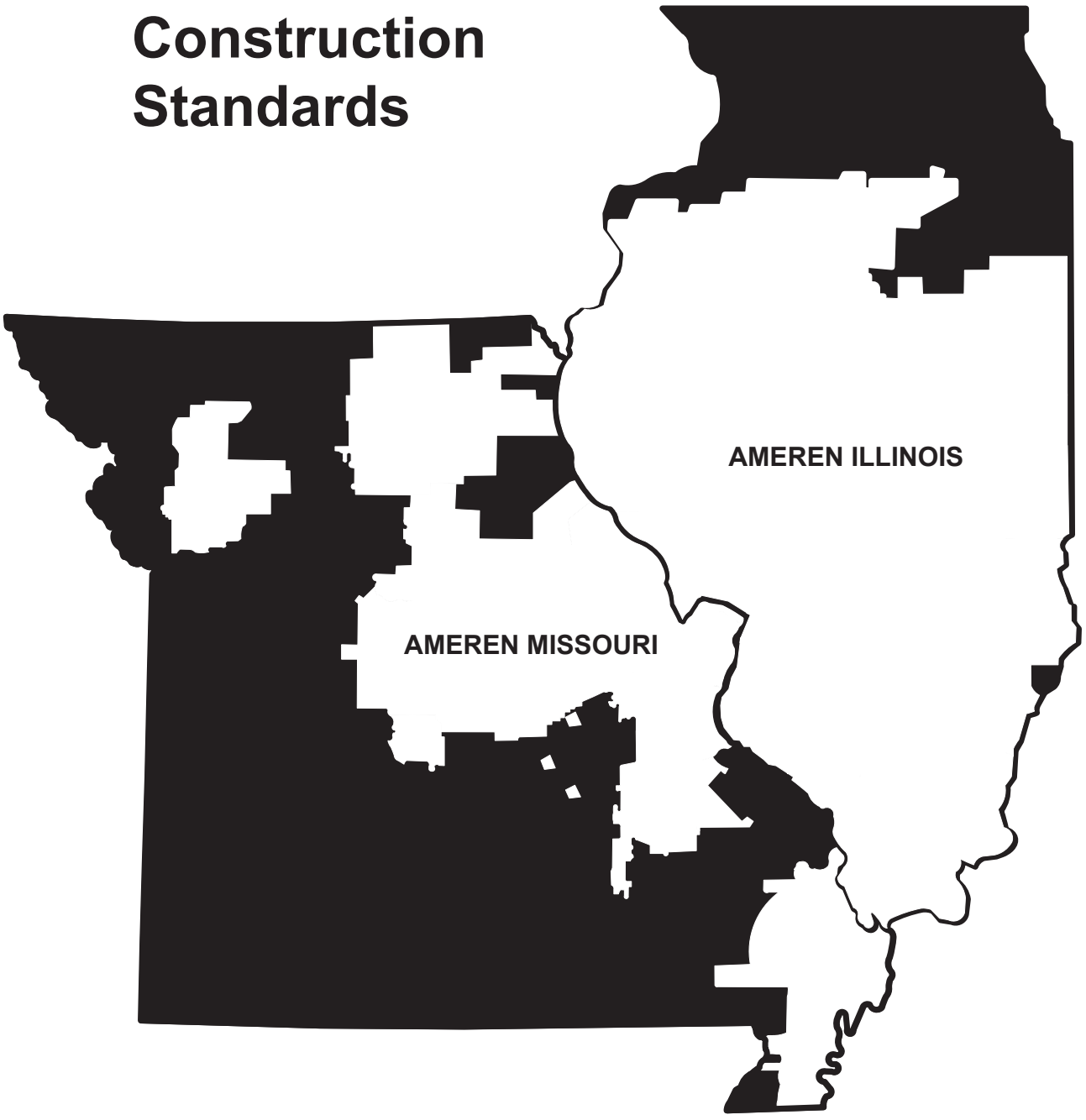
Ameren
FOCUSED ENERGY. For life.

January 1st, 2024 Revision

Distribution Construction Standards



Electric Distribution Standards
STATEMENT OF POLICY

Distribution Construction Standards are the manner in which the Ameren distribution system shall be constructed in order to provide safe, reliable, and cost effective electrical service to our customers.

The Distribution Construction Standards are to be followed for new construction, major rehabilitation, and rebuilding existing plant.

THEY ARE NEITHER GUIDES NOR SUGGESTIONS.

YOU HAVE A RESPONSIBILITY IN THIS EFFORT! You are expected to become familiar with these Distribution Construction Standards, comply with them, and to participate positively in their improvement by proposing practical and economical changes. Only with your cooperation and conformance can the main objective of standardization become a reality. When the standards are properly developed and applied they will accomplish the following:

- Ensure uniform, safe and economical construction practices.
- Establish desired design criteria and performance levels.
- Provide information on materials and their proper application.
- Minimize engineering and estimating time.
- Provide the basis for automated material and labor determination for work request and work order purposes.

Ron Pate
Senior Vice President
Operations and Technical Services, Ameren IL

Mark Birk
Senior Vice President
Customer and Power Operations, Ameren MO

INDEX

GENERAL 01
POLES 02
CONFIGURATIONS 03
CROSSARMS 04
WILDLIFE PROTECTION 05
INSULATORS & SUPPORTS 06
PRIMARIES CONDUCTOR & FASTENINGS 07
SECONDARY CONDUCTOR 08
SERVICES 09
FUSES & SWITCHES 10
GUYING 11
LIGHTNING PROTECTION & GROUNDING 12
TRANSFORMERS 13
CABLE TERMINALS 14
OUTDOOR LIGHTING 15
CAPACITORS & REGULATORS 16
LABOR OPERATIONS 17
FIBER OPTIC COMMUNICATION 18
METER INSTALLATIONS 25
OVERHEAD LINES INSTRUCTIONS 29
DUCT SYSTEMS 31
MANHOLES & VAULTS 32
MANHOLE ACCESSORIES 33
PADS & TRANSFORMER ACCESSORIES 34
UNDERGROUND CABLE SPLICE 41
UNDERGROUND CABLE TERMINATION 42

UNDERGROUND NETWORK SYSTEM 43
UNDERGROUND PRIMARY EQUIPMENT 51

EQUIPMENT CONNECTIONS 52
EQUIPMENT SWITCHING 53

UNDERGROUND EQUIPMENT MISCELLANEOUS 54
UNDERGROUND INSTRUCTIONS 59

cut

GENERAL 01

cut

TABLE OF CONTENTS

GENERAL INFORMATION 01–00–01–01

GENERAL G–TECH MAP SYMBOLS 01–00–01–02

GENERAL

1. Purpose of Construction Standards

The Standards in this book have been prepared for the use of Ameren Corporation personnel concerned with the construction, operation and maintenance of the Company's electric distribution facilities. An understanding of the necessity for these system−wide construction standards is of the greatest importance to the continued expansion of Ameren's facilities.

Standards properly developed and applied accomplish the following objectives.

a. Establish desired design criteria and performane levels.

b. Insure uniform, safe and economical construction practices.

c. Provide information on materials and their proper application.

d. Minimize engineering and estimating time.

e. Provide the basis for automated material and labor determination for work request and work order purposes.

2. Scope and Application

Ameren Corporation Standards cover the type of construction and the materials that shall be used for 4kV to 14.4kV distribution systems, outdoor lighting systems, and for 34kV and 69kV subtransmission systems.

The following guidelines shall be followed in applying these Standards.

a. All new construction shall conform to these standards.

b. When existing poles are replaced, all construction on the new poles shall conform to these standards.

c. When additional circuits are installed, or circuits are replaced on existing poles, the arrangement shall conform to the standards as nearly as is reasonable and practical.

d. Existing lines shall not be rebuilt for the sole purpose of conforming to these standards.

3. Conformance to National, State and Local Codes

Every effort has been made in the development of the Ameren Construction Standards to give proper recognition of and insure conformance to published codes of governmental bodies. All construction covered by the standards in this book meet the minimum requirements of the current edition of the National Electrical Safety Code.

4. Responsibility for Interpretation

Questions concerning the interpretation of these standards shall be directed to the Supervising Engineer in the Distribution Standards Group.

5. Standards Organization − Unitized Assemblies

This standards book is made up of various major sections, some providing basic units of assembly such as insulators, crossarms, guys, etc. Many of these basic units are then further employed as sub−assemblies in other sections, such as the configuration and switch sections of the book. However, there is a practical limit to the number of various combinations of these units for which standard drawings can be developed. As a result, several different standards are required to completely specify the construction for each pole.

6. Computerized Material and Labor Take−Off

Provisions have been incorporated into these standards which, when properly applied, will develop the associated materials, installation labor manhours and total costs by computer. This system of computerized materials take−off is now part of the DOJM system. In DOJM terminology, the Construction Standard bill−of−material is called a macro or supermacro. A major stock number or a labor code is called a comptabile unit. Minor stock number for any particular macro are gathered together to form one compatible unit for all minor items on that Construction Standard. Some of the general provisions of the computerized material and labor take−off system are described in the following paragraphs.

a. Standards Numbering System
To provide for computerized material take−off, an eight digit standards numbering system has been developed. A separate number is assigned to each variation of construction and a complete bill of material is listed on the standard for each of the variations covered. This same number with an appropriate bill of materials and associated non−material operations, if any, are recorded on the computer. Specifying the proper eight−digit standard number will, in many instances, be all that is required to obtain the proper materials, labor and costs associated with the installation or removal of the standard. In other cases, one or more adders indicated in the Bill of Materials of the standard will have to be added separately.

b. Adder Items "@"
Where it is not practical to give all the variations of an assembly of different unit standards on one standard sheet, a reminder is given in the Bill of Materials that additional materials are required. This reminder is in the form of an "@" prefixing the standard number, stock number, or wire size specific item which must be specified separately.

c. Wire Size Variable "W"
In cases where the material required on a standard varies with the wire size, a system has been designed to indicate adders to be included with a wire size suffix. See Sheet 3 of this standard for appropriate wire size suffixes. This suffix will automatically provide the proper materials when an adder is called for. The computer selects from a wire size table such items as connectors, deadends, jumper and lead wire, ties, etc. If the adder is not suffixed with an acceptable wire size, DOJM will not allow the DOJM code to be entered.

d. Transformer Standards
Transformers are specified on work requests by their stock number. Materials which vary with the transformer size and type will be automatically specified along with the transformer by the computer. These items, such as leads, connectors and bolts, are indicated by the letter "T" on the transformer standard bill of materials. Other items must be specified by listing the Standard Number for mounting the transformer.

e. Additions and Deletions
Materials may be added to or deleted from a standad by listing them on the line construction work request (NTRY Screen). This may be done either by unit standard numbers or by stock numbers. This will be useful in cases such as where a different crossarm size is required, where wire sizes are different, where some items are already installed, etc.

GENERAL

ACCEPTABLE WIRE SIZE SUFFIXES

NEUTRAL

WIRE		SIZE	SUFFIX
#6	CU	Bare	6C
#4	CU	Bare	4C
#2	CU	Bare	2C
#1/0	CU	Bare	10C
#4	ACSR	Bare	4A
#1/0	AAAC	Bare	10A

120/240 VOLTS OPEN WIDE SECONDARY

WIRE		SIZE	SUFFIX
2–#6	CU	WP	6W
1–#6	CU	Bare	
2–4#	CU	WP	4W
1–#6	CU	Bare	
2–#2	CU	WP	2W
1–#4	CU	Bare	
2–#4/0	AA	Poly	40P
1–#1/0	AAAC	Bare	

STATIC WIRE			SUFFIX
3#7	AW	Bare	37AW
110.8	ACSR	Bare	110A

COPPERWELD			SUFFIX
#6A	CWC	Bare	6AC
#4A	CWC	Bare	4AC
#2A	CWC	Bare	2AC

2.4kV through 69kV

WIRE	SIZE		SUFFIX
#4	ACSR	Bare	4A
#2	ACSR	Bare	2A
#1/O	AAAC	Bare	10A
#3/0	ACSR	Bare	30A
#4/0	ACSR	Bare	40A
335.6	T–2ACSR	Bare	335T2
336.4	ACSR	Bare	336A
477	ACSR	Bare	477A
556.5	AA	Bare	556A
795	AA	Bare	795A
954	AA	Bare	954A
#4	ACSR	Poly	4P
#2	ACSR	Poly	2P
#1/0	AAAC	Poly	10P
336.4	AA	Poly	336P
556.5	AA	Poly	556P
#4	ACSR	TreeWire	4T
#2	ACSR	TreeWire	2T
#1/0	AAAC	TreeWire	10T
336.4	ACSR	TreeWire	336T
556.5	AA	TreeWire	556T
#6	CU	Bare	6C
#4	CU	Bare	4C
#2	CU	Bare	2C
#1/0	CU	Bare	10C
#4/0	CU	Bare	40C
350	CU	Bare	350C
500	CU	Bare	500C

GENERAL

2.4kV through 69kV

WIRE SIZE			SUFFIX
#6	CU	WP	6W
#4	CU	WP	4W
#2	CU	WP	2W
#1/0	CU	WP	10W
#4/0	CU	WP	40W
500	CU	WP	500W

1. For wire sizes and voltages not shown, material must be specified separatelyl.

SYMBOL	DESCRIPTION
	OPEN SOLID BLADE SWITCH (MO)
	CLOSED SOLID BLADE SWITCh (MO)
	OPEN SOLID BLADE SWITCH (IL)
	CLOSED SOLID BLADE SWITCH (IL)
	CLOSED FUSED SWITCH
	OPEN FUSED SWITCH
	OPEN SPLIT
	CLOSED SPLIT
	OVERHEAD TRANSFORMER (1PH)
	OVERHEAD TRANSFORMER (3PH)
	PADMOUNT TRANFORMER (1PH)
	PADMOUNT TRANFORMER (3PH)
	SPACER CABLE
	OPEN CIRCUIT SWITCH PAD
	SWITCH PAD (MO)
	SWITCH PAD (IL)
	MANHOLE
	HANDHOLE
	JUNCTION BOx (4 WAY)
	JUNCTION BOx (2 WAY)

SYMBOL	DESCRIPTION
	OPEN BREAKER
	CLOSED BREAKER
	OPEN RECLOSER
	CLOSED RECLOSER
	OPEN SECTIONALIZER
	CLOSED SECTIONALIZER
	REGULATOR
	GENERATOR
	CAPACITOR
	NETWORK PROTECTOR
	KEY INTERLOCK
	OPEN LOAD BREAK ELBOW
	CLOSED LOAD BREAK ELBOW
	RADIO CONTROL SYMBOL
	STEPDOWN TRANSFORMER
	LIGHTING SUBSTATION
	MAJOR CUSTOMER
	CUSTOMER SUBSTATION MANUAL
	CUSTOMER SUBSTATION AUTOMATIC
	PRIMARY METER

SYMBOL	DESCRIPTION
+	FEEDER ORIGIN
	FAULT INDICATOR
	CABLE TERMINATION
	COMPANY POLE
	FOREIGN POLE
	NETWORK BUS POSITION
	ENCLOSED ROOM
	VAULT
	REACTOR
	CT BANK
	CT ATTACHMENT
	POTENTIAL TRANSFORMER
	COUPLING CAPACITOR
	REACTOR
	HIGH SPEED GROUND SWITCH
	WAVE TRAP
	LIGHTNING ARRESTER
	GROUND
	DISTRICT TIE

SYMBOL	DESCRIPTION
	SUBSTATION
	DOWN GUY
	SPAN GUY
	TRANSMISSION TOWER
	TRANSMISSION TOWER (FOREIGN)
	DEADEND
	JUNCTION
	CABLE SPLICE
	WIRE/PHASE CHANGE
	MUNICIPAL STREETLIGHT
	OVERHEAD FED STREETLIGHT
	UNDERGROUND FED STREETLIGHT
	SUBSTATION TRANSFORMER
	METER ATTACHMENT
	RELAY ATTACHMENT
	MISC EQUIPMENT (REPEATER)
	MISC EQUIPMENT (MCC /CRM)
	AIRCRAFT WARNING MARKER

POLES 02

WOOD POLE DATA.....02 00 01 01

POLE NUMBERING - 35kV, 69kV.....02 00 01 02

MAXIMUM EQUIPMENT WEIGHTS.....02 00 02 00

STANDARD EQUIPMENT POLE SIZES & CLASSES.....02 00 02 01

COMPOSITE POLE DATA.....02 00 04 01

UNGUYED COMPOSITE POLE.....02 00 04 02

POLE INSTALLATION - SETTING DEPTHS.....02 20 03 01

BACKFILL AND REINFORCEMENT.....02 20 05 **

STORM HARDENING STRUCTURE.....02 30 10 01

COMPOSITE SWITCH POLES - STOCK CODES.....02 30 10 02

POLE STEPS.....02 40 32 **

VISIBILITY MARKERS.....02 40 43 00

POLE EXTENSION FOR CROSSARM.....02 40 46 **

OBSTRUCTION LIGHT.....02 40 48 00

POLE TOP PROTECTION.....02 40 49 00

This standard covers stock codes, weights, and loading criteria for wood poles, in particular Southern Yellow Pine (SYP) and Douglas Fir (DF). Those are the standard pole species for the Ameren Distribution System.

The weight and circumference in these tables are approximate and should be used as a guide for shipping and handling purposes. Poles are a natural resource and may vary in weight and size within their respective class.

Wood poles, wood cross-arms, and empty non-returnable wood reels removed from the Ameren System shall, whenever possible, be disposed of on the job or taken back to the Operating Center for disposal. However, Ameren or contractor crews may provide these to a land owner upon such landowner's request. In doing so, all Construction crews shall abide by Ameren's Corporate Procedure "Investment Recovery and Accommodation Sale Policy". As required in the procedure, the recipient(s) receiving wood poles or cross-arms are required to sign Form 5809NS. Construction crews may not provide landowner materials until Form 5809NS is approved by Ameren Supervision.

Wood pole sizes have been standardized. The sizes in the table are the only available sizes for their respective heights.

Table 1 - SYP Stock Codes

Height	Class					
	1	3	5	H1	H2	H4
30'	41 02 301	41 02 303	41 02 305	-	-	-
35'	41 02 351	41 02 353	41 02 355	-	-	-
40'	41 02 401	41 02 403	-	-	-	-
45'	41 02 451	41 02 453	-	-	41 02 245	45 02 445
50'	41 02 501	-	-	-	41 02 250	-
55'	41 02 551	-	-	41 02 155	41 02 953	41 02 855
60'	41 02 601	-	-	41 02 160	41 02 954	41 02 460
65'	41 02 651	-	-	41 02 165	41 02 988	41 02 465
70'	41 02 701	-	-	-	41 02 270	41 02 470
75'	41 02 751	-	-	-	41 02 275	41 02 475
80'	41 02 801	-	-	41 02 180	41 02 280	41 02 480
85'	41 02 851	-	-	41 02 185	41 02 285	-
90'	41 02 901	-	-	-	-	-

Table 2 - DF Stock Codes

Height	Class						
	1	H1	H2	H3	H4	H5	H6
50'	41 42 001	-	41 42 194	41 42 195	41 42 196	-	-
55'	41 42 002	41 42 197	41 42 198	41 42 199	41 42 200	-	-
60'	41 42 003	41 42 193	41 42 201	41 42 202	41 42 203	41 42 204	-
65'	41 42 004	41 42 077	41 42 205	41 42 206	41 42 207	41 42 208	-
70'	41 42 005	41 42 085	41 42 209	41 42 210	41 42 184	41 42 211	41 42 187
75'	41 42 049	41 42 078	41 42 101	41 42 212	41 42 213	41 42 214	41 42 215
80'	41 42 062	41 42 079	41 42 094	41 42 216	41 42 185	41 42 217	41 42 188
85'	41 42 063	41 42 075	41 42 090	41 42 218	41 42 219	41 42 220	41 42 221
90'	41 42 058	41 42 076	41 42 095	41 42 222	41 42 223	41 42 224	41 42 183
95'	41 42 035	41 42 084	41 42 097	41 42 225	41 42 186	41 42 226	41 42 189
100'	41 42 032	41 42 081	41 42 098	41 42 227	41 42 228	41 42 229	41 42 190
105'	41 42 067	41 42 096	41 42 091	41 42 230	41 42 231	41 42 232	41 42 233
110'	41 42 080	41 42 089	41 42 099	41 42 234	41 42 235	41 42 236	41 42 191
115'	41 42 086	41 42 088	41 42 100	41 42 237	41 42 238	41 42 239	41 42 240
120'	41 42 074	41 42 092	41 42 093	41 42 241	41 42 242	41 42 243	41 42 192
125'	-	-	41 42 244	-	-	-	-

REV	DATE	ENG	DESCRIPTION
8	10/01/20	KR	Title change; STK #s added; Modified disposal note; Comb. W/ 02 00 03 01
7	02/15/12	MJ	

Table 3 - Loading, Diameters and Weight								
Wood Pole		Southern Yellow Pine & Douglas Fir						
Class		5	3	1	H1	H2		
Min. Top Circ. Ct(in)		19	23	27	29	31		
Horiz. Load (lbs) ◇2◇		1,900	3,000	4,500	5,400	6,400		
Pole Height (Ft)	Class	SYP			DF			
		Min. Circ. (in)		Average Weight (lbs)	Min. Circ. (in)		Average Weight (lbs)	
		Ground Line-Cg	6' from butt- Cg		Ground Line-Cg	6' from butt- Cg		
30	1	36.9	36.5	1,020	36.9	36.5	1,062	
	3	32.4	32.0	770	32.4	32.0	851	
	5	27.9	27.5	580	27.9	27.5	563	
35	1	39.2	39.0	1,310	39.2	39.0	1,292	
	3	34.2	34.0	985	34.2	34.0	1,040	
	5	29.2	29.0	740	29.2	29.0	698	
40	1	41.0	41.0	1,630	41.0	41.0	1,598	
	3	36.0	36.0	1,225	36.0	36.0	1,242	
45	1	42.8	43.0	1,965	42.8	43.0	1,940	
	3	37.3	37.5	1,475	37.3	37.5	1,526	
50	H2	-	-	-	-	-	-	
	H1	-	-	-	-	-	-	
	1	44.6	45.0	2,330	44.6	45.0	2,237	
55	H2	-	-	-	-	52.0	3,294	
	H1	-	-	-	-	49.5	2,808	
	1	45.9	46.5	2,715	45.9	46.5	2,552	
60	H2	-	-	-	52.5	54.0	3,852	
	H1	-	-	-	49.6	51.0	3,380	
	1	47.2	48.0	3,130	47.2	48.0	2,885	
65	H2	-	-	-	51.0	55.5	4,320	
	H1	-	-	-	47.8	52.5	3,821	
	1	48.5	49.5	3,555	48.5	49.5	3,240	
70	H2	-	-	-	55.2	57.0	4,815	
	H1	-	-	-	52.2	54.0	4,289	
	1	49.9	51.0	4,005	49.9	51.0	3,492	
75	H2	-	-	-	57.6	59.0	5,297	
	H1	-	-	-	53.6	55.5	4,694	
	1	51.2	52.5	4,475	51.2	52.5	4,005	

REV	DATE	ENG	DESCRIPTION
8	10/01/20	KR	Title change; STK #s added; Modified disposal note; Comb. W/ 02 00 03 01
7	02/15/12	MJ	

Table 3 - Continued							
Wood Pole	Southern Yellow Pine & Douglas Fir						
Class	5		3		1	H1	H2
Min. Top Circ. Ct(in)	19		23		27	29	31
Horiz. Load (lbs) ◇2◇	1,900		3,000		4,500	5,400	6,400

Pole Height (Ft)	Class	SYP			DF		
		Min. Circ. (in)		Average Weight (lbs)	Min. Circ. (in)		Average Weight (lbs)
		Ground Line-Cg	6' from butt- Cg		Ground Line-Cg	6' from butt- Cg	
80	H2	-	-	-	57.8	60.0	5,841
	H1	-	-	-	53.6	57.0	5,184
	1	52.5	54.0	4,965	52.5	54.0	4,419
85	H2	-	-	-	61.5	61.5	6,413
	H1	-	-	-	56.8	58.5	5,702
	1	53.4	55.0	5,480	53.4	55.0	5,013
90	H2	-	-	-	59.2	63.0	7,011
	H1	-	-	-	56.3	59.5	6,242
	1	54.3	56.0	6,005	54.3	56.0	5,310
95	H2	-	-	-	60.5	64.5	7,628
	H1	-	-	-	57.1	61.0	6,818
	1	55.1	57.0	6,550	55.1	57.0	5,427
100	H2	-	-	-	62.7	65.5	8,240
	H1	-	-	-	59.4	62.0	7,362
	1	56.5	58.5	7,115	56.5	58.5	6,282

DESIGN NOTE(s):

1. Alternatives such as laminated wood, steel, and composite poles are available for special applications.

◇2◇ Minimum ultimate single point load (lbs) 2 feet from top of pole per ANSI C05.1.

REV	DATE	ENG	DESCRIPTION
8	10/01/20	KR	Title change; STK #s added; Modified disposal note; Comb. W/ 02 00 03 01
7	02/15/12	MJ	

INSTRUCTIONS - INSTALLATION

ILLINOIS ONLY

1. Sub Transmission - All sub transmission lines shall be numbered at each 1st structure coming out of the substation with the circuit number at the top of the pole, on both sides. The 5th structure shall be numbered with #5, then each 5th structure will be numbered in sequence starting at the normal source end of the line. Poles shall be numbered on both sides at major road crossings.

   In the event a new pole or poles are added between any of the aerial patrol (AP) numbers (Example between 301 and 302) add pole number designation 301A, 301B, 301C, etc.

2. Aerial Patrol Numbering - All sub transmission lines numbered for aerial patrolling shall be numbered in consecutive sequence on both sides of each structure that has a number divisible evenly by 5.

   When sub transmission poles are either repaired or replaced a new AP number should be installed if the sequence is as mentioned in the above paragraph. If an AP number already exists on the pole, front and back side, no action would be required.

   When a structure that should be numbered is located at a major angle in the line and cannot be numbered, either of the adjacent structures shall be numbered with its own structure number. Example, if the major angle is on pole 95, the structure in front would be 94 and the structure behind would be 96; keeping in consecutive order with the other numbered poles.

   Numbering shall be continuous from one major switching station to another.

   Tap lines shall be numbered with number 1 on the first structure from the junction with the main line.

   Aerial patrol numbers shall be located on structures as indicated by drawings in this standard. Typically numbers shall be installed below the first set of insulators (between 1st and 2nd set), if the pole is unshielded. If the pole is shielded, then the numbers can be installed at top of the pole below the shield wire.

3. Wood poles - The vertical holder shall be installed using two lag screws, 2" long with 1/4" diameter (Stock #23 60 033). An alternative to the vertical holder for a wood pole is to securely nail the plates directly to the pole (four holes in each plate).

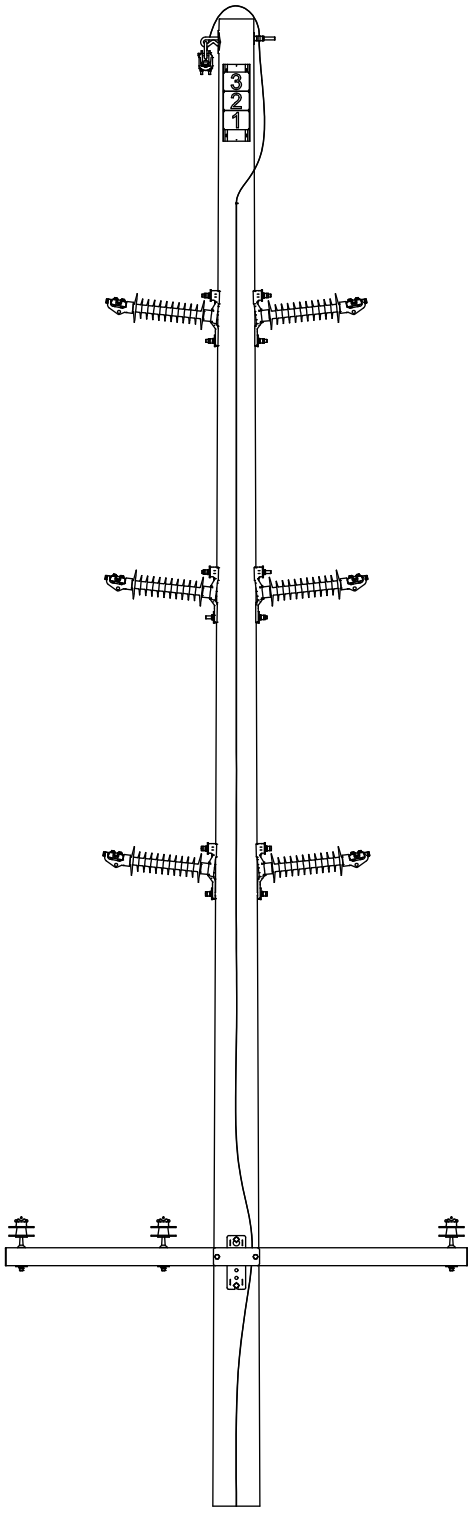
4. Composite Poles / Fiberglass Poles - Use #10 hex head 3/4" long self-tapping screws (Stock #21 76 679) in predrilled holes. If pole is not predrilled, use drill bit (Stock #86 04 289) to drill pilot hole.This length will work on all composite poles.

5. Tag Holder and Inserts
   Material used in numbering sub transmission lines shall be Black on Yellow, Aluminum 5"W x 7"H w/6" Number Embossed with a Vertical Aluminum Number Plate 29"H x 5 1/4"W. Tags will be produced from following stock numbers.

Stock Number	Description
16 04 627	Numeral "0"
16 04 628	Numeral "1"
16 04 629	Numeral "2"
16 04 630	Numeral "3"
16 04 631	Numeral "4"
16 04 632	Numeral "5"
16 04 633	Numeral "6" or "9"
16 04 634	Numeral "7"
16 04 635	Numeral "8"
16 02 691	Letter "A"
16 02 689	Letter "B"
16 02 690	Letter "C"
16 06 272	Tag Holder - Vertical

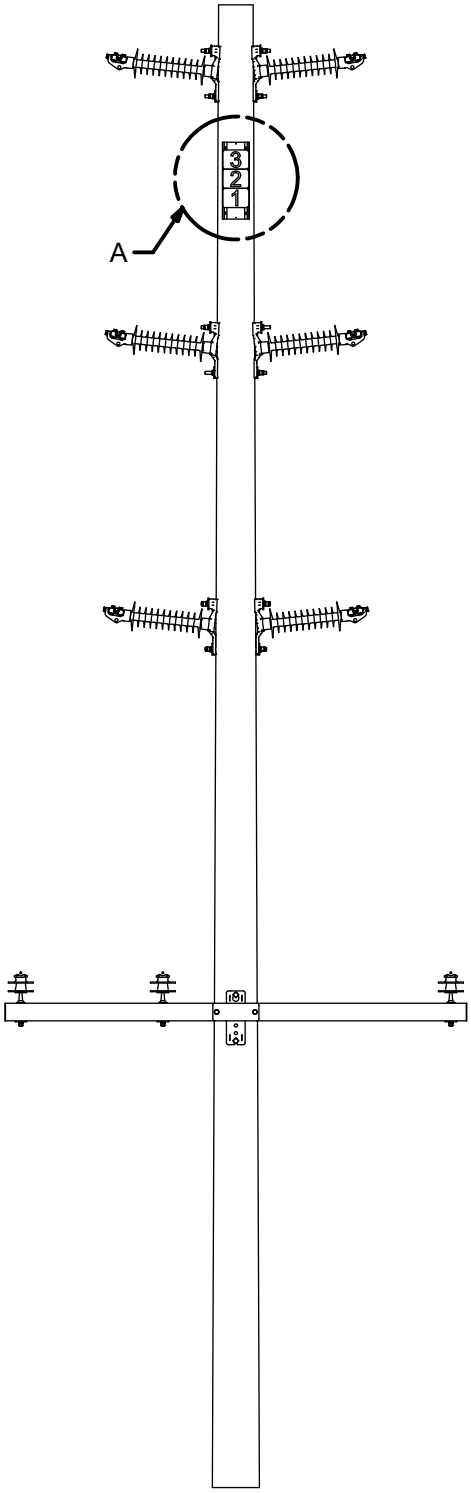
REV	DATE	ENG	DESCRIPTION
1	04/01/22	KR	Old 29 00 19 01;revised & updated entire standard
0	07/23/15	JLH	First Issue

ILLINOIS ONLY



SHIELDED

DETAIL A

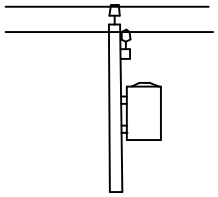


UNSHIELDED

REV	DATE	ENG	DESCRIPTION
1	04/01/22	KR	Old 29 00 19 01;revised & updated entire standard
0	07/23/15	JLH	First Issue

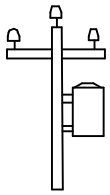
This Standard covers maximum equipment weights for wood poles that are excluded from DCS 02 00 02 01. The values listed in table below are for restrained poles only. **For unrestrained poles divide the listed values by 4.** It will not always be possible to utilize the maximum weights due to other restricting factors. Restricting factors, which can limit the load are the length and rating of gin poles, reef of blocks, load capacity of blocks, existing obstructions and clearances due to circuit configurations. All factors should be considered when determining the equipment weights, which can be installed on a wood pole.

Restrained Pole



THROUGH PRIMARY - LOAD
ON FACE OR BACK OF POLE

Unrestrained Pole



THROUGH PRIMARY - LOAD
ON FACE OR BACK OF POLE.
NO GUY

	Maximum Equipment Weight (lbs.) on Restrained Pole		
From Top (ft)	Class 5	Class 3	Class 1
30 & 35 Feet			
5	1,371	3,124	-
7	1,573	3,586	-
9	1,825	4,159	-
11	2,141	4,881	-
40 & 45 Feet			
5	-	2,670	4,794
7	-	2,959	5,312
9	-	3,296	5,919
11	-	3,696	6,636
13	-	4,172	7,491
50 & 55 Feet			
5	-	-	4,251
7	-	-	4,613
9	-	-	5,022
11	-	-	5,489
13	-	-	6,025
15	-	-	6,542

REV	DATE	ENG	DESCRIPTION
6	10/01/20	KR	Converted to new format
5	01/01/20	KR	

Application				Exist Pole		New Pole		
				Ht.	WP Cl.	Ht.	WP Cl.	CP Dia. ◇2◇
1. Service poles and extensions on private property				30'	6	35'	3	12"
2. Single Phase Circuit:								
a. Joint Use Construction				35'	6	35'	3	12"
b. Non-Joint Use Construction				35'	6	35'	3	12"
3. Three Phase Circuit:								
a. Joint Use Construction				45'	6	45'	3	12"
b. Non-Joint Use Construction				40'	6	40'	3	12"
4.16 kV Full Arm Terminal Pole ◇2◇				-	5	-	3	14"
4.16 kV Side Arm Terminal Pole ◇2◇				-	4	-	3	14"
13.8 kV Terminal Pole ◇2◇				-	4	-	3	14"
34.5 kV Terminal Pole				-	3	-	1	12"/14"
13.2 kV Pole Top Switch				-	3	-	1	-
34.5 kV Pole Top Switch				-	-	-	H2	-
34.5 kV Group Operated Switch ◇2◇ ◇3◇				-	-	-	H2	12"/14"
69 kV Group Operated Switch ◇2◇				-	-	-	-	12"/14"
T - L Pole or Cross-Corner Poles (Guying may be necessary)				One Class higher than the line poles.				
Side Arm Poles								
Transformer								
Single		Two	Three					
1-Phase	3-Phase							
> 25 kVA	-	-	-	-	7	-	3	12"
25 kVA	30 kVA	1-25 & 1-10 kVA	3-15 kVA	-	5	-	3	12"
50 kVA	45kVA	1-50 & 1-25 kVA	-	-	5	-	3	14"
75 kVA	75 kVA	-	-	-	5	-	3	14"
100 kVA	112 kVA	1-100 & 1-50 kVA	3-25 kVA	-	5	-	1	14"
167 kVA	150 kVA	1-167 & 1-50 kVA	3-50 kVA	-	3	-	1	14"
250 kVA	225 kVA		3-100 kVA	-	2	-	1	14"
	300 kVA		3-167 kVA	-	2	-	1	14"
	500 kVA		3-250 kVA	-	1	-	H1	14"
			3-333 kVA	-	H1	-	H2	12"/14"

REV	DATE	ENG	DESCRIPTION
5	10/01/20	KR	Added Note 4; converted to new format
4	01/01/20	KR	

Application						Exist. Pole	New Pole	
						Class	WP Class	CP Dia. ◇2
Two Pole Transformer Platform						3	1	14"
Center Support Pole for Platform Poles						3	1	14"
50 to 300 kVAR Capacitor Bank, 15 kV						5	1	14"
300 to 1200 kVAR Capacitor Bank, 15 kV						4	1	14"
Circuit Reclosers								
34 kV Electronic Recloser						-	H2	12"/14"
12 kV Single Phase Electronic Recloser						5	3	14"
12 kV Three Phase Electronic Recloser						5	1	14"
Voltage Regulators								
Single Phase			Two Or Three Phase					
kVa	Nameplate Amperes		kVa					
	2500 V	7620 V		2500 V	7620 V			
50	200	-	-	-	-	5	1	14"
76.2	-	100	-	-	-	4	1	14"
100	400	-	-	-	-	2	1	12"/14"
114.3	-	150	-	-	-	2	1	12"/14"
167	668	219	50	200	-	1	H2	12"/14"
250	-	328	76.2	-	100	1	H2	12"/14"
333	-	438	3-100	400	-	H1	H2	12"/14"
			3-167	-	219	H1	H2	12"/14"
			250 ◇1	-	328	-	H2	12"/14"
			333 ◇1	-	438	-	H2	12"/14"
			Two Pole Platform			-	-	-
			250	-	328	-	H2	12"/14"
			333	-	428	-	H2	12"/14"

DESIGN NOTE(s):

◇1. Consider using composite poles on any application candidate for replacement due to wood pole deflection caused by equipment weight.

◇2. Composite poles listed are the minimum required sizes. For longer and larger poles, contact Standards. Steel and laminated wood poles are also available for these applications.

◇3. For 34.5V group operated switches H2 wood poles are available for Missouri only.

◇4. The height and class of poles are determined by the number of conductors, the weight to be suspended, and ground clearance obstructions.

REV	DATE	ENG	DESCRIPTION
5	10/01/20	KR	Added Note 4; converted to new format
4	01/01/20	KR	

This standard covers composite pole stock codes and weights used in Ameren Distribution and Sub-transmission system.

Table 1	Single Layer Composite Poles							
Height (Ft.)	12" Diameter		14" Diameter		15" Diameter		17" Diameter	
	Stock Code	Weight (lbs.)	Stock Code	Weight (lbs.)	Stock Code	Weight (lbs.)	Stock Code	Weight (lbs.)
35'	41 35 012	542	41 35 014	917	41 35 015	1015	41 35 017	1253
40'	41 40 012	619	41 40 014	1048	41 40 015	1160	41 40 017	1432
45'	41 45 012	697	41 45 014	1179	41 45 015	1305	41 45 017	1611
50'	41 50 012	774	41 50 014	1310	41 50 015	1450	41 50 017	1790
55'	41 55 012	851	41 55 014	1441	41 55 015	1595	41 55 017	1969
60'	-	-	41 60 014	1572	41 60 015	1740	41 60 017	2148
65'	-	-	41 65 014	1703	41 65 015	1885	41 65 017	2327
70'	-	-	41 70 014	1834	41 70 015	2030	41 70 017	2506
75'	-	-	41 75 014	1965	41 75 015	2175	41 75 017	2685
80'	-	-	-	-	41 80 015	2320	41 80 017	2864
85'	-	-	-	-	41 85 015	2465	41 85 017	3043
90'	-	-	-	-	-	-	41 90 017	3222
95'	-	-	-	-	-	-	41 95 017	3401

Table 2	Dual Layer Composite Poles					
Height (Ft.)	12"/14" Diameter		14"/15" Diameter		15"/17" Diameter	
	35' to 55' = 10ft. Separation ◇2 60' to 75' = 15ft. Separation		35' to 55' = 10ft. Separation ◇2 60' to 85' = 15ft. Separation		35' to 55' = 10ft. Separation ◇2 60' to 95' = 15ft. Separation	
	Stock Code	Weight (lbs.)	Stock Code	Weight (lbs.)	Stock Code	Weight (lbs.)
35'	41 35 826	1197	41 35 829	1642	41 35 832	1910
40'	41 40 826	1405	41 40 829	1918	41 40 832	2234
45'	41 45 826	1614	41 45 829	2194	41 45 832	2558
50'	41 50 826	1822	41 50 829	2470	41 50 832	2882
55'	41 55 826	2030	41 55 829	2746	41 55 832	3206
60'	41 60 826	2108	41 60 829	2877	41 60 832	3351
65'	41 65 826	2316	41 65 829	3153	41 65 832	3675
70'	41 70 826	2525	41 70 829	3429	41 70 832	3999
75'	41 75 826	2733	41 75 829	3705	41 75 832	4323
80'	-	-	41 80 829	3981	41 80 832	4647
85'	-	-	41 85 829	4257	41 85 832	4971
90'	-	-	-	-	41 90 832	5295
95'	-	-	-	-	41 95 832	5619

REV	DATE	ENG	DESCRIPTION
3	10/01/20	KR	Updated all available Composite Pole sizes & stk #s & Notes
2	07/04/15	MJ	

Table 3	Multi Layer Composite Poles					
Height (Ft.)	12"/14"/15" Diameter		14"/15"/17" Diameter		12"/14"/15"/17" Diameter	
	50' to 55' = 10ft. Separation 60' to 100' = 15ft. Separation ◇2		50' to 55' = 10ft. Separation 60' to 110' = 15ft. Separation ◇2		50' to 70' = 10ft. Separation 60' to 110' = 15ft. Separation ◇2	
	Stock Code	Weight (lbs.)	Stock Code	Weight (lbs.)	Stock Code	Weight (lbs.)
50'	41 50 841	2692	41 50 846	3544	41 50 858	3408
55'	41 55 841	3045	41 55 846	3999	41 55 858	3940
60'	41 60 841	2978	41 60 846	3951	41 60 858	3515
65'	41 65 841	3331	41 65 846	4406	41 65 858	4047
70'	41 70 841	3685	41 70 846	4861	41 70 858	4580
75'	41 75 841	4038	41 75 846	5316	41 75 858	5112
80'	41 80 841	4391	41 80 846	5771	41 80 858	5644
85'	41 85 841	4745	41 85 846	6226	41 85 858	6177
90'	41 90 841	5098	41 90 846	6681	41 90 858	6709
95'	41 95 841	5452	41 95 846	7136	41 95 858	7242
100'	41 10 841	5805	41 10 846	7591	41 10 858	7774
105'	-	-	41 05 846	8046	41 05 858	8306
110'	-	-	41 01 846	8501	41 01 858	8839

DESIGN NOTE(s):

1. The composite poles in these charts are pre-drilled in the factory during fabrication. The poles are drilled to common standard configurations with an internal ground wire. Non-standard applications shall be communicated with the manufacturer for hole drilling locations.

◇2. 10' separation throughout pole will be an additional stock number. Contact Standards for those numbers. This would need to be applied in limited circumstances to help reduce deflection for larger structures.

REV	DATE	ENG	DESCRIPTION
3	10/01/20	KR	Updated all available Composite Pole sizes & stk #s & Notes
2	07/04/15	MJ	

This standard covers unguyed composite pole installations with standard configurations. The correct stock number for composite poles is determined by the number of wires, wire weight and tension, line angle, and NESC Grade B safety loading requirements. The tables apply to common applications in good soil without detailed calculations. Other unguyed or partially guyed pole applications will require communication with Standards.

Table 1	150' Ruling Span under NESC Heavy Loading					
1-1/0 AAAC Conductor (Tension = 1,200 lbs./ cond.) & 1-1/0 AAAC Neutral (Tension = 1,200 lbs./ cond.)						
Description	Line Angle					
	Tangent	Fixed		Floating		Deadend Corner
	≤1°	>1° & ≤10°	>10° & ≤20°	>20° & ≤40°	>40° & ≤60°	>60° & ≤90°
	Span Length ≥125' & <175'					
Pole Diameter (in)	12	12	12	12	14	14
Pole Height (ft)	40	40	40	40	40	45
Stock #	41 40 012	41 40 012	41 40 012	41 40 012	41 40 014	41 45 014
Configuration	**03 12 01 ****	**03 12 01 ****	**03 12 01 ****	**03 12 01 ****	**03 12 01 ****	**03 12 01 ****
Auger Size (in)	24	24	24	24	24	24
Pole Depth (ft)	6	7.5	7.5	7.5	7.5	9.5
Approx. Rake (in)	0	6	12	18	12	22
Backfill Stds	**02 20 05 11**	**02 20 05 11**	**02 20 05 11**	**02 20 05 12**	**02 20 05 12**	**02 20 05 15**

Table 2	200' Ruling Span under NESC Heavy Loading					
1-1/0 AAAC Conductor (Tension = 1,400 lbs./ cond.) & 1-1/0 AAAC Neutral (Tension = 1,400 lbs./ cond.)						
Description	Line Angle					
	Tangent	Fixed		Floating		Deadend Corner
	≤1°	>1° & ≤10°	>10° & ≤20°	>20° & ≤40°	>40° & ≤60°	>60° & ≤90°
	Span Length ≥175' & <225'					
Pole Diameter (in)	12	12	12	12	14	15
Pole Height (ft)	40	40	40	40	40	45
Stock #	41 40 012	41 40 012	42 40 012	43 40 012	41 40 014	41 45 015
Configuration	**03 12 01 ****	**03 12 01 ****	**03 12 01 ****	**03 12 01 ****	**03 12 01 ****	**03 12 01 ****
Auger Size (in)	24	24	24	24	24	30
Pole Depth (ft)	6	7.5	7.5	7.5	7.5	9.5
Approx. Rake (in)	0	8	12	20	14	15
Backfill Stds	**02 20 05 11**	**02 20 05 11**	**02 20 05 11**	**02 20 05 12**	**02 20 05 12**	**02 20 05 15**

Table 3	150' Ruling Span under NESC Heavy Loading					
3-556 AAC Conductor (Tension = 3,000 lbs./ cond.) & 1-1/0 AAAC Neutral (Tension = 1,200 lbs./ cond.) & Comm.						
Description	Line Angle					
	Tangent	Fixed		Floating		Deadend Corner
	≤1°	>1° & ≤10°	>10° & ≤20°	>20° & ≤40°	>40° & ≤60°	>60° & ≤90°
	Span Length ≥125' & <175'					
Pole Diameter (in)	11	12	14	14/15	14/15	15/17
Pole Height (ft)	45	45	45	55	55	55
Stock #	41 45 012	41 45 012	41 45 014	41 55 829	41 55 829	41 55 832
Configuration	**03 12 06 ****	**03 12 06 ****	**03 12 06 ****	**03 12 07 ****	**03 12 07 ****	**03 12 09 ****
Auger Size (in)	24	24	30	30	30	30
Pole Depth (ft)	6	8	8	10.5	10.5	12
Approx. Rake (in)	0	14	26	16	24	20
Backfill Stds	**02 20 05 11**	**02 20 05 12**	**02 20 05 12**	**02 20 05 12**	**02 20 05 15**	**02 20 05 15**

REV	DATE	ENG	DESCRIPTION
2	10/01/20	KR	Combined 02 00 04 02, 03, 04, & 05; added Notes 1 & 2
1	10/17/12	MJ	

Table 4	200' Ruling Span under NESC Heavy Loading					
3-556 AAC Conductor (Tension = 3,700 lbs./ cond.) & 1-1/0 AAAC Neutral (Tension = 1,400 lbs./ cond.) & Comm.						
Description	Line Angle					
	Tangent	Fixed		Floating		Deadend Corner
	≤1°	>1° & ≤10°	>10° & ≤20°	>20° & ≤40°	>40° & ≤60°	>60° & ≤90°
	Span Length ≥175' & <225'					
Pole Diameter (in)	12	14	15	14/15	15/17	15/17
Pole Height (ft)	45	45	45	55	55	55
Stock #	41 45 012	41 45 014	41 45 015	41 55 829	41 55 832	41 55 832
Configuration	**03 12 06 ****	**03 12 06 ****	**03 12 06 ****	**03 12 07 ****	**03 12 07 ****	**03 12 09 ****
Auger Size (in)	24	24	30	30	30	30
Pole Depth (ft)	6	8	8	10.5	10.5	12
Approx. Rake (in)	0	24	22	24	20	28
Backfill Stds	**02 20 05 11**	**02 20 05 12**	**02 20 05 12**	**02 20 05 12**	**02 20 05 12**	**02 20 05 15**

Table 5	150' Ruling Span under NESC Heavy Loading					
3-954 ACSR Conductor (Tension = 3,000 lbs./ cond.) & 1-1/0 AAAC Static (Tension = 1,200 lbs./ cond.)						
Description	Line Angle					
	Tangent	Fixed		Floating		Deadend Corner
	≤1°	>1° & ≤10°	>10° & ≤20°	>20° & ≤40°	>40° & ≤60°	>60° & ≤90°
	Span Length ≥125' & <175'					
Pole Diameter (in.)	14	12/14	12/14	14/15	15/17	14/15/17
Pole Height (ft)	60	60	60	60	60	65
Stock #	41 60 014	41 60 826	41 60 826	41 60 829	41 60 832	41 65 846
Configuration	**03 69 51 01**	**03 69 52 02**	**03 69 52 03**	**03 69 10 01**	**03 69 10 01**	**03 69 15 01**
Auger Size (in)	24	24	30	30	30	30
Pole Depth (ft)	8	9.5	9.5	11	11	13
Approx. Rake (in)	0	12	22	22	22	18
Backfill Stds	**02 20 05 11**	**02 20 05 11**	**02 20 05 12**	**02 20 05 12**	**02 20 05 12**	**02 20 05 15**

Table 6	200' Ruling Span under NESC Heavy Loading					
3-954 ACSR Conductor (Tension = 4,000 lbs./ cond.) & 1-1/0 AAAC Neutral (Tension = 1,400 lbs./ cond.)						
Description	Line Angle					
	Tangent	Fixed		Floating		Deadend Corner
	≤1°	>1° & ≤10°	>10° & ≤20°	>20° & ≤40°	>40° & ≤60°	>60° & ≤90°
	Span Length ≥175' & <225'					
Pole Diameter (in.)	14	12/14	14/15	15/17	15/17	14/15/17
Pole Height (ft)	60	60	60	60	60	65
Stock #	41 60 014	41 60 826	41 60 829	41 60 832	41 60 832	41 65 846
Configuration	**03 69 51 01**	**03 69 52 02**	**03 69 52 03**	**03 69 10 01**	**03 69 10 01**	**03 69 15 01**
Auger Size (in)	24	24	30	30	30	30
Pole Depth (ft)	8	9.5	9.5	11	11	13
Approx. Rake (in)	0	16	16	20	28	22
Backfill Stds	**02 20 05 11**	**02 20 05 11**	**02 20 05 12**	**02 20 05 12**	**02 20 05 12**	**02 20 05 15**

REV	DATE	ENG	DESCRIPTION
2	10/01/20	KR	Combined 02 00 04 02, 03, 04, & 05; added Notes 1 & 2
1	10/17/12	MJ	

Table 7	150' Ruling Span under NESC Heavy Loading					
3-954 ACSR Conductor (Tension = 3,000 lbs./ cond.) & 1-1/0 AAAC Static (Tension = 1,200 lbs./ cond.) 3-556 AAC Conductor (Tension = 3,100 lbs./ cond.) & 1-1/0 AAAC Neutral (Tension = 1,200 lbs./ cond.)						
Description	Line Angle					
	Tangent ◇2	Fixed		Floating		Deadend Corner
	≤1°	>1° & ≤10°	>10° & ≤20°	>20° & ≤40°	>40° & ≤60°	>60° & ≤90°
	Span Length ≥125' & <175'					
Pole Diameter (in.)	14	14/15	15/17	14/15/17	◇1	12/14/15/17
Pole Height (ft)	70	70	70	80	◇1	75
Stock #	41 70 014	41 70 829	41 70 832	41 80 846	◇1	41 75 858
Configuration Stds	**03 69 51 01 03 12 05 ****	**03 69 52 02 03 12 05 ****	**03 69 52 03 03 12 06 ****	**03 69 10 01 03 12 06 ****	◇1	**03 69 15 01 03 12 09 ****
Auger Size (in)	24	30	30	30	◇1	30
Pole Depth (ft)	9	9	10.5	10.5	◇1	14
Approx. Rake (in)	0	20	24	30	◇1	30
Backfill Stds	**02 20 05 11**	**02 20 05 12**	**02 20 05 12**	**02 20 05 12**	◇1	**02 20 05 15**

Table 8	200' Ruling Span under NESC Heavy Loading					
3-954 ACSR Conductor (Tension = 4,000 lbs./ cond.) & 1-1/0 AAAC Static (Tension = 1,400 lbs./ cond.) 3-556 AAC Conductor (Tension = 3,700 lbs./ cond.) & 1-1/0 AAAC Neutral (Tension = 1,400 lbs./ cond.)						
Description	Line Angle					
	Tangent ◇2	Fixed		Floating		Deadend Corner
	≤1°	>1° & ≤10°	>10° & ≤20°	>20° & ≤40°	>40° & ≤60°	>60° & ≤90°
	Span Length ≥175' & <225'					
Pole Diameter (in.)	14	12/14	12/14/15	12/14/15/17	◇1	◇1
Pole Height (ft)	70	70	70	80	◇1	◇1
Stock #	41 70 014	41 70 829	41 70 841	41 80 858	◇1	◇1
Configuration Stds	**03 69 51 01 03 12 06 ****	**03 69 52 02 03 12 06 ****	**03 69 52 03 03 12 06 ****	**03 69 10 01 03 12 07 ****	◇1	◇1
Auger Size (in)	24	30	30	30	◇1	◇1
Pole Depth (ft)	9	10.5	10.5	12	◇1	◇1
Approx. Rake (in)	0	26	24	30	◇1	◇1
Backfill Stds	**02 20 05 11**	**02 20 05 12**	**02 20 05 12**	**02 20 05 12**	◇1	◇1

DESIGN NOTE(s):

◇1. The loadings exceed composite pole limits. Call Standards to discuss other options.

◇2. If OPGW is used at least a 15" pole will need to be used in tangent application.

REV	DATE	ENG	DESCRIPTION
2	10/01/20	KR	Combined 02 00 04 02, 03, 04, & 05; added Notes 1 & 2
1	10/17/12	MJ	

INSTRUCTION(s):

The standard setting depth is 10% of the pole length plus 2 feet for class 1 and smaller poles and 10% of the pole length plus 3.5 feet for class H1 and larger. The setting depth of the pole in average and poor soil should be increased by 12 inches. Soil type shall be verified by Operating Centers.

The burial depth for composite poles changes from application to application. Composite poles are unlike a guyed wood pole due to certain forces being unaccounted for with guying. Here is a standard burial depth for composite poles and forces associated with the pole.

10% + 2' is used for tangent applications and Storm Structures for storm hardening
10% + 3.5' is used for line angles up to 20°, Switch applications, and Super Storm Structures
10% + 5' is used for line angles from 20° to 60°
10% + 6.5' is used for line angles from 60° to 90°

Additional setting depth is required in poor soil conditions. If poor or swampy soil conditions are visible then an additional 2' of burial depth will be required for embedment. Ameren does not have standards for soil conditions so this will be directly based on the Engineers judgement or best practice.

For swamp areas or poor soil conditions, utilize bearing plates at the bottom of the pole (Stock # 23 67 140).

For backfilling procedures refer to DCS 02 20 05 **.

	Wood Pole - Class 1 & Smaller Poles					Wood Pole - Class H1 & Larger Poles				
	Setting Depth in Feet					Setting Depth In Feet				
Length of Pole (ft)	In Good Soil	In Solid Rock Where Depth of Soil is to Top of Rock:				In Good Soil	In Solid Rock Where Depth of Soil is to Top of Rock:			
		6 ft	4 ft	2 ft	0 ft		6 ft	4 ft	2 ft	0 ft
30	5.0	5.0	5.0	4.5	3.5	-	-	-	-	-
35	5.5	5.5	5.5	5.0	4.0	-	-	-	-	-
40	6.0	6.0	6.0	5.0	4.0	-	-	-	-	-
45	6.5	6.5	6.5	5.5	4.5	8.0	8.0	8.0	6.5	5.5
50	7.0	7.0	7.0	5.5	4.5	8.5	8.5	8.5	7.0	5.5
55	7.5	7.5	7.5	6.0	5.0	9.0	9.0	9.0	7.5	6.0
60	8.0	8.0	8.0	6.0	5.0	9.5	9.5	9.5	7.5	6.0
65	8.5	8.5	8.5	6.5	5.5	10.0	10.0	9.5	8.0	6.5
70	9.0	9.0	8.5	6.5	6.0	10.5	10.5	10.0	8.5	7.0
75	9.5	9.5	8.5	7.0	6.0	11.0	11.0	10.0	8.5	7.0
80	10.0	10.0	9.0	7.0	6.5	11.5	11.5	10.5	9.0	7.5
85	10.5	10.5	9.0	7.5	7.0	12.0	11.5	10.5	9.0	7.5
90	11.0	11.0	9.0	7.5	7.0	12.5	12.0	10.5	9.0	7.5
95	11.5	11.0	9.0	8.0	7.0	13.0	12.5	11.0	9.5	8.0
100	12.0	11.5	9.5	8.5	7.5	13.5	12.5	11.0	9.5	8.0
105	12.5	12.0	10.0	9.5	7.5	14.0	12.5	11.0	9.5	8.0
110	13.0	12.2	10.5	10.0	8.0	14.5	12.5	11.5	10.0	8.0
115	13.5	12.0	11.0	10.0	8.5	15.0	13.0	12.0	10.5	9.0
120	14.0	12.0	11.0	10.0	9.0	15.5	13.0	12.0	0.5	9.5
D = (L/10) + 2 Where D = Setting Depth (ft.) in good soil and L = Pole Length (ft.)						D = (L/10) + 3.5 Where D = Setting Depth (ft.) in good soil and L = Pole Length (ft.)				
E = D + 12", where E = Excavated Length										

REV	DATE	ENG	DESCRIPTION
2	10/01/20	KR	Title Change; Comb. 02 20 03 01 & 02; Revised Notes; Added Constr. Notes
1	02/15/12	MJ	

INSTRUCTION(s):

1. Rock backfill consisting of compacted 1" minus rock or larger must be used for composite poles and is preferred for all 3-phase distribution and sub-transmission poles.

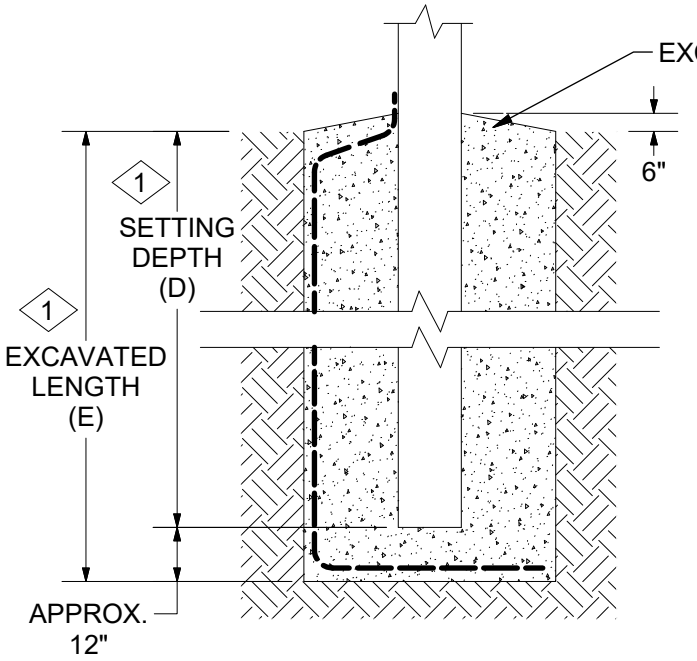
2. Clean Rock Shall Never Be Used As Backfill!

3. The backfilling procedures for rock and native soil backfill with a pole ground are as follows:

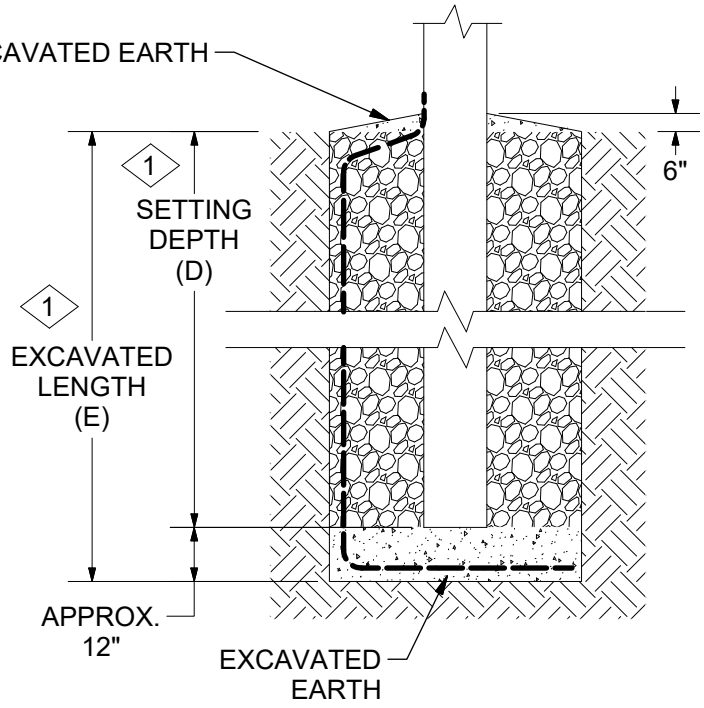
    a. When using rock backfill the pole shall be lowered into the hole after 12" of earth backfill, which shall cover the ground coil, has been thoroughly tamped at the bottom. The rock backfill shall be placed in the hole in a maximum of 12-inch layers and tamped thoroughly before adding the next layer. Tamping shall be performed with hydraulic mechanisms. The top 6" of material around the pole shall be dirt to prevent rock spoils on private property. All wood poles shall be set plumb, unless otherwise directed, and shall be checked during backfilling to make sure that they remain plumb. The hole shall be excavated to a diameter at least 8" larger than the base diameter of the pole.

    b. Where rock backfill is not feasible for wood poles, native soil may be used for backfill. The wood pole shall be lowered into the hole after loose dirt at the bottom has been thoroughly tamped. The earth backfill shall be placed in the hole in a maximum of 12-inch layers and tamped thoroughly before adding the next layer. Tamping shall be performed with hydraulic, hand-tamping, or air-tamping mechanisms. Soil shall be mounded at the ground line to cover natural future settling. All wood poles shall be set plumb, unless otherwise directed, and shall be checked during backfilling to make sure that they remain plumb. Extra soil shall either be removed from the site or spread evenly over area adjacent to the pole, if not landscaped.

Excavated Earth Backfill
Wood Poles

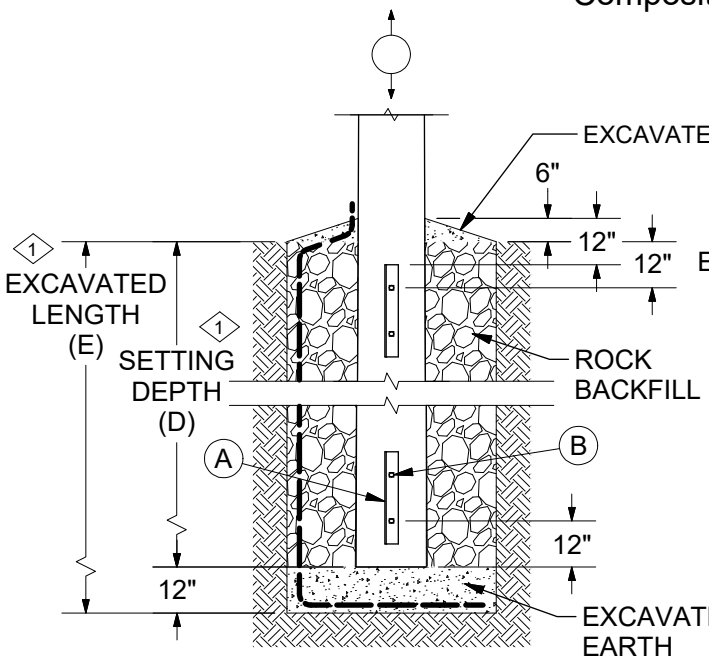


Rock Backfill
Wood Poles

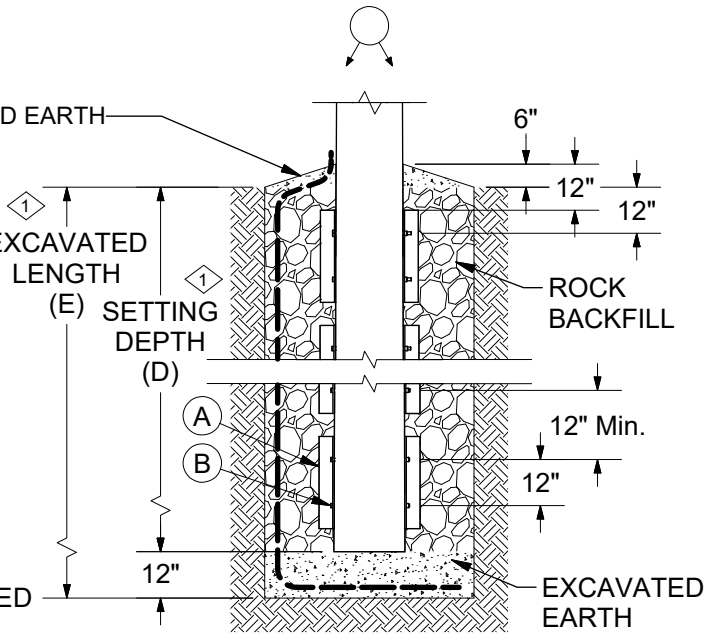


REV	DATE	ENG	DESCRIPTION
4	10/01/20	KR	Revised drawings and Notes
3	01/01/20	KR	

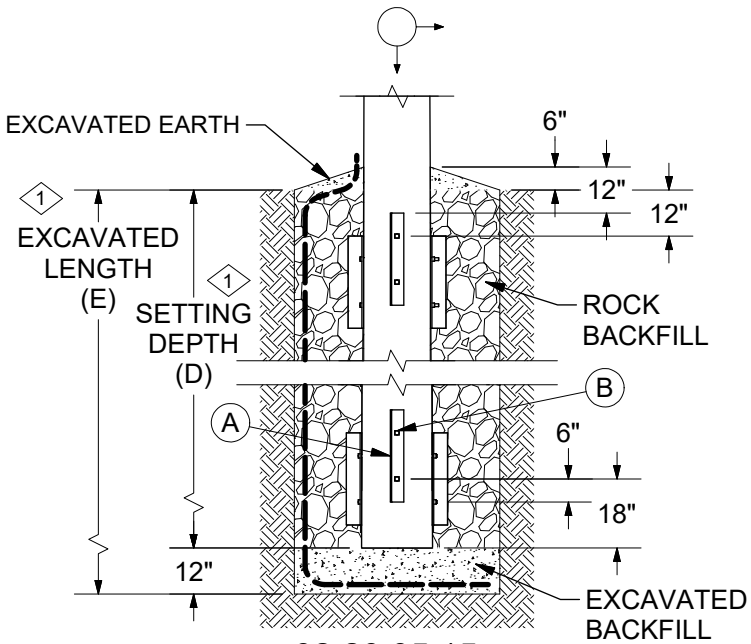
Rock Backfill
Composite Poles



02 20 05 11
Tangent



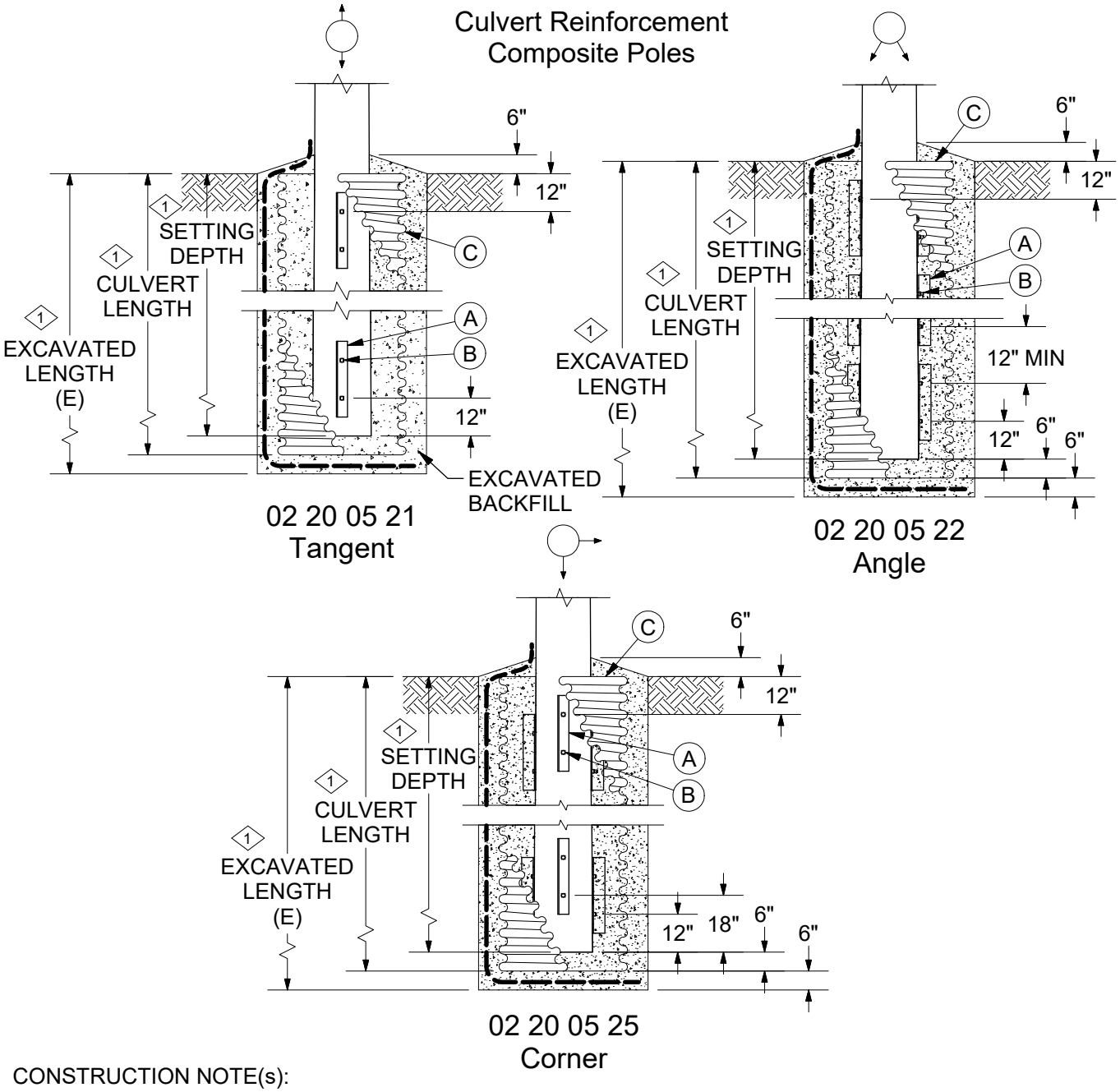
02 20 05 12
Angle



02 20 05 15
Corner

	ITEM	STK / DCS #	DESCRIPTION 02 20 05 **	11	12	15
2,3	A	23 06 126	Bracket, Angle, Fiberglass, 3 1/2" x 4" x 3/8" x 2'	4	8	8
2,3	B	23 52 118	Bolt, Mach., 3/4" x 20"	4	8	8

Culvert Reinforcement
Composite Poles



CONSTRUCTION NOTE(s):

1. See DCS **02 20 03 01** for most common wood and composite pole setting depths, and 02 00 04 02 for application specific setting depths. Poles without a pole ground do not require the extra excavated 12" of soil.

2. All storm structures require four brackets and super storm structures and switch poles require 8 brackets.

3. Angle brackets and additional bolts to be used on composite poles only.

4. Poles set in culverts shall be backfilled with 1" - 1.5" minus rock compacted in 12" or less lifts.

	ITEM	STK / DCS #	DESCRIPTION 02 20 05 **	21	22	25
2,3	A	23 06 126	Bracket, Angle, Fiberglass, 3 1/2" x 4" x 3/8" x 2'	4	8	8
2,3	B	23 52 118	Bolt, Mach., 3/4" x 20"	4	8	8
@	C	32 04 187	Pipe, Galv Stl, 18" Dia., 10'	1	1	1
		32 04 188	Pipe, Galv Stl, 24" Dia., 10'	1	1	1

REV	DATE	ENG	DESCRIPTION
4	10/01/20	KR	Revised drawings and Notes
3	01/01/20	KR	

Composite poles are an ideal option for storm hardening due to the amount of deflection they have rotationally, which can absorb the impact of cascading events. These poles can be used in un-guyed tangent applications. The tables list the stock numbers used in different configurations to minimize or halt a cascade event for tangent applications only. The recommendation for Sub-transmission is to install a storm pole every 1/4 mile or every fifth pole. Installation of Super Storm Poles is every mile or one in every 20 poles or at a double dead-end structure. A heavily guyed wood structure can be substituted as a storm pole as it will not accelerate or start a cascade. Storm hardening shall be used for distribution where cascading problems have occurred in the past.

Table 1 - Distribution Circuit

Height (ft.)	Stock Number					
	Single Phase		Three Phase			
			Single Circuit		Double Circuit	
	Storm Pole	Super Storm Pole	Storm Pole	Super Storm Pole	Storm Pole	Super Storm Pole
40'	41 40 012	41 40 014	-	-	-	-
45'	41 45 012	41 45 014	41 45 012	41 45 014	-	-
50'	-	-	41 50 012	41 50 014	41 50 014	41 50 826
55'	-	-	-	-	41 55 014	41 55 826

Table 2 - Sub-transmission Line

Height (ft.)	Stock Number					
	Single Circuit 34kV / 69kV		34kV or 69kV with Underbuild ◇2◇ ◇4◇			
			Single Circuit		Double Circuit	
	Storm Pole	Super Storm Pole	Storm Pole	Super Storm Pole	Storm Pole	Super Storm Pole
50'	41 50 014	41 50 826	-	-	-	-
55'	41 55 014	41 55 826	41 55 014	41 55 826	-	-
60'	41 60 014	41 60 826	41 60 014	41 60 826	-	-
65'	41 65 014	41 65 826	41 65 014	41 65 826	41 65 014	41 65 826
70'	41 70 014	41 70 826	41 70 014	41 70 826	41 70 014	41 70 826
75'	41 75 014	41 75 826	41 75 014	41 75 826	41 75 015	41 75 829
80'	41 80 015	41 80 829	41 80 015	41 80 829	41 80 015	41 80 829
85'	41 85 015	41 85 829	41 85 015	41 85 829	41 85 017	41 85 832
90'	41 90 017	41 90 832	41 90 017	41 90 832	41 90 017	41 90 832

DESIGN NOTE(s):

1. Storm hardening recommendations for H-Frame structures shall be one complete structure every mile. This will be a Super Storm Pole of the 14"/15" size up to 80' tall. From there it shall be a 15"/17" pole. Refer to composite pole stock number standard for stock codes.

◇2◇ OPGW static will increase the size of the pole above 70' tall. Due to the higher tensions this will constitute the larger structure for both Storm Poles and Super Storm Poles.

3. All Storm Poles are buried 10% of the pole height plus 2 feet (10%+2') deep. All Super Storm Poles are buried 10% of the pole height plus 3.5' (10%+3.5') deep.

◇4◇ Double circuit stock numbers are valid for applications with and without Underbuild.

