
- IT SHALL BE THE RESPONSIBILITY OF THE DEVELOPER TO NOTIFY THE BOARD OF PUBLIC WORKS, TWENTY-FOUR (24) HOURS IN ADVANCE OF ANY CABLE LAYING OR BACKFILL.
- NO CABLE SHALL BE INSTALLED OR TRENCHES BACKFILLED, EXCEPT IN THE PRESENCE OF AN INSPECTOR APPOINTED BY THE BOARD OF PUBLIC WORKS.
- PIECES OF SCRAP CABLE SHALL NOT BE BURIED IN THE TRENCH AS A MEANS OF DISPOSAL.
- ALL CONDUCTORS SHALL BE COMPLETELY ENCASED IN A LAYER OF EXCAVATED MATERIAL FREE OF DEBRIS IN EXCESS OF ONE (1) INCH IN DIAMETER. SIX (6) INCHES BELOW AND SIX (6) INCHES ABOVE ANY CONDUCTORS.
- EARTH CONTAINING FROST SHALL BE EXCLUDED FROM BACKFILL.
- ALL BACKFILL SHALL BE PLACED IN LIFTS EIGHT (8) INCHES OR LESS IN THICKNESS.
- PRIOR TO BACKFILLING AROUND POLE FOUNDATIONS, ALL FORMS, TRASH, DEBRIS, ETC., SHALL BE CLEARED AWAY AND LOOSE EARTH REMOVED TO SOLID GROUND. APPROVED BACKFILL SHALL BE PLACED AROUND FOUNDATION IN LAYERS NOT EXCEEDING EIGHT (8) INCHES. EACH LAYER SHALL BE MOISTENED (IF REQUIRED) AND MECHANICALLY TAMPED TO 95 PERCENT (95%) OF MAXIMUM DRY DENSITY AT OPTIMUM MOISTURE CONTENT.

511 - PRIMARY CABLE IDENTIFICATION

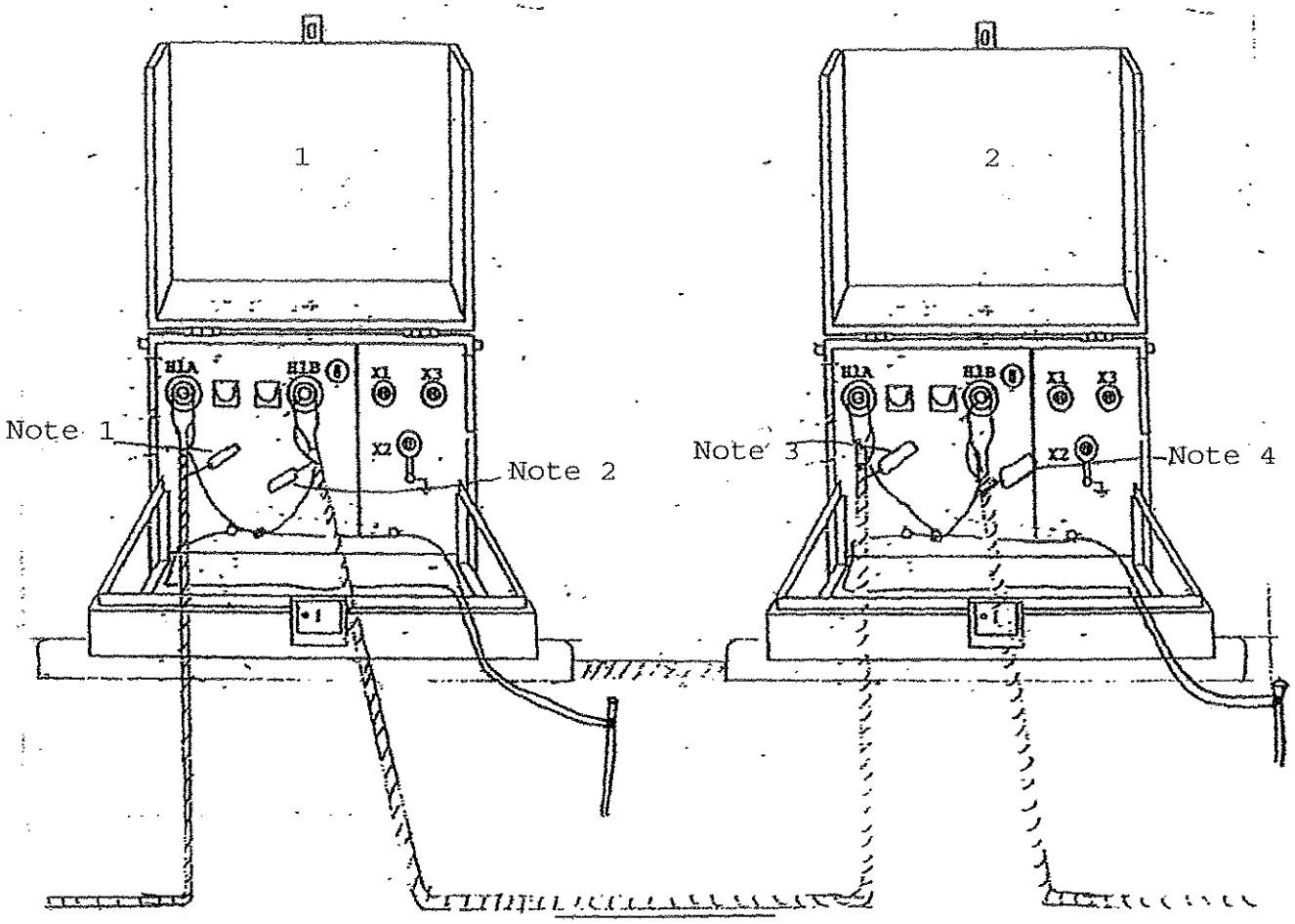
- EACH PRIMARY CABLE IN TRANSFORMERS WILL BE MARKED AT ELBOW WITH IDENTIFICATION TAGS REFERENCE TO WHAT NUMBER TRANSFORMER THEY CAME FROM AND WHAT NUMBER TRANSFORMER THEY ARE GOING TO INCLUDING IDENTIFICATION OF THE BUSHING THEY ARE ON WITH PHASE LETTER. (SEE 511-1.)

- ALL MARKINGS TO BE WITH PERMANENT MARKER PEN BLACK.

- ALL CABLES AT POLE TO BE MARKED WITH PHASE LETTER.

- MINIMUM ACCEPTABLE STANDARDS FOR CABLE LABEL MATERIALS ARE PRESENTED IN SECTION 511.2 OF THIS SPECIFICATIN.

511.1 - PRIMARY CABLE IDENTIFICATION ILLUSTRATION



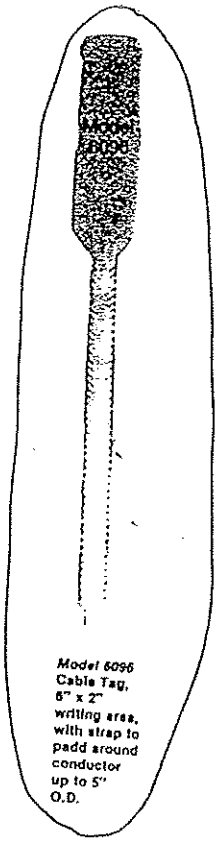
Notes

1 From Pole A Ph
2 To Xfmr 2 H1A A Ph
3 From Xfmr 1 H1B A Ph
4 To Xfmr 3 H1A A Ph

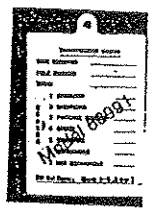
AMERICAN SAFETY UTILITY CORPORATION
AS-U-C the need for Safety Products . . .
1808 E. DIXON BLVD.
SHELBY, N.C. 28150

FlagTag™ cable label system

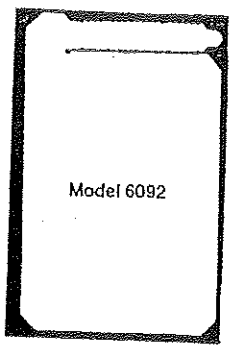
Model 609 Cable Tag, 4" x 1¾" writing area, with strap to pass around cable up to 1½" O.D.



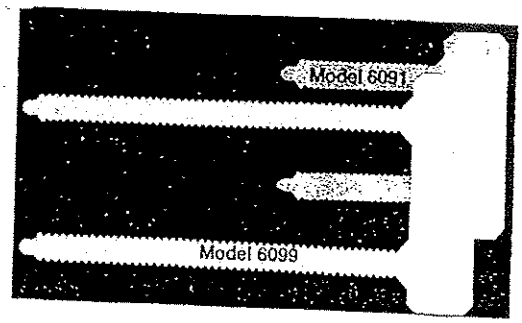
Model 6096 Cable Tag, 5" x 2" writing area, with strap to padd around conductor up to 5" O.D.



#60991
Transformer Status
Date Removed_____
Pole Number _____
Town _____
REASON
1 Overload _____
2 Lightning _____
3 Physical Damage ___
4 Other _____
5 Unknown _____
6 Repairable _____
7 Not Repairable ___
Fill Out Above;
Check 1-5 & 6 or 7

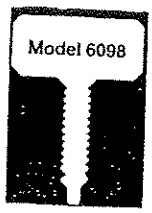


Mini-Tags, Model 6093 (3¼" green triangle), Model 6093 (3½" red round) and Model 6094 (3" white square) with grommetted holes for attaching to equipment, cables, etc.

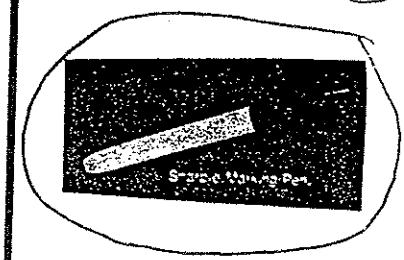


Model 6099 Jumbo Cable Tag, 6" x 2" writing area, with 2 12" straps to pass around conductor up to 5" O.D.

Model 6091 Jumbo Cable Tag, 6" x 2" writing area, with 2 straps to pass around cable up to 1¾" O.D.



Model 6098 T-Shaped Cable Tag, 4" x 1¾" writing area, with strap to pass around cable up to 1½" O.D.



Flag Tag™ Label System includes a variety of easy to attach bright colored tags that can be marked with a long-lasting Sharpie marking pen. You can order any one of five cable tags, a vault map, a transformer status tag or three Mini-Tags.

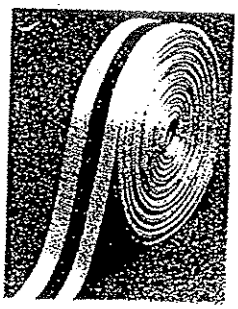
Flag Tag™ Test Results

Both the Flag Tag™ material and the Sharpie marking pen have been tested for long periods of time under extreme conditions to assure that notations will remain legible indefinitely. These tests include boiling water, electrical joint compound, fertilizer, silicon lubricant, transformer fluid, and year-around weather. Exposure to direct sunlight for long periods of time (1-2 years) may fade the ink or plastic colors. (Test results available on special request.)

AMERICAN SAFETY UTILITY CORPORATION

AS-U-C the need for Safety Products . . .

1808 E. DIXON BLVD. SHELBY, N.C. 28150



Woven Tape	Catalog No.	Size
black & yellow roll	C91172 C91176	¾"x100' 2"x200'

Thank You...

I APPRECIATE YOUR NOT SMOKING HERE

#909 (6" x 9") pressure sensitive white background with red letters

=REPORT= ALL INJURIES TO YOUR FOREMAN

#308 (9" x 12") pressure sensitive red background black letters.

UNDERGROUND TAPES

3" x 1000 Ft.

#CBCTVLB-3-U
CAUTION BURIED CABLE T.V. LINE BELOW

#CBELB-3-U
CAUTION BURIED ELECTRIC LINE BELOW

#CBGLB-3-U
CAUTION BURIED GAS LINE BELOW

#CBTLB-3-U
CAUTION BURIED TELEPHONE LINE BELOW

#CBWLB-3-U
CAUTION BURIED WATER LINE BELOW

COLOR CODES FOR UTILITY LOCATING

Red		ELECTRIC
Yellow		GAS - OIL
Orange		TELEPHONE
Blue		WATER
Green		SEWER

UNDERGROUND TAPES

6" x 1000 Ft.

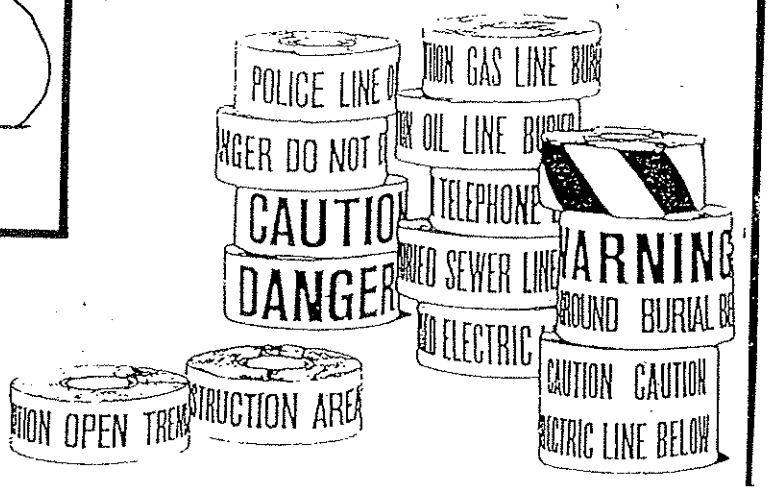
#CBELB-6-U
CAUTION BURIED ELECTRIC LINE BELOW

#CBSLB-6-U
CAUTION BURIED SEWER LINE BELOW

BARRICADE

3" x 1000 Ft.

