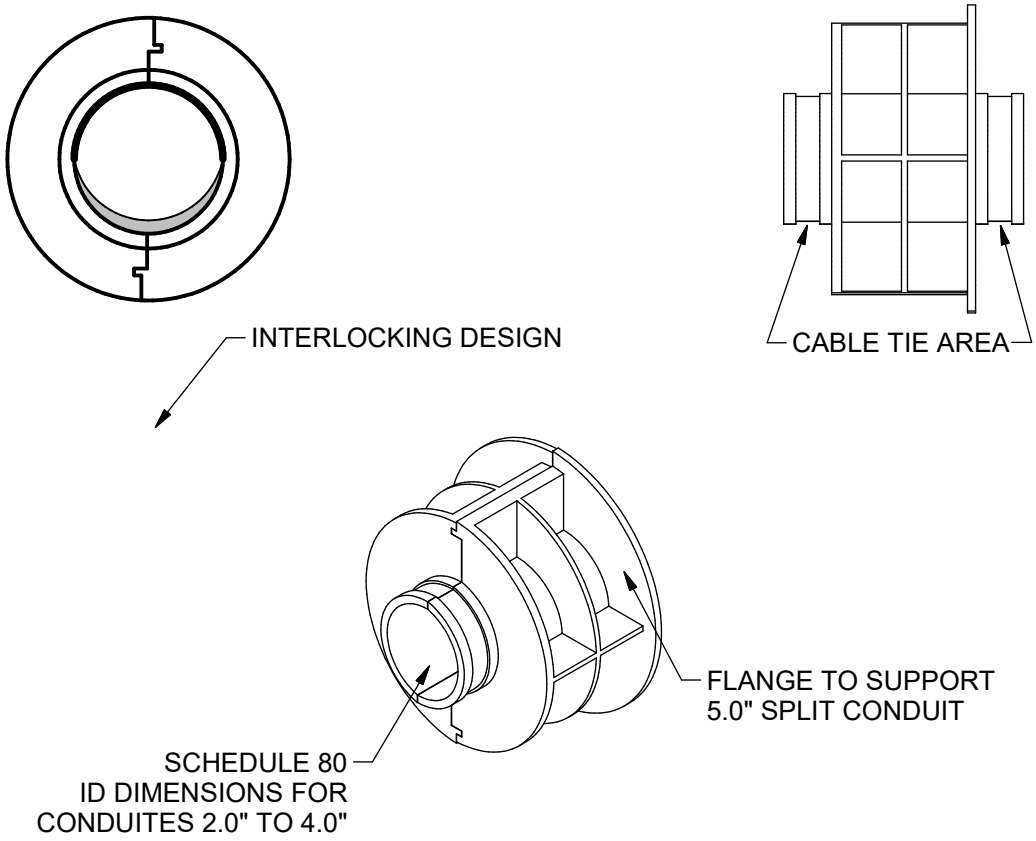
The Broken Conduit Repair System (BCRS) will be used to repair broken PVC conduit installed on poles or in the ground. The BCRS will allow Ameren Linemen to make repairs to broken conduit without having to remove the installed cables and thereby reducing customers' interruptions and the associated customers' minutes out.

The BCRS will consist of five split couplings for the 2.0" to 4.0" conduit, and a 10' length of split 5.0" schedule 80 PVC conduit. Note that the split conduit will encompass a 5.0" schedule 80 PVC conduit. The inside diameter of the split conduit is 5.563".

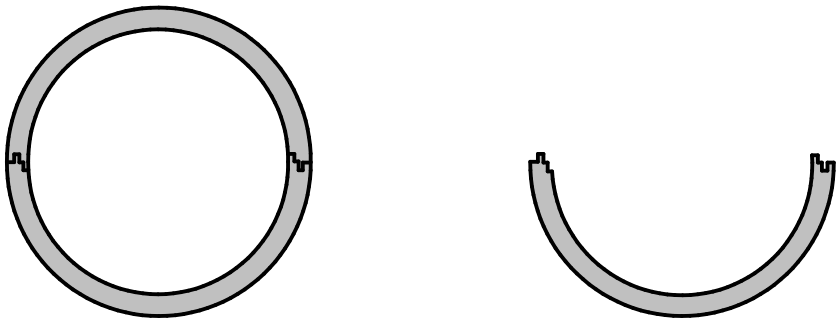
COMPONENTS OF THE BCRS

Half Veiw and Assembled View

REV	DATE	ENG	DESCRIPTION
1	07/31/21	EJB	Converted to new format
1	10/31/20	KSP	



Split Conduit Details



End View of Split Conduit Interlocking Design

REV	DATE	ENG	DESCRIPTION
1	07/31/21	EJB	Converted to new format
1	10/31/20	KSP	

INSTRUCTIONS

1. Determine the size of the broken conduit.

2. Remove the broken pieces of conduit.

3. Using PVC cement attach the correctly sized split coupling to the bottom section of the broken riser conduit (below the break on the solid conduit). Position the split coupling so that the 5" split conduit support flange is away from the broken section. If necessary, a cable tie may be used to hold the split coupling in place.

4. Using a cable tie, attach a correctly sized split coupling to the top section of the broken riser conduit (above the break on the solid conduit). Position the split coupling so that the 5" split conduit support flange is away from the broken section.

5. Measure between the two split couplings to determine the length of the 5" split conduit needed to make the repair. Cut the required length of split conduit needed to make the repair.

6. Place one section of the cut split conduit on the support flange of the bottom split coupling. Slide the top split coupling down so that the section of split conduit contacts the support flange of the top split coupling. Tighten the cable tie to secure the split coupling into place.

7. Remove the section of split conduit. Apply PVC cement to the inner surface of the split conduit in the area where the conduit contacts the split coupling.

8. Re-insert the section of split conduit between the two split couplings. Apply PVC cement to the edge of the reinstalled section of split conduit. Insert the remaining section of split conduit between the top and bottom split couplings, Hold the two split conduit sections together until the PVC cement dries. The conduit sections may be held together with cable ties.

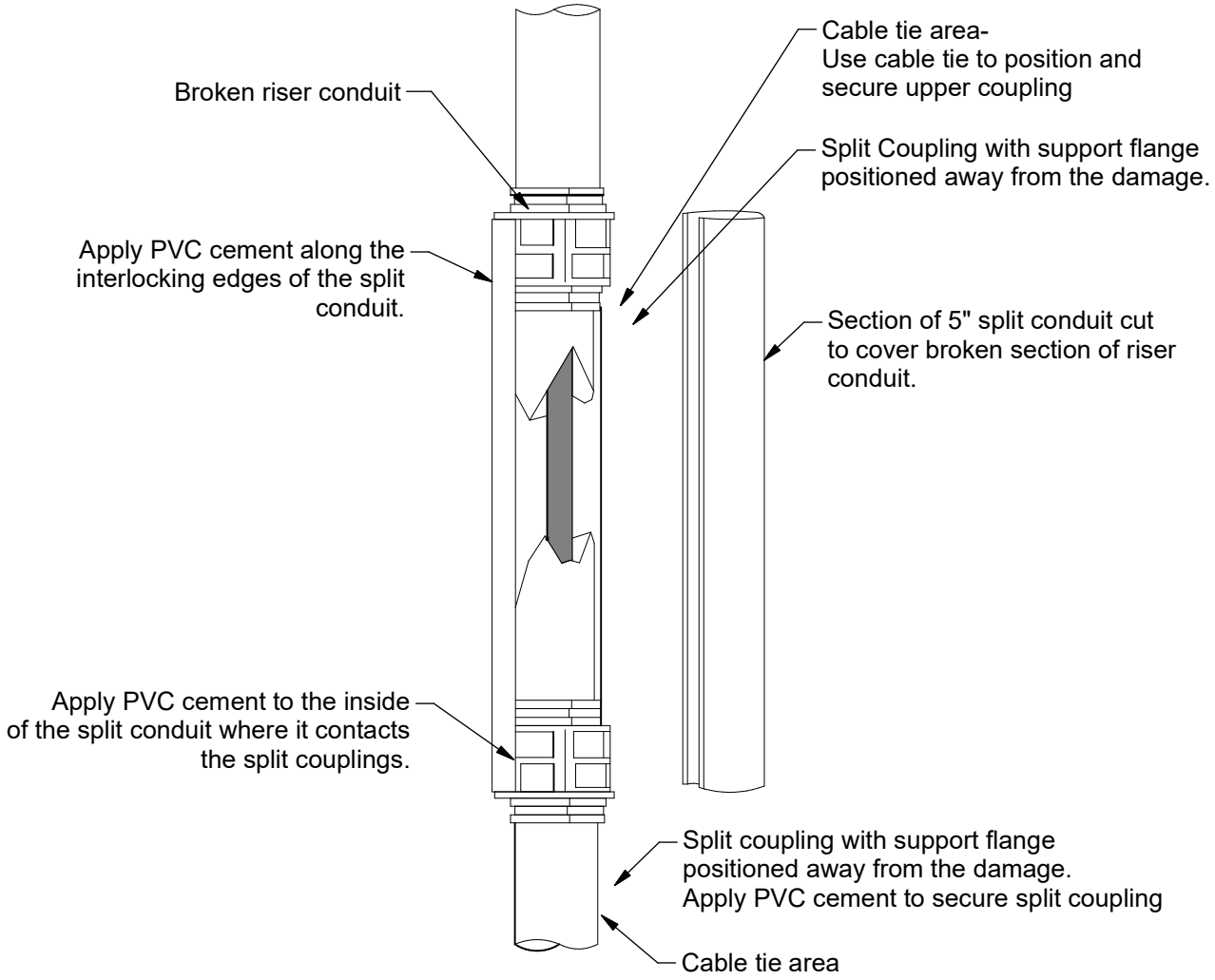


Illustration shows a repair on a riser conduit

CONSTRUCTION NOTE(s):

1. Reciprocating saw blade shown in the table is the preferred blade for cutting split conduit. Split conduit should be assembled while cutting for best cut quality.
2. When the two sections of the split conduit are mated, they may be held together with a cable tie until the PVC cement dries.
3. Rotate the illustration for an underground conduit.

STK #	DESCRIPTION
12 51 403	Conduit-Split, 10' Length, Schedule 80 PVC
12 51 404	Conduit-Split, 2.0” to 5”, PVC
12 51 408	Conduit-Split, 2.5" to 5", PVC
12 51 407	Conduit-Split, 3.0" to 5", PVC
12 51 406	Conduit-Split, 4.0" to 5", PVC
23 67 483	Strap-Kit, Standoff Bracket, 6" Conduit
12 56 099	Cement- Solvent, PVC
40 59 191	Tie-Wire, Black, 18" Reusable
86 12 994	Blade-Saw, Reciprocating

REV	DATE	ENG	DESCRIPTION
1	07/31/21	EJB	Converted to new format
1	10/31/20	KSP	

INSTRUCTIONS

1. Start the lacing at the lead or anchoring end of the grip (where the eye is located). Thread the lacings through the first two loops of the split and pull through until the lacings are centered at this point. Lace as you would your shoe, crossing the lacings before lacing the next two loops.

2. Don't pull lacing too tight. Leave a space between adjoining loops approximately equal to the width of one diamond of the mesh grip.

REV	DATE	ENG	DESCRIPTION
1	07/31/21	EJB	Converted to new format, corrected stk.# to 23 17 254 (SH1)
	xx/xx/xx	xxx	

3. At the very end of the mesh grip, twist the lacing ends tightly together. Wrap the ends tightly around the tail of the grip once or twice. Excess lace can be cut off.

4. Remove the slack from the mesh grip starting at the strand equalizers and working toward the tail end of the grip. Apply one or two cable ties (Stock #40 59 191) to the mesh grip approximately 1 to 2 inches from the tail end of the mesh grip. This may help keep the grip from moving or releasing. The tails of the cable ties should be cut off.

5. Attach the mesh grip eye to the anchoring hardware (generally a machine bolt, eyenut, and shackle) on the pole.

The split grips, used by Ameren to support cables on terminal poles, are as follows:

Cable Grips		
STK#	**Cable Diameter (in.)**	**Length (in.)**
23 17 207	1.75 - 1.99	25
23 17 245	2.00 - 2.49	27
23 17 254	2.50 - 2.99	29
23 17 220	3.00 - 3.49	34
23 17 246	3.50 - 3.99	36

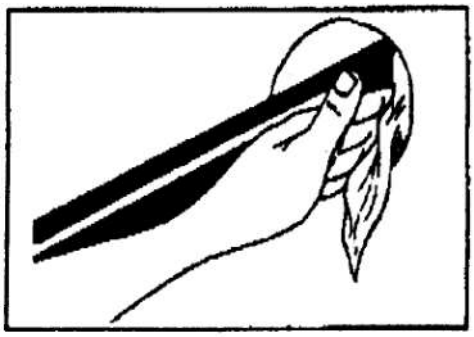
CONSTRUCTION NOTE(s):

Single weave cable grips should be laced with single strand lacing; double weave cable grips should be laced with double strand lacing. Lacing strands should be the same material as the grip. Appropriate lacing should be provided with each grip.

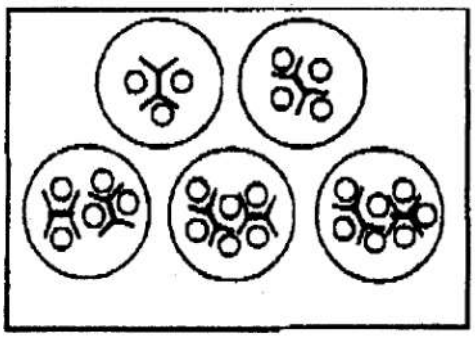
The Inflatable Duct System (DSS) may be used in conjunction with plastic, concrete, tile, fiberglass, or steel ducts to provide a watertight duct seal. The IDSS consists of an inflatable sealed bladder, made of flexible metallic laminate material, which has pre-installed, high-temperature sealant strips on both sides. The bladder is inflated to approximately 45 psi internal pressure with an inflation tool equipped with a manometer, safety relief valve, and CO_2 cartridge. After the blatter is inflated, the fill tube is removed and a self-sealing gel material seals the filling hole.

The IDSS will seal ducts with or without cable(s). If three or more cables have to be sealed, sealing clips are used in combination with the inflatable bladder. To make installation easier, the metallic surfaces should be lubricated with an approved lubricant.

INSTALLATION INSTRUCTIONS



1. It is recommended to wet clean the duct and cable Sheath. Remove as much dirt, crust, mud, etc. as possible. **For ducts with 3 or more cables, continue with step 2. For 0, 1, or 2 cables skip to step 9.**

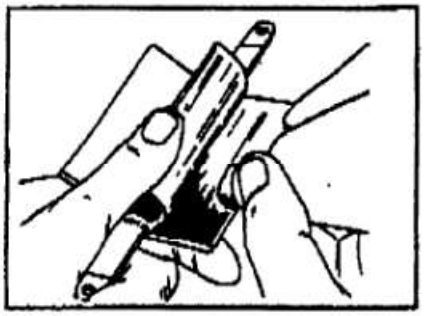


2. Examples for different multiple cable configuration. One RDSS-Clip can seal up to four cables. If more cables are to be sealed, use one extra clip per three additional cables.

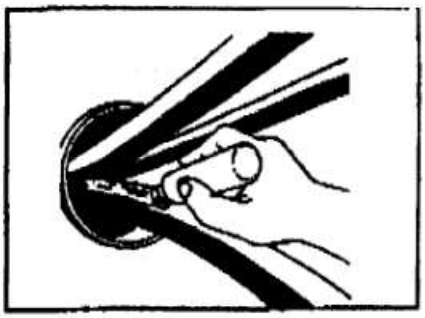
3. Open clip wings on one side. Lubricate the wings abundantly, to ensure that they don't stick together.

REV	DATE	ENG	DESCRIPTION
2	07/01/21	EJB	Converted to new format, added description and stock # to step F
1	02/14/12	HLH	Reaffirmed

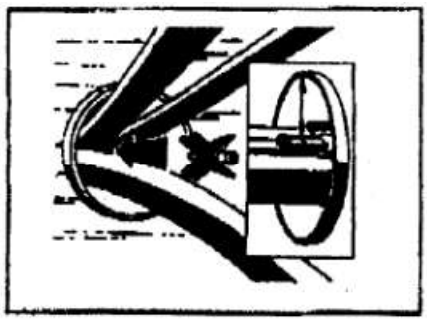
4. Remove one protection paper and lubricate abundantly the larger surface of the clip wing.



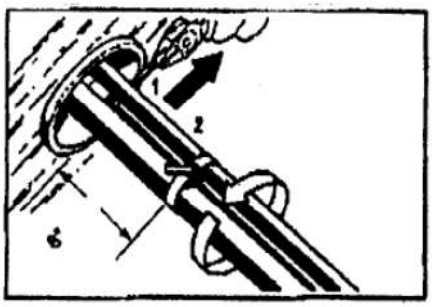
5. Repeat steps 3 & 4 for the other clip wings. Remove protection paper only after lubricating at least one wing side.



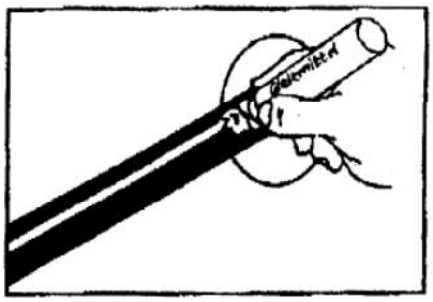
6. Abundantly lubricate the cables in the crotch area as much as possible.



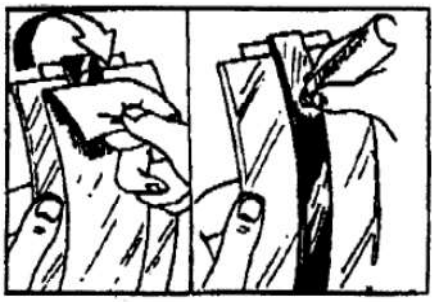
7. Insert the clip in between the cables, assuring that there is only one cable between each clip wing (see picture, step 2). Make sure that the central part of the clip is well positioned in the crotch area. The raised line on center stick should be flush with the end of the duct. Use the short tie-wrap to hold the clip in place. Cut off the excess tie-wrap and position the locking part between the cables.



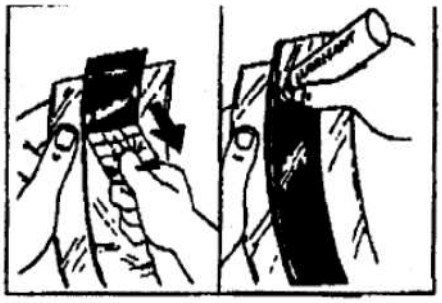
8. Install the long tie-wrap around the cable bundle at a distance of approx. 8" from the duct entrance.



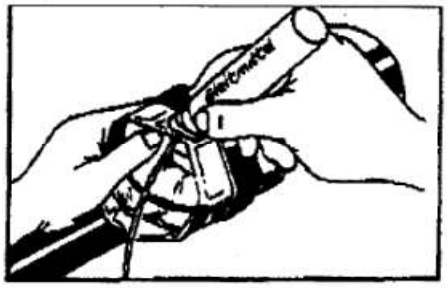
9. For ease of installation lubricate the cable.



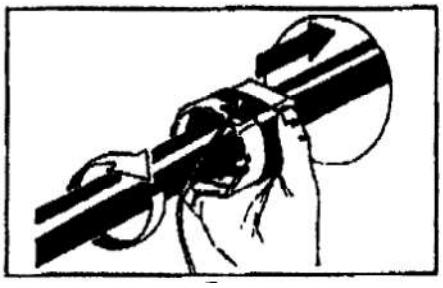
10. Remove the protective paper from the outside of the sealing strip and lubricate abundantly.



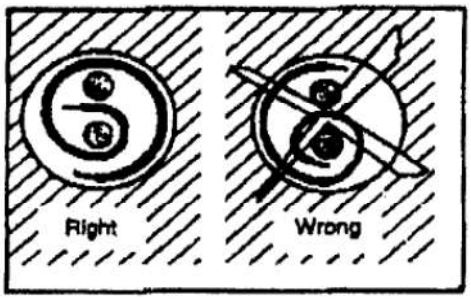
11. Continue with lubrication of the inside of the sealing strip.



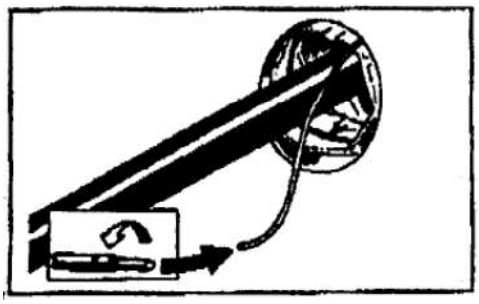
12. Lubricate the filling tube on the bladder section.