REV	DATE	ENG	DESCRIPTION
2	10/01/20	KR	Revised tables to latest allowable sizes; Added Notes 1 thru 3
1	09/23/14	MJ	

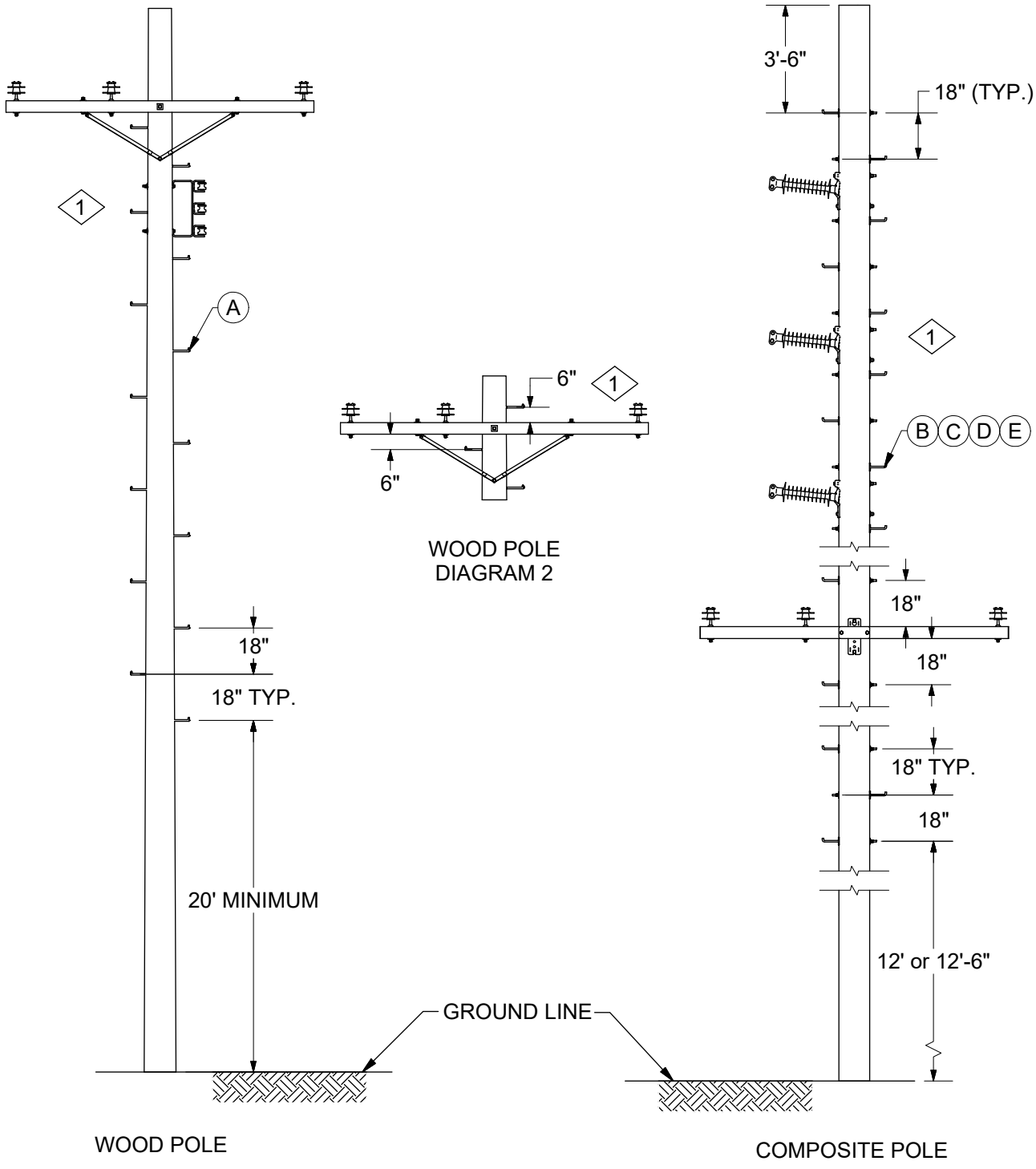
Height (Ft.)	Composite Pole Gang Operated Switch Pole Stock Numbers		
	Single Circuit 34kV / 69kV	34kV or 69kV with 12kV Underbuild	
		Single Circuit	Double Circuit
55'	4155826	-	-
60'	4160826	4160826	-
65'	4165826	4165826	4165826
70'	4170826	4170826	4170826
75'	4175829	4175829	4175829
80'	4180829	4180829	4180829
85'	4185829	4185829	4185832
90'	4190832	4190832	4190832
95'	4195832	4195832	4195832

DESIGN NOTE(s):

1. All Composite Switch Poles are buried 10% of the pole height plus 3.5' (10%+3.5') deep. They will also include 8 angle brackets below grade per Standard 02 20 05 15.

REV	DATE	ENG	DESCRIPTION
1	10/01/20	KR	New Standard - Composite Switch Pole sizes
	xx/xx/xx	xxx	

The use of pole steps in Ameren Service Areas shall be on an as needed basis. The guidelines below must be adhered to in order to provide consistency and standardization across operating divisions.



CAUTION: Pole steps must NOT be in contact with ground wires or other grounded objects.

REV	DATE	ENG	DESCRIPTION
2	10/01/20	KR	Revised Notes; Moved Wood & Composite Pole step stk #s to Sheet 2
1	12/09/15	MJ	

CONSTRUCTION NOTE(s):

1. Locate Step on opposite side of closest phase.

Wood Pole	
Pole Size	**Std. No.**
0-40 Ft.	02 00 30 01
45-50 Ft.	02 00 32 02
55-60 Ft.	02 00 32 03
65-70 Ft.	02 00 32 04
75-80 Ft.	02 00 32 05
85-90 Ft.	02 00 32 06

Composite Pole	
Pole Dia.	**Std. No.**
11"	02 00 32 10
12"	02 00 32 09
14"	02 00 32 11

	ITEM	STK / DCS #	DESCRIPTION 02 00 32 **	01	02	03	04	05	06	09	10	11
	A	23 67 036	Step, Wood Pole, Hook Head, 5/8" X 10"	8	14	20	26	32	38	-	-	-
@	B	23 67 492	Step, Composite Pole, Permanent, 12" Diameter	-	-	-	-	-	-	#	-	-
@	C	23 67 506	Step, Composite Pole, Permanent, 11" Diameter	-	-	-	-	-	-	-	#	-
@	D	23 67 507	Step, Composite Pole, Permanent, 14" Diameter	-	-	-	-	-	-	-	-	#
@	E	23 17 466	Step, Composite Pole, Working Step, 11", 12", 14" Diameter	-	-	-	-	-	-	#	#	#

DESIGN NOTE(s):

2. Pole Steps

   2.1 Poles shall not be stepped for any reason if any of the following apply:

   a. Poles are adjacent to paved areas and are bucket truck accessible.
   b. Poles are located on or adjacent to school property, playgrounds, athletic fields or similar locations where large numbers of people may assemble.
   c. Poles are located adjacent to or within 10 (ten) feet of structures or appurtenances such as porches, garages, sheds, fences, stairways or windows.

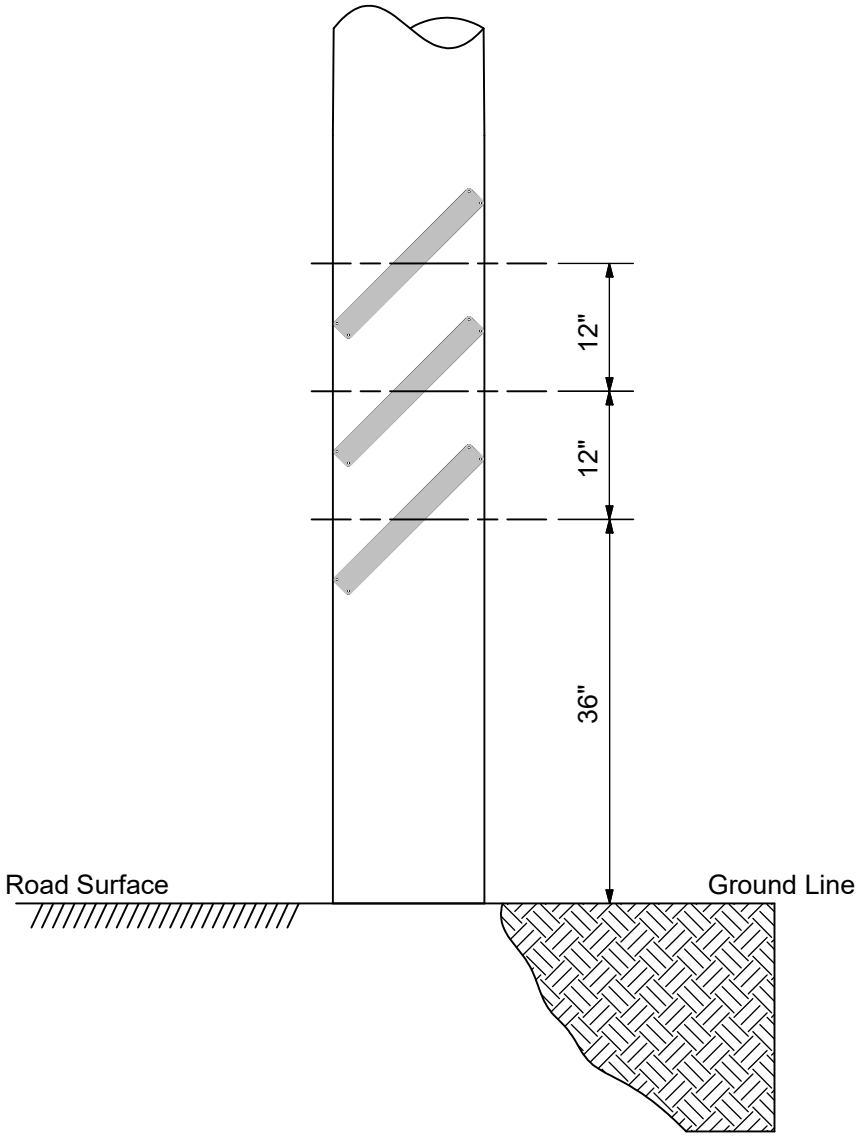
   2.2 Poles that do not meet any of the above criteria may be stepped if any of the following apply:

   a. Switch poles where the switch cannot be operated using an extend stick.
   b. Terminal poles.
   c. Recloser or sectionalizer poles.
   d. Poles that the Construction Superintendent deems appropriate to step due to unusual conditions.

   2.3 Leave pole steps on the pole unless safety concerns require removal.

3. Composite poles are fabricated without step holes unless Operating Center or Design Center communicates with supplier prior to ordering or delivery.

REV	DATE	ENG	DESCRIPTION
2	10/01/20	KR	Revised Notes; Moved Wood & Composite Pole step stk #s to Sheet 2
1	12/09/15	MJ	



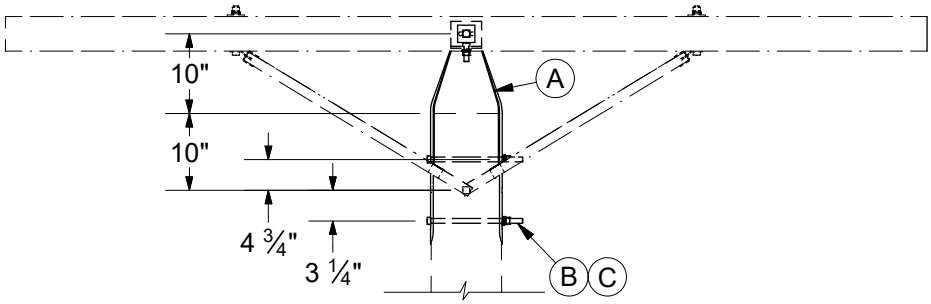
CONSTRUCTION NOTE(s):

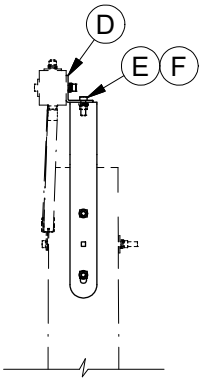
1. Install the markers at 45° to the ground line and facing oncoming traffic. Lower ends of the diagonal markers must be toward road.

2. Markers must be positioned as specified to comply with manual of uniform traffic control devices (MUTCD) requirements.

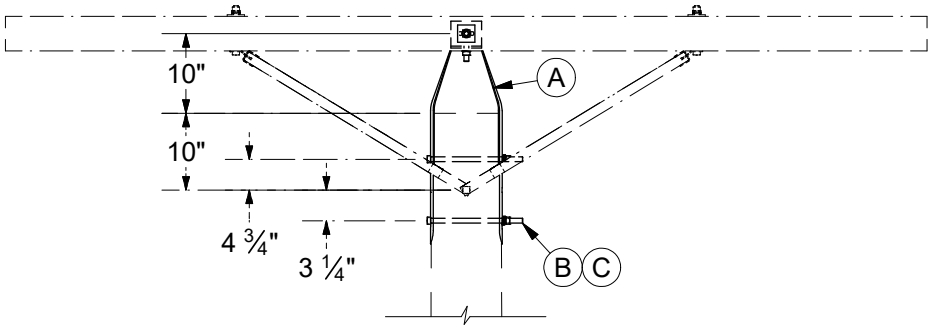
ITEM	STK / DCS#	DESCRIPTION 02 40 43 **	00
A	16 06 258	Marker - Pole, Visibility	3
B	23 64 005	Nail - Roofing, 1 1/2" x 11 GA x 7/16 HD	12

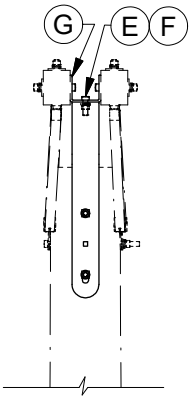
REV	DATE	ENG	DESCRIPTION
2	10/01/20	KR	Converted to new format
1	10/19/11	MJ	





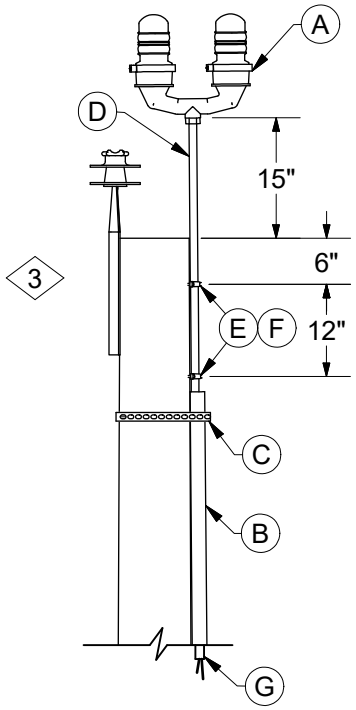
02 40 46 01
Single Arm





02 40 46 02
Double Arm

ITEM	STK / DCS #	DESCRIPTION 02 40 46 **	01	02
A	23 06 050	Bracket, Ridge Iron - 6-1/2" - 8" Dia.	1	1
B	23 52 065	Bolt, Mach., 5/8" x 12"	2	2
C	23 66 134	Lock Washer - 5/8" Double Coil	2	2
D	23 06 052	Bracket - Crossarm Support, Angle	1	-
E	23 52 049	Bolt, Mach., 5/8" x 2"	1	1
F	23 66 006	Washer - Lock 5/8"	1	1
G	23 06 051	Bracket - Crossarm Support, Double	-	1



ITEM	STK / DCS #	DESCRIPTION 02 40 48 **	00
A	40 05 223	Fixture, Obstruction Light	1
B	12 01 230	Conduit - 1-1/2" Schedule 40 (8-ft.)	2
C	27 60 035	Strap, Iron Hanger	2
D	40 03 033	Conduit 1" Heavy Wall (36" Long)	1
E	40 53 021	Clamp - Pipe 1"	2
F	23 60 002	Lag Screw - 1/4" x 4"	2
G	18 61 055	Cable - 600V, 2-14 AWG ft.	20

DESIGN NOTE(s):

1. Structures within 20,000 ft. of a landing area may require an obstruction light. The Real Estate Department can help determine whether or not obstruction lights and/or marker balls are required in each specific location.

2. For 4kV and 12kV circuits vertical configuration shall be used in first position. On 12kV 3Ø circuits the pole phase shall be located 32” from the center of the pole.

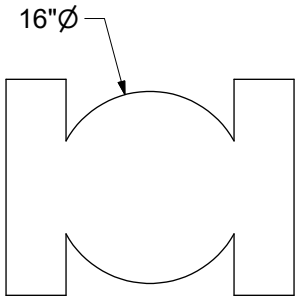
3. Static wire pin, when required, may be attached in normal position.

4. For 34kV/69kV single circuit static wire construction use DCS **03 69 01 ****.

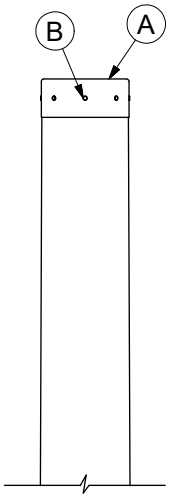
5. For 34kV69kV double circuit static wire construction use DCS **03 69 02 ****.

6. Pole extension shall not be used on poles where obstruction lights must be installed.

REV	DATE	ENG	DESCRIPTION
2	10/01/20	KR	Converted to new format
1	09/23/15	MJ	



Flat View of Pole Cap



CONSTRUCTION NOTE(s):

1. Pole caps are required to be placed on poles cut off to accommodate other heights or sizes.

2. Steps for Installation:

    a. Peel protective backing
    b. Center and adhere to top of pole
    c. Wrap tabs around pole and fold excess top over edges
    d. Secure with Nails

ITEM	STK / DCS #	DESCRIPTION 02 40 49 **	00
A	54 17 470	16" Pole Top Cover	1
B	23 64 005	Nail - Roofing, 1-1/2" x 11 GA x 7/16" HD	8

REV	DATE	ENG	DESCRIPTION
1	10/01/20	KR	New Standard - Pole Cap
	xx/xx/xx	xxx	

NOTES

CONFIGURATIONS 03

NEUTRAL LOCATIONS.....03 00 01 00

PREFERRED PHASE LOCATIONS.....03 00 01 01

STRUCTURAL ELEMENTS - DESIGN LIMITS.....03 00 03 00

NEUTRAL ATTACHMENTS.....03 01 01 **

PRE-ASSEMBLED TRIPLEX OR PARALLEL LASHED SECONDARY - 600V.....03 01 03 **

PRE-ASSEMBLED TRIPLEX OR PARALLEL LASHED SECONDARY CORNER - 600V.....03 01 05 **

PRE-ASSEMBLED TRIPLEX OR PARALLEL LASHED SECONDARY DEADEND - 600V.....03 01 07 **

OPEN WIRE SECONDARY ASSEMBLIES - 600V.....03 01 20 **

OPEN WIRE SECONDARY ASSEMBLY - 90º CORNER - 600V.....03 01 21 **

SECONDARY ASSEMBLY - 600V.....03 01 25 **

SECONDARY RUN ON WOOD CROSSARM - 600V.....03 01 26 **

SINGLE PHASE - 15KV.....03 12 01 **

SINGLE PHASE - UNDERBUILD - 15kV.....03 12 02 **

ARMLESS - TWO OR THREE PHASE - 15kV.....03 12 03 **

WOOD CROSSARM - TWO OR THREE PHASE - SINGLE & DOUBLE CIRCUIT - 15kV.....03 12 05 **

FIBERGLASS CROSSARM - TWO OR THREE PHASE - SINGLE & DOUBLE CIRCUIT - 15kV.....03 12 06 **

DEADEND CORNERS & FLOATING ANGLES - TWO OR THREE PHASE - 15kV.....03 12 07 **

BUCK ARM CORNER - TWO OR THREE PHASE - 15kV.....03 12 09 **

HORIZONTAL DEADENDS - TWO OR THREE PHASE - 15kV.....03 12 11 **

DEADEND LOOPOVERS & LOOPAROUNDS - TWO OR THREE PHASE - 15kV.....03 12 14 **

AERIAL MID-SPAN TAP - 15kV.....03 12 21 **

HORIZONTAL TAP - TWO OR THREE PHASE - 15kV.....03 12 24 **

VERTICAL TAP - TWO OR THREE PHASE - 15kV.....03 12 30 **

TANGENT STRUCTURE - SHIELDED - LINE ANGLE ≤ 1º- 35kV, 69kV.....03 69 01 **

TANGENT STRUCTURE - UNSHIELDED - LINE ANGLE ≤ 1º - 35kV.....03 69 02 **

FIXED ANGLE STRUCTURE - SINGLE CIRCUIT FOR > 1º AND ≤ 20º - 35kV, 69kV.....03 69 05 **

FIXED ANGLE STRUCTURE - DOUBLE CIRCUIT FOR > 1º AND ≤ 20º - 35kV, 69kV.....03 69 06 **

FLOATING ANGLE STRUCTURE - SINGLE CIRCUIT FOR > 20º AND ≤ 60º - 35kV, 69kV.....03 69 10 **

FLOATING ANGLE STRUCTURE - DOUBLE CIRCUIT FOR > 20º AND ≤ 60º - 35kV, 69kV.....03 69 11 **

DEADEND CORNER STRUCTURE - SINGLE CIRCUIT FOR > 60º AND ≤ 90º - 35kV, 69kV.....03 69 15 **

DEADEND CORNER STRUCTURE - DOUBLE CIRCUIT FOR > 60º AND ≤ 90º - 35kV, 69kV.....03 69 16 **

DEADEND TANGENT STRUCTURE - SINGLE & DOUBLE CIRCUIT ≤ 1º - 35KV, 69KV.....03 69 17 **

DEADEND ANGLE STRUCTURE - SINGE CIRCUIT FOR > 1º AND ≤ 60º - 35KV, 69KV……..……....03 69 18 **

DEADEND ENDLINE STRUCTURE - SINGLE CIRCUIT - 35KV, 69KV……...……03 69 19 **

TAP STRUCTURE - SINGLE CIRCUIT FOR ≤ 20º - 35KV, 69KV……..……..03 69 20 **

DOUBLE CIRCUIT STRUCTURE - SINGLE CIRCUIT TAP FOR ≤ 20º - 35KV, 69KV……03 69 21 **

T-CORNER - DEADEND TAP STRUCTURE - SINGLE CIRCUIT FOR > 1º AND ≤ 60º - 35KV, 69KV…….03 69 22 **

TANGENT AND ANGLE STRUCTURE - COMPOSITE POLE - LINE ANGLE ≤ 20º - 35KV, 69KV……03 69 51 **

DEADEND TANGENT STRUCTURE - COMPOSITE POLE - LINE ANGLE ≤ 1º - 35KV, 69KV……..……03 69 71 **

TANGENT H-FRAME STRUCTURE - COMPOSITE POLE - LINE ANGLE ≤ 1º - 35KV, 69KV…..……03 69 91 **

DEADEND H-FRAME STRUCTURE - COMPOSITE POLE - LINE ANGLE ≤ 2º - 35KV, 69KV……..…03 69 92 **

INSTRUCTION(s):

1. Historical Neutral Locations

   A. CIPS Service Territory

      Since at least 1986, CIPS Distribution Standard DS2100 has stated that the preferable location for the neutral is down 6'-2" from the crossarm or lowest conductor on spans less than 200 feet. Where span lengths exceeded 200 feet, the space btn 6'-2" spacing was mandatory. However, it was permitted to place the neutral on the crossarm or at 40" spacing to eliminate replacing otherwise adequate poles for increased height.

   B. UE Service Territory

      UE Distribution Construction Standards called for neutrals on new line poles without any equipment mounted on the pole to be 40" down from the crossarm or lowest conductor. This was applicable to both 4kV and 12kV areas. Several Standards indicate 22" spacing is permitted for existing construction on 4kV poles or on poles being converted from 2400 Volt single phase to 7200 Volt single phase.

2. Consolidated Ameren Standards

   The Standards in this book show neutral spacing on all new configurations to be 6'-0". The previous range was to accommodate present conditions of most of the existing poles at being at 40" and many of the existing poles at 6'-2".

   A. New Pole Installations

      New pole lines and relocated pole lines should use the 6'-0" neutral spacing in general. Major advantage to the 6'-0" spacing is that it permits a truck's basket to maneuver between the phase conductors and the neutral to reach the field side of the pole.

   B. Working on Existing Poles or Replacing Existing Poles

      The rule of permitting 40" to avoid replacing otherwise acceptable poles shall continue. When replacing a pole in a lead, the existing spacing should generally be used on the new pole, except that a 40" minimum neutral spacing from the crossarm or lowest conductor is required. Increasing from a 40" spacing to a 6'-0" spacing would change the conductor tensions considerably and likely cause both design and construction problems.

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format
1	02/21/12	MJ	

The phase locations shown in this distribution standard shall be standard for the Ameren System. It is not intended to change all existing structures that do not conform to this standard. However, all new constructions, as well as reconstructed existing circuits, shall, to the extent it is practicable, be in accordance with this standard.

1. Guidelines

The phase locations should be selected so as to give the maximum distance between conductors. For example, for 5kV and 15kV when going from the flat configuration as shown on Sheet 2 to vertical, the phase designation from the top of the pole shall be B, A, and C. The neutral conductor, when present on vertical corners, shall take a position below the primary phase conductor.

2. 4160 Volt Single Phase Construction Insulated for 7200 Volt Operation

Where a line is built for initial operation at 4160 Volt single phase but is insulated and spaced for future 7200 Volt operation, the conductor on the road side shall be considered the future phase wire and the field side conductor shall be the future multigrounded neutral, as shown on Sheet 2. On private property the east, northeast, north and northwest sides shall be equivalent to the road side, while the west, southwest, south and southeast sides shall be equivalent to the field side. At vertical corners the road side conductor (future 7200 Volt phase wire) shall occupy the high position on the pole. There will be instances where it will be impracticable to follow these general rules (e.g. where adjacent poles are on opposite sides of a winding road to keep line angles at a minimum). Where it is necessary to deviate from the standard conductor locations on poles adjacent to vertical corner poles the estimator shall show on his construction plats the conductor that must take the high position on the corner pole. This will obviate the need for construction changes when the line is cutover for 7200 Volt operation.

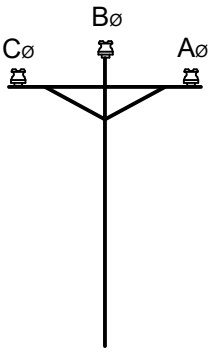
When the line is cutover to 7200 Volt operation all conductors in positions other than the standard shall be marked by placing the proper identifying aluminum letter on the crossarm directly below the conductor.

3. Marking

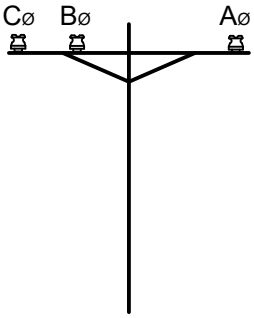
Any deviations from the standard phase locations shall be plainly marked with letters "A", "B", "C", or "N" attached to the crossarm below the respective conductor. These deviations may be due to transpositions or unusual construction. In addition to the marking of these deviations, all 3-phase switch locations, 3-phase capacitor installations, 3-phase recloser installations, 3-phase sectionalizer installations, and 3-phase terminal poles shall be plainly marked with the proper phase letter. These letters shall be placed on the crossarm or pole so that phases can be readily identified.

On long feeders with considerable distances between 3-phase switches, additional locations as required may also be marked to facilitate phase identification. Normally, these additional phase identification points should be located on poles where single phase taps take off from the 3-phase feeder main.

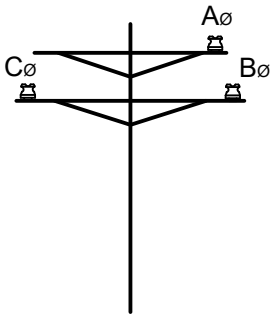
The phase locations on poles adjacent to vertical configurations shall be plainly marked to facilitate identification when making repairs. These letters shall be placed to the crossarm below the respective conductors.



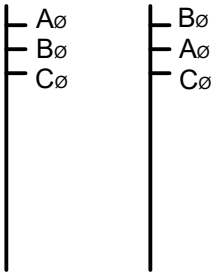
Triangular



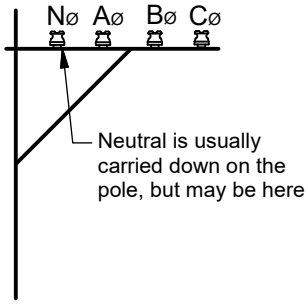
Flat



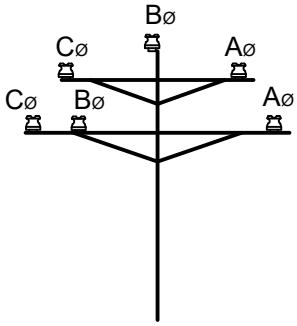
35kV Delta
Single Circuit



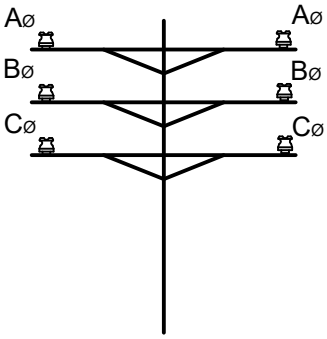
15kV & 35kV Vertical
Single Circuit



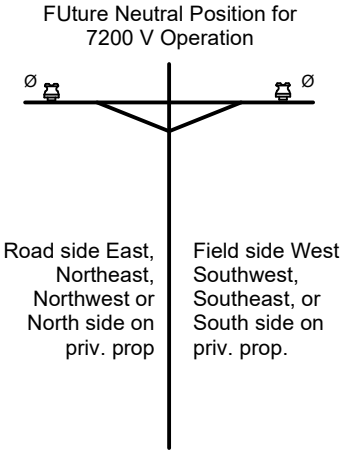
Sidearm



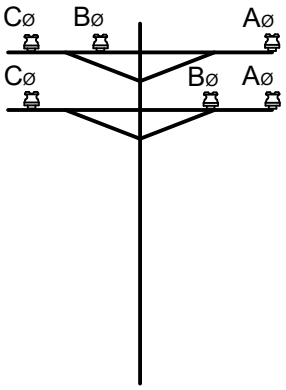
15kV Double Circuit



35kV Vertical
Double Circuit



4160V Single Phase
Insulated for Future
7200V Operation



15kV Double
Circuit Underbuild

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format, Combined with 03 00 01 02
1	10/14/11	JH	

This standard gives the design limits of the structural elements employed in building standard configurations. These limits are based on the allowable loading of crossarms and pins as shown in DCS **04 00 01 ****.

1. Angle Limits

Tables 1 thru 8 specify the maximum angle capable of being turned on pins, insulators, fiberglass standoffs, and fiberglass crossarms for various types of construction. This data is based on the transverse strength of the components of the structure and the load applied to it, due to the line angles.

2. Dead End Loadings

Table 3 specifies the maximum fiberglass crossarm deadend and loopover angle limitations. For loading criteria and number of wire attachments see DCS **04 00 01 ****. Crossarm guys should be used on unbalanced crossarm loads.

Table 1 - 600 lb Line Angle Limit on Single Pin Insulator - FG & Wood Crossarm

Conductor Size	Ruling Span					
	100'	150'	200'	250'	300'	350'
1/0 AAAC (Azusa)	23	18	14	11	8	6
336.4 ACSR (Merlin)	17	11	8	6	4	3
556 AAC (Dahlia)	22	8	5	4	3	2
954 ACSR (Rail)	14	6	4	3	2	1
1272 ACSR (Bittern)	14	6	3	2	1	1
T2-4/0 ACSR (T2 Penguin)	22	10	6	4	2	2
T2-336.4 ACSR (T2 Merlin)	11	6	4	3	2	1
T2-556 AAC (T2 Dahlia)	10	4	3	2	1	1
T2 954 ACSR (T2 Rail)	8	4	2	1	0	0
110.8 ACSR (Minorca)	23	14	9	7	5	4

Table 2 - 600 lb Line Angle Limit on Double-Insulator Single Pin - FG Crossarm

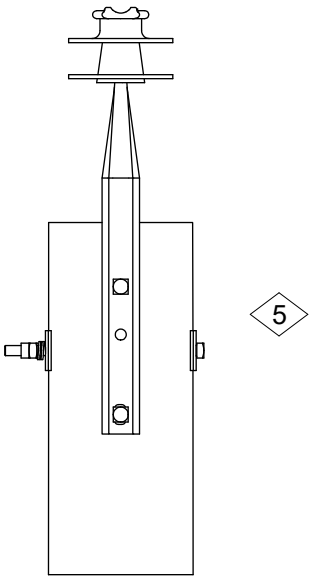
Conductor Size	Ruling Span					
	100'	150'	200'	250'	300'	350'
1/0 AAAC (Azusa)	46	35	28	21	17	13
336.4 ACSR (Merlin)	34	22	15	11	8	6
556 AAC (Dahlia)	44	15	10	7	5	4
954 ACSR (Rail)	28	12	8	5	3	2
1272 ACSR (Bittern)	27	12	6	4	2	1
T2-4/0 ACSR (T2 Penguin)	43	19	11	7	5	3
T2-336.4 ACSR (T2 Merlin)	21	12	8	5	3	2
T2-556 AAC (T2 Dahlia)	20	9	6	4	2	1
T2 954 ACSR (T2 Rail)	15	8	4	2	1	0
110.8 ACSR (Minorca)	46	28	19	14	10	8

REV	DATE	ENG	DESCRIPTION
8	10/01/23	AEP	Converted to new format, Updated Tables
7	02/21/12	DCG	

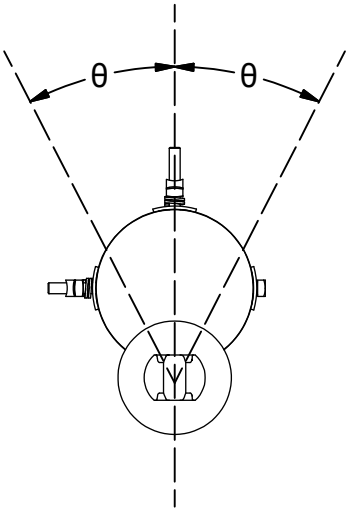
Table 3 - Maximum Deadend Line Angles for Loopovers - FG Crossarm						
Conductor Size	**Ruling Span**					
	100'	**150'**	**200'**	**250'**	**300'**	**350'**
1/0 AAAC (Azusa)	30	30	30	30	30	30
336.4 ACSR (Merlin)	30	30	30	30	30	30
556 AAC (Dahlia)	30	30	30	30	30	30
954 ACSR (Rail)	30	30	30	30	30	24
1272 ACSR (Bittern)	30	30	30	30	24	19
T2-4/0 ACSR (T2 Penguin)	30	30	30	30	30	30
T2-336.4 ACSR (T2 Merlin)	30	30	30	30	30	25
T2-556 AAC (T2 Dahlia)	30	30	30	30	25	22
T2 954 ACSR (T2 Rail)	30	30	30	25	19	14
110.8 ACSR (Minorca)	30	30	30	30	30	30

DESIGN NOTE(s):

1. The maximum line angle is limited to 30° to prevent conductor contact.
2. Double pins or double deadend pole top construction shall always be used at all NESC Grade B crossings.
3. For existing double wood crossarms at 2000 lbs per conductor during heavy loading, double pins and ties may be used.
4. Angles shown for single or double pins refer to crossarm pins and existing pole top pins mounted on the face of the pole.



Front View



Top View

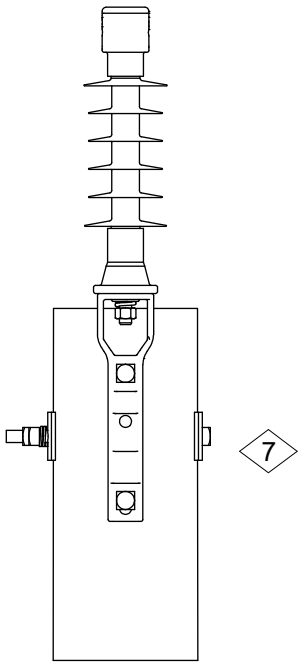
Table 4 - 1000 lb Line Angle Limit on Single Pin Insulator - Pole Top & Double Wood Crossarm						
Conductor Size	**Ruling Span**					
	100'	**150'**	**200'**	**250'**	**300'**	**350'**
1/0 AAAC (Azusa)	41	33	27	21	18	14
336.4 ACSR (Merlin)	31	21	15	12	9	8
556 AAC (Dahlia)	40	15	10	8	7	6
954 ACSR (Rail)	26	12	8	6	5	3
1272 ACSR (Bittern)	26	12	7	5	3	3
T2-4/0 ACSR (T2 Penguin)	40	18	11	8	6	4
T2-336.4 ACSR (T2 Merlin)	19	12	8	6	5	4
T2-556 AAC (T2 Dahlia)	19	9	6	5	4	3
T2 954 ACSR (T2 Rail)	15	8	5	4	2	1
110.8 ACSR (Minorca)	41	26	18	14	11	9

DESIGN NOTE(s):

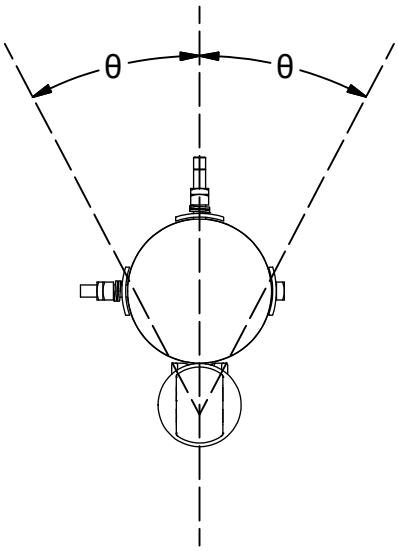
5. For standard construction, see DCS **06 12 01 02**.

6. Maximum tension caused by line angle of conductor is 1000lbs. For any cases above 1000lbs contact standards.

REV	DATE	ENG	DESCRIPTION
8	10/01/23	AEP	Converted to new format. Updated Tables
7	02/21/12	DCG	



Front View



Top View

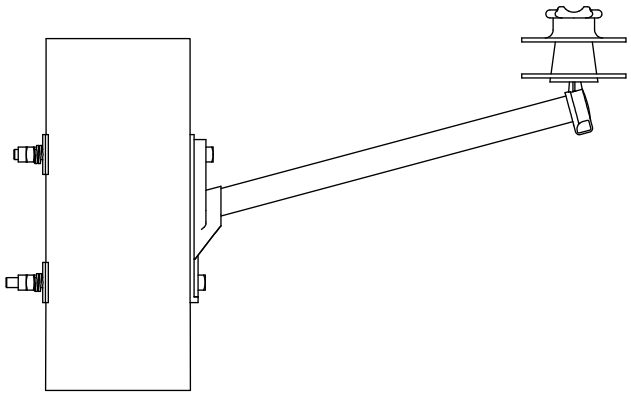
Table 5 - 1120 lb Line Angle Limit on Single Short Pin Insulator - Pole Top (34kV & 69kV)						
Conductor Size	**Ruling Span**					
	100'	**150'**	**200'**	**250'**	**300'**	**350'**
1/0 AAAC (Azusa)	47	37	30	25	21	17
336.4 ACSR (Merlin)	35	24	18	14	11	9
556 AAC (Dahlia)	46	17	11	9	8	7
954 ACSR (Rail)	30	14	10	7	5	4
1272 ACSR (Bittern)	29	13	8	6	4	3
T2-4/0 ACSR (T2 Penguin)	46	21	13	9	7	5
T2-336.4 ACSR (T2 Merlin)	22	14	10	7	6	4
T2-556 AAC (T2 Dahlia)	22	10	7	6	4	3
T2 954 ACSR (T2 Rail)	17	10	6	4	3	2
110.8 ACSR (Minorca)	47	29	21	16	13	11

DESIGN NOTE(s):

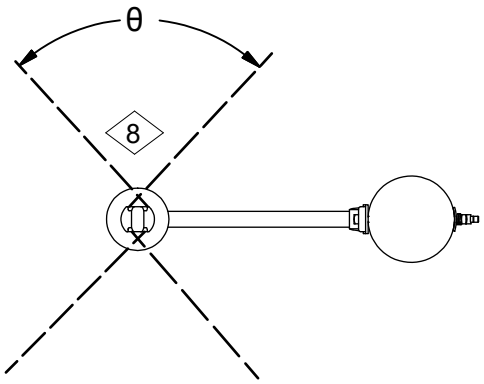
7. For standard construction, refer to DCS **06 34 01 05**.

8. Maximum tension caused by line angle of conductor is 1120lbs. For any cases above 1120lbs contact standards.

REV	DATE	ENG	DESCRIPTION
8	10/01/23	AEP	Converted to new format, Updated Tables
7	02/21/12	DCG	



Front View



Top View

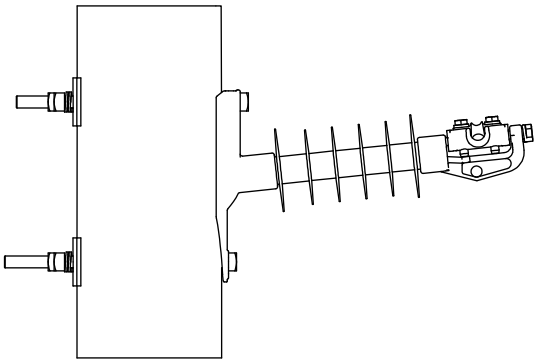
Table 6 - 1850 lb Line Angle Limit on Standoff Bracket Insulator (15kV)						
Conductor Size	**Ruling Span**					
	100'	**150'**	**200'**	**250'**	**300'**	**350'**
1/0 AAAC (Azusa)	86	67	55	45	39	32
336.4 ACSR (Merlin)	62	43	32	25	21	18
556 AAC (Dahlia)	84	30	21	17	15	14
954 ACSR (Rail)	52	25	18	14	11	8
1272 ACSR (Bittern)	52	24	15	11	8	7
T2-4/0 ACSR (T2 Penguin)	84	38	24	17	13	11
T2-336.4 ACSR (T2 Merlin)	39	25	18	14	11	9
T2-556 AAC (T2 Dahlia)	38	18	14	11	9	7
T2 954 ACSR (T2 Rail)	30	18	12	9	7	5
110.8 ACSR (Minorca)	85	52	38	29	24	21

DESIGN NOTE(s):

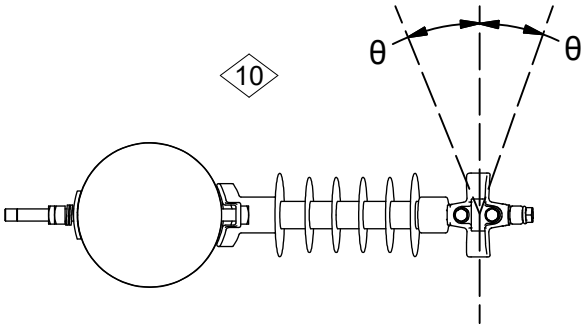
◇8.◇ Side tie in tension or compression on pin insulator of full tension take off unit.

9. Maximum tension caused by line angle of conductor is 1850lbs. For any cases above 1850lbs contact standards.

REV	DATE	ENG	DESCRIPTION
8	10/01/23	AEP	Converted to new format, Updated Tables
7	02/21/12	DCG	



Front View



Top View

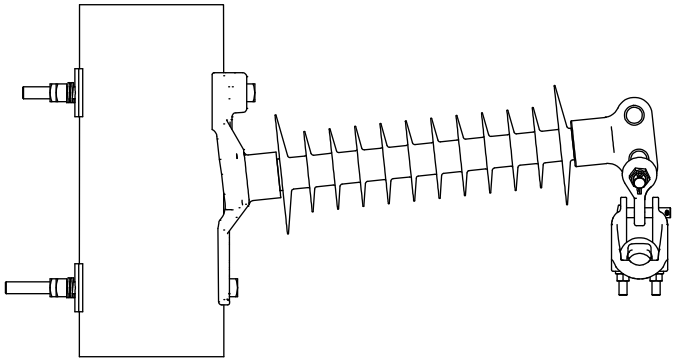
Table 7 - 2500 lb Line Angle Limit on Horizontal Line Post Insulator - Clamptop						
Conductor Size	**Ruling Span**					
	100'	**150'**	**200'**	**250'**	**300'**	**350'**
1/0 AAAC (Azusa)	20	20	20	20	20	20
336.4 ACSR (Merlin)	20	20	20	20	20	20
556 AAC (Dahlia)	20	20	20	20	20	20
954 ACSR (Rail)	20	20	20	19	16	12
1272 ACSR (Bittern)	20	20	20	16	12	10
T2-4/0 ACSR (T2 Penguin)	20	20	20	20	19	16
T2-336.4 ACSR (T2 Merlin)	20	20	20	19	16	13
T2-556 AAC (T2 Dahlia)	20	20	20	16	13	11
T2 954 ACSR (T2 Rail)	20	20	17	13	10	7
110.8 ACSR (Minorca)	20	20	20	20	20	20

DESIGN NOTE(s):

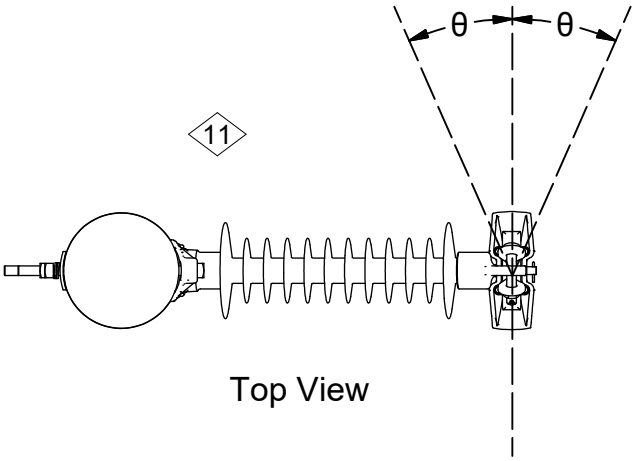
10. For standard construction in both compression and tension, refer to DCS **06 34 03 **** for 34kV and DCS **06 69 03 **** for 69kV.

11. Maximum tension caused by line angle of conductor is 2500lbs. For any cases above 2500lbs contact standards.

REV	DATE	ENG	DESCRIPTION
8	10/01/23	AEP	Converted to new format, Updated Tables
7	02/21/12	DCG	



Front View



Top View

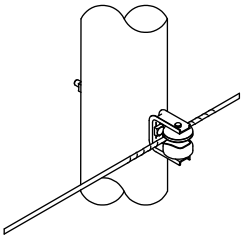
Table 8 - 5000 lb Line Angle Limit on Horizontal Line Post Insulator - Suspension						
Conductor Size	**Ruling Span**					
	100'	**150'**	**200'**	**250'**	**300'**	**350'**
1/0 AAAC (Azusa)	30	30	30	30	30	30
336.4 ACSR (Merlin)	30	30	30	30	30	30
556 AAC (Dahlia)	30	30	30	30	30	30
954 ACSR (Rail)	30	30	30	30	30	27
1272 ACSR (Bittern)	30	30	30	30	27	22
T2-4/0 ACSR (T2 Penguin)	30	30	30	30	30	30
T2-336.4 ACSR (T2 Merlin)	30	30	30	30	30	29
T2-556 AAC (T2 Dahlia)	30	30	30	30	29	25
T2 954 ACSR (T2 Rail)	30	30	30	29	22	16
110.8 ACSR (Minorca)	30	30	30	30	30	30

DESIGN NOTE(s):

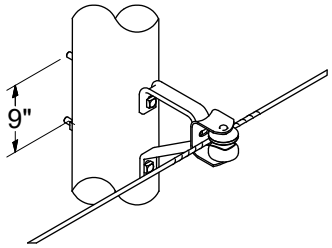
11. For standard construction in tension, refer to DCS **06 69 03 ****.

12. Maximum tension caused by line angle of conductor is 5000lbs. For any cases above 5000lbs contact standards.

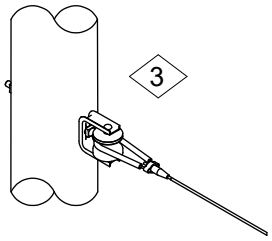
REV	DATE	ENG	DESCRIPTION
8	10/01/23	AEP	Converted to new format, Updated Tables
7	02/21/12	DCG	



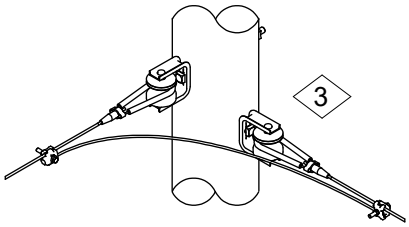
03 01 01 01



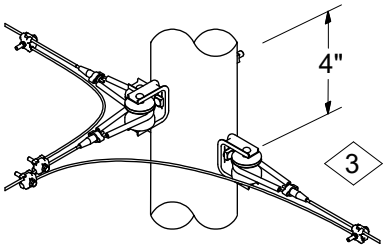
03 01 01 02



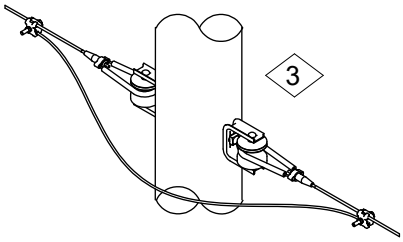
03 01 01 03



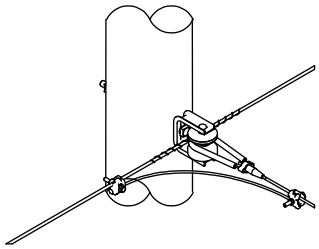
03 01 01 04



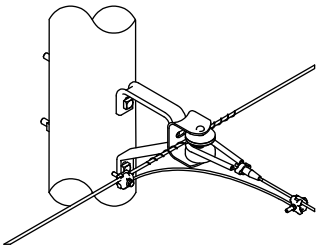
03 01 01 05



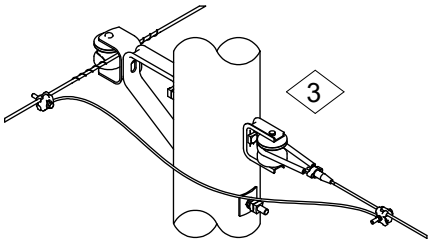
03 01 01 06



03 01 01 07



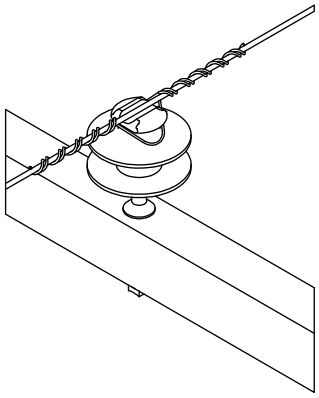
03 01 01 08



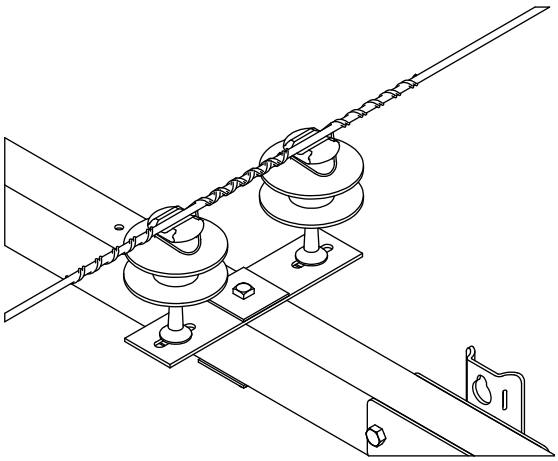
03 01 01 09

DCS #	DESCRIPTION
03 01 01 01	Thru
03 01 01 02	Thru w/ Extension
03 01 01 03	Deadend on Pole - Full Tension up to 2000 lbs
03 01 01 04	90° Angle
03 01 01 05	T-Corner
03 01 01 06	Looparound
03 01 01 07	Thru w/ Tap
03 01 01 08	Thru w/ Extension w/ Tap
03 01 01 09	Thru w/ Extension w/ Tap on Backside

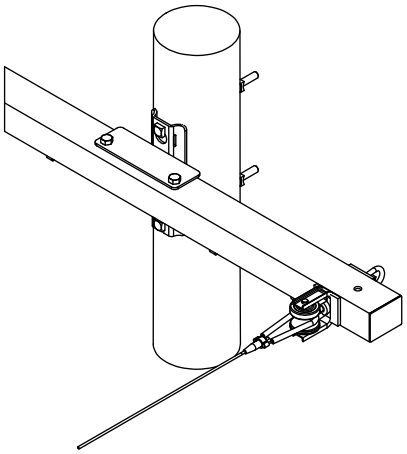
REV	DATE	ENG	DESCRIPTION
9	10/01/23	AEP	Converted to new format
8	05/19/16	EJB	



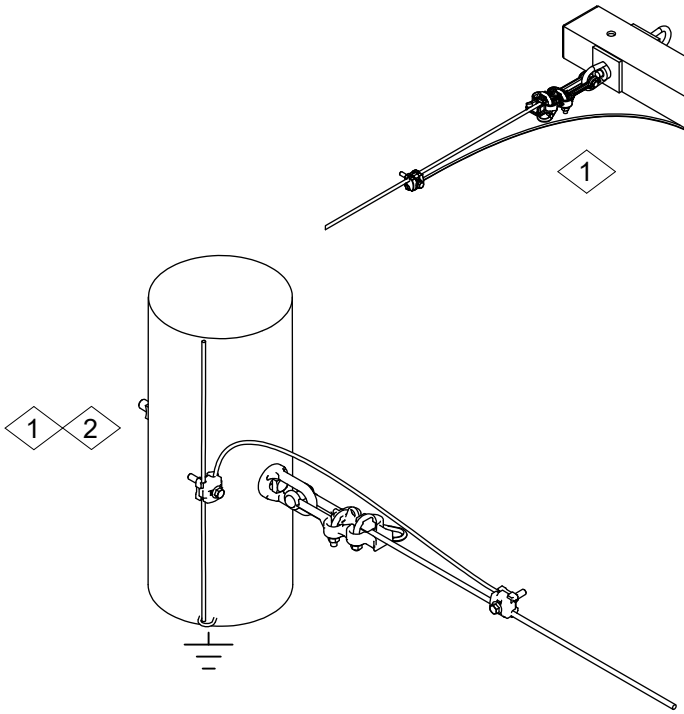
03 01 01 10



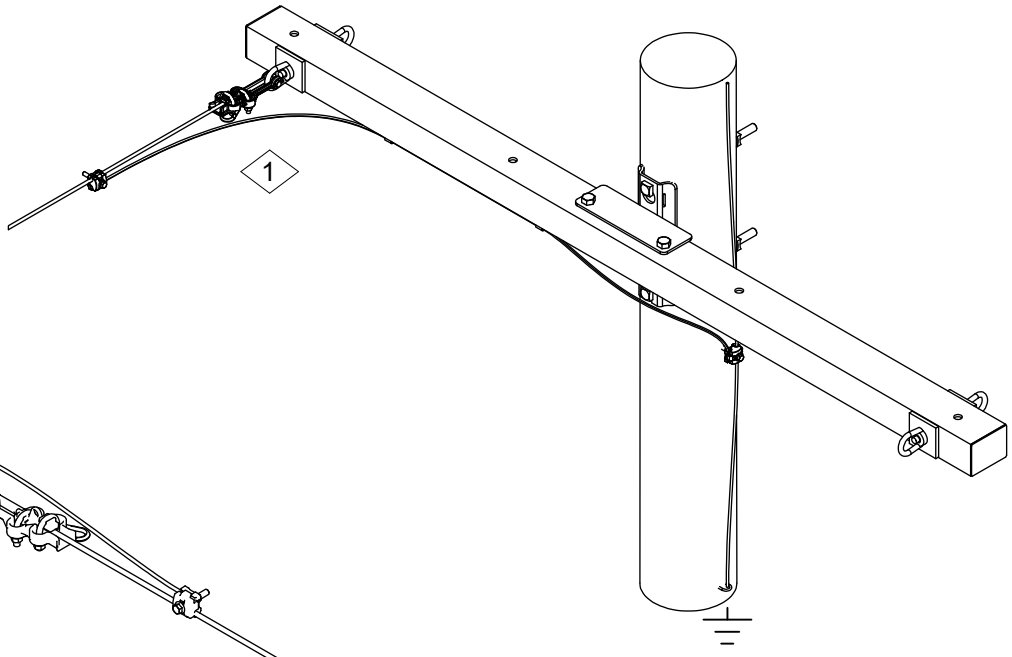
03 01 01 11



03 01 01 12



03 01 01 13



03 01 01 14

DCS #	DESCRIPTION
03 01 01 10	Thru Crossarm
03 01 01 11	Thru Double Pin on Crossarm
03 01 01 12	Deadend on Crossarm
03 01 01 13	Bolted Deadend - Slack Span or Tension > 2000 lbs
03 01 01 14	Bolted Deadend on Crossarm - Slack Span or Tension > 2000 lbs

REV	DATE	ENG	DESCRIPTION
9	10/01/23	AEP	Converted to new format
8	05/19/16	EJB	

	ITEM	STK / DCS #	DESCRIPTION 03 01 01 **	01	02	03	04	05	06	07	08	09	10	11	12	13	14
2	A	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	-	-	-	-	-	-	-	-	-	-	-	-	1	1
	B	23 59 095	Eyelet, 3/4"	-	-	-	-	-	-	-	-	-	-	-	-	1	-
	C	23 66 135	Lock Washer - 3/4" Double Coil	-	-	-	-	-	-	-	-	-	-	-	-	1	-
	D	23 65 042	Locknut, 3/4"	-	-	-	-	-	-	-	-	-	-	-	-	1	-
	E	23 66 031	Washer, Square, 3/4"	-	-	-	-	-	-	-	-	-	-	-	-	1	-
	F	23 66 027	Washer, Flat, Square, 5/8"	-	-	-	-	-	-	-	-	-	-	-	1	-	1
	G	23 52 318	Bolt, Mach., 5/8" x 6" w/ square nut	-	-	-	-	-	-	-	-	-	-	-	1	-	1
	H	23 65 043	Lock Nut - 5/8" Square	-	-	-	-	-	-	-	-	-	-	-	1	-	1
	I	23 66 134	Lock Washer - 5/8" Double Coil	-	-	-	-	-	-	-	-	-	-	-	1	-	1
	J	23 66 132	Washer, Flat, Sq., 4"x4", w/ 13/16" hole	-	-	-	-	-	-	-	-	-	-	-	1	-	2
	K	23 59 005	Eyelet, 5/8"	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	L	**06 01 01 01**	Single Clevis	1	-	1	2	1	-	1	-	1	-	-	1	-	-
	M	**06 01 01 03**	Single Clevis w/ Ext. Bracket	-	1	-	-	-	-	-	1	1	-	-	-	-	-
	N	**06 01 01 02**	Double Clevis	-	-	-	-	1	1	-	-	-	-	-	-	-	-
	O	**06 12 01 11 @**	Double Pin & Insulator - FG Crossarm	-	-	-	-	-	-	-	-	-	-	1	-	-	-
@	P	**06 12 01 01 @**	Single Pin & Insulator - Wood Crossarm	-	-	-	-	-	-	-	-	-	1	-	-	-	-
		06 12 01 02 @	Single Pin & Insulator - FG Crossarm	-	-	-	-	-	-	-	-	-	1	-	-	-	-
@	Q	**08 01 10 00 @**	Sec. Deadend, SDEA*W	-	-	1	2	3	2	1	1	1	-	-	-	-	-
@	R	**07 00 25 00 @**	Clamp, PG, PG*W	-	-	-	2	4	2	2	2	2	-	-	-	2	2
@	S	**07 00 41 00 @**	Insulator Ties, TT*W, DTT*W	-	-	-	-	-	-	-	-	-	1	1	-	-	-
@	T	**08 01 01 ** @**	Spool Ties, SPT*W	1	1	-	-	-	-	1	1	1	-	-	-	-	-
@	U	**07 00 11 00 @**	Clamp, Deadend, DEA*W	-	-	-	-	-	-	-	-	-	-	-	-	1	1
4,@	V	**12 00 10 ** @**	Grounding Unit	1	1	1	1	1	1	1	1	1	1	1	1	1	1

DESIGN NOTE(s):

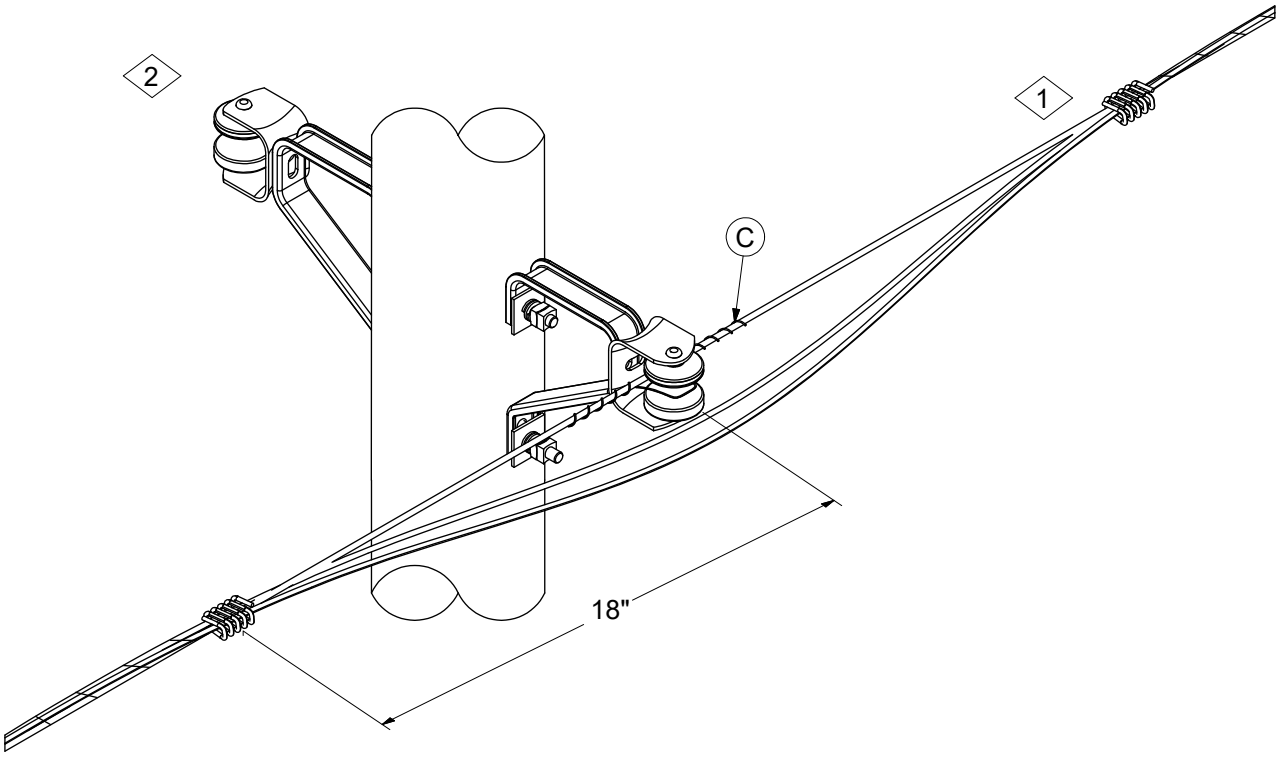
1. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

2. Use longer machine bolts for larger wood or composite poles if required.

3. If the deadend tension is $\geq$ 2000 lbs, use DCS **03 01 01 13**.

4. Pole grounds for distbution are required on each equipment pole and should be included on every 4th pole minimum per mile for adequate grounding. See DCS Section 12 for grounding applications.

REV	DATE	ENG	DESCRIPTION
9	10/01/23	AEP	Converted to new format
8	05/19/16	EJB	



DCS #	DESCRIPTION
03 01 03 01	Pre-assembled Secondary w/o Service Takeoff
03 01 03 02	Pre-assembled Secondary w/ Service Takeoff

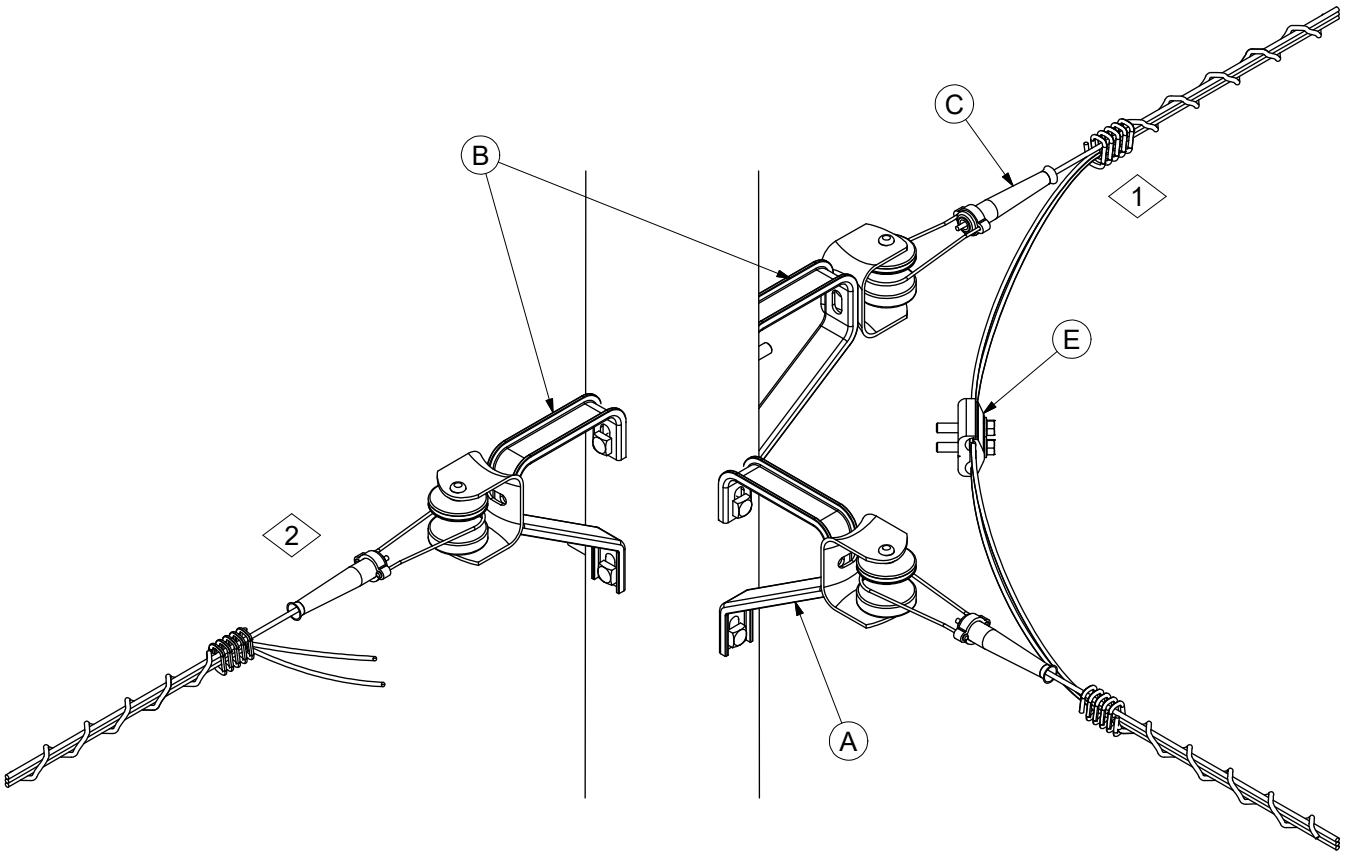
CONSTRUCTION NOTE(s):

1. Construction crew to open cable for distance of approximately 18", or more if needed, to allow room for making taps. Open cable only on side of pole where services are to be installed. Tape ends of conductors with rubber tape (Stock #25 53 080) followed by friction tape (Stock #25 53 003) and lash cable to messenger on both sides of opening with 5 close turns around entire cable and end on messenger with 2 turns and a half hitch.

2. For Service Construction Details, see DCS **09 01 34 00**.

ITEM	STK / DCS #	DESCRIPTION 03 01 03 **	01	02
A	**06 01 01 03**	Single Clevis w/ Extension Bracket	1	-
B	**06 01 01 04**	Double Clevis w/ Extension Bracket	-	1
C	**08 01 01 ** **	Tie, Preformed, SPT*W	1	1

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format
1	10/14/11	MJ	



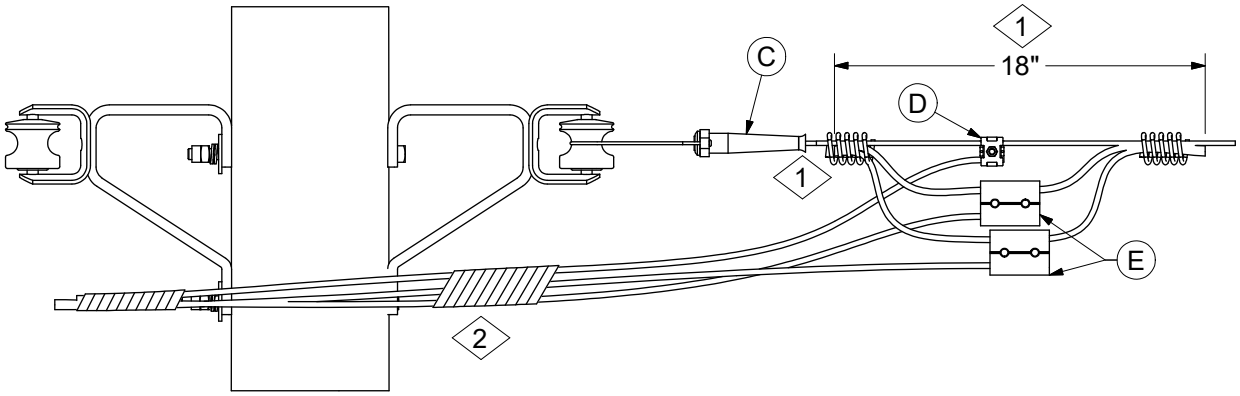
DCS #	DESCRIPTION
03 01 05 01	Pre-assembled Secondary Corner w/o Service Takeoff
03 01 05 02	Pre-assembled Secondary Corner w/ Service Takeoff

CONSTRUCTION NOTE(s):

1. Terminate lashing ribbon with 5 close turns around entire cable and end on messenger with two turns and a half hitch.

2. For more information on how to connect the service takeoff to the secondary, refer to DCS **09 01 30 00**.

ITEM	STK / DCS #	DESCRIPTION 03 01 05 **	01	02
A	**06 01 01 03**	Single Clevis w/ Extension Bracket	2	1
B	**06 01 01 04**	Double Clevis w/ Extension Bracket	-	1
C	23 78 333	Deadend - Automatic 1/0 AAAC (Bare)	2	2
	23 58 533	Deadend - Automatic 3/0 AAAC (Bare)	1	1
D	17 51 032	Clamp, PG, 1/0 AAAC	1	1
E	17 51 138	Clamp, PG , 4/0 AAAC, 3/0 AAAC	2	2



DCS #	DESCRIPTION
03 01 07 01	Pre-assembled Secondary Deadend w/o Service Takeoff
03 01 07 02	Pre-assembled Secondary Deadend w/ Service Takeoff

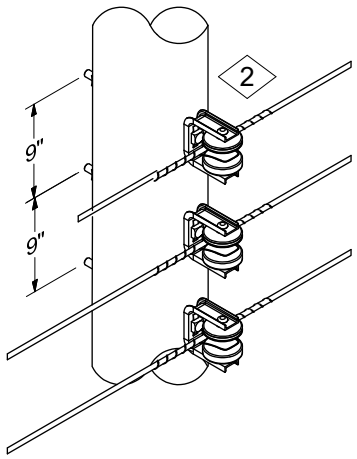
CONSTRUCTION NOTE(s):

1. Construction crew to open cable for distance of approximately 18", or more if needed, to allow room for making taps. Open cable only on side of pole where services are to be installed. Tape ends of conductors with rubber tape (Stock #25 53 080) followed by friction tape (Stock #25 53 003) and lash cable to messenger on both sides of opening with 5 close turns around entire cable and end on messenger with 2 turns and a half hitch.

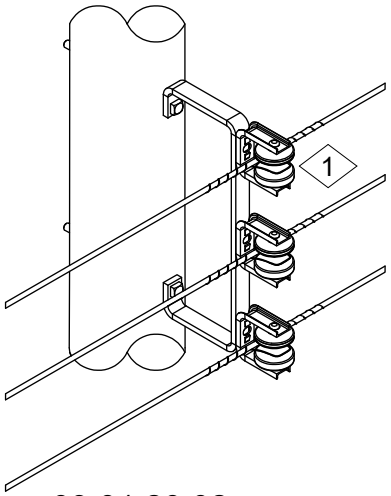
2. Bunch same phase wires to form a cable and tape as necessary.

ITEM	STK / DCS #	DESCRIPTION 03 01 07 **	01	02
A	**06 01 01 03**	Single Clevis w/ Extension Bracket	1	-
B	**06 01 01 04**	Double Clevis w/ Extension Bracket	-	1
C	23 78 333	Deadend - Automatic 1/0 AAAC (Bare)	1	1
	23 68 533	Deadend - Automatic 3/0 AAAC (Bare)	1	1
D	17 51 032	Clamp, PG, 1/0 AAAC	1	1
E	17 51 138	Clamp, PG, 4/0 AAAC, 3/0 AAAC	2	2

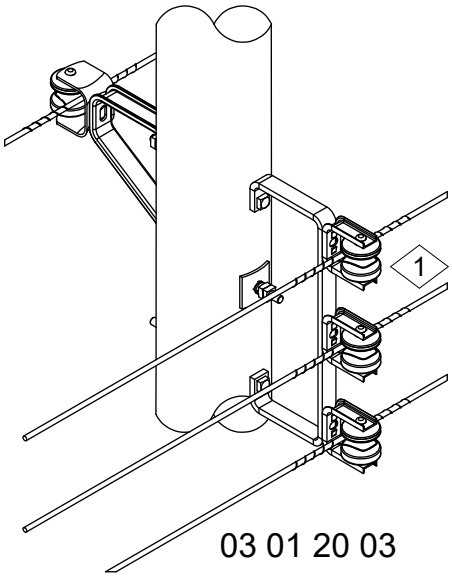
REV	DATE	ENG	DESCRIPTION
1	10/01/23	AEP	Converted to new format, Revised BOM
0	10/14/11	MJ	



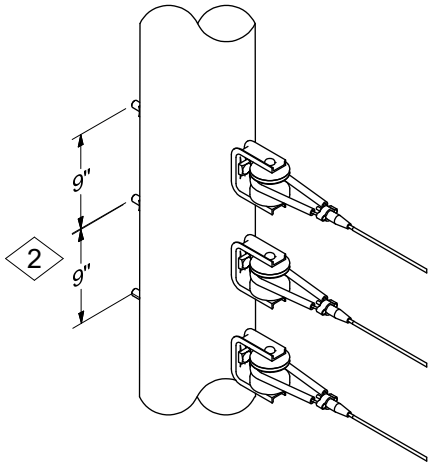
03 01 20 01



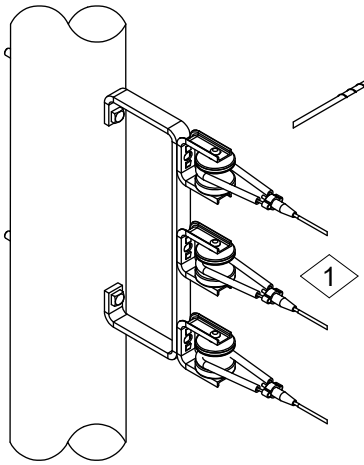
03 01 20 02



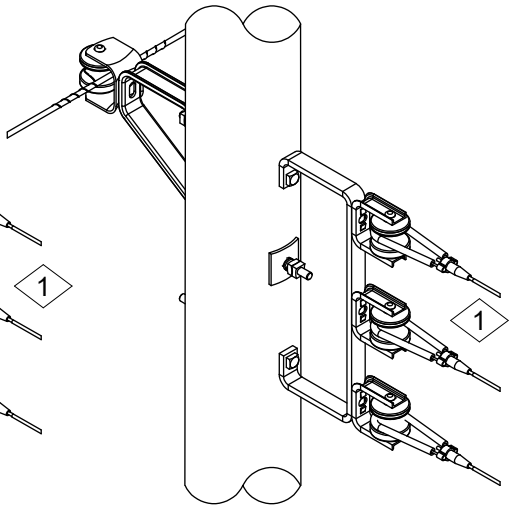
03 01 20 03



03 01 20 04



03 01 20 05



03 01 20 06

DCS#	DESCRIPTION
03 01 20 01	3-Wire Assembly Thru
03 01 20 02	3-Wire Rack Thru w/ Extension
03 03 20 03	3-Wire Rack Thru & Service w/ Extension
03 01 20 04	3-Wire Assembly Deadend
03 01 20 05	3-Wire Rack Deadend w/ Extension
03 01 20 06	3-Wire Rack Deadend & Service w/ Extension

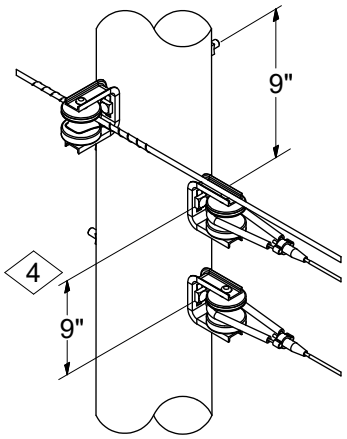
CONSTRUCTION NOTE(s):

1. Reinforce with DA bolt for deadends, span guys, side strain, or line angles in excess of 5°.

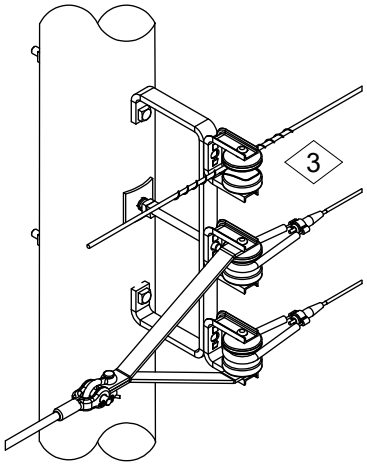
2. When multiple secondary racks are installed on the same side of the pole, a 9" separation is required between the racks.