#CCC-3-B CAUTION CAUTION CAUTION
#FLDNC-3-B FIRE LINE DO NOT CROSS
#PLDNC-3-B POLICE LINE DO NOT CROSS

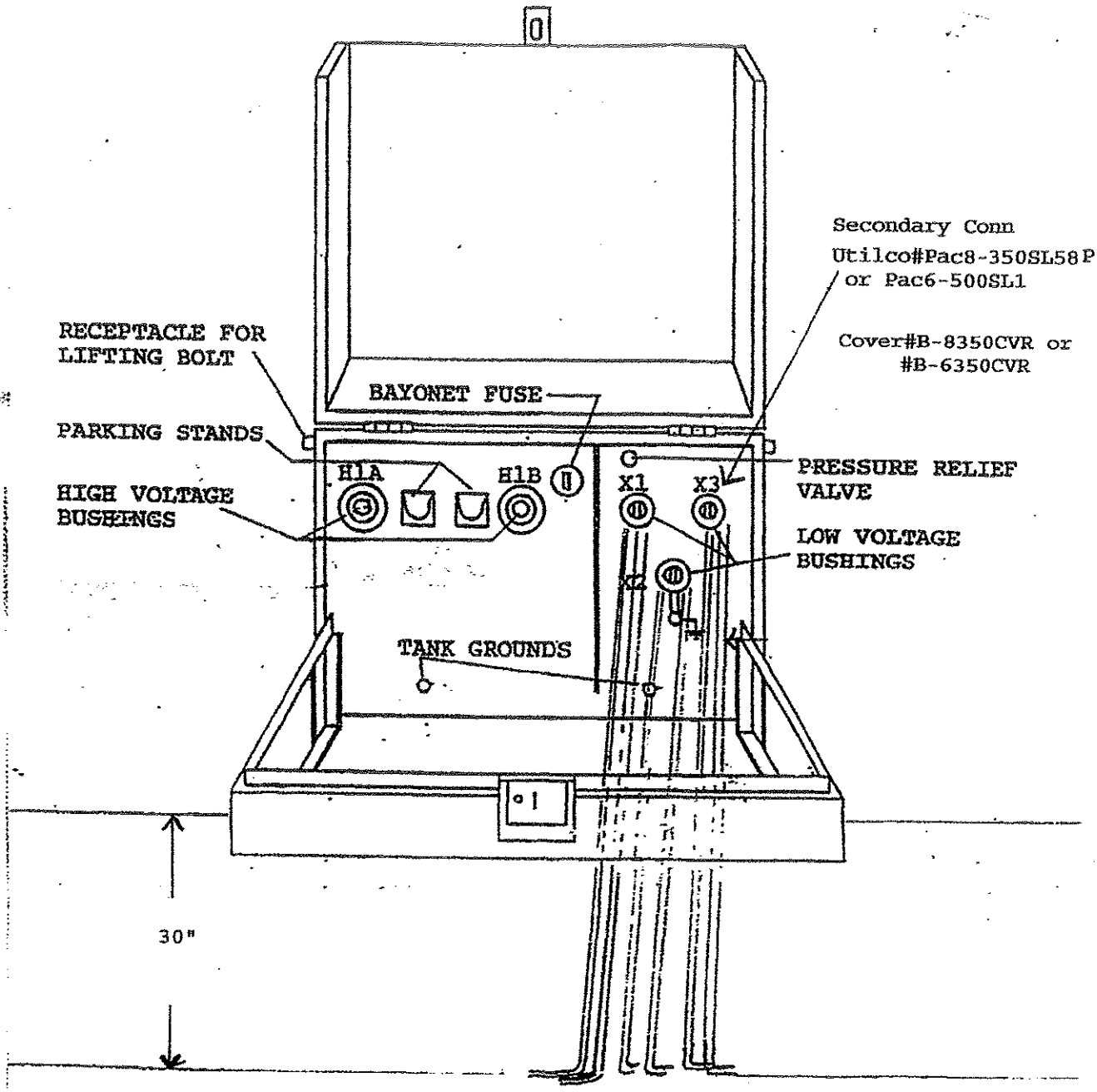


600 - SECONDARY UNDERGROUND DISTRIBUTION

601	TRANSFORMER CONNECTIONS
601.1	PADMOUNT ADAPTER CONNECTOR
602	SECONDARY PEDESTAL SPECIFICATION
603	SECONDARY PEDESTAL CONNECTIONS
604	CABLE TRENCH WITH 15 KV, SINGLE PHASE DISTRIBUTION
605	SECONDARY CABLE SPECIFICATION
605.1	SECONDARY UD POWER CABLE
606	SECONDARY CABLE AND STREET LIGTING ACCEPTANCE TEST
607	CABLE TRENCH EXCAVATION/BACKFILL
608	SECONDARY CABLE IDENTIFICATION

601 - UNDERGROUND TRANSFORMER

SECONDARY CONNECTION



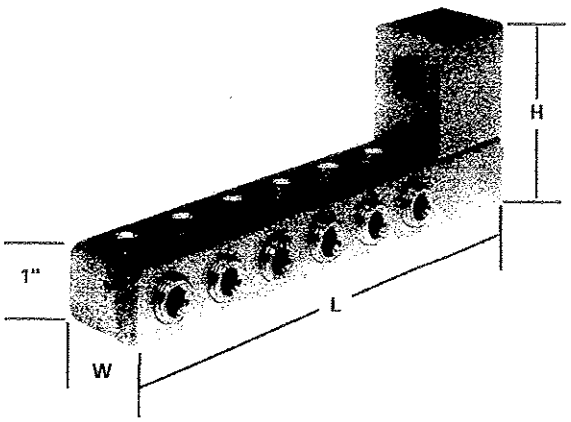
Aluminum Stud Mounted Padmount Adaptor Connectors - Dual Rated - For Threaded Stud Padmounts

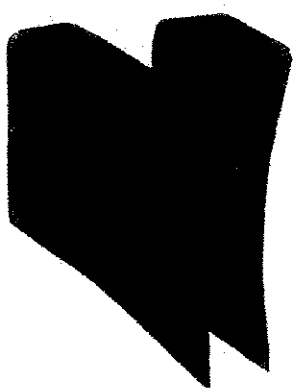
TYPE
PAC

Features
- Manufactured from high strength 6061-T6 aluminum alloy
- Rated for 600 volts
- Range taking
- Insulating cover available
- Clear plated
- Meets or exceeds ANSI C119.4 Class A specifications

Benefits
- Suitable for use with either copper or aluminum conductors
- Ensures reliability
- Reduces inventory
- Eliminates taping
- Provides low contact resistance
- Industry standard

A





Catalog Number	Wire Range	Number of Ports	For Transformer Stud	Stud Hole Size	Street Light Tap	Connector Dimensions			Cover Catalog Number
						L	H	W	
PAC4-350	350kcmil-10	4	5/8-11, 1-14	5/8	No	5-3/4	2-13/16	1-1/4	B-6350CVR
PAC6-350	350kcmil-10	6	5/8-11, 1-14	5/8	No	7-3/4	2-13/16	1-1/4	B-6350CVR
PAC8-350	350kcmil-10	8	5/8-11, 1-14	5/8	No	9-3/4	2-13/16	1-1/4	B-8350CVR
PAC6-350SL1	350kcmil-10	6	5/8-11, 1-14	1	Yes	7-3/4	2-13/16	1-1/4	B-6350CVR
PAC8-350SL1	350kcmil-10	8	5/8-11, 1-14	1	Yes	9-3/4	2-13/16	1-1/4	B-8350CVR
PAC4-350SL58	350kcmil-10	4	5/8-11, 1-14	5/8	Yes	5-3/4	2-13/16	1-1/4	B-6350CVR
PAC6-350SL58	350kcmil-10	6	5/8-11, 1-14	5/8	Yes	7-3/4	2-13/16	1-1/4	B-6350CVR
PAC8-350SL58	350kcmil-10	8	5/8-11, 1-14	5/8	Yes	9-3/4	2-13/16	1-1/4	B-8350CVR
PAC6-500SL1	500kcmil-6	6	5/8-11, 1-14	1	Yes	9-1/8	2-13/16	1-5/8	B-6350CVR

See page 225 for cover information

PAC OPTIONS:
P - Inhibitor

Example:
PAC6-350SL1P
Street Light Tap
1" Stud Mount
Inhibitor Must be LAST

602- SECONDARY PEDESTAL SPECIFICATIONS

PEDESTALS REQUIRED FOR LOW VOLTAGE DISTRIBUTION SHALL BE OF THE ABOVEGROUND TYPE AND SHALL BE ELECTRICAL MATERIALS COMPANY CATALOG NO EM3914SS NO EXCEPTION ALLOWED.

EACH PEDESTAL SHALL BE LABELED WITH ELECTRIC ON OUTSIDE COVER.

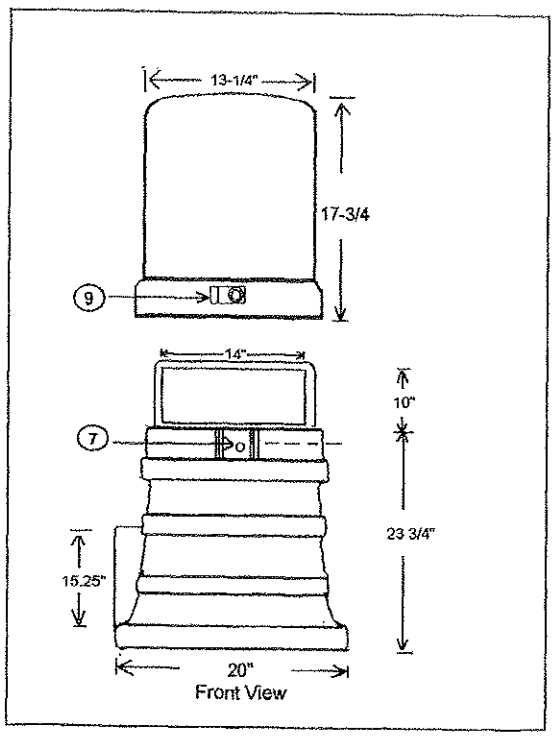
HIGH DENSITY (HMW) POLYETHYLENE RECTANGULAR SECONDARY SERVICE ENCLOSURE

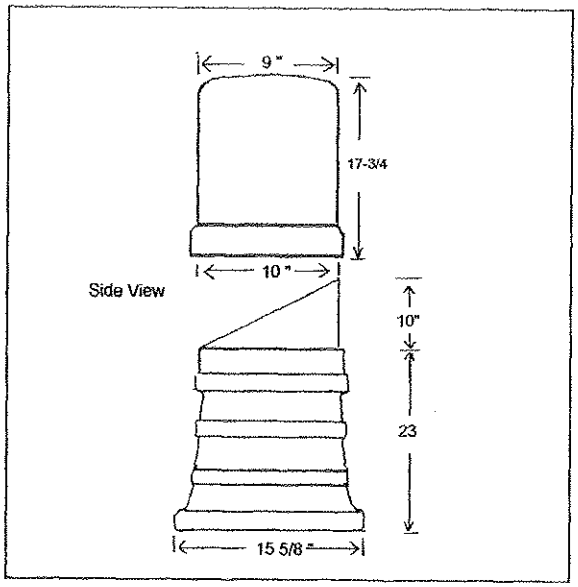
Standard Features:

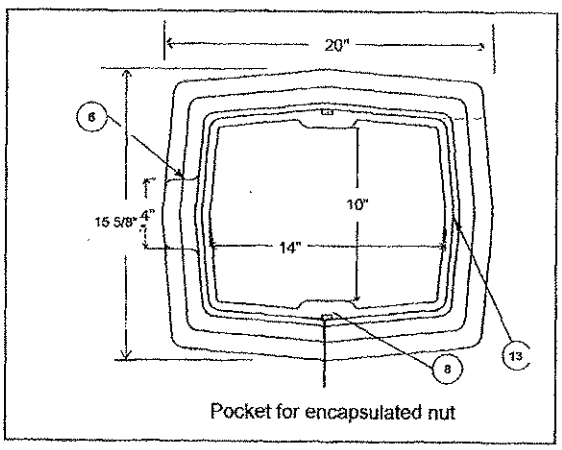
1. High Density Polyethylene (HMW) gives you:
   - Superior Impact Resistance
   - Superior Stress Crack Resistance
   - UV Stabilized Dark Green or Seafoam Green
2. Ribbed Base to Withstand side pressure and provide vertical stability
3. Molded product with 3/16" wall thickness
4. Working cable opening -- 10" x 14"
5. Standard outside dimensions:
   Width at Cable opening -- 16 inches
   Height: 39 inches
6. External attachment area for service pedestal post.
7. Recessed Stainless 3/8-16 encapsulated nuts (2) on opposite sides.
8. Molded in stainless nuts for security bolt attachment.
9. Stainless steel hinge with Padlockable Penta Cup and recessed Pentabolt.
10. "Electric" molded into face of lid
11. Stackable units to minimize storage space

Options: 12. Knockout for Temporary attachment.

CAT #EM3914SS







(PLAN VIEW)

602.1

ELECTRICAL MATERIALS COMPANY

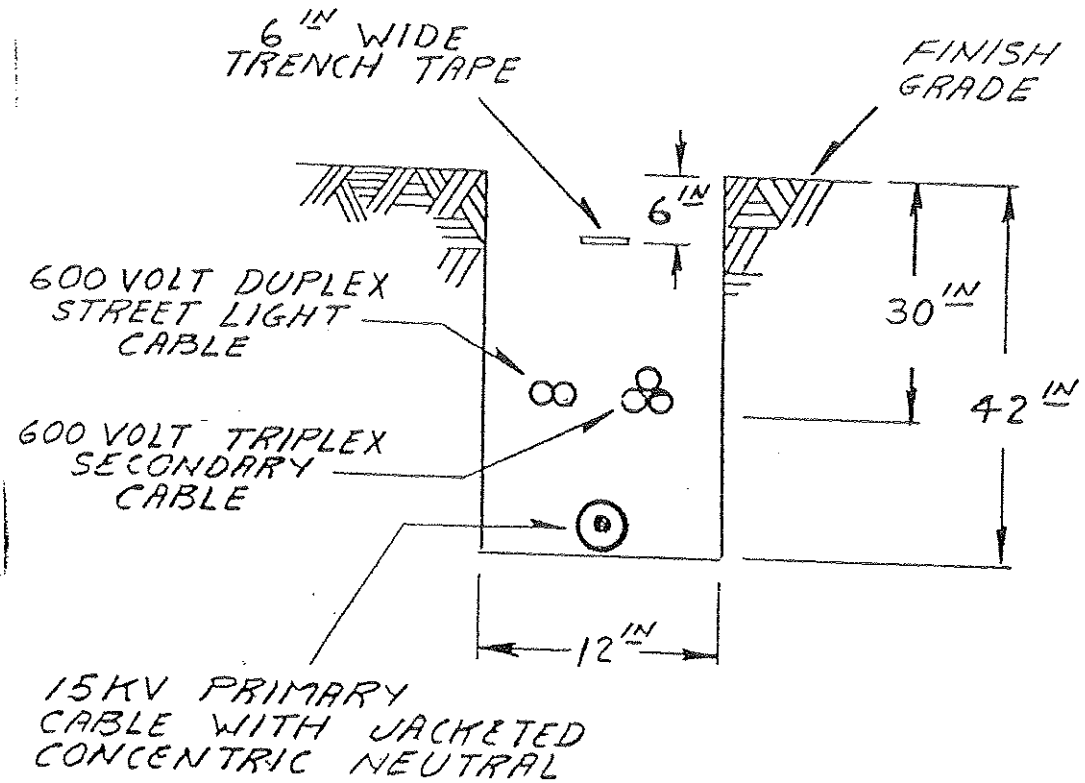
145 ELIZABETH LANE, GENOA CITY, WI 53128
(262) 279-3812 FAX (262) 279-6824

603- SECONDARY PEDESTAL CONNECTION

LEAVE CABLES 18 INCHES ABOVE FRONT LIP, TAPE WITH (3) LAYERS OF 130C OR SCOTCH 33 TAPE

MARK CABLES WITH COLORED WIRETIES CORRESPONDING TO TRANSFORMER ENDS.