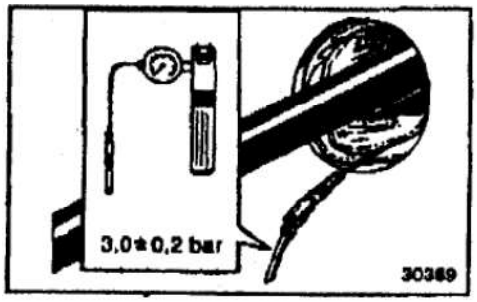
13. Wrap bladder around the cable (or cable bundle) and slide completely into the duct.



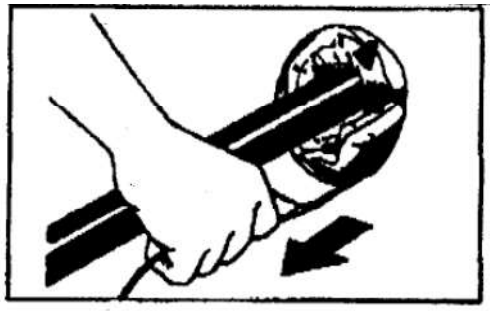
14. In case of two cables, wrap bladder around the cables as shown starting with the largest cable.



15. Connect the filling tube to the tube snap of the inflation tool. Gently insert the filling tube until it will not go in any further. Tighten down the nozzle.

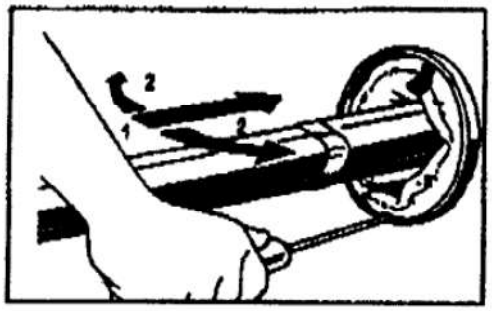


16. Inflate bladder up to the pressure of 3.0 bar (43.5 psi) and keep the pressure there for 30 seconds, after which the tool must be shut off. **Note:** Refer to the operation manual for the specific inflation tooling being used.



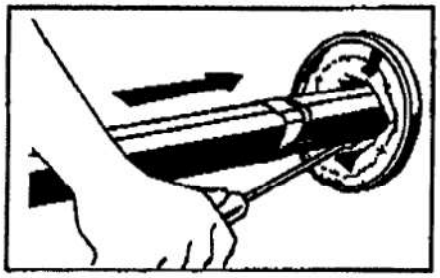
17. BEFORE removing the installation tool connection from the filling tube, pull out of the filling tube in one gentle move in the direction of the cable installation to complete.

REMOVAL INSTRUCTIONS

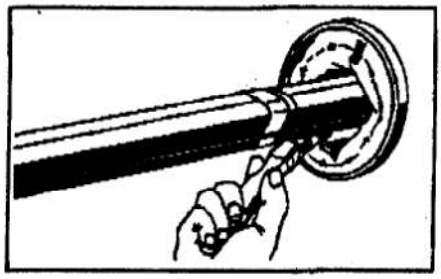


1. Deflate the bladder by piercing with a screw driver. Release the bladder from the duct wall by using a blunt tool.

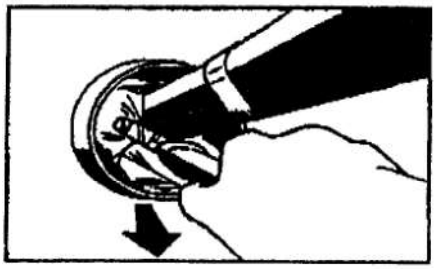
REV	DATE	ENG	DESCRIPTION
2	07/01/21	EJB	Converted to new format, added description and stock # to step F
1	02/14/12	HLH	Reaffirmed



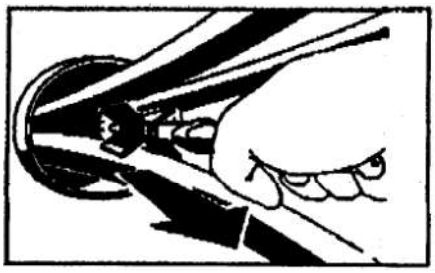
2. Release bladder from the cable or cable bundle.



3. Apply lubricant on the released areas.



4. Pull the bladder out of the duct with a pair of pliers.



5. If applicable: Remove tie wraps from the cable bundle. Spread cables. Remove clip core and sealant as much as possible with a pair of pliers

ITEM	STK / DCS #	DESCRIPTION
A	86 08 020	CO2 cartridge, Note: One cartridge will fill up multiple bladders.
B	12 51 295	Bladder for conduit with 3.25" - 4.50" I.D.
C	12 51 098	Clip for use with item B
D	12 51 296	Bladder for conduit with 4.75" - 5.00" I.D.
E	12 51 099	Clip for use with item D
F	12 51 297	Bladder for conduit with 5.25" - 6.25" I.D.
G	12 51 100	Clip for use with item F

REV	DATE	ENG	DESCRIPTION
2	07/01/21	EJB	Converted to new format, added description and stock # to step F
1	02/14/12	HLH	Reaffirmed

This instruction covers both normal installation and allowable deviations in burial depth of non-lead direct buried cables. New three phase primary cables shall be installed in conduit.

Guidelines

1. Non - Fused Primary Cable (Generally all 750 kcmil cable)
   No new or replacement 750 kcmil cable direct buried installations shall be made.
   For existing installations, the normal burial depth should be 48" in trench earth.
   Existing installations in rock should be at a depth of no less than 24" and the cable should be installed in conduit and covered with 2 or more inches of protective concrete.

2. Fused Primary (Generally #2 or 4/0 cable)
   In trenchable earth the normal burial depth shall be 36". The minimum depth shall be 30".
   This may be reduced to 12" if the cable(s) are in conduit and covered with 2 or more inches of protective concrete.

3. Secondary
   In trenchable earth the normal and minimum burial depth shall be 36". The minimum depth shall be 24".
   In areas with rock or obstructions the depth may be reduced to 12" if the cable(s) are in conduit.

4. Services
   In trenchable earth the normal and minimum burial depth shall be 24".
   In areas with rock or obstructions the depth may be reduced to 12" if the cable(s) are in conduit.

5. Street Light Cable
   In trenchable earth the normal burial depth shall be 24" and minimum burial depth shall be 18" where conflicts with other underground facilities exist. In rock the depth may be reduced to 12" if the cable(s) are in conduit.

6. Special Cases
   If depths other than those specified above are desired on specific jobs, the Standards Department shall be consulted.

7. Definitions
   A. **Trenchable Earth** - Earth that can be excavated by use of a trenching machine.

   B. **Rock** - Rock or earth and rock that cannot be excavated by use of a trenching machine at the rate of 1.5 feet/minute.

   C. **Burial Depth** - The amount of cover over the top of a cable or conduit.

   D. **Suitable Backfill** - Dirt free of rock or debris; sand; or 1/4” limestone screening.

8. Other Conditions
   A. Primary and secondary cables shall be installed random lay.

   B. The first 6” of backfill over all cables not in conduit shall be of suitable backfill material.

   C. The base of the trench on which the cable will lie shall be free of rock and/or debris. If rock and/or debris is present, backfill material can be put in the trench to form a 4” base for the cable to lie on or conduit may be used.

   D. When the material excavated from a trench is not itself suitable backfill, a field decision by the Company Construction Supervisor or his representative will be made to either obtain suitable backfill, use conduit, or use cable in duct.

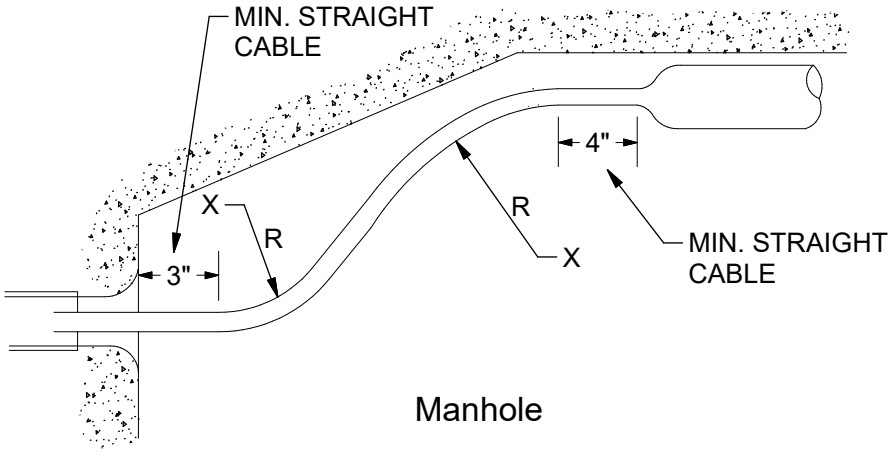
   E. When cables or conduits are installed in areas that are congested (such as where they cross other underground facilities) and additional digging by others is highly likely to occur, “Caution Buried Cable” tape (stock number 49 16 061) may be used to mark the cable route. The caution tape should be installed 12” - 18” below ground level and 12” directly above the buried cable or conduit.

REV	DATE	ENG	DESCRIPTION
4	07/31/21	EJB	Converted to new format
3	09/26/07	EJB	

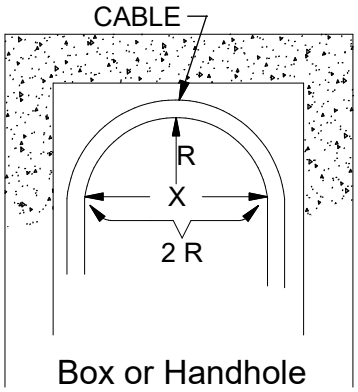
This standard covers minimum bending radii for training underground cables.

The radii quoted in this instruction are minimum standards and should be exceeded where possible. Normal bending radii are ordinarily 12 times the cable diameter for non-armored paper lead cable. Minimum bending radii for solid dielectric cables vary widely. Secondary solid dielectric cable through 350 kcmil may be trained to a radius of 4 times the cable diameter. A no. 2 solid dielectric primary cable is properly trained at 5 times the cable diameter. A 750 kcmil. 15kV cable is properly trained at 6 times and a 1500 kcmil cable at 8 times the cable diameter.

The information on this standard shall be used in obtaining minimum dimensions for construction of new underground facilities. The figures below indicate normal measurements of typical bending radii for cables not direct buried.



Manhole



Box or Handhole

REV	DATE	ENG	DESCRIPTION
4	07/31/20	EJB	Converted to new format, revised bending radii, add cable suffixes
3	12/26/07	EJB	

Table 1 - Paper Lead Cables			
Size	**Minimum Bending Radius (in)**	**Normal Bending Radius (in)**	**Cable O.D.(in) 1**
800-3C, 35 kV	36	42	3.6
500 - 350 - 3C, 35 kV	32	36	3.25
800 - 3C, 15 kV	30	34	2.9
500 - 350 - 3C, 15 kV	20	24	2.5
4/0 - 1/0 - 3C, 15 kV	16	20	1.95
800 - 500 - 3C, 5 kV	25	30	2.5
350 - 4/0 - 3C, 5 kV	15	19	1.87
750 - 500 - 1C, 35 kV	20	24	1.9
350 - 4/0 - 1C, 35 kV	16	20	1.6
750 - 500 - 1C, 15 kV	13	17	1.55
4/0 - 2 - 1C, 15 kV	9	12	1.06

Table 2 - Solid Dielectric Cables			
Size	**Minimum Bending Radius (in)**	**Normal Bending Radius (in)**	**Cable O.D.(in) 1**
3 - 750 R, 5 kV	6.5	8	1.59
3 - 350 through 1/0 R, 5 kV	5	7	1.21
3 - 500 RL, 15 kV	12	14	1.78
3 - 1500 AL., LCX, 15 kV	24	28	2.35
3-4/0 through 1/0 AL. CNX or CNP, 15 kV	8	10	0.98
3-2 through 1/0 CNR & P, 5 kV	4	6	0.841
6 through 4 CNR & P, 5 kV	3	6	0.73
3-350, FSR, P, RW, 15 kV	9	11	1.13
3-750, FSR, P, RW, 15 kV	11	14	1.43

Table 3 - 600V Solid Dielectric			
Size	**Minimum Bending Radius (in)**	**Normal Bending Radius (in)**	**Cable O.D.(in) 1**
4 through 2 R	1.5	3	0.476
10 through 6 R	1.0	2	0.30
1/0 through 4/0 R	3.25	5	0.79
250 through 500 R	4.5	7	1.15
750 R	55	9	1.37

REV	DATE	ENG	DESCRIPTION
4	07/31/20	EJB	Converted to new format, revised bending radii, add cable suffixes
3	12/26/07	EJB	

Table 4 - URD Cables				
Size	**Minimum Bending Radius (in)**	**Normal Bending Radius (in)**	**Cable O.D.(in) <1>**	**Stock No.**
2-350 x 3/0 AL, X, 600 V	3.5	5.0	0.869	18 07 201
2-350 x 3/0 AL., X, 600 V C/D	20.0	24.0	-	18 07 248
2-3/0 x 1/0 AL, X, 600 V	2.0	4.0	0.626	18 07 202
3-1/0 AL, X, 600 V	20.0	3.0	0.529	18 07 203
3-750 x 1-350 AL, X, 600 V	6.0	10.0	1.218	18 07 217
1-2 AL, CNR, P, 15 kV	7.0	9.0	0.912	18 07 238
3-2 AL. CNR, P, 15 kV	7.0	9.0	0.912	18 07 237
1-4/0 AL, CNR, P, 15 kV	8.0	10.0	1.051	18 07 239
3-4/0 AL, CNR, P, 15 kV	8.0	10.0	1.051	18 07 240
1-500 AL, CNR, P, 15 kV	12.0	15.0	1.53	18 07 261
3-750 AL, CNR, P, 15 kV	12.0	15.0	1.57	18 07 243
3-750 CU, CNR, P, 15 kV	14.0	17.0	1.76	18 07 244
1-1000 CU, TSR, P, 15 kV	22.0	28.0	1.80	18 07 046
3-1/0 AL, CNR, P, 35 kV	11.0	13.0	1.43	18 07 291
1-4/0 AL, CNR, P, 35 kV	12.0	15.0	1.59	18 07 219
3-750 AL, CNR, P, 35 kV	18.0	22.0	2.24	18 07 406
3-350 CU, CNR, P, 35 kV	14.0	17.0	1.78	18 07 250
3-750 CU, FSR, P, 35 kV	15.0	19.0	1.87	18 07 249
1-500 AL, CNR, P, 69 kV	33.0	41.0	2.713	18 07 283
1-750 AL, CNR, P, 69 kV	35.0	44.0	2.908	18 07 292
1-1000 CU, CNR, P, 69 kV	37.0	46.0	3.083	18 07 408
CIC Primary	-	-	-	-
1-#2 AL, CNR, P, 15 kV	-	18.0	-	18 07 242
1-4/0 AL, CNR, P, 15 kV	-	24.0	-	18 07 241

Table 5 - Cable Suffix Description			
1C	One Conductor	LC	Longitudinally Corrugated
3C	Three Conductor	CNP	Concentric Neutral Poly
X	Cross-Linked Poly	CNX	Concentric Neutral X-Linked Poly
R	Rubber	CNR	Concentric Neutral Rubber
RW	Reduced Wall	P	Protected (Jacketed)
RL	Rubber w/ Lead Sheath	FSR	Flat Strap, Rubber
TSR	Tape Shielded, Rubber	-	-

CONSTRUCTION NOTE(s):

<1> The outside diameter given for a multiple conductor cable is the diameter of the largest conductor.

REV	DATE	ENG	DESCRIPTION
4	07/31/20	EJB	Converted to new format, revised bending radii, add cable suffixes
3	12/26/07	EJB	

Table 1 - 15 kV Cable Ratings in Amps										
One Circuit Only - Not for Multi-Circuit Installations										
Stock Number	Size AWG or kcmil	Insulation	Direct Burial				Buried Conduit ◇1			
			Summer		Winter		Summer		Winter	
			Normal / Emergency		Normal / Emergency		Normal / Emergency		Normal / Emergency	
			Single Phase	Three Phase	Single Phase	Three Phase	Single Phase	Three Phase	Single Phase	Three Phase
18 07 238	1-2AL	XLP or EPR	226/260	165/190	249/286	182/209	176/202	150/173	194/222	165/190
18 07 260	1-1/0AL	XLP or EPR	297/342	214/246	327/376	235/267	232/267	182/209	255/294	200/230
18 07 240	3-4/0AL	XLP or EPR	–	316/363	–	348/400	–	293/337	–	322/371
18 07 261	1-500AL	XLP or EPR	–	513/590	–	564/649	–	402/462	–	442/508
18 07 237	3-2AL	XLP or EPR	–	165/190	–	182/209	–	150/173	–	165/190
18 07 239	1-4/0AL	XLP or EPR	447/514	–	492/566	–	349/401	–	384/441	–
18 07 243	3-750AL	XLP or EPR	–	628/722	–	691/794	–	493/567	–	542/624
18 07 245	3-350	XLP or EPR	–	533/613	–	586/674	–	416/478	–	458/526
18 07 244	3-750	XLP or EPR	–	745/857	–	820/943	–	582/669	–	640/736

DESIGN NOTE(s):

◇1. This rating applies only when cables are enclosed completely in conduit from the terminal pole to the first termination. Use the direct burial rating for cable installed in a conduit only for the pole riser section.

Table 2 - 600 Volt Cross-Linked Polyethylene Insulated Cable Ratings in Amps			
Stock Number	Cable Size	Direct Burial	Buried Conduit
18 07 252	#6 Al. Duplex	90	65
18 07 266	1/0-2-1/0 Al.	220	198
18 07 202	3/0-1/0-3/0 Al.	286	255
18 07 201	350-4/0-350 Al.	432	381

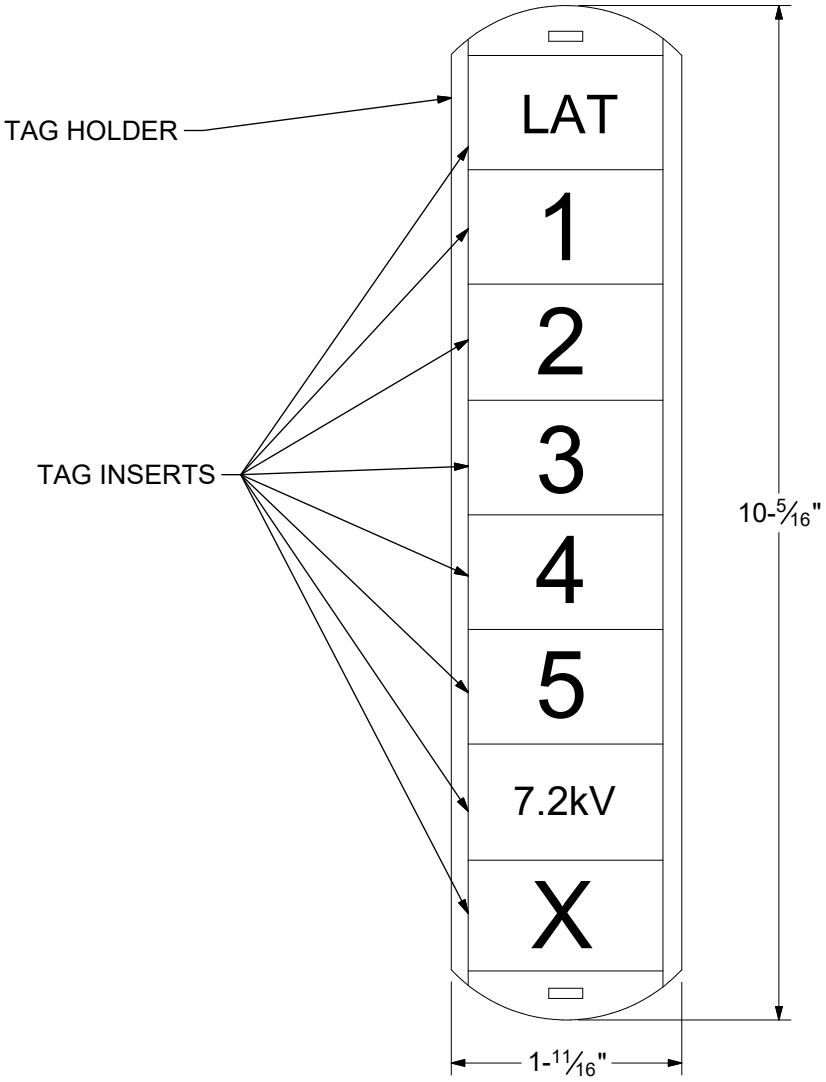
Table 3 - Quadruplex 600 Volt Cross-Linked Polyethelene Cable Ratings in Amps (Three-Phase Service)		
Number of Conduits	Stk. # 18 07 288 3-350 x 1-4/0 Al	Stk. # 18 07 217 3-750 x 1- 350 Al
1	335	509
3	278	421
6	228	346
9	208	316

REV	DATE	ENG	DESCRIPTION
2	07/31/21	EJB	Converted to new format
1	12/17/02	HLH	

This standard covers the basic information and materials required to produce cable tags for cables energized at 2.4 kV, 4 kV, 7.2 kV, 12 kV, or 34 kV. The cable tags will be produced by construction district personnel after obtaining the proper circuit designation and abbreviation from the appropriate authority. See DCS **59 40 00 41** for lead tag information and applications.