	ITEM	STK / DCS #	DESCRIPTION 03 01 20 **	01	02	03	04	05	06
	A	**06 01 01 01**	Single Clevis	3	-	-	3	-	-
	B	**06 01 03 01 @**	Single 3-Wire Rack w/ Ext. Bracket	-	1	-	-	1	-
	C	**06 01 03 02 @**	3-Wire Rack w/ Single Clevis & Ext. Bracket	-	-	1	-	-	1
	D	**06 01 03 03 @**	Double 3-Wire Rack w/ Extension Bracket	-	-	-	-	-	-
	E	**06 01 03 04**	Single 3-Wire Rack	-	-	-	-	-	-
	F	**06 01 07 02 @**	4-Wire Secondary Assembly w/ Ext.	-	-	-	-	-	-
	G	**06 01 07 03 @**	4-Wire Secondary Assembly w/ Ext. - Double	-	-	-	-	-	-
@	H	**11 00 49 0* @**	Secondary Ext. Guy	-	-	-	-	-	-
@	I	**08 01 10 00 @**	Secondary Deadend, SDEA*W	-	-	-	3	3	3

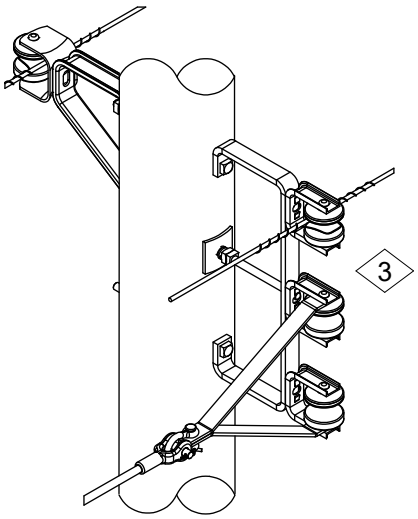
REV	DATE	ENG	DESCRIPTION
4	10/01/23	AEP	Converted to new format
3	10/14/11	MJ	



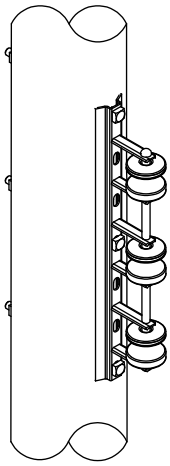
03 01 20 07



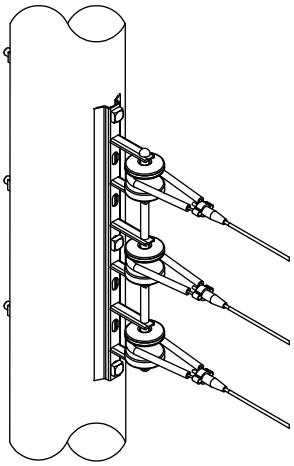
03 01 20 08



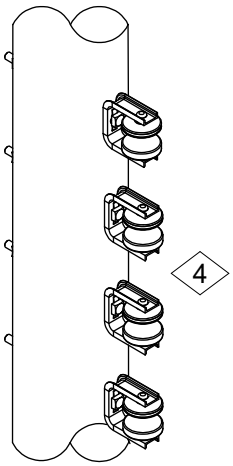
03 01 20 09



03 01 20 10



03 01 20 11



03 01 20 12

DCS #	DESCRIPTION
03 01 20 07	Neutral Thru w/ Secondary Deadend
03 01 20 08	Neutral Thru w/ Secondary Deadend w/ Extension
03 01 20 09	Neutral Thru w/ Secondary Deadend & Service w/ Extension
03 01 20 10	3-Wire Rack Thru w/o Extension
03 01 20 11	3-Wire Rack Deadend w/o Extension
03 01 20 12	4-Wire Assembly Thru
03 01 20 13	3-Wire Rack w/ Extension - Double
03 01 20 14	4-Wire Assembly w/ Extension
03 01 20 15	4-Wire Assembly w/ Extension - Double

REV	DATE	ENG	DESCRIPTION
4	10/01/23	AEP	Converted to new format
3	10/14/11	MJ	

CONSTRUCTION NOTE(s):

3. Reinforce with DA bolt for deadends, span guys, side strain, or line angles in excess of 5°.

4. When multiple secondary racks are installed on the same side of the pole, a 9" separation is required between the racks.

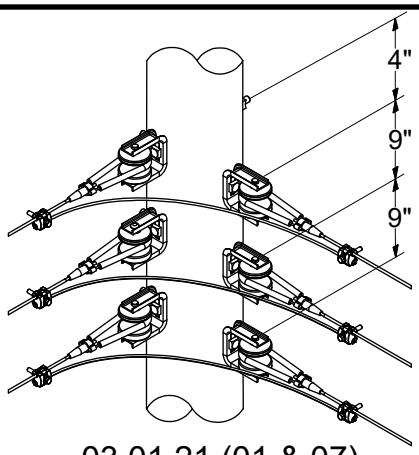
	ITEM	STK / DCS #	DESCRIPTION 03 01 20 **	07	08	09	10	11	12	13	14	15
	A	**06 01 01 01**	Single Clevis	3	-	-	-	-	4	-	-	-
	B	**06 01 03 01 @**	Single 3-Wire Rack w/ Ext. Bracket	-	1	-	-	-	-	-	-	-
	C	**06 01 03 02 @**	3-Wire Rack w/ Single Clevis & Ext. Bracket	-	-	1	-	-	-	-	-	-
	D	**06 01 03 03 @**	Double 3-Wire Rack w/ Extension Bracket	-	-	-	-	-	-	2	-	-
	E	**06 01 03 04**	Single 3-Wire Rack	-	-	-	1	1	-	-	-	-
	F	**06 01 07 02 @**	4-Wire Secondary Assembly w/ Ext.	-	-	-	-	-	-	-	1	-
	G	**06 01 07 03 @**	4-Wire Secondary Assembly w/ Ext. - Double	-	-	-	-	-	-	-	-	1
@	H	**11 00 49 0* @**	Secondary Ext. Guy	-	1	1	-	-	-	-	-	-
@	I	**08 01 10 00 @**	Secondary Deadend, SDEA*W	2	2	2	-	3	-	-	-	-

REV	DATE	ENG	DESCRIPTION
4	10/01/23	AEP	Converted to new format
3	10/14/11	MJ	

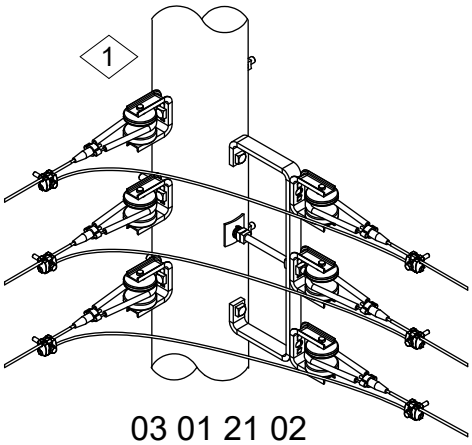
CONFIGURATIONS

Open Wire Secondary Assembly
90° Corner

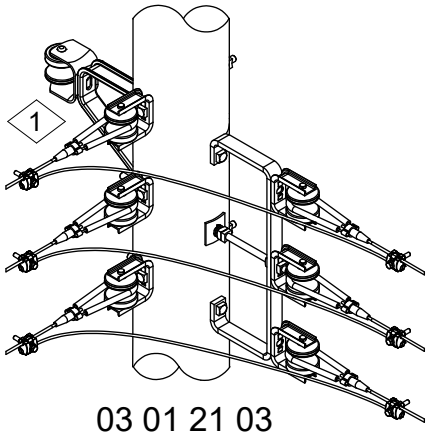
03 01 21 **
600V
1 of 1



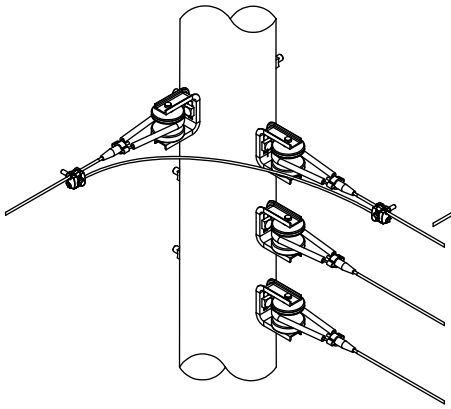
03 01 21 (01 & 07)



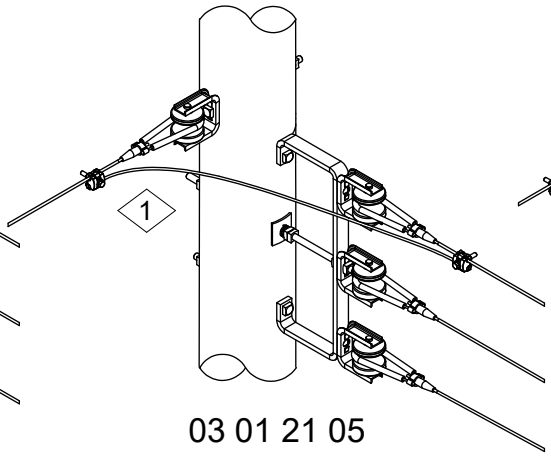
03 01 21 02



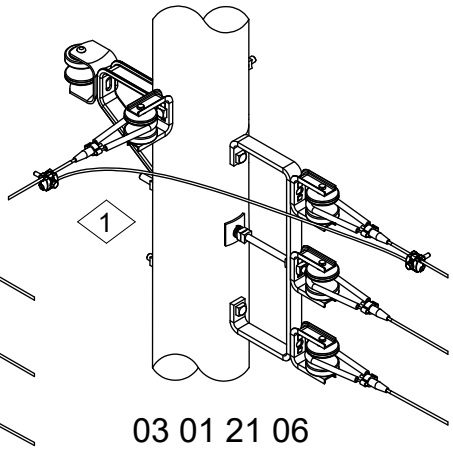
03 01 21 03



03 01 21 (04 & 08)



03 01 21 05



03 01 21 06

DCS #	DESCRIPTION
03 01 21 01	3-Wire Assembly Deadend Angle
03 01 21 02	3-Wire Assembly Deadend Angle w/ Ext.
03 01 21 03	3-Wire Assembly Deadend Angle & Service w/ Ext.
03 01 21 04	3-Wire Assembly Deadend w/ Single Neutral Angle
03 01 21 05	3-Wire Assembly Deadend w/ Single Neutral Angle w/ Ext.
03 01 21 06	3-Wire Assembly Deadend & Service w/ Single Neutral Angle w/ Ext.
03 01 21 07	3-Wire Assembly w/ 3-Wire Rack Deadend Angle
03 01 21 08	3-Wire Rack Deadend w/ Single Neutral Angle

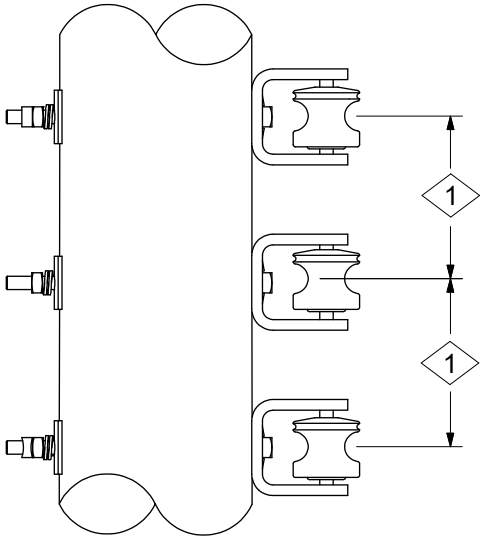
CONSTRUCTION NOTE(s):

1. Reinforce with DA bolt for deadends, span guys, side strain, or line angles in excess of 5°.

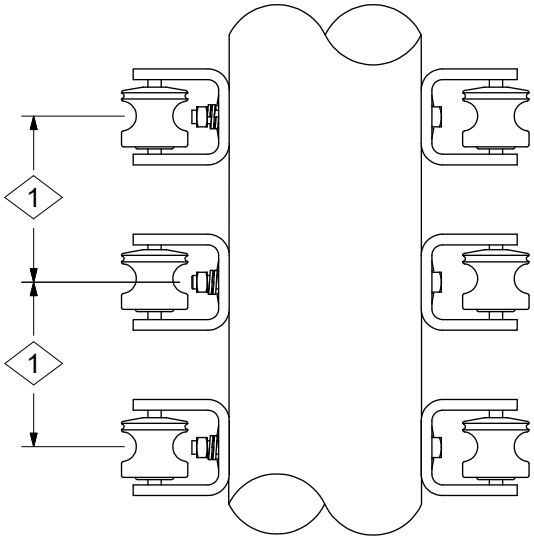
	ITEM	STK / DCS #	DESCRIPTION 03 01 21 **	01	02	03	04	05	06	07	08
	A	**06 01 01 01**	Single Clevis	6	3	3	4	1	1	3	1
	B	**06 01 03 01 @**	Single 3-Wire Rack w/ Extention Bracket	-	1	-	-	1	-	-	-
	C	**06 01 03 02 @**	3-Wire Rack w/ Single Clevis & Ext. Bracket	-	-	1	-	-	1	-	-
	D	**06 01 03 04**	Single 3-Wire Rack	-	-	-	-	-	-	1	1
@	E	**08 01 10 00 @**	Secondary Deadend, SDEA*W	6	6	6	4	4	4	6	4

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format
2	10/14/11	MJ	



03 01 25 01



03 01 25 02

CONSTRUCTION NOTE(s):

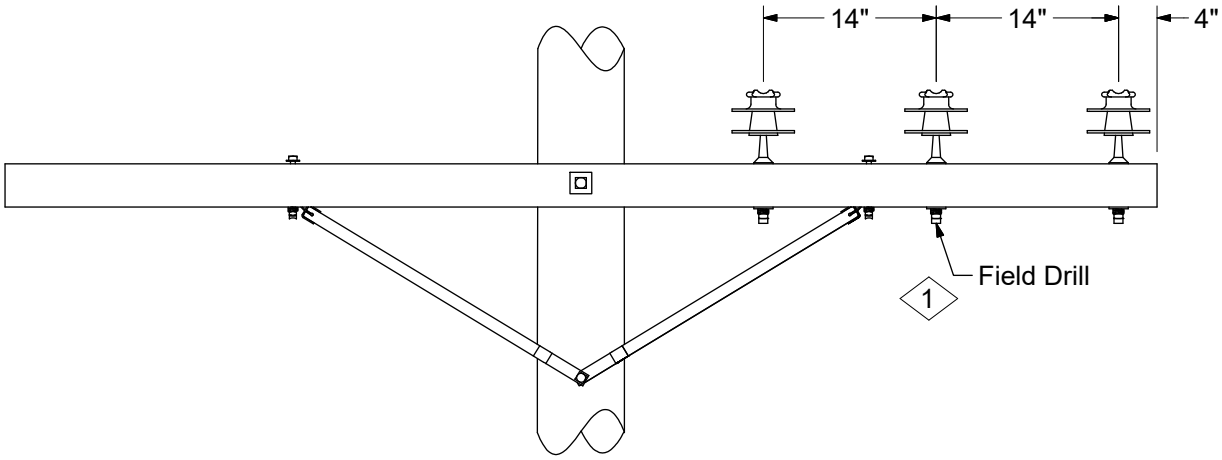
1. Distance between clevises shall be as follows:
   - A. 9” for up to 200 Ft. Spans
   - B. 12” for 200 Ft. to 250 Ft. Spans
   - C. 18” for 250 Ft. to 350 Ft. Spans
   - D. 24” for 350 Ft. to 400 Ft. Spans

2. For location of secondary clevises on rack with respect to primary circuits, see DCS **29 00 17 08**.

3. This construction is applicable to only those cases where climbing space can be obtained without use of secondary extension bracket.

ITEM	STK / DCS #	DESCRIPTION 03 01 25 **	01	02
A	**06 01 01 01**	Single Clevis	3	-
	06 01 01 02	Double Clevis	-	3

REV	DATE	ENG	DESCRIPTION
8	10/01/23	AEP	Converted to new format
7	10/14/11	MJ	



03 01 26 03
8'-0" Single Wood Arm

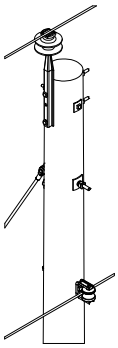
03 01 26 05
10'-0" Single Wood Arm

CONSTRUCTION NOTE(s):

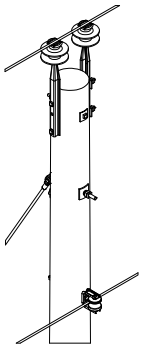
1. This construction to be used only where existing facilities prohibit the use of secondary racks or clevises.

2. For location of secondary arms with respect to primary circuits, see DCS **29 00 17 09**.

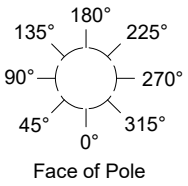
	ITEM	STK / DCS #	DESCRIPTION 03 01 26 **	03	05
	A	**04 00 20 02 @**	8' Single Wood Arm	1	-
		04 00 20 03 @	10' Single Wood Arm	-	1
	B	**06 12 01 01**	Single Pin & Insulator - Wood Crossarm	3	3
@	C	**07 00 41 00 @**	Top Ties, TT*W	3	3

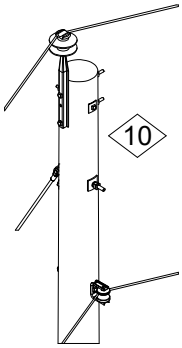


03 12 01 01

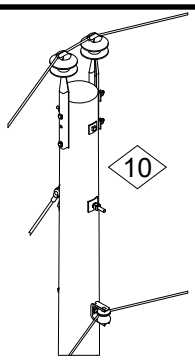


03 12 01 03

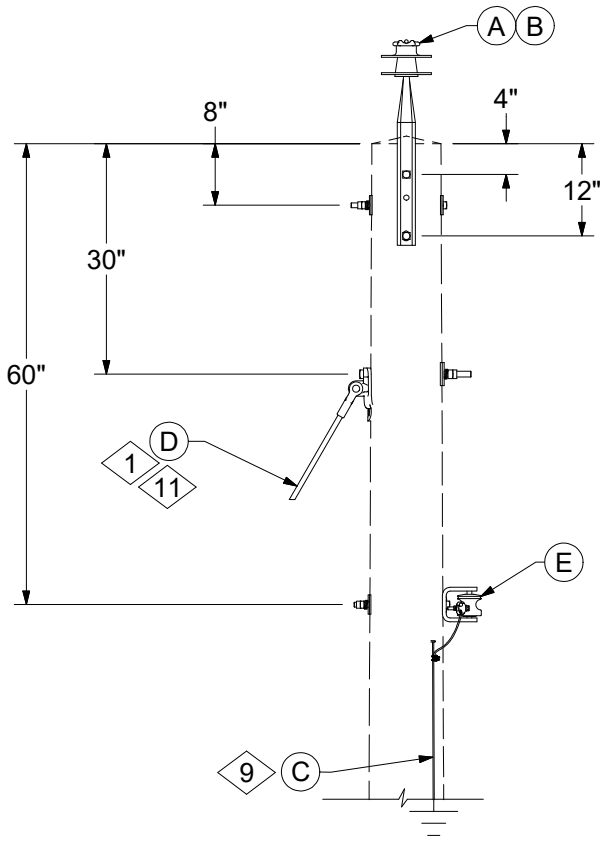




03 12 01 02



03 12 01 22



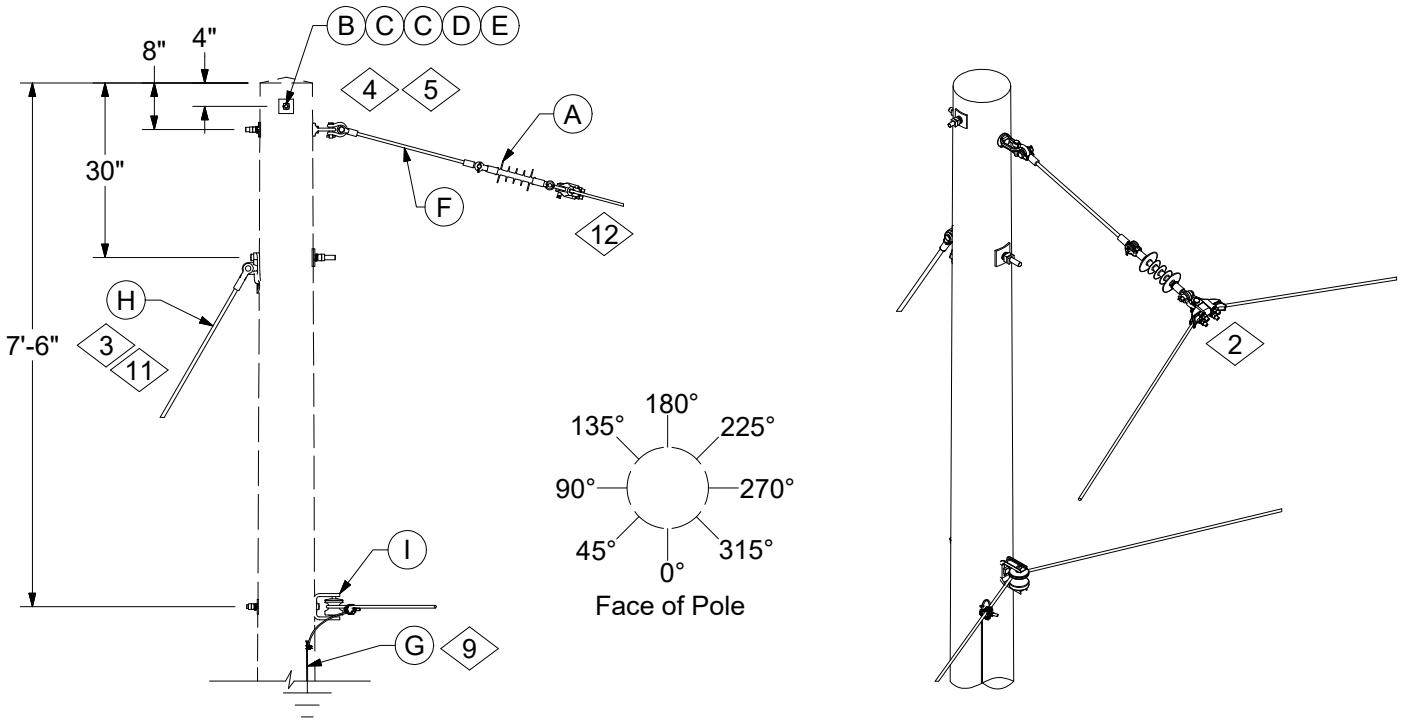
DCS #	DESCRIPTION
03 12 01 01	Single Pole Top Pin - Tangent
03 12 01 02	Single Pole Top Pin - Angle
03 12 01 03	Double Pole Top Pin - Tangent
03 12 01 22	Double Pole Top Pin - Angle

CONSTRUCTION NOTE(s):

1. See DCS **11 00 02 02** for typical guy insulator placement.

	ITEM	STK / DCS #	DESCRIPTION 03 12 01 **	01	02	03	22
	A	**06 12 01 02**	Single Pole Top Pin & Insulator	1	1	-	-
		06 12 01 13	Double Pole Top Pin & Insulator	-	-	1	1
	B	**07 00 41 00 @**	Single Top Tie, TT*W	1	-	-	-
@			Single Side Tie, ST*W	-	1	-	-
			Double Top Tie, DTT*W	-	-	1	-
			Double Side Tie, DST*W	-	-	-	1
9,13,@	C	**12 00 10 ** @**	Grounding Unit	1	1	1	1
1,@	D	**11 00 4* ** @**	Guying Unit	-	#	-	#
@	E	**03 01 01 ** @**	Neutral	1	1	1	1

REV	DATE	ENG	DESCRIPTION
12	10/01/23	AEP	Converted to new format
11	04/01/19	KR	



03 12 01 20 ◇12◇
Floating Angle

CONSTRUCTION NOTE(s):

◇2.◇ For ACSR, AAAC, and AAC conductors where spans exceed 300 feet, see DCS **07 00 08 01** for application of armor rods.

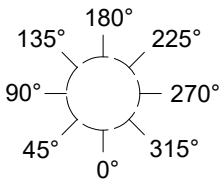
◇3.◇ See DCS **11 00 02 02** for typical guy insulator placement.

◇4.◇ Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

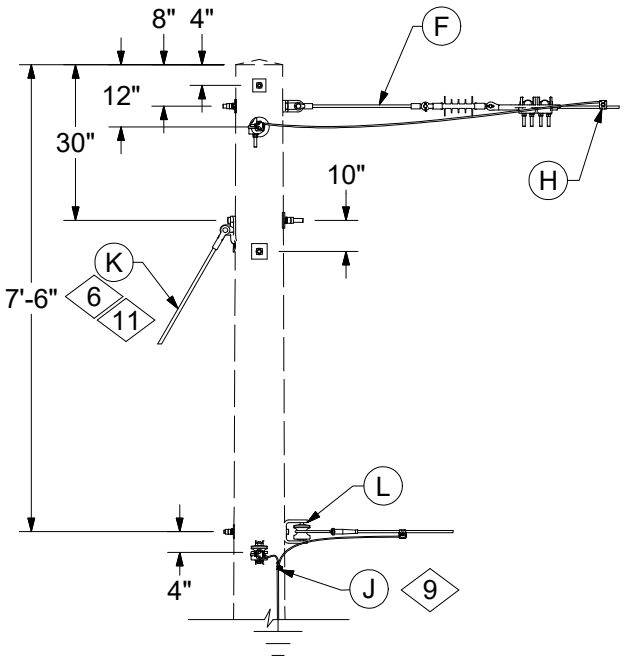
◇5.◇ Use longer machine bolts for larger wood or composite poles if required.

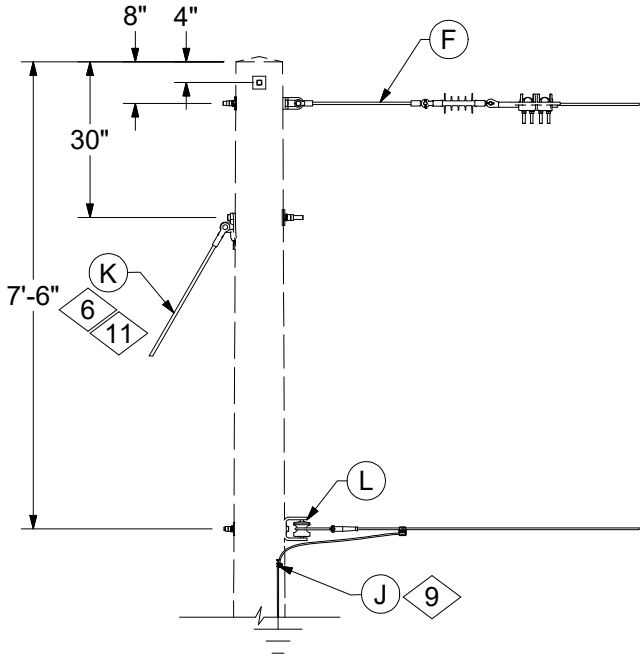
	ITEM	STK / DCS #	DESCRIPTION 03 12 01 **	20
	A	**06 12 30 02** @	Insulator, Floating Angle	1
4,5	B	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut (anti-split bolt)	1
4,5	C	23 66 207	Washer, Curved, Square, 5/8"	2
4,5	D	23 66 134	Lock Washer - 5/8" Double Coil	1
4,5	E	23 65 043	Lock Nut - 5/8" Square	1
	F	25 56 076	Insulator, Guy Strain, 26"	1
9,13,@	G	**12 00 10** ** @	Grounding Unit	1
3,@	H	**11 00 4*** ** @	Guying Unit	#
@	I	**03 01 01** ** @	Neutral	1

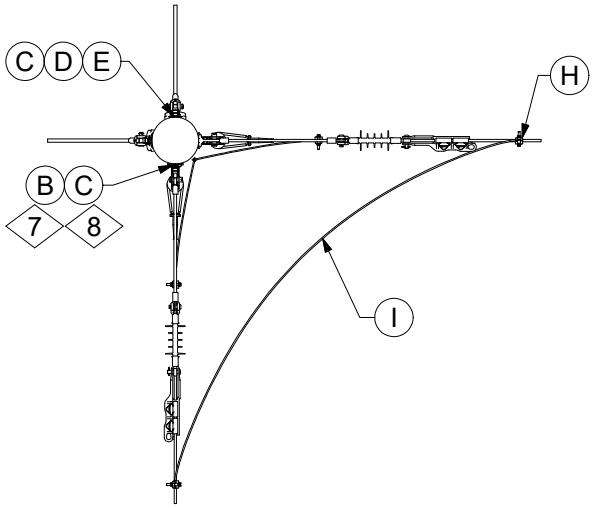
REV	DATE	ENG	DESCRIPTION
12	10/01/23	AEP	Converted to new format
11	04/01/19	KR	



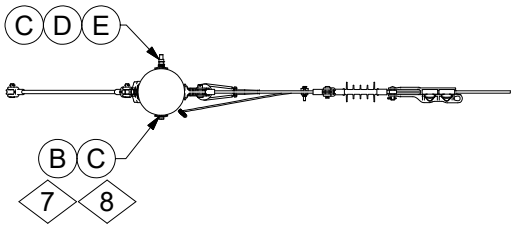
Face of Pole





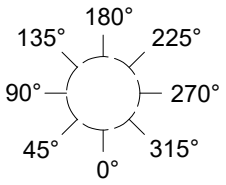


03 12 01 05
90-Degree Angle Double Deadend

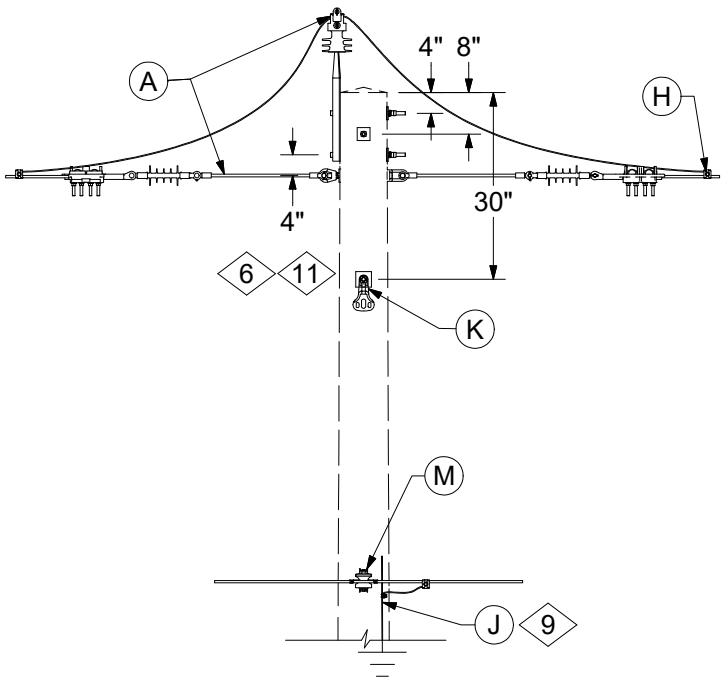


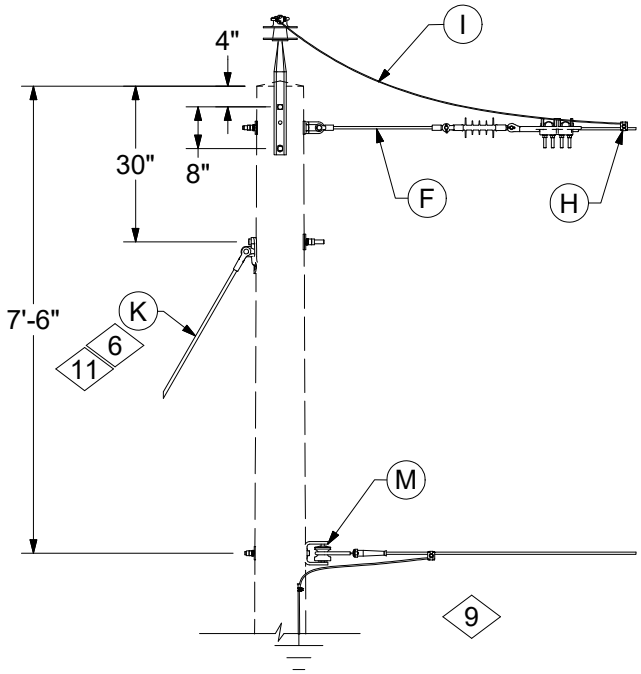
03 12 01 06
Single Deadend

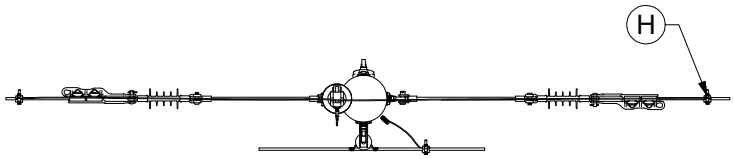
REV	DATE	ENG	DESCRIPTION
12	10/01/23	AEP	Converted to new format
11	04/01/19	KR	



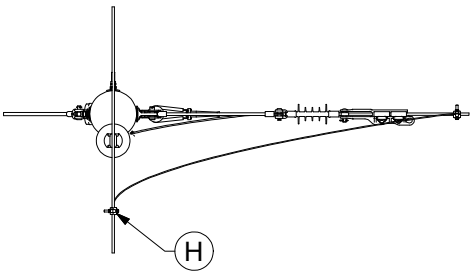
Face of Pole







03 12 01 07
Double Deadend Loopover



03 12 01 08
Single Phase Tap

REV	DATE	ENG	DESCRIPTION
12	10/01/23	AEP	Converted to new format
11	04/01/19	KR	

CONSTRUCTION NOTE(s):

6. See DCS **11 00 02 02** for typical guy insulator placement.

7. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

8. Use longer machine bolts for larger wood or composite poles if required.

	ITEM	STK / DCS #	DESCRIPTION 03 12 01 **	05	06	07	08
	A	**06 12 30 04** @	Pole Top, Loopover w/ FG Extension	-	-	1	-
7,8	B	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut (anti-split bolt)	1	1	-	-
7,8	C	23 66 207	Washer, Curved, Square, 5/8"	2	2	-	-
7,8	D	23 66 134	Lock Washer - 5/8" Double Coil	1	1	-	-
7,8	E	23 65 043	Lock Nut - 5/8" Square	1	1	-	-
@	F	**06 12 30 01** @	Deadend w/ FG Extension	2	1	-	1
@	G	**07 00 41 00** @	Top Tie, TT*W	-	-	-	1
@	H	**07 00 25 00** @	Clamp, Parallel Groove, PG*W	2	-	2	2
@	I	**07 00 80 00** @	Wire, Poly Covered, (Ft.), PLW*W	10	-	10	5
9,13,@	J	**12 00 10 **** @	Grounding Unit	1	1	1	1
6,@	K	**11 00 4* **** @	Guying Unit	#	#	#	#
@	L	**07 00 21 00** @	Hot Line Clamp, HLC*W	#	#	#	#
@	M	**03 01 01 **** @	Neutral	2	1	1	1
	N	252, 255, or 260	Op Code, Install Jumper	1	-	1	1

DESIGN NOTE(s):

9. Composite pole has factory installed (internal) pole ground in the 45° quadrant. Wood pole may require pole ground depending on application.

10. See DCS **03 00 03 00** for angle and span length limitations.

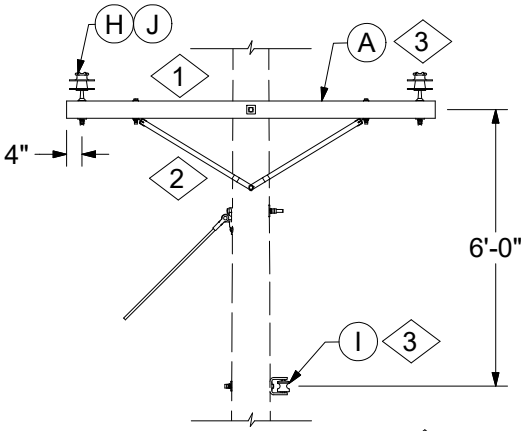
11. See DCS **02 00 04 02** for unguyed composite pole application.

12. See DCS **07 00 16 00** for angle limitations.

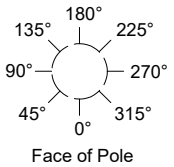
13. Pole grounds for distribution are required on each equipment pole and should be included on every 4th pole per mile for adequate grounding. See Section 12 for grounding applications.

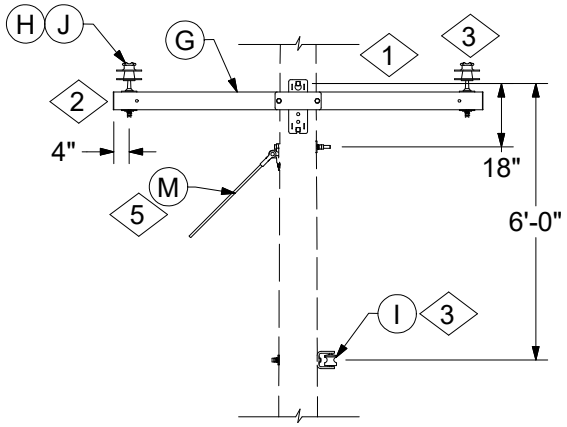
CONFIGURATIONS
Single Phase - Underbuild

03 12 02 **
15kV
1 of 2



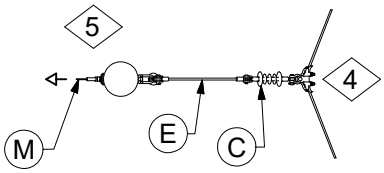
03 12 02 (01 & 11) 6

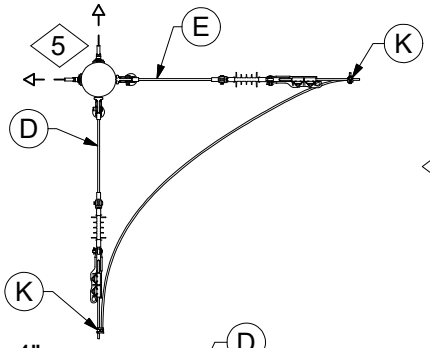


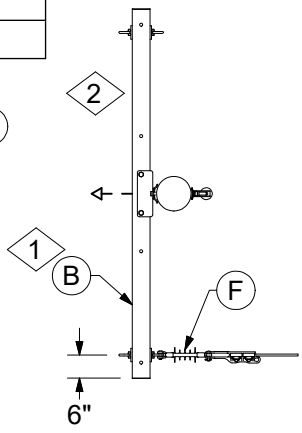


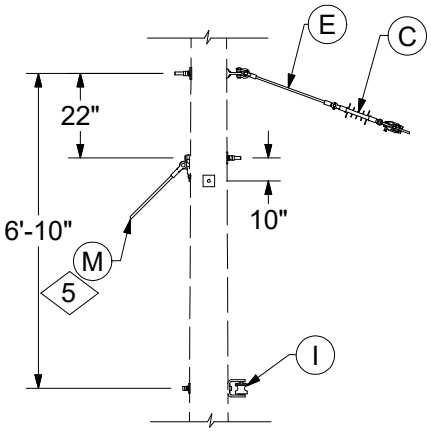
03 12 02 (03, 08, 09, 13, 14, & 15) 6

DCS #	DESCRIPTION
03 12 02 01	Tangent Single Pin - 8' Wood Crossarm
03 12 02 03	Angle Double Pin - 8' FG Crossarm
03 12 02 08	Tangent Single Pin - 8' FG Crossarm
03 12 02 09	Angle Single Pin - 8' FG Crossarm
03 12 02 11	Tangent Single Pin - 10' Wood Crossarm
03 12 02 13	Angle Double Pin - 10' FG Crossarm
03 12 02 14	Tangent Single Pin - 10' FG Crossarm
03 12 02 15	Angle Single Pin - 10' FG Crossarm

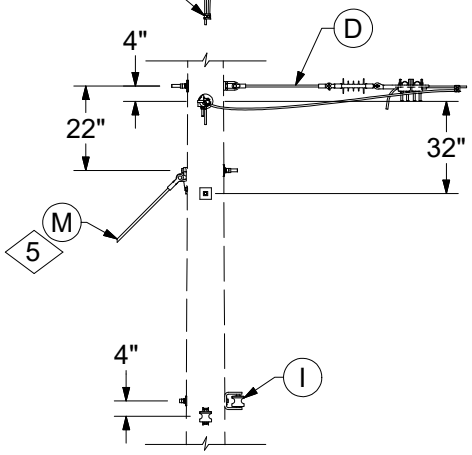




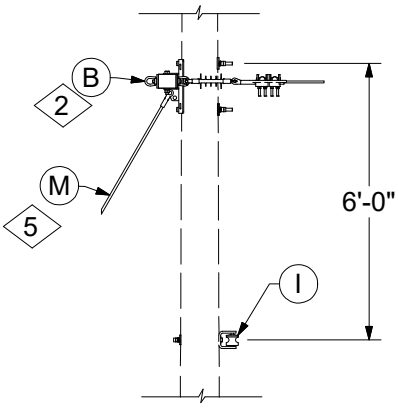




03 12 02 04 6
Floating Angle



03 12 02 05
90-Degree Corner



03 12 02 06
Single Deadend w/ Neutral - 8' FG Crossarm
03 12 02 16
Single Deadend w/ Neutral - 10' FG Crossarm

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
10	10/01/23	AEP	Converted to new format
9	03/27/18	KR	

CONSTRUCTION NOTE(s):

1. 8'-0" crossarm available for use in Ameren Missouri only.

2. See DCS **04 00 01 01** for crossarm selection options and loading requirements.

3. If neutral installed below arm, omit one pin insulator and see DCS **03 01 01 ****** for neutral materials.

4. For ACSR, AAAC, and AAC conductors where spans exceed 300 feet, see DCS **07 00 08 01** for application of armor rods.

5. See DCS **11 00 02 02** for typical guy insulator placement.

	ITEM	STK / DCS #	DESCRIPTION 03 12 02 **	01	03	04	05	06	08	09	11	13	14	15	16
1,2	A	**04 00 20 02** @	8' Single Wood Arm	1	-	-	-	-	-	-	-	-	-	-	-
		04 00 20 03 @	10' Single Wood Arm	-	-	-	-	-	-	-	1	-	-	-	-
1,2	B	**04 00 42 02** @	8' Deadend FG Crossarm	-	-	-	-	1	-	-	-	-	-	-	-
		04 00 42 03 @	10' Deadend FG Crossarm	-	-		-	-	-	-	-	-	-	-	1
	C	**06 12 30 02** @	Insulator, Floating Angle	-	-	1	-	-	-	-	-	-	-	-	-
	D	**06 12 30 01** @	Straight Deadend w/ FG Extension	-	-	-	2	-	-	-	-	-	-	-	-
	E	25 56 076	Insulator, Guy Strain, 26"	-	-	1	-	-	-	-	-	-	-	-	-
	F	**06 12 35 01** @	Single Deadend	-	-	-	-	1	-	-	-	-	-	-	1
1,2	G	**04 00 41 14** @	Crossarm, Tangent, FG, 8'	-	1	-	-	-	1	1	-	-	-	-	-
		04 00 41 16 @	Crossarm, Tangent, FG, 10'	-	-	-	-	-	-	-	-	1	1	1	-
3,6,@	H	**06 12 01 01** @	Single Pin & Insulator - Wood Arm	#	-	-	-	-	-	-	#	-	-	-	-
		06 12 01 11 @	Double Pin & Insulator - FG Arm	-	#	-	-	-	-	-	-	#	-	-	-
		06 12 01 12 @	Single Pin & Insulator - FG Arm	-	-	-	-	-	#	#	-	-	#	#	-
3,@	I	**03 01 01 ****** @	Neutral	1	1	1	2	1	1	1	1	1	1	1	1
@	J	**07 00 41 00** @	Sgl Top Tie, TT*W	2	-	-	-	-	2	-	2	-	2	-	-
			Sgl Side Tie, ST*W	-	-	-	-	-	-	2	-	-	-	2	-
			Double Top Tie, DTT*W	-	-	-	-	-	-	-	-	-	-	-	-
			Double Side Tie, DST*W	-	2	-	-	-	-	-	-	2	-	-	-
@	K	**07 00 25 00** @	Clamp, PG, PG*W	-	-	-	2	-	-	-	-	-	-	-	-
@	L	**07 00 80 00** @	Wire, Poly Covered, Ft., PLW*W	-	-	-	#	-	-	-	-	-	-	-	-
5,@	M	**11 00 4* ****** @	Guying Unit	-	#	#	#	#	-	#	-	#	-	#	#
	N	252, 255, or 260	Op Code, Install Jumper	-	-	-	1	-	-	-	-	-	-	-	-

DESIGN NOTE(s):

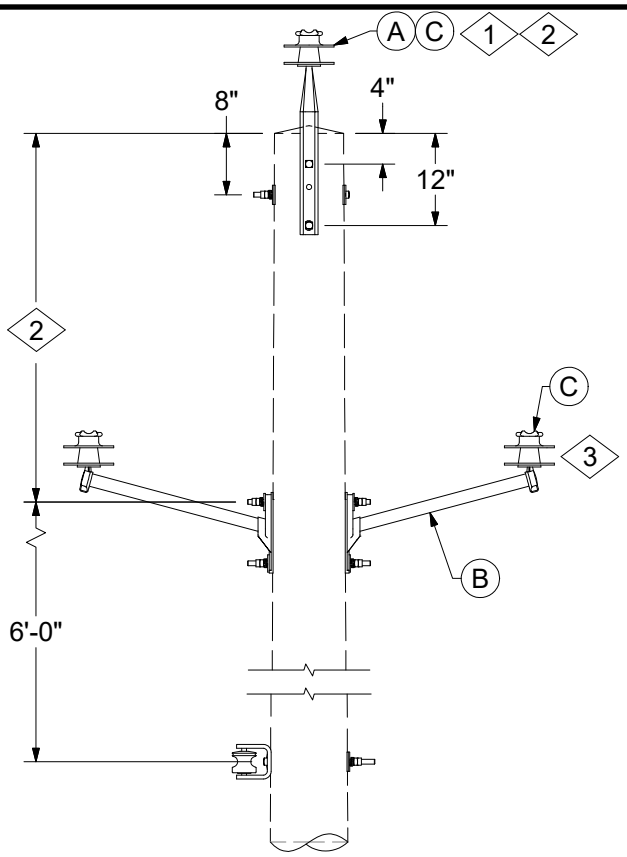
6. See DCS **03 00 03 00** for angle and span length limitations.

REV	DATE	ENG	DESCRIPTION
10	10/01/23	AEP	Converted to new format
9	03/27/18	KR	

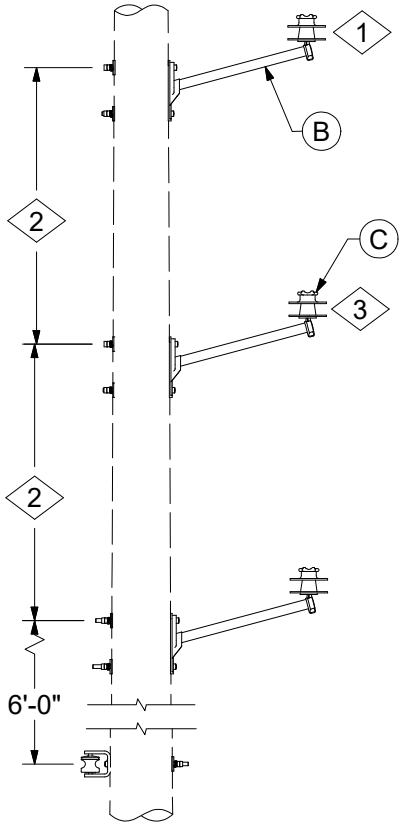
CONFIGURATIONS

Armless - Two or Three Phase

03 12 03 **
15kV
1 of 1



03 12 03 (01, 02, 03, & 04)



03 12 03 (05, 06, 07, & 08)

DCS #	DESCRIPTION
03 12 03 01	Pole Top Tangent, 2-Phase
03 12 03 02	Pole Top Angle, 2-Phase
03 12 03 03	Pole Top Tangent, 3-Phase
03 12 03 04	Pole Top Angle, 3-Phase
03 12 03 05	Vertical & Underbuild Tangent, 2-Phase
03 12 03 06	Vertical & Underbuild Angle, 2-Phase
03 12 03 07	Vertical & Underbuild Tangent, 3-Phase
03 12 03 08	Vertical & Underbuild Angle, 3-Phase

CONSTRUCTION NOTE(s):

1. Pole top 3-phase construction must meet avian protection standards.

2. For new construction use 6'-0" spacing between the phases. Clearance for single pole replacement or maintenance may be reduced as long as avian protection requirements are met.

	ITEM	STK / DCS #	DESCRIPTION 03 12 03 **	01	02	03	04	05	06	07	08
3	A	**06 12 01 02**	Single Pole Top Pin & Insulator - 24" and 30"	1	1	1	1	-	-	-	-
3	B	**06 12 21 04 @**	Single Insulator Only	1	1	2	2	2	2	3	3
@	C	**07 00 41 00 @**	Top Tie, TT*W	2	-	3	-	2	-	3	-
			Side Tie, ST*W	-	2	-	3	-	2	-	3
1,@	D	**05 16 10 01**	Conductor Cover - Single Pin	-	-	1	1	-	-	-	-

DESIGN NOTE(s):

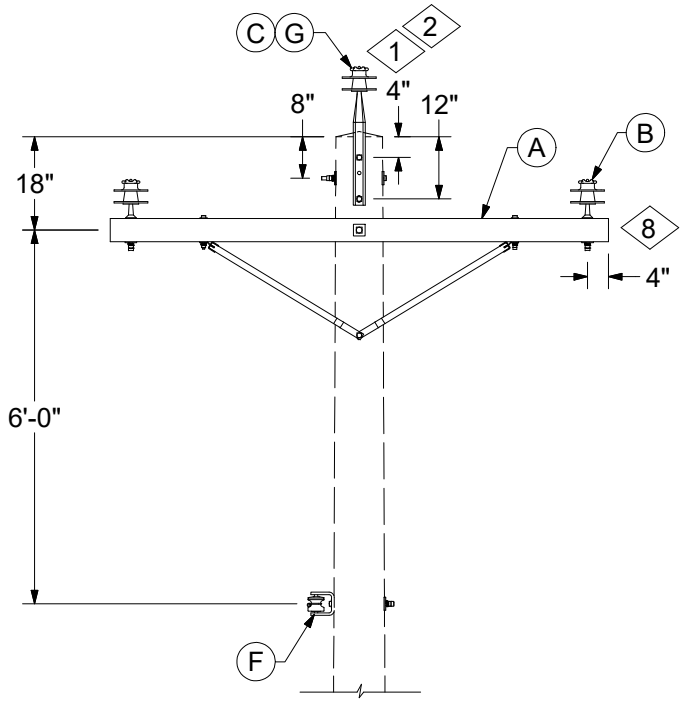
3. See DCS **03 00 03 00** for angle and span length limitations.

REV	DATE	ENG	DESCRIPTION
9	10/01/23	AEP	Converted to new format
8	10/14/11	MJ	

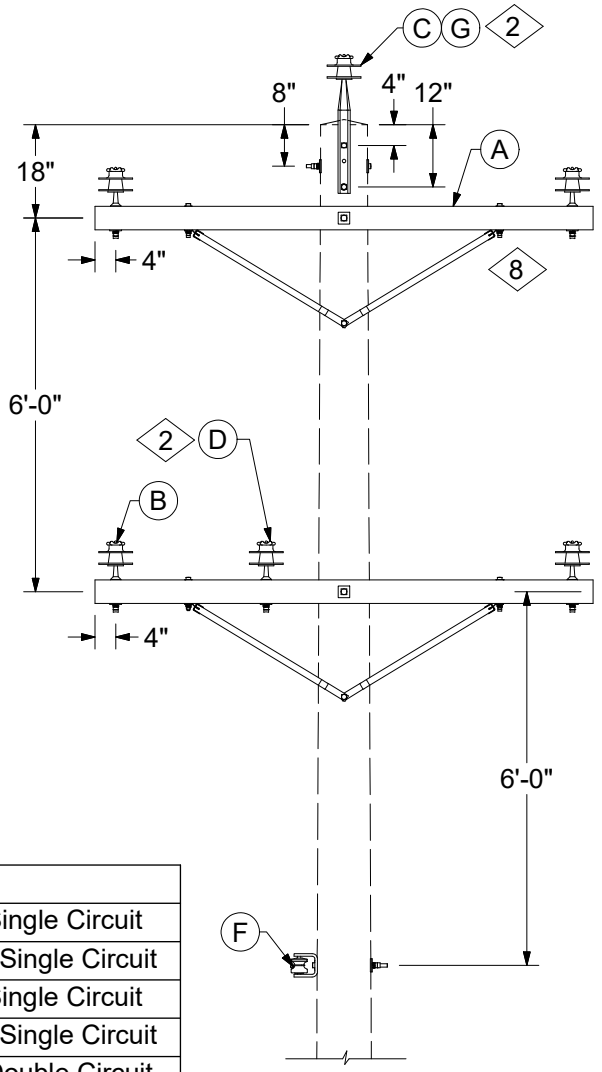
CONFIGURATIONS

Wood Crossarm - Two or Three Phase
Single & Double Circuit

03 12 05 **
15kV
1 of 4



03 12 05 (01, 04, 07, & 10)



03 12 05 (20 & 21)

DCS #	DESCRIPTION
03 12 05 01	Tangent Single Pin, 3-Phase, 8' Wood Crossarm - Single Circuit
03 12 05 04	Tangent Single Pin, 3-Phase, 10' Wood Crossarm - Single Circuit
03 12 05 07	Tangent Single Pin, 2-Phase, 8' Wood Crossarm - Single Circuit
03 12 05 10	Tangent Single Pin, 2-Phase, 10' Wood Crossarm - Single Circuit
03 12 05 20	Tangent Single Pin, 3-Phase, 8' Wood Crossarm - Double Circuit
03 12 05 21	Tangent Single Pin, 3-Phase, 10' Wood Crossarm - Double Circuit

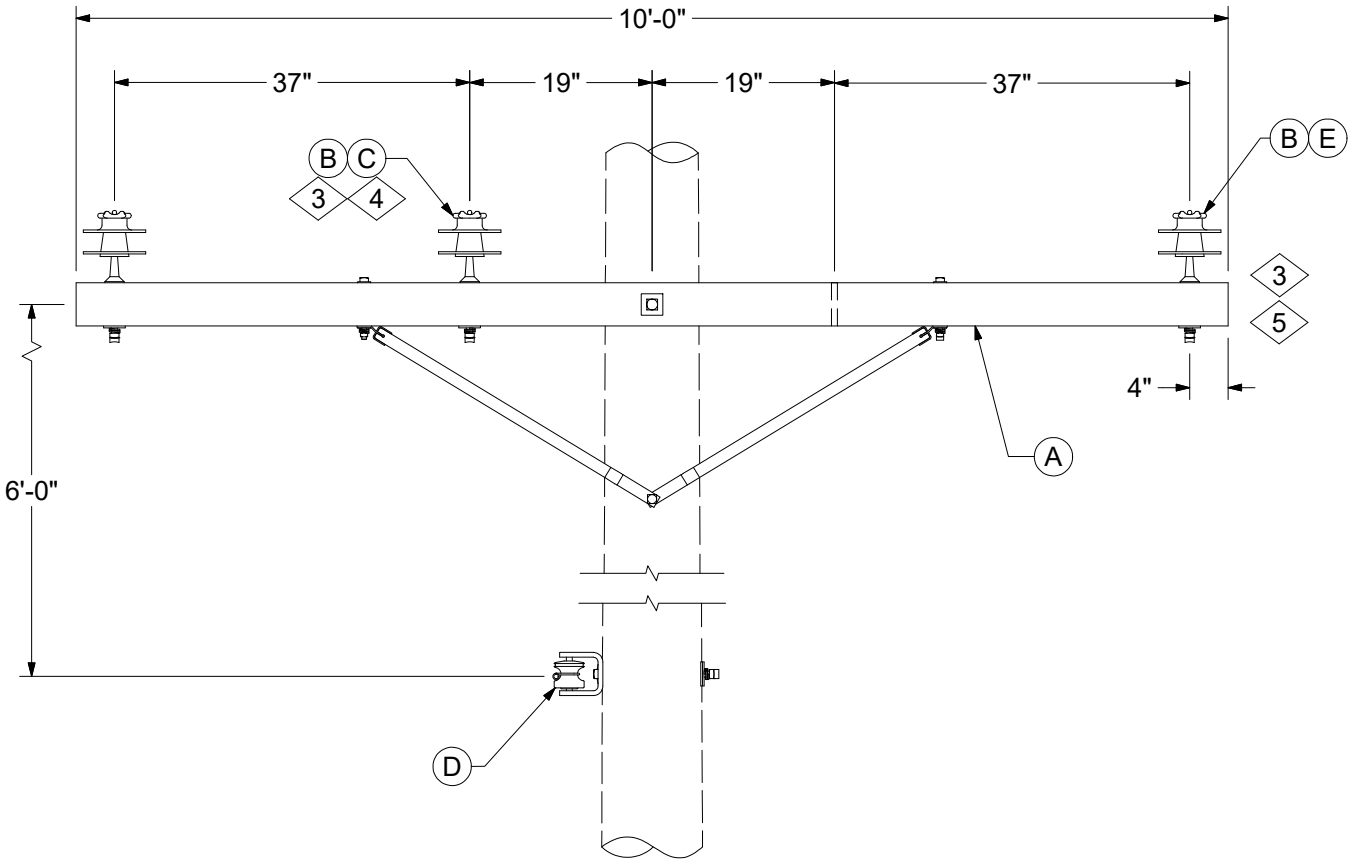
CONSTRUCTION NOTE(s):

1. For a 2-phase configuration, eliminate the center phase position.

2. 8'-0" Crossarm available for use in Ameren Missouri only. On pole top position, middle phase must meet avian protection requirements. Middle phase cover required when in lower arm position on double circuit. See DCS **05 16 10 01** for more information.

	ITEM	STK / DCS #	DESCRIPTION 03 12 05 **	01	04	07	10	20	21
2,8	A	**04 00 20 02 @**	8' Single Wood Arm	1	-	1	-	2	-
		04 00 20 03 @	10' Single Wood Arm	-	1	-	1	-	2
1	B	**06 12 01 01**	Single Pin & Insulator - Wood Crossarm	2	2	2	2	5	5
1	C	**06 12 01 02**	Single Pole Top Pin & Insulator - 24" and 30"	1	1	-	-	1	1
2	D	**05 16 10 01**	Conductor Cover - Single Pin	1	-	-	-	2	1
10,@	E	**12 00 10 ** @**	Grounding Unit	1	1	1	1	1	1
@	F	**03 01 01 ** @**	Neutral	1	1	1	1	1	1
@	G	**07 00 41 00 @**	Sgl Top Tie, TT*W	3	3	2	2	6	6

REV	DATE	ENG	DESCRIPTION
10	10/01/23	AEP	Converted to new format
9	01/06/12	MJ	



03 12 05 (40, 41, 51, & 60)

DCS #	DESCRIPTION
03 12 05 40	Underbuild Single Pin, 3-Phase, 8' Wood Crossarm - Single Circuit
03 12 05 41	Underbuild Single Pin, 2-Phase, 8' Wood Crossarm - Single Circuit
03 12 05 51	Underbuild Single Pin, 3-Phase, 10' Wood Crossarm - Single Circuit
03 12 05 60	Underbuild Single Pin, 2-Phase, 10' Wood Crossarm - Single Circuit

CONSTRUCTION NOTE(s):

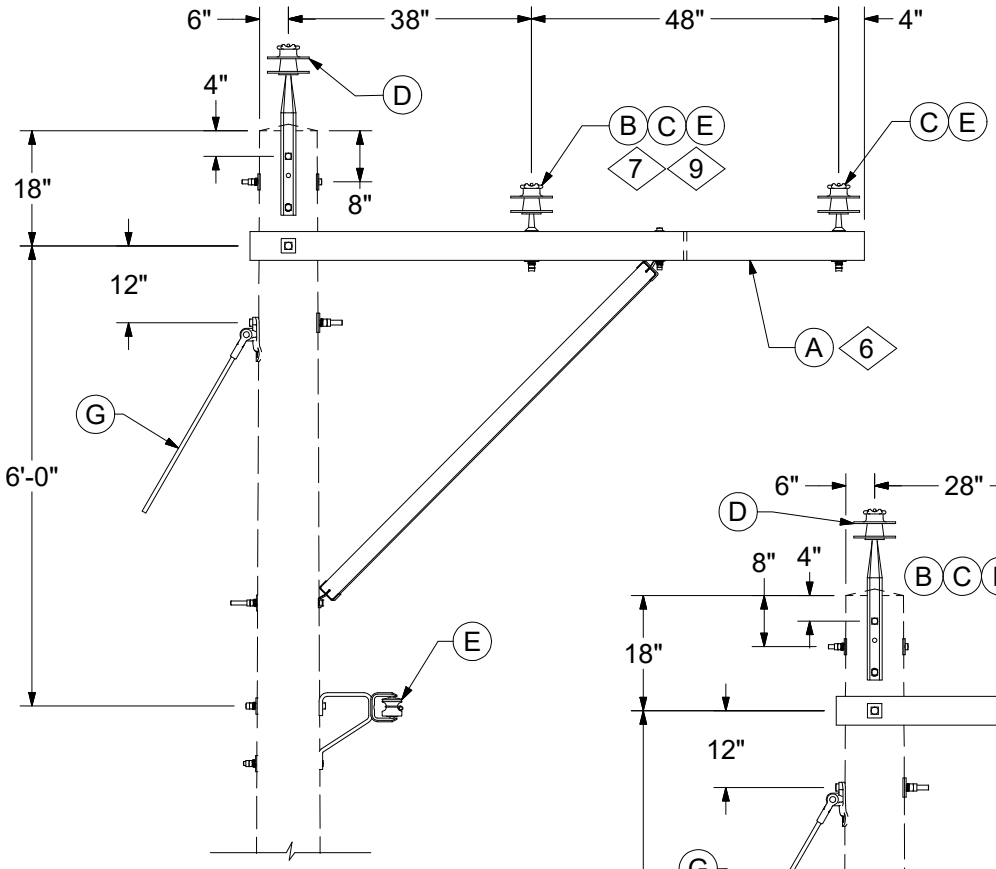
3. For a 2-phase configuration, eliminate the center phase position.

4. 8'-0" Crossarm available for use in Ameren Missouri only. On pole top position, middle phase must meet avian protection requirements. Middle phase cover required when in lower arm position on double circuit. See DCS **05 16 10 01** for more information.

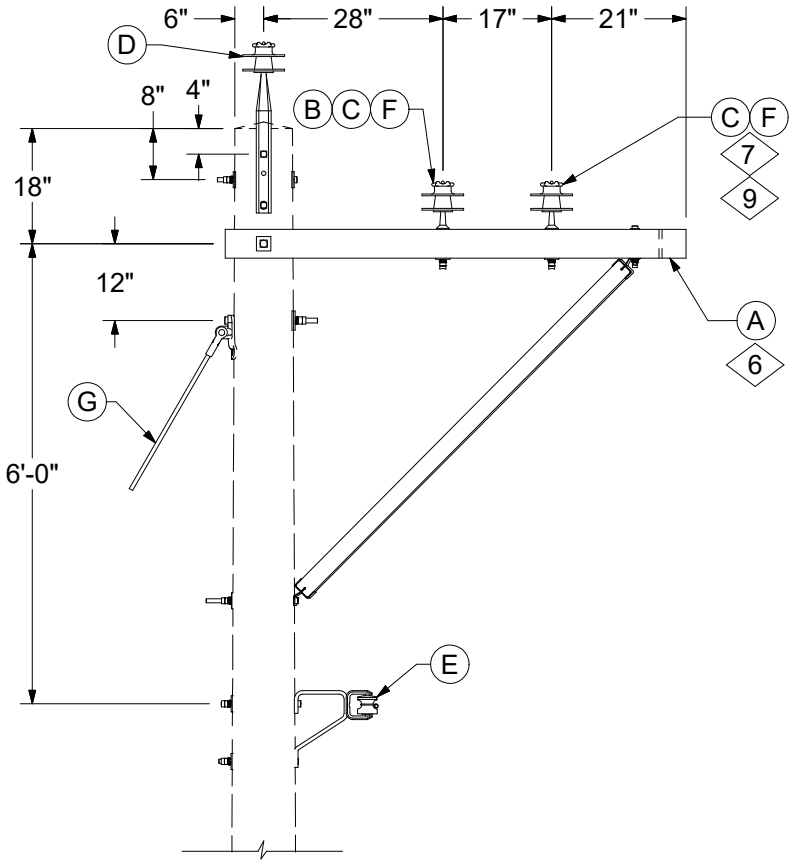
5. Wood crossarm options for underbuild available for Ameren Illinois only.

	ITEM	STK / DCS #	DESCRIPTION 03 12 05 **	40	41	51	60
3,4,5	A	**04 00 20 02 @**	8' Single Wood Arm	1	1	-	-
		04 00 20 03 @	10' Single Wood Arm	-	-	1	1
5	B	**06 12 01 01**	Single Pin & Insulator - Wood Crossarm	3	2	3	2
4	C	**05 16 10 01**	Conductor Cover - Single Pin	1	-	1	-
@	D	**03 01 01 ** @**	Neutral	1	1	1	1
@	E	**07 00 41 00 @**	Sgl Top Tie, TT*W	3	2	3	2

REV	DATE	ENG	DESCRIPTION
10	10/01/23	AEP	Converted to new format
9	01/06/12	MJ	



03 12 05 (54, 56, 63, & 65)



03 12 05 (74, 75, 76, & 77)

DCS #	DESCRIPTION
03 12 05 54	Tangent Single Pin, 3-Phase, 8' Single Side Arm
03 12 05 56	Angle Double Pin, 3-Phase, 8' Double Side Arm
03 12 05 63	Tangent Single Pin, 2-Phase, 8' Single Side Arm
03 12 05 65	Angle Double Pin, 2-Phase, 8' Double Side Arm
03 12 05 74	Tangent Single Pin, 3-Phase, 6' Single Side Arm
03 12 05 75	Angle Double Pin, 3-Phase, 6' Double Side Arm
03 12 05 76	Tangent Single Pin, 2-Phase, 6' Single Side Arm
03 12 05 77	Angle Double Pin, 2-Phase, 6' Double Side Arm

REV	DATE	ENG	DESCRIPTION
10	10/01/23	AEP	Converted to new format
9	01/06/12	MJ	

CONSTRUCTION NOTE(s):

6. 6'-0" and 8'-0" wood alley arm available for use in Ameren Missouri only.

7. On 3-phase construction, middle phase on 6'-0" and 8'-0" crossarms must be covered to meet avian protection requirements.

	ITEM	STK / DCS #	DESCRIPTION 03 12 05 **	54	56	63	65	74	75	76	77
6,7	A	**04 00 24 01 @**	6' Single Alley Arm	-	-	-	-	1	-	1	-
		04 00 24 02 @	8' Single Alley Arm	1	-	1	-	-	-	-	-
		04 00 25 01 @	6' Double Alley Arm	-	-	-	-	-	1	-	1
		04 00 25 02 @	8' Double Alley Arm	-	1	-	1	-	-	-	-
7	B	**05 16 10 01**	Cover - Single Pin	1	-	-	-	1	-	-	-
		05 16 11 01	Cover - Double Pin	-	1	-	-	-	1	-	-
	C	**06 12 01 01 @**	Single Pin & Insulator - Wood Arm	2	4	1	4	2	4	1	2
	D	**06 12 01 02 @**	Single Pole Top Pin & Insulator	1	2	1	-	1	2	1	2
@	E	**03 01 01 ** @**	Neutral	1	1	1	1	1	1	1	1
@	F	**07 00 41 00 @**	Sgl Top Tie, TT*W	3	-	2	-	3	-	2	-
			Double Side Tie, DST*W	-	3	-	2	-	3	-	2
@	G	**11 00 4* ** @**	Guying Unit	-	#	-	#	-	#	-	#
10,@	H	**12 00 10 ** @**	Grounding Unit	1	1	1	1	1	1	1	1

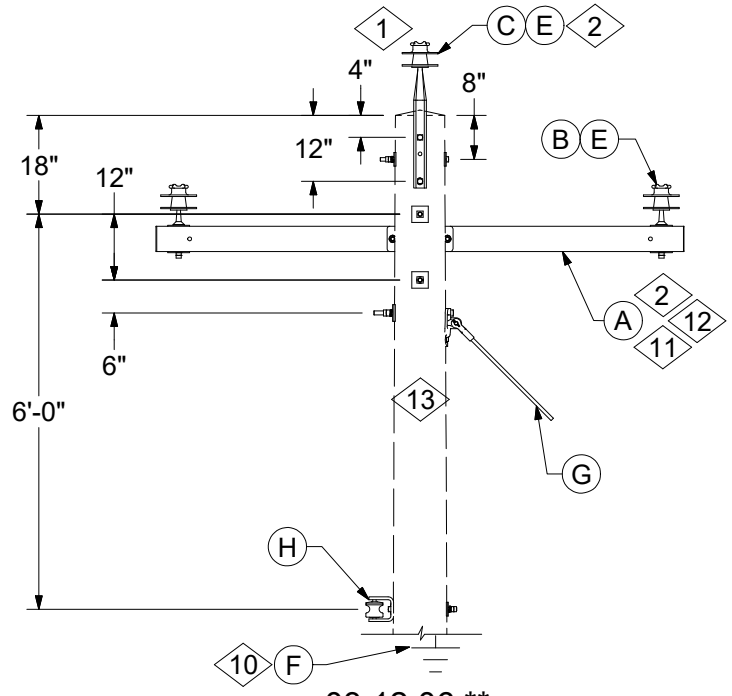
DESIGN NOTE(s):

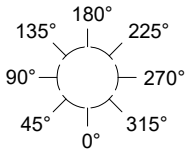
8. See DCS **04 00 20 **** for wood arm detail.

9. See DCS **03 00 03 00** Table 4 for angle and span length limitations.

10. Pole grounds for distribution are required on each equipment pole and should be included on every 4th pole per mile for adequate grounding. See Section 12 for grounding applications.

REV	DATE	ENG	DESCRIPTION
10	10/01/23	AEP	Converted to new format
9	01/06/12	MJ	





03 12 06 **

DCS #	DESCRIPTION
03 12 06 02	Tangent Single Pin. 3-Phase, 8' FG Crossarm - Single Circuit
03 12 06 04	Tangent Single Pin. 3-Phase, 10' FG Crossarm - Single Circuit
03 12 06 05	Angle Single Pin. 3-Phase, 10' FG Crossarm - Single Circuit
03 12 06 07	Tangent Single Pin. 2-Phase, 8' FG Crossarm - Single Circuit
03 12 06 10	Tangent Single Pin. 2-Phase, 10' FG Crossarm - Single Circuit
03 12 06 13	Angle Single Pin. 3-Phase, 8' FG Crossarm - Single Circuit
03 12 06 14	Angle Single Pin. 2-Phase, 8' FG Crossarm - Single Circuit
03 12 06 15	Angle Single Pin. 2-Phase, 10' FG Crossarm - Single Circuit

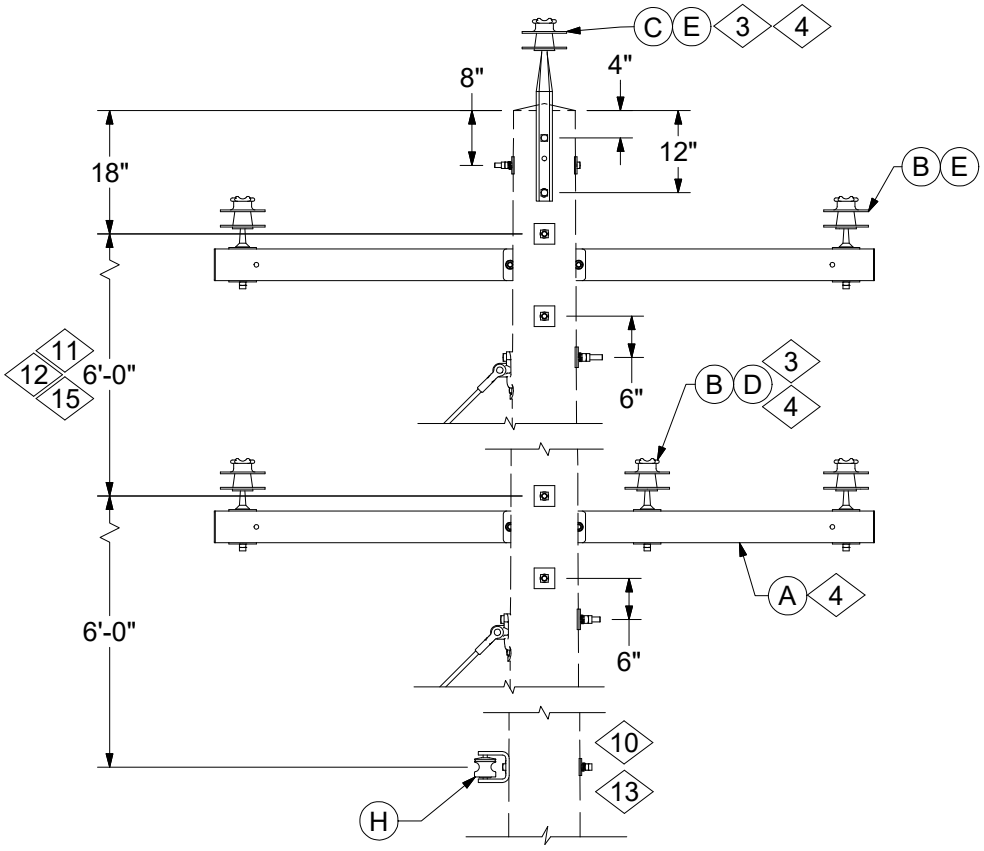
CONSTRUCTION NOTE(s):

1. For 2-phase configuration, eliminate the center phase position.

2. 8'-0" crossarm available for use in Ameren Missouri only. Middle phase must meet avian protection requirements. See DCS **05 16 10 01** for more information.

	ITEM	STK / DCS #	DESCRIPTION 03 12 06 **	02	04	05	07	10	13	14	15
2,11,12	A	**04 00 41 14 @**	8' Tangent FG Crossarm	1	-	-	1	-	1	1	-
		04 00 41 16 @	10' Tangent FG Crossarm	-	1	1	-	1	-	-	1
	B	**06 12 01 12**	Insulator, Arm, Sgl Pin	2	2	2	2	2	2	2	2
	C	**06 12 01 02**	Insulator, Pole Top, Sgl Pin	1	1	1	-	-	1	-	-
2	D	**05 16 10 01**	Conductor Cover - Single Pin	1	-	-	-	-	1	-	-
@	E	**07 00 41 00 @**	Side Tie, ST*W	-	-	3	-	-	3	2	2
			Top Tie, TT*W	3	3	-	2	2	-	-	-
16,@	F	**12 00 10 ** @**	Grounding Unit	1	1	1	1	1	1	1	1
@	G	**11 00 4* ** @**	Guying Unit	-	-	#	-	-	#	#	#
@	H	**03 01 01 ** @**	Neutral	1	1	1	1	1	1	1	1

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format
2	04/16/18	KR	



03 12 06 (30, 31, 32, & 33)

DCS #	DESCRIPTION
03 12 06 30	Tangent Single Pin, 3-Phase, 8' FG Crossarm - Double Circuit
03 12 06 31	Tangent Single Pin, 3-Phase, 10' FG Crossarm - Double Circuit
03 12 06 32	Angle Single Pin, 3-Phase, 10' FG Crossarm - Double Circuit
03 12 06 33	Angle Single Pin, 3-Phase, 8' FG Crossarm - Double Circuit

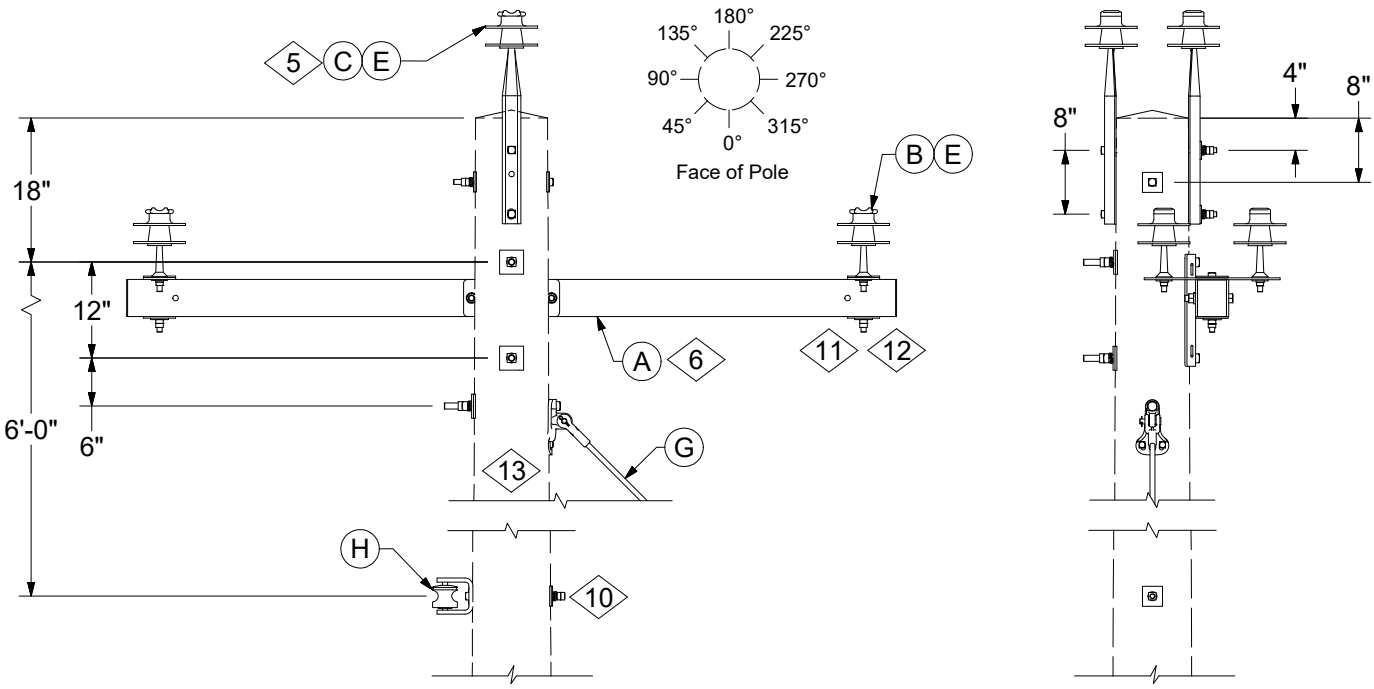
CONSTRUCTION NOTE(s):

3. For 2-phase configuration, eliminate the center phase position.

4. 8'-0" crossarm available for use in Ameren Missouri only. On pole top position, middle phase must meet avian protection requirements. Middle phase cover required when in lower arm position on double circuit. See DCS **05 16 10 01** for more information.