604 - CABLE TRENCH WITH 15KV SINGLE PHASE DISTRIBUTION



605 - SECONDARY CABLE SPECIFICATION

ALL SECONDARY CABLE INTENDED FOR UNDERGROUND DISTRIBUTION IN CONDUIT OR DIRECT BURIAL SHALL HAVE THE FOLLOWING MINIMUM ACCEPTABLE CHARACTERISTICS AND PERFORMANCE PER PRODUCT DATA PRESENTED IN SECTION 605.1 OF THIS SPECIFICATION:

- DIRECT BURIAL.
- 600 VOLT, XLPE INSULATION, 2 LAYER ABRASION RESISTANT SUPERTUF CROSSLINKED POLYETHYLENE TRIPLEXED CABLE CONFIGURATION.
- PHASE CONDUCTORS: THE CONDUCTOR SIZE SHALL BE MINIMUM 4/0 AWG STRANDED ALUMINUM ALLOY TYPE 1350.
- NEUTRAL CONDUCTORS: STRANDED ALUMINUM, FULL RATED, MINIMUM 2/0.
- CONDUCTOR SIZES FOR APPLICATIONS ABOVE THE MINIMUM RATING FOR 4/0 CABLE SHALL BE SIZED PER NEC ARTICLE 310.
- INSULATION: BOTH PHASE CONDUCTORS AND THE NEUTRAL CONDUCTOR SHALL HAVE AN INSULATION THICKNESS OF NOT LESS THAN 80 MILS. TWO LAYER INSULATION, INNER LAYER OF LOW DENSITY POLYETHYLENE, OUTER LAYER OF BLACK MEDIUM/HIGH DENSITY POLYETHYLENE.
- NEUTRAL CONDUCTOR: THE NEUTRAL CONDUCTOR INSULATION SHALL BE READILY IDENTIFIABLE WITH AN EXTRUDED YELLOW STRIPE.
- SPECIFICATIONS: UL NO. 854, ICEA P-8-570, ASTM B-231.
- MANUFACTURER: MINIMUM ACCEPTABLE STANDARD PER SECTION 605.1.

606 - SECONDARY AND STREET LIGHTING

CABLE ACCEPTANCE TEST

ACCEPTANCE TESTING OF ANY CABLE SHALL BE PERFORMED WITH ALL CABLE TERMINATIONS IN PLACE BUT DISCONNECTED FROM THE SYSTEM.

CABLE TESTING SHALL BE PERFORMED BY A CERTIFIED TESTING AGENCY APPROVED BY THE CITY OF LEWES, BOARD OF PUBLIC WORKS.

CABLES RATED 600 VOLTS OR LESS SHALL NOT BE HIGH POTENTIAL TESTED, BUT SHALL BE ACCEPTANCE TESTED AT 1000 VOLTS DC FOR ONE (1) MINUTE.

WARNING

THE APPLICATION OF SERVICE VOLTAGE OR TEST VOLTAGE TO A CABLE MAY CAUSE A VOLTAGE RECOVERY OF SUFFICIENT MAGNITUDE TO CREATE A HAZARD. EXTREME CARE MUST BE TAKEN TO PROPERLY AND COMPLETELY DISCHARGE THE CABLE AFTER COMPLETION OF TESTING.

607 - CABLE TRENCH

EXCAVATION AND BACKFILL

EXCAVATION:

- NO CABLES SHALL BE INSTALLED WITH THE USE OF AN EARTH SLITTER OR PLOW.

- ALL CABLE TRENCHES FOR ALL CABLES SHALL BE EXCAVATED AND SHALL HAVE A MINIMUM WIDTH AND DEPTH AS SHOWN ON THE DRAWINGS AND SPECIFICATIONS.

- ALL TRENCHES SHALL BE KEPT FREE OF WATER BY AN APPROVED METHOD DURING INSTALLATION. IT SHALL BE THE DEVELOPER'S RESPONSIBILITY TO SUPPLY ALL PUMPS, HOSES, HARDWARE, ETC., WHICH SHALL BE REQUIRED TO PERFORM THIS FUNCTION.

- CARE SHALL BE TAKEN TO AVOID EXCESS EXCAVATION.

- ADVANCE TRENCHING SHALL BE PERMITTED ONLY TO THE EXTENT THAT ALL INSTALLATIONS AND BACKFILLING CAN BE COMPLETED IN THAT DAY'S OPERATION.
- WHERE ROCK IS ENCOUNTERED, EXCAVATION SHALL BE TO A DEPTH OF SIX (6) INCHES GREATER THAN THE DIMENSIONS SPECIFIED. THIS EXTRA DEPTH SHALL BE BACKFILLED WITH SELECT BORROW OR SAND AND COMPACTED BEFORE ANY CABLE IS INSTALLED IN THE TRENCH.
- THE DEVELOPER SHALL NOTIFY THE BOARD OF PUBLIC WORKS IMMEDIATELY IF SOFT OR SPRING CONDITIONS ARE DISCOVERED DURING EXCAVATION. WORK IN SUCH AREAS SHALL IMMEDIATELY TERMINATE UNTIL INSTRUCTIONS ARE RECEIVED FROM THE BOARD OF PUBLIC WORKS.

607 - CABLE TRENCH

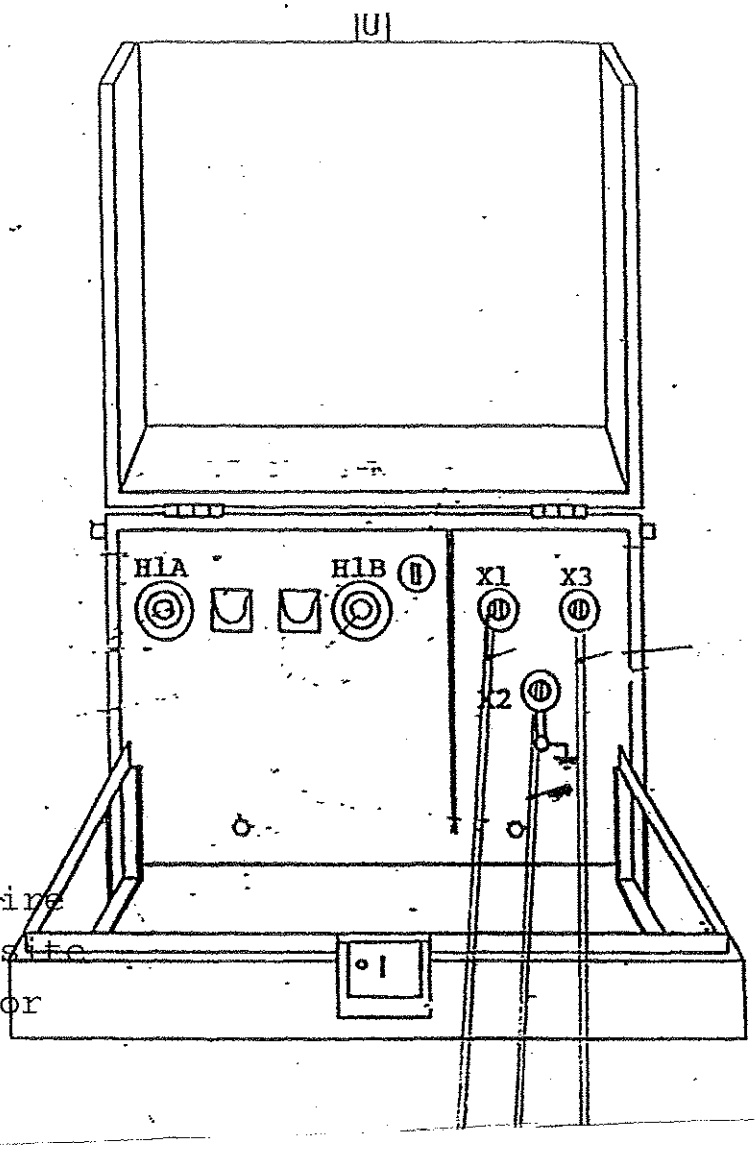
EXCAVATION AND BACKFILL (CONTINUED)

BACKFILLING:

- ALL TRENCHES SHALL BE PROPERLY BACKFILLED PRIOR TO CESSATION OF DAILY WORK PERIODS.

- BACKFILLING OF CONDUCTOR TRENCHES SHALL BE IN ACCORDANCE WITH THE TRENCH DETAILS SHOWN ON THE DRAWINGS AND SPECIFICATIONS.
- ALL EXCAVATED MATERIALS NOT SUITABLE OR REQUIRED FOR BACKFILL SHALL BE DISPOSED OF BY THE DEVELOPER.
- IT SHALL BE THE RESPONSIBILITY OF THE DEVELOPER TO NOTIFY THE BOARD OF PUBLIC WORKS, TWENTY-FOUR (24) HOURS IN ADVANCE OF ANY CABLE LAYING OR BACKFILL.
- NO CABLE SHALL BE INSTALLED OR TRENCHES BACKFILLED EXCEPT IN THE PRESENCE OF AN INSPECTOR APPOINTED BY THE BOARD OF PUBLIC WORKS.
- PIECES OF SCRAP CABLE SHALL NOT BE BURIED IN THE TRENCH AS A MEANS OF DISPOSAL.

608 - SECONDARY CABLE IDENTIFICATION



Mark each leg with colored wire ties, mark opposite end w/same color

700 UNDERGROUND DISTRIBUTION TRANSFORMERS

701 TRANSFORMER SPECIFICATIONS , SINGLE PHASE, PRIMARY VOLTAGE 12470 GRDY/7200 60 HZ. SECONDARY VOLTAGE 120/240.

702 TRANSFORMER SPECIFICATIONS THREE PHASE, PRIMARY VOLTAGE 12470 GRDY/7200 60 HZ. SECONDARY VOLTAGE 208/120.

703 TRANSFORMER SPECIFICATIONS THREE PHASE, PRIMARY VOLTAGE 12470 GRDY/7200 60 HZ. SECONDARY VOLTAGE 480Y/277.

704 TRANSFORMER BOX PADS

704.1 TRANSFORMER BOX PAD AND VAULT

704.2 TRANSFORMER BOX PAD INSTALLATION GUIDELINES.

705 SECTIONALIZING CABINETS 4 WAY

705.1 SECTIONALIZING CABINET

702 TRANSFORMER SPECIFICATIONS SINGLE PHASE PAD MOUNT

Single Phase Pad Mount Transformer Specifications For 25-50-75-100-167 KVA

The Transformer will be oil-filled with 65 degree rise above 30 degree ambient and shall have oil drain and fill plugs and a pressure relief device.

Dead-Front, loop feed construction with high voltage parking stands.

Pad-mounted , maxi-pack.

Primary voltage 12470 grdy/ 7200, 60 hertz.

Secondary voltage 120/240, volts single phase three wire grounded.

Bayonet primary fusing draw out type.

Threaded stud secondary bushings.

Finish to be munsell green paint .

REA approved design with penta-head locking.

Universal load break primary bushing wells with inserts 200 amp

Transformer oil to be Cooper Envirotemp FR-3 Fluid or Equal.

Neutral terminals shall be grounded externally thru bushing to tank with copper strap.

External safety label and KVA size, with non PCB label.

Tank grounding provisions.

703 TRANSFORMER SPECIFICATIONS THREE PHASE PAD MOUNT

Three Phase Pad Mount Transformer Specifications For

75-150-300-500-750-1000 KVA

The transformer will be oil filled with 65 degree rise above ambient and shall have oil gauge, thermometer, drain valve and sampler, fill plugs and pressure vacuum guage provisions, and a pressure relief device.

Dead front loop feed construction, with high voltage parking stands, Pad Mounted.

Primary winding voltage 12470 grdy/7200 volts, 60 hertz,taps 2@ 2.5 above and below nominal.

Secondary voltage 480/277 or 208/120 volts.

Bayonet primary fusing draw out type.

Low voltage bushings and 10 hole secondary spade terminals with NEMA hole spacing.

Finish to be Munsell green paint.

REA approved design,with Penta-Head locking.

Universal load break primary bushing wells with inserts, 200 amp.

Neutral terminals shall be grounded externally thru bushing to tank with copper strap.

All standard equipment.

External safety labels and KVA size with non-PCB labels.

Tank grounding provisions.

Transformer oil to be Cooper Envirotemp FR-3 fluid or equal.

2/2011

704 - TRANSFORMER BOX PADS

- MOLDED FIBERGLASS TRANSFORMER BOX PADS SHALL BE PROVIDED FOR EACH UNDERGROUND DISTRIBUTION TRANSFORMER.
- PADS SHALL BE PROPERLY SIZED TO ACCEPT THE TRANSFORMER.

- PADS FOR 3 PHASE TRANSFORMERS SHALL BE FORMED CONCRETE 8" THICK, 4" LARGER ON ALL SIDES THAN THE TRANSFORMER WITH 4" PVC CONDUIT IN PRIMARY AND SECONDARY COMPARTMENTS TO EXTEND THREE (3) FEET BEYOND OUTSIDE OF PAD. CHECK MANUFACTURER'S PAD DIMENSIONS.

- RODS SHALL CONFORM TO THE LATEST REVISION OF ASTM A625.

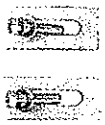
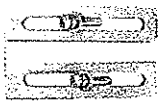
- TOP OF CONDUITS SHOULD BE 2" ABOVE SURFACE GRADE.

- WHEN PAD IS INSTALLED IN TRAFFIC AREA, PROTECTIVE BARRIERS MUST BE INSTALLED. TOP OF BARRIERS TO BE 4' ABOVE FINAL GRADE.