1. Cable Tag Construction

The cable tags will consist of a holder and various inserts. The holder will accommodate a maximum of ten inserts. A sample tag is shown.



Sample Cable Tag

REV	DATE	ENG	DESCRIPTION
10	07/31/21	EJB	Converted to new format, deleted stock#16 01 221 & 16 01 050
9	01/01/19	DT	

3. Tag Use

These tags may be used as direct replacements for lead tags (Stock #16 01 099) and formica tags. However, it is not advisable to use these tags in locations where they may be damaged for long term submersion, petroleum products, etc.

4. Tag Attachment Methods

A. Copper Wire or Nylon Cable Tie

Whenever a tag is attached directly to a cable; a piece of concentric neutral, #14 binding wire (Stock #18 52 018), or appropriately sized nylon cable tie may be used.

Whenever a tag is attached to a conduit strap; a piece of concentric neutral, #14 binding wire (Stock #18 52 018), or nylon cable tie may be used. Only black nylon cable ties shall be for outdoor applications.

B. Galvanized Nails - Stock #21 57 047

Whenever a tag is attached directly to a pole; two galvanized nails shall be used for the attachment.

5. Typical Tag Locations

Generally only one tag will be installed on a cable.

A. Cables In Manholes

Tags shall be attached within two feet of the west or north side of the cable joint nearest the manhole entrance.

Tags shall face toward the manhole entrance.

Tags attached to cables in racks shall be staggered.

See DCS **59 40 00 41** for lead tags.

B. Cables In Network Vaults

Tags shall be attached within two feet of the duct entrance and face toward the vault entrance. See DCS **59 40 00 41** for lead tags.

C. Cables On Terminal Poles

Tags may be attached directly to the pole where there is only one lateral. If the terminal pole has more than one lateral, the tags shall be attached to the appropriate cables.

Tags attached to the cables shall be positioned immediately below the terminators

Tags attached to the poles shall be positioned approximately 8'-10' above grade or immediately above the guard.

Tags may be attached to a conduit strap if one lateral is on stand - off brackets. The tags shall be positioned approximately 8'-10' above grade.

6. Special Requirements

A. Cables Cut Dead

Cables cut dead to be identified by a hole punched in the cable tag circuit voltage. Do not remove the cable tag and do not punch out any other information on the tag.

B. Customer Owned Cables

Tags shall be attached to all customer owned cables. If the customer's cables are on terminal poles or attached to overhead facilities a yellow "Customer Owned" tag (Stock #16 01 159) shall be attached (with binding wire or a black nylon cable tie) near the ends of each cables.

REV	DATE	ENG	DESCRIPTION
10	07/31/21	EJB	Converted to new format, deleted stock#16 01 221 & 16 01 050
9	01/01/19	DT	

If the customer's cable enters a padmount transformer, switchgear, or pedestal their cable shall be marked with the tag described above or a wire tie (Stock #40 59 268) that is imprinted the "Customer Owned Cable". Each customer owned cable shall be tagged.

Customer owned cables, that are inside meter enclosures, shall be marked with the wire tie described above. See DCS **59 52 00 41** for additional information about customer owned cables and parallel cables.

7. Tag Folder and Inserts

Cable tags will be produced using the following stock items. The tags are shown are black on yellow measuring 7/8" H x 1 1/2" W

Cable Tags			
STK#	**Description**	**STK#**	**Description**
16 06 277	Holder, Black, Poly	16 01 209	F
16 01 318	LAT	16 01 210	G
16 01 329	Dash (-)	16 01 211	H
16 01 330	FDR	16 01 303	I
16 01 331	DIP	16 01 304	J
16 01 319	12 kV	16 01 305	K
16 01 320	7.2 kV	16 01 306	L
16 01 321	2.4 kV	16 01 307	M
16 01 326	4 kV	16 01 308	N
16 01 195	34 kV	16 01 309	O
16 01 196	0	16 01 212	P
16 01 197	1	16 01 310	Q
16 01 198	2	16 01 311	R
16 01 198	3	16 01 213	S
16 01 199	4	16 01 214	T
16 01 200	5	16 01 312	U
16 01 201	6 or 9	16 01 313	V
16 01 202	7	16 01 314	W
16 01 203	8	16 01 215	X
16 01 204	A	16 01 216	Y
16 01 205	B	16 01 217	Z
16 01 206	C	16 01 224	Pedestal
16 01 207	D	16 01 322	Riser
16 01 208	E	16 01 225	Service
16 01 218	A - Phase	16 01 223	Streetlight
16 01 219	B - Phase	16 01 323	Switch
16 01 220	C - Phase	16 01 324	Trans.
-	-	16 01 222	To

CONSTRUCTION NOTE(s):

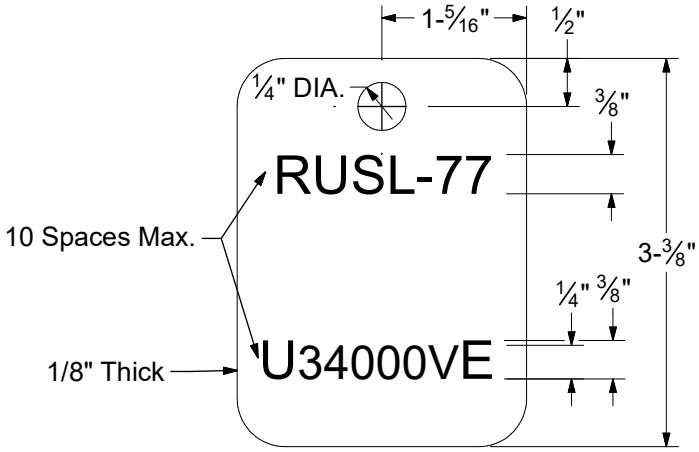
1. The zero tag is actually a phase symbol that has been rotated 90° to appear as a zero with a line through it. This is to help distinguish between "zero" and the letter "O".

REV	DATE	ENG	DESCRIPTION
10	07/31/21	EJB	Converted to new format, deleted stock#16 01 221 & 16 01 050
9	01/01/19	DT	

The standard covers a method that may be used for tagging cables.

1. Tags

Lead cable tags are generally stamped in the field and are routinely used for marking cables in manholes. The blank lead tag is Stock #16 01 099. The voltage shall be as shown, not abbreviated. See DCS **59 40 00 40** for tags that may be used on terminal poles.



Voltage Stamping
Method 1

Voltage Stamping
Method 2

2. Method of Attachment

Tags are to be attached to cables with a No. 14 tinned binding wire, Stock #18 52 018.

the procedure of attachment outlined below shall be followed

A. Securely fasten tag to one end of wire.

B. Bring the free end of wire under cable and bind it on the tag end.

C. Bend the wire down on cable in such a manner that the tag can easily be seen.

3. Tag Placement

Only one tag per cable shall be installed in a given manhole. After repairs are completed, tags are to be returned to their original location.

Cable tags shall be located as outlined below.

A. Tagging Cables in Manholes

Tags shall be attached within two feet of the west or north side of the cable joint nearest the manhole entrance.

The attached tag shall face toward the manhole entrance.

Tags attached to cables in racks shall be staggered.

B. Tagging in Network Vaults

Tags shall be attached within two feet of the duct entrance and face toward the vault entrance.

C. Tagging on Terminal Poles

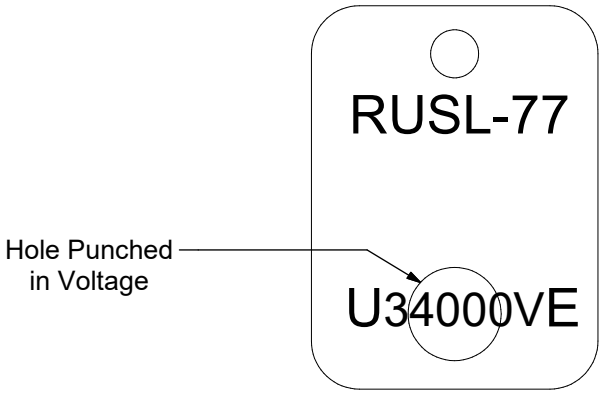
See DCS **59 40 00 40** for tags used on terminal poles.

D. Tagging Customer Owned Cables

Tags shall be placed on all customer owned cables. If the customer's cables are on terminal poles or attached to overhead facilities, a yellow "Customer Owned" tag (Stock #16 01 159) should be attached (with binding wire) near the end of each cable. If the Customer Owned cables enter a padmount transformer, switchgear, or pedestal, etc. they should be marked with either the tag described above, or a wire tie (Stock #40 59 268) imprinted with "Customer Owned Cable". Each cable should be tagged. Customer owned cables inside meter enclosures should be marked with wire ties, Stock #40 59 268. See DCS **59 52 00 41** for additional information about customer owned cables and parallel cables.

4. Tagging Cables Cut Dead

Cables cut dead are to be identified by a 3/4" hole punched in the cable tag circuit voltage as shown below. Do not punched out circuit name, cable number, or circuit number.

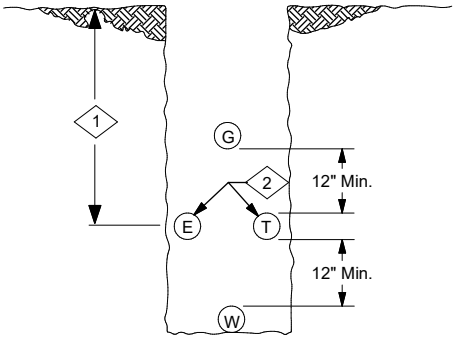


Method to Identify Dead Cables

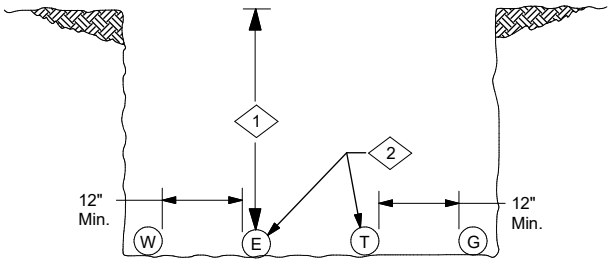
REV	DATE	ENG	DESCRIPTION
5	07/31/21	EJB	Converted to new format
4	08/04/11	HLH	

1. Joint Trench Separation Requirements (NESC, 2017 Edition, Rules 320B and 353)
These minimum separations apply to direct buried cables and cables installed in conduit.

VERTICAL SEPARATION



HORIZONTAL SEPARATION



LEGEND

E - ELECTRIC
G - GAS
T - TELEPHONE
W - WATER

DESIGN NOTES:

1. Burial depth per DCS **59 40 00 10**.

2. This dimension may be reduced to 6 inches minimum in Missouri providing all parties are in agreement to this reduction. (NESC, 2017 Edition, Rule 320B2 Exception)

2. Swimming Pool Separation Requirements (NESC, 2017 Edition, Rule 351 C1 and C2)

A. Direct buried supply cables should not be installed within 5 feet of a swimming pool or its auxiliary equipment. If 5 feet is not attainable, see B. below.

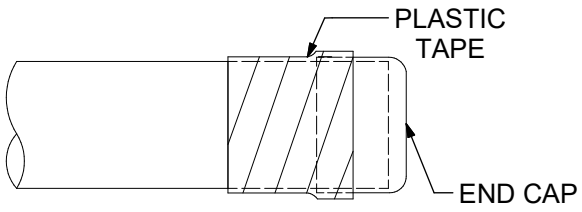
B. Supply cables installed in conduit have no clearance requirement. Burying under a swimming pool, even in conduit, should be avoided.

ATTENTION: ALL CABLES MUST BE SEALED.

INSTRUCTIONS

Sealing with End Caps

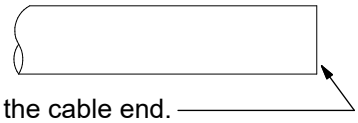
This method is for service, non-jacketed and jacketed cable.



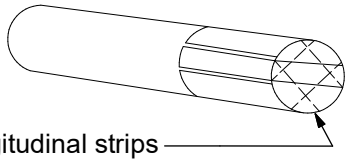
1. Choose the proper end cap for the cable being sealed.
2. Square cut the cable end.
3. Insert the cable into the end cap.
4. Secure the end cap with plastic tape (Stock #25 53 055). Note: The heat shrinkable end cap requires no taping. Just shrink cap using an appropriate torch.

Sealing Without End Caps

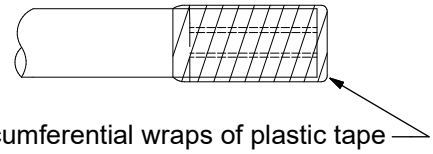
This method is to be used when end caps are not available.



1. Square cut the cable end.



2. Apply longitudinal strips of plastic tape. (Stock #25 53 055)



3. Apply circumferential wraps of plastic tape over the longitudinally applied tape.

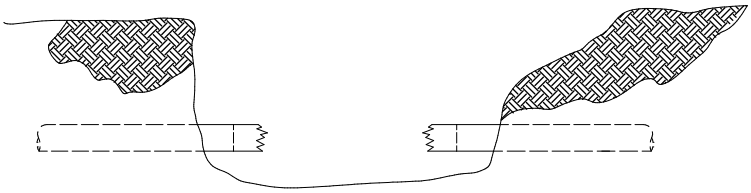
Cable End Caps						
STOCK NO.	**COLOR**	**I.D. (INCHES)**	**600 VOLT CABLE SIZE**	**5 kV NON-SHIELDED CABLE**	**15 kV JACKETED CABLE**	**35 kV EPR JACKETED**
40 59 144	RED	.437	1/0			
40 59 145	YELLOW	.562	3/0 4/0			
40 59 146	ORANGE	.813	350	1/0		
40 59 171	MAROON	1.00			#2 AL.	
40 59 166	BLACK	1.125	500 NW 750		350 Reduced Dia.	
40 59 194	BROWN	1.37	750 NW		4/0	
40 59 172	BLUE	1.50		750	350	1/0
40 59 193	BLACK	1.625			500	
40 59 173	GREEN	1.75			750	350
12 05 041	BLACK - HEATSHRINKABLE	4.5			1000	750

REV	DATE	ENG	DESCRIPTION
2	07/31/21	EJB	Converted to New Format
1	02/10/05	HLH	

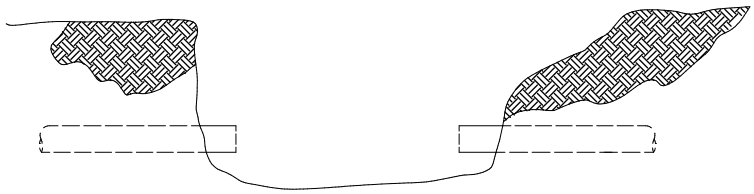
This standard provides for joining, sealing, placing, and repair of plastic conduit.

The conduits and fittings used shall be in accordance with Ameren Specification and the conduit standards referenced therein. The male ends of all conduit shall be beveled on the inside ½" wide from the edge. Pieces that are field cut shall be cut straight and beveled on the inside edge. This will provide a smooth internal transition between pieces avoiding damage to the cable. All plastic conduit and fittings to be joined should be exposed to the same temperature conditions for an hour prior to joining.

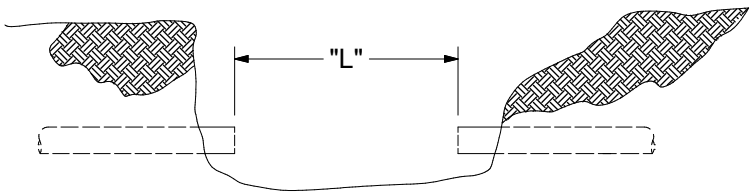
INSTRUCTIONS



1. Expose conduit and clear debris, cleaning surfaces to be joined and eliminating cracked or defective parts of conduit.

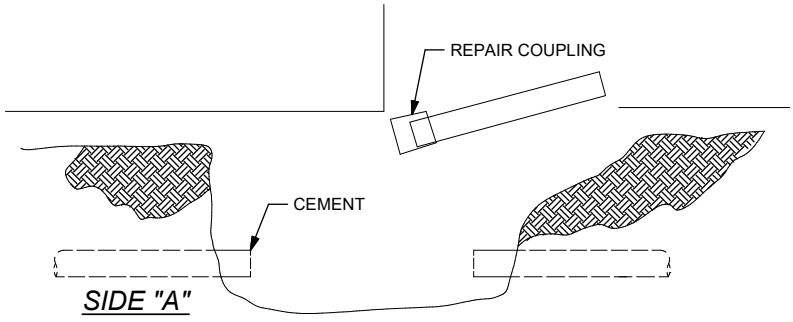


2. Square cut edges, making sure that male ends have an inside beveled edge.



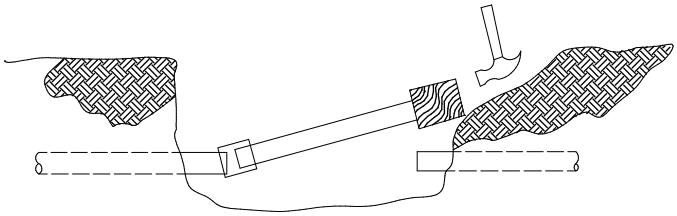
3. Measure and cut repair piece 1/2" shorter than "L" (see table). Clean all edges to be fitted

Minimum Length of Repair Conduit	
Diameter (in)	**L (in)**
2	15
3	20
4	25
5	30

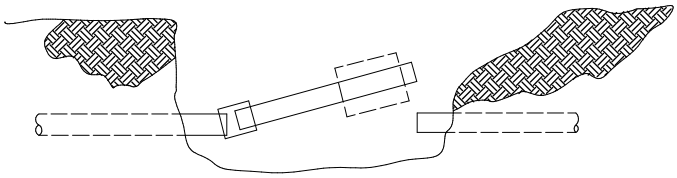


4. Apply a liberal amount of cement, coating the entire length of the socket, and install coupling on repair length and apply cement to side "A". Slip the conduit into the socket with a firm twist until bottom is felt, holding the joint motionless for 15 seconds longer when the weather is very cold. Do not drive or twist a complete joint. Full curing takes one hour.

REV	DATE	ENG	DESCRIPTION
5	07/31/21	EJB	Converted to new format
4	05/23/11	DDG	



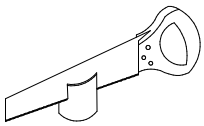
5. Use hammer block to drive repair piece into place.



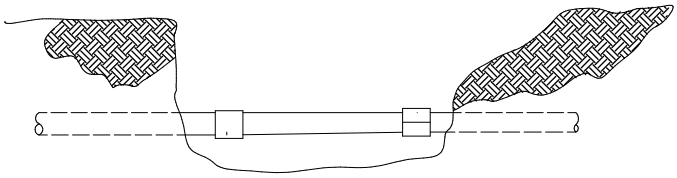
6. Slide repair sleeve on conduit past joint.

OR

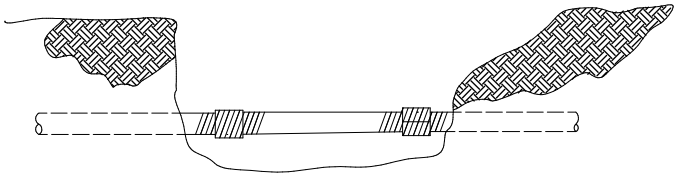
OR



Split repair coupling in half.