	ITEM	STK / DCS #	DESCRIPTION 03 12 06 **	30	31	32	33
4,11,12	A	**04 00 41 14 @**	8' Tangent FG Crossarm	2	-	-	2
		04 00 41 16 @	10' Tangent FG Crossarm	-	2	2	-
	B	**06 12 01 12**	Insulator, Arm, Sgl Pin	5	5	5	5
	C	**06 12 01 02**	Insulator, Pole Top, Sgl Pin	1	1	1	1
4	D	**05 16 10 01**	Conductor Cover - Single Pin	2	1	1	2
@	E	**07 00 41 00 @**	Top Tie, TT*W	6	6	-	-
			Side Tie, ST*W	-	-	6	6
16,@	F	**12 00 10 ** @**	Grounding Unit	1	1	1	1
@	G	**11 00 4* ** @**	Guying Unit	-	-	#	#
@	H	**03 01 01 ** @**	Neutral	1	1	1	1

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format
2	04/16/18	KR	



03 12 06 (01, 03, 08, 11, 52, 54, 68, & 70)

DCS #	DESCRIPTION
03 12 06 01	Tangent Double Pin, 3-Phase, 8' FG Crossarm - Single Circuit
03 12 06 03	Tangent Double Pin, 3-Phase, 10' FG Crossarm - Single Circuit
03 12 06 08	Tangent Double Pin, 2-Phase, 8' FG Crossarm - Single Circuit
03 12 06 11	Tangent Double Pin, 2-Phase, 10' FG Crossarm - Single Circuit
03 12 06 52	Angle Double Pin, 3-Phase, 8' FG Crossarm - Single Circuit
03 12 06 54	Angle Double Pin, 3-Phase, 10' FG Crossarm - Single Circuit
03 12 06 68	Angle Double Pin, 2-Phase, 8' FG Crossarm - Single Circuit
03 12 06 70	Angle Double Pin, 2-Phase, 10' FG Crossarm - Single Circuit

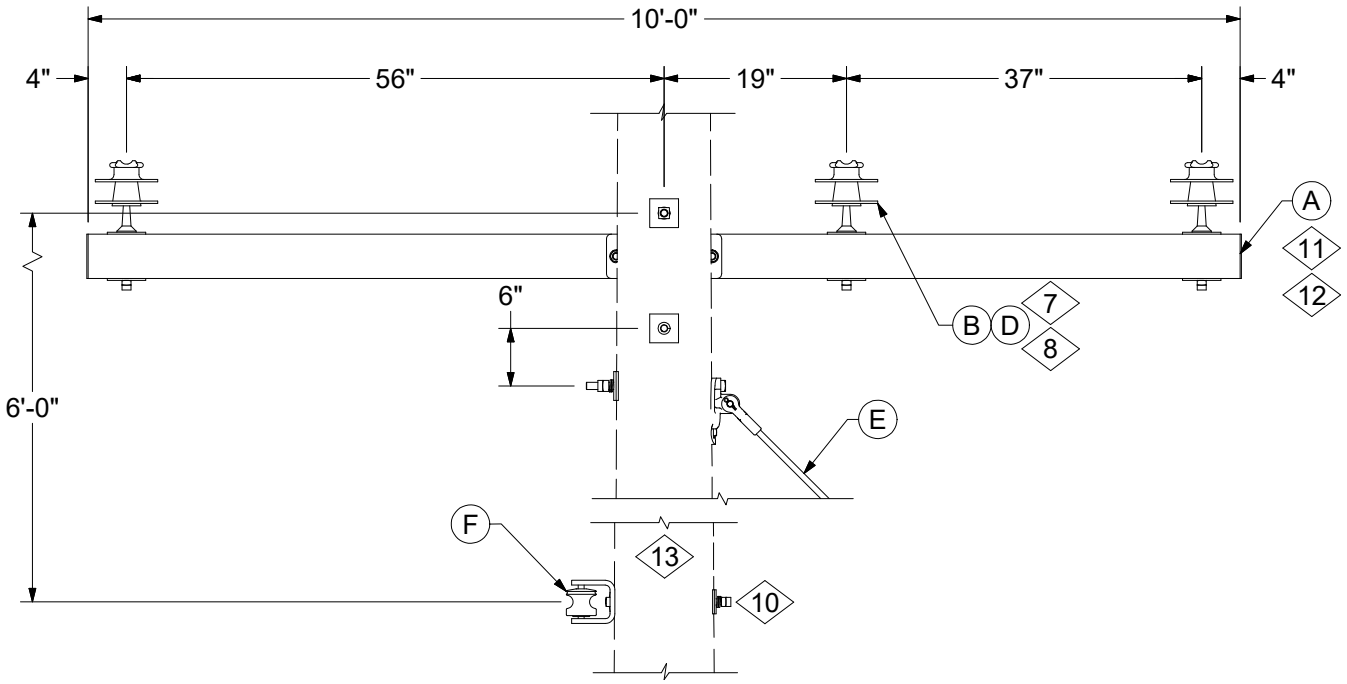
CONSTRUCTION NOTE(s):

5. For 2-phase configuration, eliminate the center phase position.

6. 8'-0" crossarm available for use in Ameren Missouri only. Middle phase must meet avian protection requirements. See DCS **05 16 11 01** for more information.

	ITEM	STK / DCS #	DESCRIPTION 03 12 06 **	01	03	08	11	52	54	68	70
6,11,12,14	A	**04 00 41 14 @**	8' Tangent FG Crossarm	1	-	1	-	1	-	1	-
		04 00 41 16 @	10' Tangent FG Crossarm	-	1	-	1	-	1	-	1
	B	**06 12 01 11**	Insulator, Arm, Dbl Pin	2	2	2	2	2	2	2	2
	C	**06 12 01 13**	Insulator, Pole Top, Dbl Pin	1	1	-	-	1	1	-	-
6	D	**05 16 10 01**	Conductor Cover - Single Pin	1	-	-	-	1	-	-	-
@	E	**07 00 41 00 @**	Double Side Tie, Dbl Pin, DST*W	-	-	-	-	3	3	2	2
			Double Top Tie, Dbl Pin, DTT*W	3	3	2	2	-	-	-	-
16,@	F	**12 00 10 ** @**	Grounding Unit	1	1	1	1	1	1	1	1
@	G	**11 00 4* ** @**	Guying Unit	-	-	-	-	#	#	#	#
@	H	**03 01 01 ** @**	Neutral	1	1	1	1	1	1	1	1

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format
2	04/16/18	KR	



03 12 06 (40, 41, 42, 43, 44, 45, 46, & 47)

DCS #	DESCRIPTION
03 12 06 40	Underbuild Tangent Single Pin, 3-Phase, 8' FG Crossarm - Single Circuit
03 12 06 41	Underbuild Tangent Single Pin, 2-Phase, 8' FG Crossarm - Single Circuit
03 12 06 42	Underbuild Tangent Single Pin, 3-Phase, 10' FG Crossarm - Single Circuit
03 12 06 43	Underbuild Tangent Single Pin, 2-Phase, 10' FG Crossarm - Single Circuit
03 12 06 44	Underbuild Angle Single Pin, 3-Phase, 8' FG Crossarm - Single Circuit
03 12 06 45	Underbuild Angle Single Pin, 2-Phase, 8' FG Crossarm - Single Circuit
03 12 06 46	Underbuild Angle Single Pin, 3-Phase, 10' FG Crossarm - Single Circuit
03 12 06 47	Underbuild Angle Single Pin, 2-Phase, 10' FG Crossarm - Single Circuit

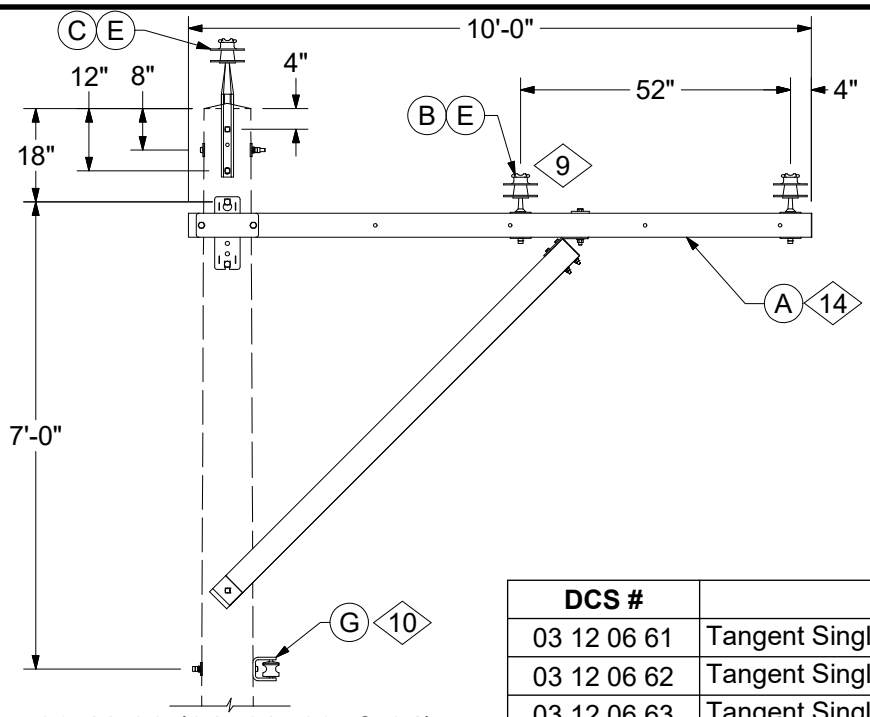
CONSTRUCTION NOTE(s):

7. For 2-phase configuration, eliminate the center phase position.

8. On 3-phase underbuild construction, middle phase on 8'-0" and 10'-0" crossarms must be covered to meet avian protection requirements.

	ITEM	STK / DCS #	DESCRIPTION 03 12 06 **	40	41	42	43	44	45	46	47
7,11,12	A	**04 00 41 14 @**	8' Tangent FG Crossarm	1	1	-	-	1	1	-	-
		04 00 41 16 @	10' Tangent FG Crossarm	-	-	1	1	-	-	1	1
	B	**06 12 01 12**	Insulator, Arm, Sgl Pin	3	2	3	2	3	2	3	2
8,12	C	**05 16 10 01**	Conductor Cover - Single Pin	1	-	1	-	1	-	1	-
@	D	**07 00 41 00 @**	Top Tie, TT*W	3	2	3	2	-	-	-	-
			Side Tie, ST*W	-	-	-	-	3	2	3	2
@	E	**11 00 4* ** @**	Guying Unit	-	-	-	-	#	#	#	#
@	F	**03 01 01 ** @**	Neutral	1	1	1	1	1	1	1	1

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format
2	04/16/18	KR	



03 12 06 (61, 62, 63, & 64)

DCS #	DESCRIPTION
03 12 06 61	Tangent Single Pin, 3-Phase, 8' Single Side Arm
03 12 06 62	Tangent Single Pin, 2-Phase, 8' Single Side Arm
03 12 06 63	Tangent Single Pin, 3-Phase, 10' Single Side Arm
03 12 06 64	Tangent Single Pin, 2-Phase, 10' Single Side Arm

CONSTRUCTION NOTE(s):

9. On 3-phase construction, middle phase must be covered to meet avian protection requirements.

	ITEM	STK / DCS #	DESCRIPTION 03 12 06 **	61	62	63	64
14	A	**04 00 43 01 @**	8' FG Alley Arm	1	1	-	-
		04 00 43 02 @	10' FG Alley Arm	-	-	1	1
	B	**06 12 01 12**	Insulator, Arm, Sgl Pin	2	1	2	1
	C	**06 12 01 02**	Insulator, Pole Top, Sgl Pin	1	1	1	1
9	D	**05 16 10 01**	Conductor Cover - Single Pin	1	-	1	-
@	E	**07 00 41 00 @**	Top Tie, TT*W	3	2	3	2
16,@	F	**12 00 10 ** @**	Grounding Unit	1	1	1	1
@	G	**03 01 01 ** @**	Neutral	1	1	1	1

DESIGN NOTE(s):

10. Composite pole has factory installed (internal) pole ground in the 45° quadrant. Wood pole may require pole ground depending on application.

11. See DCS **03 00 03 00** for angle and span length limitations.

12. See DCS **04 00 41 ****** for arm detail.

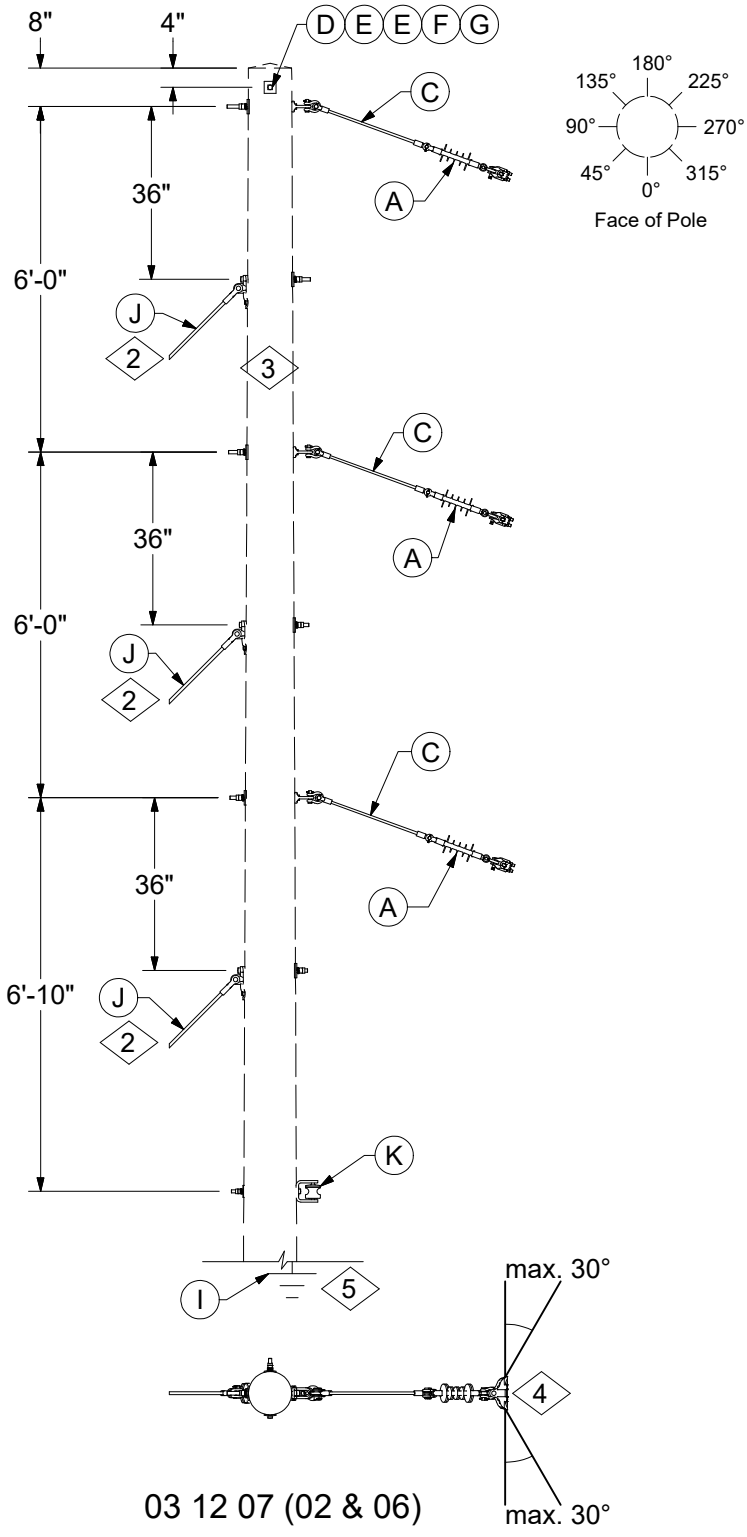
13. See DCS **02 00 04 02** for unguyed composite pole application.

14. See DCS **04 00 01 01** for side arm loading criteria.

15. The distance between the two crossarms shall maintain a minimum of 6'-0" separation. Greater distance may be needed if galloping is a concern.

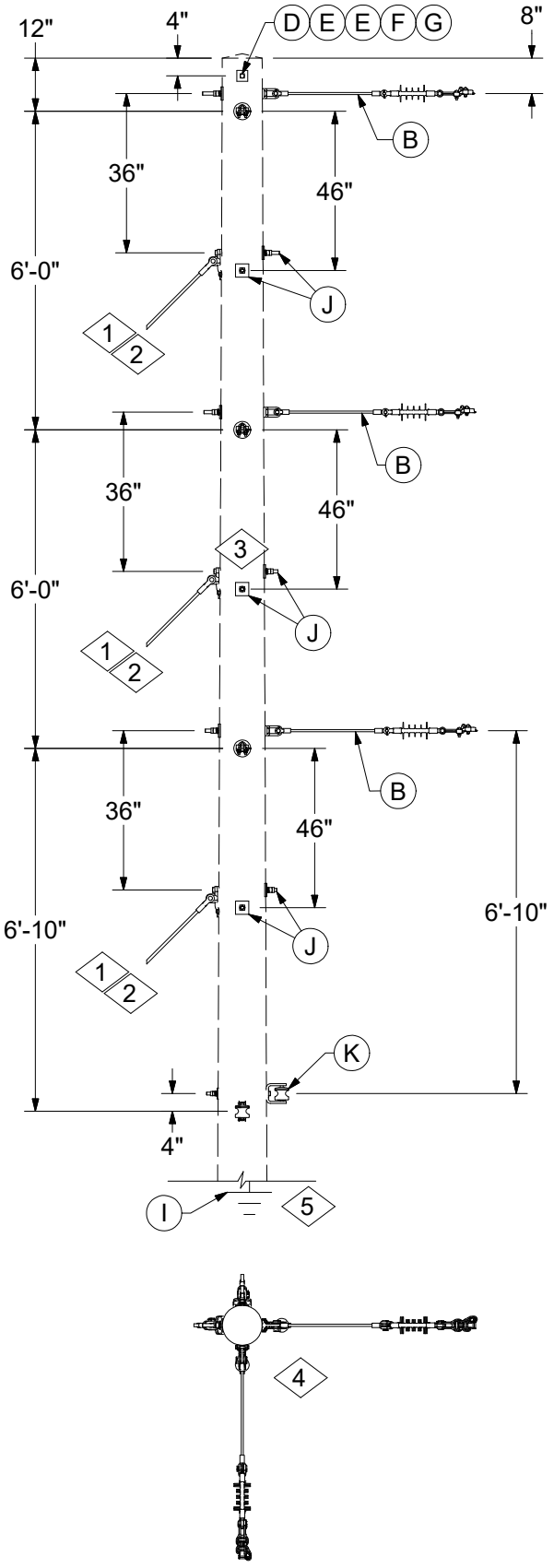
16. Pole grounds for distribution are required on each equipment pole and should be included on every 4th pole per mile for adequate grounding. See Section 12 for grounding applications.

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format
2	04/16/18	KR	



03 12 07 (02 & 06)

DCS #	DESCRIPTION
03 12 07 02	Floating Angle, 3-Phase
03 12 07 04	Deadend Corner, 3-Phase
03 12 07 06	Floating Angle, 2-Phase
03 12 07 08	Deadend Corner, 2-Phase



03 12 07 (04 & 08)

REV	DATE	ENG	DESCRIPTION
9	10/01/23	AEP	Converted to new format
8	04/01/19	KR	

CONSTRUCTION NOTE(s):

1. If a span guy or guys are required or two through bolts are used to attach the guy hook(s), the location of one or both of the guy hooks will need to be adjusted up or down 2" to ensure bolts are at least 4" apart.

2. See DCS **11 00 02 02** for typical guy insulator placement.

	ITEM	STK / DCS #	DESCRIPTION 03 12 07 **	02	04	06	08
	A	**06 12 30 02** @	Insulator, Floating Angle	3	-	2	-
	B	**06 12 30 01** @	Deadend w/ FG Extension	-	6	-	4
	C	25 56 076	Insulator, Guy Strain, 26"	3	-	2	-
	D	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut (anti-split bolt)	1	1	1	1
	E	23 66 207	Washer, Curved, Square, 5/8"	2	2	2	2
	F	23 66 134	Lock Washer - 5/8" Double Coil	1	1	1	1
	G	23 65 043	Lock Nut - 5/8" Square	1	1	1	1
@	H	**07 00 80 00** @	Wire, Poly Covered, PLW*W	-	30	-	20
5,6,@	I	**12 00 10 **** @	Grounding Unit	1	1	1	1
1,2,@	J	**11 00 4* **** @	Guying Unit	#	#	#	#
@	K	**03 01 01 **** @	Neutral	1	1	1	1
	L	252, 255, or 260	Op Code, Install Jumper	-	3	-	2

DESIGN NOTE(s):

3. See DCS **02 00 04 02** for unguyed composite pole application.

4. For ACSR, AAAC, and AAC conductors where spans exceed 300 feet, see DCS **07 00 08 01** for application of armor rods.

5. Composite pole has factory installed (internal) pole ground in the 45° quadrant. Wood pole may require pole ground depending on application.

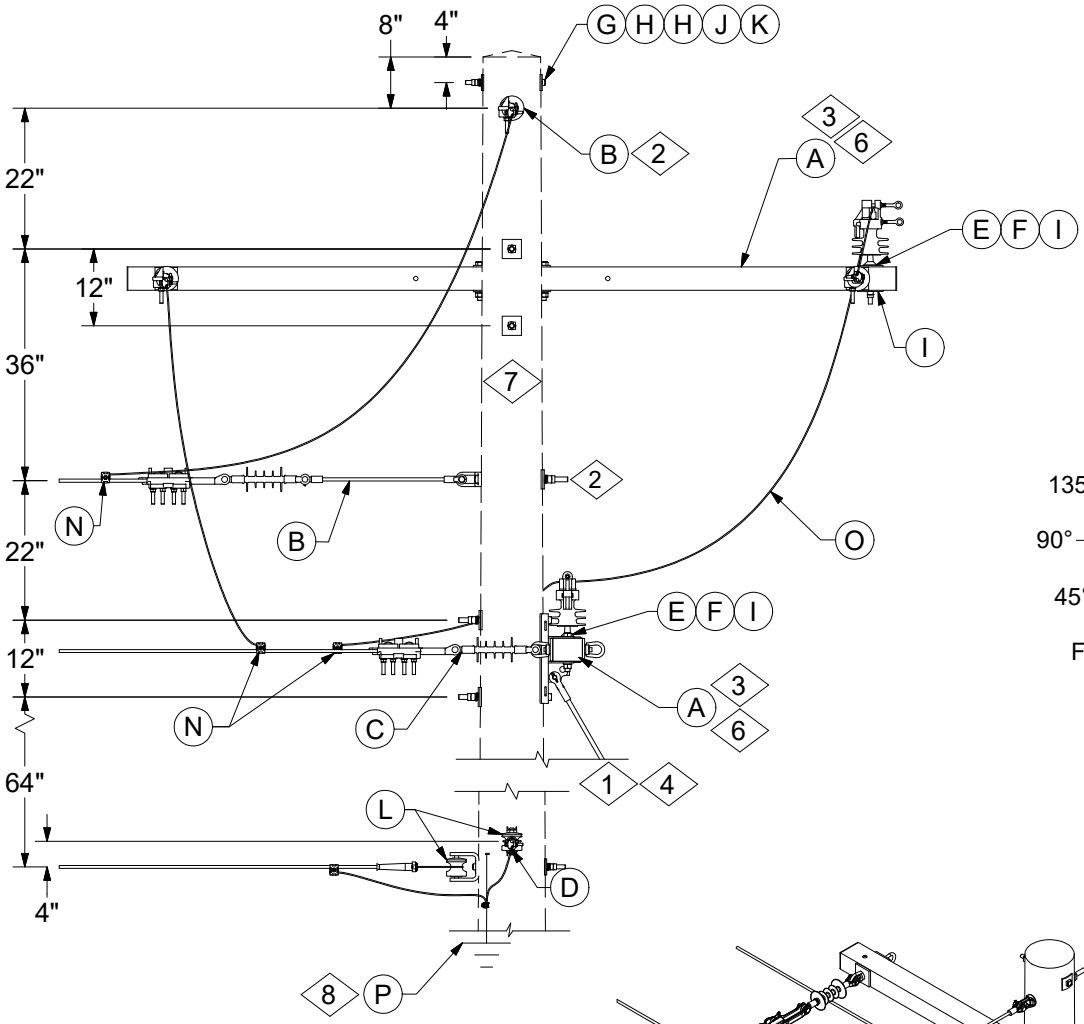
6. Pole grounds for distribution are required on each equipment pole and should be included on every 4th pole per mile for adequate grounding. See Section 12 for grounding applications.

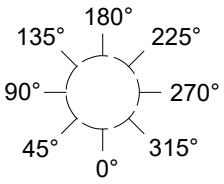
REV	DATE	ENG	DESCRIPTION
9	10/01/23	AEP	Converted to new format
8	04/01/19	KR	

CONFIGURATIONS

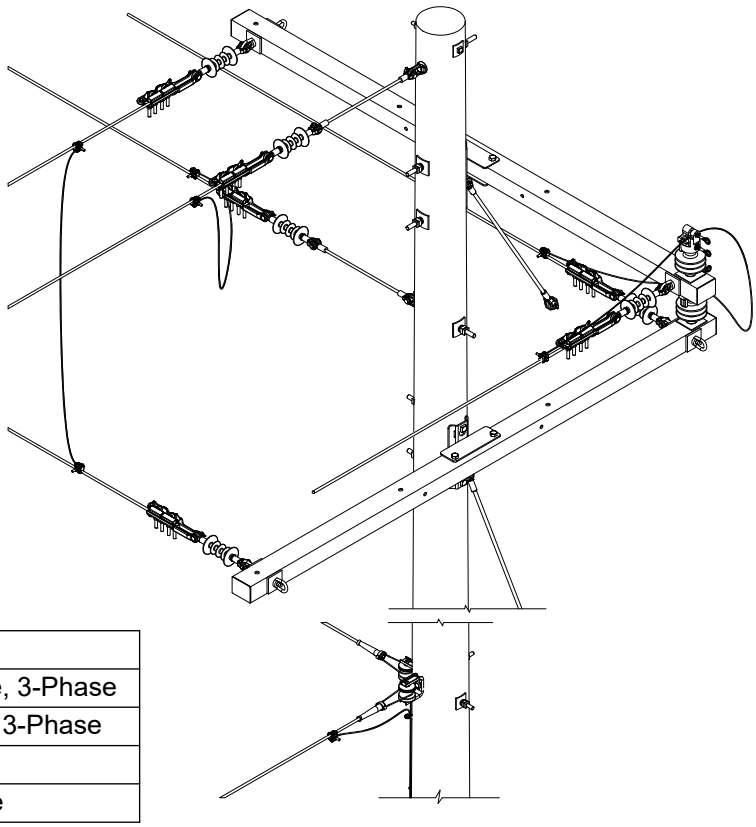
Buck Arm Corner - Two or Three Phase

03 12 09 **
15kV
1 of 2





Face of Pole



DCS#	DESCRIPTION
03 12 09 02	Deadend, 10' FG Crossarm and Pole, 3-Phase
03 12 09 03	Deadend, 8' FG Crossarm and Pole, 3-Phase
03 12 09 04	Deadend, 8' FG Crossarm, 2-Phase
03 12 09 08	Deadend, 10' FG Crossarm, 2-Phase

REV	DATE	ENG	DESCRIPTION
10	10/01/23	AEP	Converted to new format
9	04/20/18	KR	

CONSTRUCTION NOTE(s):

1. Attach guy to fiberglass arm guy hook.

2. For 2-phase configuration, eliminate the center phase position.

3. 8'-0" Crossarm available for use in Ameren Missouri only. If middle phase is installed on inside crossarm position, see DCS **05 16 12 01** for avian protection.

4. See DCS **11 00 02 02** for typical guy insulator placement.

5. The 2" square washer received with the pin should be used after the 4" square washer.

	ITEM	STK / DCS #	DESCRIPTION 03 12 09 **	02	03	04	08
3,6	A	**04 00 42 02** @	8' Deadend FG Crossarm	-	2	2	-
		04 00 42 03 @	10' Deadend FG Crossarm	2	-	-	2
2	B	**06 12 30 01** @	Straight Deadend w/ FG Extension	2	2	-	-
	C	**06 12 35 01** @	Single Deadend on FG Arm	4	4	4	4
	D	17 51 032	Neutral PG Clamp	2	2	2	2
	E	23 62 028	Pin, Insulator, Long Shank	2	2	2	2
5	F	25 05 143	Insulator, Vice Top, 15kV	2	2	2	2
	G	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut (anti-split bolt)	1	1	1	1
	H	23 66 207	Washer, Curved, Square, 5/8"	2	2	2	2
	I	23 66 132	Washer, Flat, Sq., 4" x 4", w/ 13/16" Hole	4	4	4	4
	J	23 66 134	Lock Washer - 5/8" Double Coil	1	1	1	1
	K	23 65 043	Lock Nut - 5/8" Square	3	3	3	3
@	L	**03 01 01 ** @**	Neutral	#	#	#	#
1,4,7,@	M	**11 00 4* ** @**	Guying Unit	#	#	#	#
@	N	**07 00 25 00** @	Clamp, PG, PG*W	6	6	4	4
@	O	**07 00 80 00** @	Lead Wire, Poly Covered, PLW*W	30	30	20	20
8,9,@	P	**12 00 10 ** @**	Grounding Unit	1	1	1	1

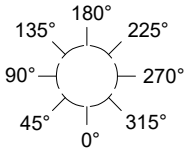
DESIGN NOTE(s):

6. DCS **04 00 01 01** for crossarm loading. In some applications larger crossarm may be needed for heavier loadings.

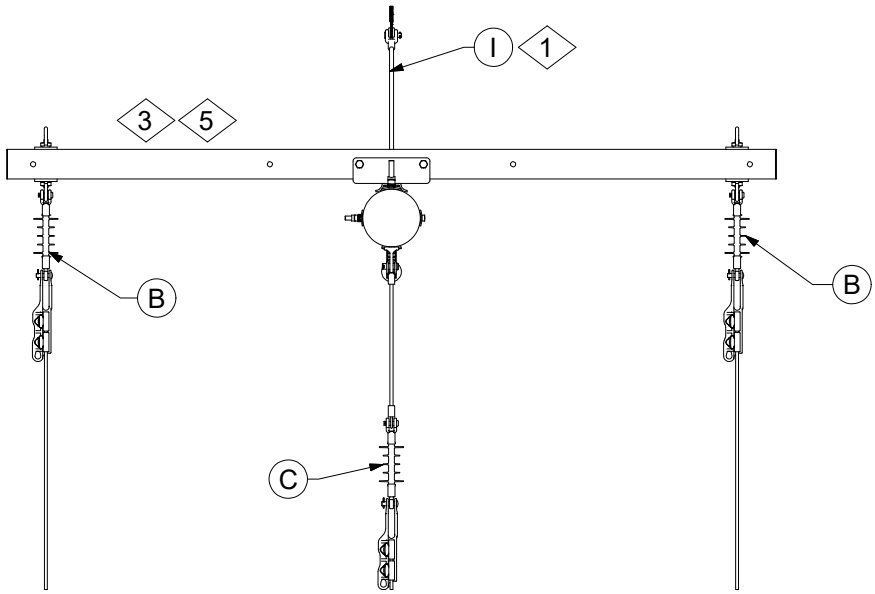
7. See DCS **02 00 04 02** for unguyed composite pole application.

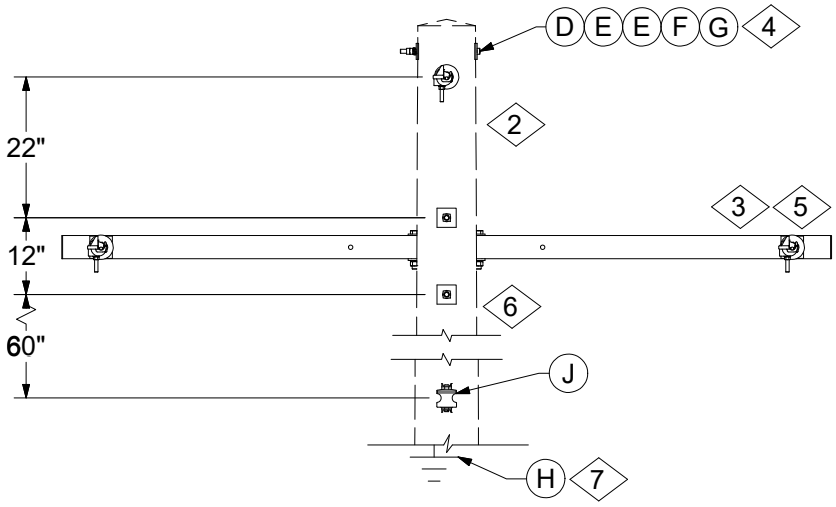
8. Composite pole has factory installed (internal) pole ground in the 45° quadrant. Wood pole may require pole ground depending on application.

9. Pole grounds for distribution are required on each equipment pole and should be included every 4th pole per mile for adequate grounding. See Section 12 for grounding applications.



Face of Pole





DCS #	DESCRIPTION
03 12 11 31	Deadend, 8' FG Crossarm, 2-Phase
03 12 11 51	Deadend, 8' FG Crossarm, 3-Phase
03 12 11 52	Deadend, 10' FG Crossarm, 3-Phase
03 12 11 54	Deadend, 10' FG Crossarm, 2-Phase

REV	DATE	ENG	DESCRIPTION
9	10/01/23	AEP	Converted to new format
8	11/10/11	MJ	

CONSTRUCTION NOTE(s):

1. Attach guy to fiberglass arm guy hook.

2. For 2-phase configuration, eliminate the center phase position.

3. 8'-0" crossarm available for use in Ameren Missouri only. If middle phase is installed on inside crossarm position, see DCS **05 16 12 01** for avian protection.

4. For pole top applications, install anti-split bolt.

	ITEM	STK / DCS #	DESCRIPTION 03 12 11 **	31	51	52	54
2,3,5	A	**04 00 42 02 @**	8' Deadend FG Crossarm	1	1	-	-
		04 00 42 03 @	10' Deadend FG Crossarm	-	-	1	1
	B	**06 12 35 01 @**	Single Deadend on FG Arm	2	2	2	2
	C	**06 12 30 01 @**	Straight Deadend w/ FG Extension	-	1	1	-
4	D	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut (anti-split bolt)	1	1	1	1
4	E	23 66 207	Washer, Curved, Square, 5/8"	2	2	2	2
4	F	23 66 134	Lock Washer - 5/8" Double Coil	1	1	1	1
4	G	23 65 043	Lock Nut - 5/8" Square	1	1	1	1
7,8,@	H	**12 00 10 ** @**	Grounding Unit	1	1	1	1
1,6,@	I	**11 00 4* ** @**	Guying Unit	#	#	#	#
@	J	**03 01 01 ** @**	Neutral, Deadend	1	1	1	1

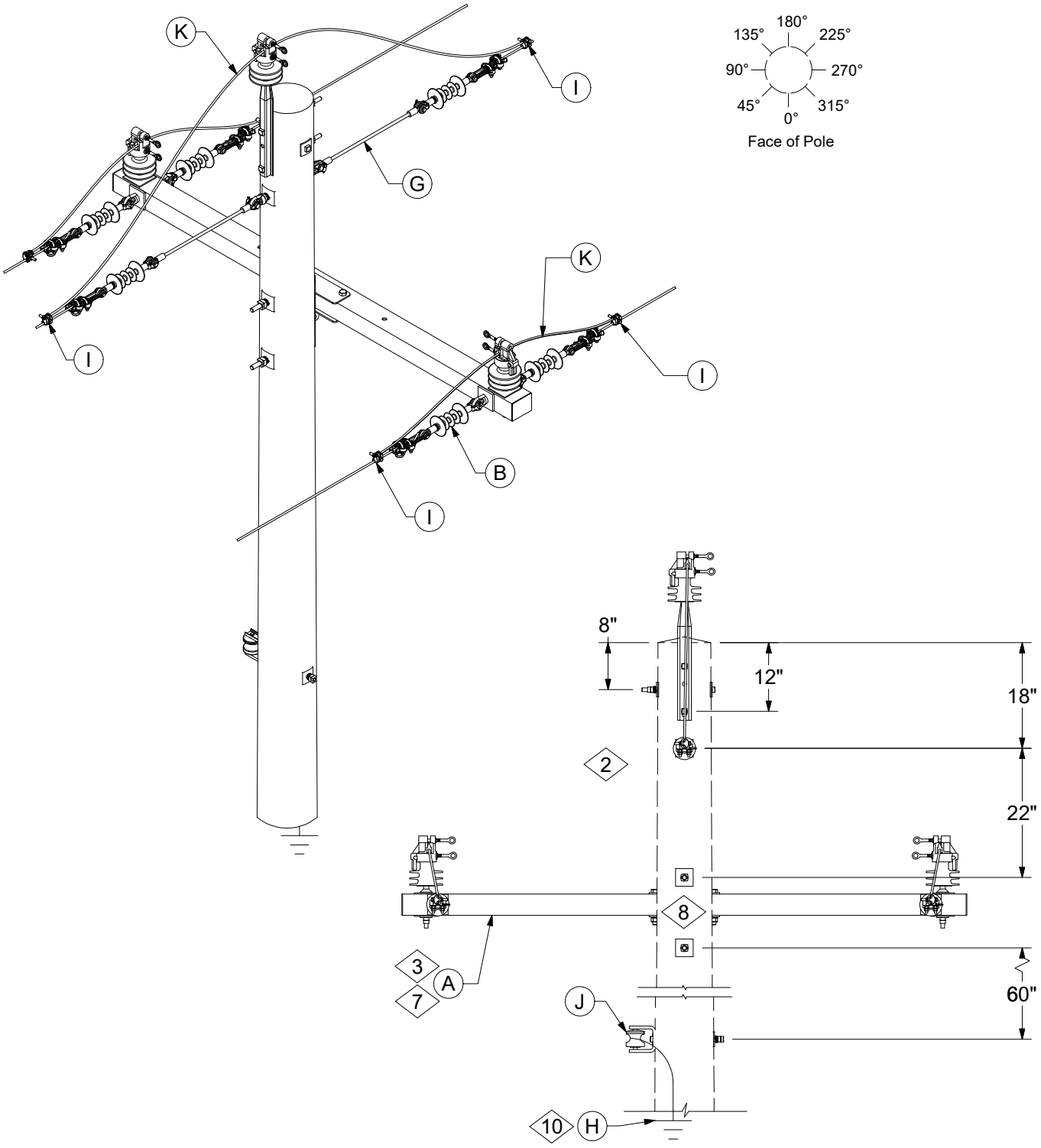
DESIGN NOTE(s):

5. See DCS **04 00 01 01** for crossarm loading. In some applications larger crossarm may be needed for heavier loadings.

6. See DCS **02 00 04 02** for unguyed composite pole application.

7. Composite pole has factory installed (internal) pole ground in the 45° quadrant. Wood pole may require pole ground depending on application.

8. Pole grounds for distribution are required on each equipment pole and should be included on every 4th pole per mile for adequate grounding. See Section 12 for grounding applications.



03 12 14 (64, 65, 68, & 69)

DCS #	DESCRIPTION
03 12 14 64	Deadend Loopover, 8' FG Crossarm, 3-Phase
03 12 14 65	Deadend Loopover, 10' FG Crossarm, 3-Phase
03 12 14 68	Deadend Loopover, 10' FG Crossarm, 2-Phase
03 12 14 69	Deadend Loopover, 8' FG Crossarm, 2-Phase

REV	DATE	ENG	DESCRIPTION
10	10/01/23	AEP	Converted to new format, "Removed W/O FG Extension" Standards
9	02/17/12	MJ	

CONSTRUCTION NOTE(s):

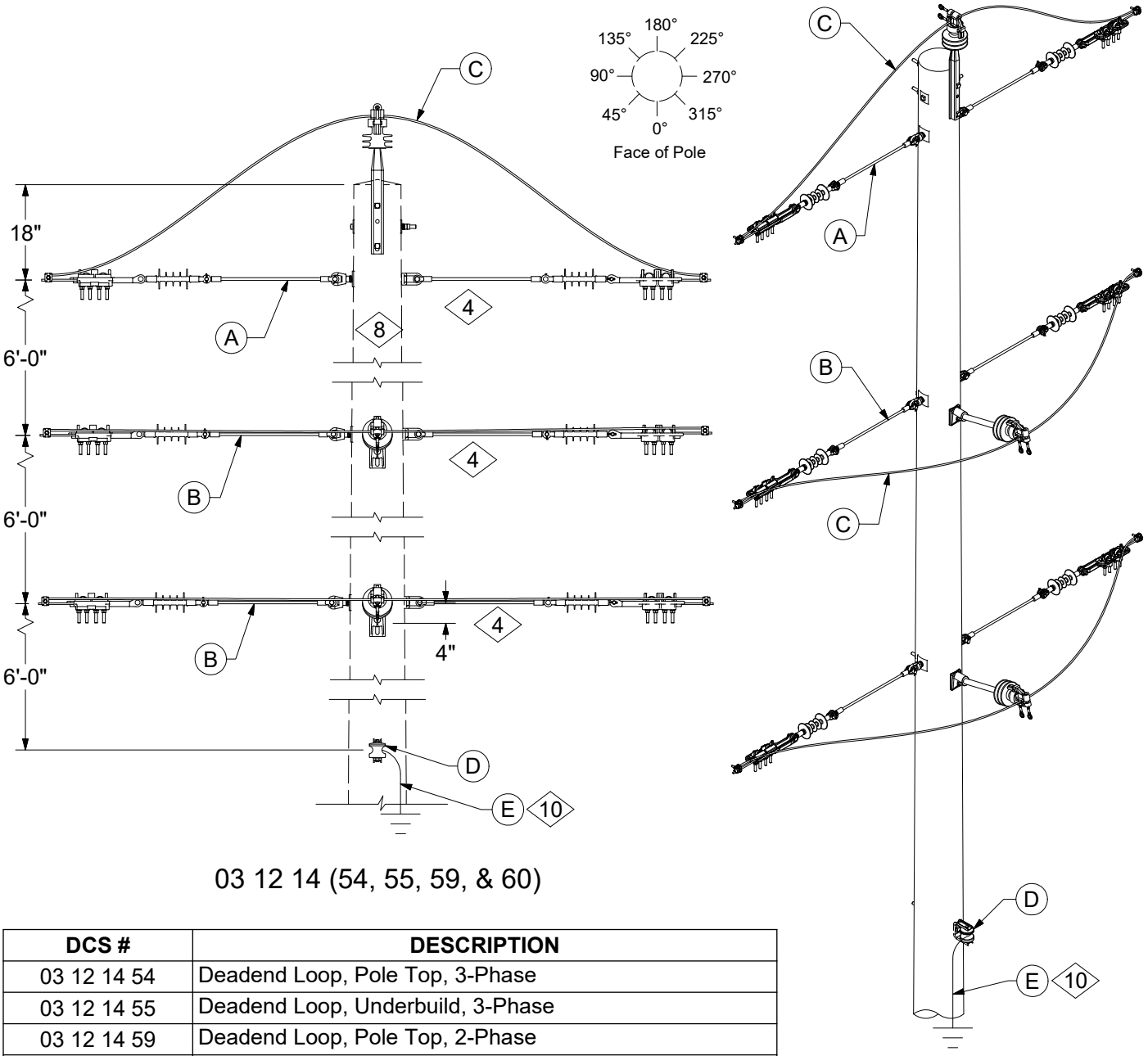
1. If guying is needed to account for difference in tension, see DCS **11 00 4* ****.

2. For 2-phase configuration, eliminate the center phase position.

3. 8'-0" crossarm available for use in Ameren Missouri only. Middle phase must meet avian protection requirements. See DCS **05 16 10 01** for more information.

	ITEM	STK / DCS #	DESCRIPTION 03 12 14 **	64	65	68	69
2,3,7	A	**04 00 42 02 @**	8' Deadend FG Crossarm	1	-	-	1
		04 00 42 03 @	10' FG Deadend FG Crossarm	-	1	1	-
	B	**06 12 35 05 @**	Double Deadend w/ Loopover of FG Crossarm	2	2	2	2
	C	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut (anti-split bolt)	-	-	1	1
	D	23 66 207	Washer, Curved, Square, 5/8"	-	-	2	2
	E	23 66 134	Lock Washer - 5/8" Double Coil	-	-	1	1
	F	23 65 043	Lock Nut - 5/8" Square	-	-	1	1
2,@	G	**06 12 30 04 @**	Loopover w/ FG Extension, Pole Top	1	1	-	-
10,11,@	H	**12 00 10 ** @**	Grounding Unit	1	1	1	1
@	I	**07 00 25 00 @**	Clamp, PG, PG*W	6	6	4	4
@	J	**03 01 01 ** @**	Neutral	1	1	1	1
@	K	**07 00 80 00 @**	Lead Wire, Poly Covered, Ft., PLW*W	24	24	24	24
1,@	L	**11 00 4* ** @**	Guying Unit	#	#	#	#
	M	252 or 260	Op Code, Install Jumper	3	3	2	2

REV	DATE	ENG	DESCRIPTION
10	10/01/23	AEP	Converted to new format, "Removed W/O FG Extension" Standards
9	02/17/12	MJ	



03 12 14 (54, 55, 59, & 60)

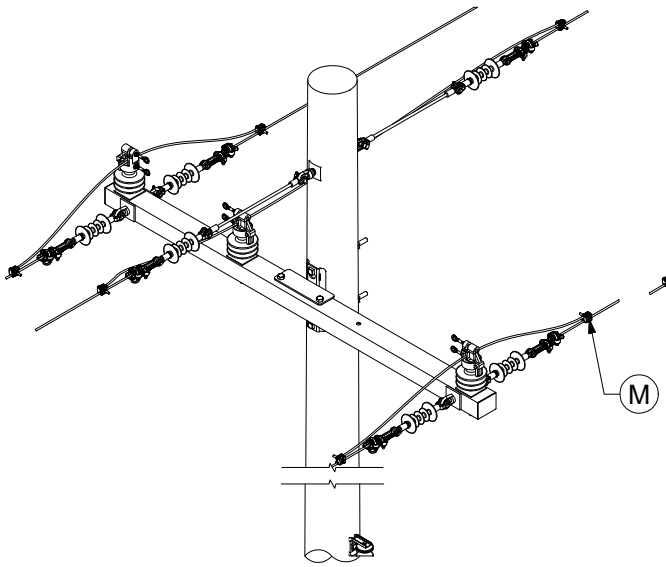
DCS #	DESCRIPTION
03 12 14 54	Deadend Loop, Pole Top, 3-Phase
03 12 14 55	Deadend Loop, Underbuild, 3-Phase
03 12 14 59	Deadend Loop, Pole Top, 2-Phase
03 12 14 60	Deadend Loop, Underbuild, 2-Phase

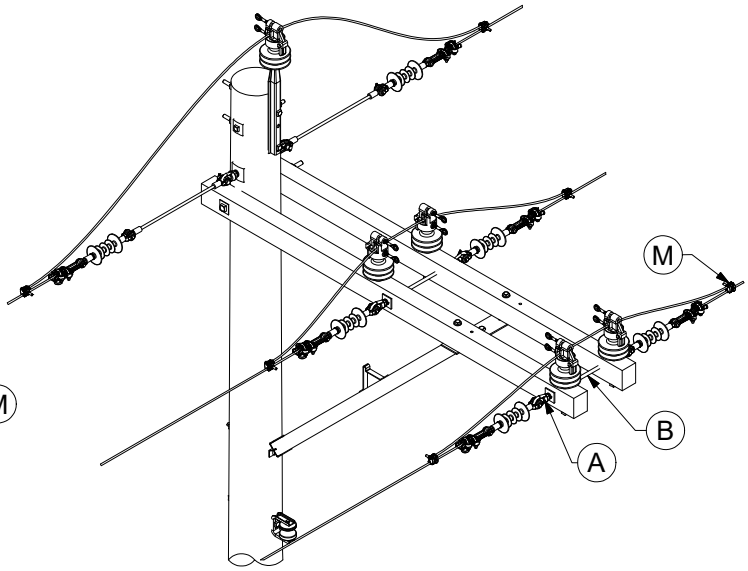
CONSTRUCTION NOTE(s):

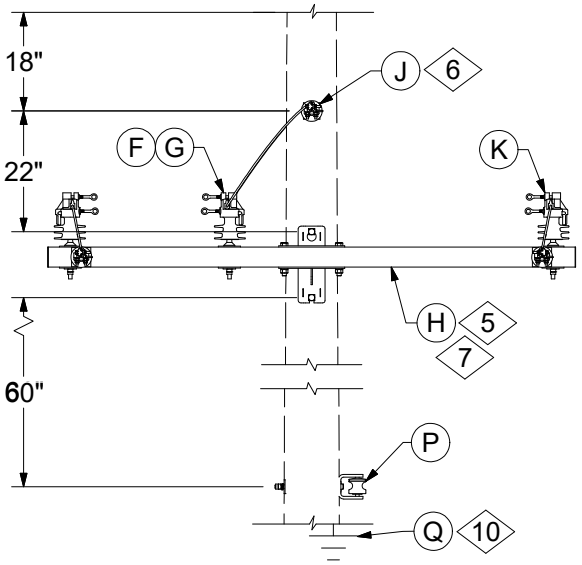
4. If deadending on angle greater than 5° offset deadend insulators by 4".

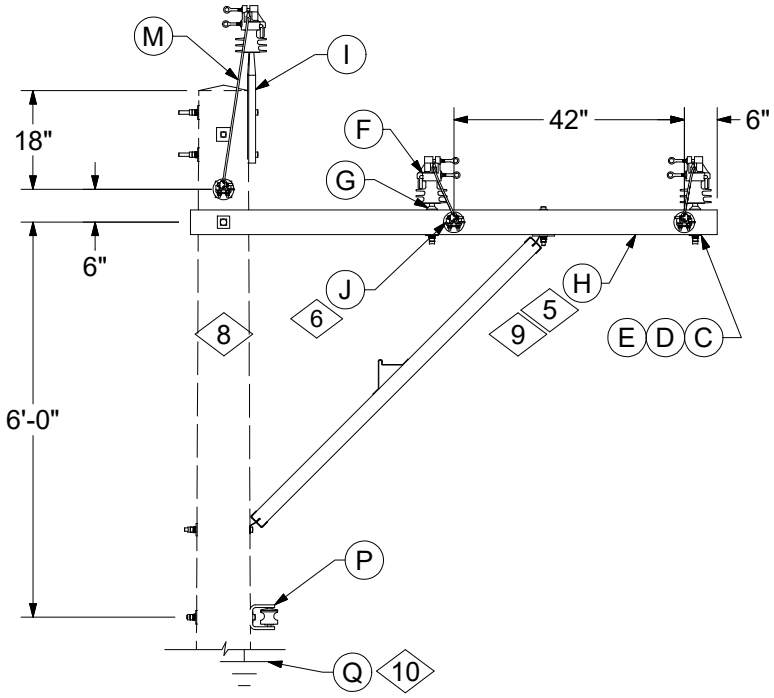
	ITEM	STK / DCS #	DESCRIPTION 03 12 14 **	54	55	59	60
	A	**06 12 30 04 @**	Pole Top Loopover w/ FG Extension	1	-	1	-
	B	**06 12 30 05 @**	Looparound w/FG Extension	2	3	1	2
@	C	**07 00 80 00 @**	Lead Wire, Poly Covered, Ft., PLW*W	30	30	30	30
@	D	**03 01 01 ** @**	Neutral	1	1	1	1
10,11,@	E	**12 00 10 ** @**	Grounding Unit	1	1	1	1
	F	252 or 260	Op Code, Install Jumper	3	3	2	2

REV	DATE	ENG	DESCRIPTION
10	10/01/23	AEP	Converted to new format, "Removed W/O FG Extension" Standards
9	02/17/12	MJ	









DCS #	DESCRIPTION
03 12 14 40	Deadend Loop, 6' Double Wood Side Arm, 3-Phase
03 12 14 41	Deadend Loop, 6' Double Wood Side Arm, 2-Phase
03 12 14 42	Deadend Loop, 10' Single FG Side Arm, 3-Phase
03 12 14 43	Deadend Loop, 10' Single FG Side Arm, 2-Phase
03 12 14 44	Deadend Loop Underbuild, 8' FG Crossarm, 3-Phase
03 12 14 45	Deadend Loop Underbuild, 10' FG Crossarm, 3-Phase
03 12 14 58	Deadend Loop, 8' Double Wood Side Arm, 3-Phase
03 12 14 66	Deadend Loop, 8' Double Wood Side Arm, 2-Phase

CONSTRUCTION NOTE(s):

5. 8'-0" crossarm available for use in Ameren Missouri only. If middle phase is installed on inside crossarm position, see DCS **05 16 12 01** for avian protection.

6. For 2-Phase configuration, eliminate the center phase position.

	ITEM	STK / DCS #	DESCRIPTION 03 12 14 **	40	41	42	43	44	45	58	66
	A	23 65 012	Eyenut, 5/8"	4	2	-	-	-	-	4	2
	B	23 53 002	Bolt, DA, 5/8" Dia x 16" w/ 4 nuts	2	1	-	-	-	-	2	1
	C	23 66 027	Washer, Flat, Square 5/8"	4	2	-	-	-	-	4	2
	D	23 66 134	Lock Washer - 5/8" Double Coil	8	4	-	-	-	-	8	4
	E	23 65 043	Lock Nut - 5/8" Square	4	2	-	-	-	-	4	2
	F	25 05 143	Insulator, Vice Top, 15kV	4	2	-	-	-	-	4	2
	G	23 62 028	Pin, Insulator, Long Shank	4	2	-	-	-	-	4	2
	H	**04 00 25 01 @**	6' Double Alley Arm - Wood	1	1	-	-	-	-	-	-
		04 00 25 02 @	8' Double Alley Arm - Wood	-	-	-	-	-	-	1	1
5,6,7,9		**04 00 42 02 @**	8' Deadend FG Crossarm	-	-	-	-	1	-	-	-
		04 00 42 03 @	10' Deadend FG Crossarm	-	-	-	-	-	1	-	-
		04 00 43 02 @	10' Single FG Alley Arm	-	-	1	1	-	-	-	-
6,@	I	**06 12 30 04 @**	Pole Top Loopover w/ FG Extensions	1	1	1	1	-	-	1	1
@	J	**06 12 35 02 @**	Double Deadend	2	1	-	-	-	-	2	1
@	K	**06 12 35 05 @**	Dbl DE w/ Loopover on FG Crossarm	-	-	2	1	2	2	-	-
@	L	**06 12 30 05 @**	Looparound w/ FG Extensions	-	-	-	-	1	1	-	-
@	M	**07 00 25 00 @**	Clamp, PG, PG*W	-	-	-	-	-	-	-	-
@	N	**07 00 80 00 @**	Lead Wire, Poly Covered, Ft., PLW*W	24	24	24	24	24	24	24	24
5,@	O	**05 16 12 01**	Wildlife Cover - DE	2	-	2	-	2	2	2	-
@	P	**03 01 01 ** @**	Neutral	1	1	1	1	1	1	1	1
10,11,@	Q	**12 00 10 ** @**	Grounding Unit	1	1	1	1	1	1	1	1
	R	252 or 260	Op Code, Install Jumper	3	2	3	2	3	3	3	2

DESIGN NOTE(s):

7. DCS **04 00 01 01** for crossarm loading. In some applications larger crossarm may be needed for heavier loadings.

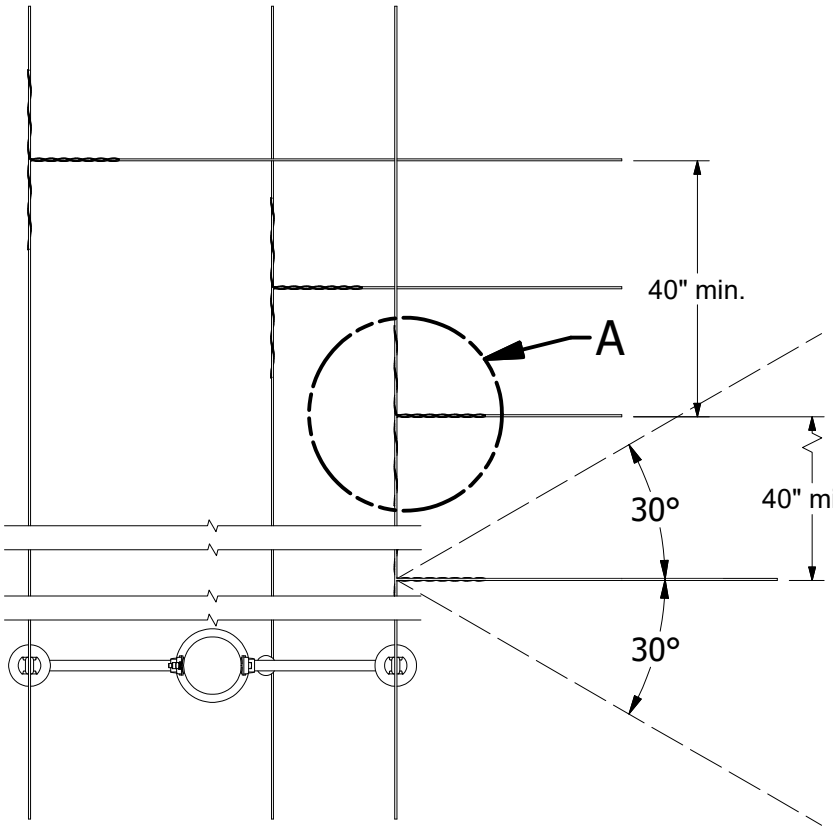
8. See DCS **02 00 04 02** for unguyed composite pole application.

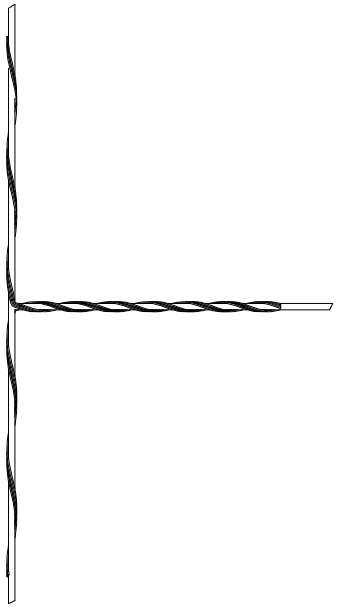
9. Equal deadend tension is required on both sides of the FG side arm.

10. Composite pole has factory installed (internal) ground in the 45° quadrant. Wood pole may require pole ground depending on application.

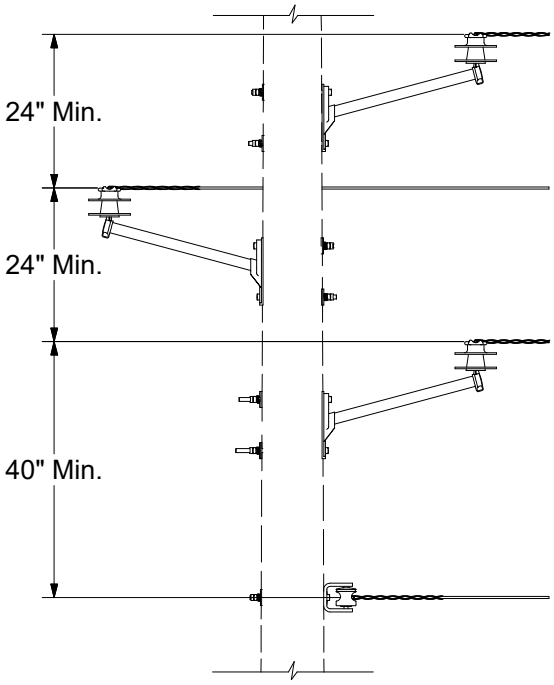
11. Pole grounds for distribution are required on each equipment pole and should be included on every 4th pole per mile for adequate grounding. See Section 12 for grounding applications.

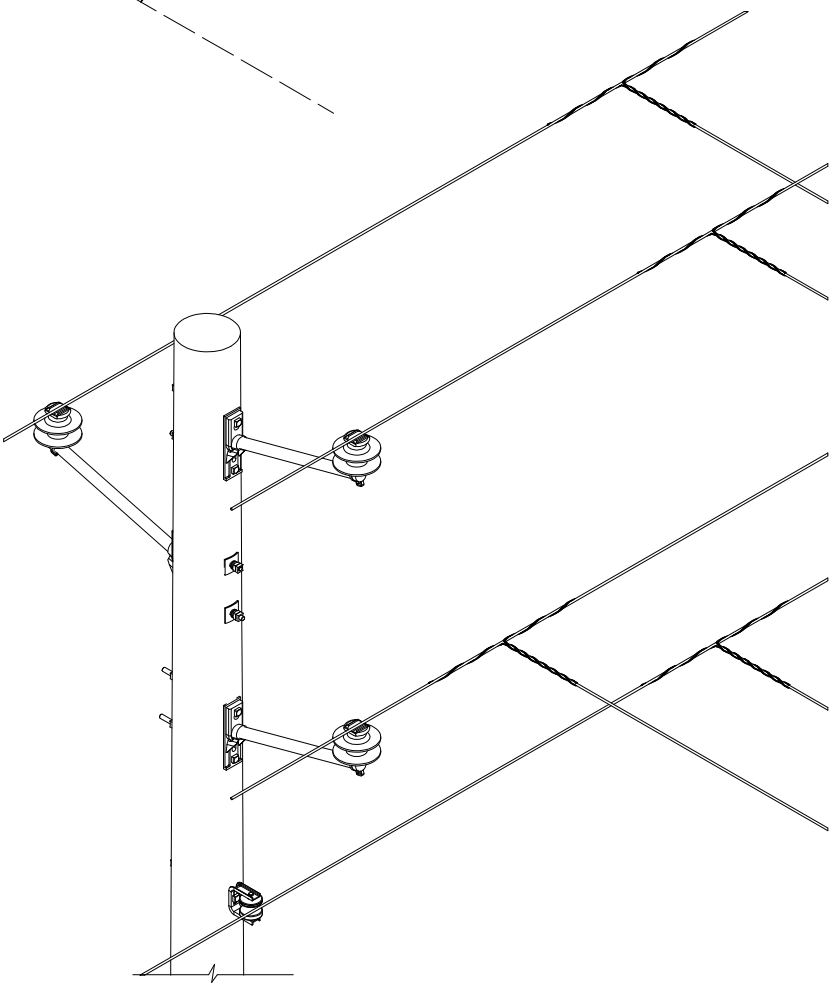
REV	DATE	ENG	DESCRIPTION
10	10/01/23	AEP	Converted to new format, "Removed W/O FG Extension" Standards
9	02/17/12	MJ	





DETAIL A





REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format
1	02/21/12	MJ	

Table 1 - Sag & Tension Data						
Line Size		Tap Span in Feet				Tap Tension Per Conductor in Pounds
		40	60	80	100	
Main	Tap	Tap Span in Inches				
#4 ACSR	#4 ACSR	6	13	24	37	27
1/0 AAAC	#4 ACSR	4	9	20	25	40
	1/0 AAAC	5	12	22	34	51
556 AAC	1/0 AAAC	5	11	19	30	58
	556 AAC	15	34	-	-	85

CONSTRUCTION NOTE(s):

1. Mid-span taps are permitted only if all of the following conditions are met:

   A. The location is easily accessible to a bucket truck, and
   B. The main conductor(s) is full tension, and
   C. The tap will be made on the nearest phase in horizontal configuration, or any phase in the vertical configuration, and
   D. The tap can be made in accordance with the above sag and tension table, and
   E. The mid-span tap will eliminate setting an additional pole.

2. Clearance shall be based on the main conductor's attachment height minus 3'-0" and minus the sag from Table 1. Tap spans shall be as level as possible.

3. Switches shall be installed on the first pole in the tap circuit.

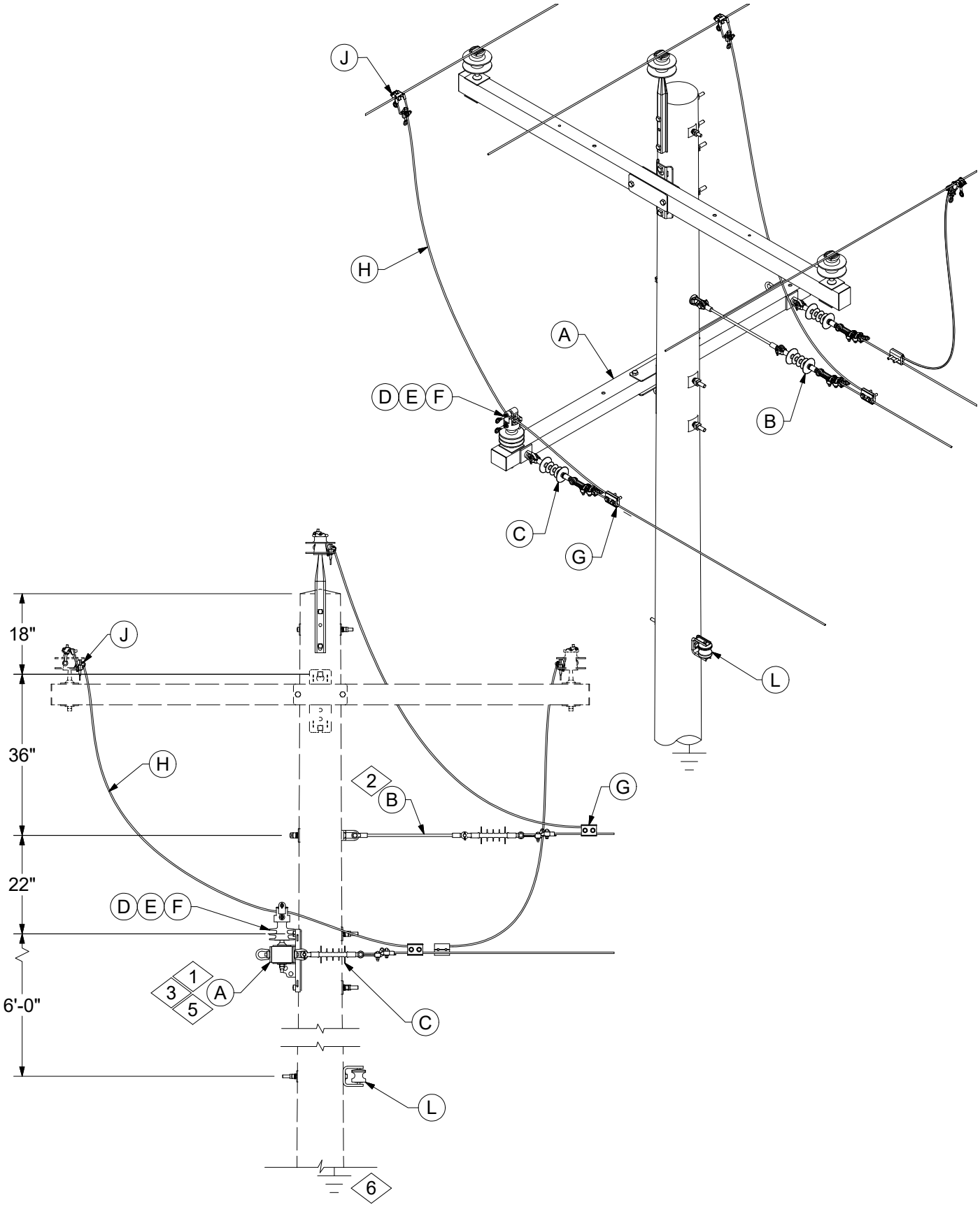
4. Taps shall be limited to one per conductor span run.

5. Quantity specified in the material list is for tapping one conductor.

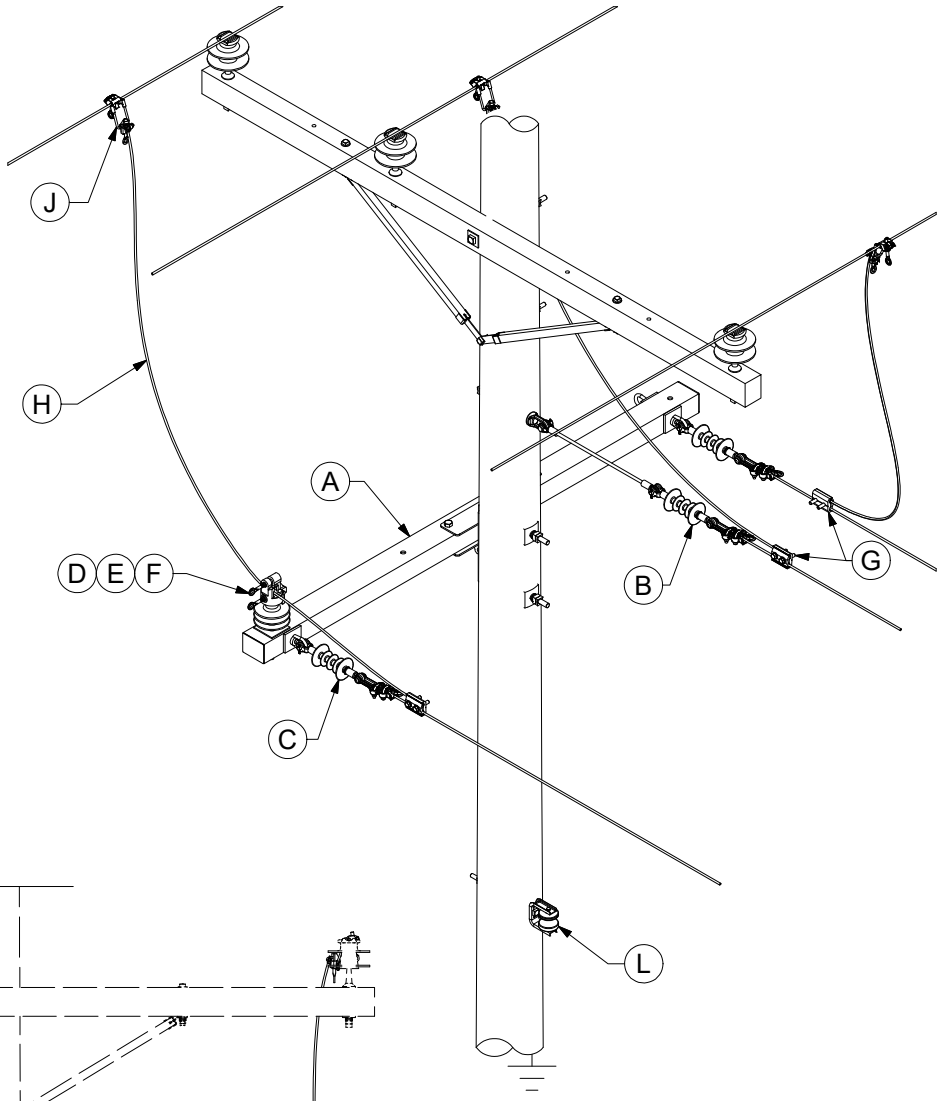
6. This Standard applies to tangent construction. In case of angle construction, the tap shall be within 10'-0" of the insulator, and the angles must comply with DCS **03 00 03 00**. Taps that are located 10'-0" to 30'-0" from the insulator shall meet insulator transverse loading limitations.

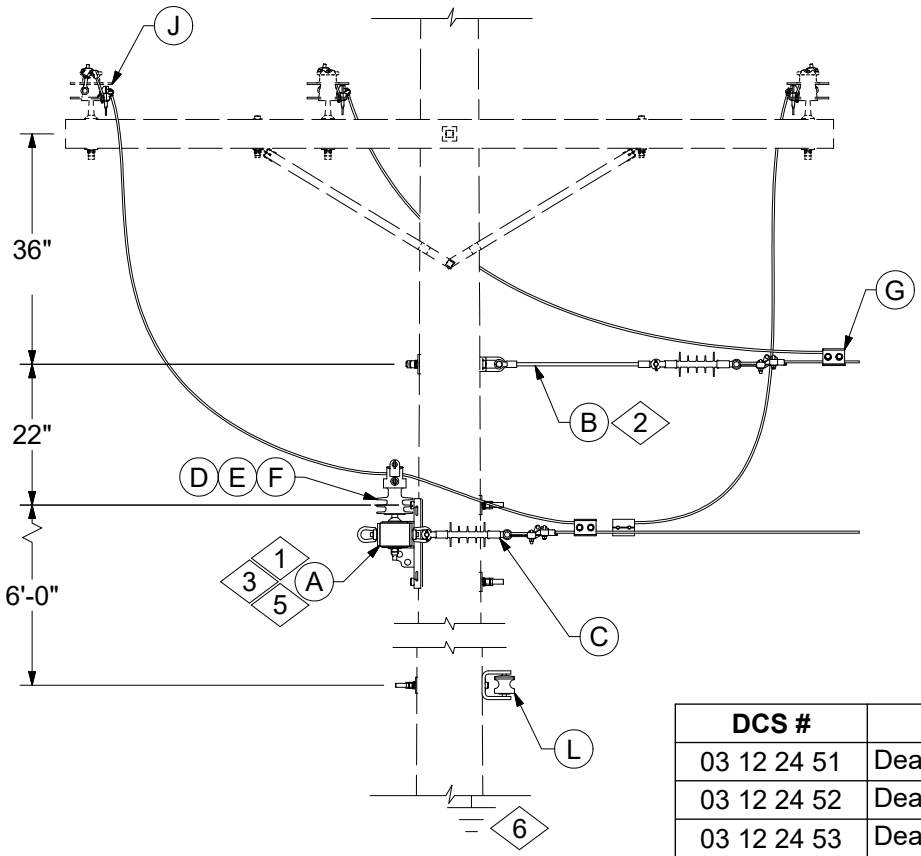
Table 2									
STK #	Line Size		Color Code		01	02	03	04	05
	Main	Tap	Main	Tap					
17 54 284	#4 ACSR	#4 ACSR	Orange	Orange	1	-	-	-	-
17 54 285	1/0 AAAC	#4 ACSR	Black	Orange	-	1	-	-	-
17 64 248	1/0 AAAC	1/0 AAAC	Yellow	Yellow	-	1	-	-	-
17 64 249	556 AAC	1/0 AAAC	Orange	Black	-	-	-	1	-
17 64 288	556 AAC	556 AAC	Orange	Orange	-	-	-	1	
295	Operations Code				1	1	1	1	1

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format
1	02/21/12	MJ	



REV	DATE	ENG	DESCRIPTION
8	10/01/23	AEP	Converted to new format
7	01/12/12	MJ	





DCS #	DESCRIPTION
03 12 24 51	Deadend Tap, 8' FG Crossarm, 3-Phase
03 12 24 52	Deadend Tap, 10' FG Crossarm, 3-Phase
03 12 24 53	Deadend Tap, 8' Fg Crossarm, 2-Phase
03 12 24 54	Deadend Tap, 10' FG Crossarm, 2-Phase

REV	DATE	ENG	DESCRIPTION
8	10/01/23	AEP	Converted to new format
7	01/12/12	MJ	

CONSTRUCTION NOTE(s):

1. Attach guy to fiberglass arm guy hook.

2. For 2-Phase configuration, eliminate the center phase position.

3. 8'-0" crossarm available for use in Ameren Missouri only. Middle phase must meet avian protection requirements. See DCS **05 16 12 01** for more information.