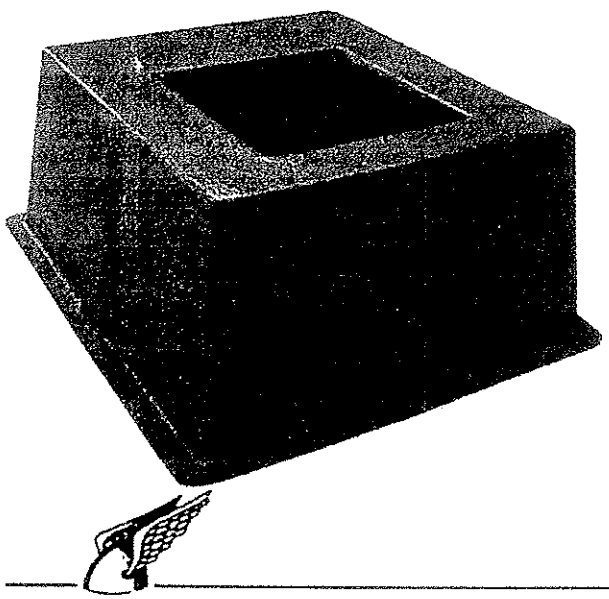
- THE MINIMUM ACCEPTABLE STANDARD FOR TRANSFORMER BOX PAD AND VAULT IS PRESENTED IN SECTIONS 704.1 AND 704.2 OF THIS SPECIFICATION.

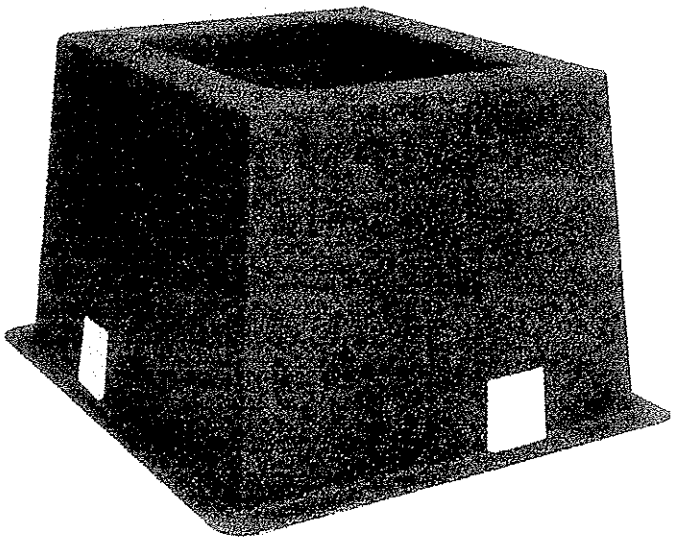
Nordic Fiberglass Single-Phase Transformer Box Pads

- These heavy duty 1/4" thick box pads are produced of fire-retardant resin and a combination of chopped glass sprayup and hand layup using woven roving glass reinforcement, which contributes greatly to their strength.
- Ribs are built into all sides for greater vertical and sidewall strength.
- The exterior is covered with gel-coat, which contains UV stabilizer in addition to pigments and polyester resin for superior weatherability and resistance to ultraviolet attack.
- Cable entrance holes are optional.
- The AB-1 and AB-2 anchor brackets enable various insert patterns to accommodate more sizes of equipment.

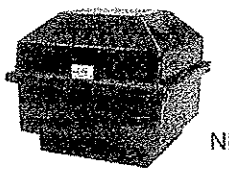
AB-1 Brackets   AB-2 Brackets

Catalog No.	Outside Dimension	Top Opening
GS-37-43-24A	37" x 43" Top x 24" High	26" x 32"
GS-37-43-24B	37" x 43" Top x 24" High	20" x 20"
GS-37-43-24C	37" x 43" Top x 24" High	12" x 20"
GS-37-43-24D	37" x 43" Top x 24" High	22" x 24"
GS-37-43-32A	37" x 43" Top x 32" High	26" x 32"
GS-37-43-32B	37" x 43" Top x 32" High	20" x 20"
GS-37-43-32C	37" x 43" Top x 32" High	22" x 24"

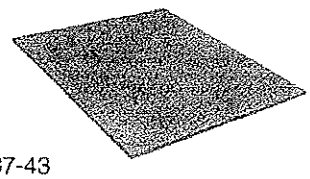




- The ND-28 deferral cabinet is designed for cabl feed-through where a transformer will be installed at later date. The GS-37-43-24D and GS-37-43-32C wi accommodate the ND-28.

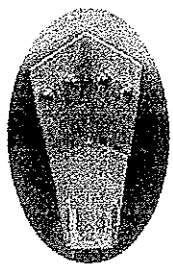


ND-28

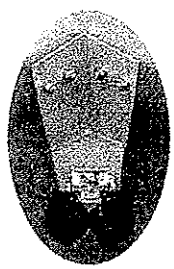


GSC-37-43

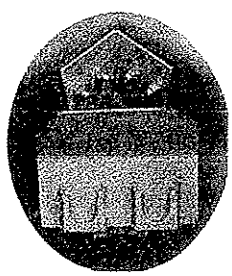
- The GSC-37-43 flat cover has four brass penta-hea recesses and comes with four 3/8"x1-1/2" penta-head bolts for securing the cover to the box pad.
- The TDB-1, TDB-2, and TDB-3 brackets are anothe option for transformer deferral. The GS-37-43-32A and GS-37-43-32C box pads will accommodate these 15kV, 25kV, or 35kV deferral brackets.



TDB-1



TDB-2



TDB-3

Fabricators of Quality Fiberglass Products for the Electric Utility Industry

Nordic Fiberglass, Inc. - P. O. Box 27, Warren, MN 56762
02/98

Phone: 218-745-5095
Fax: 218-745-4990

704.2 - TRANSFORMER BOX PAD INSTALLATION GUIDELINES

INSTALLATION GUIDELINES

Trenching and Digging

Figs. 1 and 2 show the most common relationships between the cable trench and the box pad opening. Since a firm base for the box pad is very important, the offset relationship (Fig. 1) is preferable. Any trenching under the pad must be thoroughly filled in and tamped.

Some utilities lay-in the primary cables before digging the box pad opening. Others install the box pad and the cables, and then install the fiberglass cover until they are ready to install the transformer.

Box-Pad Opening Size (Fig.3)

The opening should be at least 6'X6'X33" deep.

FIG 1

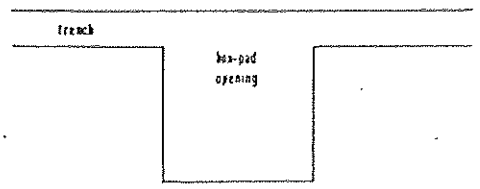
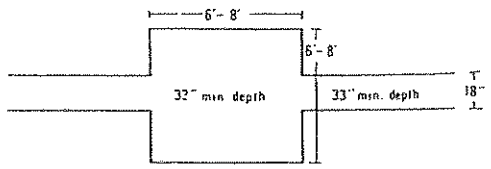


FIG 2

FIG 3



BOX PAD OPENING DIMENSION

Base Preparation (Figs. 4 & 5)

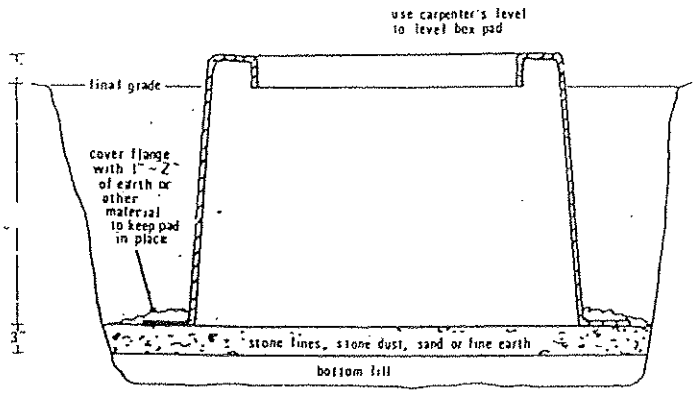
This is extremely important. The bottom flange must rest on a firm foundation, and we recommend that a 3" base be prepared and thoroughly tamped. After the box pad has been placed in position and levelled, 3" of soil should be placed on the flange to keep the box pad in place. Some installers place 3" of sand inside the box pad to hold it in place.

Backfilling

Some utilities delay back-filling so that their linesmen can stand in the opening and work on the transformer at waist-height, rather than working on their hands and knees. They use the box pad as a work bench.

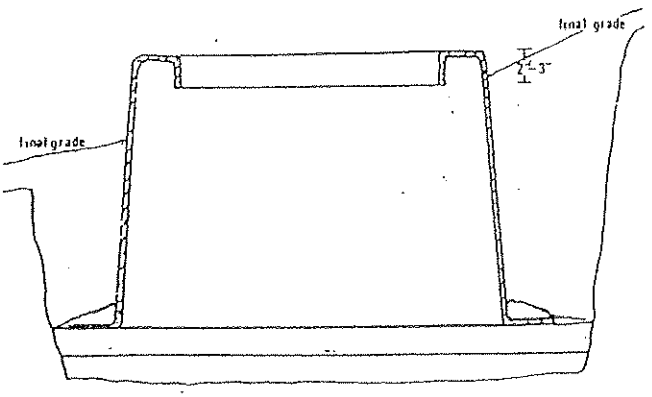
When backfilling, make sure that no large boulders are resting against the sides of the box, since they could produce high pressure points.

Sand is not a good back filling material since it provides very little resistance to surface loads.



INSTALLATION DETAILS

FIG 4



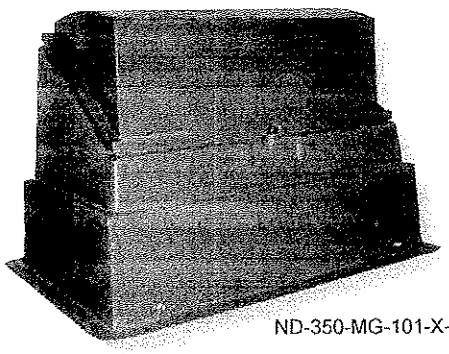
MEASURING DEPTH ON SLOPING LAND

FIG 5

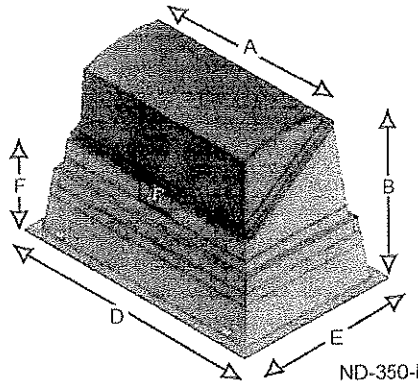
705 - SECTIONALIZING CABINETTS - 4 WAY

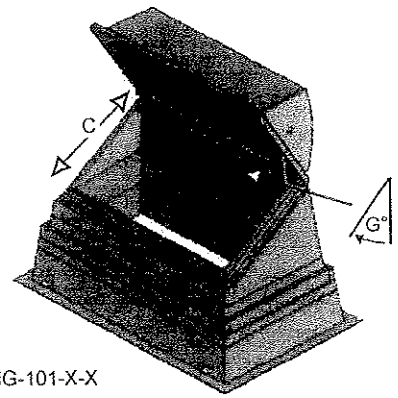
WHERE USED, THE MINIMUM ACCEPTABLE STANDARD FOR SECTIONALIZING CABINETS SHALL BE NORDIC ND-360, SUPPLIED WITH ALL HARDWARE FOR 4 WAY SECTIONALIZING PER SECTION 705.1 OF THIS SPECIFICATION.

NORDIC FIBERGLASS, INC.



ND-350-MG-101-X-X





ND-350-MG-101-X-X

Material Specifications: ND three phase hinged cabinets are produced of fire retardant resin and a combination of chopped glass spray-up and hand-lay up using woven roving glass reinforcement. The exterior is covered with gel-coat, which contains UV stabilizer for superior weather-ability. All hardware is stainless steel.

ND Roto-Cab Sectionalizing Cabinets	A Top Width	B Cabinet Height	C Top-Operating Depth	D Base Width	E Base Depth	F Max. Burial Depth	G Angle	Units per Pallet
ND-250-MG-101-X-X	53.5"	34.5"	23"	67"	37"	Pad Mount	5°	3
ND-330-MG-101-X-X	53.5"	36"	19"	75"	45.5"	10"	20°	3
ND-350-MG-101-X-X	53.5"	48"	22.5"	77.5"	47"	16"	5°	2
ND-360-MG-101-X-X	53.5"	54"	23"	77.5"	47"	27"	5°	2
ND-430-MG-101-X-X	68.5"	53"	25.5"	93"	52.5"	10"	20°	2
ND-450-MG-101-X-X	68.5"	64.5"	29"	96"	54.5"	23.5"	5°	2

Ordering Example: ND-350-MG-101-4152-B3A

Style	Dimensions	Color	Mounting Plate	Load or Dead Break Junction Accommodations	Ground System	Special Part Number
ND	350	MG	101	4152	B3A	Suffix
N-Nordic D-Design	200=Pad Mount 300-400= Direct Burial	MG-Munsell Green WG-Willow Green DT-Desert Tan GR-Mist Gray Special Colors upon request	101-Hot-Dipped Galvanized Steel X-No Mounting Plate Optional Mounting Plate: S101, Stainless Steel Mounting Plate (Below Parking) 10135=Hot-Dipped Galv. for ND-430 & 450 S10135=SST for ND-430 & 450	X=No load or deabreak junctions 4 Interfaces: 2=2pt. 3=3pt. 4=4pt. 15 Kilo-Volts: 15-15kV 25=25kV 35=35kV 2 Amps: 2=200A 6=600A Accommodates 1, 2-4pt. Junction with U-strap from the following manufacturers: H=Hubbell, E=Elastimold, C=Cooper	B3A= 3/8" solid conductor W3A=#2 bare strand wire X=No Ground System ND-250,330,350, 360, have either B3A or W3A ground systems ND-430, 450: B3B= 3/8" solid conductor W3B=#2 bare strand wire X=No Ground System	Suffix is for special custom products CAS-Cabinet Anchor System (for cement pad mount applications) ND-250 comes with a cabinet anchoring system If blank, not a special

200 Amp Deadbreak Junction

kV	H	E	C
15	Yes	Yes	Yes
25	Yes	Yes	Yes
35	N-A	Yes	*Yes

600 Amp Deadbreak Junction

15-25kV	Yes	Yes	Yes
35kV	N-A	Yes	*Yes

*Pertains to ND-430-450 with (S)10135 mounting plates will accommodate 200A Taps and all Cooper Junctions. SS-MP-101 will not accommodate Cooper 35KV 200A junctions and not Cooper 35KV 600A Deadbreak junctions.