7. Apply cement to joint and slide repair sleeve OR both halves of split repair coupling over joint.



8. Completely seal repair sleeve or coupling with 1-1/2" wide plastic tape.

9. Allow cement to set, then carefully backfill from the center of the ditch toward the ends or from one tie in point to the other.

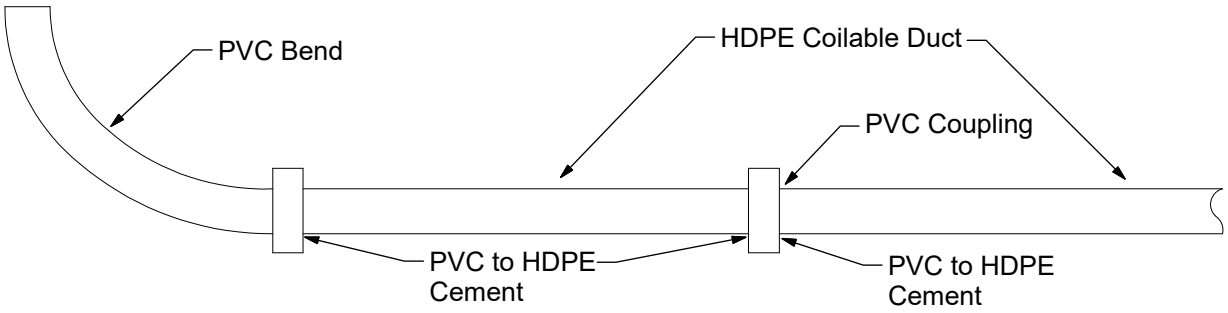
CONSTRUCTION NOTE(s):

1. Close tolerances shall be adhered to in the cutting and fitting.
2. Fresh good solvent or cement shall be used.
3. Continuity of sizes shall be maintained between manholes, etc., where conduits end. Necessary changes in size due to adaptation to existing systems shall use approved fittings and methods.

4. Proper support and transportation must be used to insure good materials, avoiding unnecessary movement or transportation during curing.
5. Precautions shall be taken to allow extra length where the conduit is at higher temperature than the earth or the reverse, extra room, if the conduit is colder than the earth.
6. Free ends of the conduit must be sealed when any work delay occurs. All completed ducts shall be wired and sealed.
7. No center stop in repair sleeve.

Stock Numbers for Schedule 40 Couplings and Repair Sleeves		
Size (in)	**Schedule 40 Couplings**	**Repair Sleeves** 7
1	12 51 237	-
1-1/4	12 51 280	-
1-1/2	12 51 278	-
2	12 51 181	12 51 287
2-1/2	12 51 265	12 51 288
3	12 51 158	12 51 289
4	12 51 157	12 51 290
5	12 51 156	12 51 291

1. Joining Using Epoxy Cement



INSTRUCTIONS:

The stocked epoxy cement will effectively bond HDPE coilable duct to PVC bends and couplings if the following instructions are properly observed:

A. Cut the HDPE coilable duct to the desired length at a 90 - degree angle. A straight cut will maximize adhesion.

B. For coilable duct over 3 inches, taper the end at a 45 - degree angle using a knife.

C. Clean the coilable duct and the coupling or bend thoroughly to remove dirt and grime.

D. Using the abrasive cloth provided with the bonding kit, sand the outside of the coilable duct from the end to 1/2 in. beyond the depth of insertion into the coupling or bend. Using the same cloth, thoroughly sand the inside of the coupling or bell end of the bend. Be sure that all of the polish is removed.

E. Clean the adhesion surfaces again to remove loose material or water.

F. To avoid waste of the epoxy cement clean as many coilable duct ends, couplings, and bends as possible before opening the adhesive cartridge.

G. Place the epoxy cement cartridge into the dispensing tool and snap it into place.

H. Twist the cap off of the epoxy cement cartridge.

I. Place the mixing nozzle onto the cartridge and lock into place by twisting clockwise. Depress the handle on the dispensing tool until the epoxy cement comes out of the nozzle tip. Pump one or two more times to assure that the mixture is even (no streaking). Discard this excess cement.

J. Place the epoxy cement in a 1/8 to 1/4 inch bead using a zigzag pattern the depth of the connector insert. The pattern should be about 1/2 inch in width and extend to the outer edge of the coilable duct. The end of the nozzle may be trimmed off up to the last notch to place a larger bead for larger diameter duct.

K. Twist the coupling immediately onto the coilable duct. It is important to twist the coupling to make sure that the epoxy cement is well mixed and spread evenly on the inside of the connection.

L. Smooth any excess epoxy cement. Use gloves to smooth out the cement.

M. Allow sufficient time for the epoxy cement to set:

Epoxy Set Time		
Temp	**Working Time**	**Set Time Before Movement**
35 Deg. F	40 Minutes	7 Hours
52 Deg. F	20 Minutes	3-1/2 hours
60 Deg. F	10 Minutes	1-1/2 Hours
70 Deg. F	6 Minutes	60 Minutes
88 Deg. F	4 Minutes	40 Minutes

N. To store cartridge for later reuse, remove the mixing nozzle and replace the cap on the cartridge. Discard used mixing nozzles.

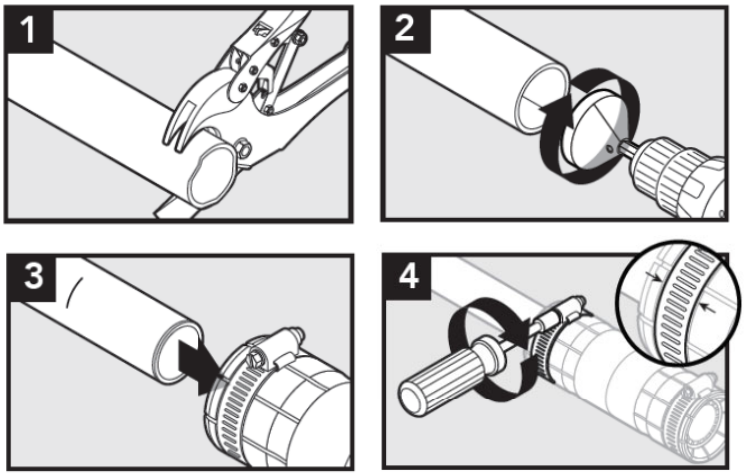
REV	DATE	ENG	DESCRIPTION
3	04/01/25	EJB	Added instructions for mechanical coupling
2	07/31/21	EJB	Converted to new format

O. The working temperature for the epoxy cement is 35 Deg. F to 95 Deg. F.

P. The following epoxy cement components are stocked by Ameren:

1. Starter Kit (Dispensing tool, 2 cartridges, and 10 nozzles) Stock #12 06 126
2. Case of 12 cartridges and 24 mixing nozzles Stock #12 06 127
3. Mixing Nozzles (each) Stock #12 06 128

2. Joining Using a Mechanical Coupling

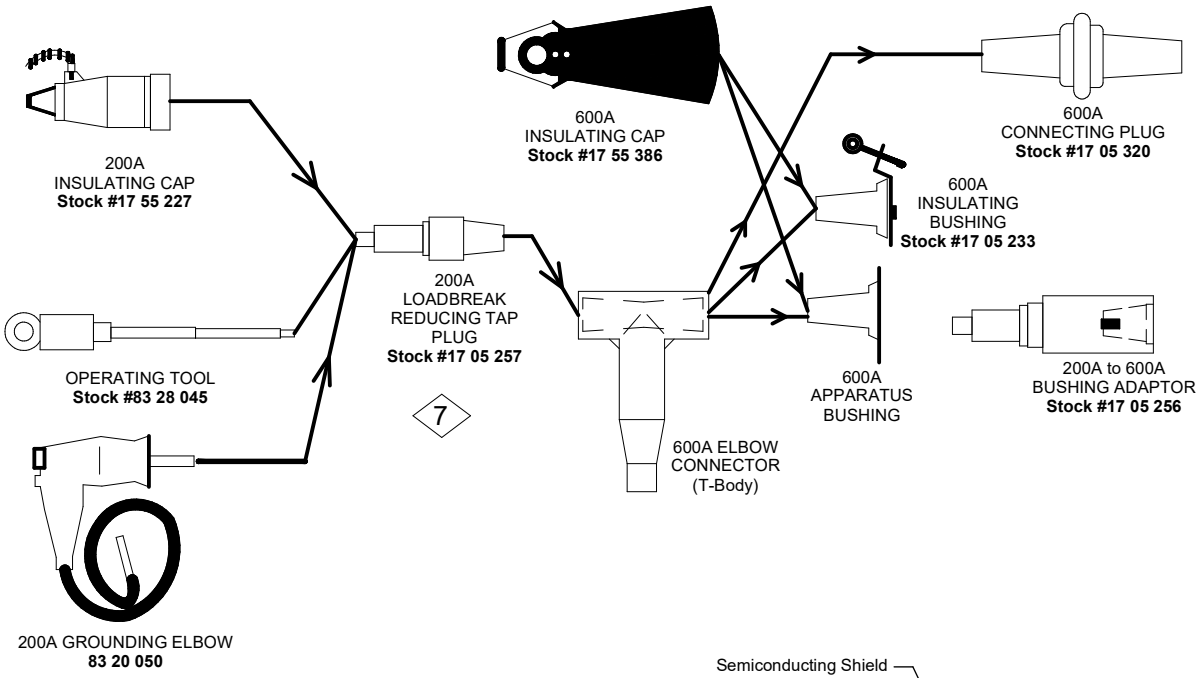


Coupling Stock #	Duct Size
12 01 351	2"
12 01 352	3"
12 01 353	4"
12 01 354	5"
100 011 429	6"

INSTRUCTIONS:

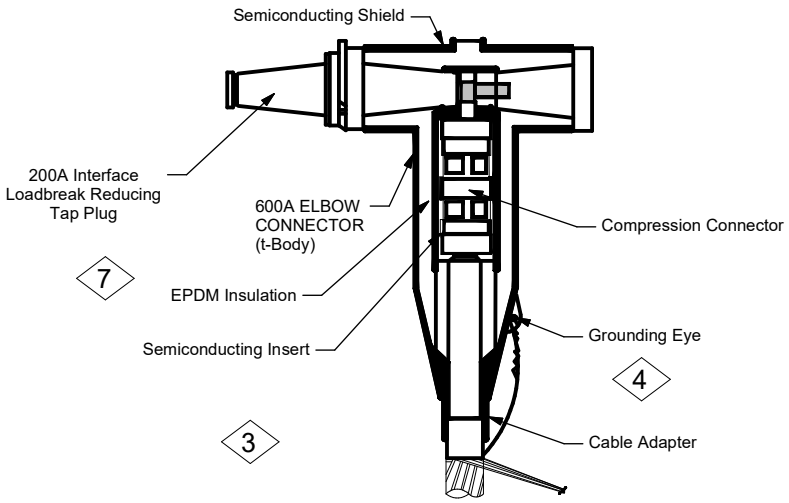
1. Cut the HDPE duct as squarely as possible.
2. Remove the sharp edges from the inside and outside of the cut edge with a file or a knife blade.
3. Insert the HDPE duct into the coupling until it reaches the interior stop.
4. Tighten the stainless-steel band clamp with a screwdriver or 5/16" nut driver.
5. Repeat steps 1-4 for the PVC conduit to be joined to the HDPE duct.

REV	DATE	ENG	DESCRIPTION
3	04/01/25	EJB	Added instructions for mechanical coupling
2	07/31/21	EJB	Converted to new format



T Wrench
(For Elbow Assembly)
Stock #85 41 370

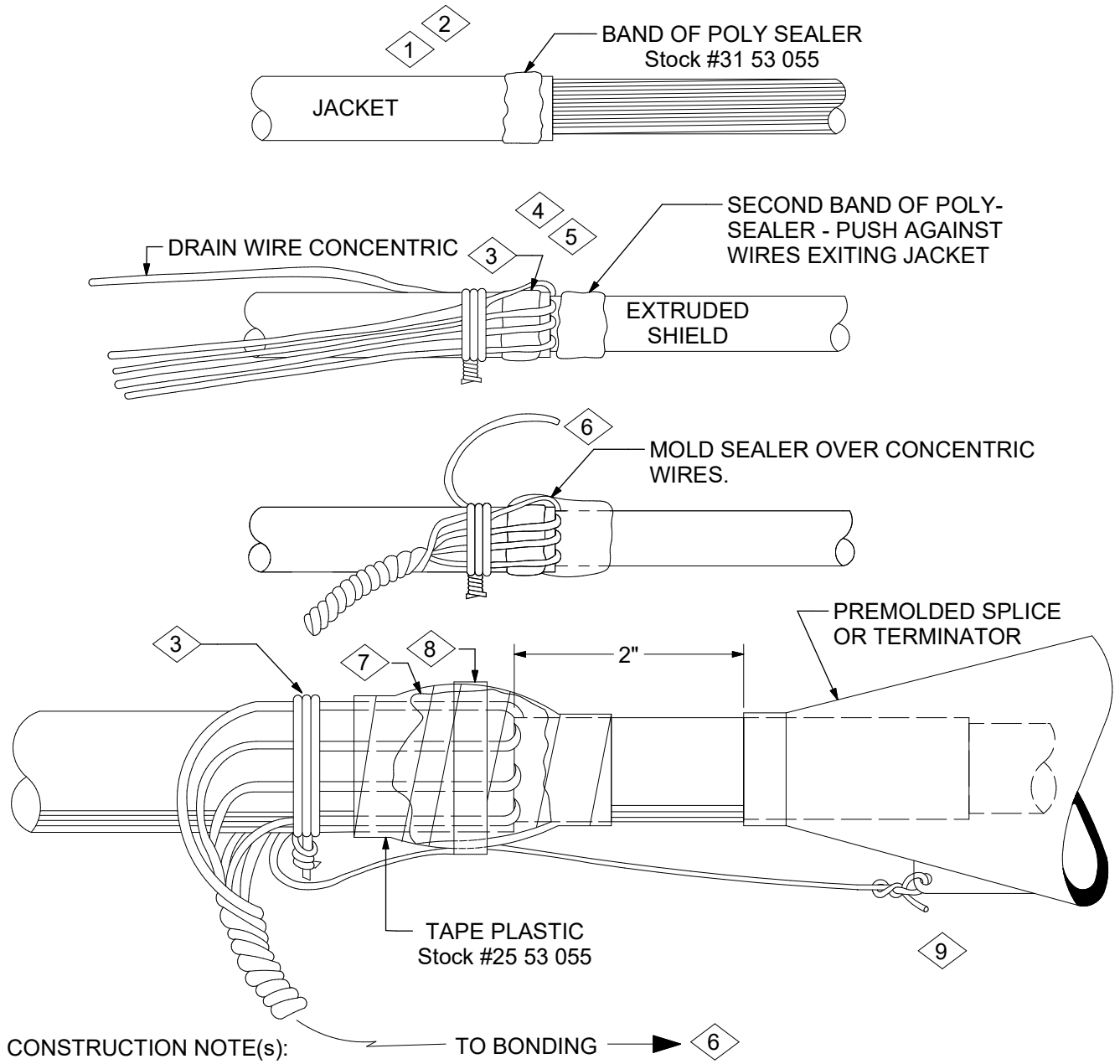
CAUTION: **600 Amp elbows are non-loadbreak elbows and can only be removed after the circuit is de-energized.**



Assembled T-Body

CONSTRUCTION NOTE(s):

1. Tools and hands shall be clean at all times to eliminate foreign particles in the elbow.
2. In cold weather, keep the elbow in your truck cab until you are ready to install it.
3. Install elbow per manufacturer's instructions and DCS **42 34 64 ****.
4. Connect one concentric neutral strand in the grounding eye and twist tight. Reform the strands as nearly as possible to their original position and bind at this point with a scrap piece of concentric neutral strand. Twist the strands to form a single conductor for ground connection.
5. The apparatus bushing must be clean and silicone grease applied before the elbow is connected.
6. Remove all marking tape.
7. Replacement needed only if existing loadbreak reducing tap plug is damaged. Note: A Cooper (RTE) Loadbreak Reducing Tap Plug (LBRTP) will only fit a Cooper (RTE) elbow and an Elastimold LBRTP will only fit an Elastimold elbow. Richards LBRTP is not replaceable.



CONSTRUCTION NOTE(s):

1. Remove jacket sufficiently long to allow concentric length for neutral connections.
2. Place a band of sealer putty just 1/2” to 3/4” wide sufficient to bury concentrics into.
3. Bend concentrics back and bury them in the putty. Bind concentrics into place with wire as shown.
4. Place a band of poly putty in front of the jacket on the extruded shield so that it seals against the concentric wires where they exit from under the jacket.
5. Mold against the jacket & over the concentric wires.
6. Leave one wire out of bunch. Twist the balance to form one stranded conductor to take to the neutral bond or connection.
7. Tape two layers of plastic tape stretched tightly over the molded putty seal.
8. Add a third layer of tape using less tension.
9. Take the bond wire to grounding eyelet of accessory and connect as shown.

REV	DATE	ENG	DESCRIPTION
2	07/01/21	EJB	Converted to new format
1	07/23/11	EJB	

INSTRUCTIONS

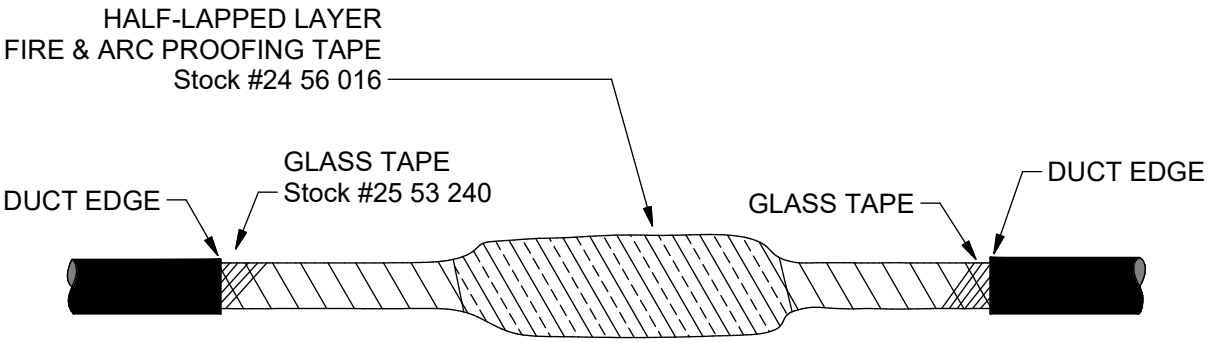
1. All cables in manholes and vaults, where personnel may be present, and the cables are operating at 2400 volts and above should be protected from fire and arcing. Note: Do not cover bond wires or bare neutral wires.

2. Apply fire and arc proofing tape to the cable with one half-lapped layer. The tape may be applied with either side toward the cable. The tape may be pulled tight to obtain a snug, wrinkle-free wrap, which conforms to the cable (and splice). Overlap the last six (6) inches of protected cable when starting a new roll of tape.

3. Since fire and arc proofing tape may not be adhesive coated, it must be held in place after wrapping with glass tape. Secure the ends with several wraps of glass tape. (See Figure)

4. Fire and arc proofing tape shall be applied from duct edge to duct edge.

5. Triplexed cables shall be treated as a single cable except at locations where it is un-layed for splicing and then protect each leg and splice individually.