	ITEM	STK / DCS #	DESCRIPTION 03 12 24 **	51	52	53	54
3,5	A	**04 00 42 02 @**	8' Deadend FG Crossarm	1	-	1	-
		04 00 42 03 @	10' Deadend FG Crossarm	-	1	-	1
	B	**06 12 30 01 @**	Straight Deadend w/ FG Extension	1	1	-	-
	C	**06 12 35 01 @**	Straight Deadend on FG Crossarm	2	2	2	2
	D	25 05 143	Insulator, Vice Top, 15kV	1	1	1	1
	E	23 62 028	Pin, Insulator, Long Shank	1	1	1	1
	F	23 66 132	Washer, Flat, Sq., 4" x 4", w/ 13/16" Hole	2	2	2	2
@	G	**07 00 25 00 @**	Clamp, Parallel Groove, PG*W	3	3	2	2
@	H	**07 00 80 00 @**	Wire, Poly Covered (Ft.), PLW*W	24	24	16	16
6,7,@	I	**12 00 10 ** @**	Grounding Unit	1	1	1	1
@	J	**07 00 21 00 @**	Clamp, Hotline w/Stirrup, STC*W	3	3	2	2
1,4,@	K	**11 00 4* ** @**	Guying Unit	#	#	#	#
@	L	**03 01 01 ** @**	Neutral	1	1	1	1
	M	252 or 260	Op Code, Install jumper	3	3	2	2

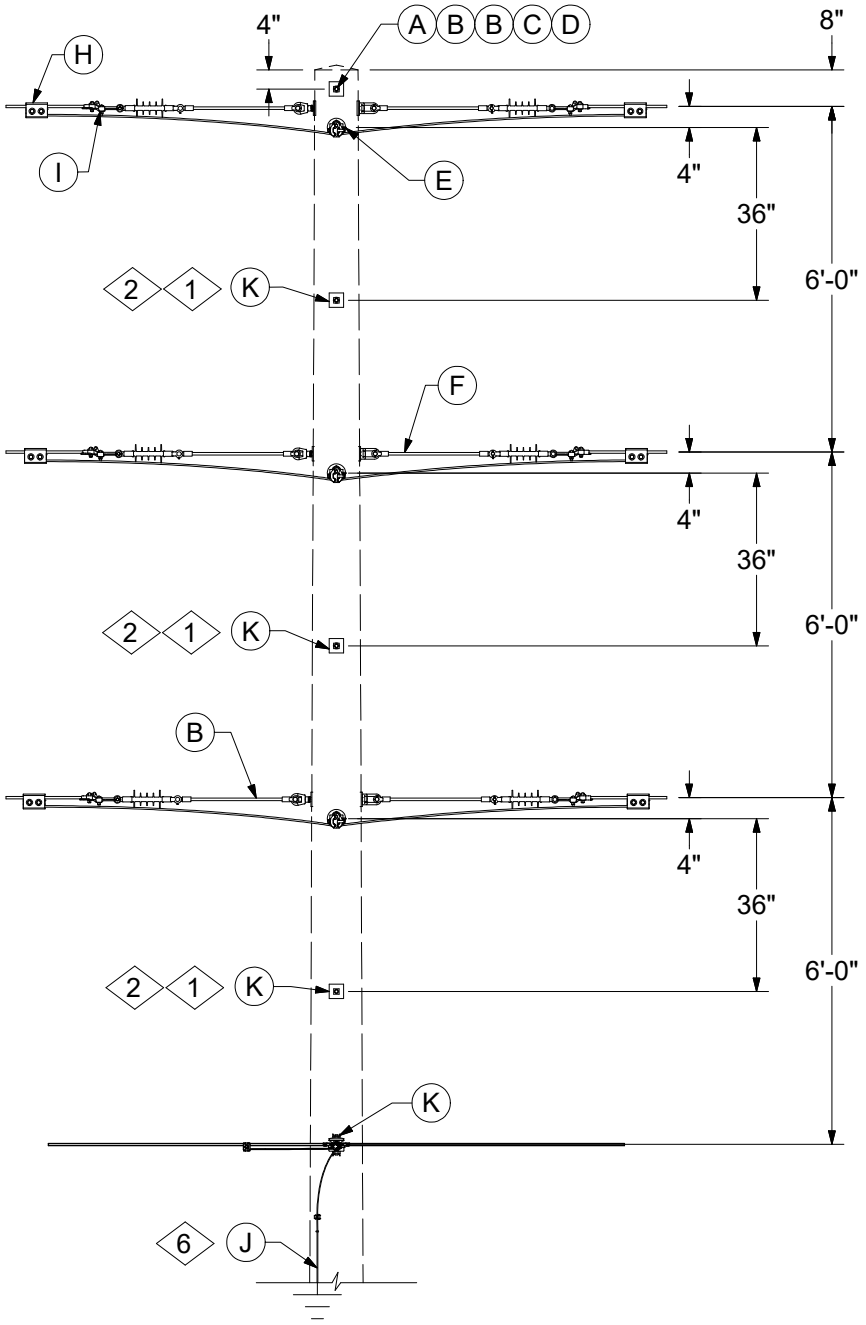
DESIGN NOTE(s):

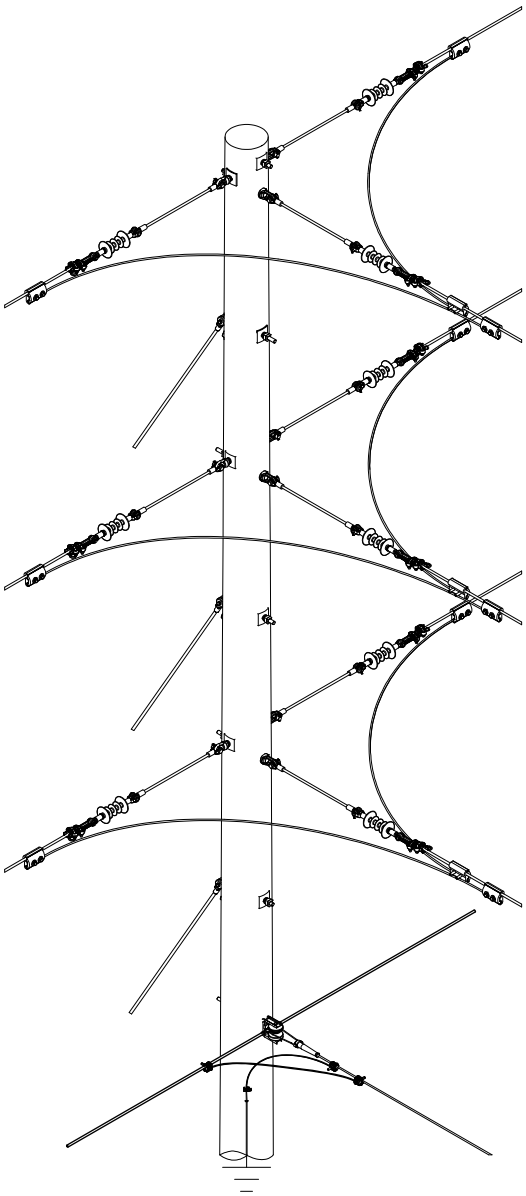
4. See DCS **02 00 04 02** for unguyed composite pole application.

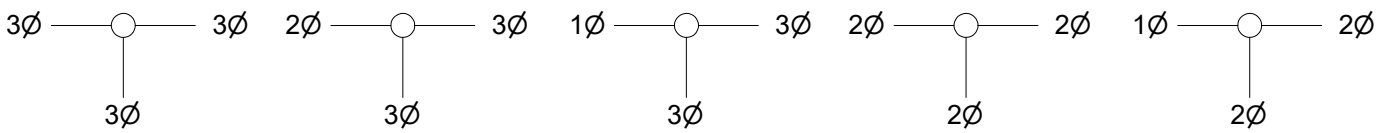
5. See DCS **04 00 01 01** for crossarm loading. In some applications a larger crossarm may be needed for heavier loadings.

6. Composite pole has factory installed (internal) pole ground in the 45° quadrant. Wood pole may require pole ground depending on application.

7. Pole grounds for distribution are required on each equipment pole and should be included on every 4th pole per mile for adequate grounding. See Section 12 for grounding applications.







03 12 30 11 | 03 12 30 12 | 03 12 30 13 | 03 12 30 14 | 03 12 30 15

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
8	10/01/23	AEP	Converted to new format
7	04/23/18	KR	

DCS #	DESCRIPTION
03 12 30 11	3-Phase Double Deadend on Pole w/ 3-Phase Tap
03 12 30 12	3- and 2-Phase Double Deadend on Pole w/ 3-Phase Tap
03 12 30 13	3- and 1-Phase Double Deadend on Pole w/ 3-Phase Tap
03 12 30 14	2-Phase Double Deadend on Pole w/ 2-Phase Tap
03 12 30 15	2- and 1-Phase Double Deadend on Pole w/ 2-Phase Tap

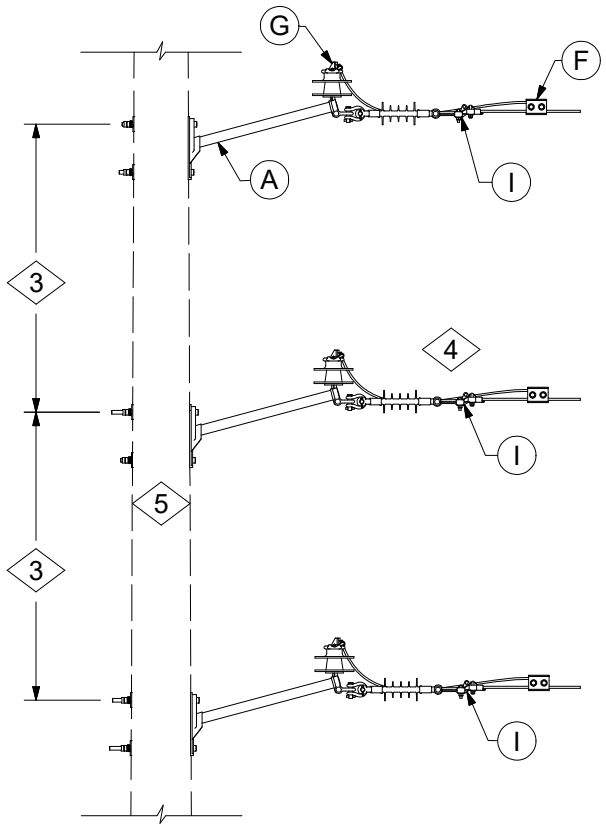
CONSTRUCTION NOTE(s):

1. If a span guy or guys are required or two through bolts are used to attach the guy hook(s), the location of one or both guy hooks will need to be adjusted up or down 2" to ensure bolts are at least 4" apart.

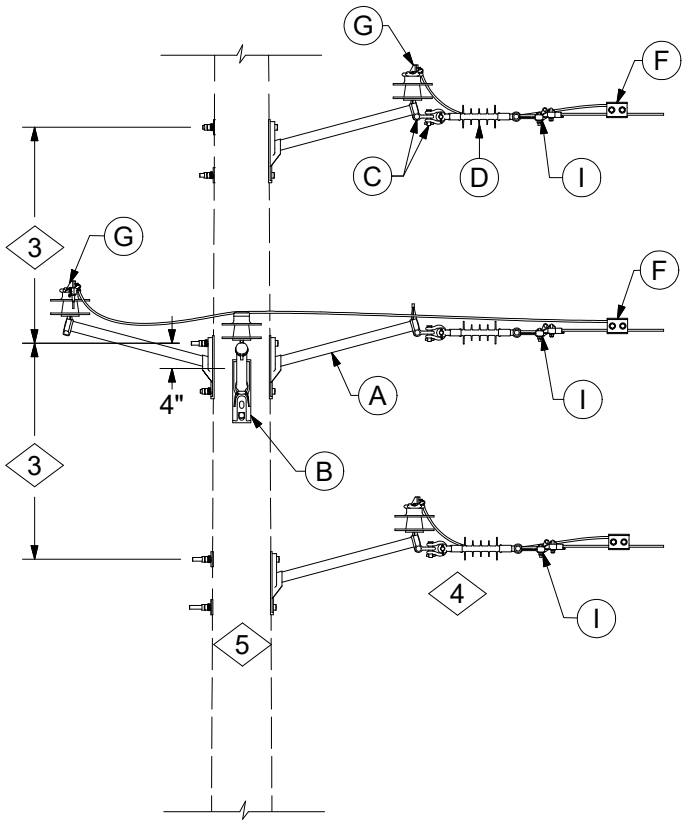
2. See DCS **11 00 02 02** for typical guy insulator placement.

	ITEM	STK / DCS #	DESCRIPTION 03 12 30 **	11	12	13	14	15
	A	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut (Anti-Split)	1	1	1	1	1
	B	23 66 207	Washer, Curved, Square, 5/8"	2	2	2	2	2
	C	23 66 134	Lock Washer - 5/8" Double Coil	1	1	1	1	1
	D	23 65 043	Lock Nut - 5/8" Square	1	1	1	1	1
	E	**06 12 30 01 @**	Straight Deadend w/ FG Extension	3	4	5	2	3
	F	**06 12 30 03 @**	Double Deadend w/ FG Extensions	3	2	1	2	1
@	G	**07 00 80 00 @**	Wire, Poly Covered (Ft.), PLW*W	30	25	20	20	15
@	H	**07 00 25 00 @**	Clamp, Parallel Groove, PG*W	12	10	8	8	6
6,7,@	I	**12 00 10 ** @**	Grounding Unit	1	1	1	1	1
1,2,5,@	J	**11 00 4* ** @**	Guying Unit	#	#	#	#	#
@	K	**03 01 01 ** @**	Neutral	1	1	1	1	1
	L	252, 255, or 260	Op Code, Install Jumper	6	5	4	4	3

REV	DATE	ENG	DESCRIPTION
8	10/01/23	AEP	Converted to new format
7	04/23/18	KR	



New Construction
03 12 30 (20 & 21)



Existing Construction
03 12 30 (22, 23, 24 & 25)

DCS #	DESCRIPTION
03 12 30 20	Underbuild, Vertical, 3-Phase Tap, New Construction
03 12 30 21	Underbuild, Vertical, 2-Phase Tap, New Construction
03 12 30 22	Underbuild, Staggered Vertical, 3-Phase Tap, Existing Construction
03 12 30 23	Underbuild, Staggered Vertical, Opposite 3-Phase Tap, Existing Construction
03 12 30 24	Underbuild, Staggered Vertical, 2-Phase Tap, Existing Construction
03 12 30 25	Underbuild, Staggered Vertical, Opposite 2-Phase Tap, Existing Construction

CONSTRUCTION NOTE(s):

3. For new construction use 6'-0" spacing between the phases. Clearance for single pole replacement or maintenance may be reduced as long as avian protection requirements are met.

	ITEM	STK / DCS #	DESCRIPTION 03 12 30 **	20	21	22	23	24	25
3,4,@	A	**06 12 21 05 @**	Single Insulator & Deadend - FG Standoff	3	2	-	-	-	-
		06 12 21 06 @	Single Deadend - FG Standoff	-	-	1	2	-	1
	B	**06 12 20 04**	Wire Training Assembly	-	-	1	2	-	1
	C	23 68 181	Shackle - Deadend	-	-	2	1	2	1
	D	25 06 052	Insulator, Deadend, 12kV	-	-	2	1	2	1
@	E	**07 00 80 00 @**	Wire, Poly Covered (Ft.) PLW*W	9	6	15	21	6	12
@	F	**07 00 25 00 @**	Clamp, Parallel Groove, PG*W	3	2	3	3	2	2
@	G	**07 00 21 00 @**	Clamp, Hotline w/ Stirrup, STC*W	3	2	3	3	2	2
@	H	**07 00 41 00 @**	Top Tie, TT*W	3	2	-	-	-	-
@	I	**07 00 11 00 @**	Clamp, Deadend, DEC*W	3	2	3	3	2	2
@	J	252 or 260	Op Code, Install jumper	1	1	1	1	1	1

DESIGN NOTE(s):

4. See DCS **03 00 03 00** for angle and span length limitations. See DCS **06 12 21 **** for standoff bracket and deadend insulator loading limitations.

5. See DCS **02 00 04 02** for unguyed composite pole application.

6. Composite pole has factory installed (internal) pole ground in the 45° quadrant. Wood pole may require pole ground depending on application.

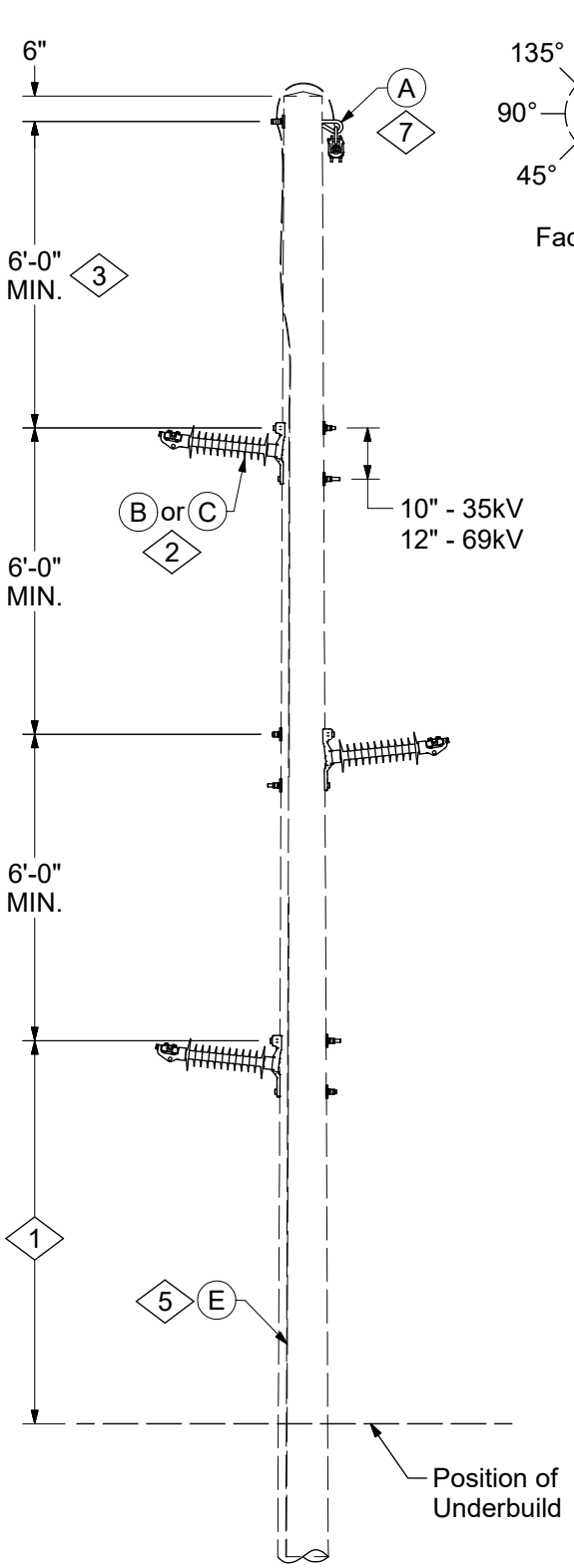
7. Pole grounds for distribution only are required on each equipment pole and should be placed every 4th pole to allow for adequate grounding. See DCS Section 12 for grounding applications.

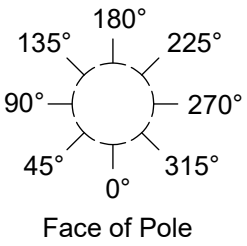
REV	DATE	ENG	DESCRIPTION
8	10/01/23	AEP	Converted to new format
7	04/23/18	KR	

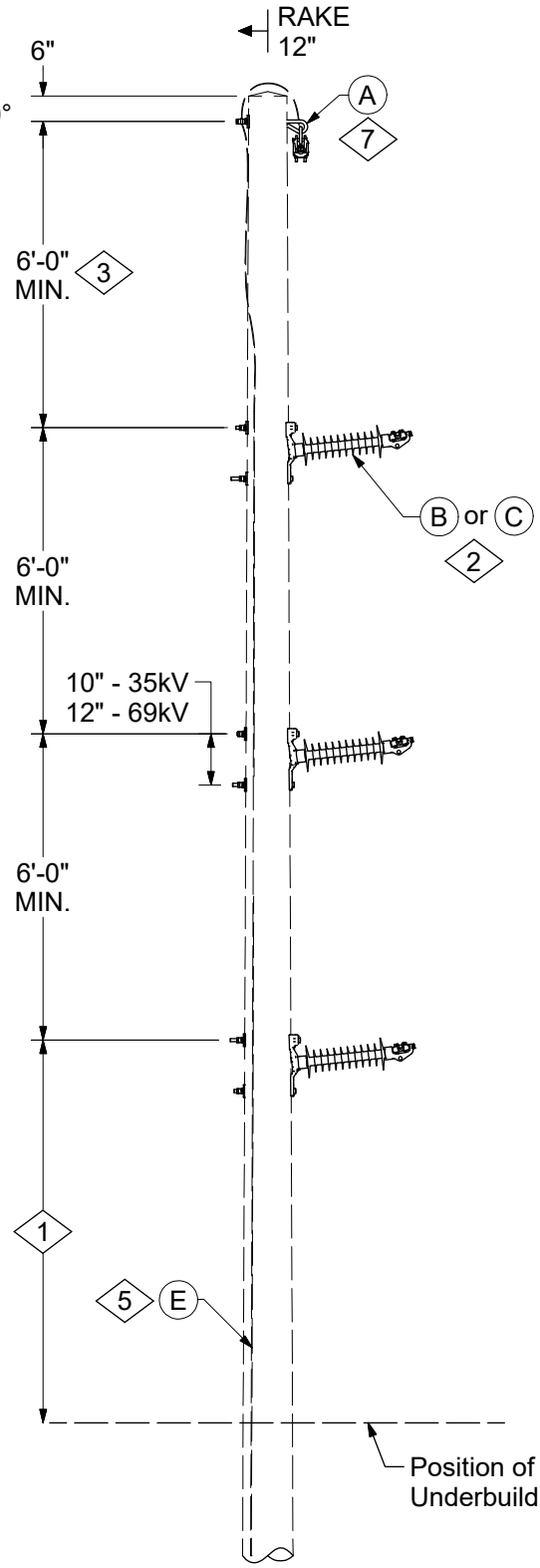
CONFIGURATIONS

Tangent Structure - Shielded
Line Angle ≤ 1°

03 69 01 **
35kV, 69kV
1 of 3





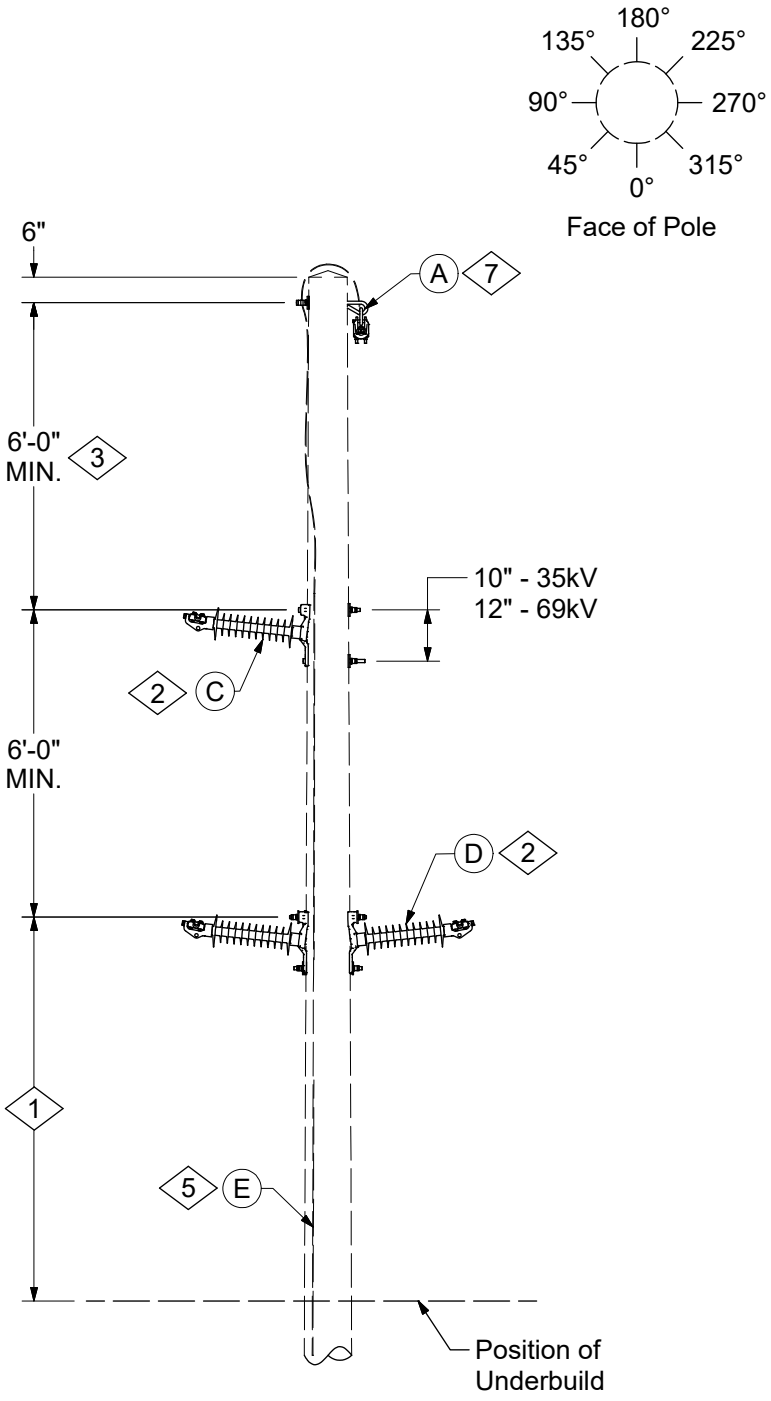


03 69 01 01 - Offset, 69kV ◇4
03 69 01 05 - Offset, 35kV

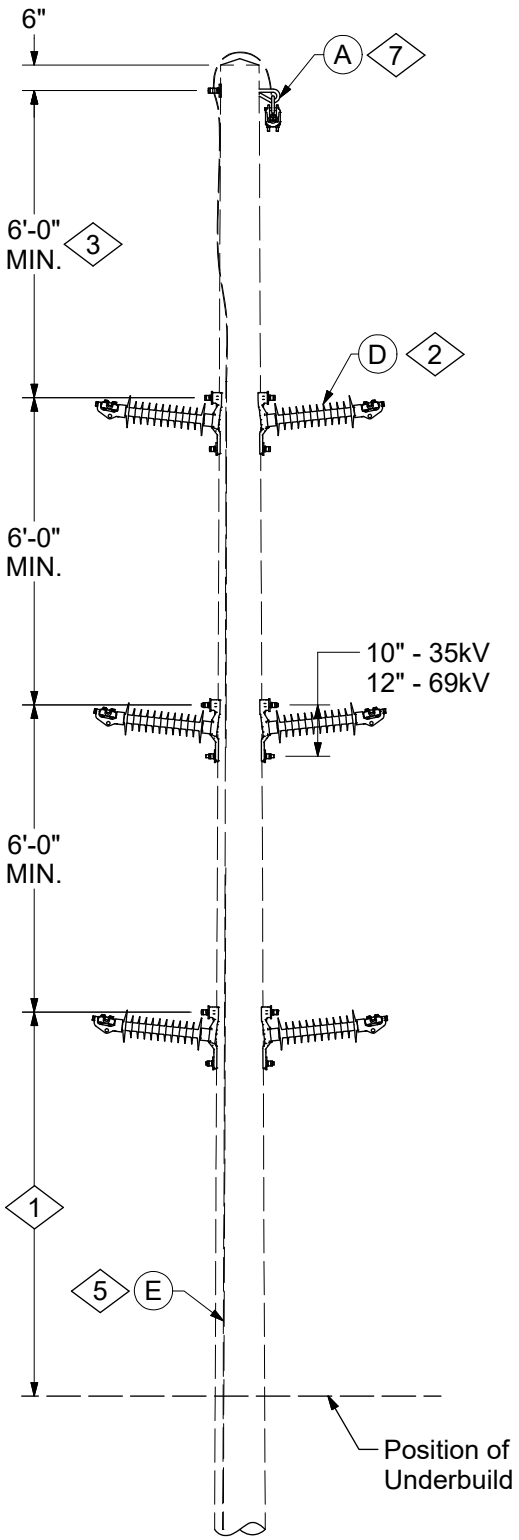
03 69 01 02 - In-line, 69kV ◇4
03 69 01 06 - In-line, 35kV

DISTRIBUTION
CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
4	10/01/23	AEP	Converted to new format
3	01/22/16	KR	



03 69 01 03 - Back-to-Back Single Circuit, 69kV



03 69 01 04 - In-line Double Circuit, 69kV

REV	DATE	ENG	DESCRIPTION
4	10/01/23	AEP	Converted to new format
3	01/22/16	KR	

DCS #	DESCRIPTION
03 69 01 01	Offset, 69kV
03 69 01 02	In-line, 69kV
03 69 01 03	Back to Back Single Circuit, 69kV
03 69 01 04	In-line Double Circuit, 69kV
03 69 01 05	Offset, 35kV
03 69 01 06	In-line, 35kV

CONSTRUCTION NOTE(s):

1. Use 7'-6" spacing for tangent and 7'-0" spacing for deadend on underbuild. When using fiberglass crossarm, spacing is measured to the top bolt of the crossarm brace.

	ITEM	STK / DCS #	DESCRIPTION 03 69 01 **	01	02	03	04	05	06
7,@	A	**06 00 11 04 @**	Static Wire Attachment - Tangent & Angle	1	1	1	1	1	1
		18 05 10 01 @	OPGW Static Support w/ Suspension Clamp	1	1	1	1	1	1
2,@	B	**06 34 03 03 @**	34kV Single Horizontal Line Post Insulator, Clamptop	-	-	-	-	3	3
2,6,@	C	**06 69 03 03 @**	69kV Single Horizontal Line Post Insulator, Clamptop	3	3	1	-	-	-
		06 69 03 01 @	69kV Single Horizontal Line Post Insulator, Suspension	3	3	1	-	-	-
2,6,@	D	**06 69 03 04 @**	69kV Double Horizontal Line Post Insulator, Clamptop	-	-	1	3	-	-
		06 69 03 02 @	69kV Double Horizontal Line Post Insulator, Suspension	-	-	1	3	-	-
5,@	E	**12 00 10 ** @**	Grounding Unit	1	1	1	1	1	1

DESIGN NOTE(s):

2. When additional clearance is needed, use 138kV horizontal line post insulators (Stock #25 05 099, 25 05 132, and 25 05 213) and install them at 9'-0" from the static bolt to ensure the proper shielding.

3. New Line construction must meet the minimum 6'-0" clearance requirement. Clearance for single pole replacement or maintenance of existing poles can be reduced to no less than 4'-0".

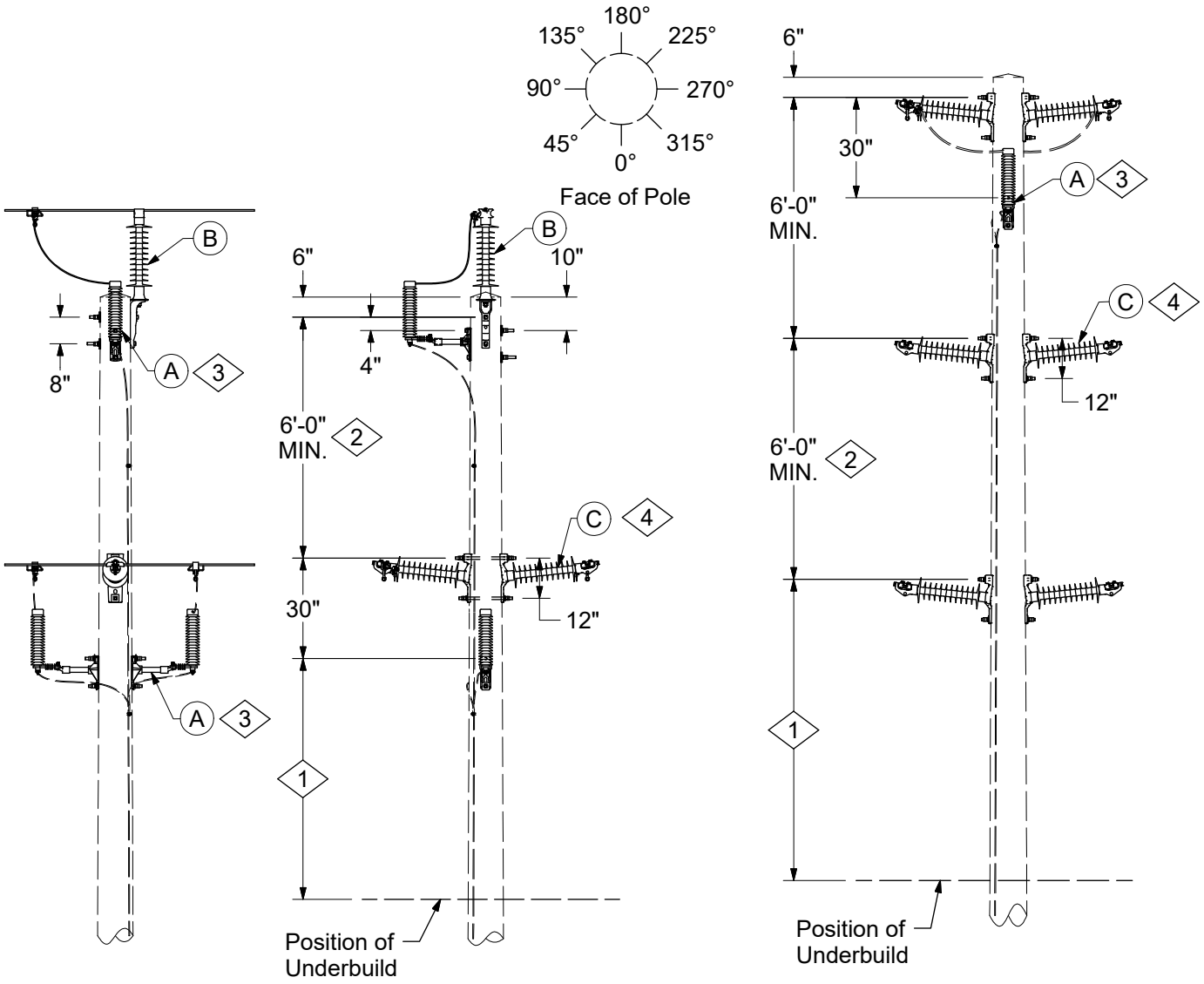
4. DCS **03 69 01 02** is to be used where a future second circuit is anticipated or where constrained by horizontal clearance requirements or right-of-way issues.

5. Composite pole has factory installed (internal) pole ground in the 45° quadrant. See DCS **12 00 10 **** for grounding detail.

6. Clamptop style insulators may be used in both compression and tension applications, and the suspension style insulators should be used in tension applications within allowable line angles.

7. Refer to DCS Section 18 for OPGW applications.

REV	DATE	ENG	DESCRIPTION
4	10/01/23	AEP	Converted to new format
3	01/22/16	KR	



03 69 02 51 - Single Circuit, 69kV
03 69 02 56 - Single Circuit, 35kV

03 69 02 52 - Double Circuit, 69kV

CONSTRUCTION NOTE(s):

1. Use 7'-6" spacing for tangent and 7'-0" spacing for deadend on underbuild. When using fiberglass crossarm, spacing is measured to the top bolt of the crossarm brace.

	ITEM	STK / DCS #	DESCRIPTION 03 69 02 **	51	52	56
3,@	A	**12 34 ** ** @**	Arrester Assemblies	1	1	1
@	B	**06 34 01 05 @**	34kV Vertical Line Post Insulator, F-Neck	-	-	1
		06 69 01 04 @	69kV Vertical Line Post Insulator, F-Neck	1	-	-
2,4,@	C	**06 69 03 04 @**	69kV Double Horizontal Line Post Insulator, Clamptop	1	3	1
		06 69 03 02 @	69kV Double Horizontal Line Post Insulator, Suspension	1	3	1

REV	DATE	ENG	DESCRIPTION
6	10/01/23	AEP	Converted to new format
5	01/14/16	KR	

DESIGN NOTE(s):

2. New line construction must meet the minimum 6'-0" clearance requirement. Clearance for single pole replacement or maintenance of existing poles can be reduced to no less than 4'-0".

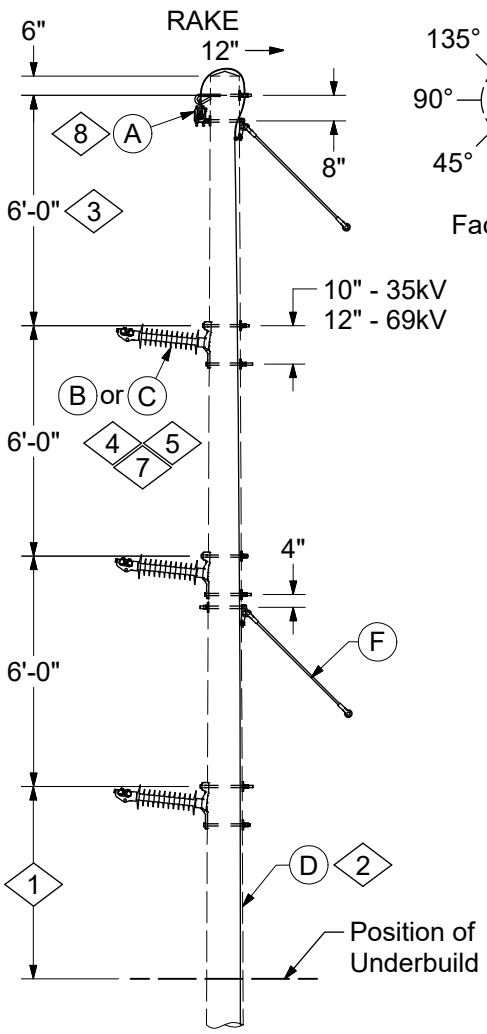
3. See DCS **12 34 ** **** for lightning arresters application and installation methods.

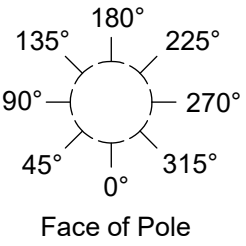
4. When additional clearance is needed, use 138kV horizontal line post insulators (Stock #25 05 099, 25 05 132, and 25 05 213) and install them at 9'-0" from the static bolt to ensure the proper shielding.

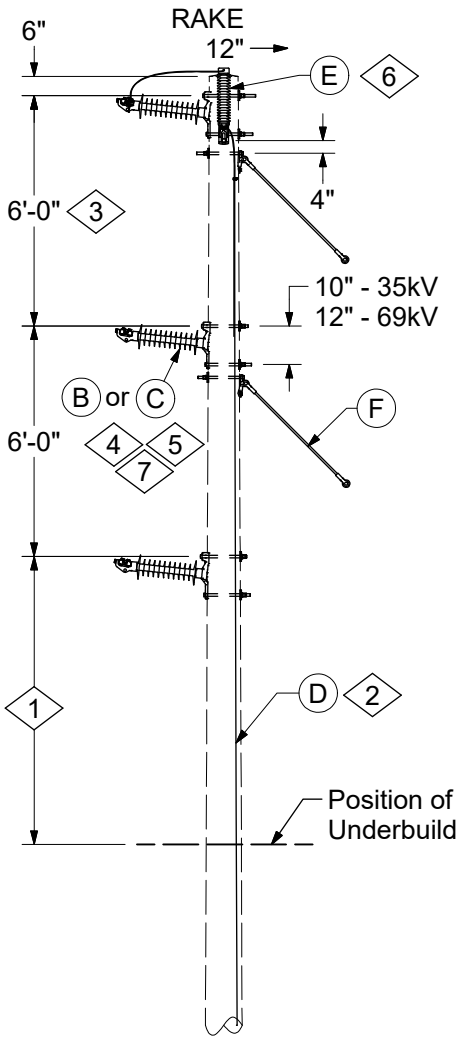
5. Composite pole has factory installed (internal) pole ground in the 45° quadrant. See DCS **12 00 10 **** for grounding detail.

CONFIGURATIONS

Fixed Angle Structure
Single Circuit for > 1° and ≤ 20°







03 69 05 01 - Shielded, 69kV
03 69 05 02 - Shielded, 35kV

03 69 05 51 - Unshielded, 69kV
03 69 05 52 - Unshielded, 35kV

CONSTRUCTION NOTE(s):

1. Use 7'-6" spacing for tangent and 7'-0" spacing for deadend on underbuild. When using fiberglass crossarm, spacing is measured to the top bolt of the crossarm brace.

	ITEM	STK / DCS #	DESCRIPTION 03 69 05 **	01	02	51	52
8,@	A	**06 00 11 04 @**	Static Wire Attachment - Tangent & Angle	1	1	-	-
		18 05 10 01 @	OPGW Static Support w/ Suspension Clamp	1	1	-	-
5,7,@	B	**06 34 03 03 @**	34kV Single Horizontal Line Post Insulator, Clamptop	3	3	-	3
5,7,@	C	**06 69 03 03 @**	69kV Single Horizontal Line Post Insulator, Clamptop	3	3	3	3
		06 69 03 01 @	69kV Single Horizontal Line Post Insulator, Suspension	3	3	3	3
2,@	D	**12 00 10 ** @**	Grounding Unit	1	1	-	-
6,@	E	**12 34 ** ** @**	Arrester Assemblies	-	-	1	1
@	F	**11 00 4* ** @**	Guying Unit	#	#	#	#

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format
1	02/17/12	MJ	

DESIGN NOTE(s):

2. Composite pole has factory installed (internal) pole ground in the 45° quadrant. See DCS **12 00 10 ****** for grounding detail.

3. New line construction must meet the minimum 6'-0" clearance requirement. Clearance for single pole replacement or maintenance of existing poles can be reduced to no less than 4'-0".

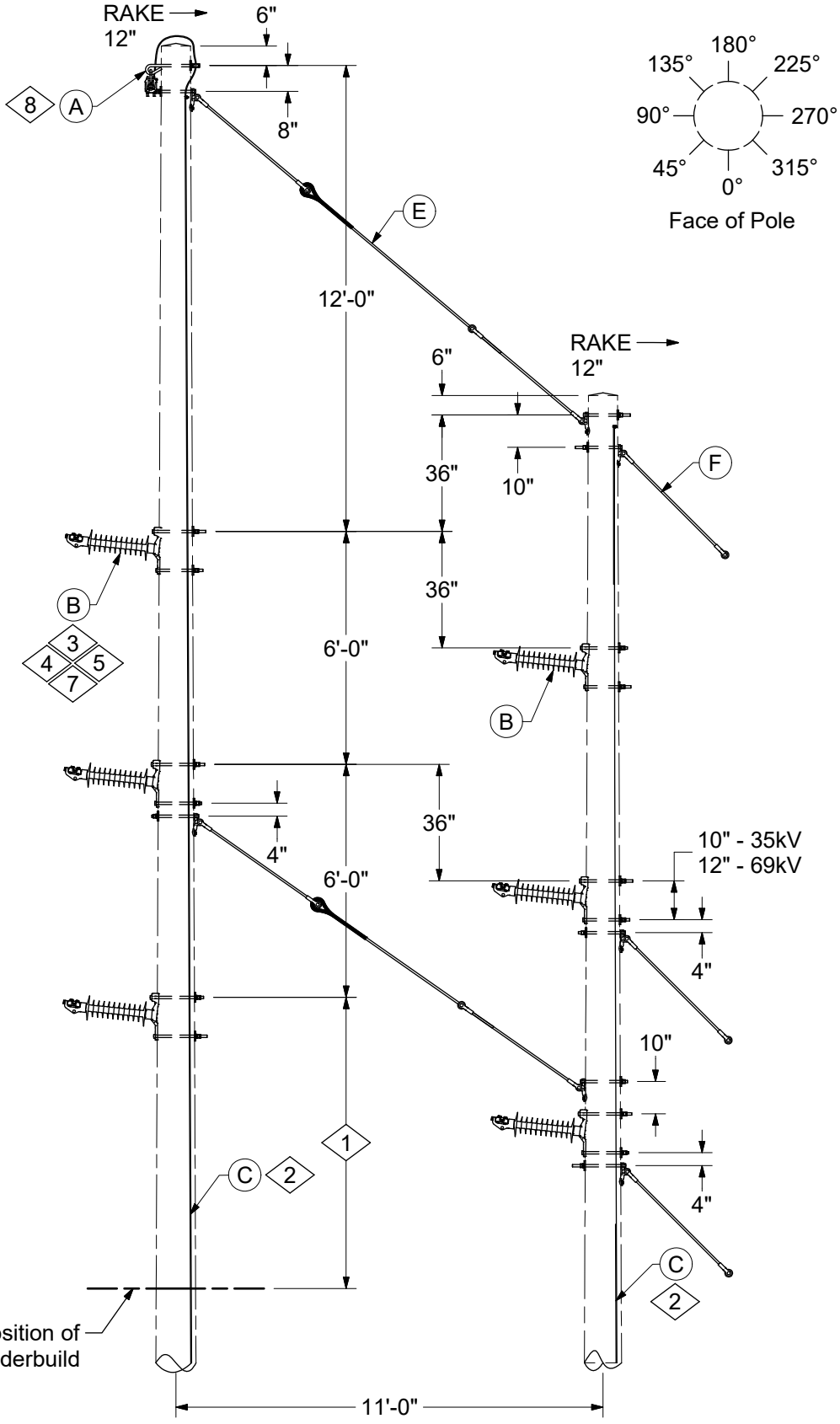
4. See DCS **03 00 03 00** for angle and span length limitations.

5. When additional clearance is needed, use 138kV horizontal line post insulators (Stock #25 05 099, 25 05 132, and 25 05 213) and install them at 9'-0" from the static bolt to ensure the proper shielding.

6. See DCS **12 34 ** ****** for lightning arresters application and installation method.

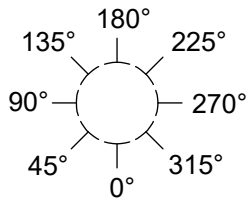
7. Clamptop style insulators may be used in both compression and tension applications, and the suspension style insulators should be used in tension applications within allowable line angles.

8. Refer to DCS Section 18 for OPGW applications.

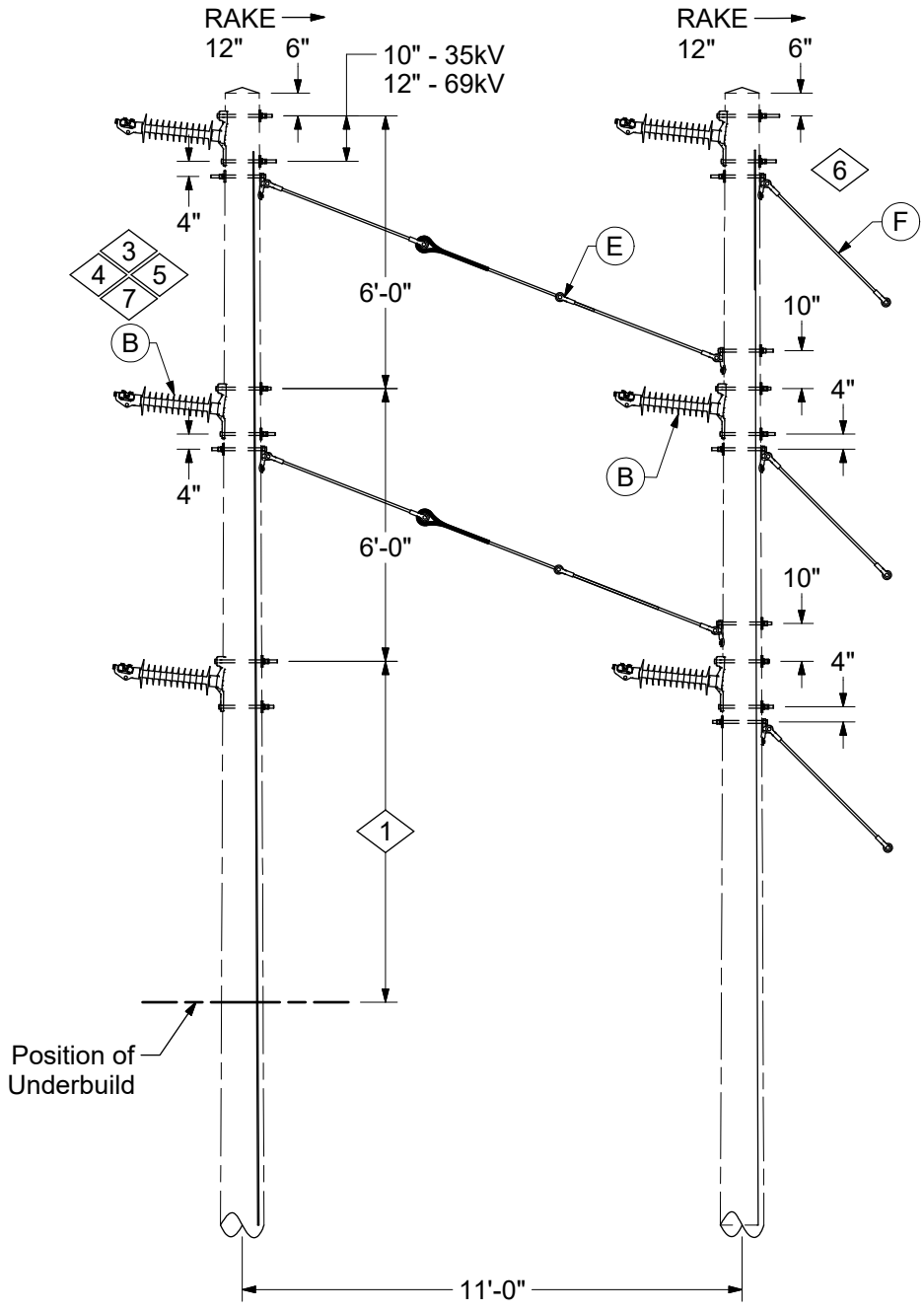


03 69 06 01 - Shielded Double Pole, 69kV
03 69 06 03 - Shielded Double Pole, 35kV

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format
1	02/17/12	MJ	

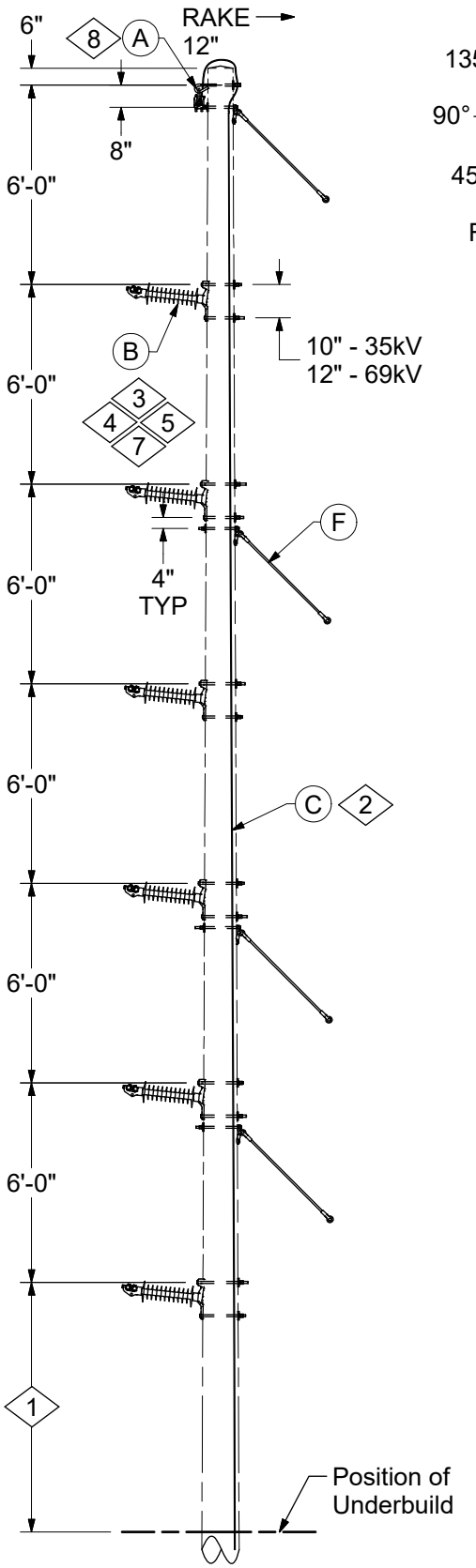


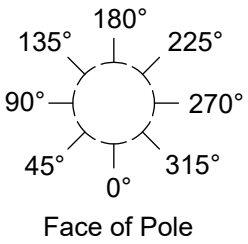
Face of Pole

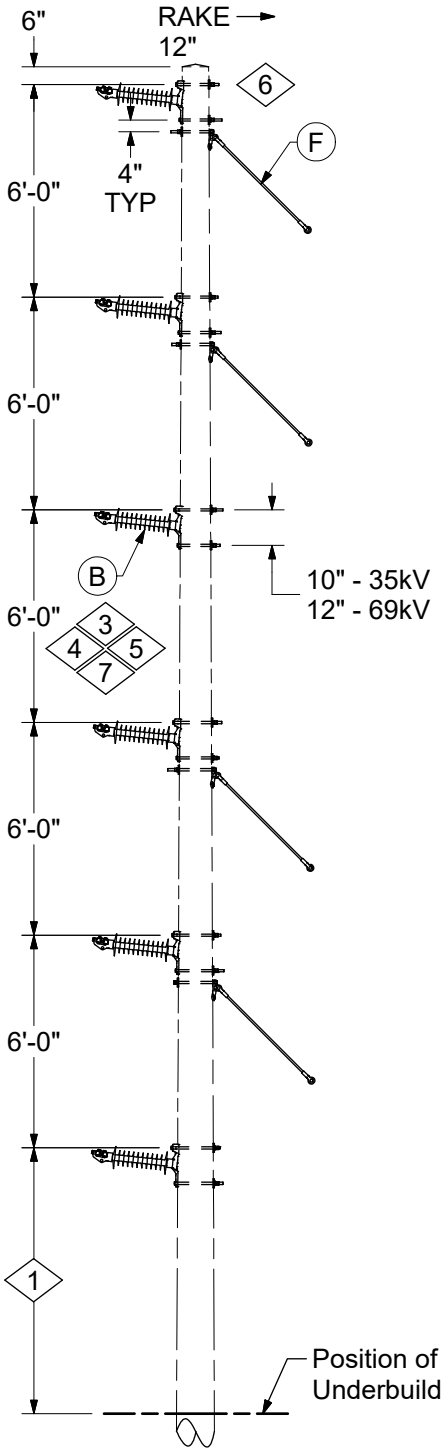


03 69 06 51 - Unshielded Double Pole, 69kV
03 69 06 53 - Unshielded Double Pole, 35kV

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format
1	02/17/12	MJ	







03 69 06 02 - Shielded Single Pole, 69kV
03 69 06 04 - Shielded Single Pole, 35kV

03 69 06 52 - Unshielded Single Pole, 69kV
03 69 06 54 - Unshielded Single Pole, 35kV

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format
1	02/17/12	MJ	

CONSTRUCTION NOTE(s):

1. Use 7'-6" spacing for tangent and 7'-0" spacing for deadend on underbuild. When using fiberglass crossarm, spacing is measured to the top bolt of the crossarm brace.

	ITEM	STK / DCS #	DESCRIPTION 03 69 06 **	01	02	03	04	51	52	53	54
8,@	A	**06 00 11 04 @**	Static Wire Attachment - Tangent & Angle	1	1	1	1	-	-	-	-
		18 05 10 01 @	OPGW Static Support w/ Suspension Clamp	1	1	1	1	-	-	-	-
3,4,5, 7,@	B	**06 34 03 03 @**	34kV Single Horizontal Line Post Insulator, Clamptop	-	-	6	6	-	-	6	6
		06 69 03 01 @	69kV Single Horizontal Line Post Insulator, Suspension	6	6	-	-	6	6	-	-
		06 69 03 03 @	69kV Single Horizontal Line Post Insulator, Clamptop	6	6	-	-	6	6	-	-
2,@	C	**12 00 10 ** @**	Grounding unit	2	1	2	1	-	-	-	-
6,@	D	**12 34 ** ** @**	Arrester Assemblies	-	-	-	-	1	1	1	1
@	E	**11 00 46 ** @**	Span Guy Unit	2	-	2	-	2	-	2	-
@	F	**11 00 4* ** @**	Guying Unit	#	#	#	#	#	#	#	#

DESIGN NOTE(s):

2. Composite pole has factory installed (internal) pole ground in the 45° quadrant. See DCS **12 00 10 **** for grounding detail.

3. New line construction must meet the minimum 6'-0" clearance requirement. Clearance for single pole replacement or maintenance of existing poles can be reduced to no less than 4'-0".

4. See DCS **03 00 03 00** for angle and span length limitations.

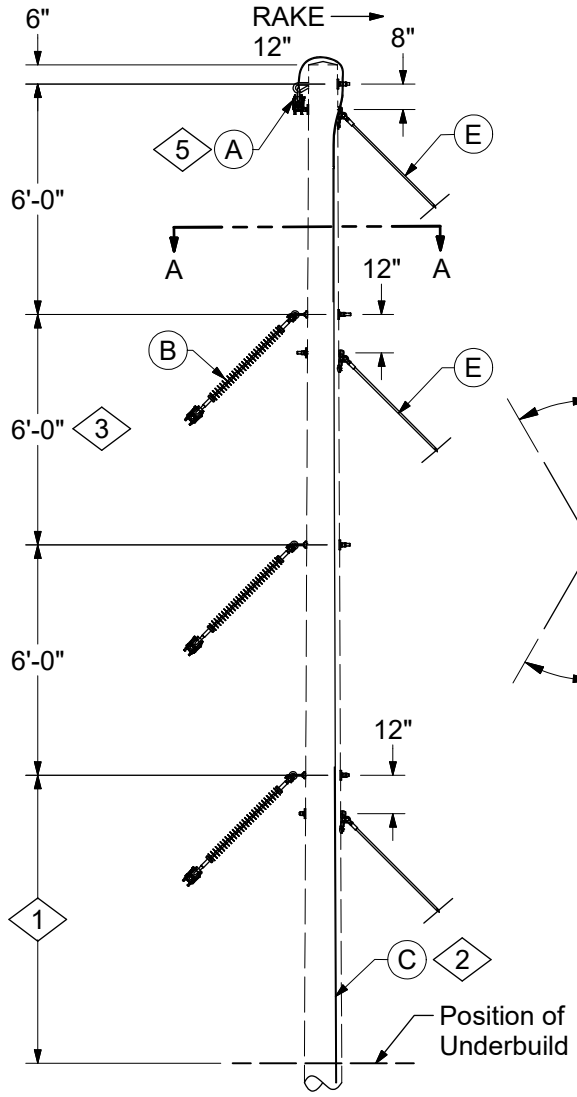
5. When additional clearance is needed, use 138kV horizontal line post insulators (Stock #25 05 099, 25 05 132, and 25 05 213) and install them at 9'-0" from the static bolt to ensure the proper shielding.

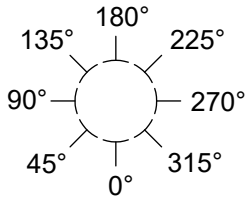
6. See DCS **12 34 ** **** for lightning arresters application and installation methods.

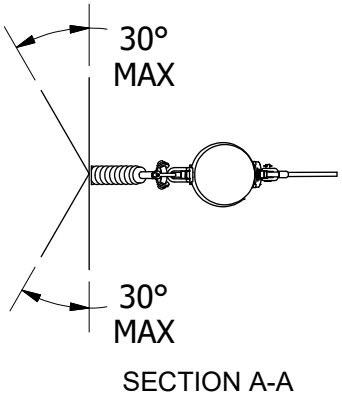
7. Clamptop style insulators may be used in both compression and tension applications, and the suspension style insulators should be used in tension applications within allowable line angles.

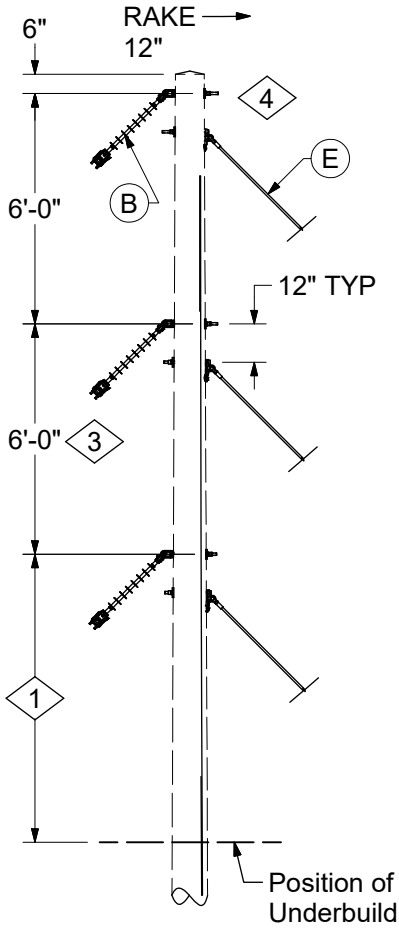
8. Refer to DCS Section 18 for OPGW applications.

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format
1	02/17/12	MJ	









03 69 10 51 - Unshielded, 69kV
03 69 10 53 - Unshielded, 35kV

03 69 10 01 - Shielded, 69kV
03 69 10 03 - Shielded, 35kV

CONSTRUCTION NOTE(s):

1. If underbuild is in vertical configuration, 6'-0" spacing is adequate. For underbuild on crossarms, use 7'-6" spacing for tangent and 7'-0" spacing for deadends. When using fiberglass crossarm, spacing is measured to the top bolt of the crossarm.

	ITEM	STK / DCS #	DESCRIPTION 03 69 10 **	01	03	51	53
5,@	A	**06 00 11 04 @**	Static Wire Attachment - Tangent & Angle	1	1	-	-
		18 05 1* ** @	OPGW Static Support	1	1	-	-
@	B	**06 34 60 08 @**	34kV Single Floating Angle Assembly	-	3	-	3
		06 34 60 28 @	69kV Single Floating Angle Assembly	3	-	3	-
2,@	C	**12 00 10 ** @**	Grounding Unit	1	1	-	-
4,@	D	**12 34 ** ** @**	Arrester Assemblies	-	-	1	1
@	E	**11 00 4* ** @**	Guying Unit	#	#	#	#

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Updated to new format
1	02/17/12	MJ	

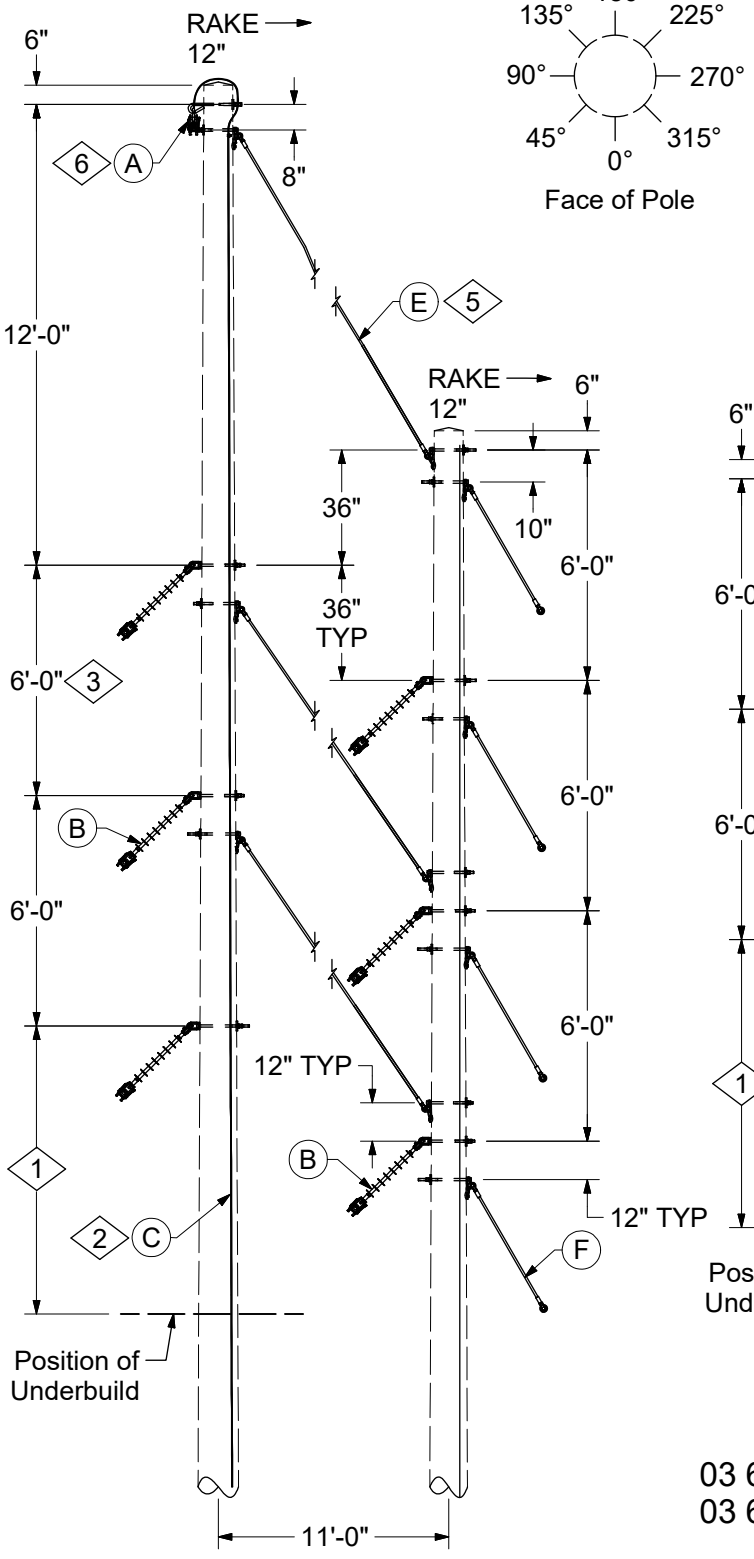
DESIGN NOTE(s):

2. Composite Pole has factory installed (internal) pole ground in the 45° quadrant. See DCS **12 00 10 ** ** for grounding detail.

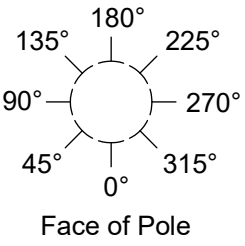
3. New line construction must meet the minimum 6'-0" clearance requirement. Clearance for single pole replacement or maintenance of existing poles can be reduced to no less than 4'-0".

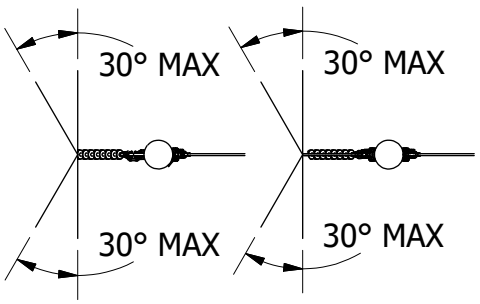
4. See DCS **12 34 ** ** ** for lightning arrester application and installation methods.

5. Refer to DCS Section 18 for OPGW applications.

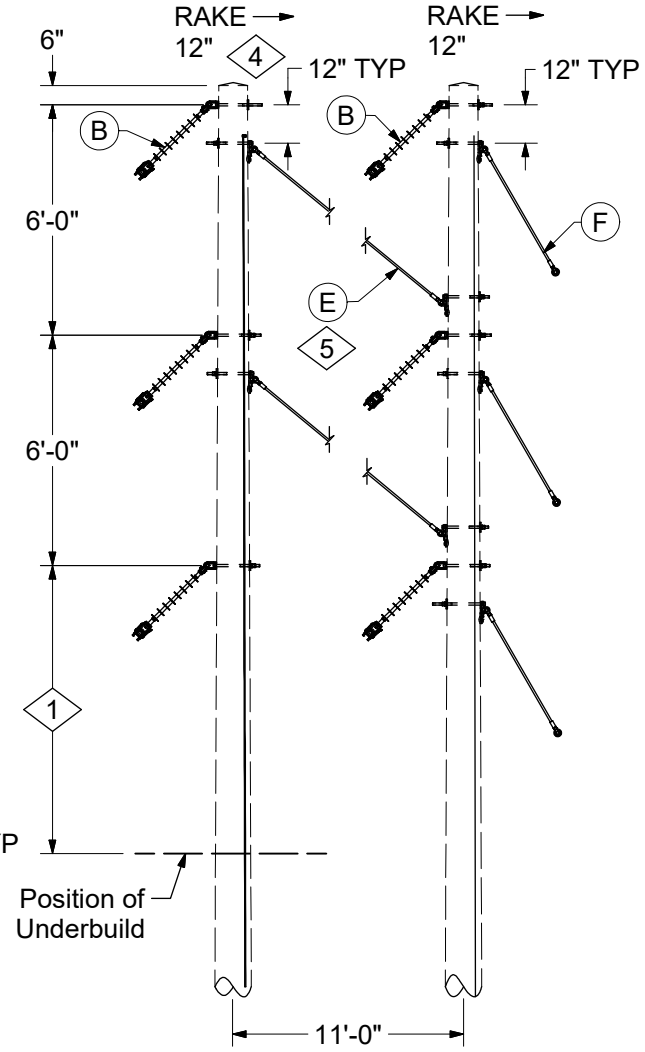


03 69 11 01 - Shielded Double Pole, 69kV
03 69 11 03 - Shielded Double Pole, 35kV



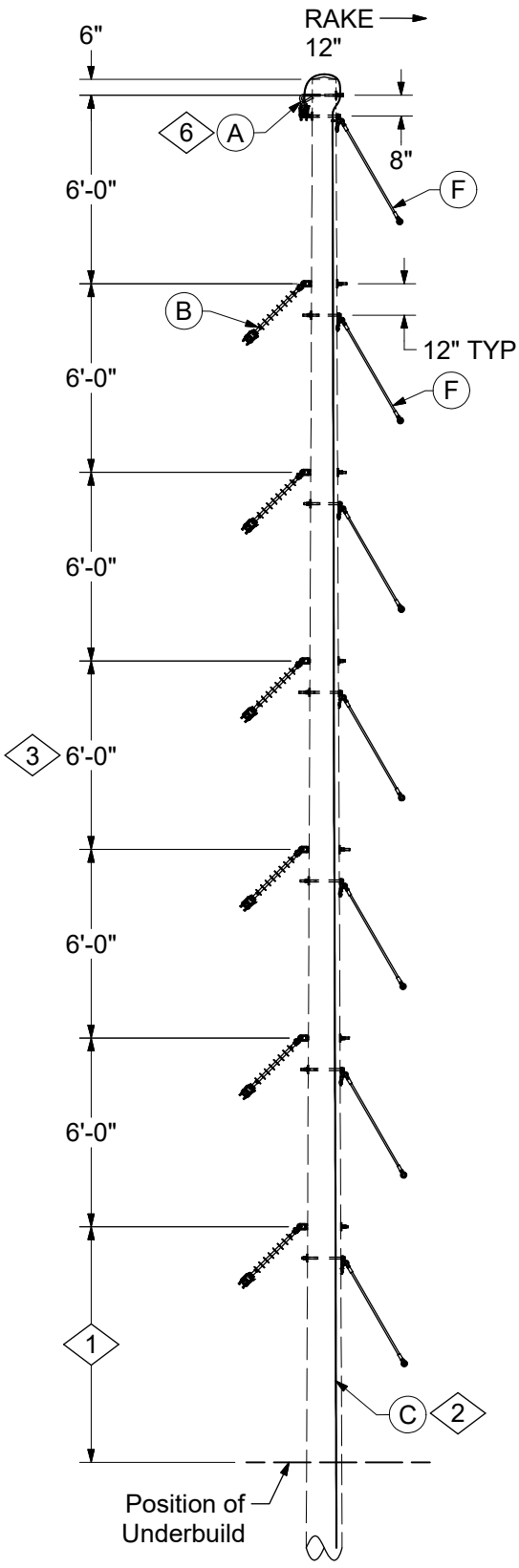


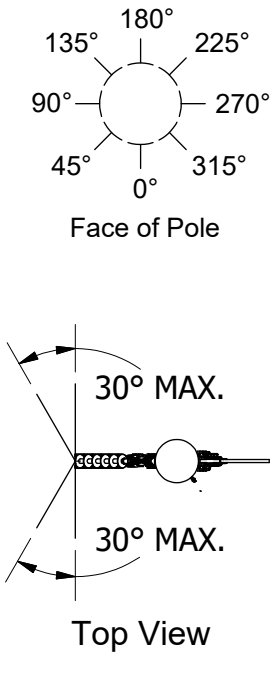
Top View

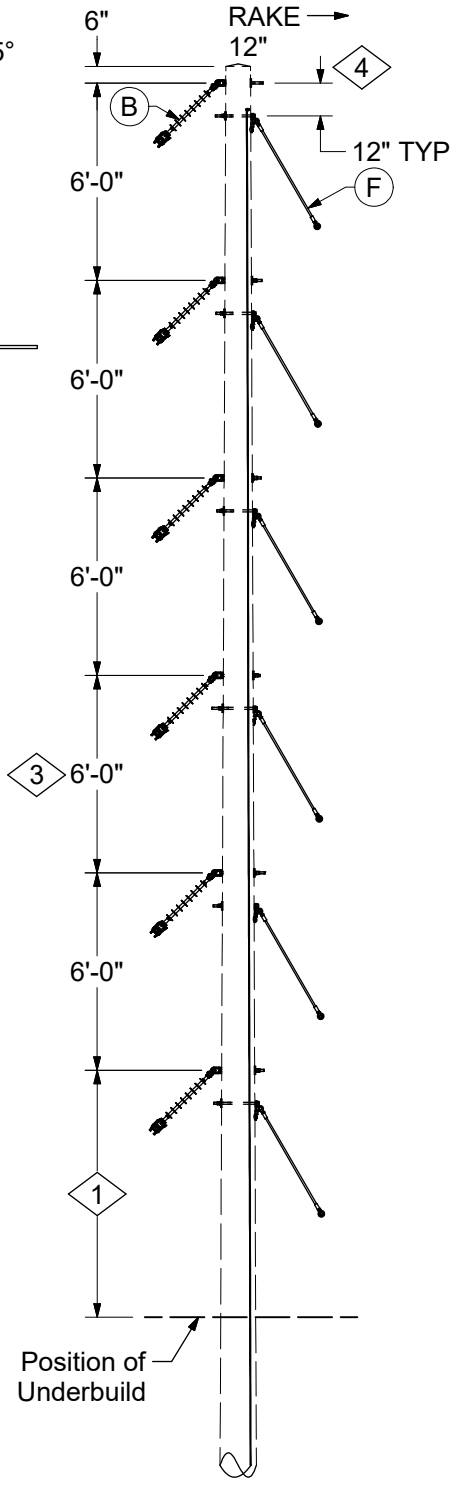


03 69 11 51 - Unshielded Double Pole, 69kV
03 69 11 53 - Unshielded Double Pole, 35kV

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format
1	12/19/11	DCG	







03 69 11 02 - Shielded, 69kV
03 69 11 04 - Shielded, 35kV

03 69 11 52 - Unshielded, 69kV
03 69 11 54 - Unshielded, 35kV

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format
1	12/19/11	DCG	

CONSTRUCTION NOTE(s):

1. If underbuild is in vertical configuration, 6'-0" spacing is adequate. For underbuild on crossarms, use 7'-6" spacing for tangent and 7'-0" spacing for deadends. When using fiberglass crossarm, spacing measured from top bolt of the crossarm brace.

	ITEM	STK / DCS #	DESCRIPTION 03 69 11 **	01	02	03	04	51	52	53	54
6,@	A	**06 00 11 04** @	Static Wire Attachment - Tangent & Angle	1	1	1	1	-	-	-	-
		18 05 1* ** ** @	OPGW Static Support	1	1	1	1	-	-	-	-
3,@	B	**06 34 60 08** @	34kV Single Floating Angle Assembly	-	-	6	6	-	-	6	6
		06 34 60 28 @	69kV Single Floating Angle Assembly	6	6	-	-	6	6	-	-
2,@	C	**12 00 10 ** @**	Grounding Unit	2	1	2	1	-	-	-	-
4,@	D	**12 34 ** ** @**	Arrester Assemblies	-	-	-	-	1	1	1	1
5,@	E	**11 00 46 ** @**	Span Guy Unit	3	-	3	-	2	-	2	-
@	F	**11 00 4* ** @**	Guying Unit	#	#	#	#	#	#	#	#

DESIGN NOTE(s):

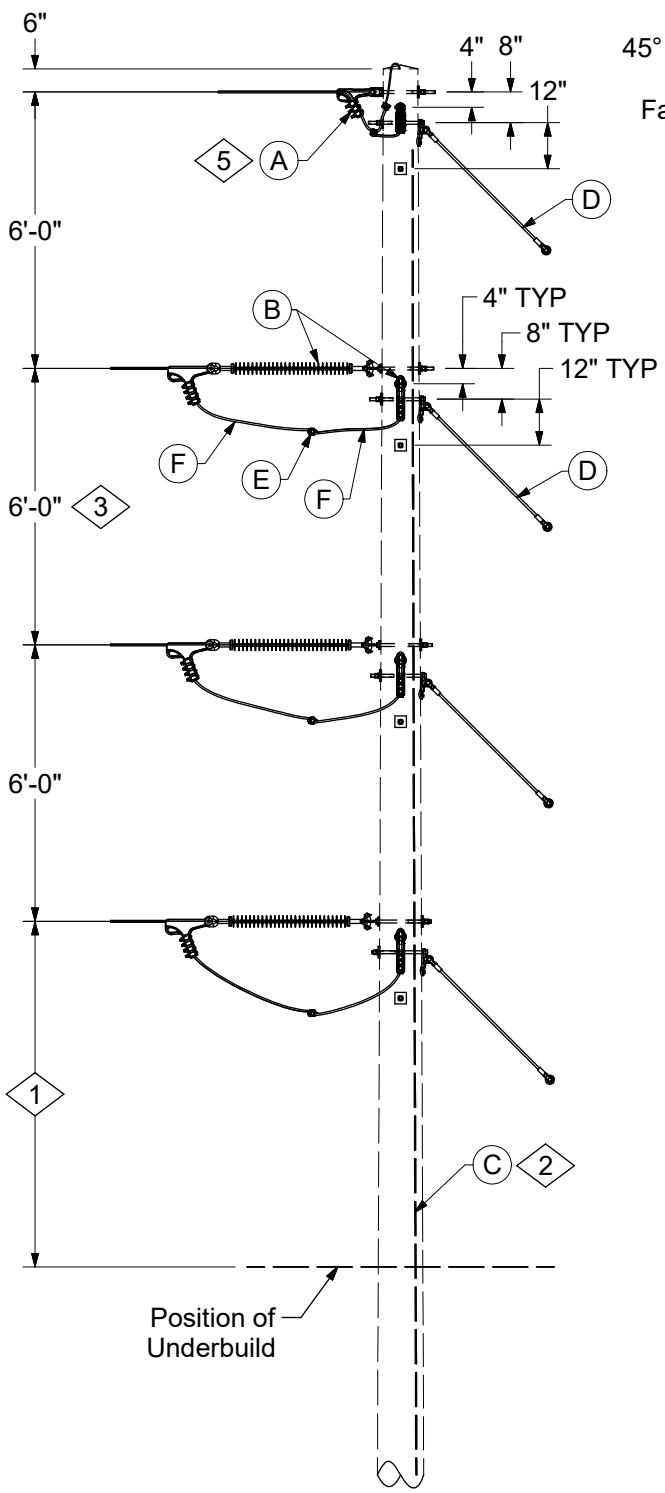
2. Composite pole has factory installed (internal) pole ground in the 45° quadrant. See DCS **12 00 10 ** ** for grounding detail.

3. New line construction must meet the minimum 6'-0" clearance requirement. Clearance for single pole replacement or maintenance of existing poles can be reduced to no less than 4'-0".

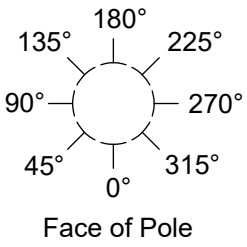
4. See DCS **12 34 ** ** ** for lighting arresters application and installation methods.

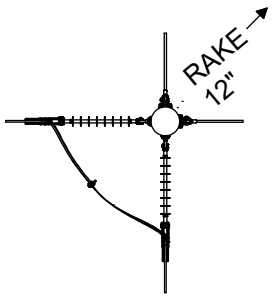
5. Lower span guy 24" on pole, or 12", if electrical clearance is an issue on pole 2 with line angle closer to 20°.