Fabricators of Quality Fiberglass Products for the Electric Utility Industry
21415 US Highway 75 NW · P.O. Box 27 · Warren · Minnesota · 56762
Ph: (218) 745-5095 · Fx: (218) 745-4990 · www.nordicfiberglass.com

800 - CONDUIT/U-GUARD

801 CONDUIT SPECIFICATION

801 - CONDUIT SPECIFICATION

ALL CONDUIT INCLUDING SPARE CONDUIT SHALL BE SCHEDULE 40 PVC CONDUIT SUITABLE FOR DIRECT BURIAL.

CONDUIT SHALL BE SIZED AND INSTALLED IN ACCORDANCE WITH ARTICLE 347 OF THE NATIONAL ELECTRIC CODE.

ALL CONDUIT SHALL BE CARLON PLUS 40 OR APPROVED EQUAL SCHEDULE 40 PVC AND SHALL CONFORM TO NEMA SPECS, TC-2 CONDUIT, TC-3 FITTINGS, UL-514, UL651.

ALL EXPOSED ENDS OF CONDUIT SHALL BE PLUGGED DURING CONSTRUCTION TO PREVENT THE ENTRANCE OF FOREIGN MATERIAL AND MOISTURE.

BURRS, SHARP EDGES AND PROJECTIONS SHALL BE REMOVED.

OPEN ENDS OF CONDUIT SHALL HAVE BUSHINGS INSTALLED TO PROTECT CABLES.

RISER CONDUITS SHALL EXTEND AT LEAST TWO (2) FEET ABOVE GRADE.

ALL SPARE CONDUIT SHALL BE INSTALLED NEXT TO SERVICE CONDUIT.

ENDS OF SPARE CONDUIT SHALL REMAIN SEALED WITH GLUED PVC CAPS TO EXCLUDE THE ENTRANCE OF FOREIGN MATERIAL AND MOISTURE.

1000 - STREET LIGHTING

1001 - SUBDIVISION STREET ILLUMINATION DESIGN REQUIREMENTS

SUBDIVISION STREET ILLUMINATION SHALL BE IN COMPLIANCE WITH THE APPLICATION DESIGN STANDARDS OF PART IV. LIGHTING APPLICATIONS. CHAPTER 24 - ROADWAY LIGHTING OF THE LIGHTING HANDBOOK, 8TH EDITION OF THE ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA. APPLICABLE AREA CLASSIFICATIONS INCLUDE LOCAL ROADWAYS AND RESIDENTIAL.

The minimum Acceptable Standard Luminare For Design Application is The Cooper Lighting Model LXF 10SPW334 100 Watt High Pressure Sodium 120 Volt. Top Mounted Photo Recepticle.
The Standard Distribution Pattern For This Luminaire is IES Type III.

VALUES FOR ROADWAY AVERAGE MAINTAINED LUMINANCE SHALL CONFORM TO THOSE DATA OF FIGURE 24-8 OF CHAPTER 24, IES HANDBOOK, PART IV.
THE VALUES FOR LUMINANCE UNIFORMITY OF THE ROADWAY LIGHTING DESIGN SHALL COMPLY WITH THE DATA OF FIGURE 24-8, (I.E., LUMINANCE AVERAGE LEVEL TO MINIMUM LEVEL RATIO SHALL NOT EXCEED 6 TO 1.)

LUMINAIRE SUPPORT STRUCTURES SHALL COMPLY WITH DESIGN STANDARDS OF AASHTO - STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORT HIGHWAY SIGNS, LUMINAIRES, AND TRAFFIC SIGNALS 1985.

101.1 Post Top Luminaire Design

Notes

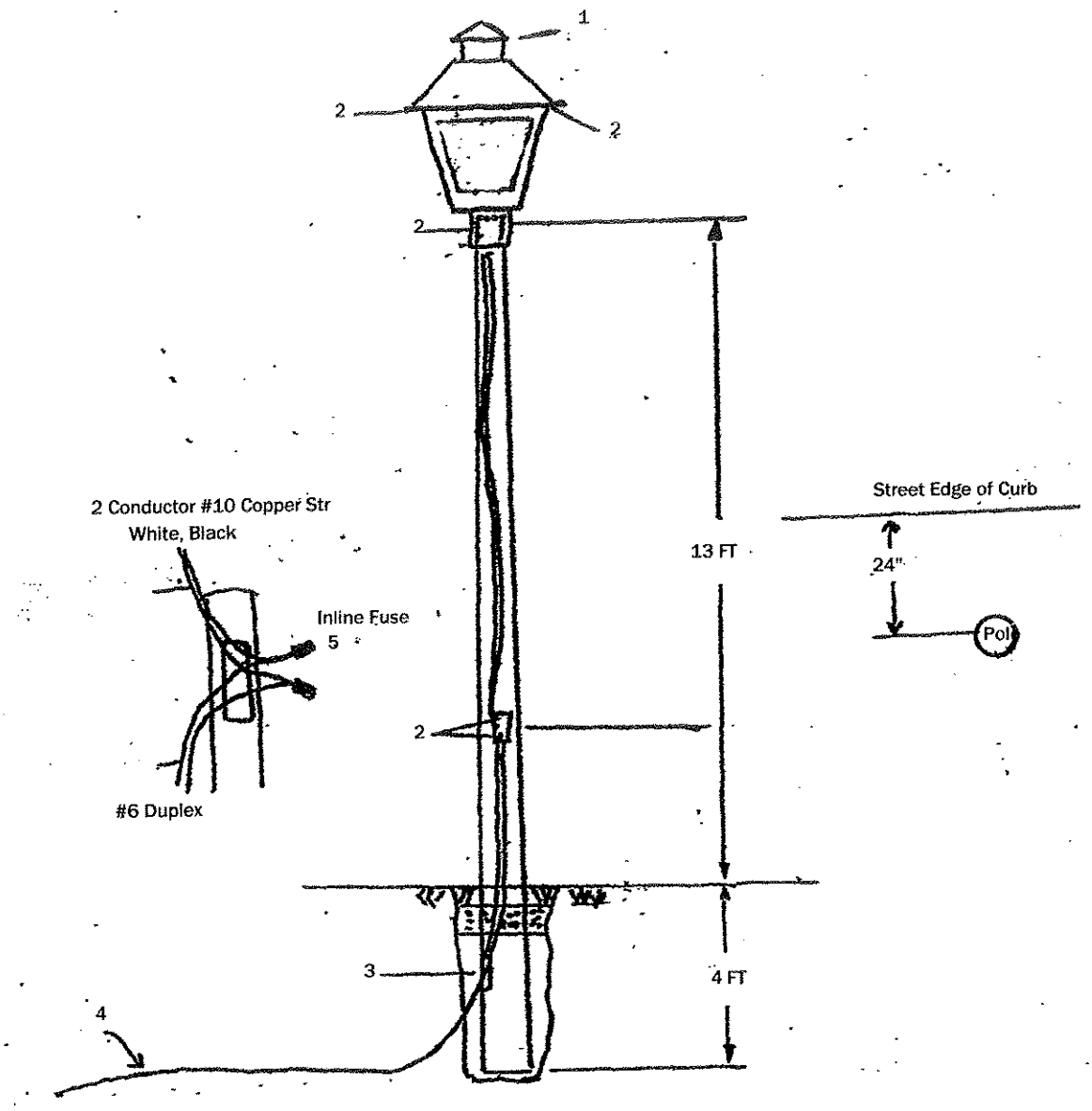
1 Photo Control To Be Mounted Per Manufacturers Spec's

2 All Hinges Set Screws and Screws to be Coated With Inhibiting Compound

3 Back Fill and Tamp Hole

4 Line connection to Nearest Point, Transformer or Pedestal

5 In Line Fuse



STREETWORKS™ energy

DESCRIPTION

The Lexington tastefully compliments communities, parks and residential roadways.

		Type
Catalog #	LXF10SPW334	
Project		
Comments		Date
Prepared by		02/22/2011

SPECIFICATION FEATURES

Construction
TOP: Hinged die-cast aluminum top with cupola cover. SCREWS: Captive retaining screw. HOUSING: Die-cast aluminum base housing. Standard color is black. Other finish colors available. Consult your Streetworks Representative. 1" ANSI wattage/source label.

Electrical
SOCKET: Vertical: Base up standard on Type II, III and V. Horizontal: Available with Type II and III horizontal reflector. Mogul-base porcelain socket is field adjustable on horizontal only. 50-150W Metal Halide is medium-base socket standard. STARTER: Plug-in starter. TERMINAL BLOCK: Terminal block standard.

Optical
REFRACTOR: Injection molded acrylic refractor panels.

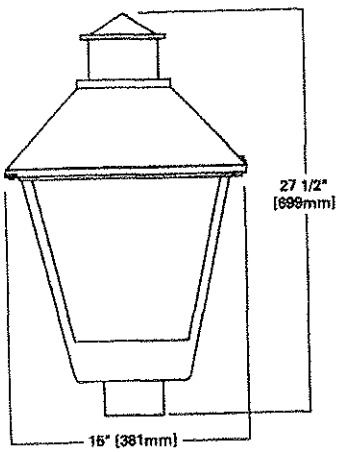
Mounting
Self-aligning pole-top fitter fits 2 3/8" and 3" O.D. tenons. Square headed 1 1/4" polymer coated mounting bolts.

LXF
LEXINGTON

50 - 175W
Pulse Start Metal Halide
High Pressure Sodium
Metal Halide

DECORATIVE LUMINAIRE

DIMENSIONS



EPA
Effective Projected Area:
1.7 Square Feet

SHIPPING DATA
Approximate Net Wt:
26 lbs. (11kgs.)

COOPER Lighting
www.cooperlighting.com

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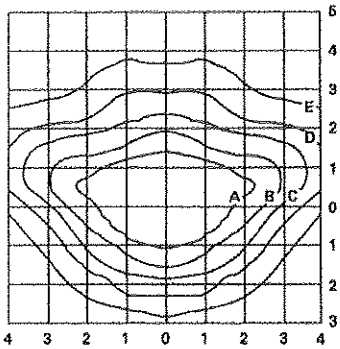
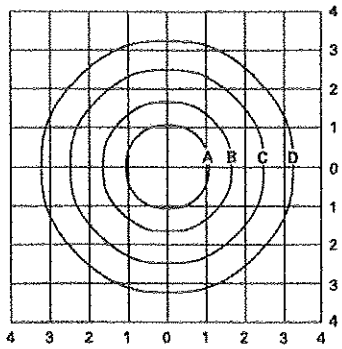
PHOTOMETRICS (Complete IES files available at www.cooperlighting.com)



LXF15S3H.IES
150-Watt HPS
16,000-Lumen Lamp
Type III Semi Cutoff



LXF10S55.IES
100-Watt HPS
9,500-Lumen Lamp
Type V

Footcandle Table

Select mounting height and read across for footcandle values of each isofootcandle line. Distance in units of mounting height.

Mounting Height	Footcandle Values for Isofootcandle Lines				
	A	B	C	D	E
LXF15S3H.IES					
10'	2.88	1.44	0.72	0.36	0.28
12'	2.00	1.00	0.50	0.25	0.10
14'	1.50	0.75	0.37	0.18	0.07
LXF10S55.IES					
10'	1.44	0.72	0.36	0.28	
12'	1.00	0.50	0.25	0.10	
14'	.75	0.37	0.18	0.07	

ORDERING INFORMATION

LXF10SPW334

LXF	10	S	P	W	33	4

Product Family
LXF=Lexington

Lamp Wattage [1]
10=100W

Lamp Type [1]
S=High Pressure Sodium

Ballast Type [1]
P=Hi. Reac./HPF

Voltage [1]
W=Multi-Tap wired 120V

Distribution
33=Type III

Options
4=NEMA Photocontrol Receptacle

Notes: 1 Refer to the technical section for lamp/ballast voltage compatibility.

1001.2

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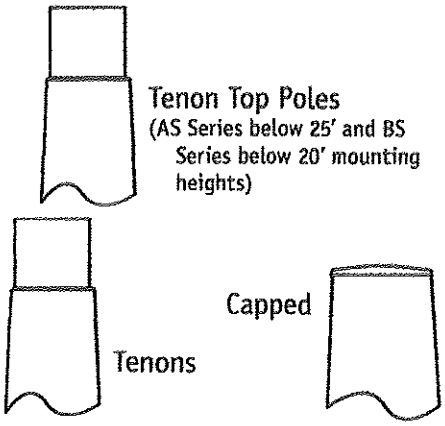
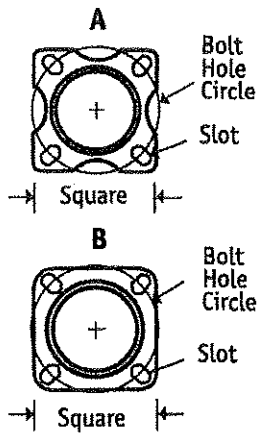
Round Tapered Composite Tuff-Poles® 1001.3 Luminaire Support Structure