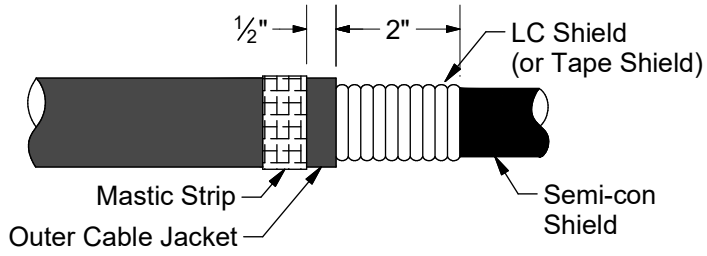


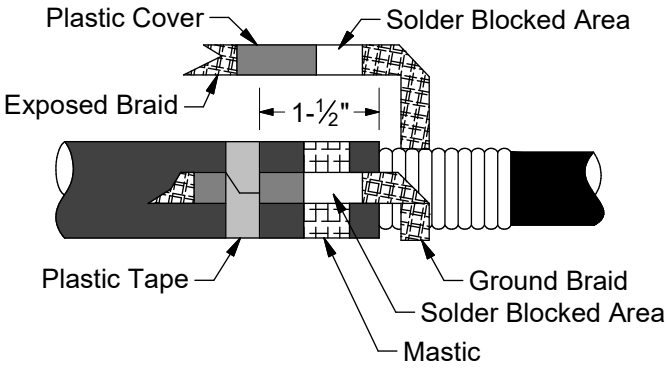
CABLE & SPLICE COVERED

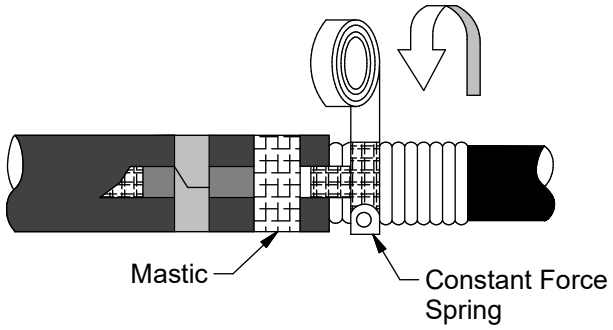
REV	DATE	ENG	DESCRIPTION
2	07/01/21	EJB	Converted to new format
1	01/17/14	HLH	

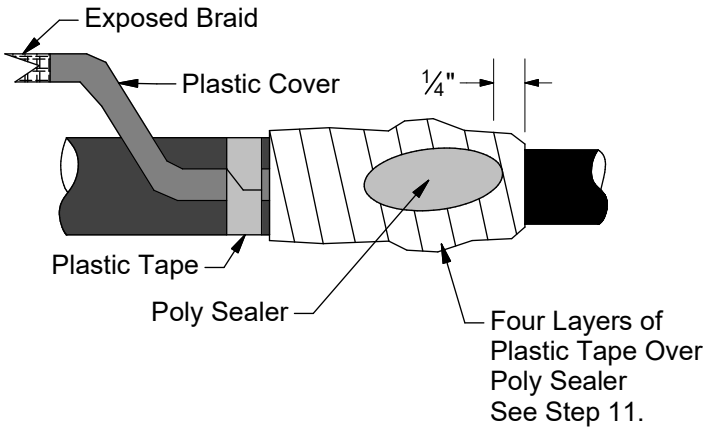
The constant force spring connector can be used on either LC shielded or tape shielded cables.

INSTRUCTIONS









1. Strip jacket and semi-con shield to dimensions required.
2. Select one of three mastic strips from the grounding kit (Stock #17 54 306). Remove liners and wrap mastic around the cable jacket, 1/2" from the cut edge. Discard any excess mastic from this piece.
3. Position twin pre-formed ground braid with one tail along the cable jacket. The mastic must be within the solder blocked area.
4. Secure the braid to the cable jacket with plastic tape, 1-1/2" from the cut edge of the jacket.
5. Wrap the braid around the metallic shield and secure it in place with the constant force spring.
6. Wrap the spring in the same direction as the braid and cinch (tighten) the final lap.
7. Position the tail of the preformed ground braid along the cable jacket. The mastic must be within the solder blocked area.
8. Secure the braid to the cable jacket with plastic tape, 1-1/2" from the edge of the jacket.
9. Apply a second mastic strip layer over the braid tail. The second mastic strip should be positioned so that it overlays the previously installed mastic strip. Press the two mastic strips together to form a watertight seal.
10. To seal the connection, apply poly sealer (Stock #31 53 055) over the metallic shield, the constant force spring, and the mastic strips. Start sealing approximately 1/4" beyond the end of the metallic shield.
11. Tape over the poly sealer with two layers of plastic tape (Stock #25 53 055) stretched very tightly. Add two more layers of plastic tape, half lapped, to complete the water seal.
12. Attach the two exposed braid tails to a #2 Cu. bond wire (Stock #18 54 027) with a two-bolt connector (Stock #17 54 145). If an accessory drain wire is needed, include a #14 Cu. binding wire (Stock #18 52 018) in the two-bolt connection. Seal the two-bolt connector using poly sealer and plastic tape.

REV	DATE	ENG	DESCRIPTION
5	07/31/21	EJB	Converted to new format.
4	10/17/08	HLH	

INSTRUCTIONS

1. Jacket Removal

Remove the jacket by scoring with a sharp knife. This jacket is only 50 mils thick − (0.05 inches). A deep circumferential cut could go thru the jacket and then thru the copper shield tape, which is only .005 inches thick. A slanted blade cut or a perpendicular score will both do a good job for the long score, but the circumferential score is more tricky.

2. Removal of the Copper Shield Tape

Two wraps of 3/4 inch plastic tape (Stock #25 53 055) shall be used to mark the cut off dimension for the copper shield tape. The tape should be positioned on the keeper side of the cut off dimension so that it can be left in place to hold the shield tapes. Using the triangular file (Stock #85 19 036) to score the shield tape insures that no deep cut will be made into or thru the extruded shield. A file score mark on the extruded shield does not injure the cable. Removal of the copper tape by scoring leaves no sharp burrs or disfigured shield points to worry about. Since the tape is only 5 mils thick, not much of a file score is necessary. A deeper score will be needed where the shield tapes overlap, or the knife blade can be used as a ruler edge to tear the tape against at the overlay points. The plastic guide tape is left in place to secure the shield tape.

3. SemiCon Shield Removal

Removal of the semicon shield should be done with the banana peelerscoring tool (Stock #85 32 090). Using the banana peeler to score the semicon is the most controllable method to accomplish this task.

4. Repairs

Any score which digs into the insulation must be sanded out using sanding cloth (Stock #22 05 213). A score in the insulation resulting from the circumferential scoring should be filled with silicone grease since it would be nearly impossible to sand out next to the semicon shield.

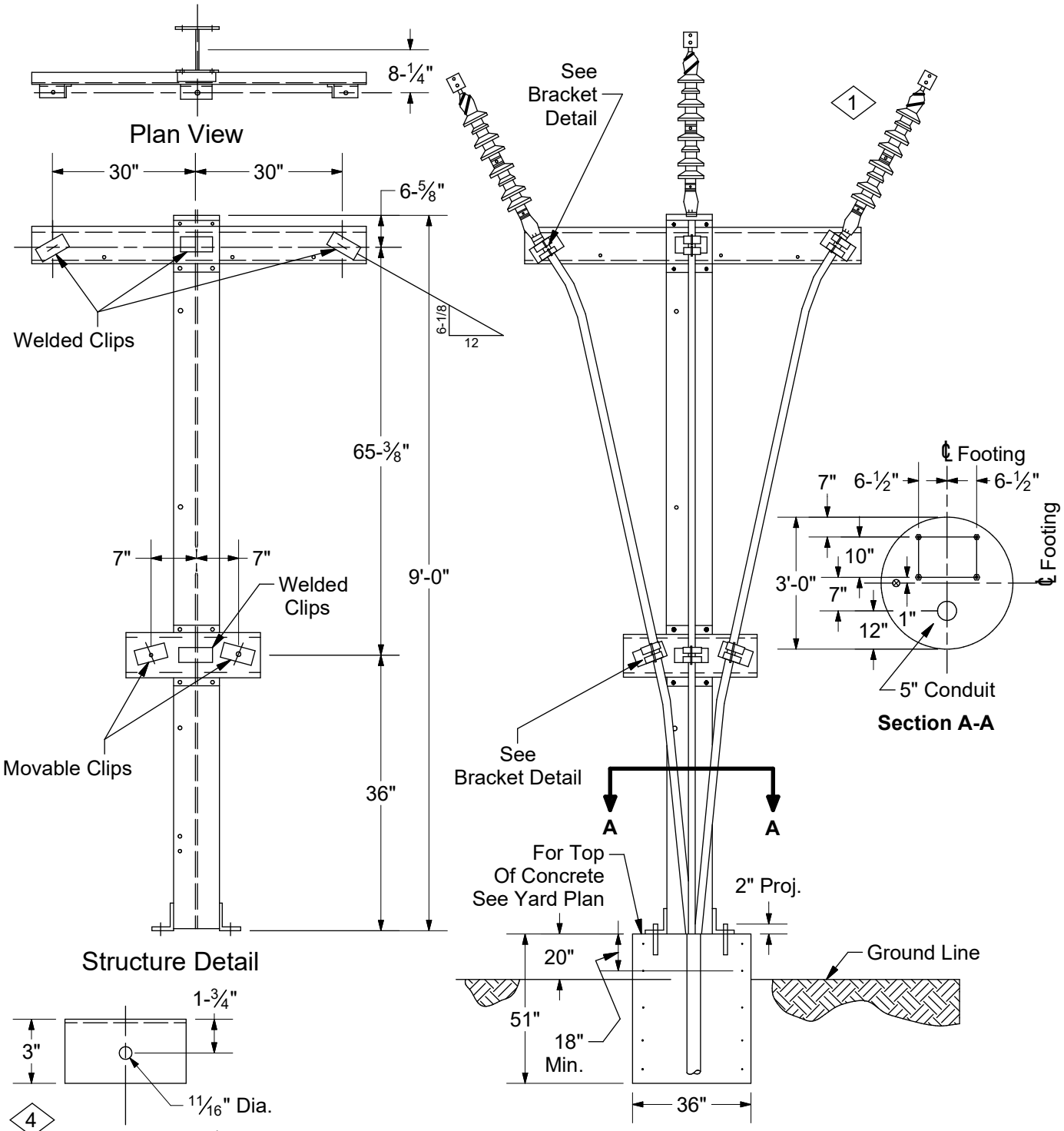
5. Insulation Removal

Insulation stripping for the lug or sleeve is left to the splicers discretion and preference. An insulation stripping tool is available from stock. Ripley Co. Utility Tool WS-50 (Stock #83 36 031), or Speed Systems 1542-2AS (Stock #83 32 051).

UNDERGROUND INSTRUCTIONS

Terminations & Cable Training at Substation

59 42 44 10
35kV
1 of 1

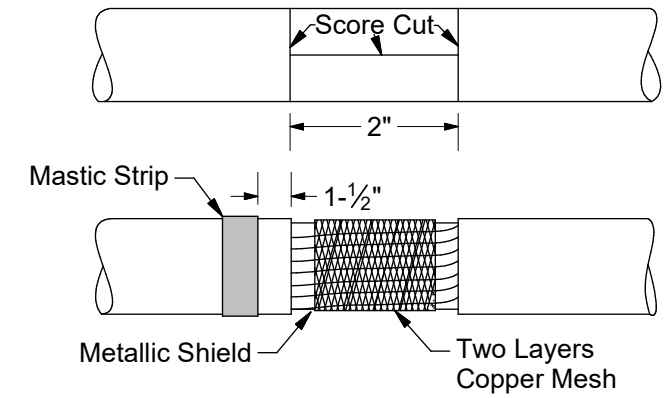


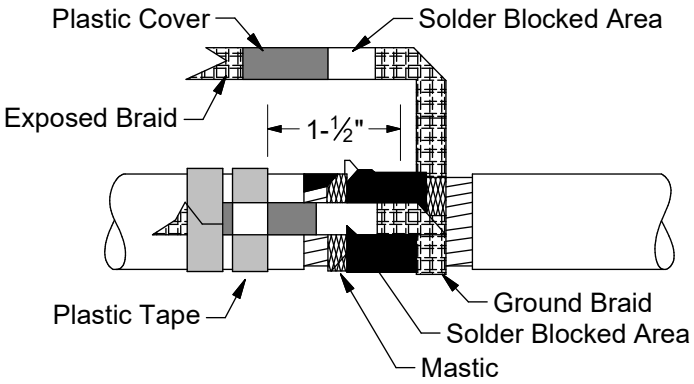
CONSTRUCTION NOTE(s):

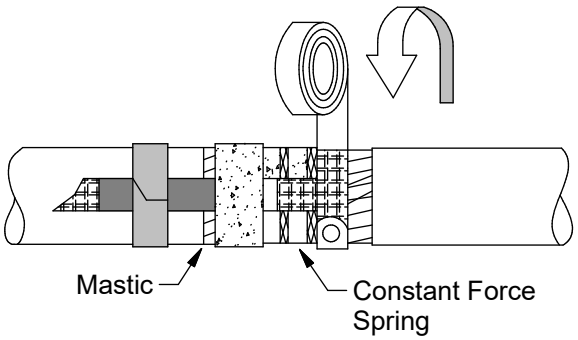
1. Install terminations per DCS **42 44 12 ****.
2. Attach ground leads to the structure.
3. Use support brackets (Stock #23 67 197) for positioning the cables.
4. Clips similar to Stock #23 06 052, may be required when replacing potheads with terminations.

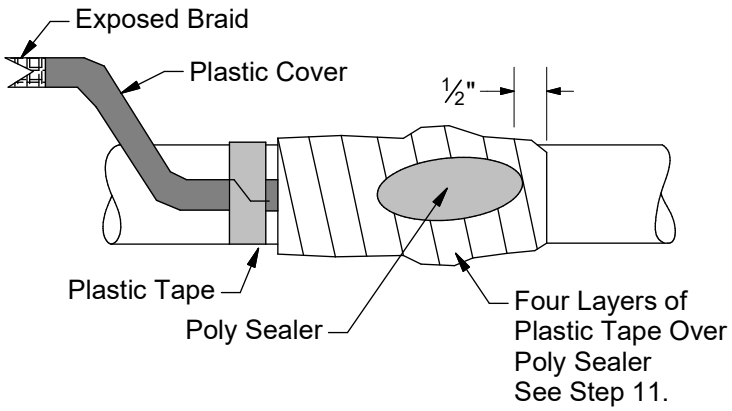
DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
3	07/31/21	EJB	Converted to new format
2	08/08/08	HLH	









1. Score jacket carefully as shown. Do not cut through concentrics, which are #18 AWG wires. Remove the jacket by prying and lifting along score. Cut.
2. Wrap two layers of half lapped copper mesh (Stock #18 66 101) over concentric wires as shown.
3. Select one of three mastic strips from the grounding kit (Stock #17 54 306). Remove liners and wrap mastic around cable 1/2" from the cut edge. Discard any excess mastic from this piece.
4. Position twin pre-formed ground braid with one tail along the cable. The mastic must be within the solder blocked area.
5. Secure the braid to the cable with plastic tape, 1-1/2" from the cut edge of the copper mesh.
6. Wrap the braid around the copper mesh and secure it in place with the constant force spring.
7. Wrap the spring in the same direction as the braid and cinch (tighten) the final lap.
8. Position the tail of the preformed ground braid along the cable. The mastic must be within the solder blocked area.
9. Secure the braid to the cable with plastic tape, 1-1/2" from the cut edge.
10. Apply a second mastic strip layer over the braid tail. The second mastic strip should be positioned so that it overlays the previously installed mastic strip. Press the two mastic strips together to form a watertight seal.
11. Seal the connection by applying poly sealer (Stock #31 53 055). Start sealing approximately 1/2" beyond the cut edge and extend the seal to the plastic tape.
12. Tape over the poly sealer with two layers of plastic tape (Stock #25 53 055) stretched very tightly. Add two more layers of plastic tape, half lapped, to complete the water seal.
13. Attach the two exposed braid tails to a #2 Cu. bond wire (Stock #18 54 027) with a two bolt connector (Stock #17 54 145).
14. Seal the two-bolt connector using poly sealer and plastic tape.

REV	DATE	ENG	DESCRIPTION
2	07/01/21	EJB	Converted to new format
1	01/30/12	HLH	

This instruction provides a method for labeling cables, transformers or switch locations supplied by primary cable loops associated with underground distribution. This labeling is used to identify a particular switch, cable, padmount junction or padmount transformer for operating purposes.

The labeling method described here is used primarily in the former UE service areas. Labeling methods, different from those described here, are used by the other legacy companies. This instruction should not be interpreted as a requirement for the other legacy companies to change their current labeling methods.

1. The engineer responsible for the job's one line drawing shall show on the one line (or plat if there is no one line) the lateral name, and at each transformer or switching location, a location (or pad) number and an X and Y terminal of the primary cables.

   Lateral naming shall be in accordance with the Operating Procedures followed by the reporting center located by district or division.

   In the St. Louis area, the transformer or switch location (pad) number assignment will also be obtained from the Distribution Operating Department where these numbers are assigned and recorded. In other divisions or districts it will probably be convenient to use the transformer number for a location number. (All numbers must be different.)

   Where cables loop up into a transformer or switch, the ends shall be marked with X and Y tags. One end of each cable shall be tagged with an X and the other end tagged with a Y in such a manner that when tracing along the path of the cable in one direction, the near ends of each cable segment will be tagged X and far ends Y. Each transformer or switch location will have a Y end of one cable segment and an X end of the next segment.

   The X and Y designation will have nothing to do with the normal direction of supply or the normally open switch. They are to designate which of the two switches or connections at a location are being referenced. The X and Y are not to be considered part of the lateral/loop name.

   The lateral should be marked according **DCS 59 40 00 40.**

   Pad mounted switching and/or fusing compartments, usually associated with three phase supply, shall also be numbered for identification purposes. Cables in the switching and/or fusing compartments are to be tagged similar to terminal poles.

2. Construction Personnel will label each cable end and transformer location in accordance with the one line drawing or construction plat. The foreman or crew leader, after checking that the marking is in accord with the one line, will sign it and return it to the office for posting in the usual manner.

   Pad mounted transformers will be numbered as shown on the one line by applying pressure sensitive numbers. These numbers shall be located on the outside of the transformers facing in the direction of most likely access so that they can be seen from the street or from as far away as possible by the troublemen. A duplicate set of numbers shall be located on the inside of the door in such a position that they can be readily seen by anyone operating the high voltage switch or disconnect.

Vault mounted transformers shall have the assigned numbers stamped in brass or copper identification plates. The plates shall be affixed to the vault grates.

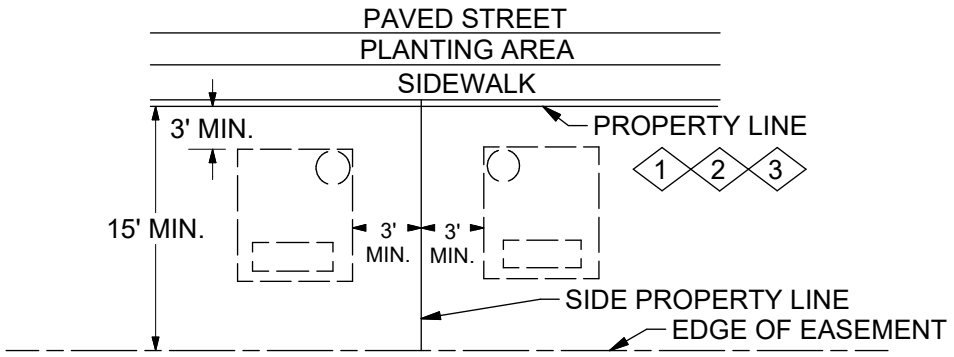
The cable ends will be marked X or Y as shown by the one line by applying a "tag - blue formica triangle - letter Y" (Stock #16 51 080) or "tag - orange formica square - letter X" (Stock #16 51 079), tied with a small copper wire to the cable at the end of the concentric neutral strands or just below the termination. To avoid confusion the cables should enter on the side of the pad from which they come and should not cross each other under the pad.

When a pad mounted transformer is replaced, the number should be removed from the old transformer and the same number used for the new transformer using new pressure sensitive high visibility numbers. In the case of a vault mounted transformer, the plate shall remain attached to the grate.

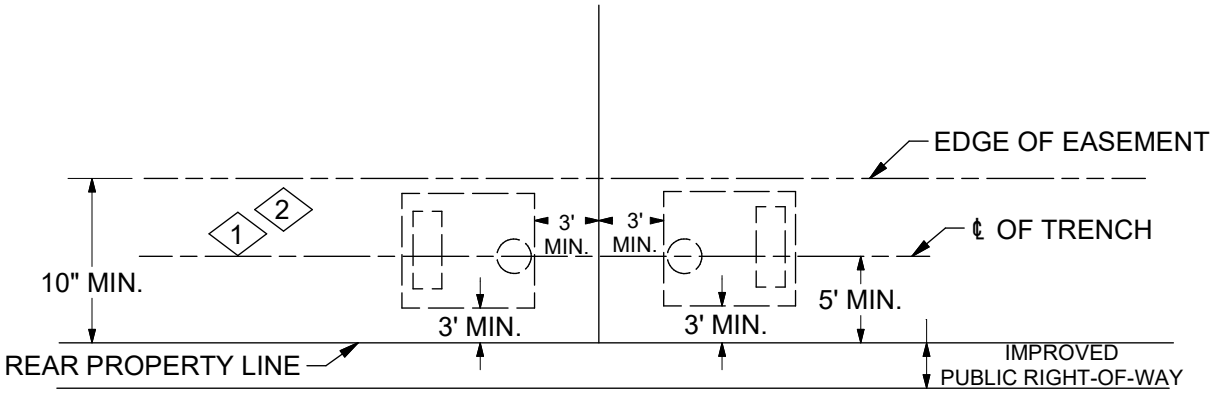
3. Construction personnel shall number each pad mounted switching or fusing compartment by applying pressure sensitive high visibility numbers. These numbers shall be located on the outside of the compartment facing in the direction of most likely access.