6. Refer to DCS Section 18 for OPGW applications.

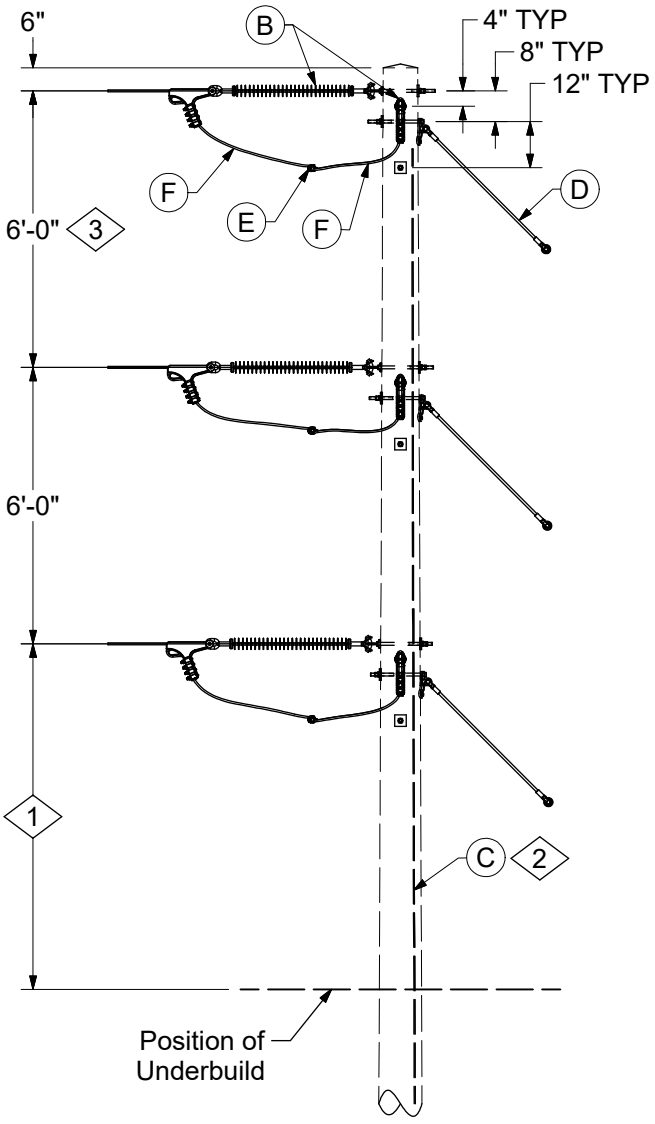


03 69 15 01 - Shielded, 69kV
03 69 15 02 - Shielded, 35kV



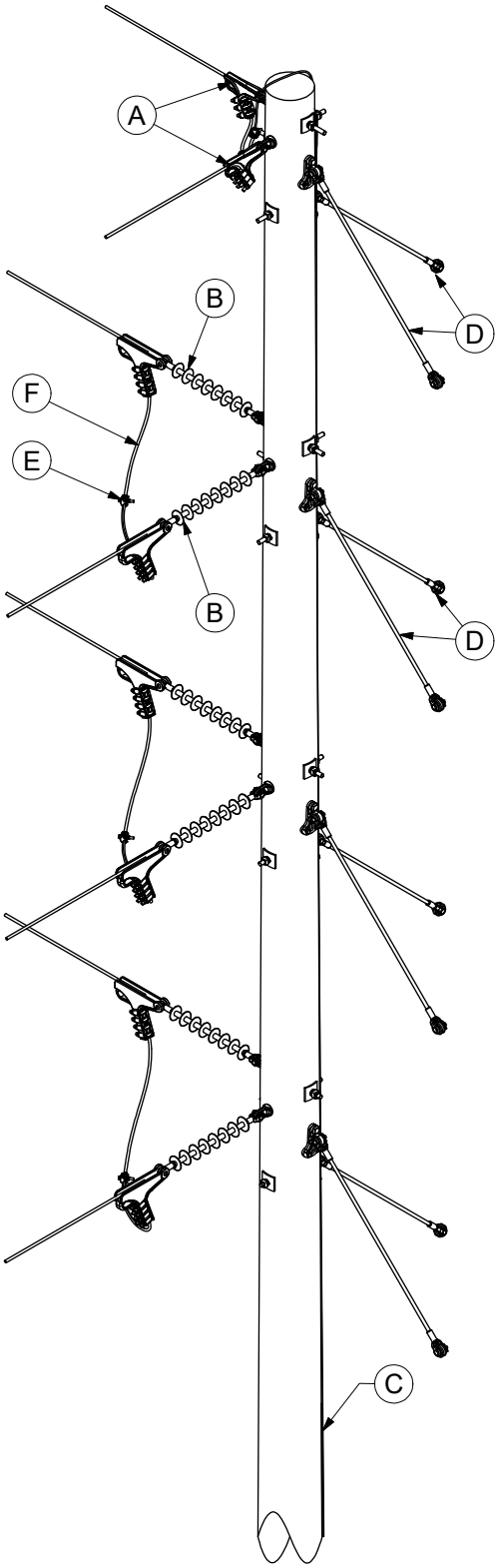


Top View

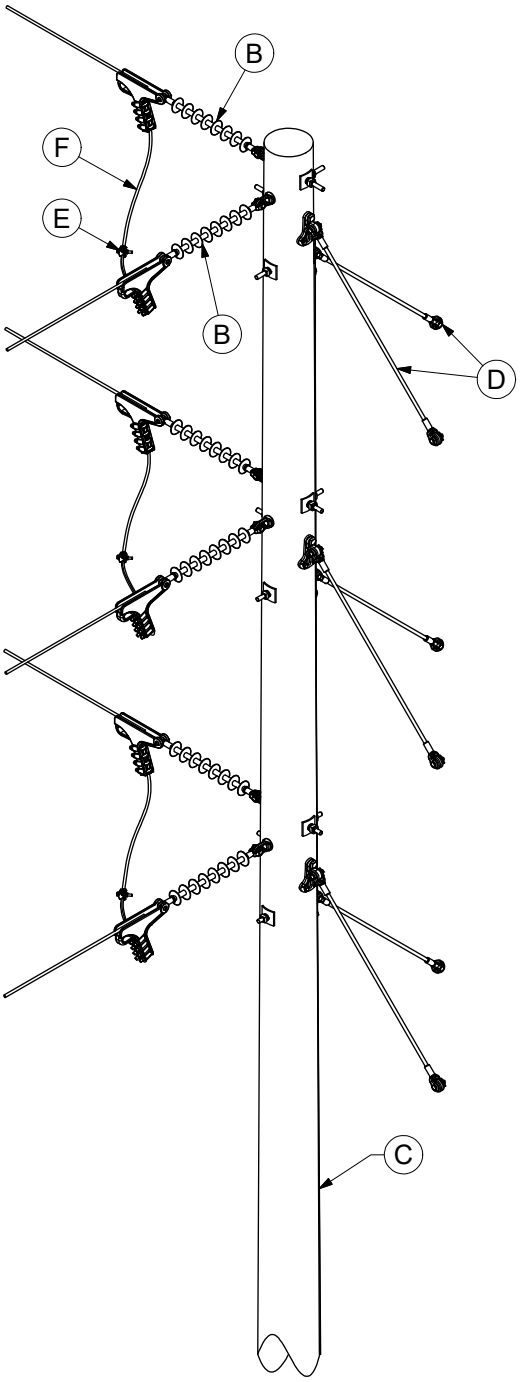


03 69 15 51 - Unshielded, 69kV
03 69 15 52 - Unshielded, 35kV

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format
1	06/04/12	DCG	



Isometric View
03 69 15 01 - Shielded, 69kV
03 69 15 02 - Shielded, 35kV



Isometric View
03 69 15 51 - Unshielded, 69kV
03 69 15 52 - Unshielded, 35kV

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format
1	06/04/12	DCG	

CONSTRUCTION NOTE(s):

1. If underbuild is in vertical configuration, 6'-0" spacing is adequate. For underbuild on crossarms, use 7'-6" spacing for tangent and 7'-0" spacing for deadends. When using fiberglass crossarm, spacing is measured to the top bolt of the crossarm brace.

	ITEM	STK / DCS #	DESCRIPTION 03 69 15 **	01	02	51	52
5,@	A	**06 00 11 05 @**	Deadend Static w/Clamp	1	1	-	-
		18 05 12 01 @	OPGW Corner Without Splice	1	1	-	-
		18 05 13 01 @	OPGW Corner With Splice	1	1	-	-
@	B	**06 34 60 02 @**	34kV Single Deadend	-	6	-	6
		06 34 60 06 @	69kV Single Deadend	6	-	6	-
2,@	C	**12 00 10 ** @**	Grounding Unit	1	1	1	1
@	D	**11 00 4* ** @**	Guying Unit	#	#	#	#
@	E	**07 00 25 00 @**	Clamp, PG, PG*W	6	6	6	6
@	F	**07 00 80 00 @**	Lead Wire, LW*W, PLW*W	#	#	#	#
	G	252, 255, or 260	Op Code, Install Jumper	3	3	3	3

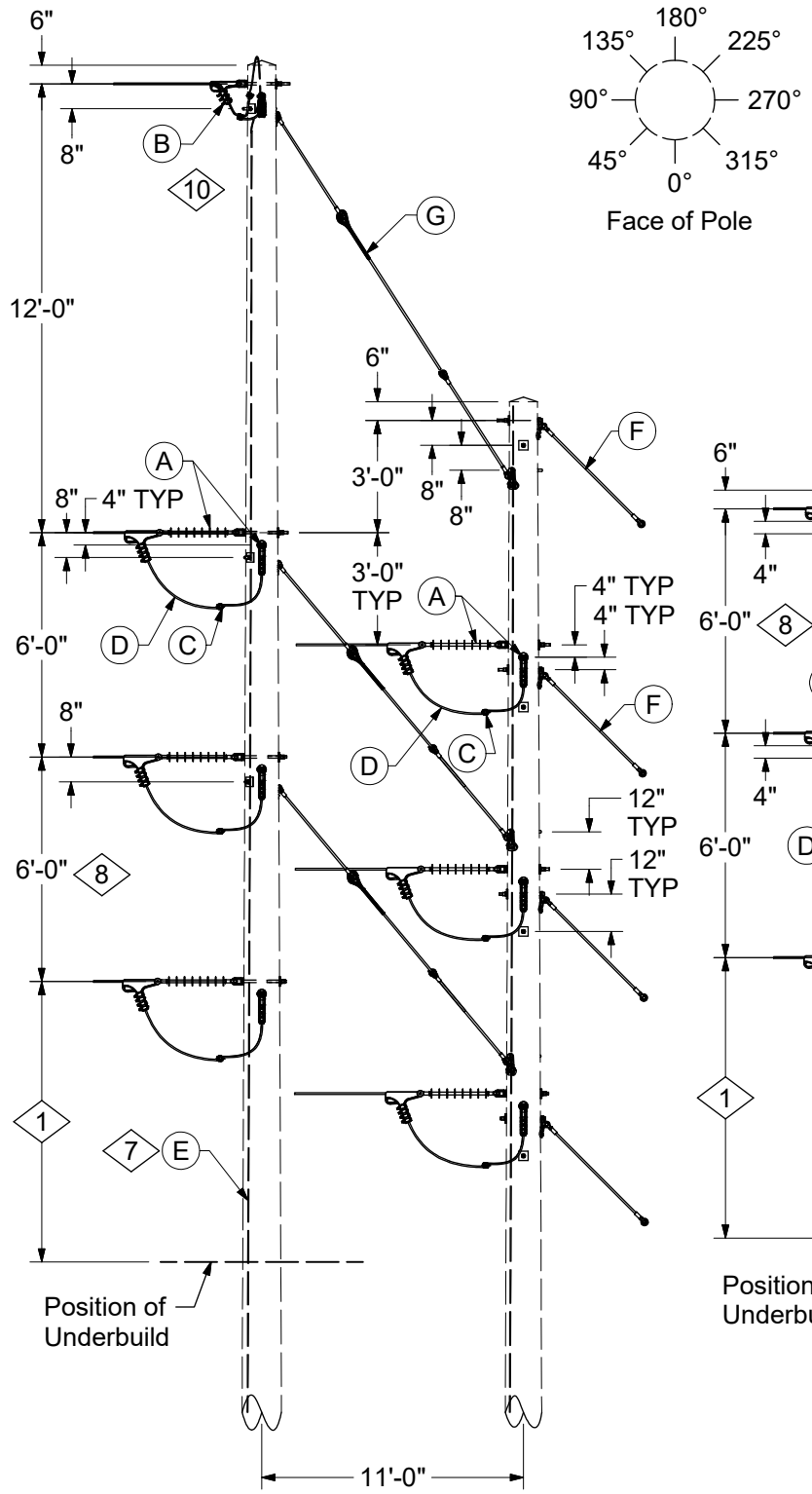
DESIGN NOTE(s):

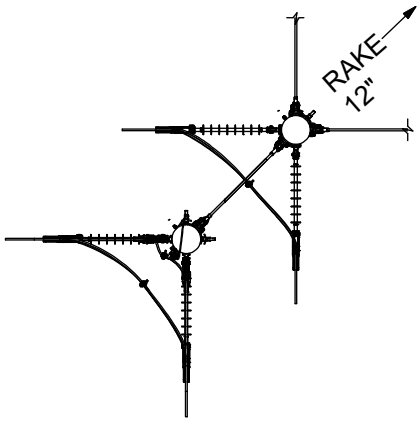
2. Composite pole has factory installed (internal) pole ground in the 45° quadrant. See DCS **12 00 10 **** for grounding detail.

3. New line construction must meet the minimum 6'-0" clearance requirement. Clearance for single pole replacement or maintenance of existing poles can be reduced to no less than 4'-0".

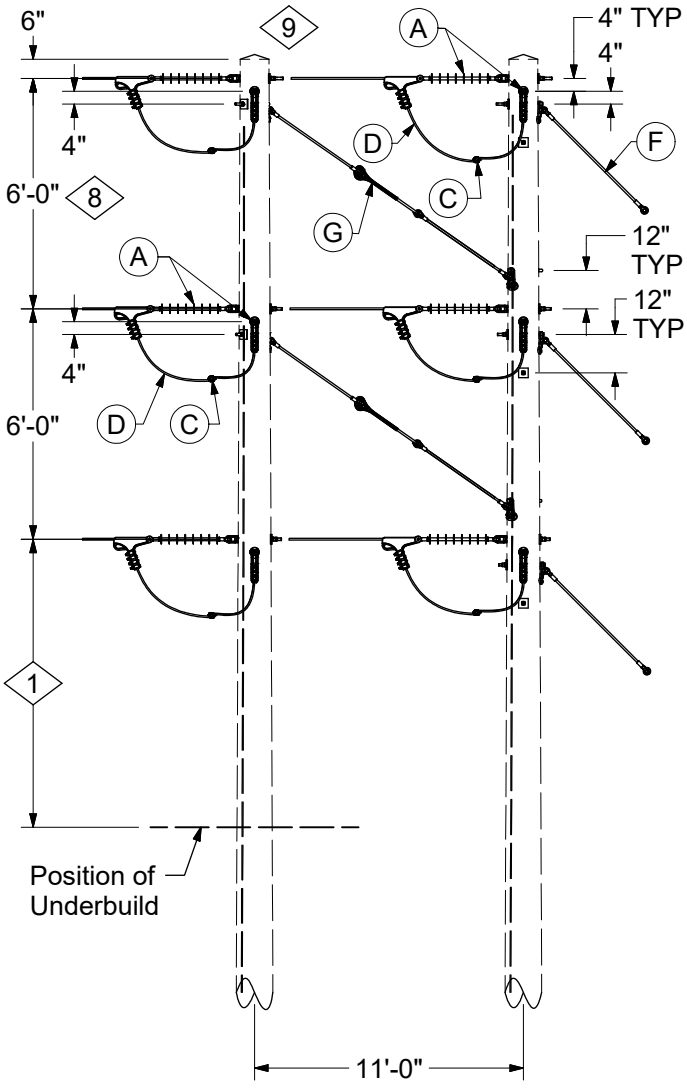
4. Avoid arrester assembly installations on corner poles and utilize adjacent poles. Refer to DCS Section 12 for additional arrester information.

5. Refer to DCS Section 18 for OPGW applications.





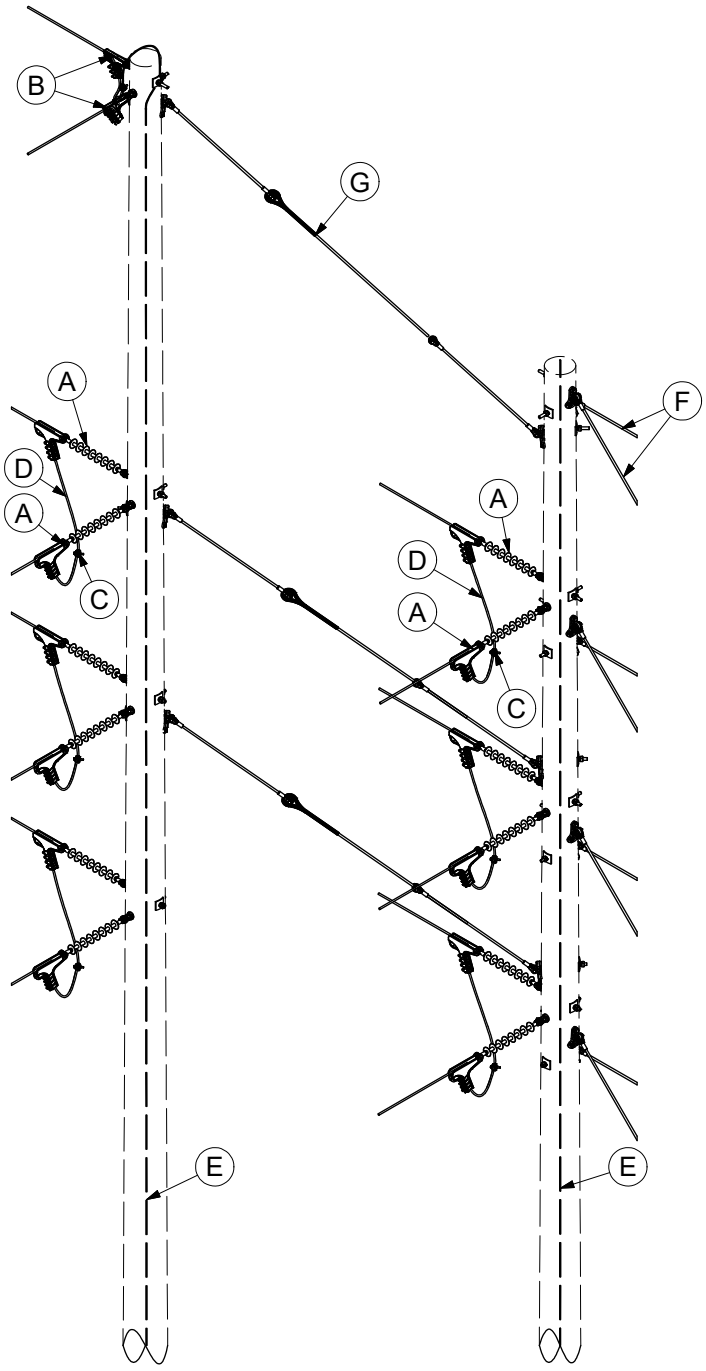
Top View



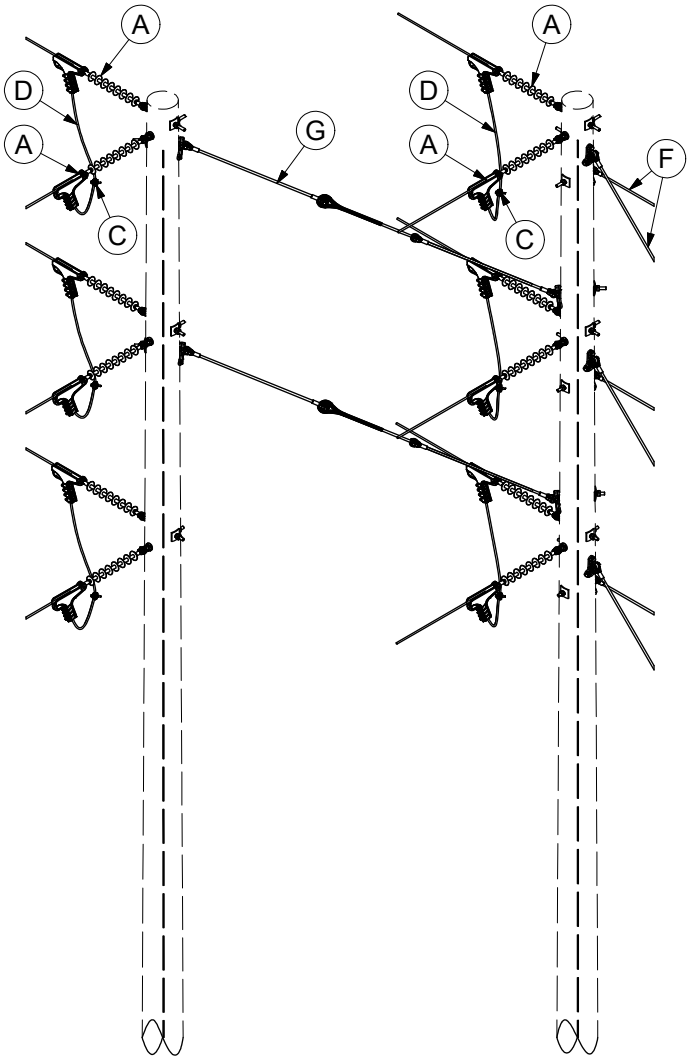
03 69 16 01 - Double Pole Shielded, 69kV
03 69 16 02 - Double Pole Shielded, 35kV

03 69 16 51 - Double Pole Unshielded, 69kV
03 69 16 52 - Double Pole Unshielded, 35kV

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format, added new standard
2	02/17/12	DCG	



Isometric View
03 69 16 01 - Double Pole Shielded, 69kV
03 69 16 02 - Double Pole Shielded, 35kV



Isometric View
03 69 16 51 - Double Pole Unshielded, 69kV
03 69 16 52 - Double Pole Unshielded, 35kV

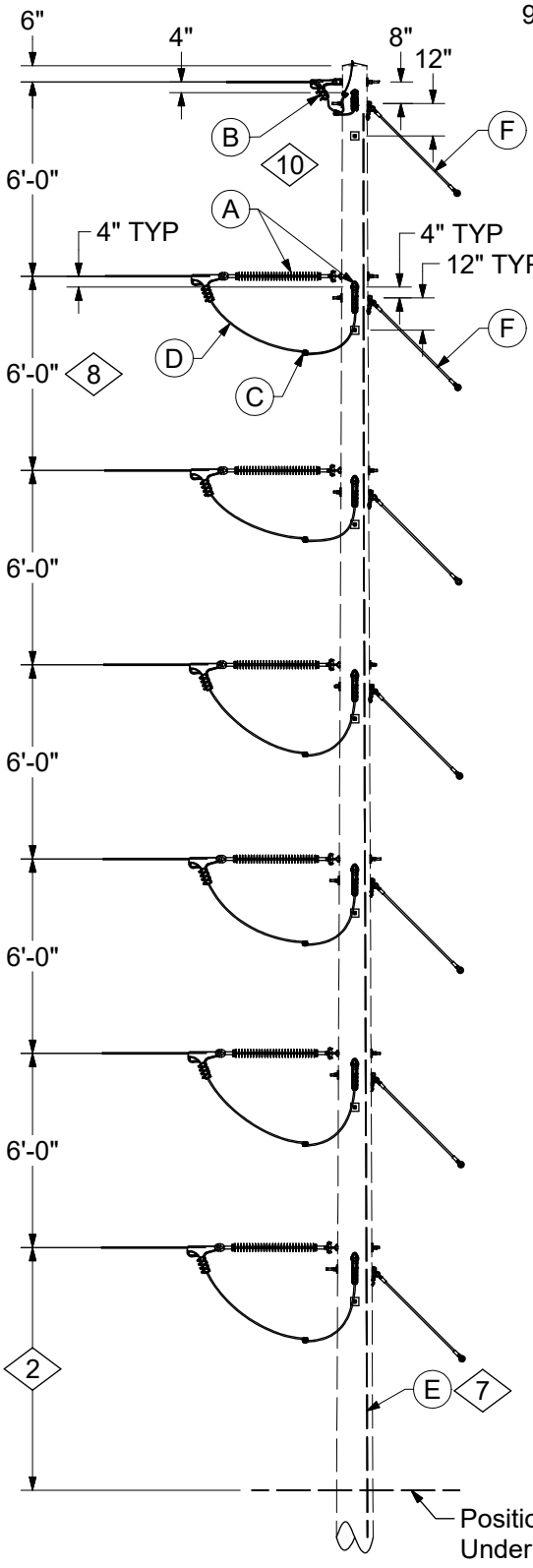
REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format, added new standard
2	02/17/12	DCG	

CONSTRUCTION NOTE(s):

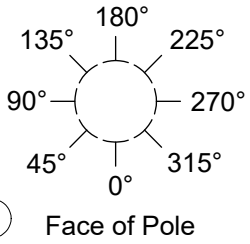
1. If underbuild is in vertical configuration, 6'-0" spacing is adequate. For underbuild on crossarms, use 7'-6" spacing for tangent and 7'-0" spacing for deadends. When using fiberglass crossarm, spacing is measured to the top bolt of the crossarm brace.

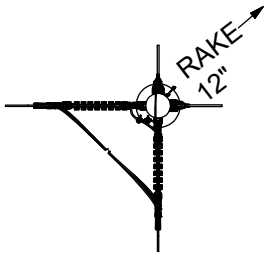
	ITEM	STK / DCS #	DESCRIPTION 03 69 16 **	01	02	51	52
	A	**06 34 60 02 @**	34kV Single Deadend on Pole	-	12	-	12
		06 34 60 06 @	69kV Single Deadend on Pole	12	-	12	-
	B	**06 00 11 05 @**	Static Wire Attachment - Corner w/ Pole Ground	1	1	-	-
10,@		**18 05 12 01 @**	OPGW Corner Without Splice	1	1	-	-
		18 05 13 01 @	OPGW Corner With Splice	1	1	-	-
@	C	**07 00 25 00 @**	Clamp, PG, PG*W	12	12	12	12
@	D	**07 00 80 00 @**	Lead Wire, LW*W, PLW*W	#	#	#	#
7,@	E	**12 00 10 ** @**	Grounding Unit	2	2	2	2
@	F	**11 00 4* ** @**	Guying Unit	#	#	#	#
@	G	**11 00 46 ** @**	Span Guy Unit	3	3	2	2
	H	252, 255, or 260	Op Code, Install Jumper	6	6	6	6

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format, added new standard
2	02/17/12	DCG	

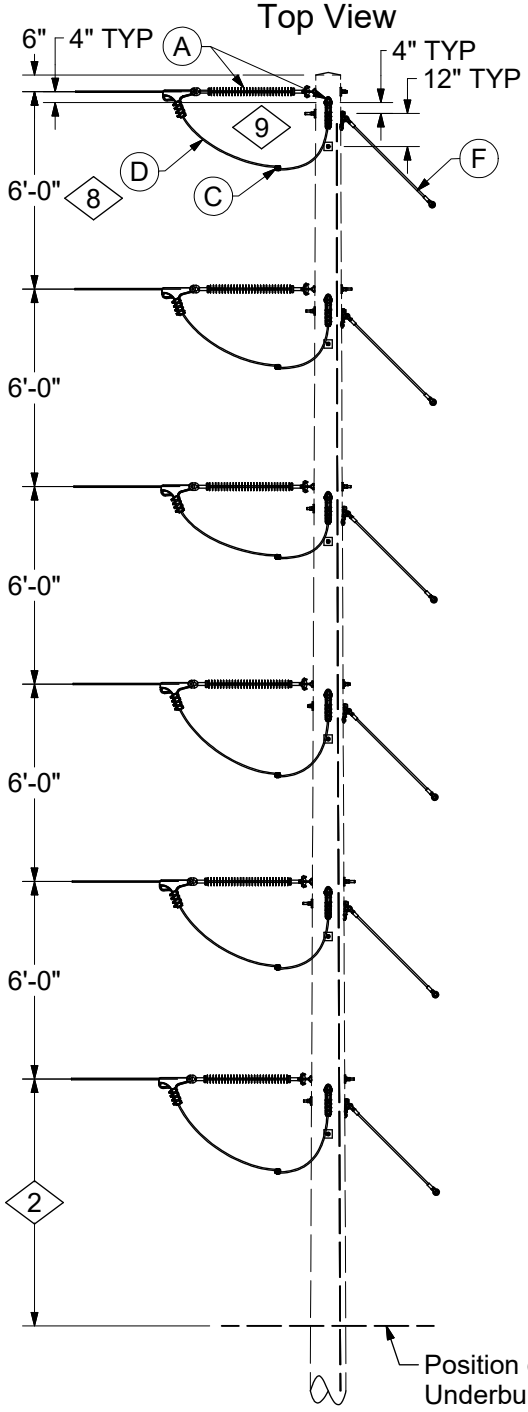


03 69 16 03 - Shielded, 69kV
03 69 16 04 - Shielded, 35kV



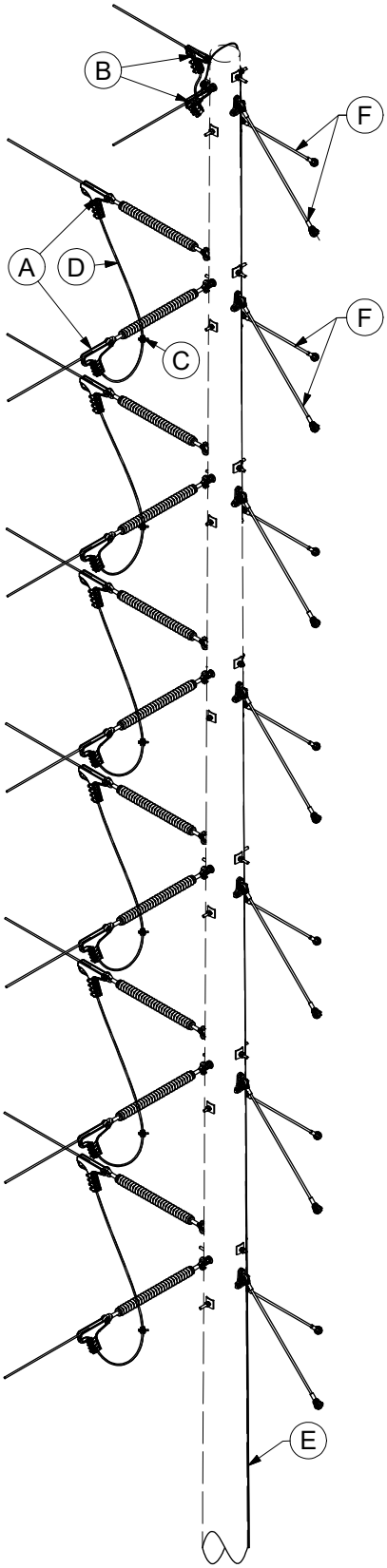


Top View

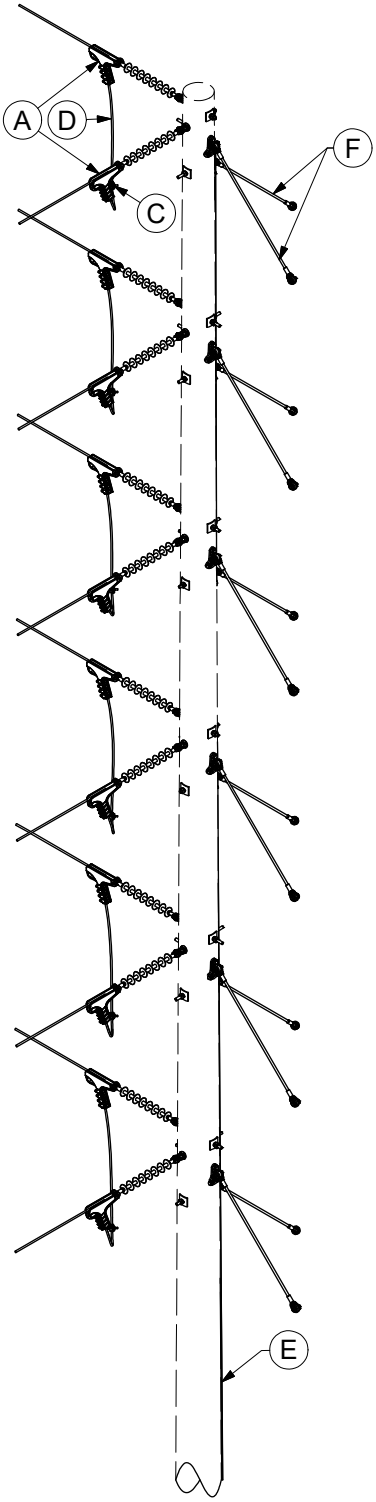


03 69 16 53 - Unshielded, 69kV
03 69 16 54 - Unshielded, 35kV

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format, added new standard
2	02/17/12	DCG	



Isometric View
03 69 16 03 - Shielded, 69kV
03 69 16 04 - Shielded, 35kV



Isometric View
03 69 16 53 - Unshielded, 69kV
03 69 16 54 - Unshielded, 35kV

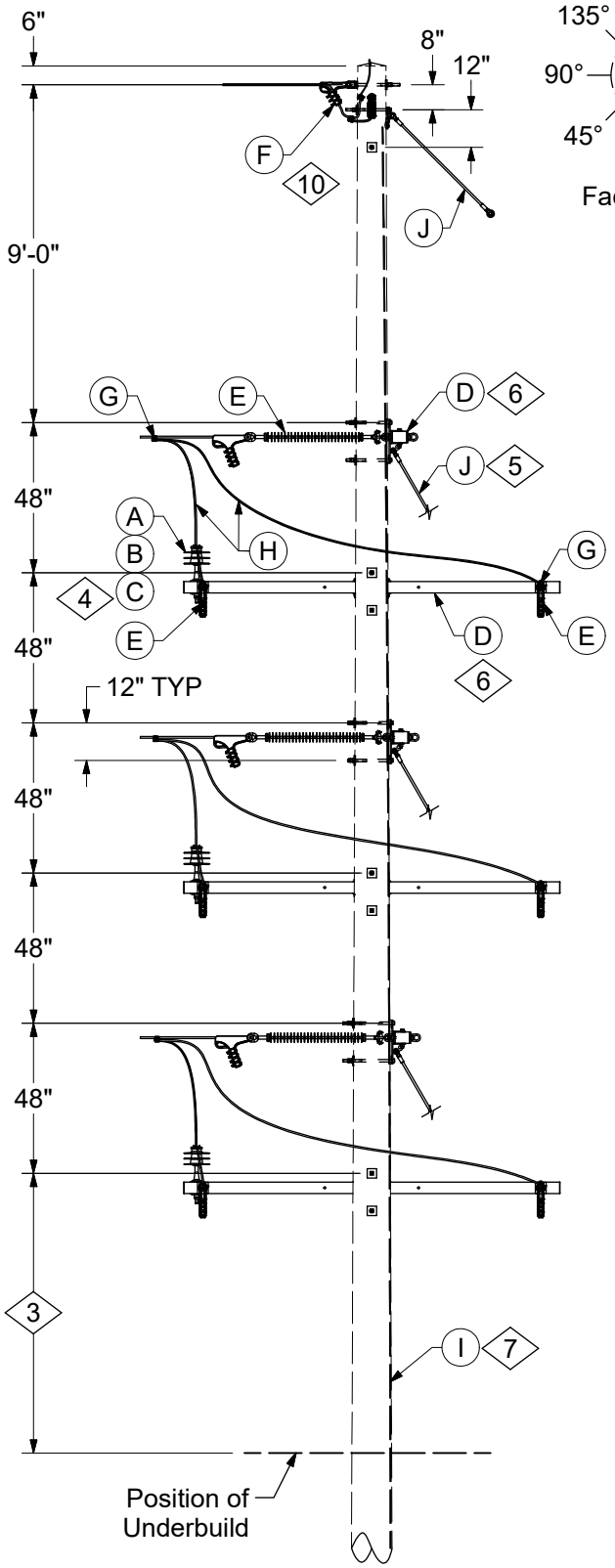
REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format, added new standard
2	02/17/12	DCG	

CONSTRUCTION NOTE(s):

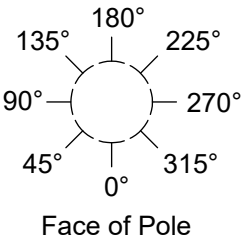
2. If underbuild is in vertical configuration, 6'-0" spacing is adequate. For underbuild on crossarms, use 7'-6" spacing for tangent and 7'-0" spacing for deadends. When using fiberglass crossarm, spacing is measured to the top bolt of the crossarm brace.

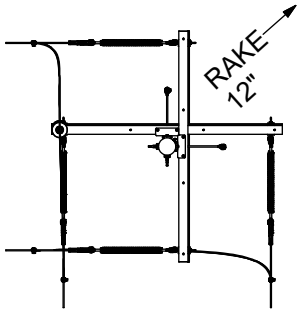
	ITEM	STK / DCS #	DESCRIPTION 03 69 16 **	03	04	53	54
	A	**06 34 60 02 @**	34kV Single Deadend on Pole	-	12	-	12
		06 34 60 06 @	69kV Single Deadend on Pole	12	-	12	-
	B	**06 00 11 05 @**	Static Wire Attachment - Corner w/ Pole Ground	1	1	-	-
10,@		**18 05 12 01 @**	OPGW Corner Without Splice	1	1	-	-
		18 05 13 01 @	OPGW Corner With Splice	1	1	-	-
@	C	**07 00 25 00 @**	Clamp, PG, PG*W	12	12	12	12
@	D	**07 00 80 00 @**	Lead Wire, LW*W, PLW*W	#	#	#	#
7,@	E	**12 00 10 ** @**	Grounding Unit	1	1	1	1
@	F	**11 00 4* ** @**	Guying Unit	#	#	#	#
@	G	252, 255, or 260	Op Code, Install Jumper	6	6	6	6

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format, added new standard
2	02/17/12	DCG	

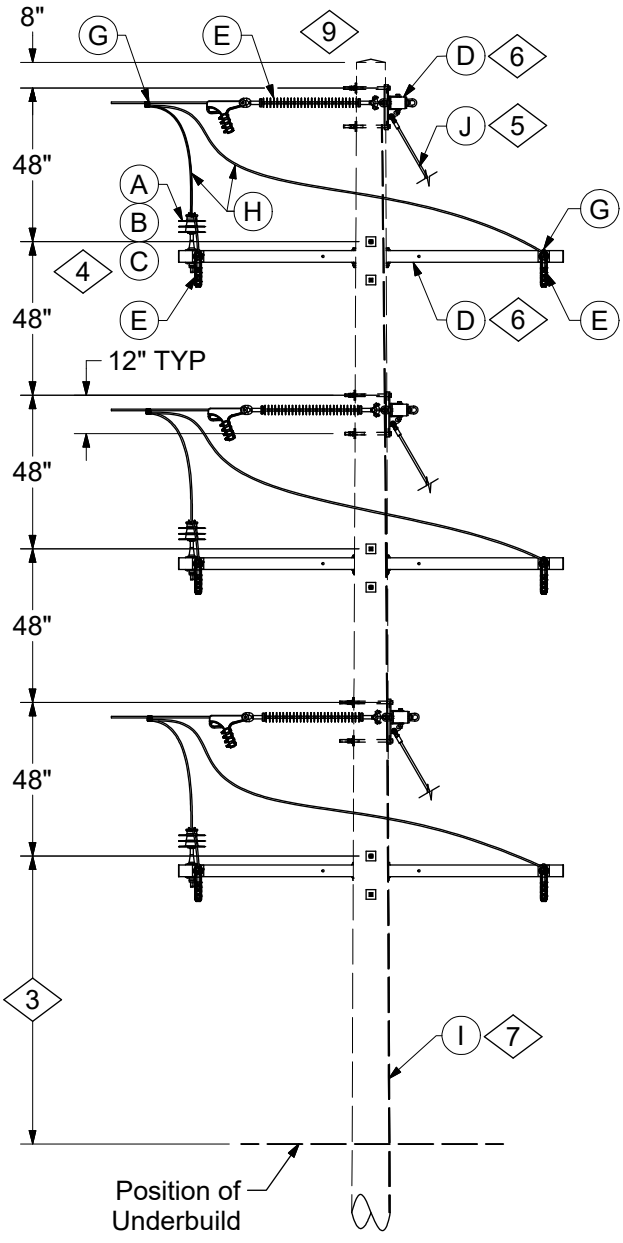


03 69 16 05 - Shielded, 69kV
03 69 16 06 - Shielded, 35kV



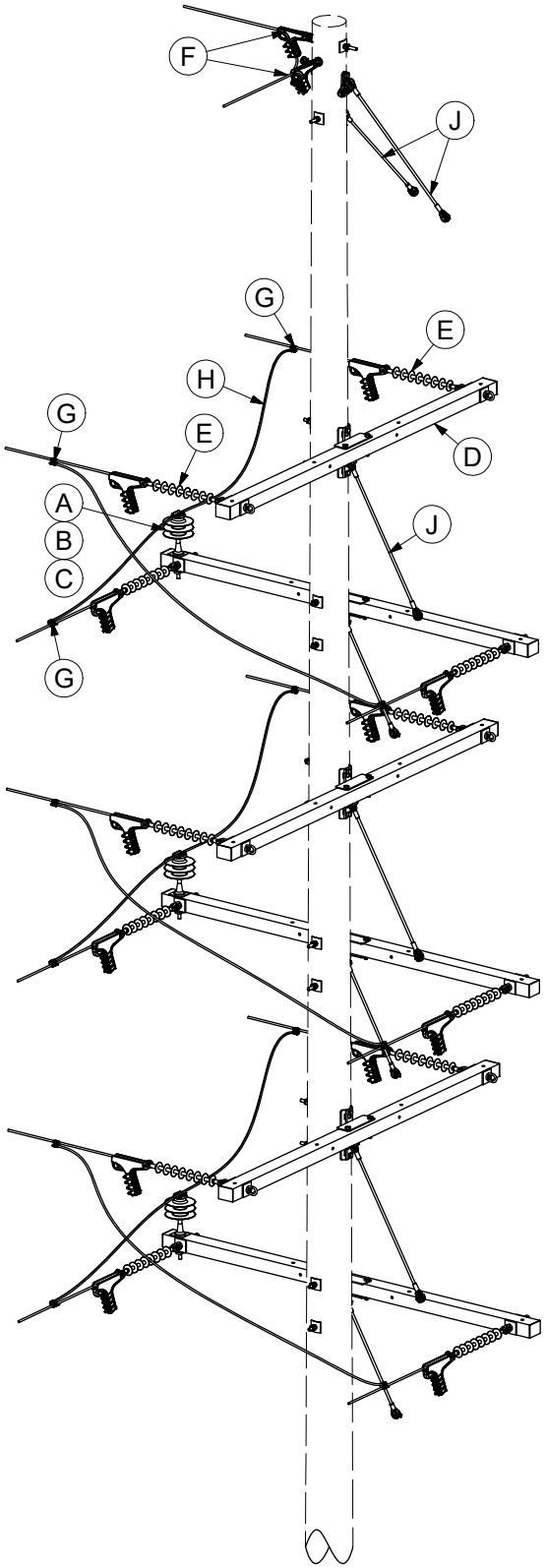


Top View

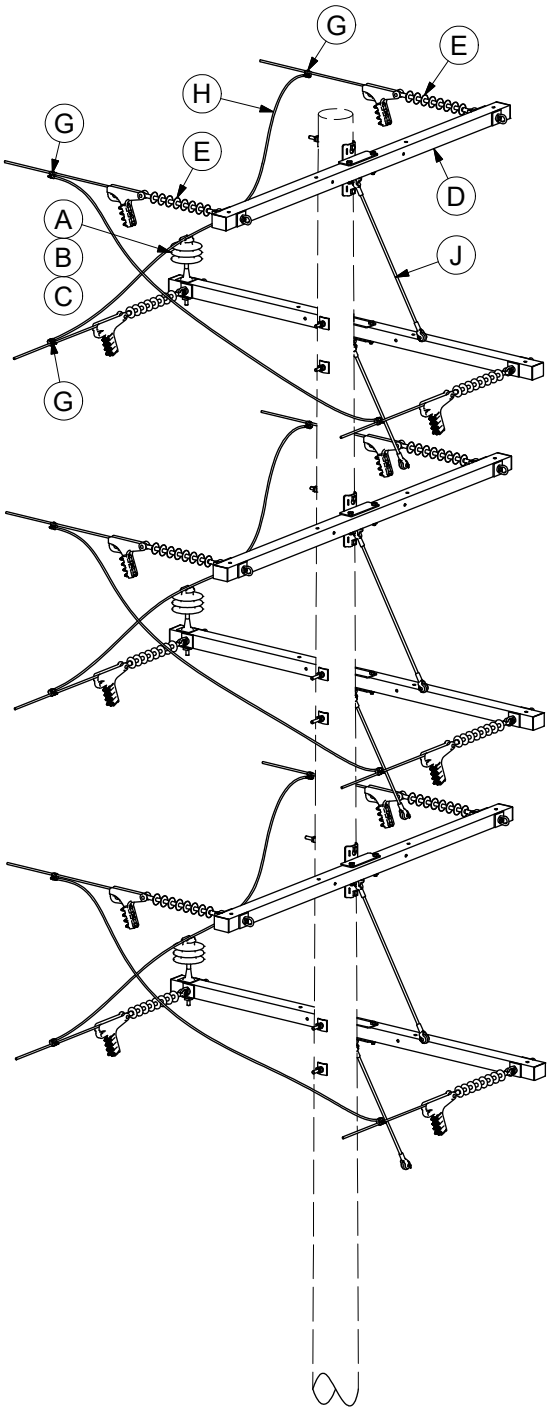


03 69 16 55 - Unshielded, 69kV
03 69 16 56 - Unshielded, 35kV

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format, added new standard
2	02/17/12	DCG	



Isometric View
03 69 16 05 - Shielded, 69kV
03 69 16 06 - Shielded, 35kV



Isometric View
03 69 16 55 - Unshielded, 69kV
03 69 16 56 - Unshielded, 35kV

CONSTRUCTION NOTE(s):

3. Use 7'-6" spacing for tangent and 7'-0" spacing for deadend on underbuild. When using fiberglass crossarm, spacing is measured to the top bolt of the crossarm brace.

4. The 2" square washer received with the pin should be used after the 4" square washer.

5. Attach guy to fiberglass arm guy hook.

	ITEM	STK / DCS #	DESCRIPTION 03 69 16 **	05	06	55	56
	A	25 05 080	Insulator, Pin Type, 34kV, F-Neck	-	3	-	3
		25 05 098	Insulator, Vertical L.P., 69kV, F-Neck	3	-	3	-
	B	23 12 126	Pin, 3/4" x 7"	-	3	-	3
		23 64 023	Stud, 3/4" x 7" w/ Hardware	3	-	3	-
6	C	23 66 132	Washer, Flat, Sq., 4" x 4", w/ 13/16" Hole	6	6	6	6
	D	**04 00 42 03 @**	10' Deadend FG Crossarm	6	6	6	6
	E	**06 34 68 11 @**	34kV Single Deadend on FG Arm	-	12	-	12
		06 34 68 12 @	69kV Single Deadend of FG Arm	12	-	12	-
	F	**06 00 11 05 @**	Static Wire Attachment - Corner w/ Pole Ground	1	1	-	-
10,@		**18 05 12 01 @**	OPGW Corner Without Splice	1	1	-	-
		18 05 13 01 @	OPGW Corner With Splice	1	1	-	-
@	G	**07 00 25 00 @**	Clamp, PG, PG*W	12	12	12	12
7,@	H	**07 00 80 00 @**	Lead Wire, LW*W, PLW*W	#	#	#	#
5,@	I	**12 00 10 ** @**	Grounding Unit	1	1	-	-
@	J	**11 00 4* ** @**	Guying Unit	#	#	#	#
	K	252, 255, or 260	Op Code, Install Jumper	6	6	6	6

DESIGN NOTE(s):

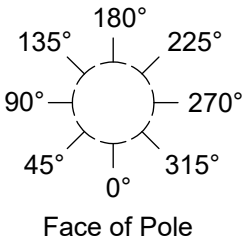
6. See DCS **04 00 01 01** for crossarm loading. In some applications larger crossarm may be needed for heavier loadings.

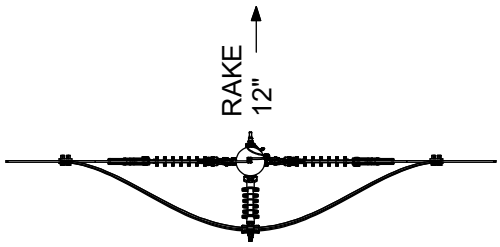
7. Composite pole has factory installed (internal) pole ground in the 45° quadrant. See DCS **12 00 10 ** ** for grounding detail.

8. New line construction must meet the minimum 6'-0" clearance requirement. Clearance for single pole replacement or maintenance of existing poles can be reduced to no less than 4'-0".

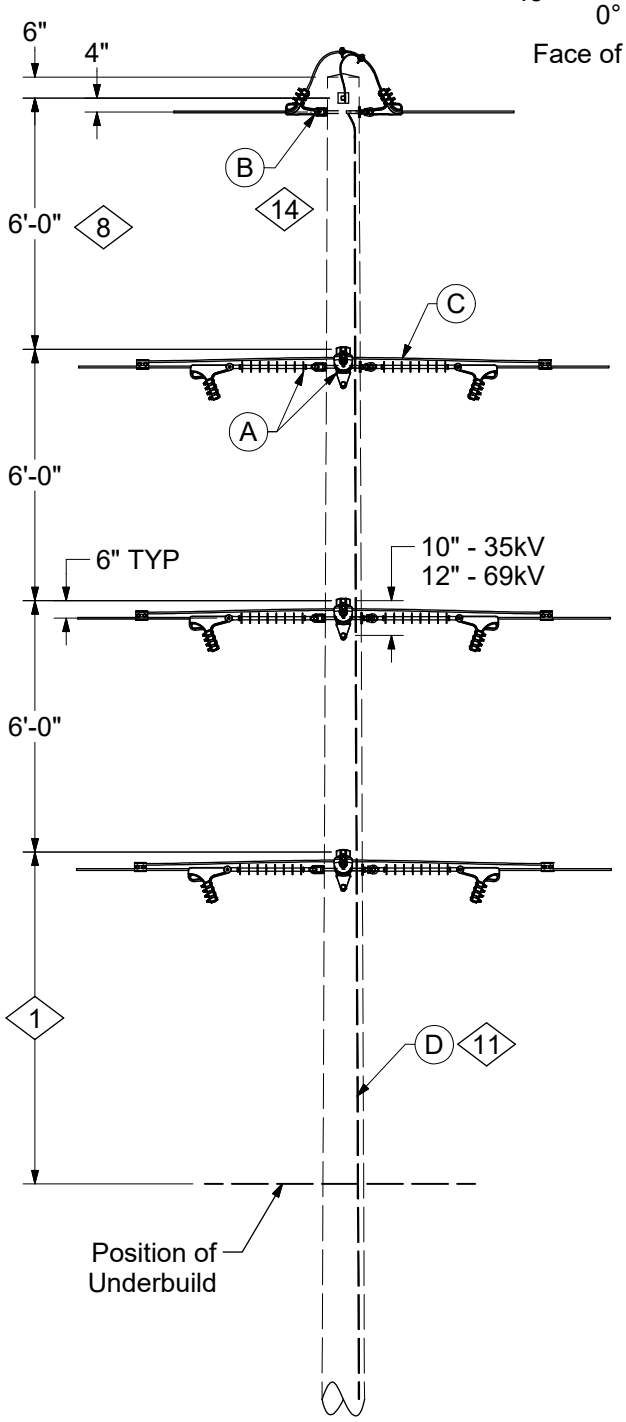
9. Avoid arrester assembly installation on corner poles and utilize adjacent poles.

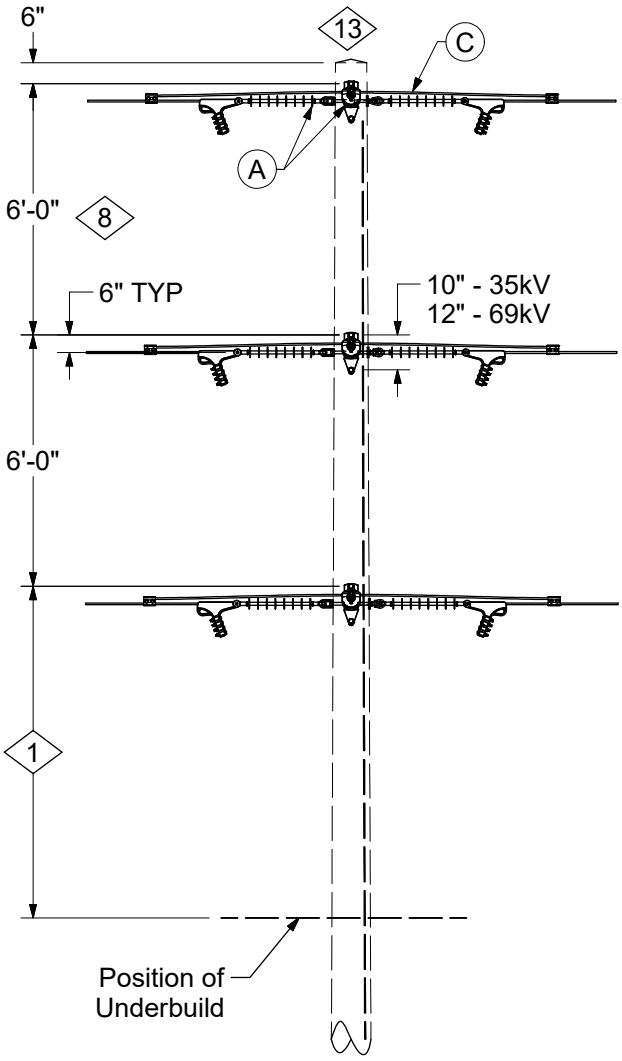
10. Refer to DCS Section 18 for OPGW appplications.





Top View

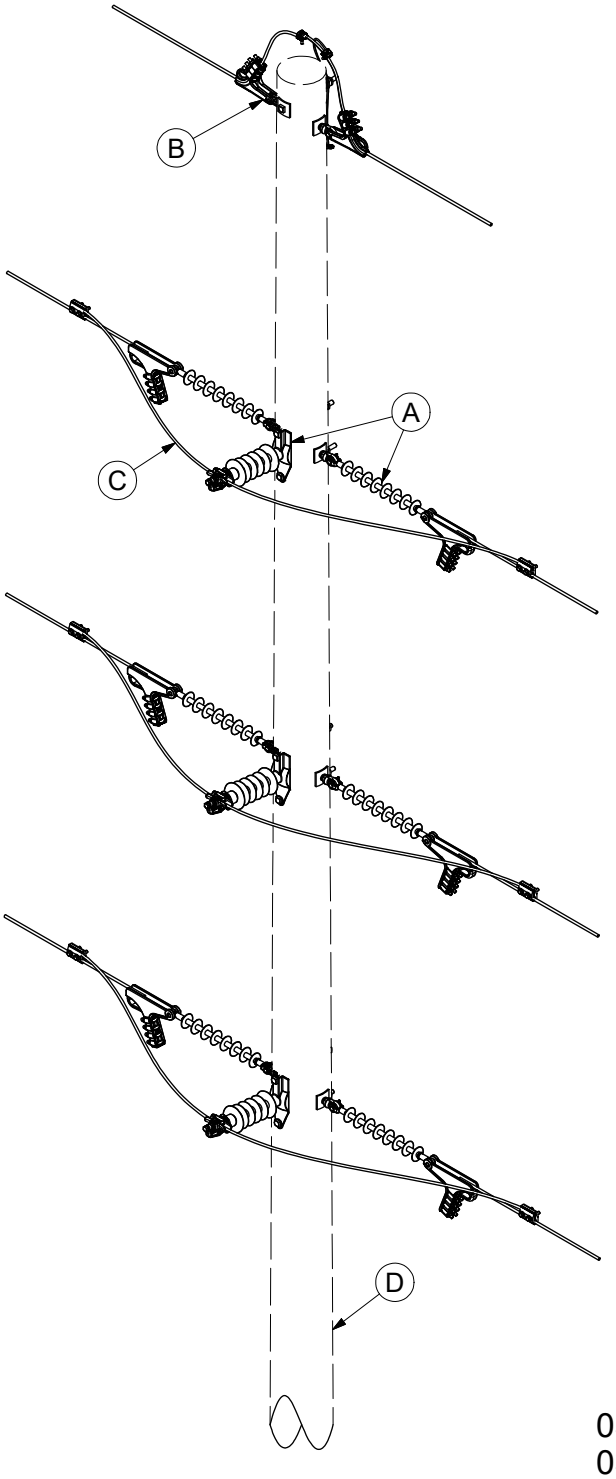




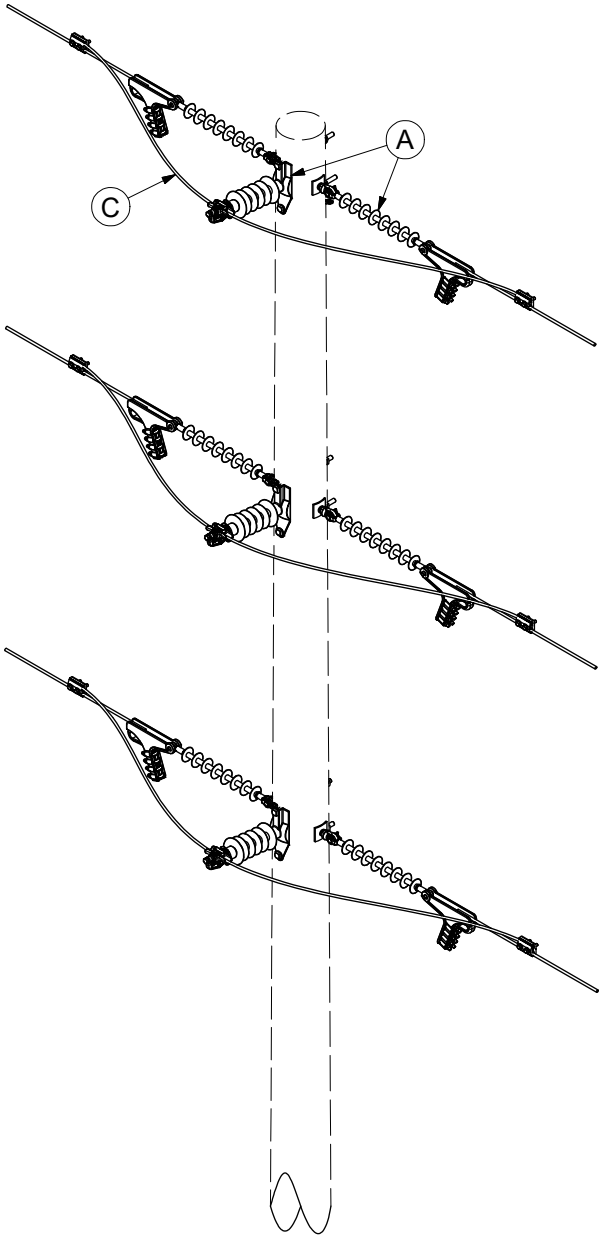
03 69 17 51 - Equal Tension Unshielded, 69kV
03 69 17 54 - Equal Tension Unshielded, 35kV

03 69 17 01 - Equal Tension Shielded, 69kV
03 69 17 04 - Equal Tension Shielded, 35kV

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format, added new standard
1	12/19/11	MJ	



Isometric View
03 69 17 01 - Equal Tension Shielded, 69kV
03 69 17 04 - Equal Tension Shielded, 35kV



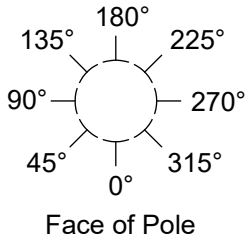
Isometric View
03 69 17 51 - Equal Tension Unshielded, 69kV
03 69 17 54 - Equal Tension Unshileded, 35kV

CONSTRUCTION NOTE(s):

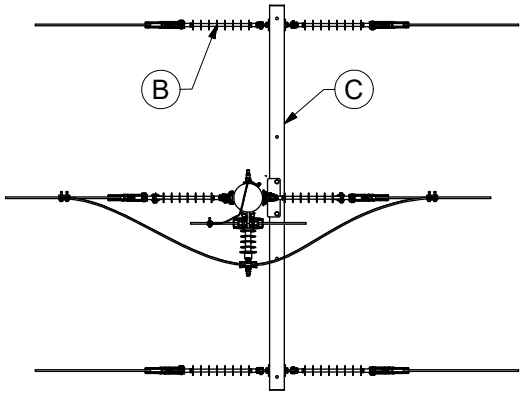
1. If underbuild is in vertical configuration, 6'-0" spacing is adequate. For underbuild on crossarms, use 7'-6" spacing for tangent and 7'-0" spacing for deadends. When using fiberglass crossarm, spacing is measured to the top bolt of the crossarm brace.

	ITEM	STK / DCS #	DESCRIPTION 03 69 17 **	01	04	51	54
	A	**06 34 60 01 @**	69kV Looparound - Straight	3	-	3	-
		06 34 60 25 @	34kV Looparound - Straight	-	3	-	3
@	B	**06 00 11 06 @**	Static Wire Attachment - Deadend Tangent	1	1	-	-
		18 05 1* ** @	OPGW Static Support	1	1	-	-
@	C	**07 00 80 00 @**	Lead Wire, LW*W PLW*W	#	#	#	#
2,@	D	**12 00 10 ** @**	Grounding Unit	1	1	-	-
4,@	E	**12 34 ** ** @**	Arrester Assemblies	-	-	1	1
	F	252 or 260	Op Code, Install Connectors	6	6	6	6

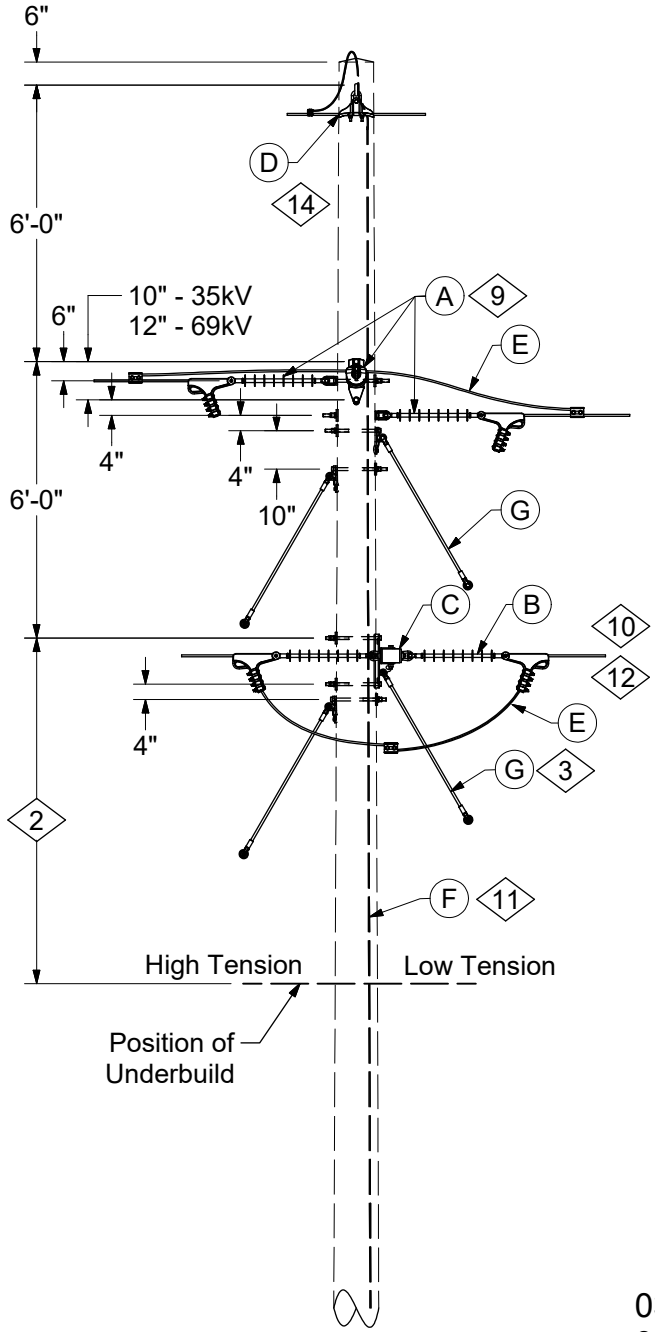
REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format, added new standard
1	12/19/11	MJ	

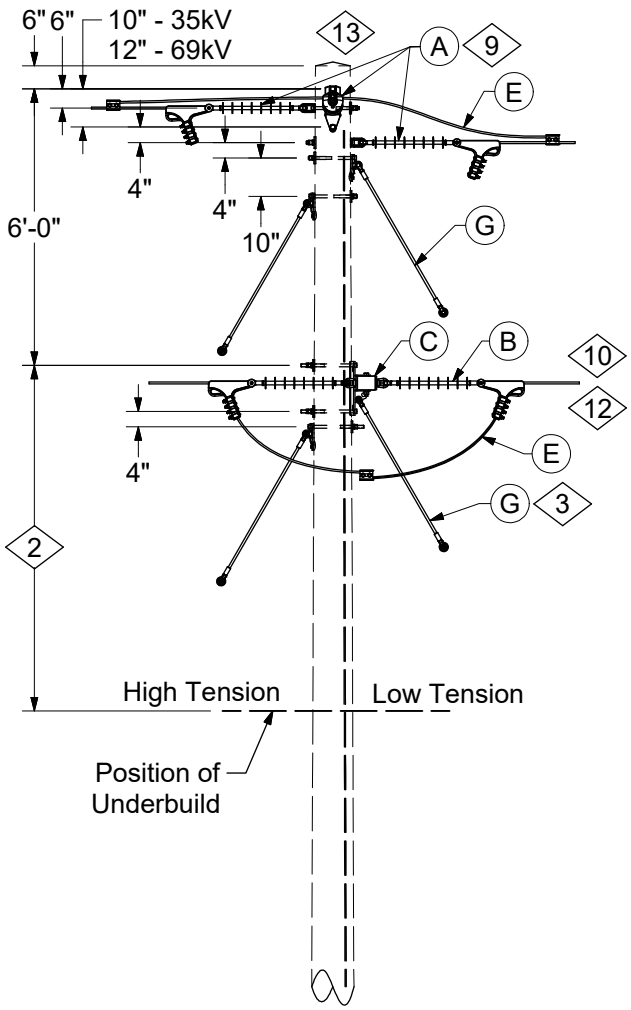


Face of Pole



Top View

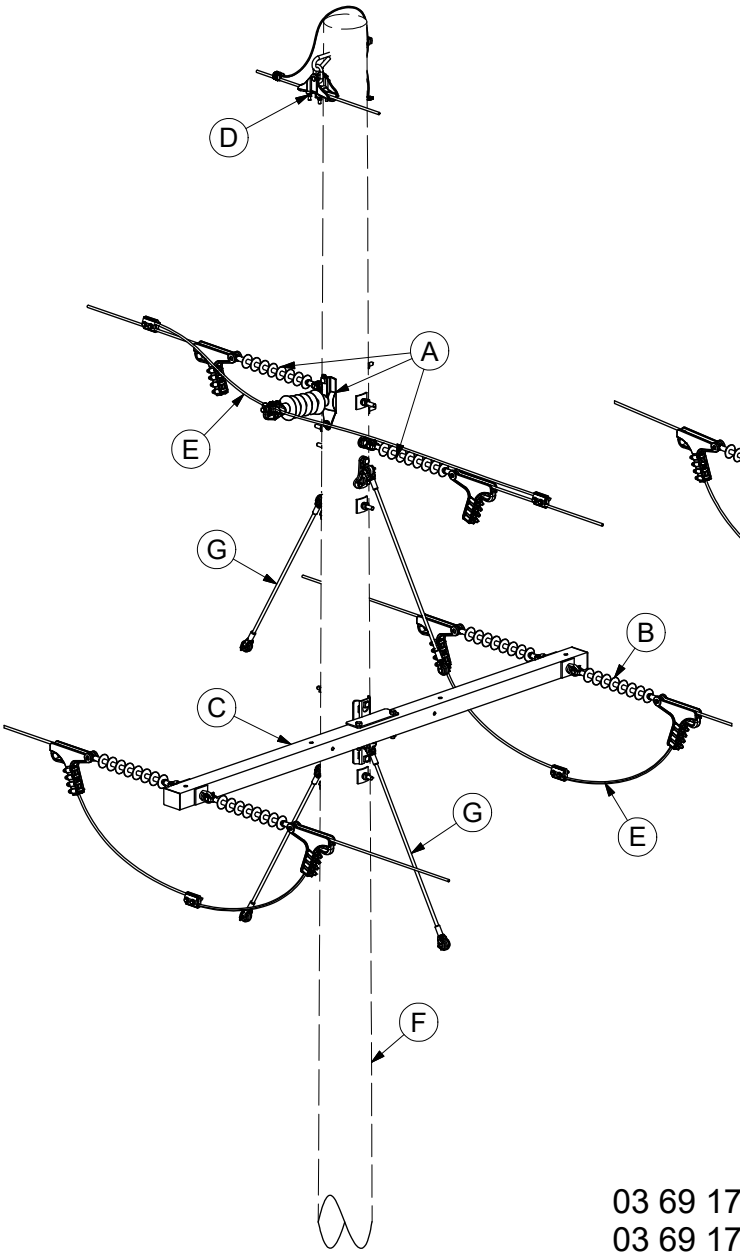




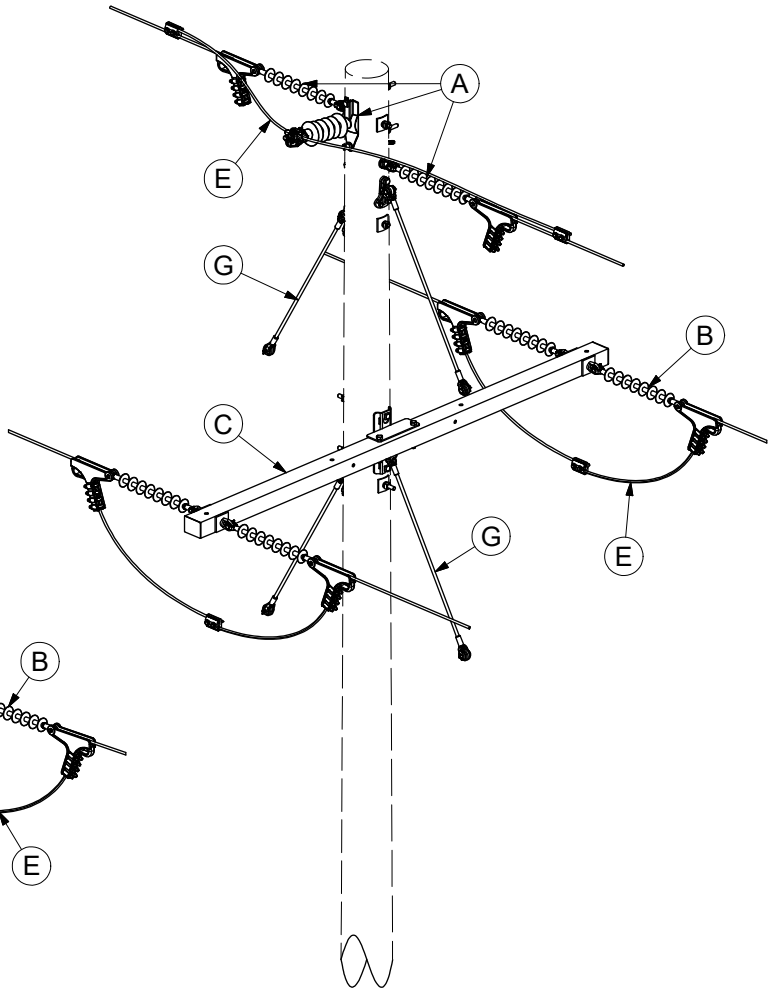
03 69 17 52 - Unequal Tension Unshielded, 69kV
03 69 17 55 - Unequal Tension Unshielded, 35kV

03 69 17 02 - Unequal Tension Shielded, 69kV
03 69 17 05 - Unequal Tension Shielded, 35kV

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format, added new standard
1	12/19/11	MJ	



Isometric View
03 69 17 02 - Unequal Tension Shielded, 69kV
03 69 17 05 - Unequal Tension Shielded, 35kV



Isometric View
03 69 17 52 - Unequal Tension Unshielded, 69kV
03 69 17 55 - Unequal Tension Unshielded, 35kV

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format, added new standard
1	12/19/11	MJ	

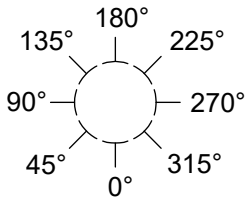
CONSTRUCTION NOTE(s):

2. Use 7'-6" spacing for tangent and 7'-0" spacing for deadend on underbuild. When using fiberglass crossarm, spacing is measured from top bolt.

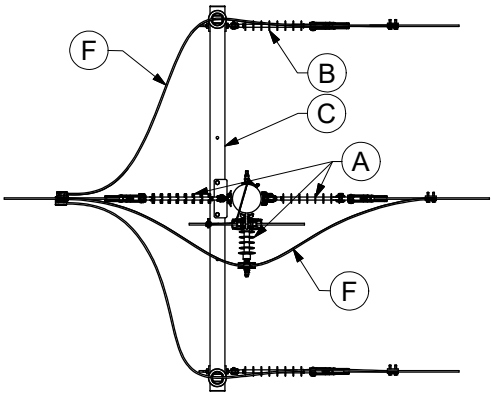
3. Attach guy to fiberglass arm guy hook.