Tenon Top and Capped

Direct Burial and Anchor Base **CAT # BS17-01S1BZ0401**

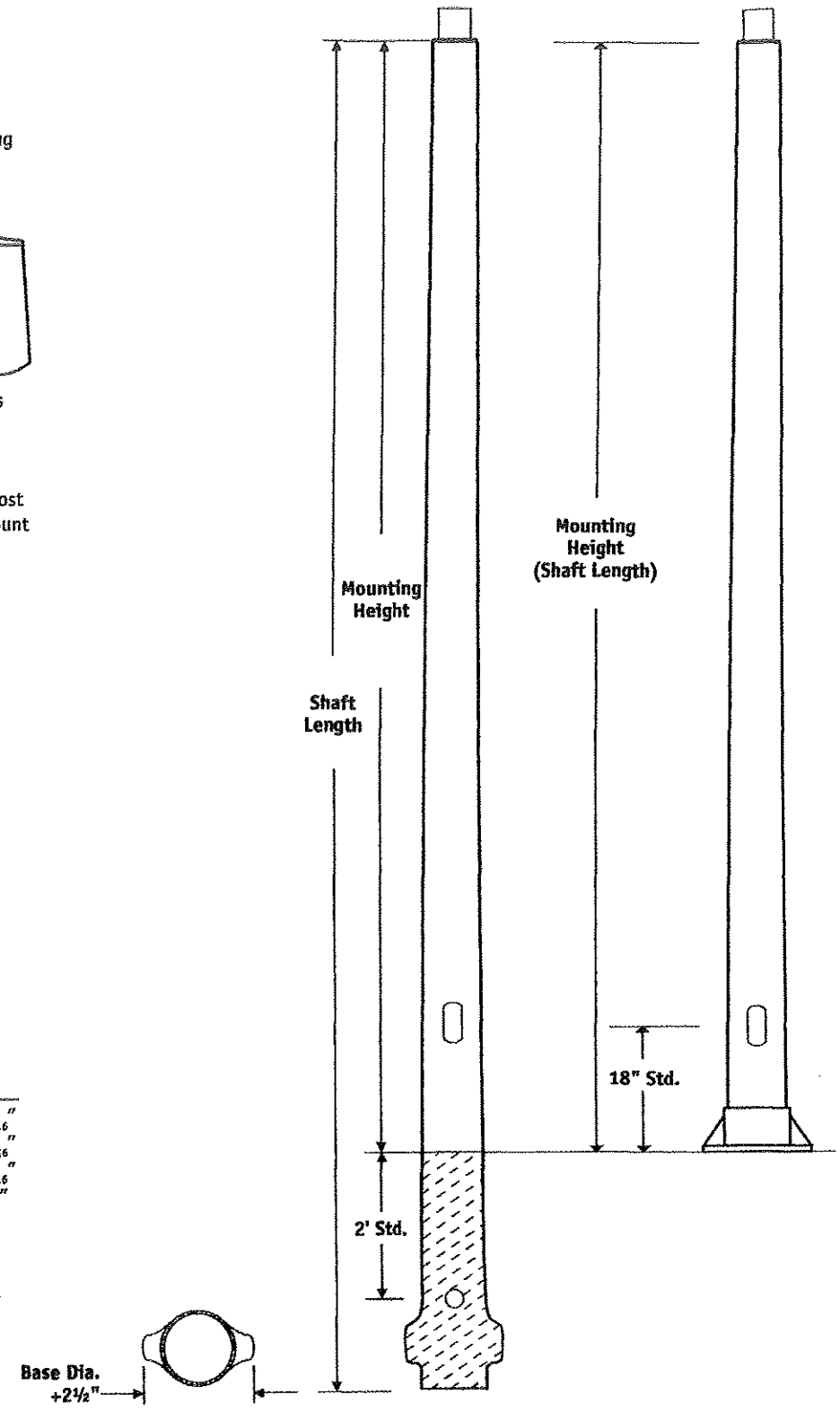


TENONS: $2^{3}/_{8}$", 3", 4" OD, if pole dimensions permit. Tenons are A356-T6 aluminum or hot-dipped galvanized steel, and are available in all standard sizes; for other optional tenons contact Shakespeare. Post top fixtures, flood lights, or brackets mount with ease.



Anchor Base Dimensions

Bolt Hole Circle	Drawing	Square	Slot
8"	A	7.75"	$^{13}/_{16}$" x $1^{5}/_{16}$"
8½"	A	8.125"	$^{13}/_{16}$" x $1^{5}/_{16}$"
9½"	A	8.8"	$^{13}/_{16}$" x $1^{5}/_{16}$"
11½"	B	11"	1¼" x 1¾"
14"	B	12.9"	1½" x 2"
14½"	B	13.3"	1½" x 2"
15"	B	13.5"	1½" x 2"
15½"	B	14"	1½" x 2"



ANCHOR BASE: Cast A356-T6 aluminum, polyurethane coated to match pole color.

Hot dipped galvanized steel anchor bolts complete with nuts (2) and washers (2) are supplied standard ($^{5}/_{8}$" x 21" x 3", 1" x 30" x 4", or 1¼" x 36" x 6" depending on the pole specified).

Nominal Mounting Height (ft.)	Shaft Length (ft.)	Pole Weight (lbs.)	POLE DIAMETER		Standard Handhole Location from Base (in.)	SUGGESTED MAXIMUM TOTAL LOADING					Bolt Hole Circle (in.)	BASIC CATALOG NUMBER	Comment
			Shaft Top (in.)	Shaft Base (in.)		Total Weight (lbs.)	80 MPH EPA* (sq. ft.)	90 MPH EPA* (sq. ft.)	100 MPH EPA* (sq. ft.)	120 MPH EPA* (sq. ft.)			
Anchor Base, Series AS, Tenon Top													
10**	10	22	2.9	4.6	18	150	16.3	12.5	9.9	6.7	8	**AS10**	Tenon Top only
12**	12	25	2.9	4.9	18	150	13.6	10.3	8.1	5.3	8	**AS12**	Tenon Top only
14**	14	28	2.9	5.3	18	150	9.8	7.2	5.6	3.6	8	**AS14**	Tenon Top only
16**	16	30	2.9	5.5	18	100	6.8	4.9	3.7	2.2	8.5	**AS16**	Tenon Top only
18**	18	34	2.9	5.8	18	100	6.7	4.9	3.8	2.4	8.5	**AS18**	Tenon Top only
20**	20	44	2.9	6.1	18	100	5.7	4.0	3.1	1.8	8.5	**AS20**	Tenon Top only
25**	25	52	2.9	6.8	18	100	4.0	2.9	2.1	0.9	9.5	**AS25**	Tenon Top only

**Not available Capped - do not use AS Series below 25' mounting height for side mount applications, or with tenon mounted arms or for multiple fixture applications - Use AO Series, instead.

Nominal Mounting Height (ft.)	Shaft Length (ft.)	Pole Weight (lbs.)	POLE DIAMETER		Standard Handhole Location from Base (in.)	SUGGESTED MAXIMUM TOTAL LOADING					Suggested Burial Depth (ft.)	BASIC CATALOG NUMBER	Comment
			Shaft Top (in.)	Shaft Base (in.)		Total Weight (lbs.)	80 MPH EPA* (sq. ft.)	90 MPH EPA* (sq. ft.)	100 MPH EPA* (sq. ft.)	120 MPH EPA* (sq. ft.)			
Direct Burial Base, Series BS, Tenon Top													
10**	13	23	2.9	5.0	54	150	16.3	12.5	9.9	6.7	3	**BS13**	Not available Capped
12**	15	25	2.9	5.3	54	150	10.7	7.9	6.1	4.1	3	**BS15**	Not available Capped
13**	17	27	2.9	5.6	66	150	10.2	7.6	5.9	3.9	4	**BS17**	Not available Capped
14**	18	29	2.9	5.7	66	150	9.7	7.1	5.6	3.7	4	**BS18**	Not available Capped
16**	20	38	2.9	6.1	66	100	7.3	5.3	4.2	2.7	4	**BS20**	Not available Capped
20**	24	44	2.9	6.6	66	100	6.1	4.6	3.5	2.2	4	**BS24**	Not available Capped

**Not available Capped - do not use BS Series below 20' mounting height for side mount applications, or with tenon mounted arms or for multiple fixture applications - Use BO Series, instead.

For capped poles, and poles suitable for side mount or arm mounted fixtures, see Round Tapered Poles. For poles with arms, see Mast Arm Poles.

■ Standard handhole: 2½" x 5" oval. All handhole covers are polyurethane coated to match pole color.
*All EPA recommendations are based on poles with handholes, and include a 30% gust factor for all wind speeds, including 120 mph.

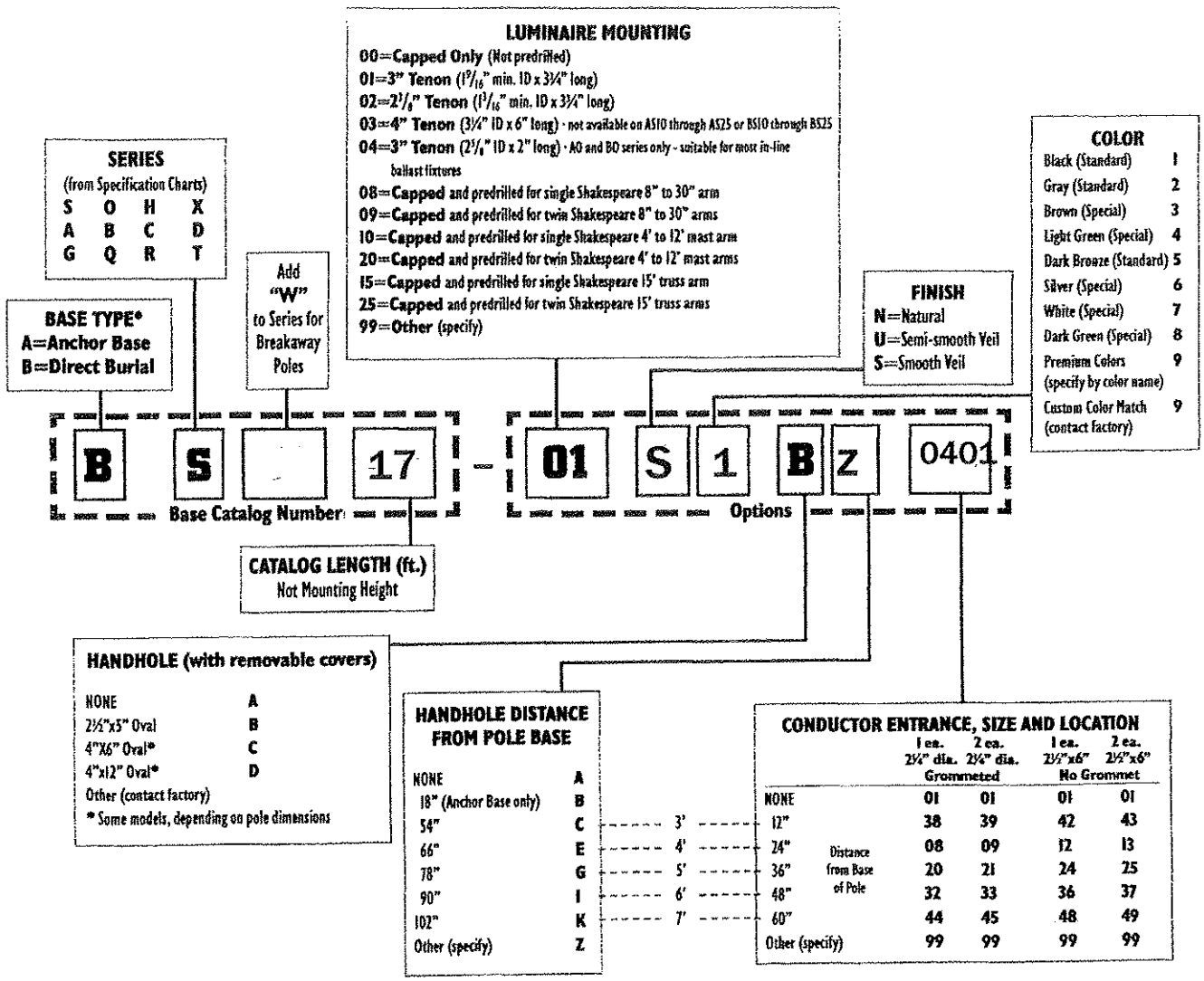
A complete Shakespeare Composite Structures Composite Tuff-Pole® Catalog Number includes all of the information detailed below, in order from left to right, including the dash. The letters and numbers to the left of the dash are the Basic Catalog Number found in the listings of the poles. Poles with mast arms include two digits to the right of the dash. The remainder of the Catalog Number details the options which you can specify in the order listed to define accessories, handholes, colors, etc. Please use the standard specification for these options whenever possible.

You can assemble your own catalog numbers, or call for assistance. Most of the available options are listed in the template. Call for information on all other options.

How to use this manual

To decide which Tuff-Pole® you need, first consider your application: Anchor Base or Direct Burial. Shakespeare Composite Structures recommends Direct Burial style poles for cost efficiency and ease of installation, if your application permits. Next choose round or square, standard or Breakaway, hinge or stub styles, and the method of luminaire attachment and wiring access. Then, using your required mounting height, wind speed, and the total EPA and weight of all intended attachments, select a pole with loading ratings that meet your needs.

If you need help choosing or specifying, our experienced staff will be glad to help. Just call.



***Order logic and specifications for Tuff-Stub base poles are detailed in Shakespeare Composite Structures publication LSP-I. Order logic and specifications for Tuff-Hinge hinged base poles are detailed in Shakespeare publication LHP-I. For SportsLighting Tuff-Poles up to 125' mounting height, ask for SportsLighting brochure.**

1002 - STREET LIGHTING CABLE SPECIFICATION

ALL STREET LIGHTING CABLE INTENDED FOR UNDERGROUND DISTRIBUTION IN CONDUIT OR DIRECT BURIAL SHALL HAVE THE FOLLOWING MINIMUM ACCEPTABLE CHARACTERISTICS AND PERFORMANCE PER PRODUCT DATA PRESENTED IN SECTION 1002.1 OF THIS SPECIFICATION.

- DIRECT BURIAL.

- 600 VOLT, XLP INSULATION, CROSSLINKED POLYETHYLENE DUPLEX CABLE CONFIGURATION.

- PHASE CONDUCTORS: THE CONDUCTOR SIZE SHALL BE MINIMUM #6 AWG STRANDED ALUMINUM ALLOY TYPE 1350.

- NEUTRAL CONDUCTORS: STRANDED ALUMINUM, FULL RATED, MINIMUM NO. 6.

- CONDUCTOR SIZES FOR APPLICATIONS ABOVE THE MINIMUM RATING FOR #6 CABLE SHALL BE SIZED PER NEC ARTICLE 310.

- INSULATION: THE PHASE CONDUCTOR AND THE NEUTRAL CONDUCTOR SHALL HAVE AN INSULATION THICKNESS OF NOT LESS THAN 60 MILS.

- NEUTRAL CONDUCTOR: THE NEUTRAL CONDUCTOR INSULATION SHALL BE READILY IDENTIFIABLE WITH AN EXTRUDED YELLOW STRIPE.

- SPECIFICATIONS: UL NO. 44, UL NO. 854, ICEA-S-66-524/NEMA WC7.

- MANUFACTURER: Southwire Claflin/Hi-Score or Equal

1002.1 Street Lighting Cable Spec's

Duplex 600V Secondary UD HI-SCORE

Aluminum Conductors. Ruggedized XLP Insulation. Provides Superior Mechanical Protection.

APPLICATIONS

Used for secondary distribution and underground service at 600 volts or less, either direct burial or in ducts. Especially suited for applications requiring superior resistance to mechanical damage. Rated 90°C continuous operation, 130°C emergency overload and short circuit 250°C.