   The cable ends shall be marked with a phase identification in each pad mounted switchgear, three phase transformer, and terminal pole with more than one phase. This will be done by applying a "tag - round formica, green A" (Stock #16 01 122), "tag - round formica, black B" (Stock #16 01 123), or "tag - round formica, red C" (Stock #16 01 124) tied with a small copper wire to the cable just below the cable termination.

   All other information, such as circuit names, shall be stenciled on the inside of the compartments.



Front Lot Line Distribution 6



Rear Lot Line Distribution 6

CONSTRUCTION NOTE(s):

1. Location of transformer pad or above grade pedestal should be within area indicated. Straddling side property line is acceptable for the front lot line distribution.

2. 10 feet minimum clearance is required in front (door side) of transformer. 3 feet minimum clearance is required for the other three sides.

3. In front lot line distribution, one option is to locate transformer pad so the door of the transformer faces to the rear of the property as shown in the drawing. Another option is to locate the transformer pad so the door opens parallel to the street with the primary on the street side and the secondary on the house side to minimize the overlapping of primary, secondary, and service conduits.

4. When transformer is located adjacent to a driveway, it should, when possible, clear the driveway by at least 5 feet.

5. See **DCS 34 21 05 **** for pad site preparation.

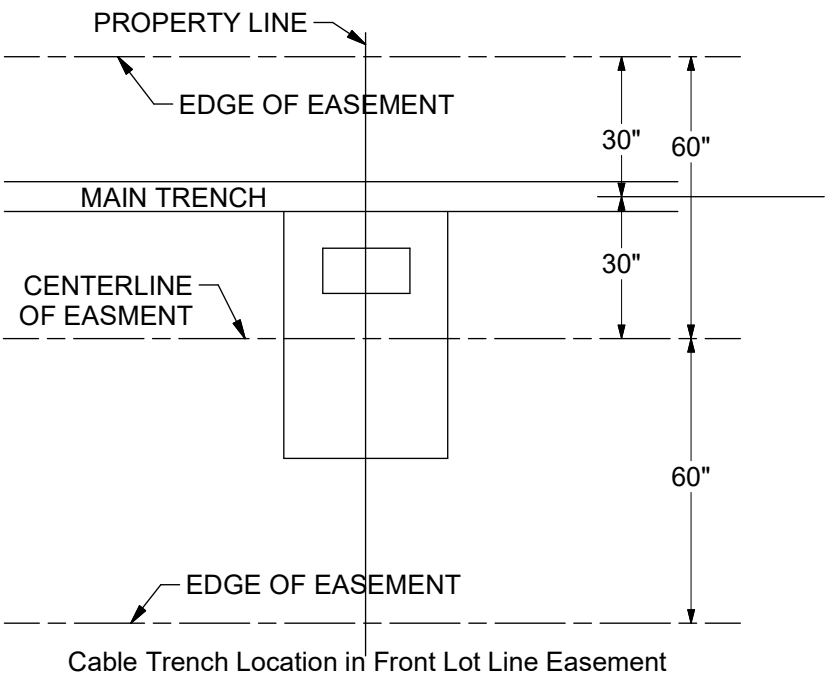
DESIGN NOTE(s):

6. Front lot line distribution is standard for all new construction. Where local ordinances require rear lot line distribution, unobstructed improved truck access via public rightofway adjacent to Ameren easement is required.

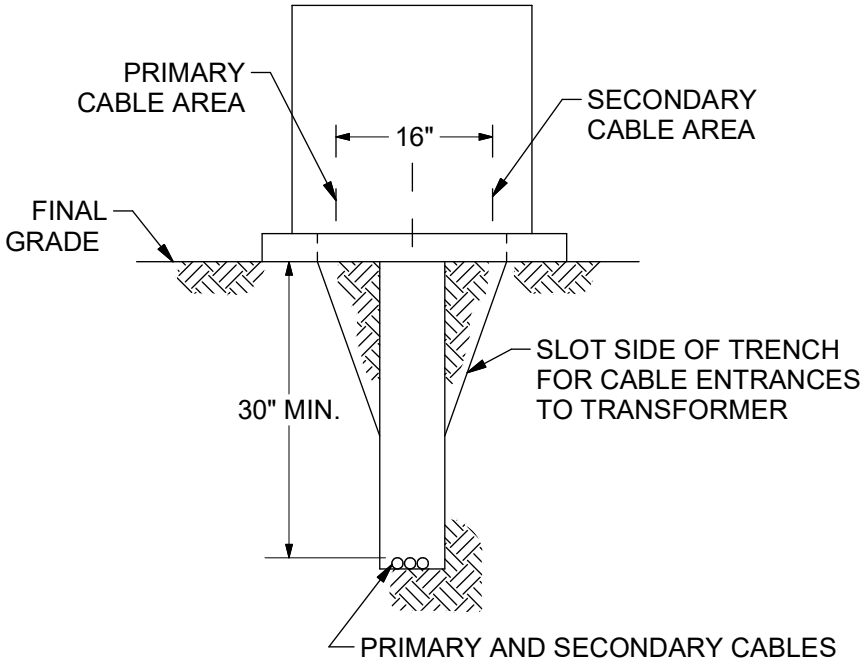
7. In multifamily developments, transformers should be located within 15 feet of a paved surface intended for vehicular traffic. Transformers should be oriented to maintain 10 feet minimum of clear working room on the front (door-side) and 3 feet minimum on the other three sides.

REV	DATE	ENG	DESCRIPTION
2	07/31/21	EJB	Converted to new format
1	08/17/11	DG	

ILLINOIS ONLY



Cable Trench Location in Front Lot Line Easement



High-Profile Transformer

CONSTRUCTION NOTE(s):

1. Bottom of trench shall be free from rocks or debris. Backfill shall be dirt, free from stones, broken glass, cans, or other debris that might damage the cables.

2. The backfill must be tamped at pedestal locations. See **DCS 34 21 05 **** for transformer pad site preparation.

REV	DATE	ENG	DESCRIPTION
2	07/31/21	EJB	Converted to new format
1	08/02/11	DG	

ILLINOIS ONLY

Many three-phase pad mount transformers installed in legacy CIPS Districts are equipped with dry-well current-limiting fuses. Three-phase Commercial Subsurface Transformers (CST) installed in some legacy IP Districts are also equipped with dry-well current-limiting fuses.

The instructions provided in this DCS are for de-energizing and re-energizing dry-well fusaed pad mounted transformers. The replacment fuse parts shown in the drawings are also for dry-well fuses in pad mounted transformers.

CST transformers are equipped with three-phase loadbreak switches that interlock with the fuse holders to prevent the removal or insertion of the current-limiting fuses unless the switch is in the open position. The replacment fuse parts for CST transformers are similar but different in that they are modified for submersible enviroments to prevent water ingress into the transformer. If such replacement parts are needed, contact Distribution Standards.

The current-limiting fuses listed at the end of this DCS can be used in either type of transformer.

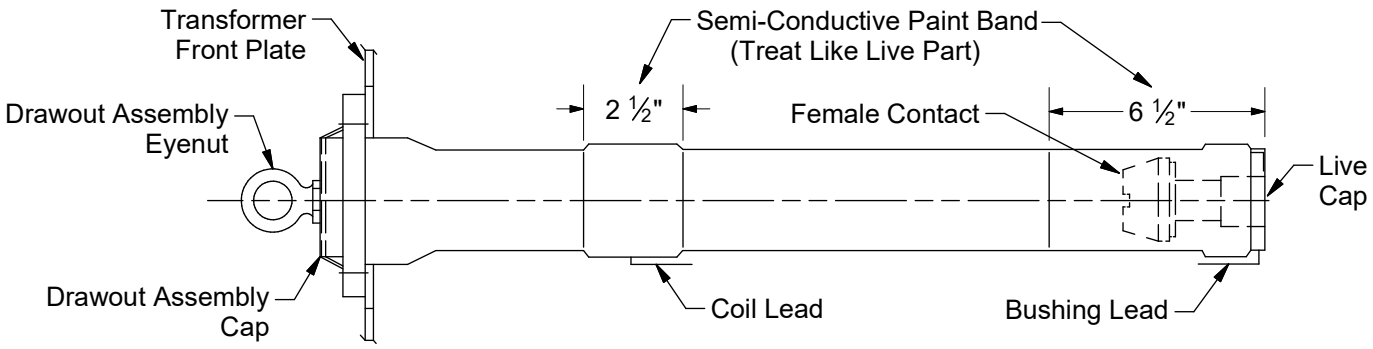


Figure 1 - Loadbreak Dry Well Fuseholder Housing

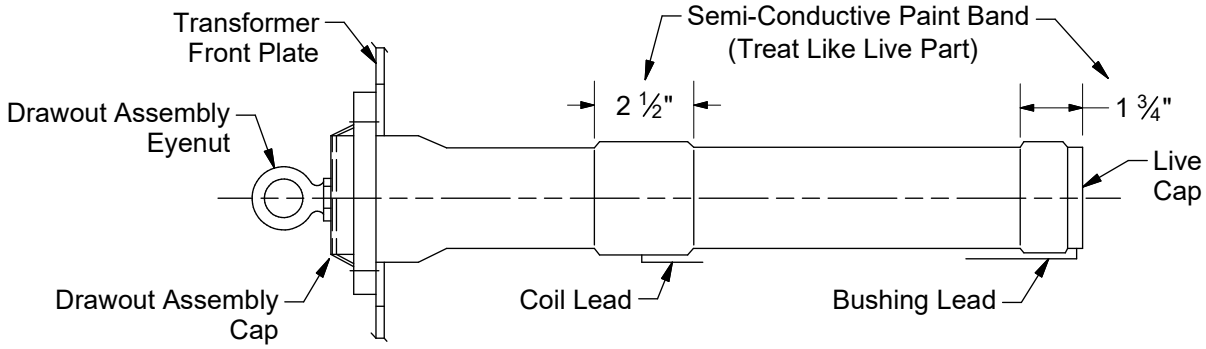


Figure 2 - Non-Loadbreak Dry Well Fuseholder Housing

REV	DATE	ENG	DESCRIPTION
3	07/31/21	EJB	Converted to new format
2	02/14/12	DG	

ILLINOIS ONLY

INSTRUCTIONS - TO DE-ENERGIZE

CAUTION: Only Loadbreak Fuseholders And Loadbreak Fuse Assemblies Can Be Operated While Energized.

1. Attach live-line tool to the drawout assembly eyenut.

2. Rapidly withdraw the drawout assembly from fuse holder housing.

3. Removal of the drawout assemblies will de-engergize the transformer. However, the primary elbows are still energized and the remaining transformers are energized (if in a loop).

NOTE 1: Three-phase transformers, 500 kVA and below, are equipped with three loadbreak fuseholders and assemblies. Three-phase transformers, 750 kVA and above, are equipped with three loadbreak fuseholders and assemblies in parallel with three non-loadbreak fuseholders and assemblies.

NOTE 2: When loadbreak fuseholders are connected in parallel with non-loadbreak fuseholders, the transformers will be designed so that the non-loadbreak fuseholders cannot be accessed without first removing the drawout assemblies from the loadbreak fuseholders. The design will also prevent the drawout assemblies from non-loadbreak fuseholders from being inserted after the drawout assemblies for the loadbreak fuseholders have been inserted.

INSTRUCTIONS - TO RE-ENERGIZE

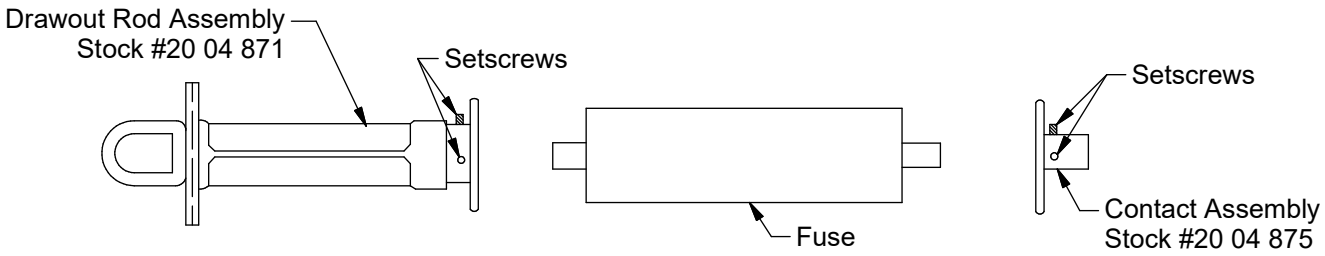
1. Attach live-line tool to the drawout assembly eyenut.

2. Insert the drawout assembly into the fuseholder housing. The end of the drawout rod should be positioned just inside the fuseholder housing.

3. Rapidly push the drawout assembly into the fuseholder housing until the drawout assembly cap seats under the spring clips.

INSTRUCTIONS - FUSE REPLACEMENT

Three different fuse assembly styles are in use. The styles are loadbreak, non-loadbreak (Figure 3), Loadbreak (Figure 4), and parallel loadbreak (Figure 5). Fuses listed can be used with all the fuse assembly styles.



A. Disassemble by loosening the setscrews.

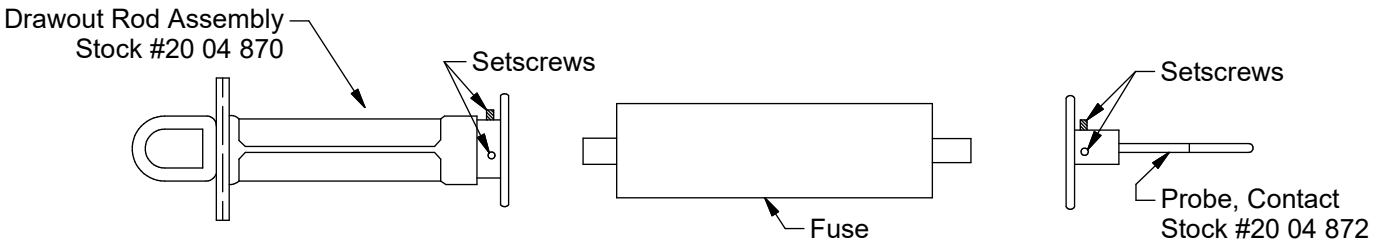
B. Replace the blown fuse with a new fuse of the same rating.

C. Reassemble with the parts oriented as shownabove.

D. Securely tighten the set screws.

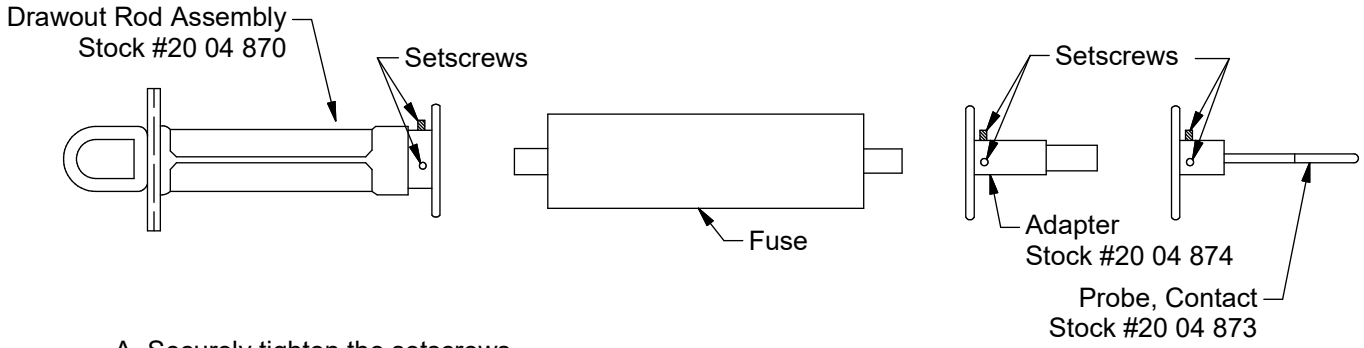
Figure 3 - Non-Loadbreak Fuse Assembly

ILLINOIS ONLY



A. Disassemble by loosening the setscrews.
B. Replace the blown fuse with a new fuse of the same rating.
C. Reassemble with the parts oriented as shown above.

Figure 4 - Loadbreak Fuse Assembly



A. Securely tighten the setscrews.
B. Disassemble by loosening the setscrews in the drawout rod assembly and the adapter.
C. Replace the blown fuse with a new fuse of the same rating.
D. Reassemble with the parts oriented as shown above.
E. Securely tighten all setscrews.

Figure 5 - Parallel Loadbreak Fuse Assembly

REV	DATE	ENG	DESCRIPTION
3	07/31/21	EJB	Converted to new format
2	02/14/12	DG	

ILLINOIS ONLY

FUSE TABLE

TRANSFORMER SIZE (kVA)	4160 VOLTS		12470 VOLTS		
	FUSE RATING (Amp) ◇4	AMEREN STOCK # (4.3 kV) ◇1	FUSE RATING (Amp) ◇4	AMEREN STOCK # (8.3 kV) ◇2	AMEREN STOCK # (15.5 kV) ◇3
75	18C	20 04 370	8C	20 04 382	-
150	35C	20 04 372	12C	20 04 384	20 04 646
225	50C	20 04 374	18C	20 04 386	20 04 647
300	75C	20 04 376	25C	20 04 388	20 04 648
500	100C	20 04 378	40C	20 04 391	20 04 663
750	2-75C ◇5	20 04 376	2-25C ◇5	20 04 388	20 04 648
1000	2-100C ◇5	20 04 378	2-40C ◇5	20 04 391	20 04 663

DESIGN NOTE(s):

◇1. 4.3 kV rated fuses are clip style fuses, 10 inches long from tip-to-tip, and fit in code 4 fuse mountings or canisters. These fuses are not to be used on systems above 4.16 kV.

◇2. 8.3 kV rated fuses are clip style fuses, 10 inches long from tip-to-tip, and fit in code 4 fuse mountings or canisters. These fuses are used in 2.47 kV transformers and switchgear with dry-well fusing (see note 3 for exceptions). These fuses are also to be used in dual rated (4.16 X 12.47 kV) dry-well fused transformers when operated at 12.47 kV. Note: Although not used by Ameren, 8.3 kV rated fuses larger than 40C Amps require code 5 fuse mountings or canisters.

◇3. Some 12.47 kV dry-well fused transformers purchased by legacy company Illinois Power were purchased with 15.5 kV dry-wells. The 15.5 kV rated fuses are required for these transformers. They are clip style fuses, 14.4 inches long from tip-to-tip, and fit in code 5 fuse mountings or canisters.

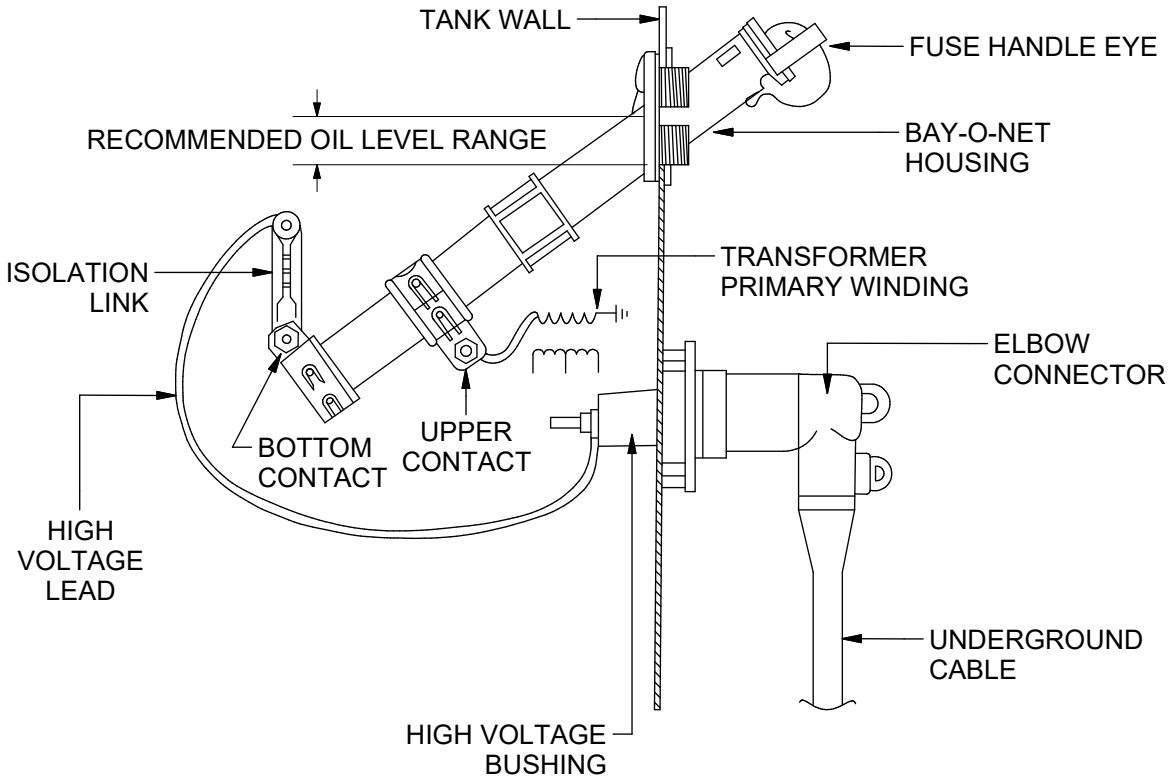
◇4. Fault current interrupting capability of these fuses is 50,000 Amps symmetrical.