	ITEM	STK / DCS #	DESCRIPTION 03 69 17 **	02	05	52	55
	A	**06 34 60 03 @**	69kV Looparound - Offset	1	-	1	-
		06 34 60 26 @	34kV Looparound - Offset	-	1	-	1
	B	**06 34 68 14 @**	69kV Double Deadend Loopunder	2	-	2	-
		06 34 68 13 @	34kV Double Deadend Loopunder	-	2	-	2
9,10,12,@	C	**04 00 42 03 @**	10' Deadend FG Crossarm	1	1	1	1
	D	**06 00 11 ** @**	Static Wire Attachment	1	1	-	-
14,@		**18 05 1* ** @**	OPGW Static Support	1	1	-	-
@	E	**07 00 80 00 @**	Lead Wire, LW*W PLW*W	#	#	#	#
@	F	**11 00 4* ** @**	Guying Unit	#	#	#	#
11,@	G	**12 00 10 ** @**	Grounding Unit	1	1	-	-
13,@	H	**12 34 ** ** @**	Arrester Assemblies	-	-	1	1
	I	252 or 260	Op Code, Install Connectors	4	4	4	4

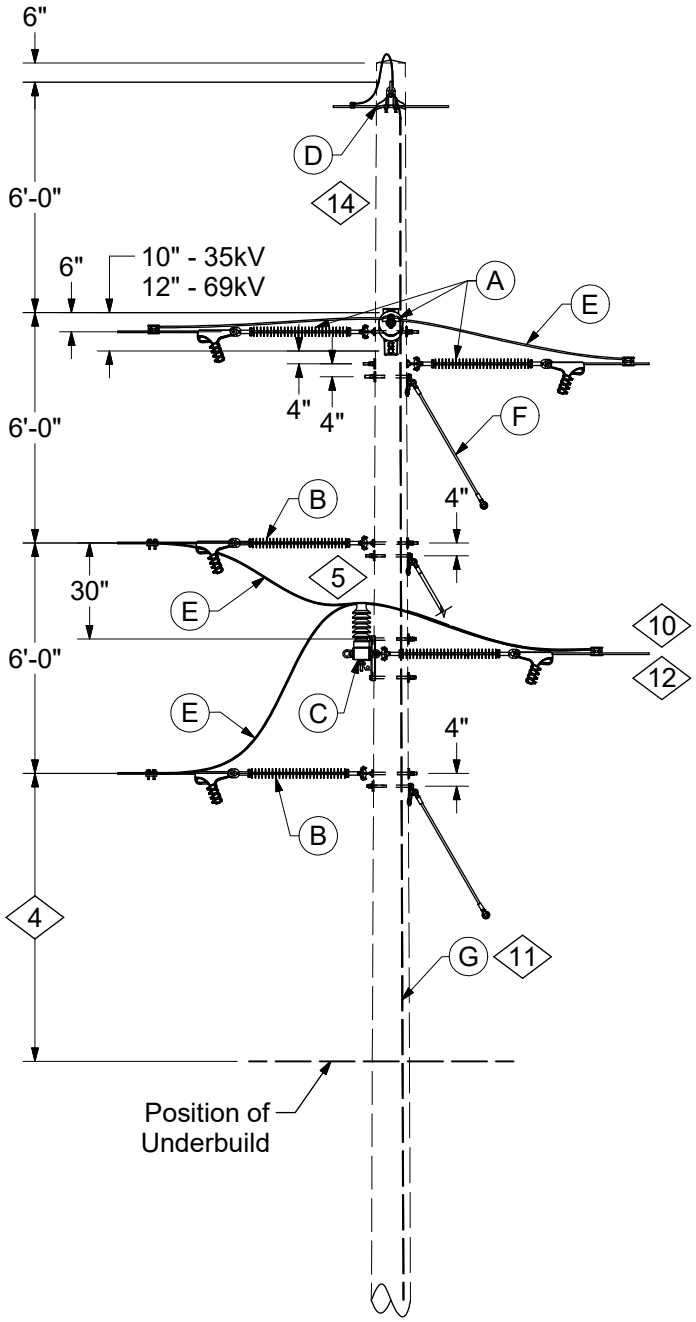
REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format, added new standard
1	12/19/11	MJ	



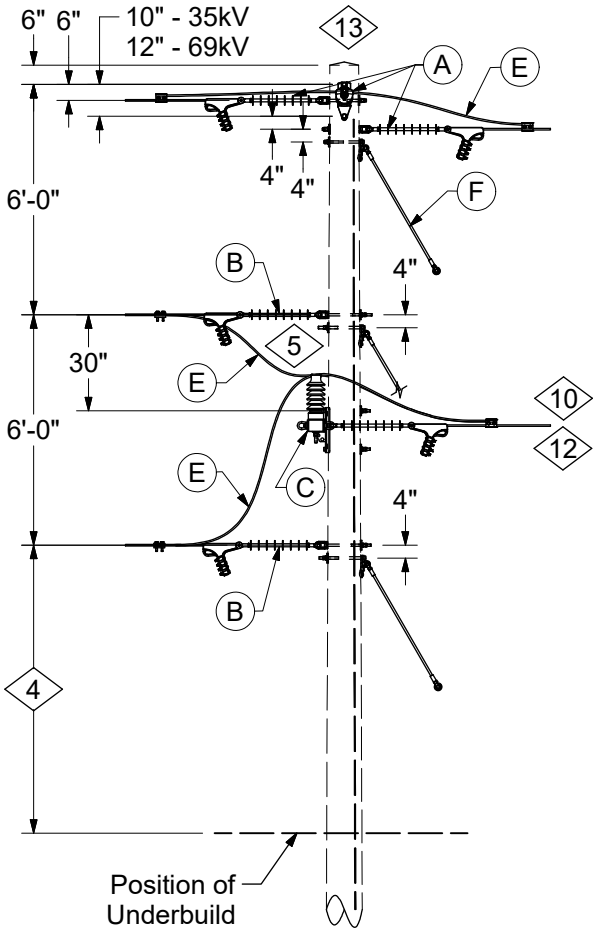
Face of Pole



Top View

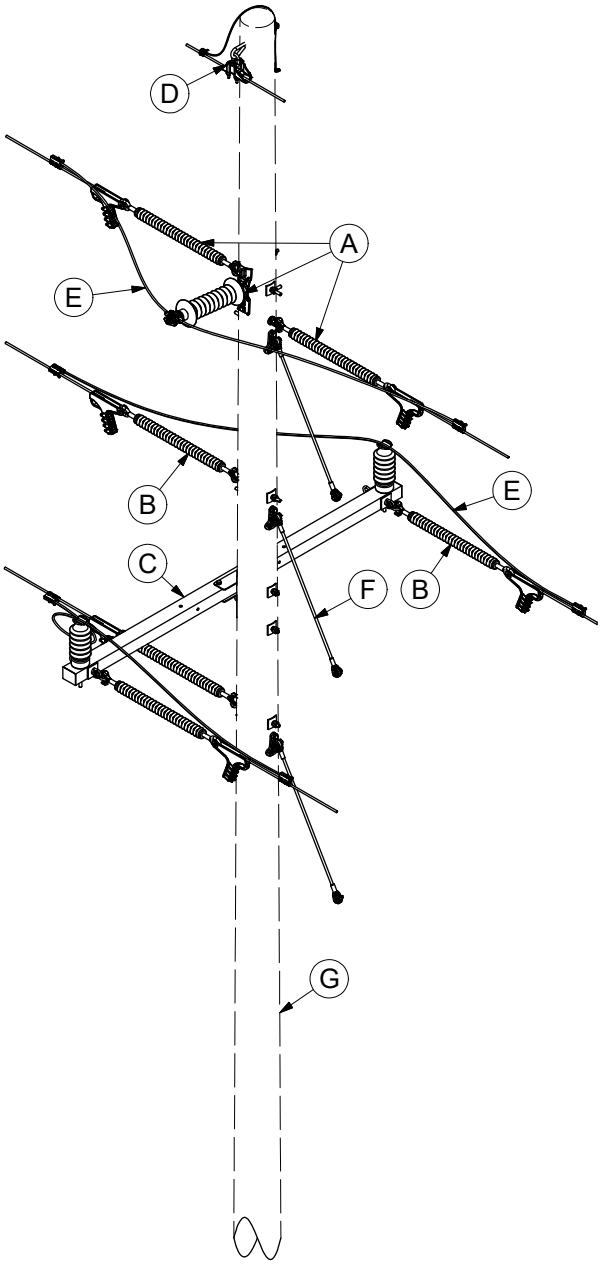


03 69 17 03 - Unequal Tension
Shielded, Offset, 69kV
03 69 17 06 - Unequal Tension
Shielded, Offset, 35kV

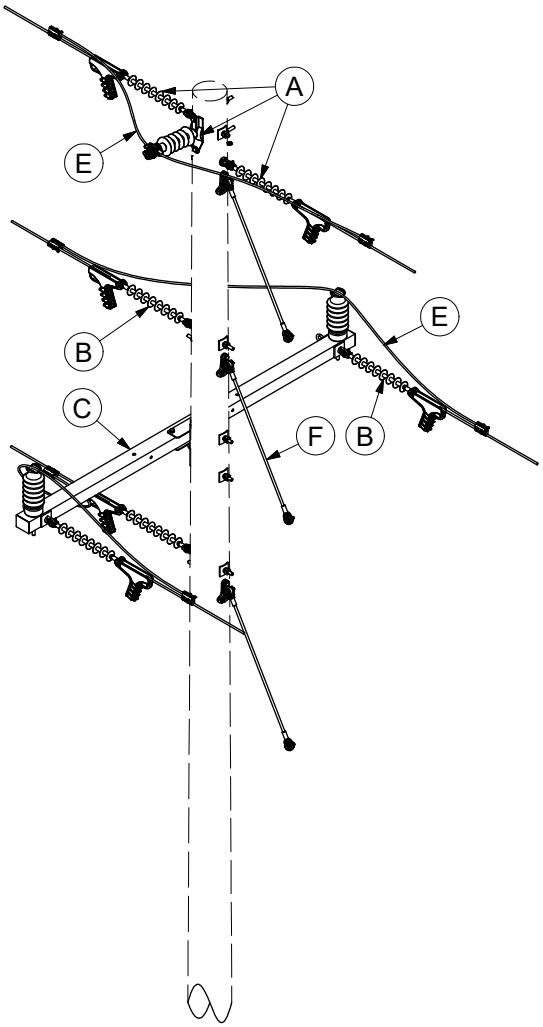


03 69 17 53 - Unequal Tension
Unshielded, Offset, 69kV
03 69 17 56 - Unequal Tension
Unshielded, Offset, 35kV

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format, added new standard
1	12/19/11	MJ	



Isometric View
03 69 17 03 - Unequal Tension
Shielded, Offset, 69kV
03 69 17 06 - Unequal Tension
Shielded, Offset, 35kV



Isometric View
03 69 17 53 - Unequal Tension
Unshielded, Offset, 69kV
03 69 17 56 - Unequal Tension
Unshielded, Offset, 35kV

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format, added new standard
1	12/19/11	MJ	

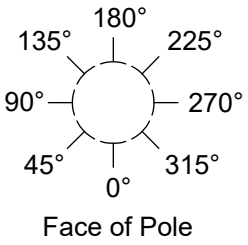
CONSTRUCTION NOTE(s):

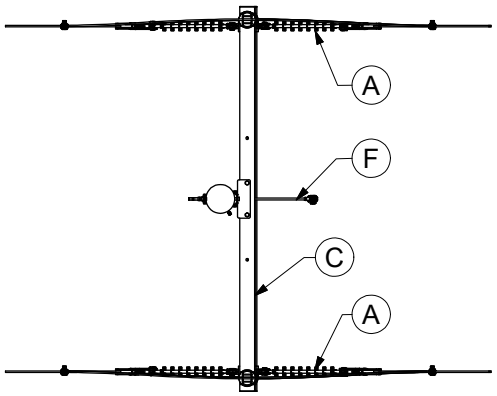
4. Use 7'-6" spacing for tangent and 7'-0" spacing for deadend on underbuild. When using fiberglass crossarm, spacing is measured from top bolt.

5. The 2" square washer recieved with the pin should be used after the 4" square washer.

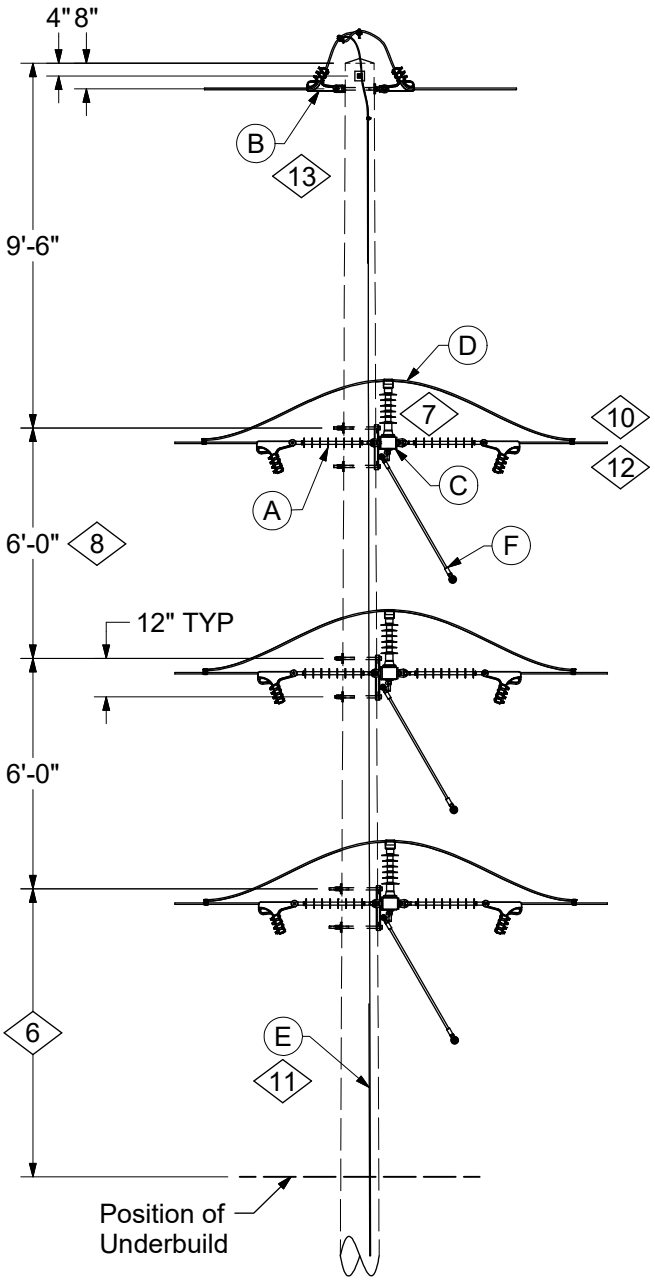
	ITEM	STK / DCS #	DESCRIPTION 03 69 17 **	03	06	53	56
	A	**06 34 60 03 @**	69kV Looparound - Offset	1	-	1	-
		06 34 60 26 @	34kV Looparound - Offset	-	1	-	1
5	B	**06 34 60 27 @**	69kV Loopover - Offset	2	-	2	-
		06 34 60 29 @	34kV Loopover - Offset	-	2	-	2
10,13,@	C	**04 00 42 03 @**	10' Deadend FG Crossarm	1	1	1	1
	D	**06 00 11 ** @**	Static Wire Attachment	1	1	-	-
15,@		**18 05 1* ** @**	OPGW Static Support w/ Suspension Clamp	1	1	-	-
@	E	**07 00 80 00 @**	Lead Wire, LW*W PLW*W	#	#	#	#
@	F	**11 00 4* ** @**	Guying Unit	#	#	#	#
11,@	G	**12 00 10 ** @**	Grounding Unit	1	1	-	-
14,@	H	**12 34 ** ** @**	Arrester Assemblies	-	-	1	1
	I	252 or 260	Op Code, Install Connectors	6	6	6	6

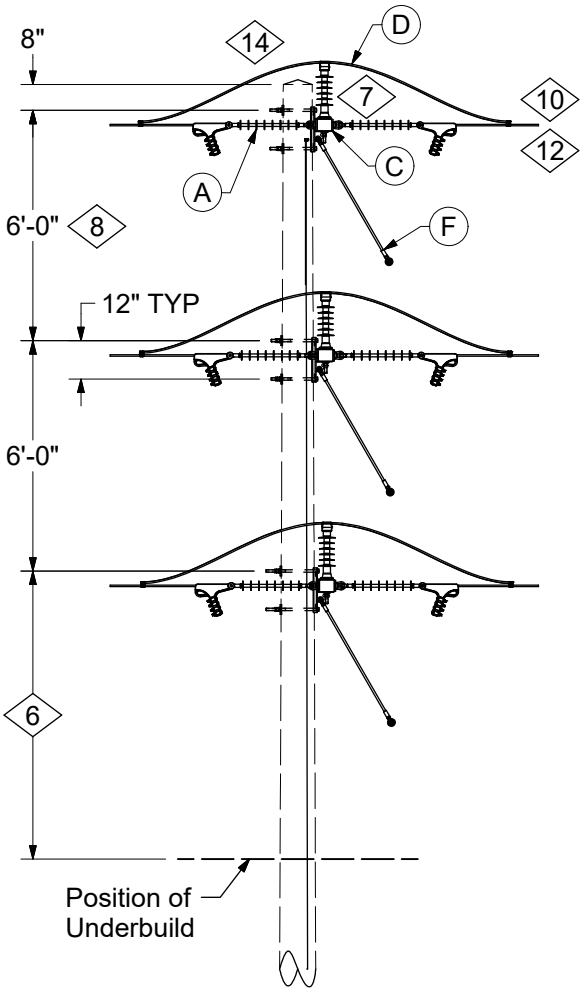
REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format, added new standard
1	12/19/11	MJ	





Top View

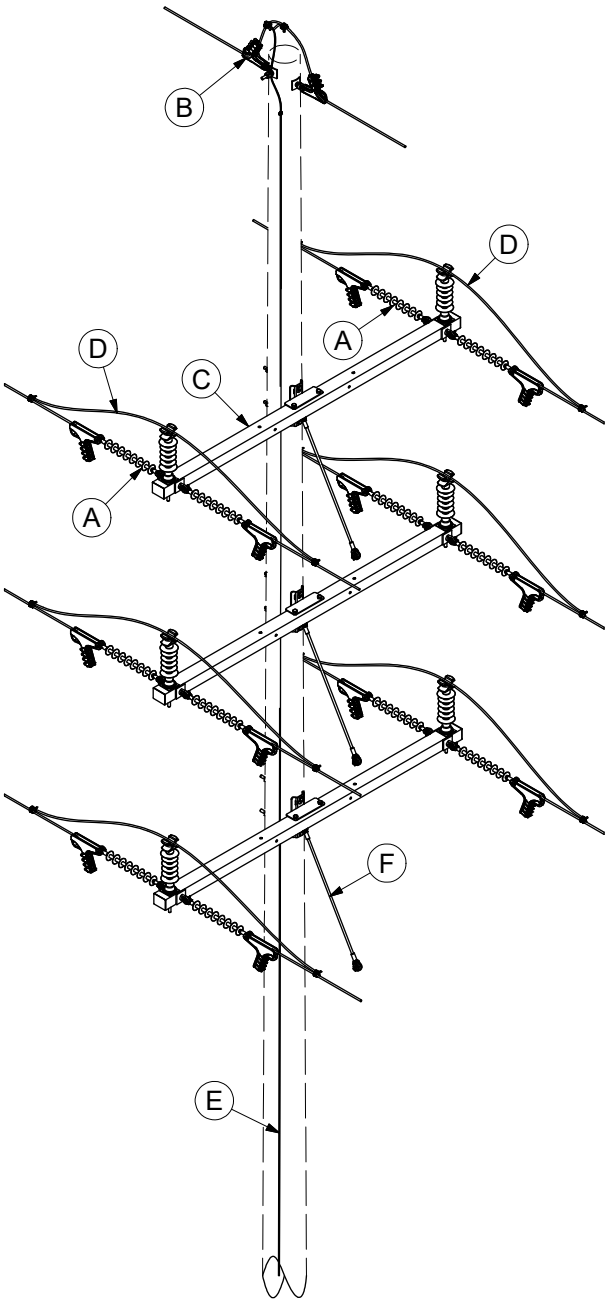




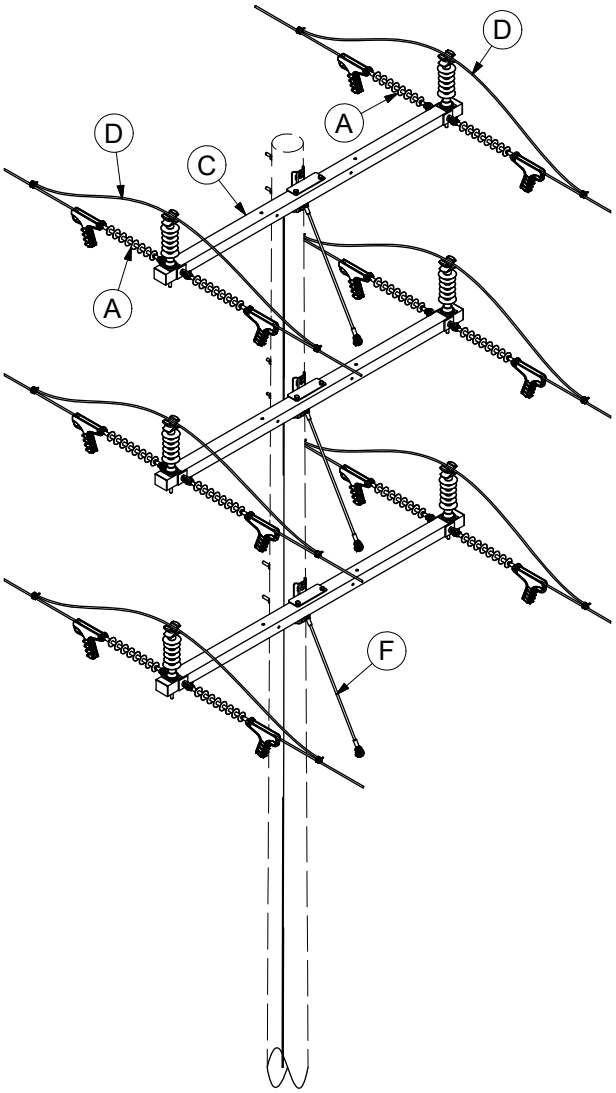
03 69 17 07 - Shielded Double Circuit
In-Line Deadend, 35kV
03 69 17 08 - Shielded Double Circuit
In-Line Deadend, 69kV

03 69 17 57 - Unshielded Double Circuit
In-Line Deadend, 35kV
03 69 17 58 - Unshielded Double Circuit
In-Line Deadend, 69kV

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format, added new standard
1	12/19/11	MJ	



Isometric View
03 69 17 07 - Shielded Double Circuit
In-Line Deadend, 35kV
03 69 17 08 - Shielded Double Circuit
In-Line Deadend, 69kV



Isometric View
03 69 17 57 - Unshielded Double Circuit
In-Line Deadend, 35kV
03 69 17 58 - Unshielded Double Circuit
In-Line Deadend, 69kV

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format, added new standard
1	12/19/11	MJ	

CONSTRUCTION NOTE(s):

6. Use 7'-6" spacing for tangent and 7'-0" spacing for deadend on underbuild. When using fiberglass crossarm, spacing is measured to the top bolt of the crossarm brace.

7. The 2" square washer recieved with the pin should be used after the 4" square washer.

	ITEM	STK / DCS #	DESCRIPTION 03 69 17 **	07	08	57	58
7,@	A	**06 34 68 05 @**	34kV Double Deadend Loopover	3	-	3	-
		06 34 68 07 @	69kV Double Deadend Loopover	-	3	-	3
		06 34 68 13 @	34kV Double Deadend Loopunder	3	-	3	-
		06 34 68 14 @	69kV Double Deadend Loopunder	-	3	-	3
14,@	B	**06 00 11 04 @**	Static Wire Attachement - Tangent and Angle	1	1	-	-
		06 00 11 06 @	Static Wire Attachment - Deadend Tangent and Angle	1	1	-	-
		18 05 16 01 @	OPGW Single Deadend w/ Splice	1	1	-	-
		18 05 16 02 @	OPGW Siingle Deadend w/o Splice	1	1	-	-
9,10,12,@	C	**04 00 42 03 @**	10' Deadend Crossarm	3	3	3	3
@	D	**07 00 80 00 @**	Lead Wire, LW*W, PLW*W	#	#	#	#
11,@	E	**12 00 10 ** @**	Grounding Unit	1	1	1	1
@	F	**11 00 4* ** @**	Guying Unit	#	#	#	#
13,@	G	**12 34 ** ** @**	Arrester Assemblies	-	-	1	1
@	H	252, 255, or 260	Op Code, Install jumper	6	6	6	6

DESIGN NOTE(s):

8. New line construction must meet the minimum 6'-0" clearance requirement. Clearance for single pole replacement or maintenance of existing pole can be reduced to no less that 4'-0".

9. In underbuild applications, middle phase is deadended on the pole per DCS **03 12 14 ****.

10. See DCS **04 00 01 01** for crossarm loading. In some applications larger crossarms may be needed for heavier loadings.

11. Composite pole has factory installed (internal) pole ground in the 45° quadrant. See DCS **12 00 10 ** ** for grounding detail.

12. 8'-0" crossarm available for Ameren Missouri only.

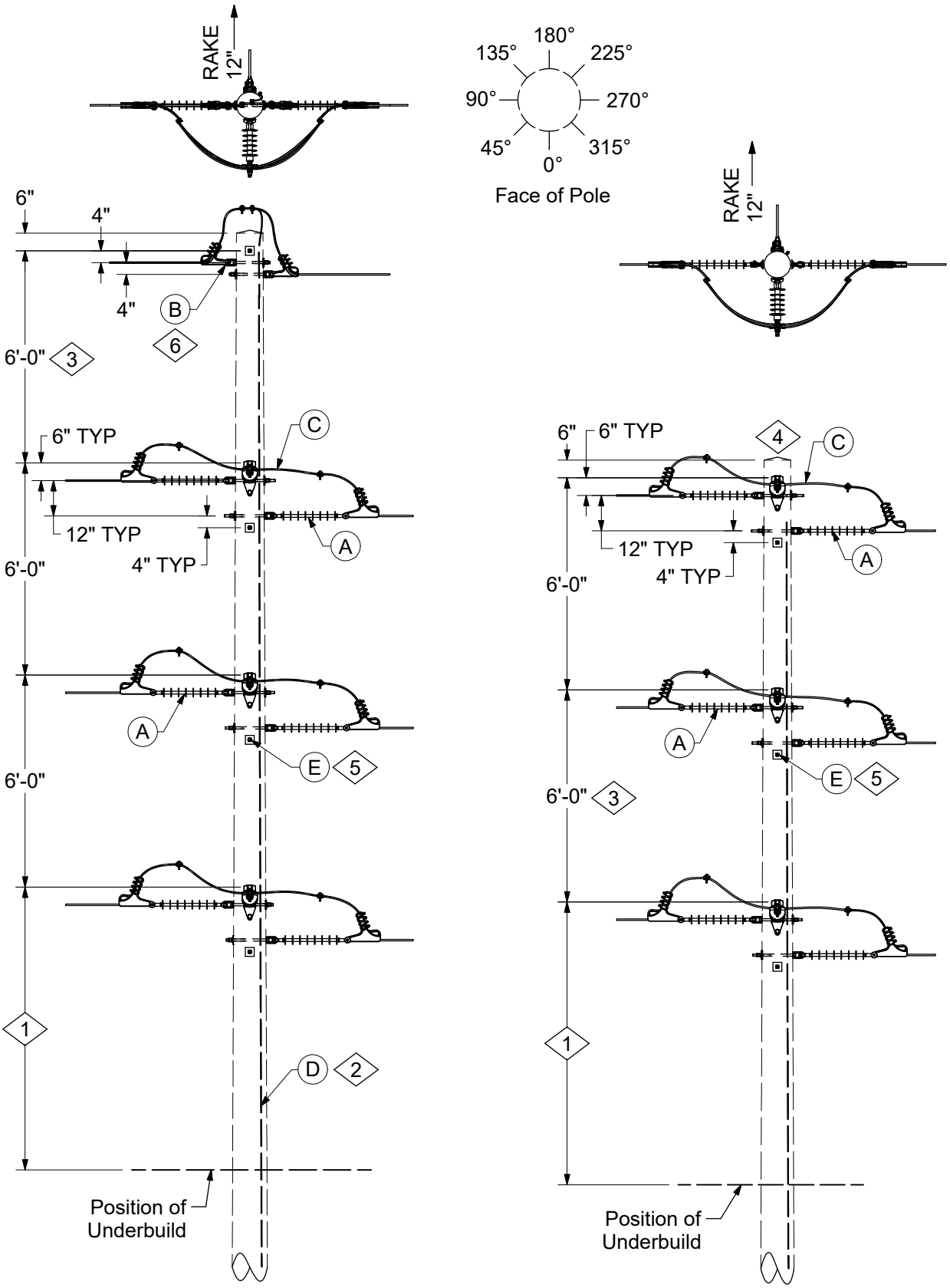
13. See DCS **12 34 ** ** ** for lightning arrester application and installation methods.

14. Refer to DCS Section 18 for OPGW applications.

CONFIGURATIONS

Deadend Angle Structure
Single Circuit for > 1° and ≤ 60°

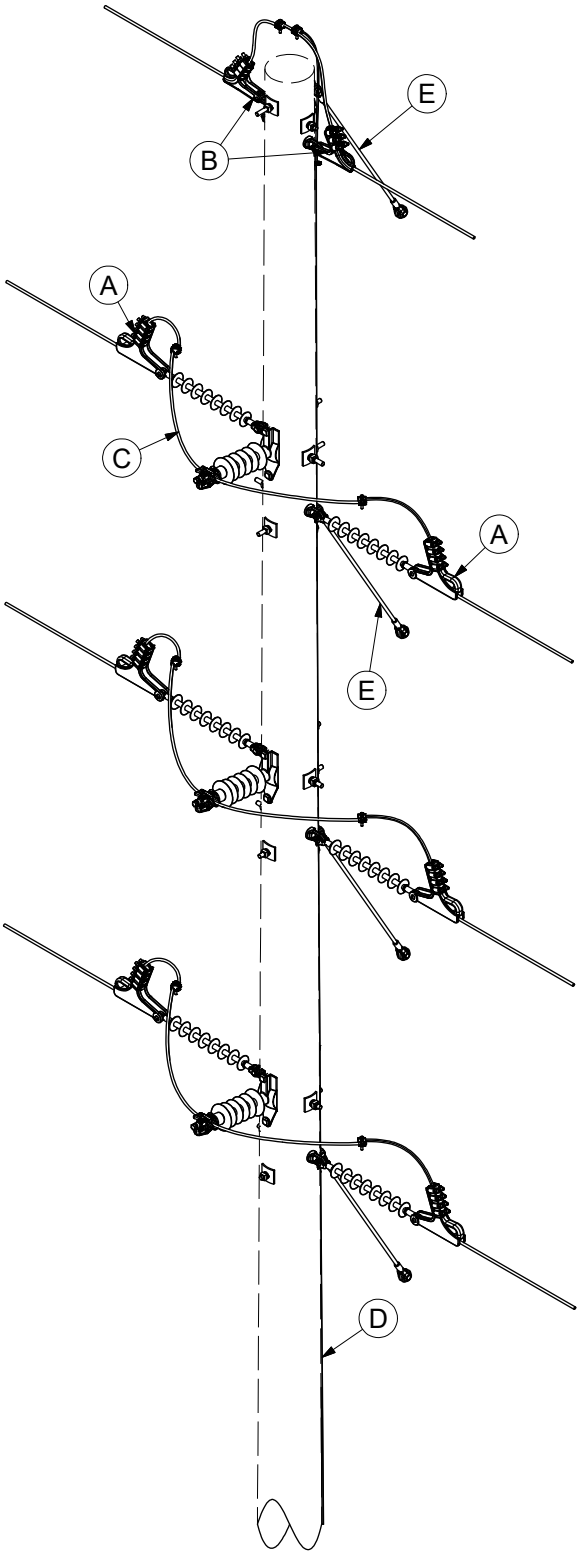
03 69 18 **
35kV, 69kV
1 of 3



03 69 18 01 - Eqaul Tension Shielded, 69kV
03 69 18 02 - Equal Tension Shielded, 35kV
03 69 18 51 - Equal Tension Unshielded, 69kV
03 69 18 52 - Equal Tension Unshielded, 35kV

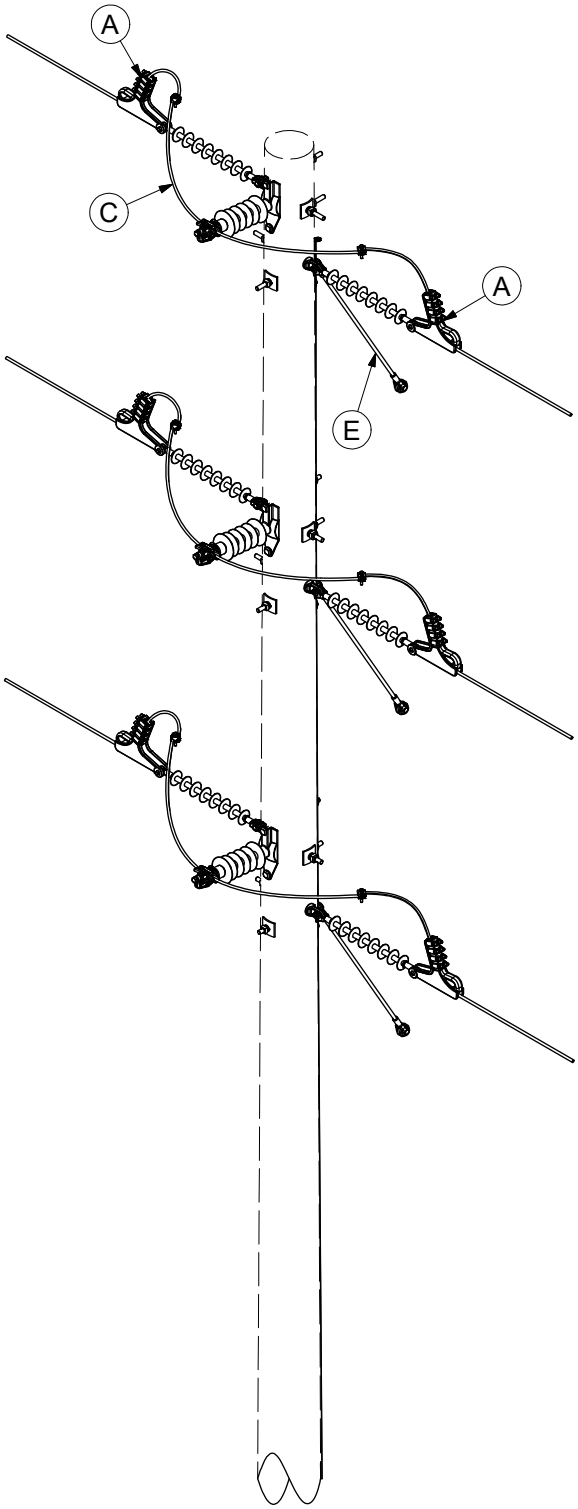
DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format
1	02/17/12	DCG	



Isometric View

03 69 18 01 - Eqaul Tension Shielded, 69kV
03 69 18 02 - Equal Tension Shielded, 35kV



Isometric View

03 69 18 51 - Equal Tension Unshielded, 69kV
03 69 18 52 - Equal Tension Unshielded, 35kV

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format
1	02/17/12	DCG	

CONSTRUCTION NOTE(s):

1. Use 7'-6" spacing for tangent and 7'-0" spacing for deadend on underbuild. When using fiberglass crossarm, spacing is measured to the top bolt of the crossarm brace.

	ITEM	STK / DCS #	DESCRIPTION 03 69 18 **	01	02	51	52
	A	**06 34 60 03 @**	69kV Looparound - Offset	3	-	3	-
		06 34 60 26 @	34kV Looparound - Offset	-	3	-	3
	B	**06 00 11 04 @**	Static Wire Attachment - Tangent and Angle	1	1	-	-
		06 00 11 07 @	Deadend Angle w/ Pole Ground	1	1	-	-
6,@		**18 05 10 01 @**	OPGW Tangent or Corner ≤ 30°	1	1	-	-
		18 05 11 01 @	OPGW Tangent or Corner ≥ 30° ≤ 60°	1	1	-	-
		18 05 16 ** @	OPGW Deadend w/ Splice	1	1	-	-
@	C	**07 00 80 00 @**	Lead Wire, LW*W, PLW*W	#	#	#	#
2,@	D	**12 00 10 ** @**	Grounding Unit	1	1	-	-
5,@	E	**11 00 4* ** @**	Guying Unit	#	#	#	#
4,@	F	**12 34 ** ** @**	Arrester Assemblies	-	-	1	1
	G	252 or 260	Op Code, Install Jumper	6	6	6	6

DESIGN NOTE(s):

2. Composite Pole has Factory installed (internal) pole ground in the 45° quadrant. See DCS **12 00 10 ** ** for grounding detail.

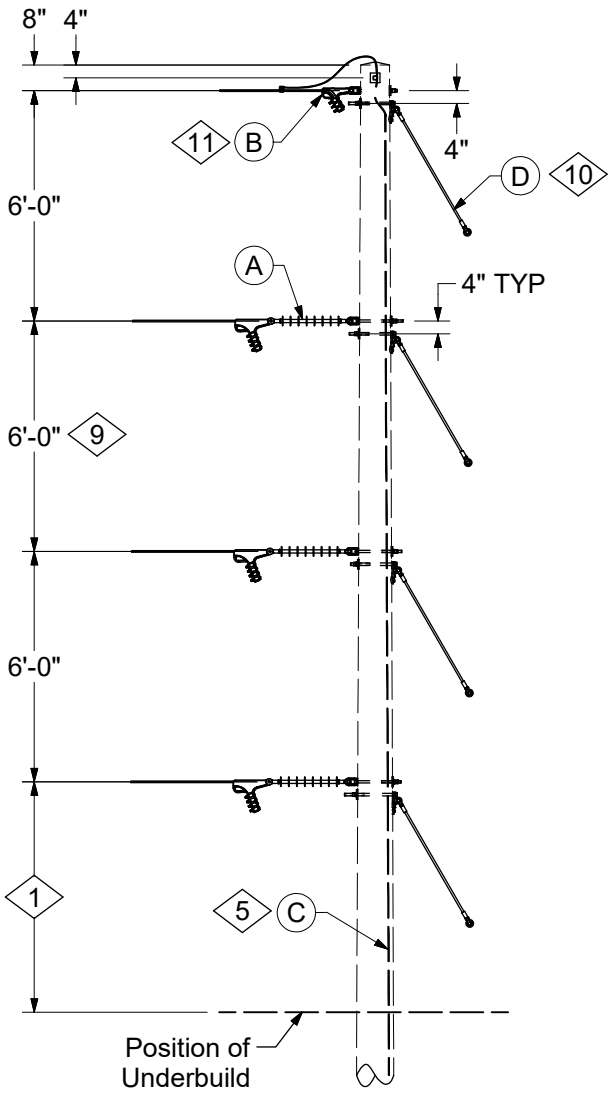
3. New line construction must meet the minimum 6'-0" clearance requirement. Clearance for single pole replacement or maintenance of existing poles can be reduced to no less than 4'-0".

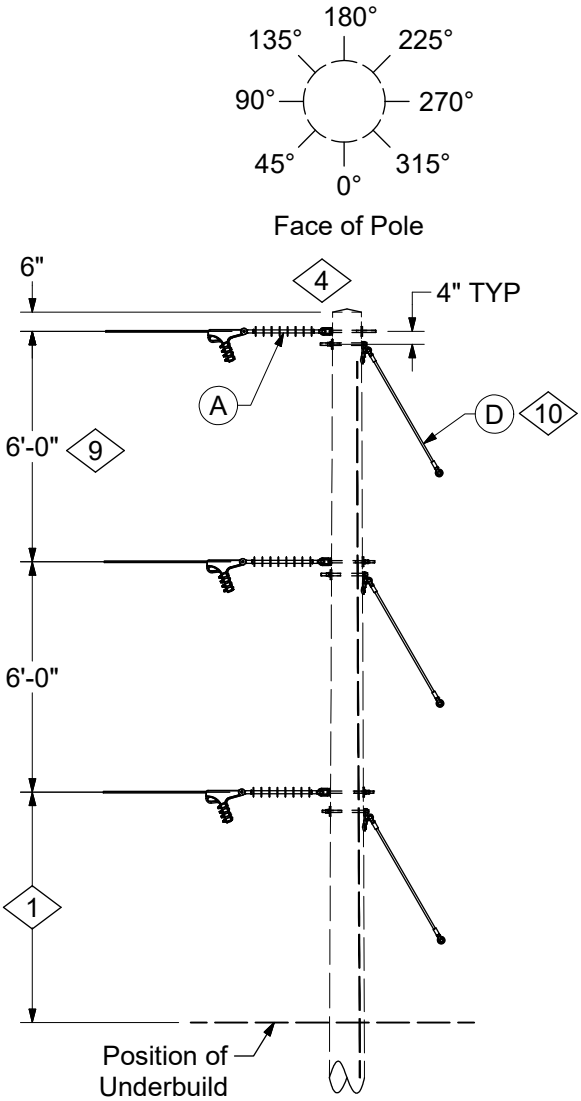
4. See DCS **12 34 ** ** ** for lighting arresters application and installation methods.

5. Additional guys may be required depending on line tension and line angle.

6. Refer to DCS Section 18 for OPGW applications.

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format
1	02/17/12	DCG	





03 69 19 01 - Vertical Shielded, 69kV
03 69 19 02 - Vertical Shielded, 35kV

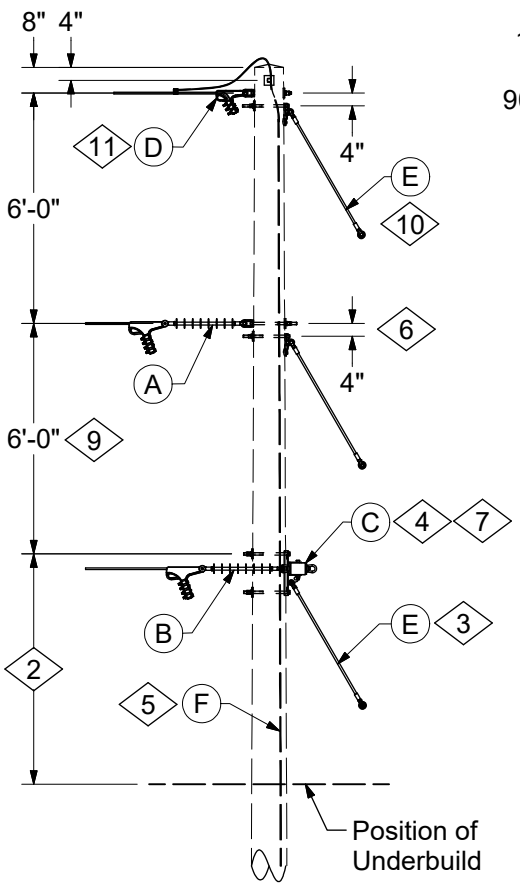
03 69 19 51 - Vertical Unshielded, 69kV
03 69 19 52 - Vertical Unshileded, 35kV

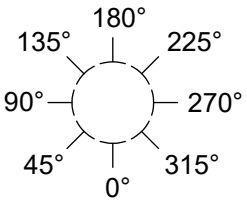
CONSTRUCTION NOTE(s):

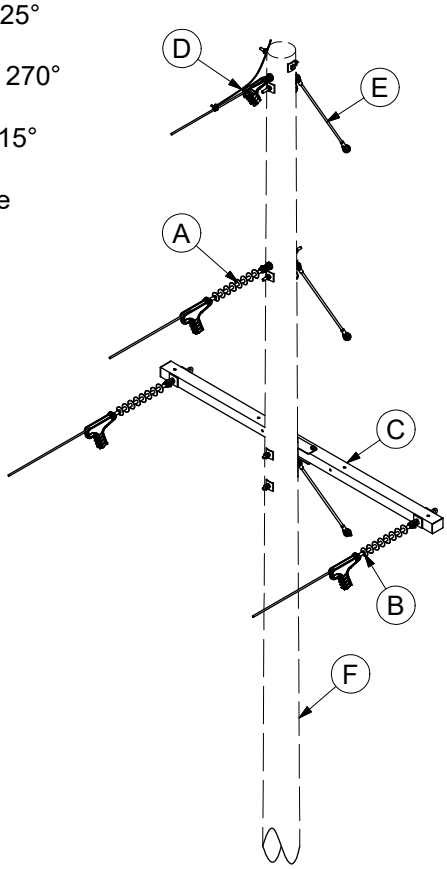
1. Use 7'-6" spacing for tangent and 7'-0" spacing for deadend on underbuild. When using fiberglass crossarm, spacing is measured to the top bolt of the crossarm brace.

	ITEM	STK / DCS #	DESCRIPTION 03 69 19 **	01	02	51	52
	A	**06 34 60 06 @**	69kV Single Deadend	3	-	3	-
		06 34 60 02 @	34kV Single Deadend	-	3	-	3
11,@	B	**06 00 11 08 @**	Static Wire Attachment - Deadend Endline w/ Pole Ground	1	1	-	-
		18 05 16 01 @	OPGW Single Deadend w/ Splice	1	1	-	-
5,@	C	**12 00 10 ** @**	Grounding Unit	1	1	-	-
10,@	D	**11 00 4* ** @**	Guying Unit	#	#	#	#
8,@	E	**12 34 ** ** @**	Arrester Assemblies	-	-	1	1
	F	252 or 260	Op Code, Install Jumper	6	6	6	6

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to ne format
1	02/17/12	DCG	

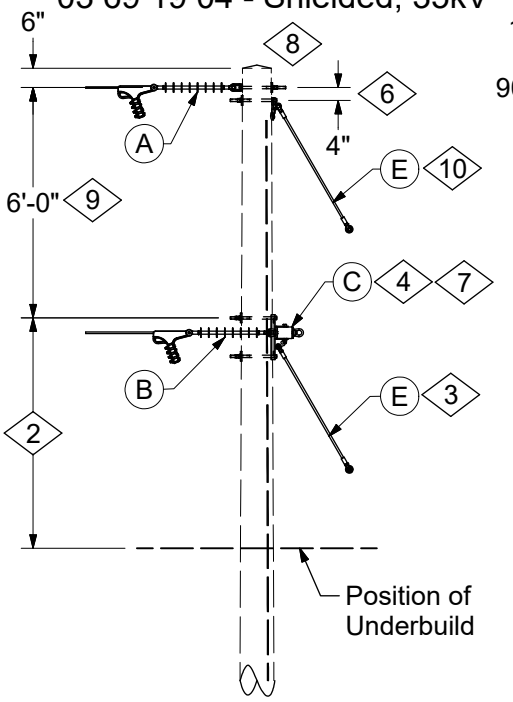


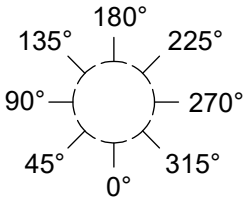


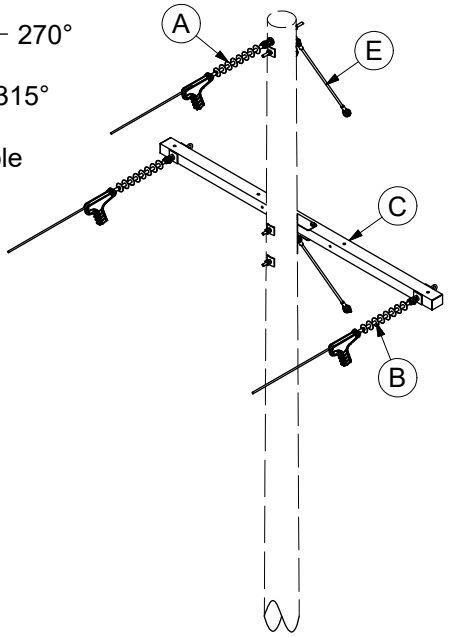


03 69 19 03 - Shielded, 69kV
03 69 19 04 - Shielded, 35kV

ISOMETRIC VIEW







03 69 19 53 - Unshielded, 69kV
03 69 19 54 - Unshielded, 35kV

ISOMETRIC VIEW

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to ne format
1	02/17/12	DCG	

CONSTRUCTION NOTE(s):

2. Use 7'-6" spacing for tangent and 7'-0" spacing for deadend on underbuild. When using fiberglass crossarm, spacing is measured to the top bolt of the crossarm brace.

3. Attach guy to fiberglass arm guy hook.

	ITEM	STK / DCS #	DESCRIPTION 03 69 19 **	03	04	53	54
	A	**06 34 60 06 @**	69kV Single Deadend	1	-	1	-
		06 34 60 02 @	34kV Single Deadend	-	1	-	1
	B	**06 34 68 12 @**	69kV Single Deadend on Arm	2	-	2	-
		06 34 68 11 @	34kV Single Deadend on Arm	-	2	-	2
4,7	C	**04 00 42 03 @**	10' Deadend FG Crossarm	1	1	1	1
11,@	D	**06 00 11 08 @**	Static Wire Attachment - Deadend Endline w/ Pole Ground	1	1	-	-
		18 05 16 01 @	OPGW Single Deadend w/ Splice	1	1	-	-
3,10,@	E	**11 00 4* ** @**	Guying Unit	#	#	#	#
5,@	F	**12 00 10 ** @**	Grounding Unit	1	1	-	-
8,@	G	**12 34 ** ** @**	Arrester Assemblies	-	-	1	1
	H	252 or 260	Op Code, Install Jumper	#	#	#	#

DESIGN NOTE(s):

4. See DCS **04 00 01 01** for crossarm loading. In some applications larger crossarm may be needed for heavier loadings.

5. Composite pole has factory installed (internal) pole ground in the 45° quadrant. See DCS **12 00 10 **** for grounding detail.

6. In underbuild applications middle phase is deadended on the pole per DCS **03 12 14 **.

7. 8'-0" crossarm available for Ameren Missouri only.

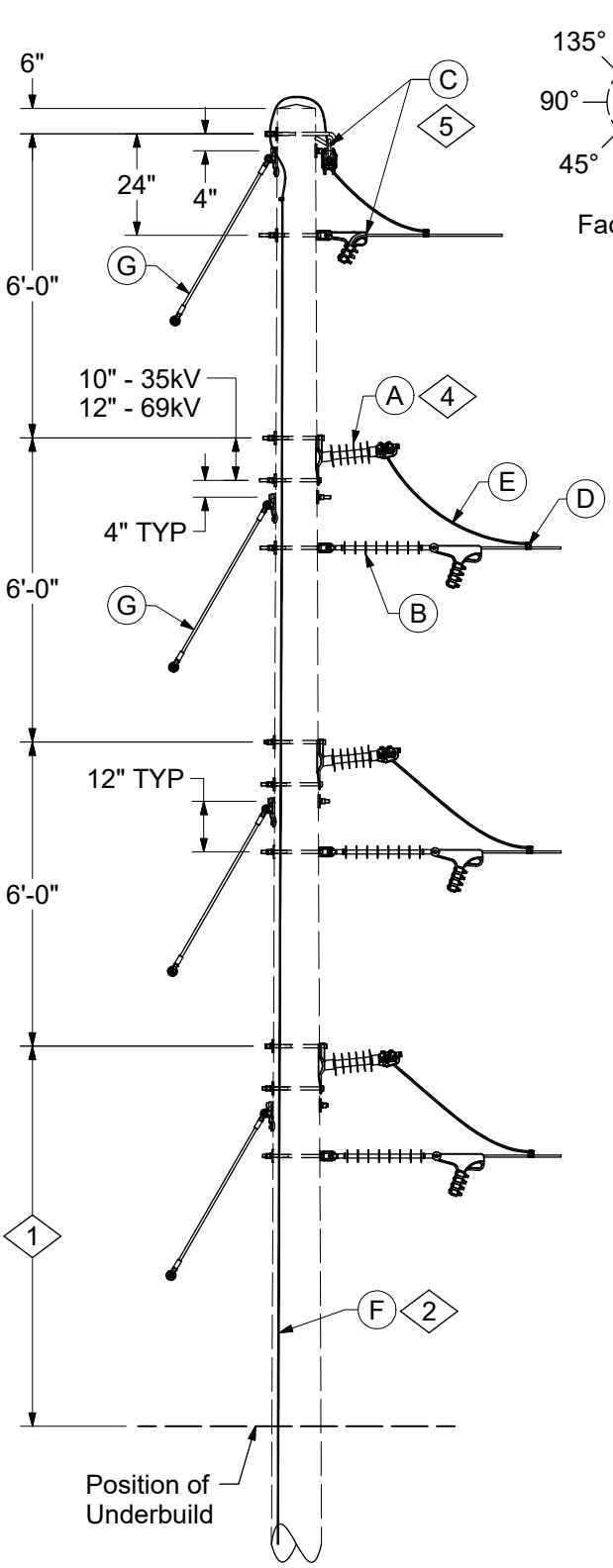
8. See DCS **12 34 ** **** for lightning arrester application and installation methods.

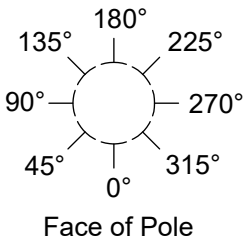
9. New line construction must meet the minimum 6'-0" clearance requirement. Clearance for single pole replacement or maintenance of existing poles can be reduced to no less than 4'-0".

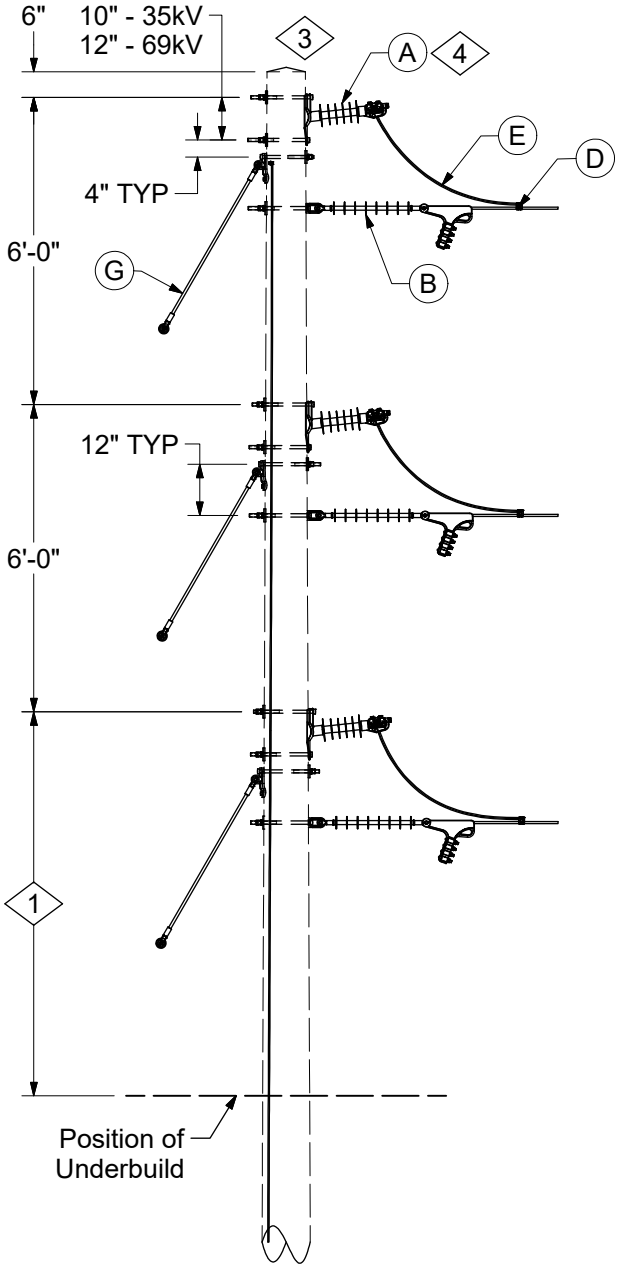
10. Additional guys may be required depending on line tension.

11. Refer to DCS Section 18 for OPGW applications.

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to ne format
1	02/17/12	DCG	



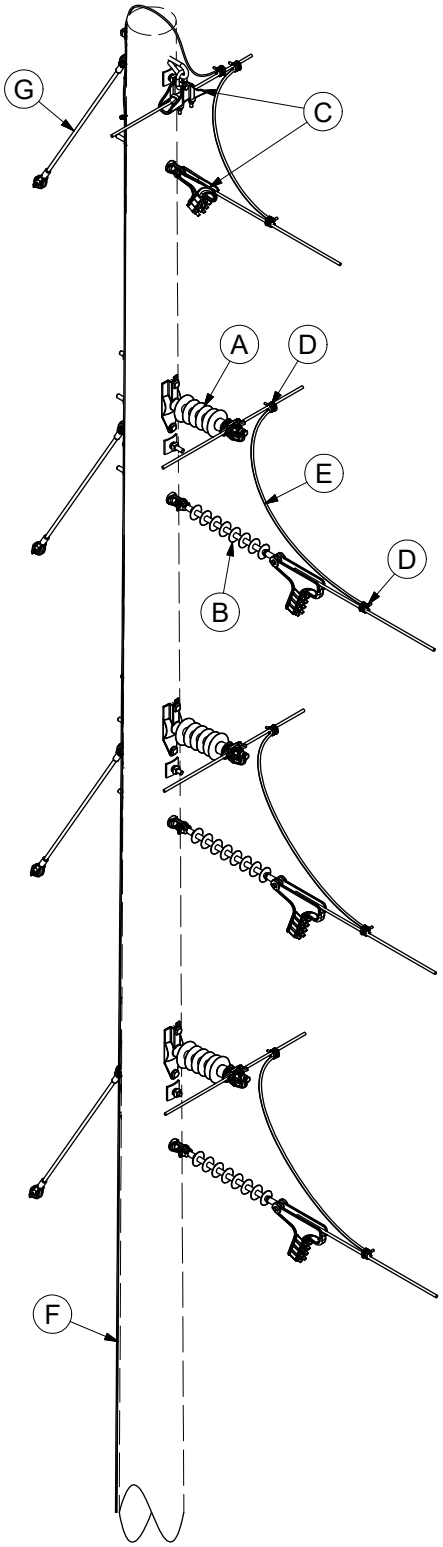




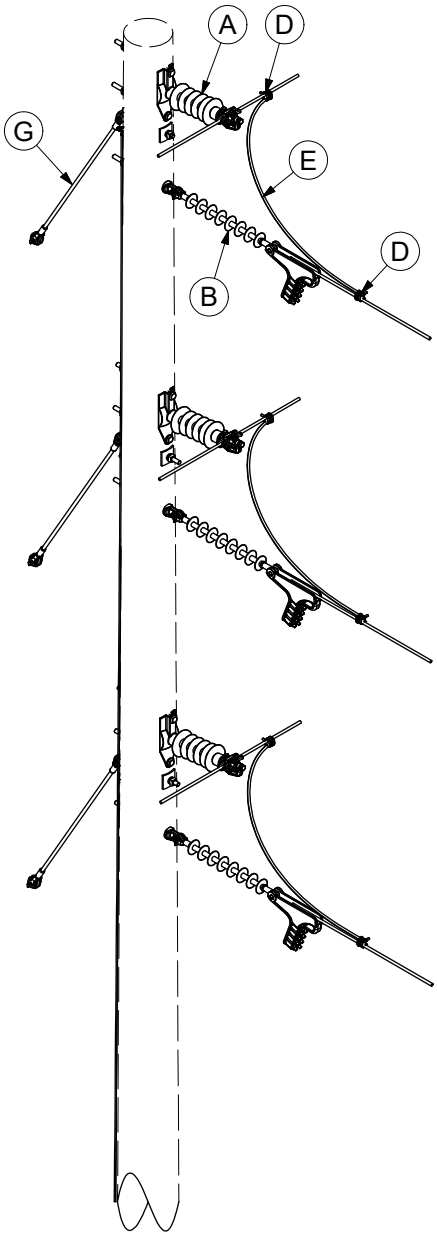
03 69 20 01 - Shielded, 69kV
03 69 20 02 - Shielded, 35kV

03 69 20 51 - Unshielded, 69kV
03 69 20 52 - Unshielded, 35kV

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format
2	02/17/12	DCG	



Isometric View
03 69 20 01 - Shielded, 69kV
03 69 20 02 - Shielded, 35kV



Isometric View
03 69 20 51 - Unshielded, 69kV
03 69 20 52 - Unshielded, 35kV

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format
2	02/17/12	DCG	

CONSTRUCTION NOTE(s):

1. Use 7-6" spacing for tangent and 7'-0" spacing for deadend on underbuild. When using fiberglass crossarm, spacing is measured to the top bolt of the crossarm brace.

	ITEM	STK / DCS #	DESCRIPTION 03 69 20 **	01	02	51	52
4	A	**06 69 03 03 @**	69kV Single Horizontal Line Post Insulator - Clamptop	3	-	3	-
		06 34 03 03 @	34kV Single Horizontal Line Post Insulator - Clamptop	-	3	-	3
	B	**06 34 60 06 @**	69kV Single Deadend	3	-	3	-
		06 34 60 02 @	34kV Single Deadend	-	3	-	3
5,@	C	**06 00 11 04 @**	Static Wire Attachment - Tangent and Angle	1	1	-	-
		06 00 11 08 @	Static Wire Attachment - Deadend Endline w/ Pole Ground	1	1	-	-
		18 05 16 01 @	OPGW Single Deadend w/ Splice	1	1	-	-
		18 05 16 02 @	OPGW Double Deadend w/o Splice	1	1	-	-
@	D	**07 00 11 00 @**	Clamp, PG, PG*W	6	6	6	6
@	E	**07 00 80 00 @**	Lead Wire, LW*W, PLW*W	#	#	#	#
2,@	F	**12 00 10 ** @**	Grounding Unit	1	1	-	-
@	G	**11 00 4* ** @**	Guying Unit	#	#	#	#
3,@	H	**12 34 ** ** @**	Arrester Assemblies	-	-	1	1
	I	252 or 260	Op Code, Install Jumper	6	6	6	6

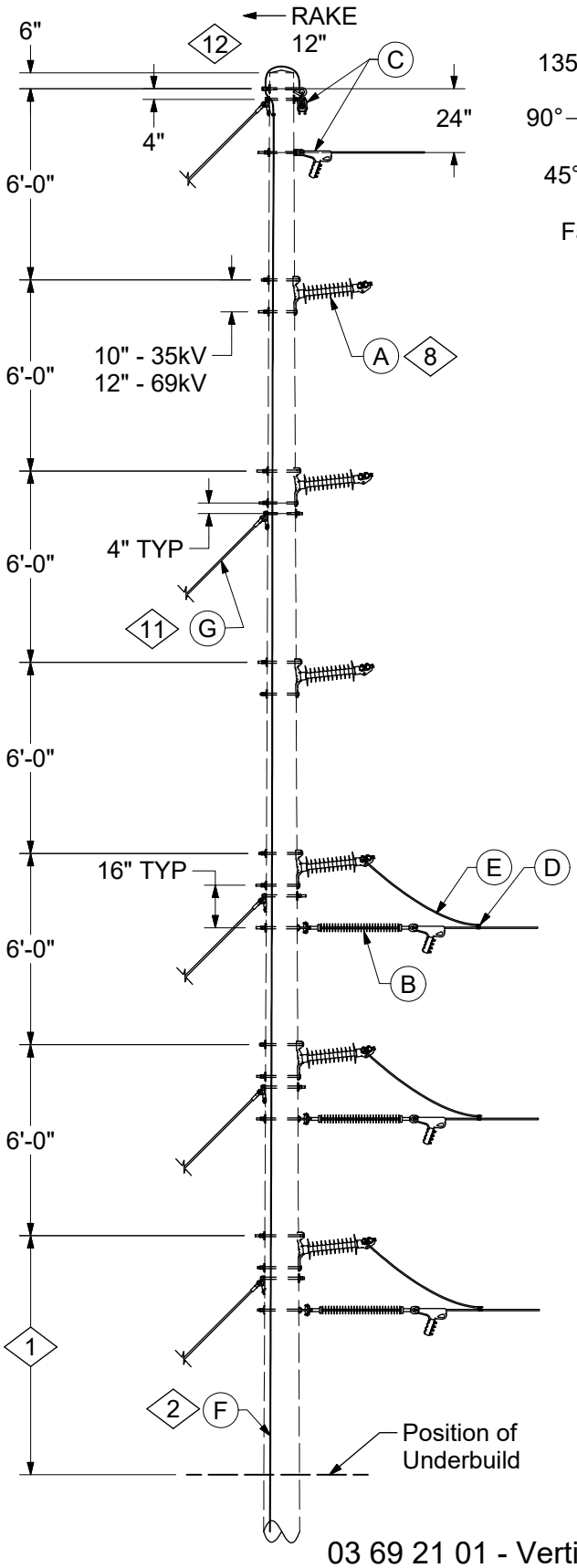
DESIGN NOTE(s):

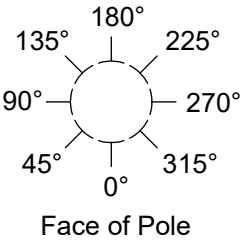
2. Composite pole has factory installed (internal) pole ground in the 45° quadrant. See DCS **12 00 10 ** ** for grounding detail.

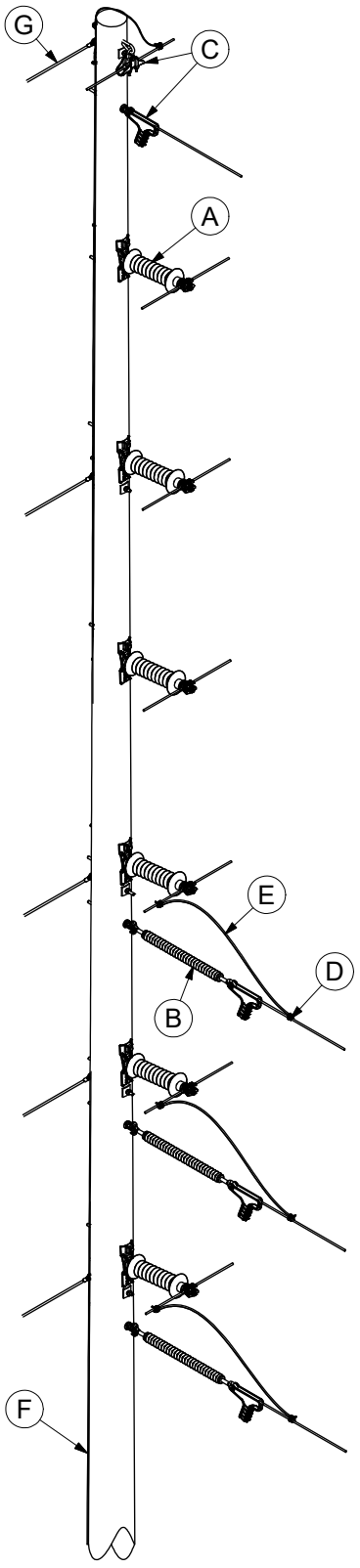
3. See DCS **12 34 ** ** ** for lightning arrester application and installation methods.

4. When additional clearance is needed, use 138kV horizontal line post insulators (Stock #25 05 099, 25 05 132, and 25 05 213) and install them at 9'-0" from the static bolt to ensure the proper shielding.

5. Refer to DCS Section 18 for OPGW applications.



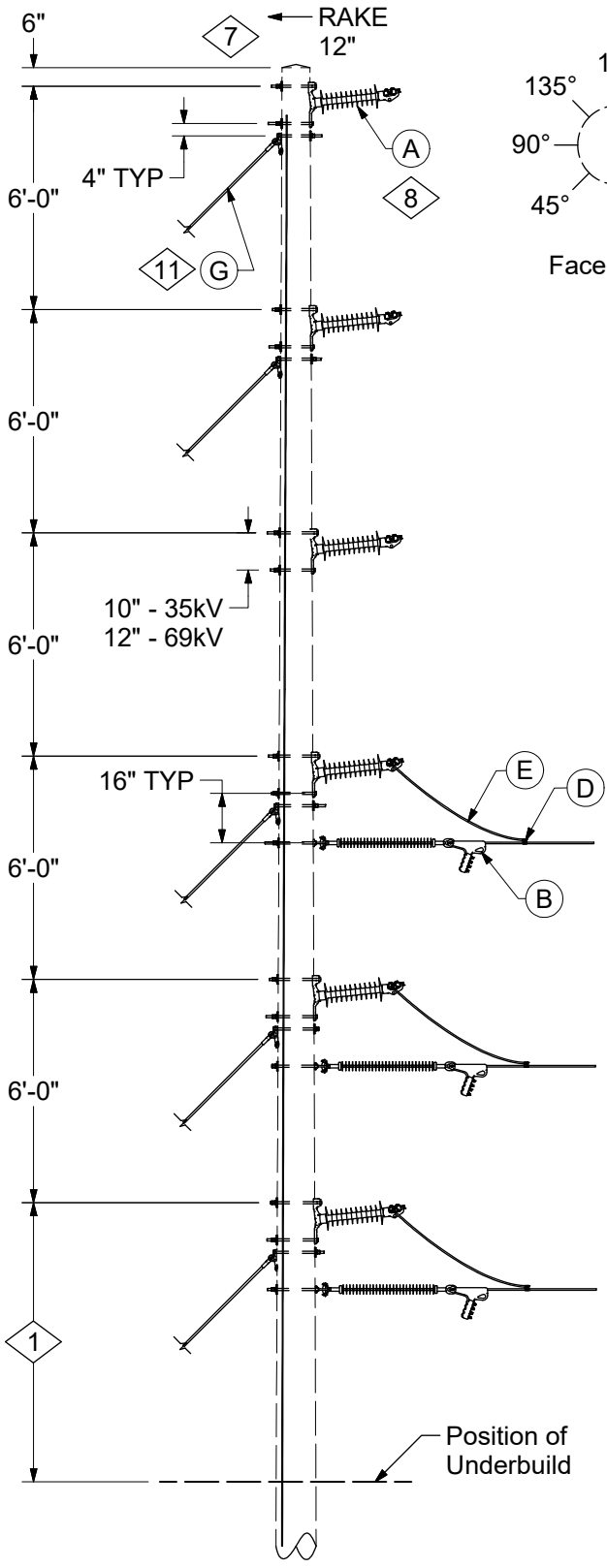


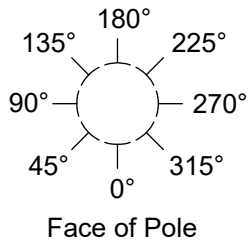


Isometric View

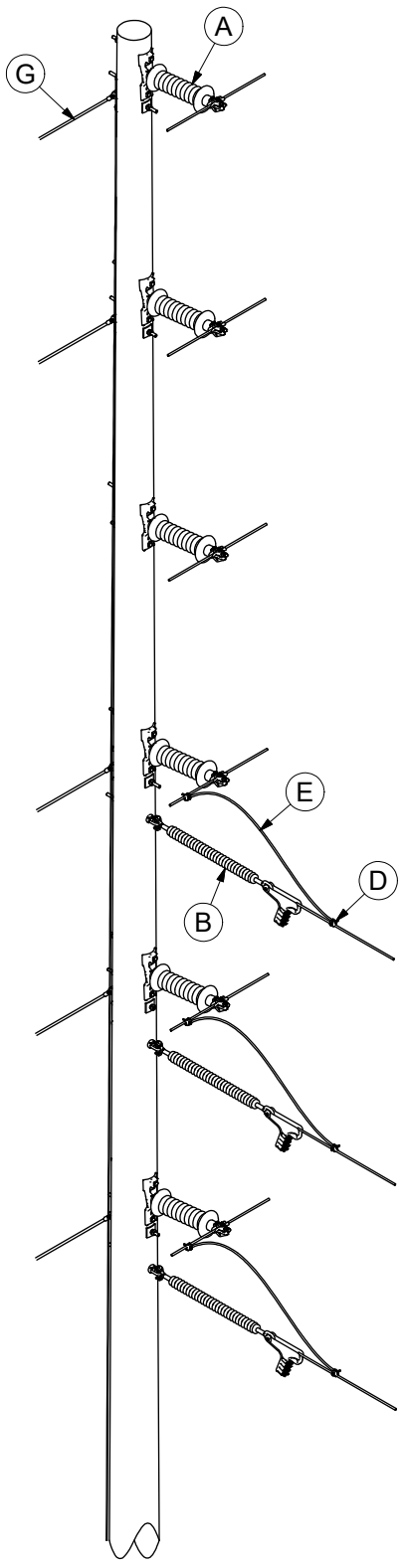
03 69 21 01 - Vertical Shielded, 69kV
03 69 21 02 - Vertical Shielded, 35kV

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format and added new standard
2	02/17/12	DCG	





Face of Pole



Isometric View

03 69 21 51 - Vertical Unshielded, 69kV
03 69 21 52 - Vertical Unshielded, 35kV

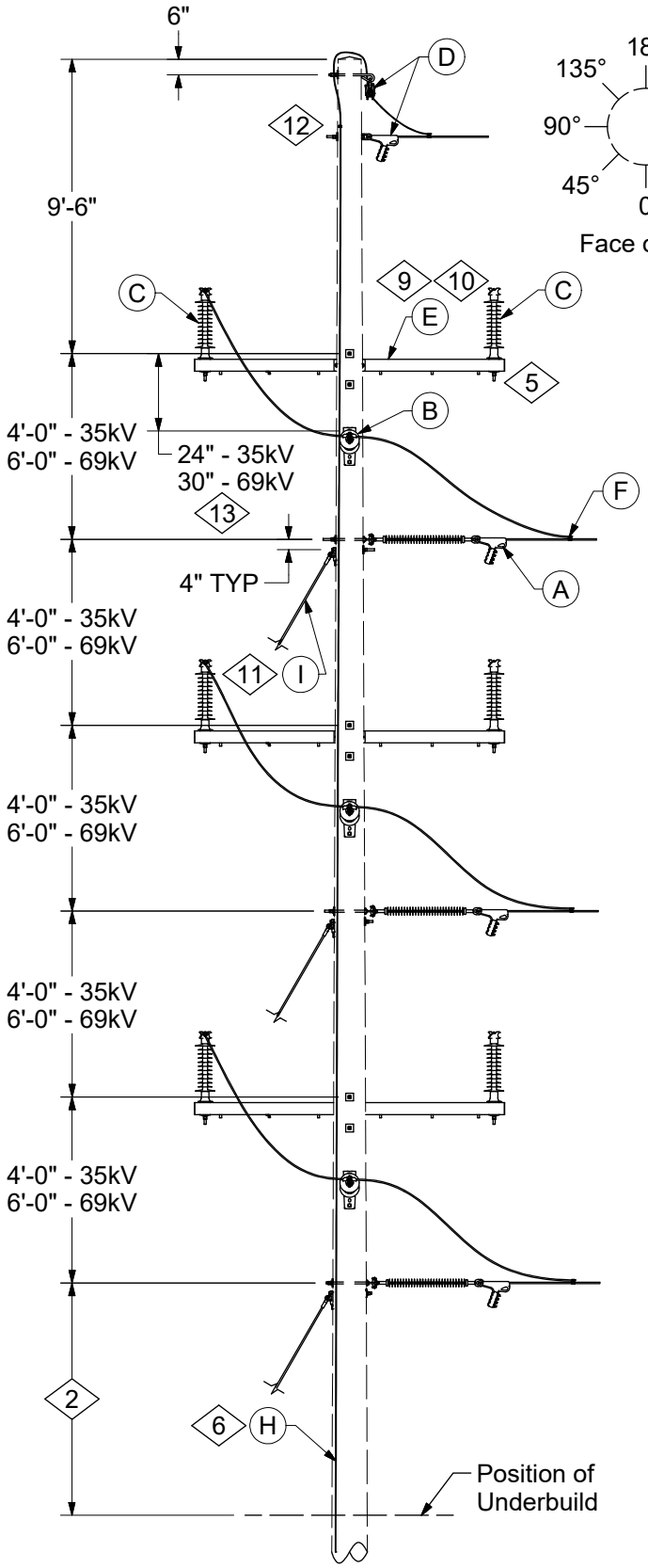
REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format and added new standard
2	02/17/12	DCG	

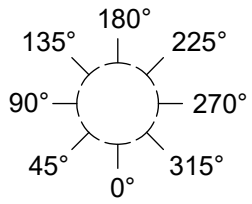
CONSTRUCTION NOTE(s):

1. Use 7'-6" spacing for tangent and 7'-0" spacing for deadend on underbuild. When using fiberglass crossarm, spacing is measured to the top bolt of the crossarm brace.