SPECIFICATIONS

HI-SCORE duplex 600 volt secondary UD cable meets or exceeds the following applicable ASTM specifications:

- B-231 Aluminum 1350 Conductors, Concentric-Lay-Stranded.
- B-609 Aluminum 1350 Round Wire, Annealed and Intermidiate Tempers, for Electrical Purposes.
- B-786 19 Wire Combination Unilay-Stranded Aluminum Conductors for Subsequent Insulation.
- B-901 Compressed Round Stranded Aluminum Conductors Using Single Input Wire.

HI-SCORE duplex 600 volt secondary UD cable insulation meets or exceeds all grade and type requirements of ICEA S-81-570 and UL Standard 854 for Type USE-2.

CONSTRUCTION

Conductors are stranded, compressed 1350-H16/H26 aluminum, insulated with a cross-linked polyethylene meeting the requirements of ANSI/ICEA S-81-570. Neutrals are triple yellow extruded stripe. Cables with "YES" neutrals have sequential footage markers. Conductors are durably surface printed for identification.

Spliced Cables Will Not be Accepted

1002.1

Southwire
One Southwire Drive
Carrollton, Ga. 30119 USA

MADE IN THE USA

HI-SCORE Duplex 600V

Code Word	Phase Conductor			Neutral			Diameter (mils)			Weight Per 1000 ft. (lbs.)	Allowable Ampacities+	
	Size (AWG)	Strand-ing	Insul. Thick. (mils)	Size (AWG)	Strand-ing	Insul. Thick. (mils)	Single Phase Cond.	Neutral Cond.	Complete Cable		Direct Burial	In Ducts
	DUPLEX WITH YELLOW EXTRUDED STRIPE NEUTRAL											
Claflin/HI-SCORE	6	7	60	6	7	60	298	298	596	90	90	65
Delgado/HI-SCORE	4	7	60	4	7	60	345	345	690	128	125	90

+Ampacity: 90°C conductor temperature, 20°C ambient temperature, RHO factor 90. For NEC Applications, use NEC Table 310.16 Ampacities.

1002.2

Southwire
One Southwire Drive
Carrollton, Ga. 30119 USA

MADE IN THE USA

1003 - SECONDARY AND STREET LIGHTING

CABLE ACCEPTANCE TEST

ACCEPTANCE TESTING OF ANY CABLE SHALL BE PERFORMED WITH ALL CABLE TERMINATIONS IN PLACE BUT DISCONNECTED FROM THE SYSTEM.

CABLE TESTING SHALL BE PERFORMED BY A CERTIFIED TESTING AGENCY APPROVED BY THE CITY OF LEWES, BOARD OF PUBLIC WORKS.

CABLES RATED 600 VOLTS OR LESS SHALL NOT BE HIGH POTENTIAL TESTED, BUT SHALL BE ACCEPTANCE TESTED AT 1000 VOLTS DC FOR ONE (1) MINUTE.

WARNING

THE APPLICATION OF SERVICE VOLTAGE OR TEST VOLTAGE TO A CABLE MAY CAUSE A VOLTAGE RECOVERY OF SUFFICIENT MAGNITUDE TO CREATE A HAZARD. EXTREME CARE MUST BE TAKEN TO PROPERLY AND COMPLETELY DISCHARGE THE CABLE AFTER COMPLETION OF TESTING.

1100 - HARDWARE/FITTINGS/CONNECTORS

1101 HARDWARE STANDARDS

1102 CONDUIT MOUNTING HARDWARE

CABLE MATERIAL

CONDUIT MOUNTING HARDWARE

Brackets

Hot Galvanized

Stock Number	Figure No.	Conduit Dia. — Ins. Nominal	Conduit Dia. — Ins. Outside	No. Of Conduits	Dimensions — Ins. A	Dimensions — Ins. B	Dimensions — Ins. C	Approx. Wt. Lbs. 100 Pcs.
STANDOFF — WITH CURVED BACK (Order U-Bolt Separately)								
598EF	1-15	¾ - 2 or 2½ - 4	1 -2⅜ or 2⅞ - 4½	1	2⅞ and 5	—	5 15/16	205
STANDOFF — WITH POLE STEP (Order U-Bolt Separately)								
899*	1-16	3-6	3½ - 6⅝	1	5 7/16	—	8	155
900*	1-16	2-5	2⅜ - 5 9/16	1	4 7/16	—	7	141
902*	1-17	3-6	3½ - 6⅝	2	5½	2 1/16	16⅜	393
901*	1-18	2-5	2⅜ - 5 9/16	3	4 7/16	2 7/16	21	448
SERVICE DROP (With U-Bolt)								
2020	1-19	1¼ - 2½		1	3⅜	—	3⅝	62

*Available with ⅝" captive nut in place of Pole Step for machine or double arming bolt mounting.

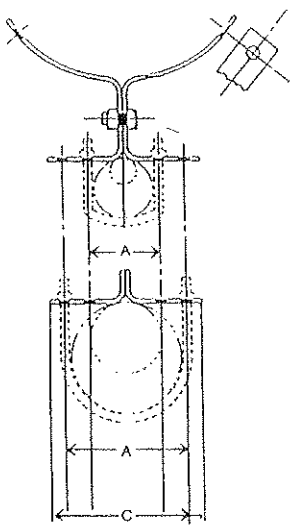


Figure 1-15

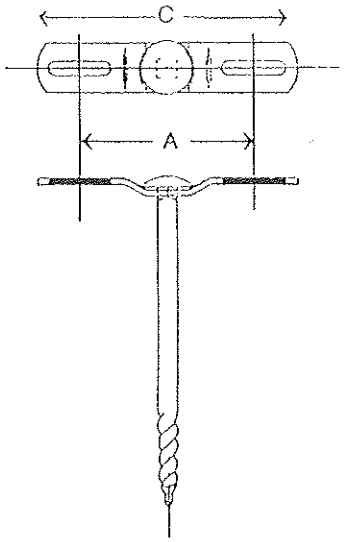


Figure 1-16

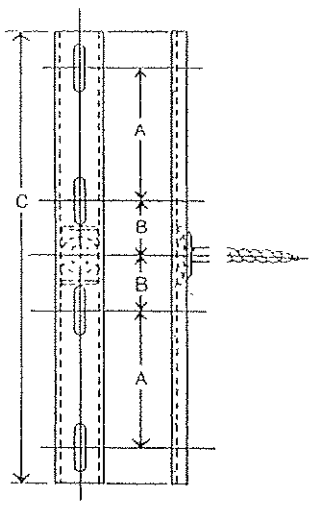


Figure 1-17

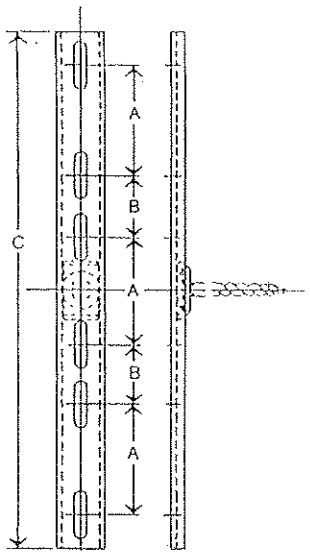


Figure 1-18

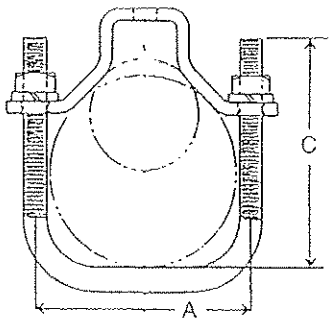


Figure 1-19

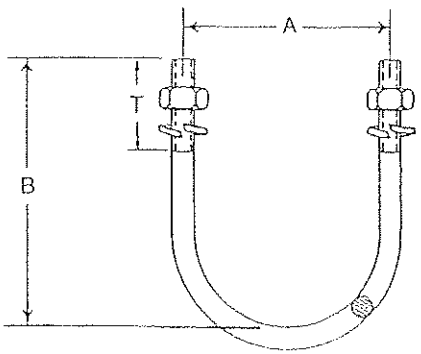


Figure 1-20

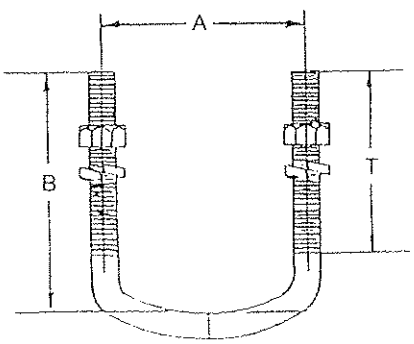


Figure 1-21

1101 - HARDWARE STANDARDS

HARDWARE SHALL BE HOT-DIPPED GALVANIZED.

POLE TOP AND CROSSARM PINS SHALL CONFORM TO EEI SPECIFICATION TDJ-17.

BOLTS AND NUTS SHALL CONFORM TO EEI SPECFICATIONS AS FOLLOWS:

- TDJ-1-1969 FOR MACHINE, CARRIAGE, AND DOUBLE ARMING BOLTS.
- TDJ-1958 FOR EYE BOLTS.
- TDJ-3-1964 FOR LAG SCREWS.

STEEL PARTS SHALL CONFORM TO ASTM SPECIFICATIONS A7-56T.

MALLEABLE IRON SHALL CONFORM TO ASTM SPECIFICATIONS A47-52.

GALVANIZING SHALL CONFORM TO ASTM SPECIFICATIONS A153-53.

1200 - PROTECTIVE DEVICES AND SUPPORTING HARDWARE

1201 15 KV SINGLE PHASE FUSED CUTOUT

EACH PRIMARY CABLE SHALL HAVE A 15 KV LOAD-BREAK FUSED CUTOUT INSTALLED AT THE TOP OF THE PRIMARY RISER POLE.

CUTOUTS SHALL BE DISTRIBUTION CLASS, CROSSARM MOUNTED WITH ARC SUPPRESSOR .

CUTOUTS SHALL BE LOCATED THAT THEY MAY BE READILY AND SAFELY OPERATED AND RE-FUSED; AND SO THAT THE EXHAUST OF THE FUSE SHALL NOT ENDANGER PERSONNEL OR EQUIPMENT.

CUTOUTS SHALL HAVE PERMANENT, LEGIBLE IDENTIFICATION SHOWING MANUFACTURERS TYPE, CONTINUOUS CURRENT RATING, MAXIMUM VOLTAGE RATING AND INTERRUPTING RATING.

CUTOUTS SHALL BE 100 AMPERE CONTINUOUS RATED WITH T- LINK FUSES OF APPROPIATE RATING FOR THE SYSTEM.

THE ACCEPTABLE MANUFACTURER FOR CUTOUTS SHALL BE ABB TYPE LBU II OVERHEAD POLE TOP STYLE, 15 KV, 110 BIL, 100 AMPERE CATALOG NO. 279C789A11, AS PRESENTED IN SECTIONS 1201.1,1201.2 OF THIS SPECIFICATION.

FUSE RATINGS SHALL BE SELECTED PER ARTICLE 230 OF THE NATIONAL ELECTRIC CODE.

Product Features

- 7.8/15 kV, 15 kV, 15/27 kV, 20/34.5 kV, and 27 kV
- 110, 125, 150, 170, and 200 kV BIL
- 100 A, 200 A Fused
- 300 A Disconnect Blade
- Porcelain, Polymer Concrete, or Silicone Insulators Available
- Cutout/Arrester Combo

Description

The ABB LBU-II cutout performs as an outdoor loadbreak switch, as well as a fused cutout for distribution systems. Loadbreak interruption is accomplished by means of a self-contained loadbreak arc chute which confines the arc and provides a deionizing action.

Conventional operation loadbreak is accomplished by normal opening of the cutout by hookstick. There are no parts to replace and the loadbreak feature lasts the life of the cutout. The self-contained loadbreak concept enables the line worker to interrupt load current with a simple hook-stick operation. Silicone or polymer concrete insulators and cutout/arrester combinations are available on certain models.

The LBU-II can successfully switch currents as high as 300 A at 15 kV and 50 A at 27 kV. It has fault-interrupting (not loadbreak) capacities as high as 20,000 A RMS asymmetrical.

Applications

Capacitor Banks

The LBU-II provides over-current protection for capacitor banks and gives visible indication that the equipment is energized. It also provides a convenient and inexpensive switch capable of interrupting capacitor currents.

Transformer Bank Switching

The LBU-II can be used for switching the magnetizing currents of both single-phase and three-phase transformer banks.

Sectionalizing

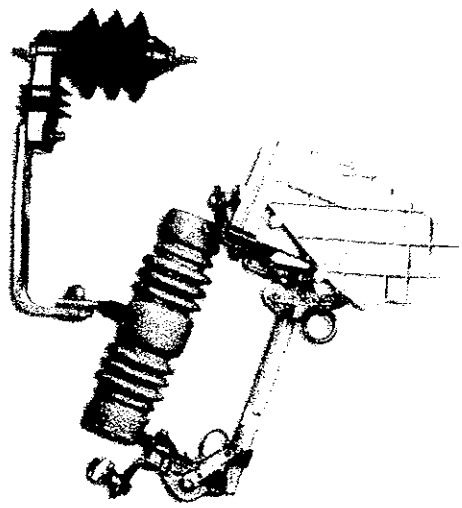
The LBU-II provides a convenient method of sectionalizing single and three-phase, loop, or lateral lines during maintenance or under contingency conditions.

Riser Pole

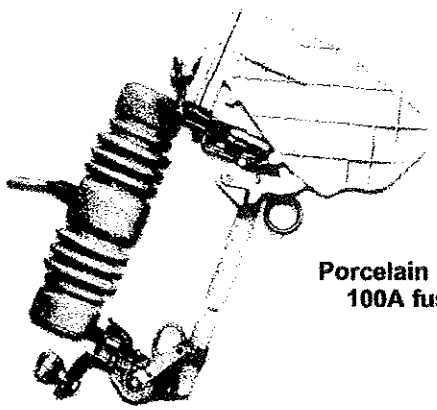
The LBU-II provides a way to switch the capacitive currents associated with the underground feeder cables at the riser pole.

Standards and Design Testing

The LBU-II cutout meets or exceeds all applicable requirements of EEI, NEMA SG-2, and IEEE C37.41 and C37.42 standards.