◇5. Two fuses in parallel.

REV	DATE	ENG	DESCRIPTION
3	07/31/21	EJB	Converted to new format
2	02/14/12	DG	

Bay-O-Net fuses can be used to turn transformers off or on with primary load current 150 Amps or less up to 15kV and 50 Amps or less up to 35kV. This DCS provides instructions on the de-energizing and re-energizing of padmount transformers equipped with Bay-O-Net fuses. Fuse link replacement instructions are also provided.

CAUTION: Bay-O-Net fuses MUST be latched at all times when the transformer is unattended.



Line Illustration Of Bay-O-Net Assembly With Internal Isolation Link

INSTRUCTIONS - BEFORE OPERATING THE BAY-O-NET FUSE

1. Carefully assess the condition of the transformer. Check for any audible sounds of arcing occurring inside the tank. Check for bulging of the tank or any signs of oil leakage or spillage. Check the tank in the proximity of the pressure relief device for any signs of oil leakage, spillage, or for black carbon smudges. If any of these conditions are present, do not attempt to switch the transformer on or off with the Bay-O-Net fuse.

2. Inspect the area around the unit to make sure the ground is level and the footing is sound.

INSTRUCTIONS - TO DE-ENERGIZE

1. Release transformer tank pressure.
   A. Pull pressure relief valve open for 30 seconds or until pressurized air can no longer be heard evacuating audibly through the valve.
   B. Close pressure relief valve and wait 30 seconds.
   C. Pull pressure relief valve open again and keep it open until audible pressure (air flow) stops and hold it open for an additional 5 seconds.

NOTE: If the transformer does not have a pressure relief valve, loosen the 1/2” oil fill plug to relieve any built-up tank pressure.

2. Standing to one side of the transformer, attach live-line line tool to fuse handle eye and lift the handle to unlock the Bay-O-Net.

3. Push down and rotate the handle 90 degrees to release additional pressure and to break the adhesion between the seal gasket and the Bay-O-Net housing.

4. Pull the Bay-O-Net fuse holder out rapidly in one motion 6 to 8 inches to interrupt the transformer load. Wait several seconds for oil to drain into tank.

CAUTION: If any arcing is noticed or rumbling is heard, the fuse should be immediately slammed back into the transformer and latched. De-energize the transformer at a remote location before proceeding with fuse removal.

5. Remove fuse holder from the Bay-O-Net housing. If a drop guard is present, rest the Bay-O-Net holder on the drop guard for 30 seconds to 1 minute to minimize the potential of oil spillage onto the rubber terminations. Remove the Bay-O-Net and wipe off remaining oil.

6. The transformer is now de-energized. However, the primary elbows are still energized and the remaining transformers (if in a loop) are energized

NOTE: On 3 phase transformers, there will be three Bay-O-Nets and the same procedure must be followed for each one.

INSTRUCTIONS - TO RE-ENERGIZE

1. Check the oil level in the transformer. It should be approximately at the base of the protruding plastic threads of the Bay-O-Net housing at 25°C (77°F) with the transformer on a level surface.

2. Pull pressure relief valve, keeping it held open until audible pressure evacuation stops and then hold open for another 5 seconds.

3. Attach the live-line tool to the fuse handle eye of the Bay-O-Net.

4. Place the Bay-O-Net into the housing until it is about 5 inches from the closed position.This will prevent any damage to the contacts due to arcing.

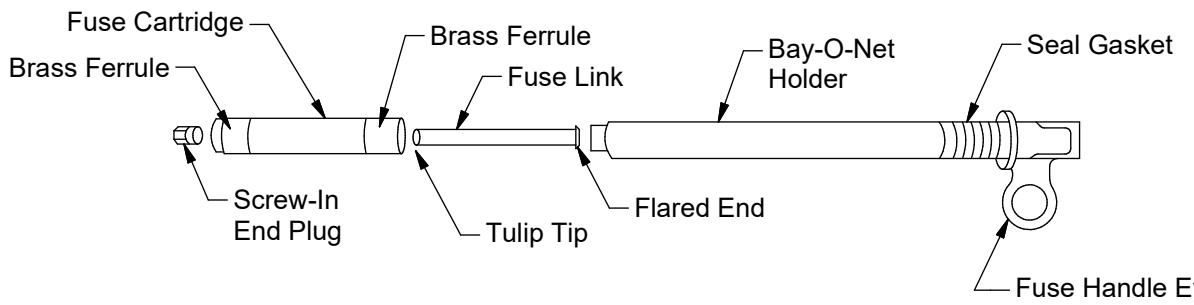
5. Turn away from the transformer and slam the Bay-O-Net home.

6. When the Bay-O-net is inserted as far as possible, push down and rotate the locking handle hooking it over the shoulder of the housing. When the handle is in the locked position, check to make sure the cover washer is seated against the shoulder of the housing.

7. The transformer is now energized.

CAUTION: If the fuse blows upon re-energizing the transformer, find and correct the cause of the failure before attempting to re-energize the transformer again.

INSTRUCTIONS - FUSE LINK REPLACEMENT



1. Unscrew and remove the fuse cartridge from the fuse holder.
2. Remove the plug from the end of the fuse cartridge.

REV	DATE	ENG	DESCRIPTION
6	07/31/21	EJB	Converted to new format
5	01/17/17	DG	

3. Straighten the spread leaves of the tulip tip and push the fuse link out of the fuse cartridge.

4. Inspect the cartridge bore to make sure it is clean; then replace the fuse link with a new fuse link of the same size and rating. The new fuse link may be inserted from either end of the fuse cartridge (at times, a slight resistance may occur).

5. Be sure the contact flare end is secured in place between the fuse cartridge and the Bay-O-Net. Tighten the fuse cartridge against the Bay-O-Net. Do not overtighten. Hand tight is sufficient.

6. Spread the tulip tip of the fuse link and place the end plug on the end of the fuse cartridge. Tighten the end plug. Do not use wrench on brass ferrules of the cartridge. A wrench can be used on the end plug.

7. Remove the end plug and ensure the leaves of the tulip tip have spread uniformly. Failure to do so can cause malfunction.

8. Replace the end plug.

Table 1 - FUSE LINKS FOR THREE−PHASE PADMOUNT TRANSFORMERS
(ALL FUSE LINKS ARE LOAD CURRENT AND TEMPERATURE SENSING)

	Ameren Stock #	Transformer (kVA)	Fuse Part Numbers	
			4160 Volts	12470 Volts & 13200 Volts
	20 53 109	75	358C10 (25A)	–
	20 53 110	150	358C12 (50A)	–
	20 53 121	300	358C14 (65A)	–
	20 53 119	75	–	358C05 (8A)
	20 53 108	150	–	358C08 (15A)
	20 53 109	300	–	358C10 (25A)
	20 53 110	500	–	358C12 (50A)
	20 53 121	750	–	358C14 (65A)
	20 53 121	1000	–	358C14 (65A)
1	20 53 238	1500	–	38361C04CB (100A)
1	20 53 239	2500	–	38361C05CB (125A)

Table 2 - FUSE LINKS FOR SINGLE−PHASE PADMOUNT TRANSFORMERS
(ALL FUSE LINKS ARE LOAD CURRENT AND TEMPERATURE SENSING)

	Ameren Stock #	Transformer (kVA)	Fuse Part Numbers	
			2400 Volts	7200 Volts, 7620 Volts & 7970 Volts
	20 53109	25	358C10 (25A)	–
	20 53 110	50	358C12 (50A)	–
	20 53 121	75	358C14 (65A)	–
	20 53 121	100	358C14 (65A)	–
1	20 53 120	167	358C18C (140A)	–
	20 53 119	25	–	358C05 (8A)
	20 53 108	50	–	358C08 (15A)
	20 53 109	75	–	358C10 (25A)
	20 53 109	100	–	358C10 (25A)
	20 53 110	167	–	358C12 (50A)
	20 53 121	250	–	358C14 (65A)

OPERATING NOTE:

1. This fuse comes pre-assembled as a unit with the fuse, the cartridge, and the end-plug. Replace the entire fuse and cartridge when the fuse operates.

REV	DATE	ENG	DESCRIPTION
6	07/31/21	EJB	Converted to new format
5	01/17/17	DG	

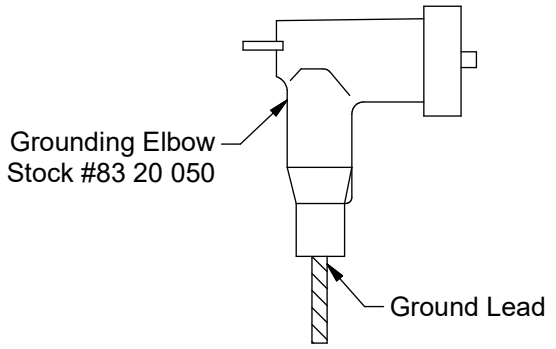


Figure 1

1. Connect lead on Grounding Elbow to Ground. IMPORTANT: DO NOT INSERT GROUNDING ELBOW INTO FEED-THRU BUSHING UNTIL CIRCUIT HAS BEEN TESTED ”DEAD”. Grounding elbow shown in Figure 1.

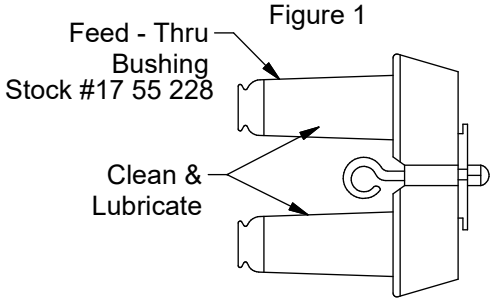


Figure 2

2. Remove protective covers from the feed-thru bushing. Clean and lubricate the surfaces of the feed-thru bushing with silicone grease. ALWAYS REPLACE PROTECTIVE COVERS WHEN THE FEED-THRU BUSHING IS NOT IN USE. Connect one #14 ground wire to grounding point of feed-thru bushing. Connect the other end of the wire to ground, leaving enough slack to operate with a shotgun tool. Feed-thru bushing shown in Figure 2.

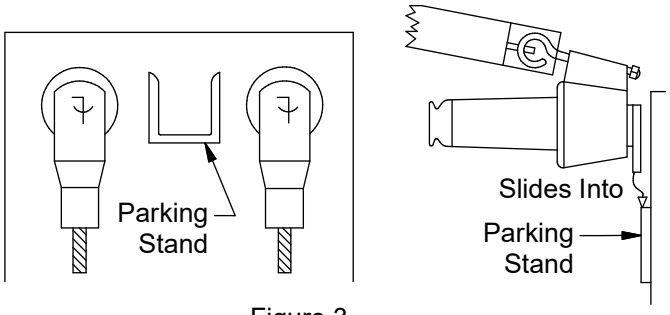


Figure 3

3. Attach the feed-thru bushing eye and crossbar firmly to shotgun tool. Slide the feed-thru bushing onto parking stand. Tighten down eye by rotating shotgun tool clockwise until snug. DO NOT OVERTIGHTEN. See Figure 3. NOTE: #14 ground wire not shown.

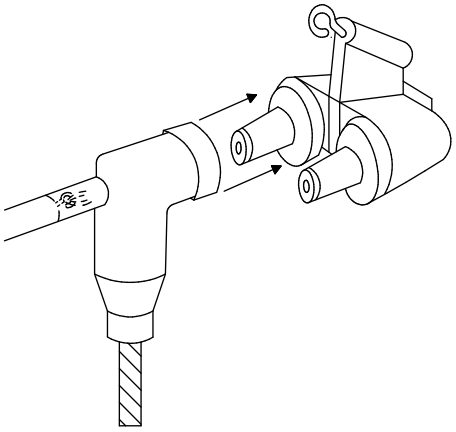


Figure 4

4. Remove the elbow from the equipment bushing following applicable loadbreak operating instructions. Insert the elbow into the nearest feed-thru plug and push until it is firmly in place and the internal locking ring is seated. See Figure 4.

REV	DATE	ENG	DESCRIPTION
2	07/01/21	EJB	Converted to new format
1	07/27/11	EJB	

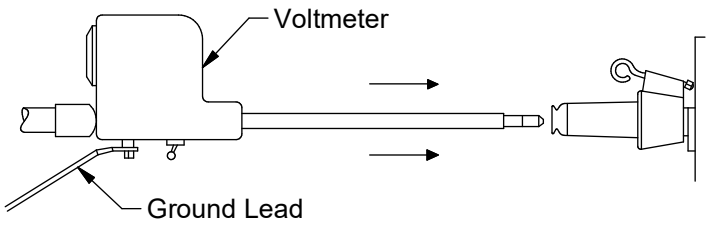


Figure 5

5. Attach voltmeter firmly to universal hot stick. Insert meter rod in second plug of feed-thru bushing. Check for voltage. CAUTION: Do not leave the meter attached to an energized line any longer than 1 minute. If attached longer, the instrument may overheat. See Figure 5. NOTE: Elbow not shown on the feed-thru bushing.

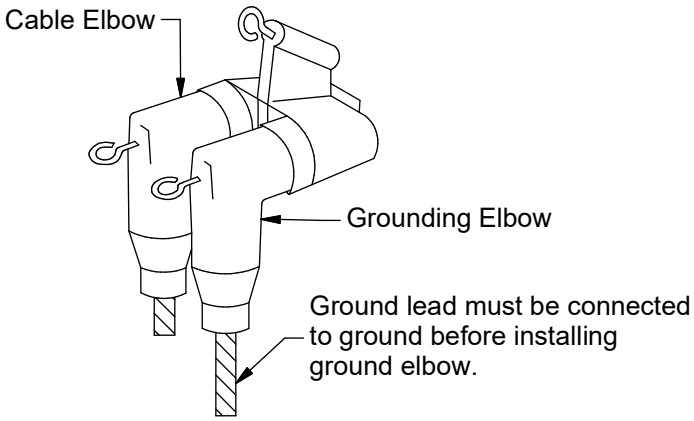


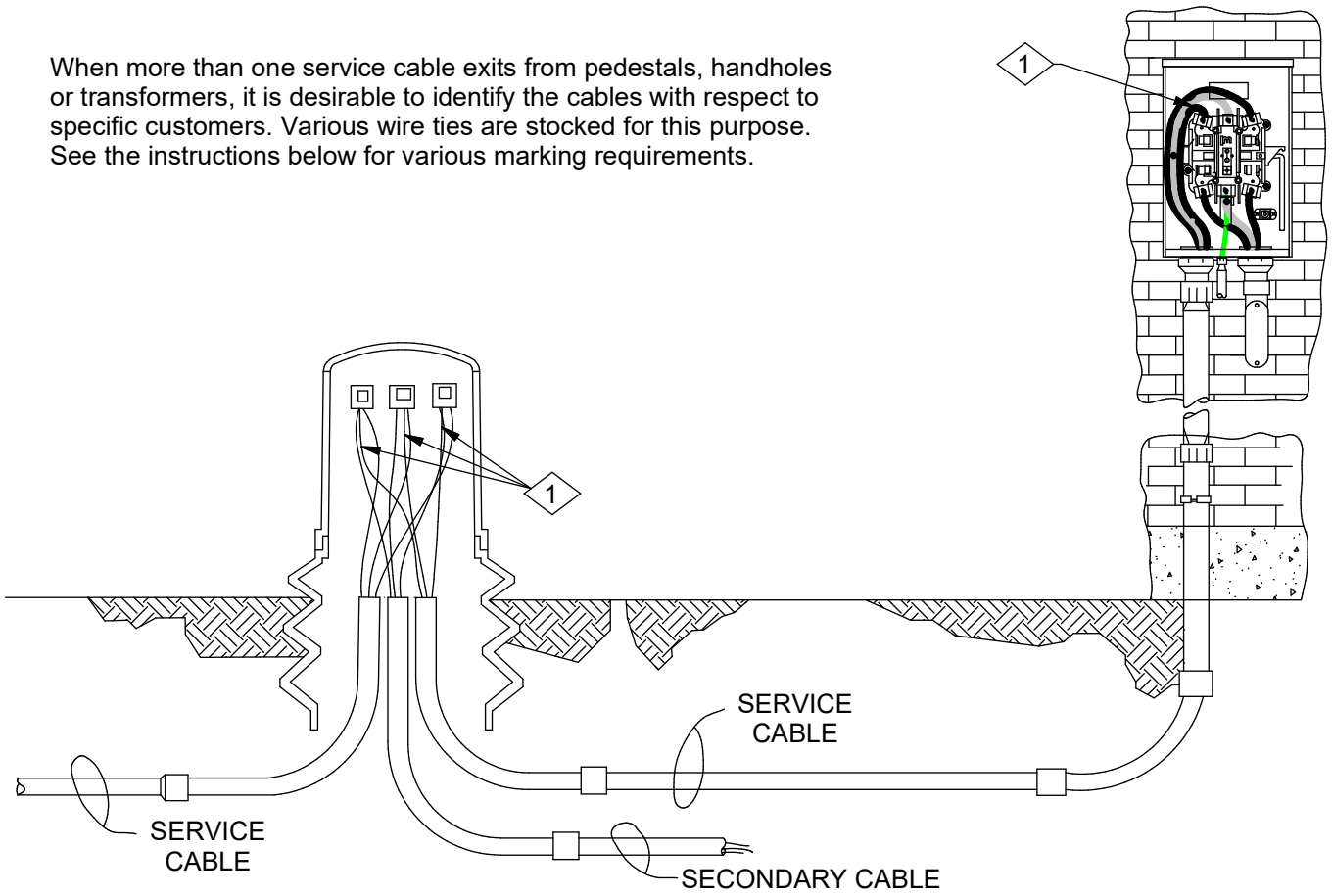
Figure 6

6. After circuit has been tested "Dead", remove test rod and using shotgun tool immediately insert the grounding elbow into the feed-thru bushing. See Figure 6.