Porcelain LBU-II with arrester combination



Porcelain LBU-II with 100A fuseholder

Porcelain LBU-II Cutout Style Numbers

1201.2

RATINGS						STYLE NUMBER			
Voltage		Current			Cap Type on Fuseholder	Clamshell Terminal Connectors		Eyebolt Terminal Connectors	
Voltage	BIL (kV)	Current Rating (A)	Loadbreak Current (A)	Interrupting Rating (kA)		with NEMA Brkt	without NEMA Brkt	with NEMA Brkt	without NEMA Brkt
7.8/15	110	100	100	12	Solid	279C790A03MP	279C790A38MP	279C789A03MP	4992C85A22
7.8/15	110	100	100	20	Barrel exp.	279C790A04	279C790A32	279C789A04	279C789A61
7.8/15	110	200	200	12	Solid	279C790A05	279C790A07	279C789A05	1C08030A13
7.8/15	110	200	200	20	Barrel exp.	279C790A06	279C790A39	279C789A06	4986C49A36
15	110	100	100	10	Solid	279C790A10MP	279C789A48MP	279C789A10MP	279C789A54
15	110	100	100	16	Barrel exp.	279C790A11	279C790A34	279C789A11	279C790A40
15	110	200	200	8	Solid	279C790A12	279C789A49	279C789A12	279C789A55
15	110	200	200	10	Link extender	4992C85A23	4992C85A24	4992C85A25	4992C85A26
15	110	200	200	12	Barrel exp.	279C790A13	279C790A43	279C789A13	279C790A41
15	110	300	300	Disconnect	Blade	279C790A14	279C790A53	279C789A14	279C790A37
15/27	125	100	100	10	Solid	279C790A17MP	279C790A35MP	279C789A17MP	279C789A28
15/27	125	100	100	16	Barrel exp.	279C790A18	279C790A36	279C789A18	279C789A57
15/27	125	200	200	10	Solid	279C790A19	279C789A46	279C789A19	279C789A58
15/27	125	200	200	16	Link extender	4992C85A36	4992C85A37	4992C85A43	4992C85A44
15/27	125	300	300	Disconnect	Blade	279C790A21	279C789A47	279C789A21	279C789A59
15/27	200	100	100	10	Link extender	1C08030A01MP	1C08030A02MP	1C08030A03MP	1C08030A04MP
15/27	200	100	100	10	Barrel exp.	1C08030A05	1C08030A06	1C08030A07	1C08030A08
20/34.5	150	100	100	6	Solid	279C790A22MP	279C789A44MP	279C789A22MP	-
20/34.5	150	100	100	12	Barrel exp.	279C790A23	279C790A49	279C789A23	279C789A65
20/34.5	150	100	100	12	Link extender	4992C85A27MP	4992C85A31MP	4992C85A31MP	-
20/34.5	200	100	100	12	Link extender	4992C85A28MP	4992C85A30MP	4992C85A32MP	-
20/34.5	150	300	100	Disconnect	Blade	279C790A27	279C789A45	279C789A27	-
27	125	100	50	6	Solid	279C790A24MP	279C790A63MP	279C789A24MP	-
27	125	100	50	12	Barrel exp.	4986C49A07	4986C49A08	4986C49A09	-
27	125	100	50	12	Link extender	4992C85A02MP	4992C85A04MP	4992C85A05MP	4992C85A06
27	200	100	50	12	Link extender	4992C85A33MP	4992C85A34MP	4992C85A35MP	-
27	125	300	50	Disconnect	Blade	279C790A26	279C790A64	279C789A26	279C789A25

~~1201.2~~

1201.2

1202 – THREE PHASE EQUIPMENT MOUNTING BRACKET

EACH RISER POLE SHALL BE FURNISHED WITH A THREE PHASE EQUIPMENT MOUNTING BRACKET TO SUPPORT FUSED CUTOUTS AND LIGHTNING ARRESTERS.

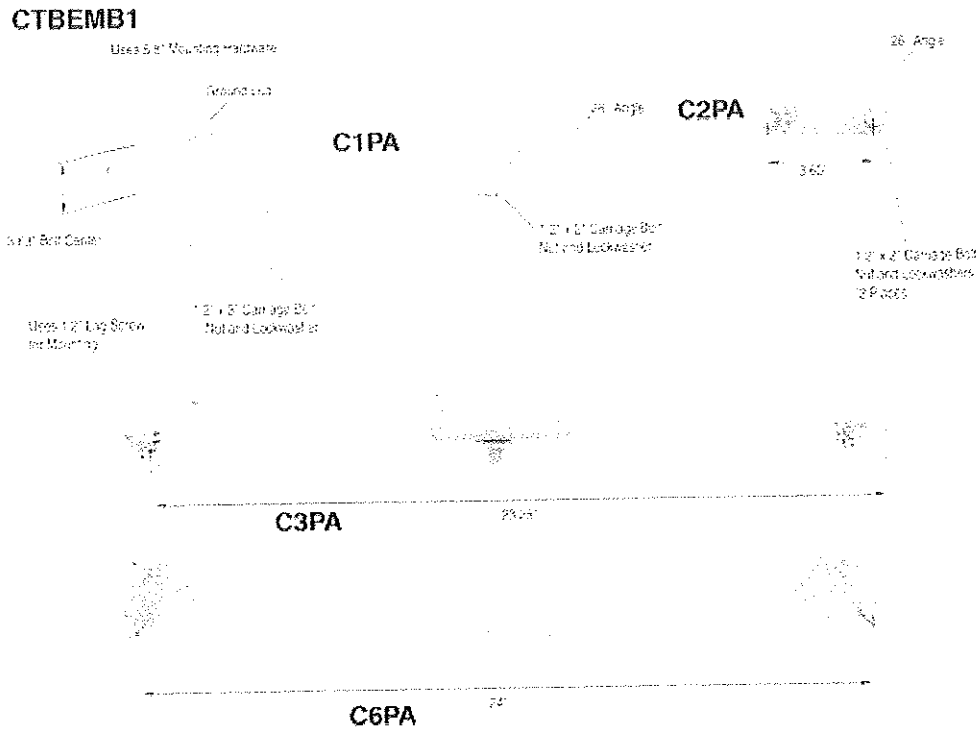
MANUFACTURER IS HUBBELL POWER SYSTEMS OR EQUAL CAT # CTBEMB16PA35, COMPONENT CAT# C2PA (2) PER BRACKET.

HUBBELL
Power Systems

210 N. Allen S
Centralia, MO 6

hubbellpowersystems.

Terminator & Arrester Bracket Components



Terminator and Arrester Bracket Components

Catalog Number	Description	Approx. Ship Wt. per Each
CTBEMB1	Pole Mounting Bracket	3.00 lbs.
C1PA	Single Position Bracket	1.00 lbs.
C2PA	Two Position Bracket	1.50 lbs.
C3PA	Three Phase Terminator Bracket	4.00 lbs.
C6PA	Three Phase Terminator & Arrester Bracket	5.00 lbs.

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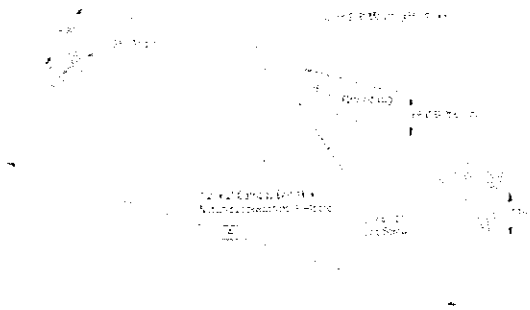
Terminator & Arrester Brackets

Bracket for three phase mounting of terminators and/or arresters. Extruded aluminum material offers lightweight for easy handling. Mounts to pole with 5/8" thru-bolt and 1/2" lag screw. Shipped completely assembled. Mounting hardware is purchased separately.



3 Phase Terminator and Arrester Brackets

Catalog Number	Hole to Hole Distance - A	Extension from Pole	Mounting Hole Spacing	Mounting Hardware (Not Included)	Approx. Ship Wt. per Each
CTBEMB16PA	24"	8-7/8"	3-5/8"	5/8" Through Bolt & 1/2" Lag Screw	8.00 lbs.
CTBEMB16PA35	35"				9.00 lbs.

1203 – 9 KV DISTRIBUTION ARRESTER

EACH PRIMARY CABLE SHALL HAVE A 9 KV LIGHTNING ARRESTER ATTACHED AT THE TOP OF THE PRIMARY RISER POLE.

LIGHTNING ARRESTERS SHALL BE DISTRIBUTION CLASS , CROSSARM MOUNT.

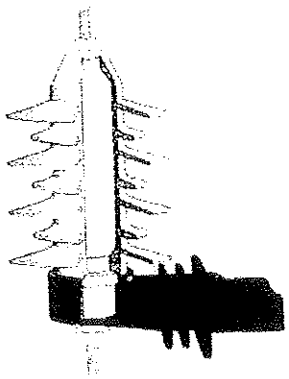
LIGHTNING ARRESTERS SHALL BE SO LOCATED THAT EXHAUST OF THE ARRESTER SHALL NOT ENDANGER PERSONNEL OR EQUIPMENT.

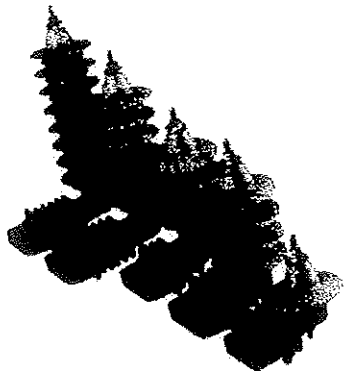
THE MINIMUM STANDARD FOR LIGHTNING ARRESTERS SHALL BE MACCLEAN POWER SYSTEMS TYPE ZHP 9KV DISTRIBUTION SURGE ARRESTER, CAT # ZHP009-0C00100 WITH CROSSARM BRACKET AS PRESENTED IN SECTION 1203.1, 1203.2

Maclean Power Systems

Arresters >> Distribution Arresters

Zforce ZHP Arresters





Features:

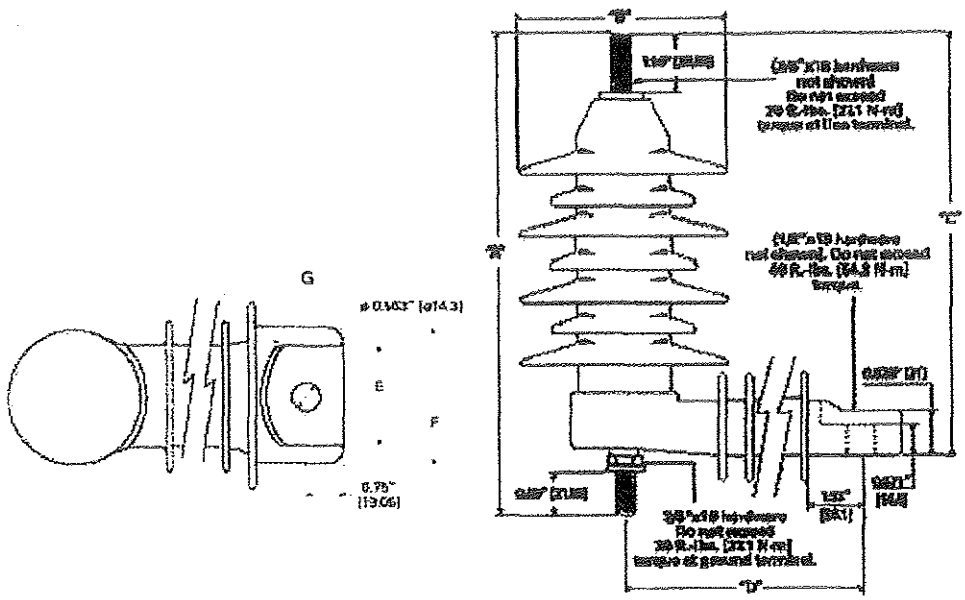
- Zforce arresters have mold-on polymer housing for the ultimate seal against moisture ingress
- High strength Fiberglass for high fault-withstand design
- Integrated Ground Lead Disconnet for fast, reliable operation. Operates in less than 2 seconds at 1 amp and less than 2 cycles at 1,000 amps

Performance:

- The ZHP designs are tested in accordance with the latest ANSI/IEEE standards for metal oxide arresters. (patent no. 5,923,518
- 1. High Currect - Sort Duration 100kA
  2. Low Current - Lon Duration 250 amps
  3. Nominal discharge class per IEC 10kA
  4. Duty Cycle - 10kA
  5. Line Discharge Class per IEC: Class 1
  6. Minimum Energy Capability - 100% production tests: 2.7kJ/kV
  7. Fault Withstand Capability: 20kA
  8. REA Listed

See EZ Ordering Information Link for catalog number assistance

1203.1



ZHP Heavy Duty -Protective Characteristics											
Catalog Number	Voltage Rating (Ur) (kV rms)	MCOV (Uc) (kVrms)	Equivalent F.O.W. kV (Crest)	Switching Surge kV (crest)	Discharge Voltage (1.5kA)	Discharge Voltage (2.5kA)	Discharge Voltage (3kA)	Discharge Voltage (5kA)	Discharge Voltage (10kA)	Discharge Voltage (20kA)	Discharge Voltage (40kA)
ZHP003	3	2.55	11.5	7.5	8.4	8.6	8.7	9.2	10.2	11.6	13.7
ZHP006	6	5.1	23.4	15.1	17.1	17.5	17.7	18.8	20.7	23.6	27.7
ZHP009	9	7.65	33.5	21.6	24.4	25.0	25.4	26.8	29.6	33.8	39.7
ZHP010	10	8.4	36.3	23.5	26.5	27.2	27.5	29.1	32.1	36.6	43.0
ZHP012	12	10.2	43.5	28.2	31.8	32.6	33.0	34.9	38.5	44.0	51.6
ZHP015	15	12.7	54.2	35.0	39.5	40.5	41.0	43.4	47.9	54.7	64.2
ZHP018	18	15.3	65.6	42.4	47.8	49.1	49.7	52.6	58.0	66.2	77.7
ZHP021	21	17.0	70.2	45.4	51.2	52.5	53.2	56.3	62.1	70.9	83.2
ZHP024	24	19.5	87.9	56.8	64.1	65.7	66.6	70.4	77.7	88.7	104.1
ZHP027	27	22.0	98.7	63.8	72.0	73.9	74.8	79.1	87.3	99.7	117.0
ZHP030	30	24.4	109.6	70.9	79.9	82.0	83.0	87.8	96.9	110.6	129.9
ZHP036	36	29.0	131.3	84.9	95.8	98.2	99.5	105.2	116.1	132.6	155.6

Notes:

1. Reduce creepage by 1.45 inches (36.8mm) when ordering without insulating bracket.
2. Weight does not include metal mounting hardware.
3. MCOV = Maximum Continuous Operating Voltage that may be applied continuously between the terminals of the arrester.
4. The equivalent Front-of-Wave is the maximum discharge voltage for a 10kA impulse current wave which produces a voltage wave cresting in 0.5 µs
5. Based on switching surge current imulse of 45x90 µs, 500 amperes.

1203.2