REV	DATE	ENG	DESCRIPTION
2	07/01/21	EJB	Converted to new format
1	07/27/11	EJB	

MISSOURI ONLY

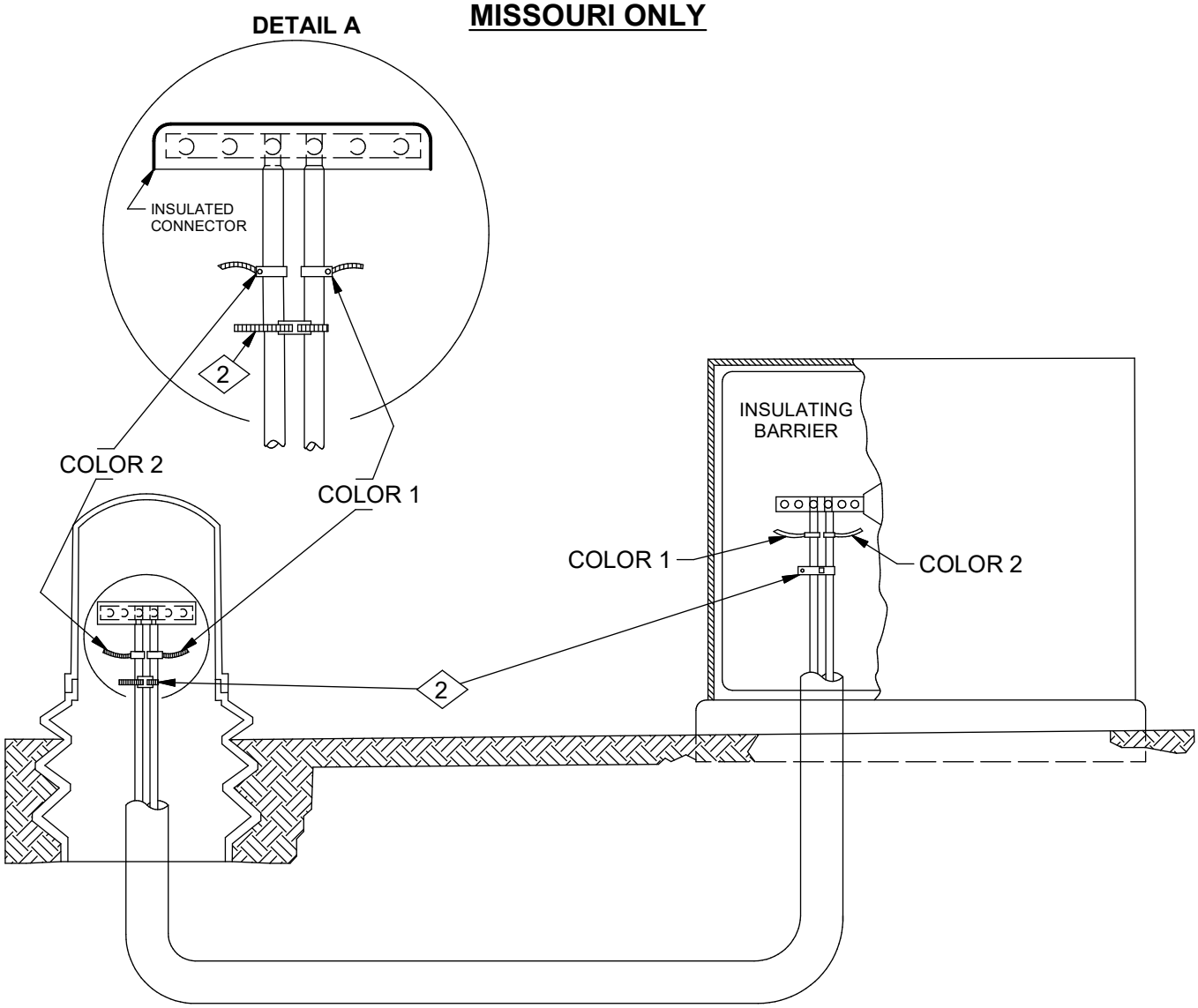
When more than one service cable exits from pedestals, handholes or transformers, it is desirable to identify the cables with respect to specific customers. Various wire ties are stocked for this purpose. See the instructions below for various marking requirements.



	Cable Identification Stock Numbers		
	ITEM	**STK / DCS #**	**DESCRIPTION**
1	A	40 59 135	Tie−Wire, Identification, Red Color
	B	40 59 138	Tie−Wire, Identification, Green Color
	C	40 59 139	Tie−Wire, Identification, Blue Color
	D	40 59 137	Tie−Wire, Identification, Yellow Color
	E	40 59 136	Tie−Wire, Identification, Orange Color
	F	40 59 140	Tie−Wire, Identification, Purple Color
	G	40 59 162	Tie−Wire, Identification, Brown Color
	H	40 59 163	Tie−Wire, Identification, Gray Color
2	I	40 59 191	Tie−Wire, Identification for Parallel Cables
	J	16 01 184	Tag − Parallel Cable
4	K	40 59 268	Tie − Wire, Identification, ”Customer Owned Cable”
	L	16 01 159	Tag − Customer Owned

REV	DATE	ENG	DESCRIPTION
4	07/31/21	EJB	Converted to new format
3	08/09/11	EJB	

MISSOURI ONLY



CONSTRUCTION NOTE(s):

1. With reference to the sketch, one identification tie of a particular color is installed on a conductor within the meter socket. At the supply end of the service cable, identification ties of the same color are installed on each of the three conductors. Thus, by using the different colored ties, as many as eight sets of service cables can be identified. Four ties of the same color required per service cable.

2. After identifying each cable with a different color tie, parallel cables are marked as a pair by using Stock #40 59 191 around both cables. A tag (Stock #16 01 184) engraved "Parallel Cable" may also be attached to the parallel cables. Parallel cables shall be marked on the plats.

3. Parallel cables fed from the overhead shall be tagged at the top of the conduit on the pole with a tag (Stock #16 01 184) engraved "Parallel Cable". These cables shall be marked on the plats.

4. If the cable is owned by the customer, attach a "Customer Owned Cable" wire tie (Stock #40 59 268) to each cable end and are in addition to any other ties required to identify the cables. A ”Customer Owned” tag may also be used (Stock #16 01 159). Customer owned cable should be marked on the plats.

REV	DATE	ENG	DESCRIPTION
4	07/31/21	EJB	Converted to new format
3	08/09/11	EJB	

This instruction covers the special procedures required for making bolted aluminum connections, both aluminum-to-aluminum and aluminum-to-copper.

1. Contact Surface Preparation

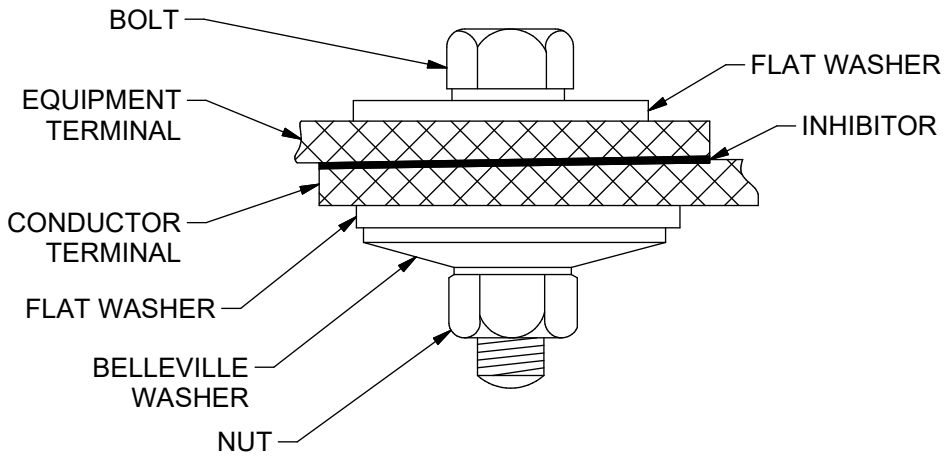
All aluminum contact surfaces that are not either silver plated or tin plated must be properly cleaned prior to making the electrical connection. Clean the contact surfaces with a wire brush to remove the oxide coating. Immediately coat the brushed contact surface with a liberal amount of corrosion inhibitor (Stock #31 59 058).

2. Flat-To-Flat Connections

The electric current will flow between the two mated surfaces at the points or areas of least resistance. Therefore, the distribution of forces at the contact surfaces must be given careful consideration.

To avoid concentrated paths of current flow and hot spots within the connection the clamping forces must be properly distributed. A flat washer of the same alloy as the bolt should be placed between the bolt head and one side of the connection. A steel Belleville washer with a matching steel flat washer should be placed on the opposite side of the connection under the nut. The Belleville washer must be installed with the convex side up (toward the nut).

Tighten the nut until a sudden increase in torque is felt. The Belleville washer is now flattened. Do not over tighten. And it is not necessary to ”back off” the nut. The bolted assembly should be as shown in the figure below.



REV	DATE	ENG	DESCRIPTION
3	07/31/21	EJB	Converted to new format
2	03/28/11	HLH	

INSTRUCTIONS:

1) Choose the correct underground Faulted Circuit Indicator (FCI) based on the cable diameter and the application:

STK #	Cable Diameter (in.)	Application
60 55 001	0.8 - 1.6	Below Terminations & Elbows
60 55 024	1.6 - 2.6	Below Terminations & Elbows
60 55 034	0.8 - 1.6	Below Fused Elbows

2) On new cable installations remove an additional 4-6 inches of cable jacket below the load break elbow or bolted T elbow prior to applying the underground FCI. On terminal poles, do not remove any additional cable jacket prior to applying the underground FCI.

3) Grasp the clamp on the back of the underground FCI and pull it back until it locks in the open position.

4) Grasp the bail on the front of the underground FCI with a hot stick.

5) Push the FCI onto the cable. For load break elbows and bolted T elbows apply the FCI on the semi-con shield of the cable below the elbow but above the concentric neutral fold back. The clamp on the rear of the FCI should grasp the cable. The concentric neutral wires must be folded down and they should not go under the FCI (through the clamp). The drain wire may go through the clamp or outside of the clamp. See Figure 1.

6) For live terminations on terminal poles, the FCI may be applied over the cable jacket below the termination if the bundled concentric neutral wires are run down through the FCI clamp to cancel out the effects of the neutral return current. See Figure 2.

7) Underground FCI's can be tested by holding a strong magnet to the test and reset point marked on the side of the unit. The unit will flash. To turn off, hold the magnet up to the same test and reset point on the FCI.

8) A remote indication can be established outside of an enclosure using a fiber optic cable (Stk. # 18 66 658). See DCS **59 53 51 00** for remote indication of an underground FCI.

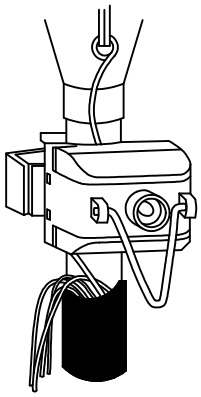


FIGURE 1

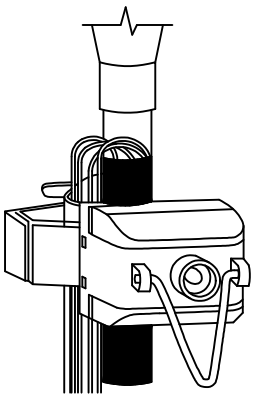


FIGURE 2

REV	DATE	ENG	DESCRIPTION
000	10/01/24	EB	New Standard

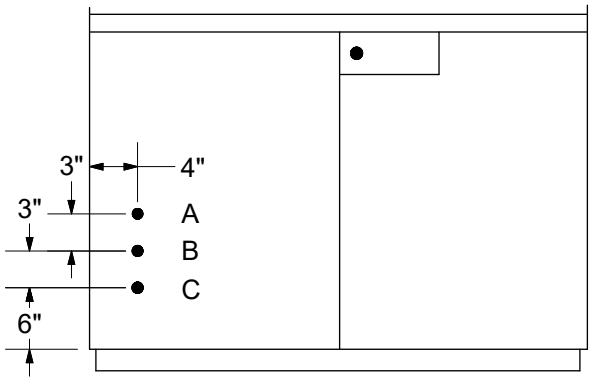


Figure 1

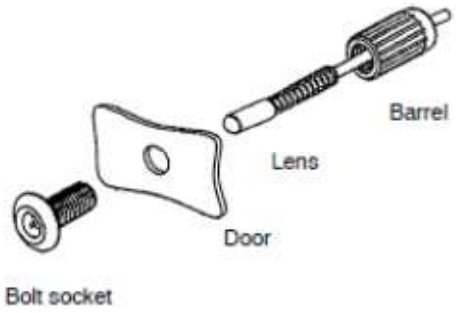


Figure 2

INSTRUCTIONS:

1. Drill three 5/16” holes in the lower (hinged) corner of the outgoing switch compartment door. The holes should be positioned as shown in Figure 1.
   Note: Changes have been made to the material specification for padmount switchgear to call for predrilled and plugged holes in each switch compartment door.

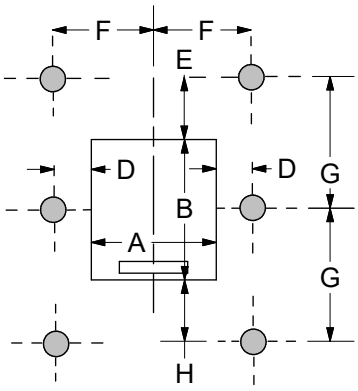
2. Directly beside each hole apply a high intensity reflective 1-3/4" x 2-7/8" letter for phase identification. The top hole will be marked with “A” (Stock #16 04 317), the middle hole with “B” (Stock #16 04 318), and the bottom hole with “C” (Stock #16 04 319) as shown in Figure 1.

3. Install a faulted circuit indicator (Stock # 60 55 001) onto each outgoing cable/lug.
   Note: Faulted circuit indicator Stock #60 55 024 may be used if the cable/lug OD is larger than 1.57”.

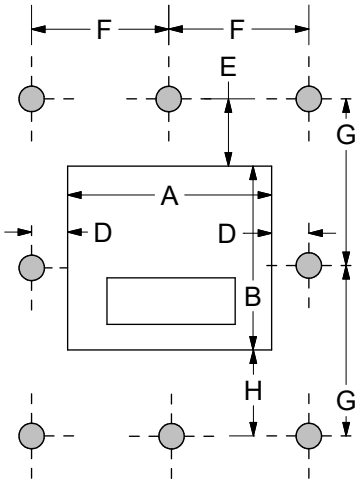
4. Snap the fiber optic cable plastic end fitting into the cup around the LED on the faulted circuit indicator. The fiber optic cable (Stock #18 66 658) is 6 foot long. Care must be taken not to kink the fiber optic cable. The fiber optic cables must be routed and secured to prevent damage associated with the operation of the door and other routine work.

5. Remove the bolt socket from the fiber optic cable barrel. The bolt socket will then be inserted through the 5/16” hole. See Figure 2.

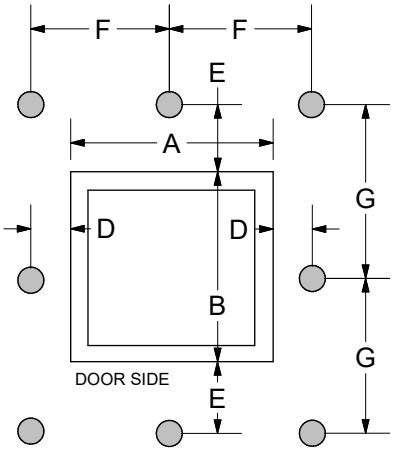
6. Place the fiber optic cable lens into the bolt socket and securely screw the barrel onto the bolt socket. BE SURE THAT THE FIBER OPTIC CABLES ARE POSITIONED BY THE CORRECT PHASE DESIGNATION.



Single Phase Transformer



Three Phase Transformer



Switchgear

Equipment Type	Description of Equipment	Composite Pad Stock No.	A (in)	B (in)	C (in) ◇3	D (in)	E (in)	F (in)	G (in)	H (in)
1P Transformer	0-167 kVA, Light Weight Pad	12 06 184	42	47	4	12	15	33	40	18
1P Transformer	0-167 kVA, Heavy Weight Pad	12 06 198	42	47	4	12	15	33	40	18
3P Transformer	75-750 kVA Radial Feed, SM 3 PH Pad	12 06 123	72	65	4	32	27	68	64	36
3P Transformer	1000-2500 kVA Radial Feed, LG 3 PH Pad	12 06 124	84	72	5	32	38	74	73	36
3P Transformer	75-1000 kVA Loop Feed, LG 3 PH Pad	12 06 124	84	72	5	32	38	74	73	36
Switchgear	Manual, Live Front Pad	12 06 109	69	63	36	24	36	58-1/2	67-1/2	-
Switchgear	Manual, Dead Front Pad	12 06 165	76	74	36	24	36	62	73	-
Switchgear	Automated, Dead Front Pad ◇4	12 06 165	76	74	36	49	36	62	73	-

REV	DATE	ENG	DESCRIPTION
10	07/31/21	EJB	Converted to new format
9	02/06/15	EJB	

CONSTRUCTION NOTE(s):

1. If Ameren crews are to install the barriers, the following material is required. The concrete and paint is stocked in Ameren storerooms:

Stk. No.	Description
Non-stock	Pipe - Steel, 4"
11 04 105	Concrete - Premix (Sk)
30 57 025	Lacquer - Yellow (Gal)

CAUTION: Installation of barrier rails must be coordinated with electric conduit installation to avoid mutual interference.

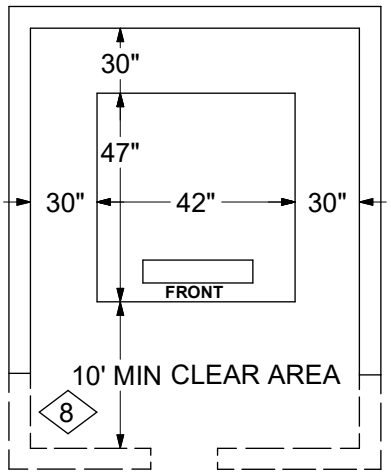
2. Construct the pipe barriers as follows:
   A. Use 8' 6"sticks of steel pipe.
   B. Drill holes with an 8" auger.
   C. Bury 56" of pipe leaving 46" of pipe exposed above grade.
   D. Fill the hole around the pipe with concrete to the top of grade.
   E. Fill the pipe with concrete.
   F. Paint the pipe with yellow lacquer.

DESIGN NOTES:

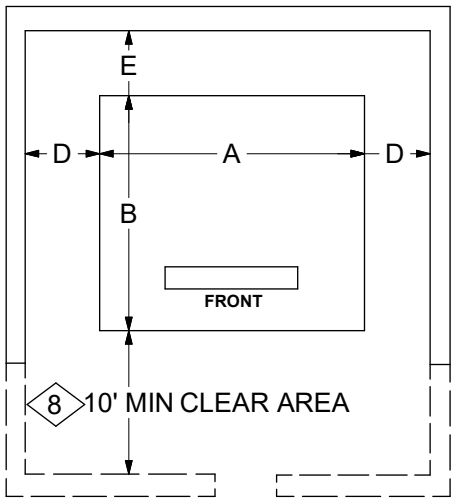
◇3. Dimension (C) is the height or thickness of the pad.

◇4. Automated switchgears require larger side clearances (D) to open the doors on the control boxes and motor operators.

5. An alternative barrier to steel pipe is a power installed bumper post. (See DCS 34 22 01 00).



Single Phase Installations
25-167kVA Transformers



Three Phase Intallations

Clearances				
3 Ø INSTALLATIONS	**A**	**B**	**D**	**E**
75 Thru 300 kVA Radial Feed Transformers	72"	65"	30'	35"
500 & 750 kVA Radial Feed Transformers	72"	65"	45"	43"
75 Thru 1000 kVA Loop Feed Transformers	84"	72"	45"	44"
1000 Thru 2500 kVA Radial Feed Transformers	84"	72"	45"	56"
Switchgear (Live Front)	69"	63"	49"	120"
Switchgear (Dead Front)	76"	74"	49"	120"
DA Switchgear (Dead Front)	76"	74"	60"	120"

DESIGN NOTE(s):

1. The critical dimensions for all padmounted equipment are the distances from the left, right, rear, and front of pads, not the equipment installed on the pad. These dimensions shall be maintained in all installations.
2. If pad mount is enclosed on all 4 sides, 10’ minimum clearance from the front of transformer to inside of wall must be maintained for hot stick operations.
3. If a 4 sided enclosure is used, an opening or doorway shall be provided. If a lock is required provisions shall be made to provide Ameren personnel access.
4. Customer to provide drainage away from enclosed areas to prevent oil and/or water from standing.
5. If a 4 sided enclosure is used, a minimum of 10 square feet of venting space in the form of 50% effective louvers or 5 square feet of opening shall be provided located along the bottom of each wall. If a 3 sided wall is used, wall venting space is desirable, but not required.
6. Location must be accessible for installing or replacing transformer with crane.
7. Developer to provide plastic conduit of size specified by Ameren to a point designated by Ameren outside the wall 36” to 42” below final grade.
8. The 10’ distance between the front of the pad and the wall may be reduced to 48” if an opening or gate is provided. The opening or gate should be centered on the front of the pad and should provide for a minimum opening of 3-1/2' for 1Ø and 9-1/2' for 3Ø installation. A 10' clear area in front of the pad must still be available with the opening or when the gate is open for hot stick operations.
9. To provide for transformer replacement, enclosed area is to be free of overhangs or overhead obstructions. Wall height not to exceed 8’ unless the above mentioned gate or opening is provided or an easily removable wall is used.
10. Should upgrading be required, the dimensions as shown provide adequate ventilation and space for 1 size larger transformer.
11. Walls shown in drawing, but clearances are required for any obstruction, i.e. switchgear, dumpsters, etc.

REV	DATE	ENG	DESCRIPTION
11	07/31/21	EJB	Converted to new format
10	02/06/15	EJB	

NOTES