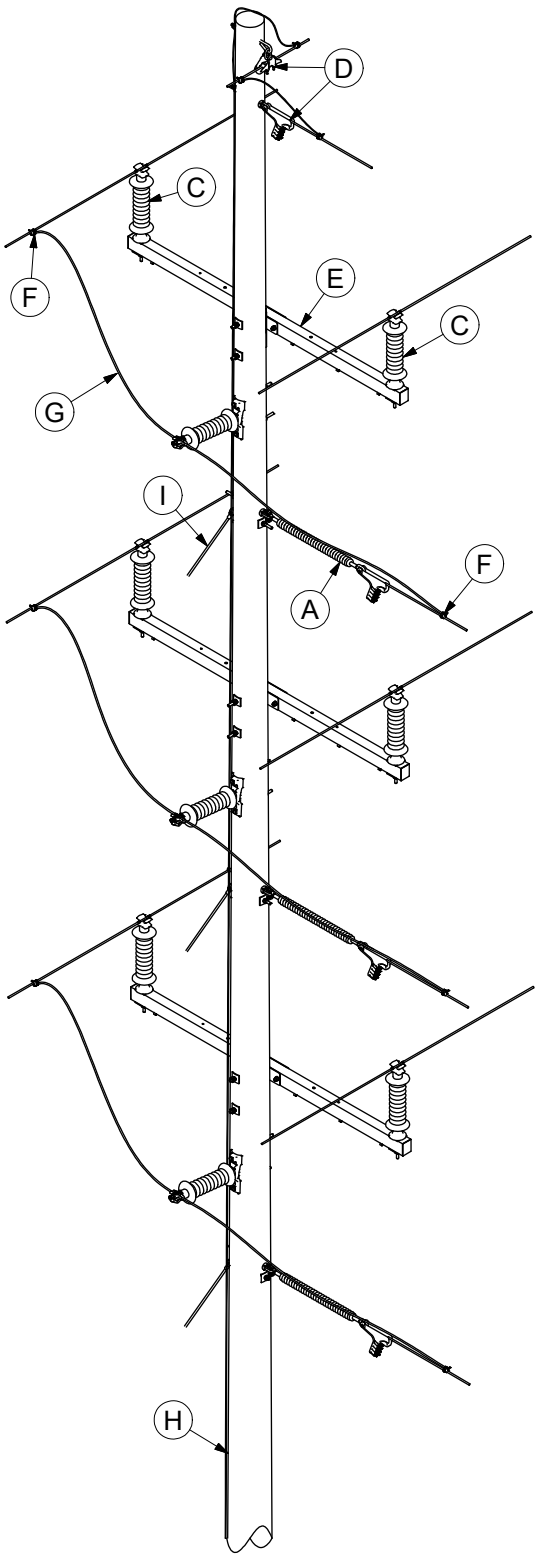
	ITEM	STK / DCS #	DESCRIPTION 03 69 21 **	01	02	51	52
	A	**06 69 03 03 @**	69kV Single Horizontal Line Post Insulator - Clamptop	6	-	6	-
		06 34 03 03 @	34kV Single Horizontal Line Post Insulator - Clamptop	-	6	-	6
	B	**06 34 60 06 @**	69kV Single Deadend	3	-	3	-
		06 34 60 02 @	34kV Single Deadend	-	3	-	3
	C	**06 00 11 04 @**	Static Wire Attachment - Tangent and Angle	1	1	-	-
12,@		**06 00 11 08 @**	Static Wire Attachment - Deadend Endline w/ Pole Ground	1	1	-	-
		18 05 16 01 @	OPGW Single Deadend w/Splice	1	1	-	-
		18 05 16 02 @	OPGW Double Deadend w/o Splice	1	1	-	-
@	D	**07 00 11 00 @**	Clamp, PG, PG*W	6	6	6	6
@	E	**07 00 80 00 @**	Lead Wire, LW*W, PLW*W	#	#	#	#
6,@	F	**12 00 10 ** @**	Grounding Unit	1	1	-	-
11,@	G	**11 00 4* ** @**	Guying Unit	#	#	#	#
7,@	H	**12 34 ** ** @**	Arrester Assemblies	-	-	1	1
	I	252 or 260	Op Code, Install Jumper	6	6	6	6

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format and added new standard
2	02/17/12	DCG	





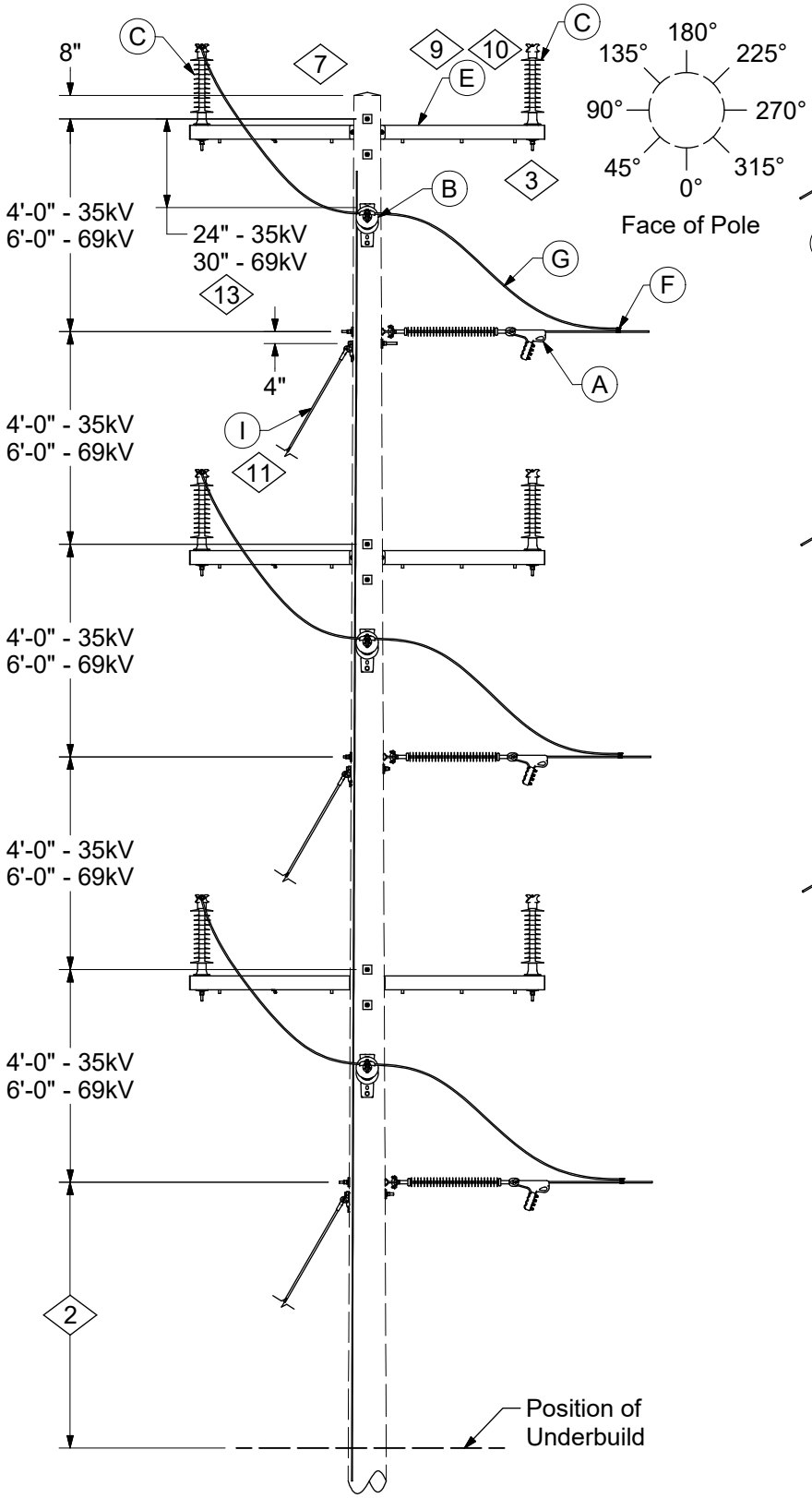
Face of Pole

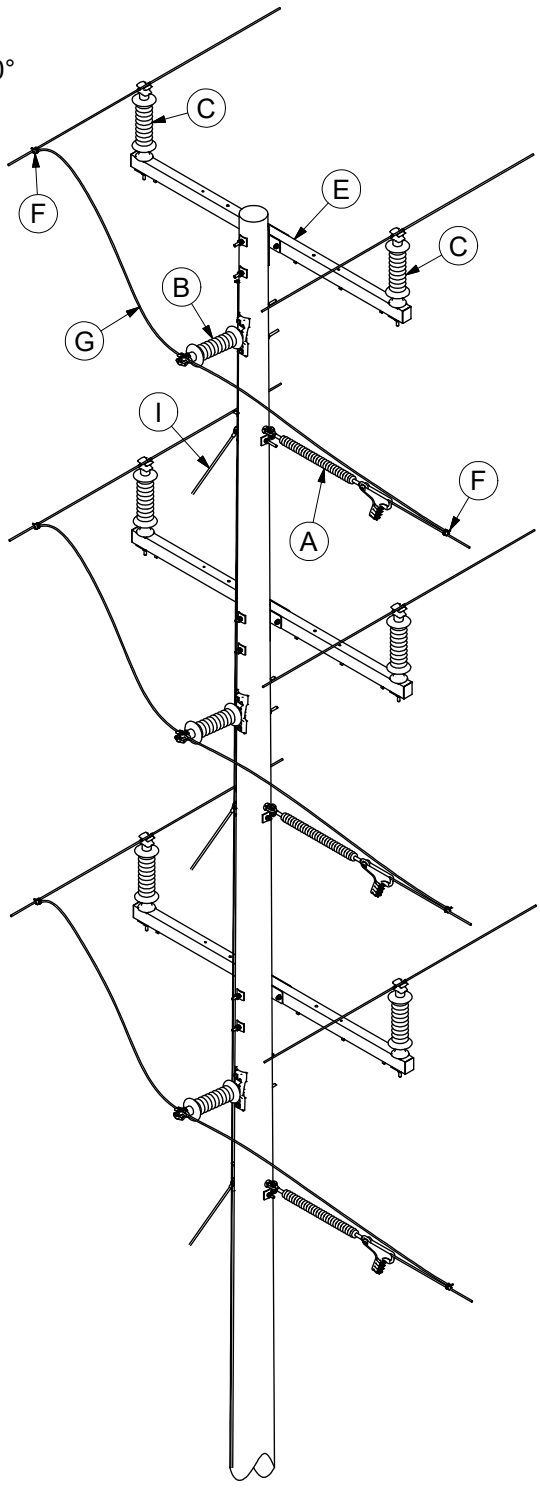


Isometric View

03 69 21 03 - Far Phase Tap, Shielded, 69kV
03 69 21 04 - Far Phase Tap, Shielded, 35kV

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format and added new standard
2	02/17/12	DCG	





Isometric View

03 69 21 53 - Far Phase Tap, Unshielded, 69kV
03 69 21 54 - Far Phase Tap, Unshielded, 35kV

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format and added new standard
2	02/17/12	DCG	

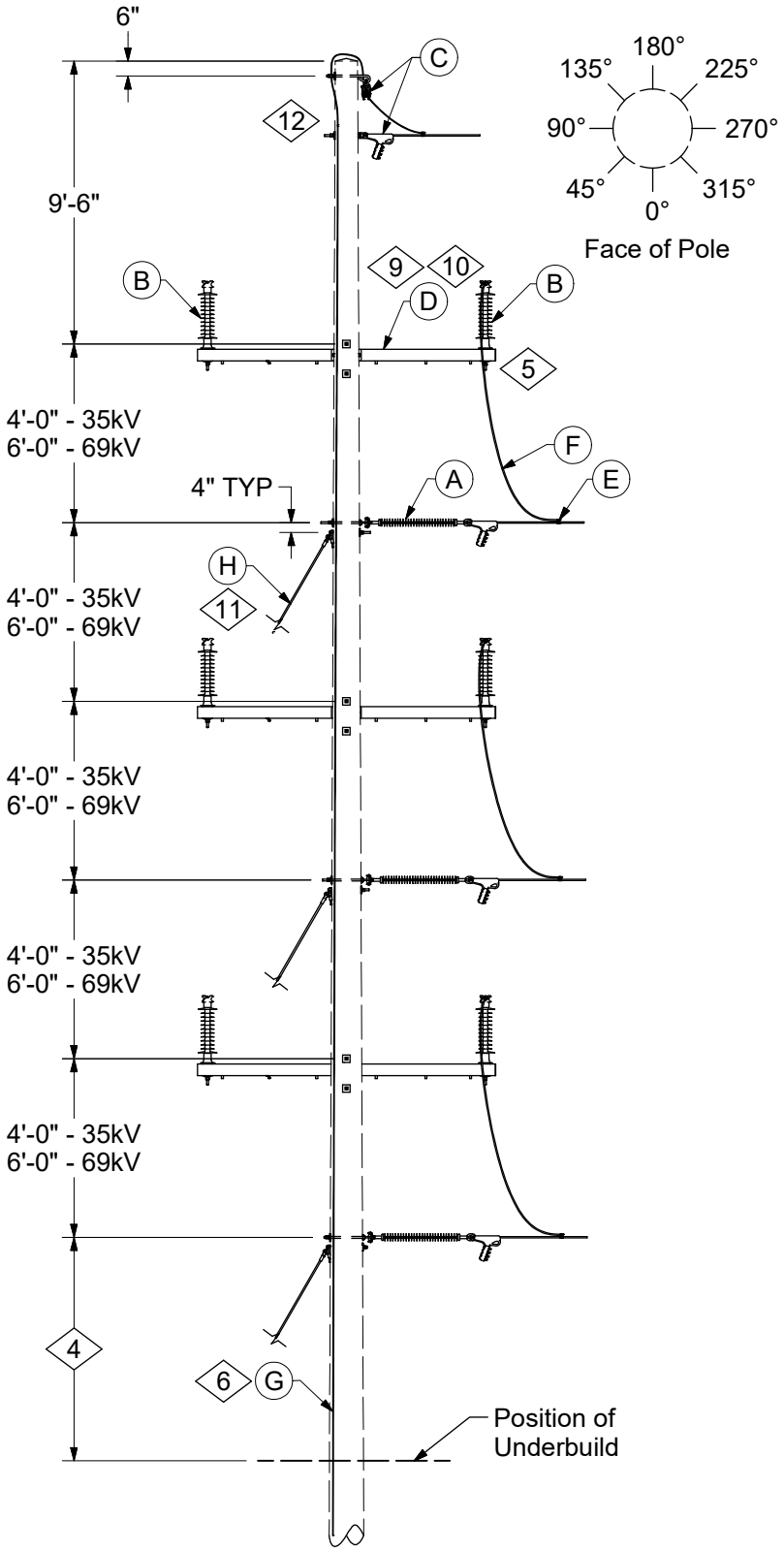
CONSTRUCTION NOTE(s):

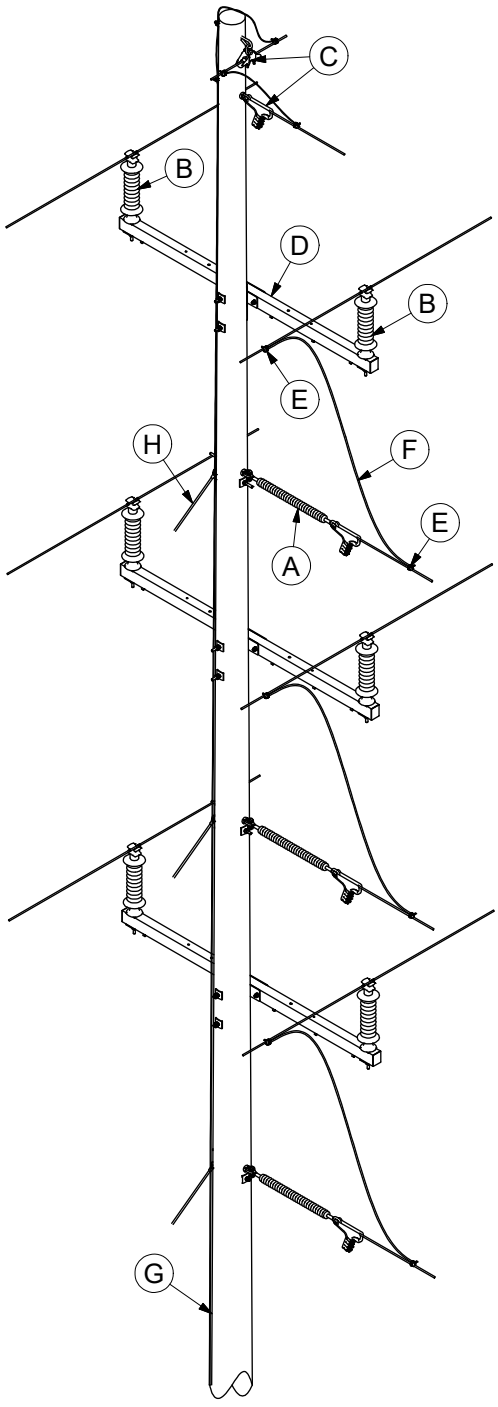
2. Use 7'-6" spacing for tangent and 7'-0" spacing for deadend on underbuild. When using fiberglass crossarm, spacing is measured to the top bolt of the crossarm brace.

3. The 2" square washer received with the pin should be used after the 4" square washer.

	ITEM	STK / DCS #	DESCRIPTION 03 69 21 **	03	04	53	54
	A	**06 34 60 06 @**	69kV Single Deadend	3	-	3	-
		06 34 60 02 @	34kV Single Deadend	-	3	-	3
	B	**06 69 03 03 @**	69kV Single Horizontal Line Post Insulator - Clamptop	3	-	3	-
		06 34 03 03 @	34kV Single Horizontal Line Post Insulator - Clamptop	-	3	-	3
3,@	C	**06 69 01 ** @**	69kV Single Vertical Line Post Insulator on Crossarm	6	-	6	-
		06 34 01 ** @	34kV Single Vertical Line Post Insulator on Crossarm	-	6	-	6
	D	**06 00 11 04 @**	Static Wire Attachment - Tangent and Angle	1	1	-	-
11,@		**06 00 11 08 @**	Static Wire Atachment - Deadend Endline w/ Pole Ground	1	1	-	-
		18 05 16 01 @	OPGW Single Deadend w/ Splice	1	1	-	-
		18 05 16 02 @	OPGW Double Deadend w/o Splice	1	1	-	-
9,10,@	E	**04 00 41 16 @**	10' Tangent FG Crossarm	3	3	3	3
@	F	**07 00 11 00 @**	Clamp, PG, PG*W	6	6	6	6
@	G	**07 00 80 00 @**	Lead Wire, LW*W, PLW*W	#	#	#	#
6,@	H	**12 00 10 ** @**	Grounding Unit	1	1	-	-
11,@	I	**11 00 4* ** @**	Guying Unit	#	#	#	#
7,@	J	**12 34 ** ** @**	Arrester Assemblies	-	-	1	1
	K	252, 255, or 260	Op Code, Install Jumper	6	6	6	6

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format and added new standard
2	02/17/12	DCG	

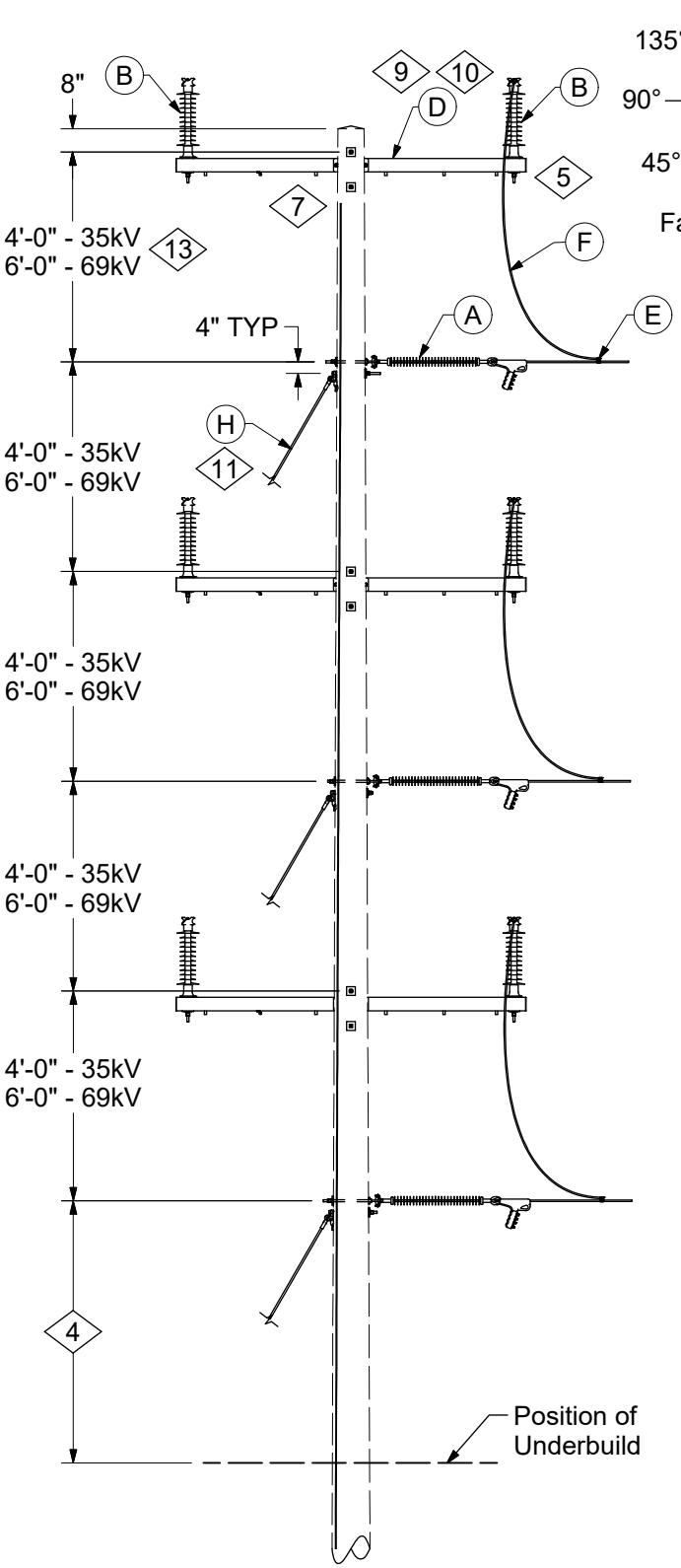


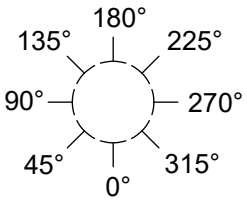


Isometric View

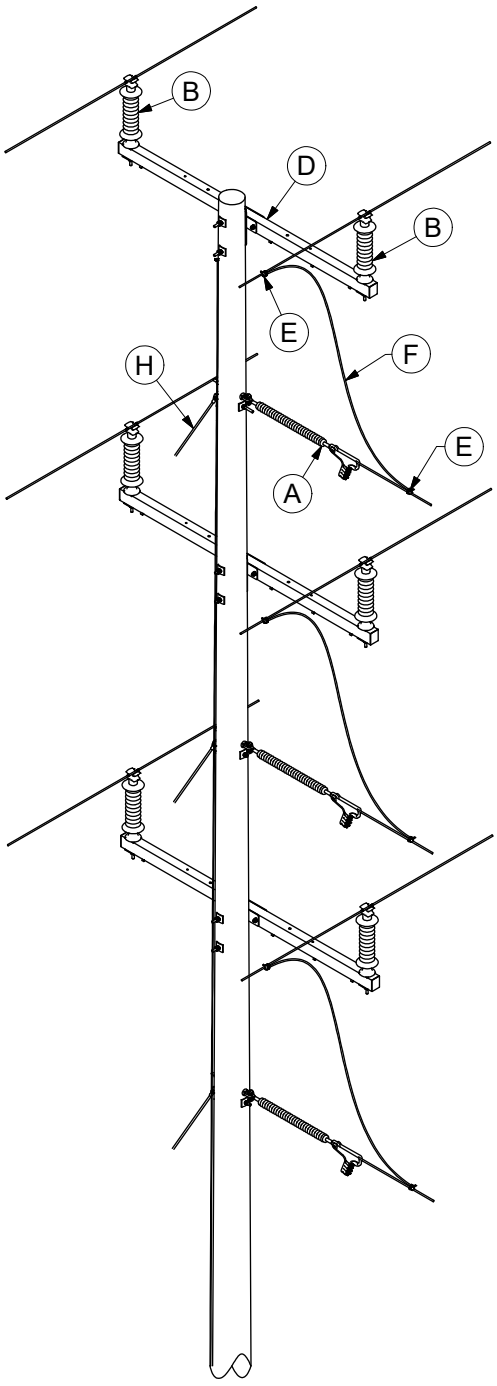
03 69 21 05 - Near Phase Tap, Shielded, 69kV
03 69 21 06 - Near Phase Tap, Shielded, 35kV

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format and added new standard
2	02/17/12	DCG	





Face of Pole



Isometric View

03 69 21 55 - Near Phase Tap, Unshielded, 69kV
03 69 21 56 - Near Phase Tap, Unshielded, 35kV

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format and added new standard
2	02/17/12	DCG	

CONSTRUCTION NOTE(s):

4. Use 7'-6" spacing for tangent and 7'-0" spacing for deadend on underbuild. When using fiberglass crossarm, spacing is measured to the top bolt of the crossarm brace.

5. The 2" square washer received with the pin should be used after the 4" square washer

	ITEM	STK / DCS #	DESCRIPTION 03 69 21 **	05	06	55	56
	A	**06 34 60 06** @	69kV Single Deadend	3	-	3	-
		06 34 60 02 @	34kV Single Deadend	-	3	-	3
5,@	B	**06 69 01** ** @	69kV Single Vertical Line Post Insulator on Crossarm	6	-	6	-
		06 34 01 ** @	34kV Single Vertical Line Post Insulator on Crossarm	-	6	-	6
	C	**06 00 11 04** @	Static Wire Attachment - Tangent and Angle	1	1	-	-
11,@		**06 00 11 08** @	Static Wire Atachment - Deadend Endline w/ Pole Ground	1	1	-	-
		18 05 16 01 @	OPGW Single Deadend w/ Splice	1	1	-	-
		18 05 16 02 @	OPGW Double Deadend w/o Splice	1	1	-	-
9,10,@	D	**04 00 41 16** @	10' Tangent FG Crossarm	3	3	3	3
@	E	**07 00 11 00** @	Clamp, PG, PG*W	6	6	6	6
@	F	**07 00 80 00** @	Lead Wire, LW*W, PLW*W	#	#	#	#
6,@	G	**12 00 10** ** @	Grounding Unit	1	1	-	-
11,@	H	**11 00 4*** ** @	Guying Unit	#	#	#	#
7,@	I	**12 34** ** ** @	Arrester Assemblies	-	-	1	1
	J	252, 255, or 260	Op Code, Install Jumper	6	6	6	6

DESIGN NOTE(s):

6. Composite pole has factory installed (internal) pole ground in the 45° quadrant. See DCS **12 00 10** ** for grounding detail.

7. See DCS **12 34** ** ** for lightning arrester application and installation methods.

8. When additional clearance is needed, use 138kV line post insulators (Stock #25 05 099, 25 05 132, and 25 05 213) and install them 9'-0" from the static bolt to ensure the proper shielding.

9. See DCS **04 00 01 01** for crossarm loading.

10. 8'-0" crossarm available for Ameren Missouri only.

11. Addtional guys may be required depending on line tension and line angle.

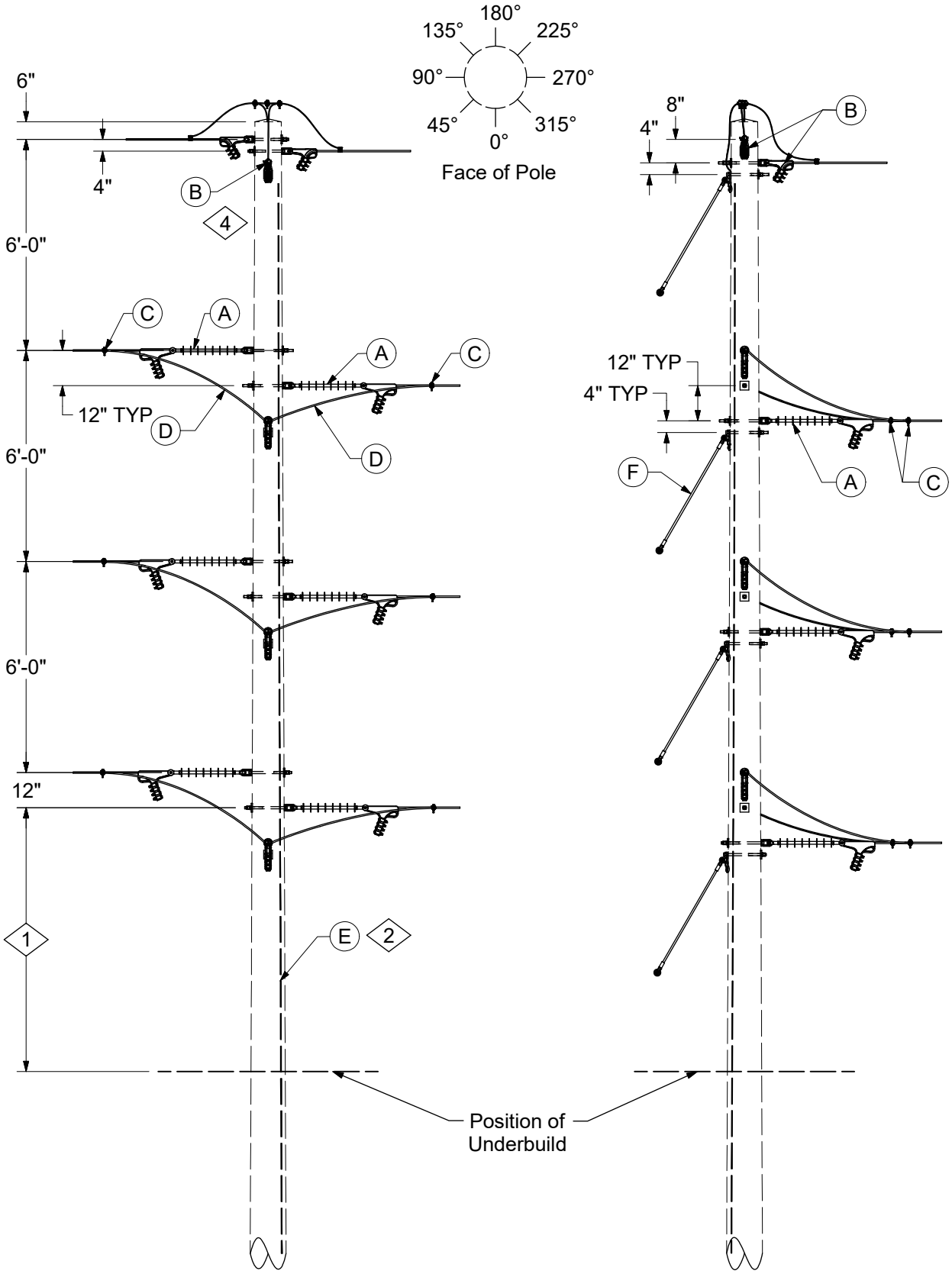
12. Refer to DCS Section 18 for OPGW applications.

13. Contact standards if there are composite pole layering issues when fabricating.

CONFIGURATIONS

T-Corner - Deadend Tap Structure
Single Circuit for > 1° and ≤ 60°

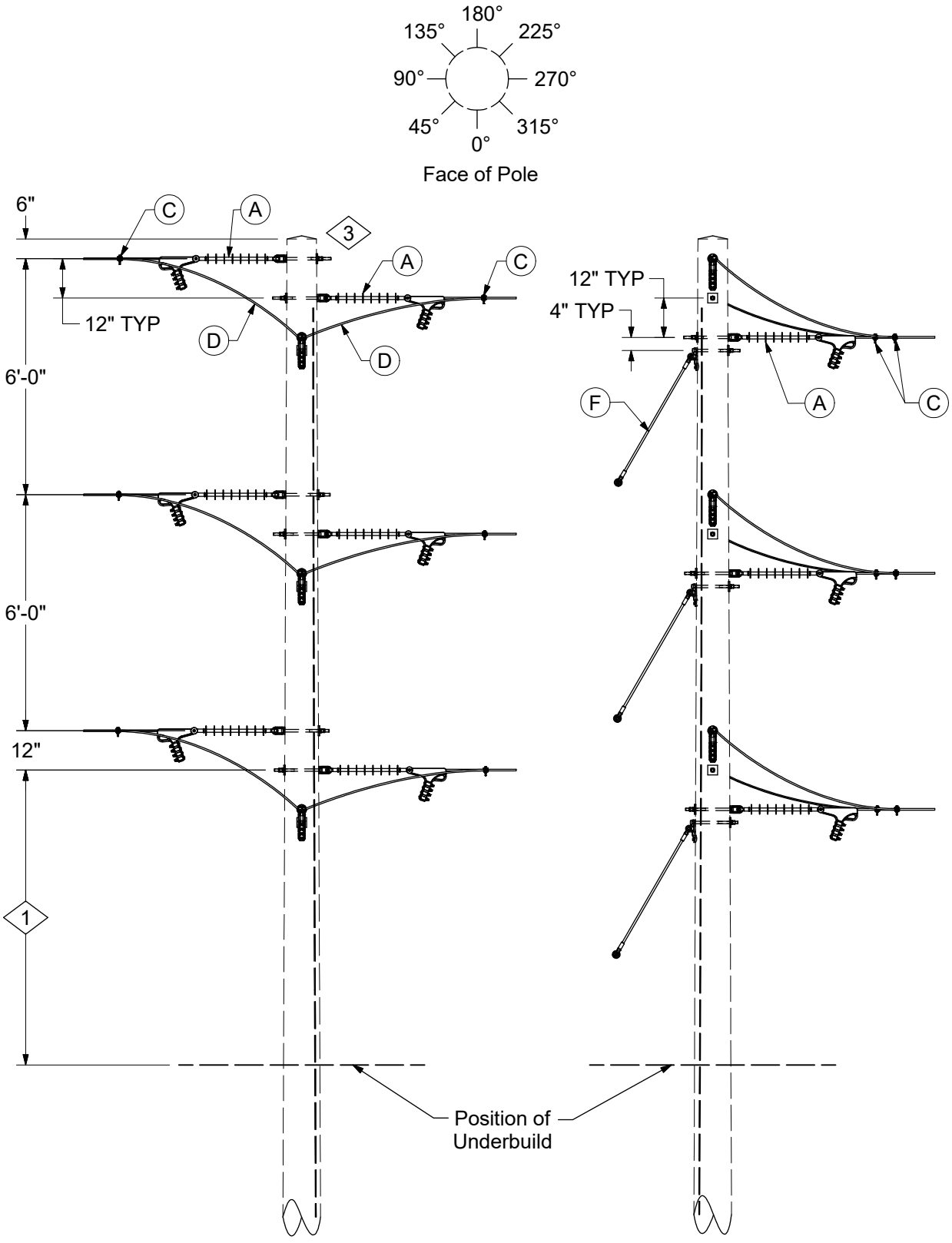
03 69 22 **
35kV, 69kV
1 of 4



03 69 22 01 - Equal Tension Shielded, 69kV
03 69 22 02 - Equal Tension Shielded, 35kV

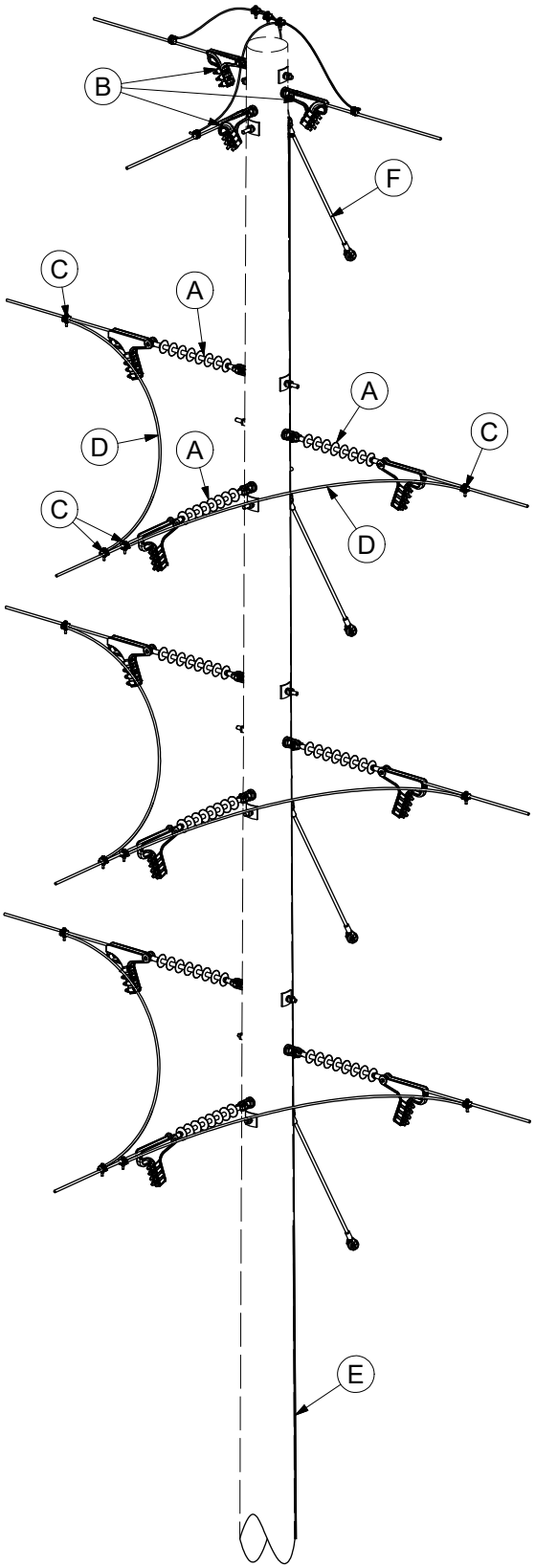
DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format
2	02/17/12	DCG	

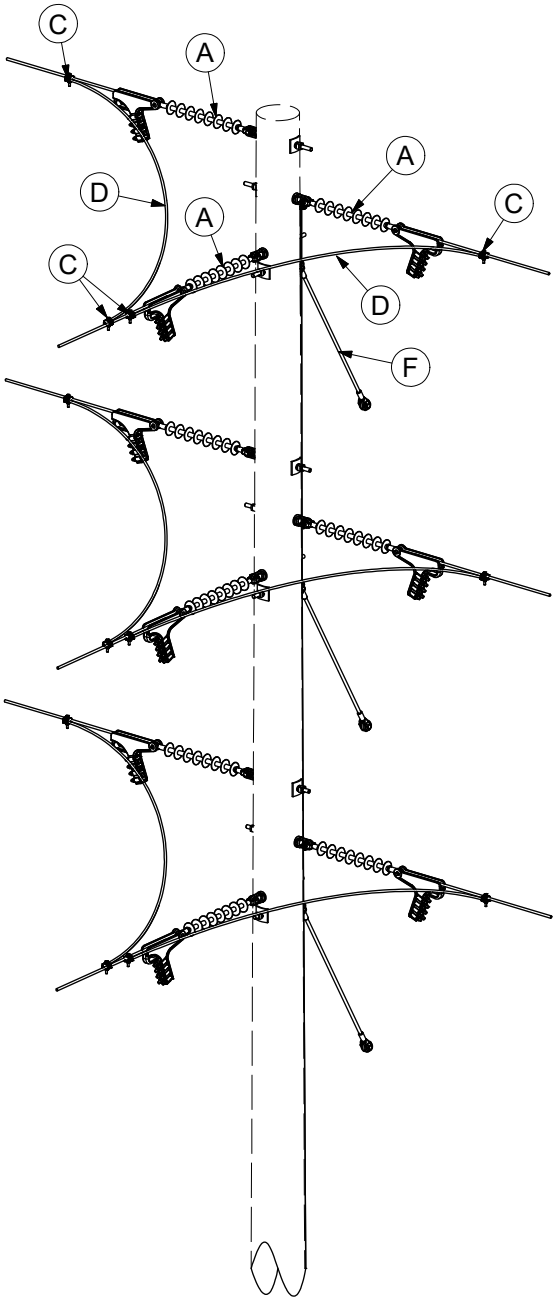


03 69 22 51 - Equal Tension Unshielded, 69kV
03 69 22 52 - Equal Tension Unshielded, 35kV

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format
2	02/17/12	DCG	



Isometric View
03 69 22 01 - Equal Tension Shielded, 69kV
03 69 22 02 - Equal Tension Shielded, 35kV



Isometric View
03 69 22 51 - Equal Tension Unshielded, 69kV
03 69 22 52 - Equal Tension Unshielded, 35kV

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format
2	02/17/12	DCG	

CONSTRUCTION NOTE(s):

1. Use 7'-6" spacing for tangent and 7'-0" spacing for deadend on underbuild. When using fiberglass crossarm, spacing is measured to the top bolt of the crossarm brace.

	ITEM	STK / DCS #	DESCRIPTION 03 69 22 **	01	02	51	52
	A	**06 34 60 06 @**	69kV Single Deadend	9	-	9	-
		06 34 60 02 @	34kV Single Deadend	-	9	-	9
	B	**06 00 11 07 @**	Static Wire Attachment - Deadend Angle w/ Pole Ground	1	1	-	-
4,@		**06 00 11 08 @**	Static Wire Attachment - Deadend Endline w/ Pole Ground	1	1	-	-
		18 05 16 01 @	OPGW Single Deadend w/ Splice	1	1	-	-
		18 05 16 02 @	OPGW Double Deadend w/o Splice	1	1	-	-
@	C	**07 00 25 00 @**	Clamp, PG, PG*W	12	12	12	12
@	D	**07 00 80 00 @**	Lead Wire, LW*W, PLW*W	#	#	#	#
2,@	E	**12 00 10 ** @**	Grounding Unit	1	1	-	-
@	F	**11 00 4* ** @**	Guying Unit	#	#	#	#
3,@	G	**12 34 ** ** @**	Arrester Assemblies	-	-	1	1
	H	252 or 260	Op Code, Install Jumper	12	12	12	12

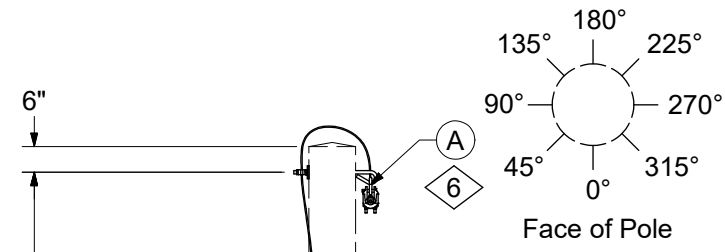
DESIGN NOTE(s):

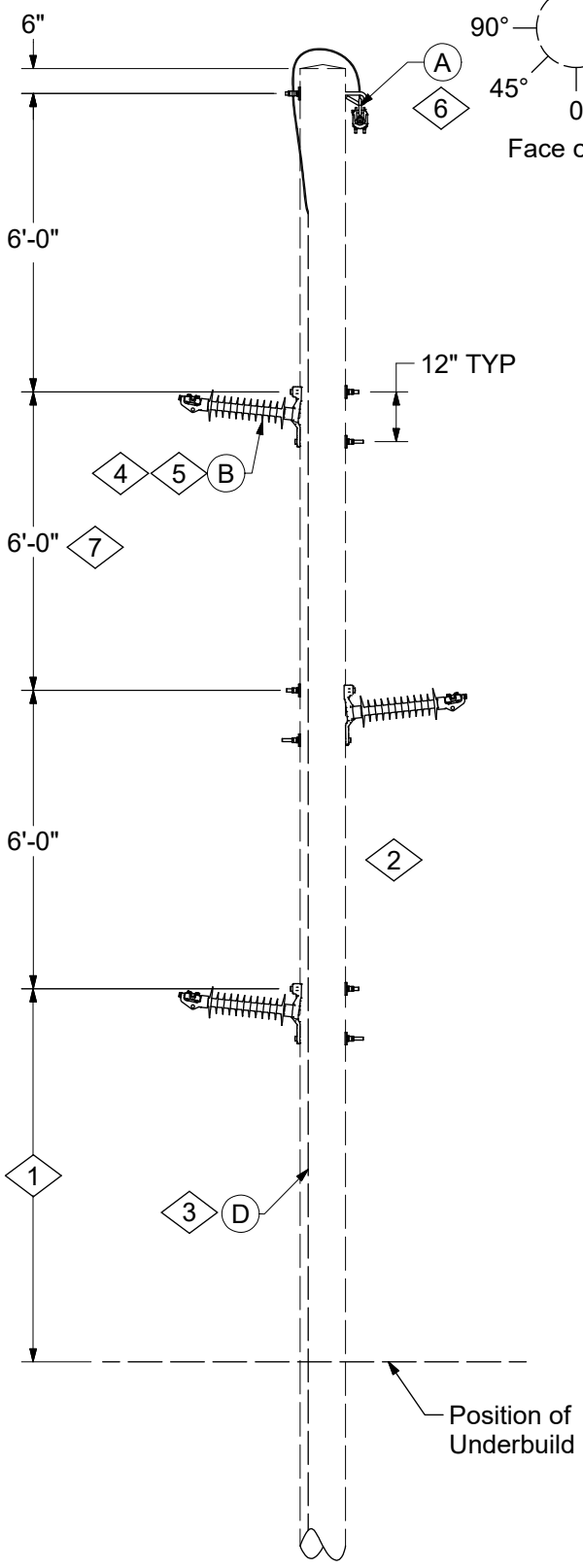
2. Composite pole has factory installed (internal) pole ground in the 45° quadrant. See DCS **12 00 10 ** ** for grounding detail.

3. See DCS **12 34 ** ** ** for lightning arrester application and installation method.

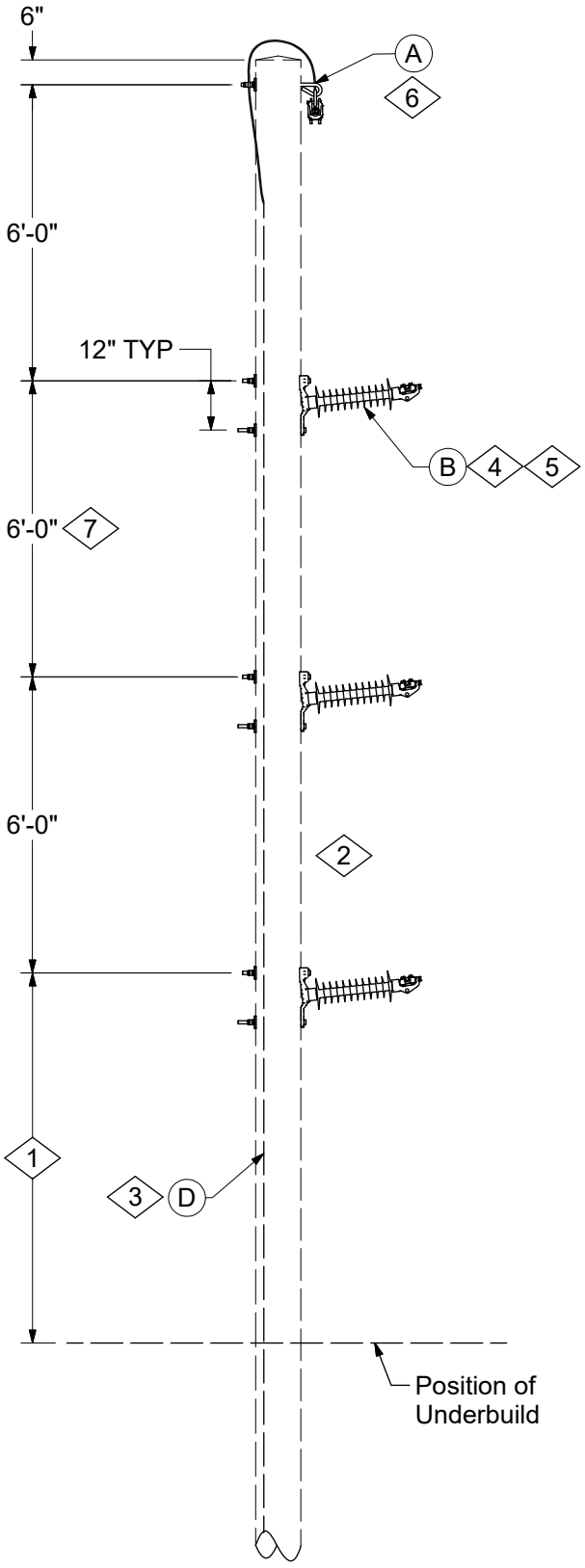
4. Refer to DCS Section 18 for OPGW applications.

REV	DATE	ENG	DESCRIPTION
3	10/01/23	AEP	Converted to new format
2	02/17/12	DCG	



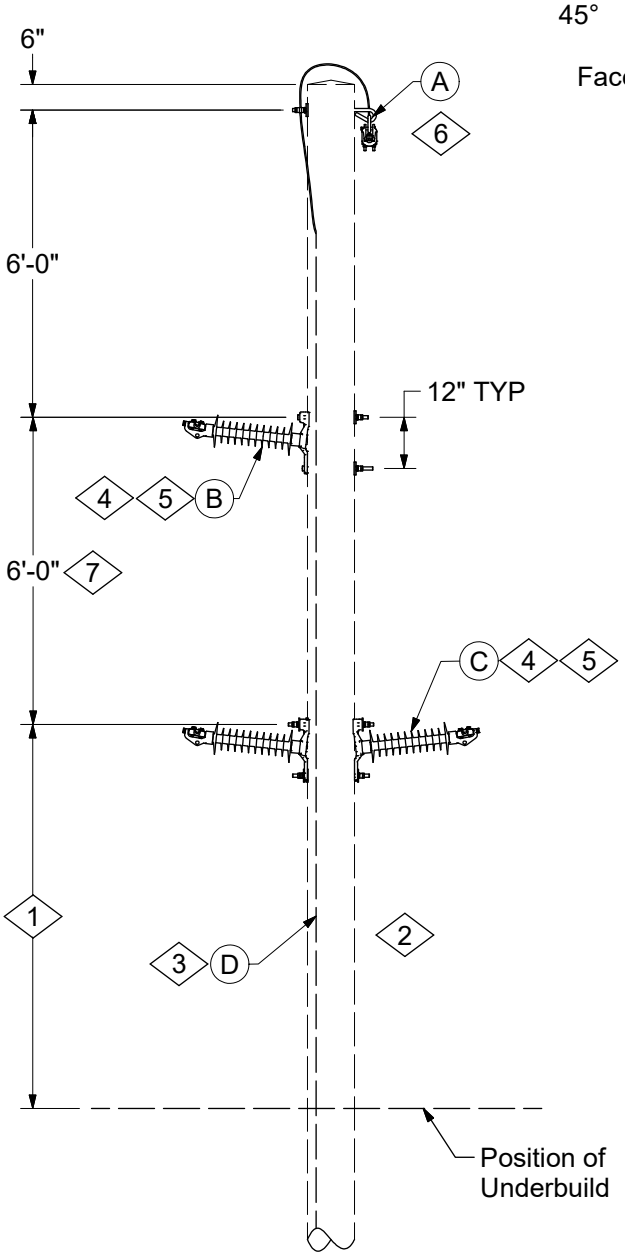


03 69 51 01 - Offset, 69kV

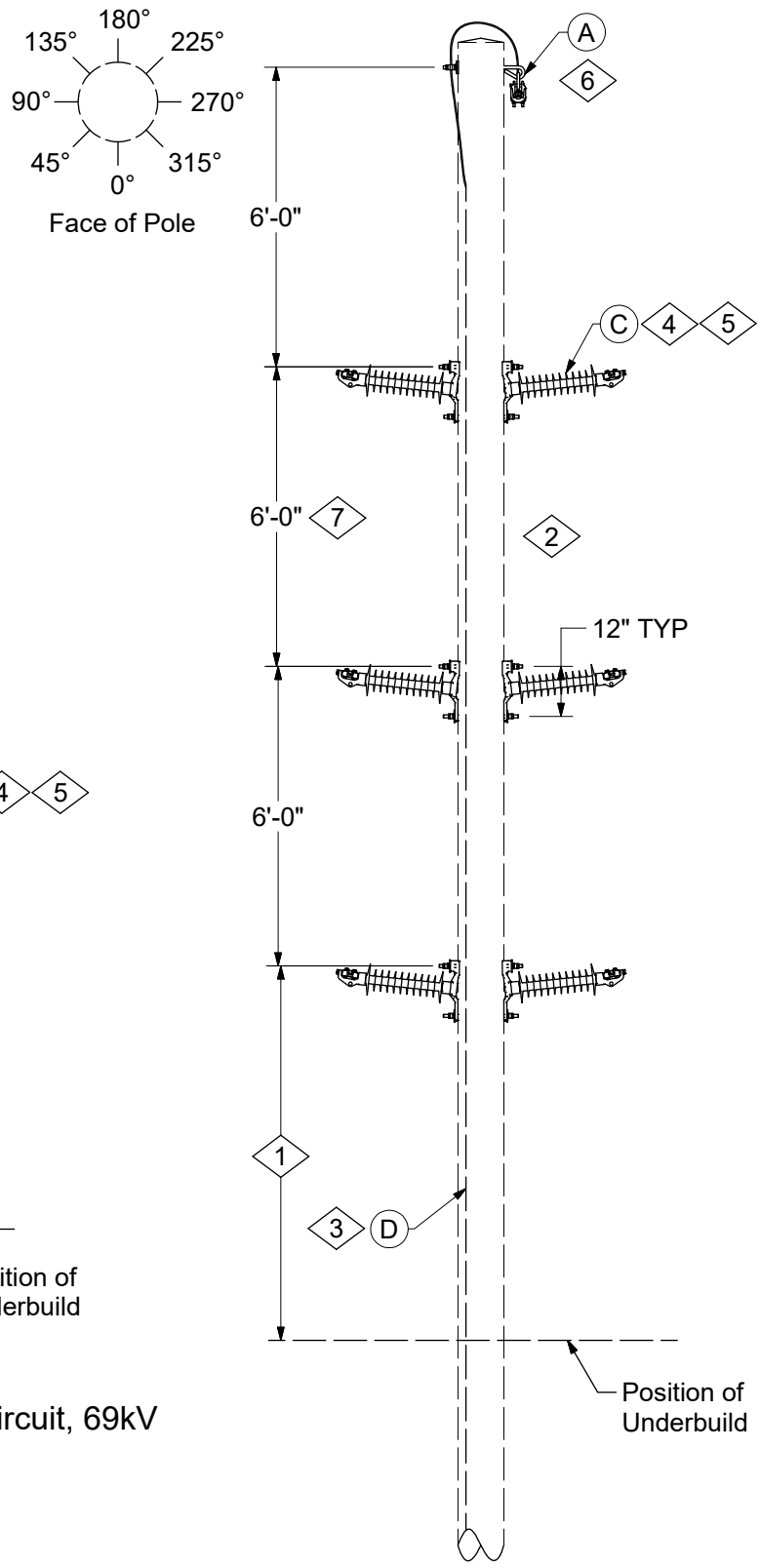


03 69 51 02 - In-line, 69kV

REV	DATE	ENG	DESCRIPTION
4	10/01/23	AEP	Converted to new format
3	01/26/16	MJ	



03 69 51 03 - Back-to-Back Single Circuit, 69kV



03 69 51 04 - In-line Double Circuit, 69kV

REV	DATE	ENG	DESCRIPTION
4	10/01/23	AEP	Converted to new format
3	01/26/16	MJ	

DCS #	DESCRIPTION
03 69 51 01	Offset, 69kV
03 69 51 02	In-line, 69kV
03 69 51 03	Back to Back Single Circuit, 69kV
03 69 51 04	In-line Double Circuit, 69kV

CONSTRUCTION NOTE(s):

1. Use 7-6" spacing for tangent and 7'-0" spacing for deadend on underbuild. When using fiberglass crossarm, spacing is measured to the top bolt of the crossarm brace.

	ITEM	STK / DCS #	DESCRIPTION 03 69 51 **	01	02	03	04
6,@	A	**06 00 11 04 @**	Static Wire Attachment - Tangent & Angle	1	1	1	1
		18 05 10 01 @	OPGW Tangent or Corner ≤ 30°	1	1	1	1
4,5,@	B	**06 69 03 03 @**	69kV Single Horizontal Line Post Insulator, Clamptop	3	3	1	-
		06 69 03 01 @	69kV Single Horizontal Line Post Insulator, Suspension	3	3	1	-
4,5,@	C	**06 69 03 04 @**	69kV Double Horizontal Line Post Insulator, Clamptop	-	-	1	3
		06 69 03 02 @	69kV Double Horizontal Line Post Insulator, Suspension	-	-	1	3
3,@	D	**12 00 10 ** @**	Grounding Unit	1	1	1	1
2,@	E	**02 20 05 ** @**	Backfill and Reinforcement	1	1	1	1

DESIGN NOTE(s):

2. See DCS Section 2 for pole selection options and refer to Engineering Design Manual (EDM) LS-25, LS-26, and LS-27 for design criteria.

3. Composite pole has factory installed (internal) pole ground in the 45° quadrant. See DCS **12 00 10 ** ** for grounding detail.

4. When additional clearance is needed, use 138kV horizontal line post insulators (Stock #25 05 099, 25 05 132, and 25 05 213) and install them at 9'-0" from the static bolt to ensure the proper shielding.

5. Clamptop style insulators may be used in both compression and tension applications, and the suspension style insulators should be used in tension applications within allowable line angles.

6. Refer to DCS Section 18 for OPGW applications.

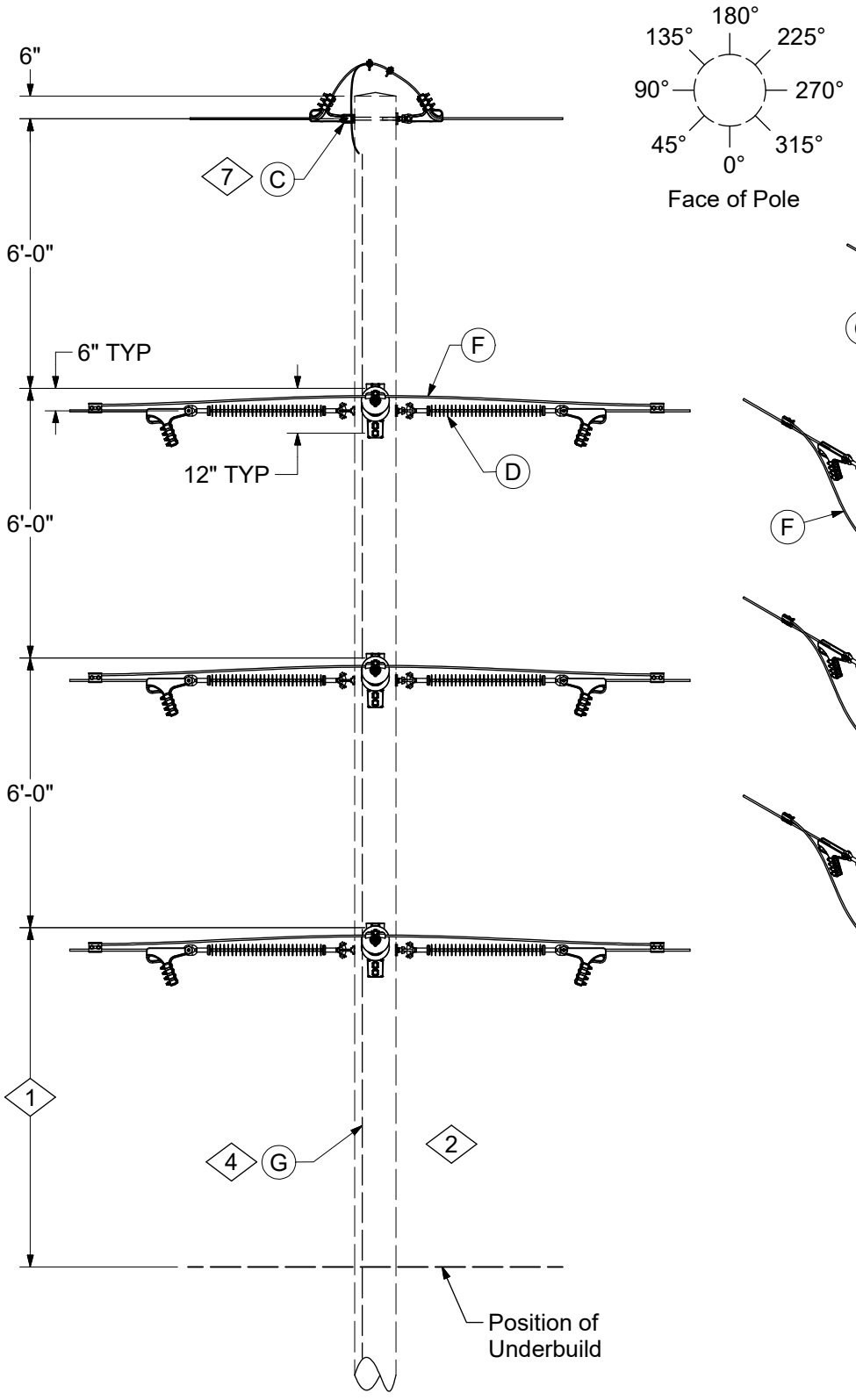
7. New line construction must meet the minimum 6'-0" clearance requirement. Clearance for single pole replacement or maintenance of existing poles can be reduced to no less than 4'-0".

REV	DATE	ENG	DESCRIPTION
4	10/01/23	AEP	Converted to new format
3	01/26/16	MJ	

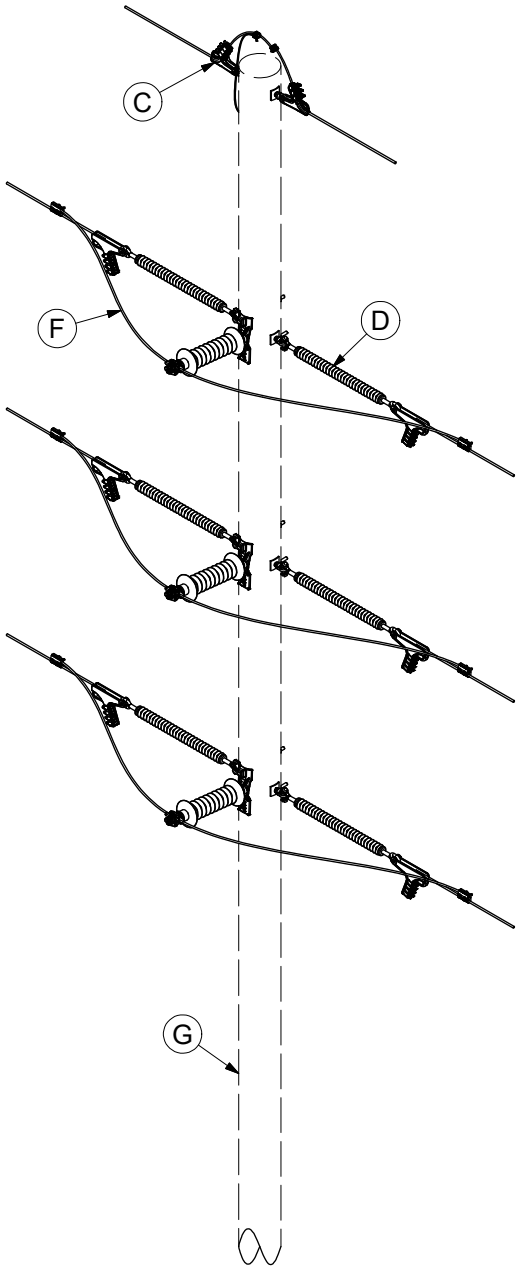
CONFIGURATIONS

Deadend Tangent Structure Composite Pole
Line Angle ≤ 1°

03 69 71 **
35kV, 69kV
1 of 3



Face of Pole

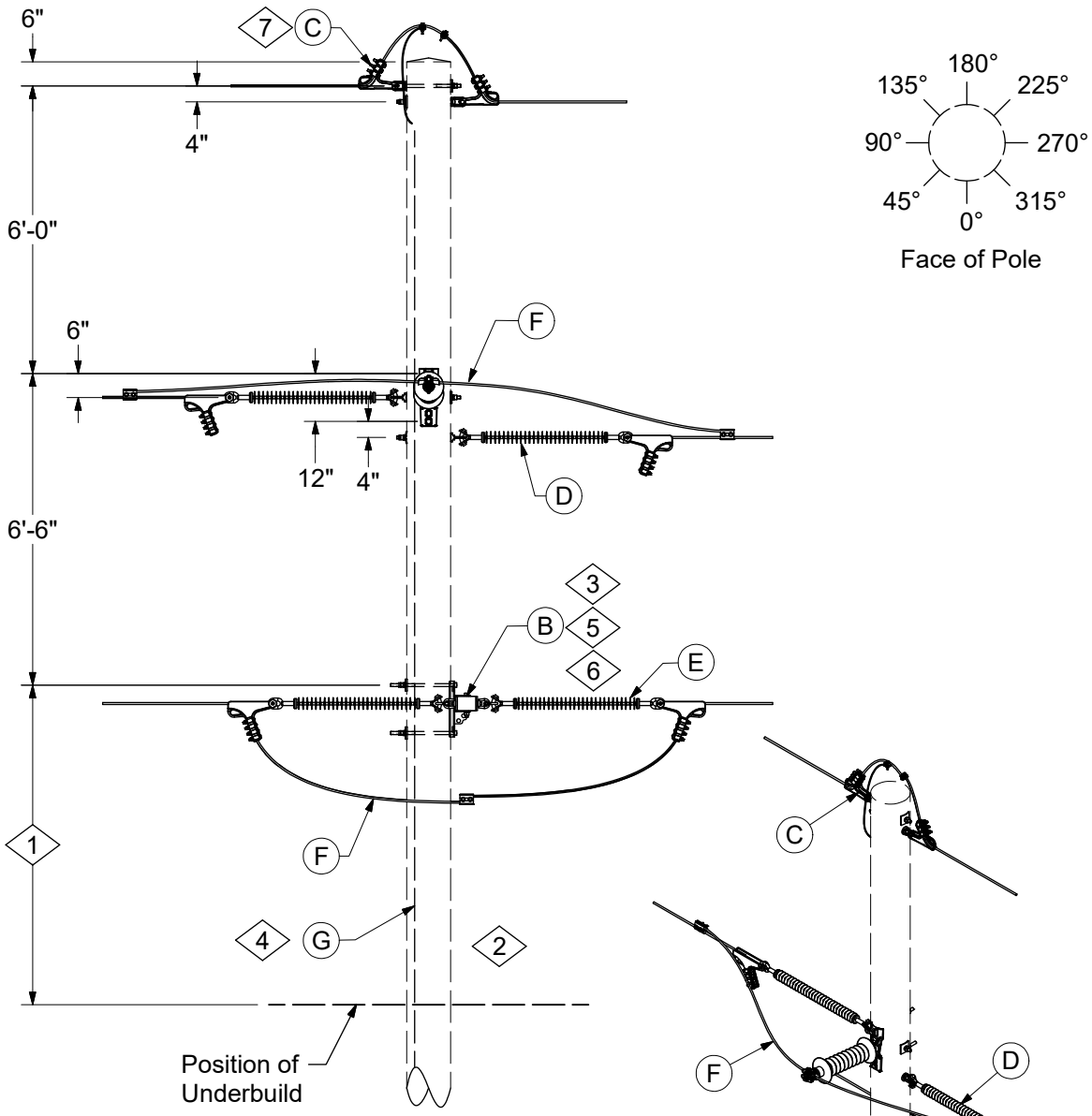


Isometric View

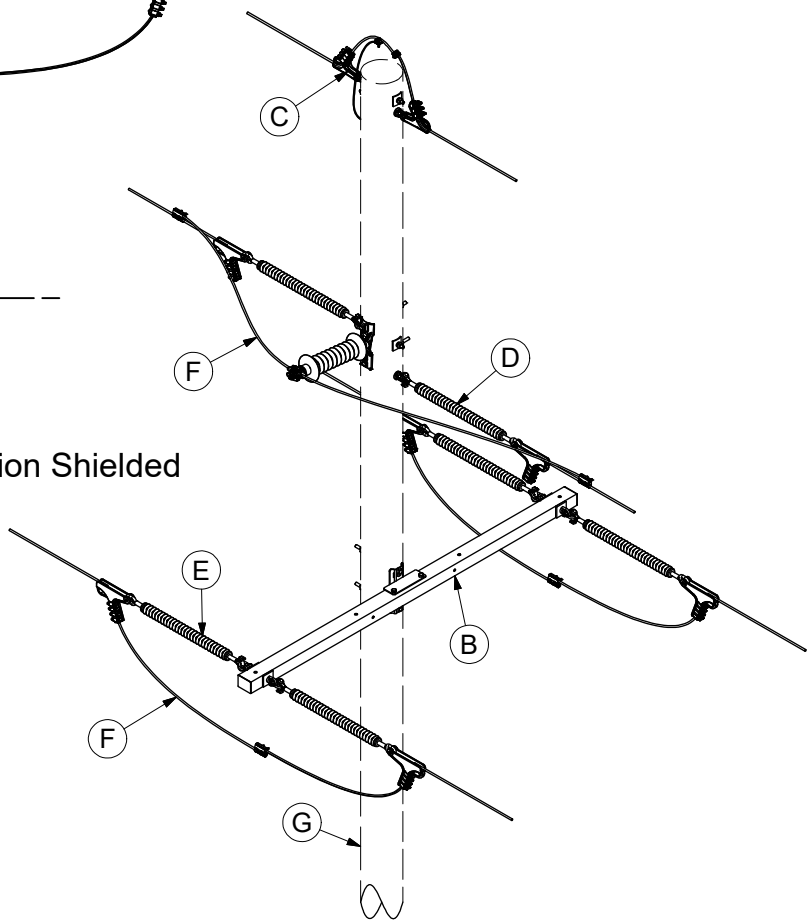
03 69 71 01 - Equal Tension Shielded

DISTRIBUTION
CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format
1	09/13/13	MJ	



03 69 71 02 - Unequal Tension Shielded



Isometric View

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format
1	09/13/13	MJ	

CONSTRUCTION NOTE(s):

1. Use 7'-6" spacing for tangent and 7'-0" spacing for deadend on underbuild. When using fiberglass crossarm, spacing is measured to the top bolt of the crossarm brace.

	ITEM	STK / DCS #	DESCRIPTION 03 69 71 **	01	02
2	A	**02 20 05 15**	Backfill and reinforcment, Corner	1	1
3,6,@	B	**04 00 42 03 @**	10' Deadend FG Crossarm	-	1
7,@	C	**06 00 11 07 @**	Static Wire Attachment - Deadend Angle w/ Pole Ground	-	1
		06 00 11 06 @	Static Wire Attachment - Deadend Tangent and Angle	1	-
		18 05 10 01 @	OPGW Tangent or Corner ≤ 30°	1	1
		18 05 16 ** @	OPGW Deadend	1	1
@	D	**06 34 60 01 @**	69kV Double Deadend w/ Looparound - Striaght	3	-
		06 34 60 03 @	69kV Double Deadend w/ Looparound - Offset	-	1
@	E	**06 34 68 14 @**	69kV Double Deadend Loopunder	-	2
@	F	**07 00 80 00 @**	Lead Wire, LW*W PLW*W	#	#
4,@	G	**12 00 10 ** @**	Grounding Unit	1	1
@	H	252 or 260	Op Code, Install Jumper	6	4

DESIGN NOTE(s):

2. See DCS Section 2 for pole selection options and refer to Engineering Design Manual (EDM) LS-25, LS-26, and LS-27 for design criteria.

3. See DCS **04 00 01 01** for crossarm loading. In some applications larger crossarm may be needed for heavier loadings.

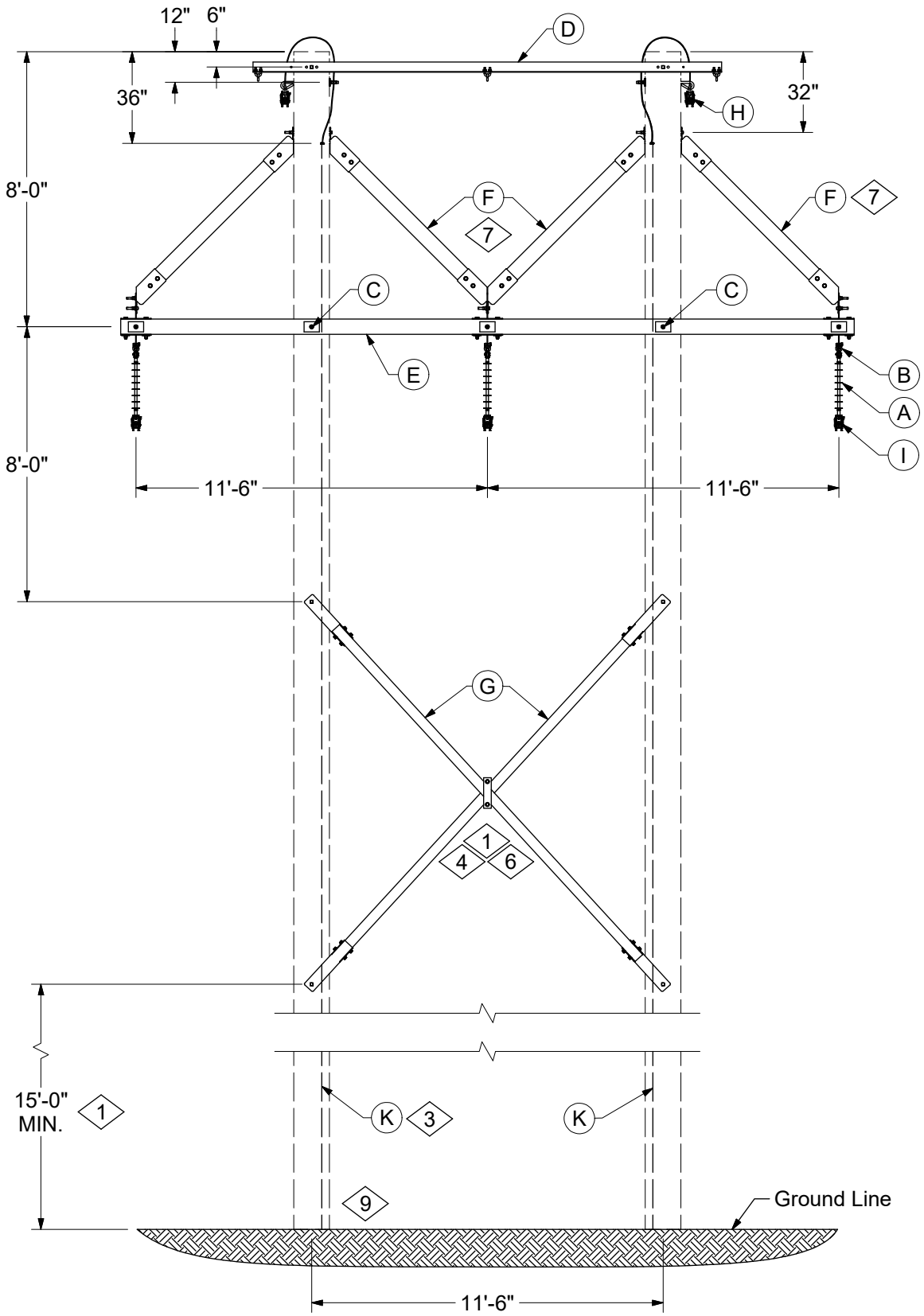
4. Composite pole has factory installed (internal) pole ground in the 45° quadrant. See DCS **12 00 10 **** for grounding details.

5. In underbuild applications, middle phase is deadended on the pole per DCS **03 12 14 ****.

6. 8'-0" crossarm available for Ameren Missouri only.

7. Refer to DCS Section 18 for OPGW applications.

REV	DATE	ENG	DESCRIPTION
2	10/01/23	AEP	Converted to new format
1	09/13/13	MJ	



03 69 91 01 - Tangent 69kV
03 69 91 02 - Tangent 35kV

REV	DATE	ENG	DESCRIPTION
1	10/01/23	AEP	New Standard

CONSTRUCTION NOTE(s):

1. Bottom bolt of X-brace shall remain 15' off ground.

2. Armor rods are required for spans greater than 300'.

	ITEM	STK / DCS #	DESCRIPTION 03 69 91 **	01	02
	A	25 06 053	Insulator, Suspension, 34kV	-	3
		25 06 113	Insulator, Suspension, 69kV	3	-
	B	23 68 181	Shackle - Deadend	3	3
	C	23 53 072	Bolt, Double Arming, 3/4"	2	2
	D	23 68 755	Static Support Bar, Galvanized	1	1
10,@	E	41 01 296	Fiberglass Tangent Arm Assembly, 24'	1	1
7,@	F	41 56 201	Vee Brace, 7'-6"	1	1
1,4,6,@	G	41 56 202	X-Brace, Fiberglass, 14'-8"	1	1
8,@	H	**06 00 11 04 @**	Static Wire Attachment - Tangent	2	2
		18 05 10 01 @	OPGW Support w/ Suspension Clamp	#	#
@	I	**07 00 20 00 @**	Clamp, Suspension, SC*W	3	3
9,@	J	**02 20 05 15 @**	Backfill and Reinforcement, Corner	2	2
3,@	K	**12 00 10 ** @**	Grounding unit	2	2

DESIGN NOTE(s):

3. Composite Pole has factory installed (internal) ground in the 45° quadrant.

4. Depending on structure height, additional X-braces may be needed.

5. See DCS **02 00 04 01** for composite pole sizes. Refer to (EDM) LS-25 for pole size requirements.

6. Center clamps and hardware are included with X-brace assembly.

7. Both sets of vee braces are included with Stock #41 56 201.

8. Refer to DCS Section 18 for OPGW applications.

9. Each pole must have (8) total angle brackets per DCS **02 20 05 15**.

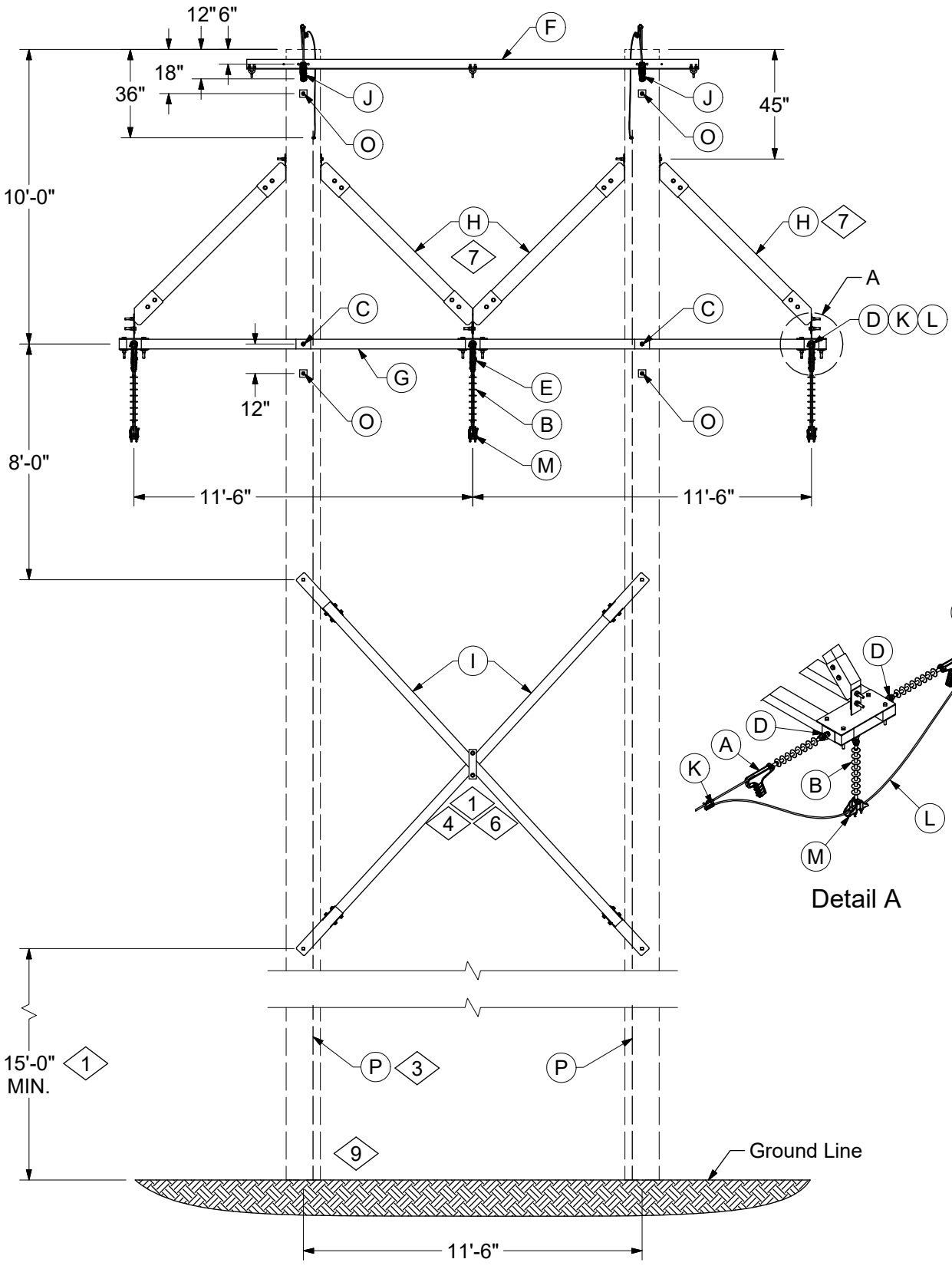
10. Stock #41 01 296 is to only be used for composite pole structures.

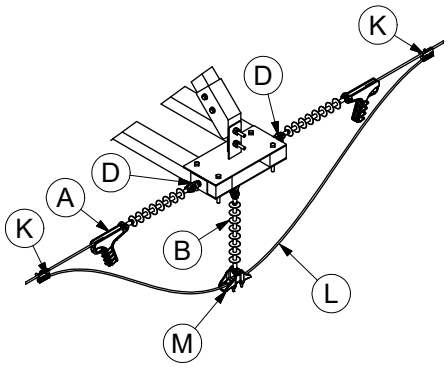
REV	DATE	ENG	DESCRIPTION
1	10/01/23	AEP	New Standard

CONFIGURATIONS

Deadend H-Frame Structure - Composite Pole
Line Angle ≤ 2°

03 69 92 **
35kV, 69kV
1 of 2





Detail A

03 69 92 01 - Deadend 69kV
03 69 92 02 - Deadend 35kV

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
1	10/01/23	AEP	New Standard

CONSTRUCTION NOTE(s):

1. Bottom bolt of X-brace shall remain 15' off ground.

2. Armor rods are required for spans greater than 300'.

	ITEM	STK / DCS #	DESCRIPTION 03 69 92 **	01	02
	A	**06 34 68 13 @**	34kV Double Deadend Loopunder	-	3
		06 34 68 14 @	69kV Double Deadend Loopunder	3	-
	B	25 06 053	Insulator, Suspension, 34kV	-	3
		25 06 113	Insulator, Suspension, 69kV	3	-
	C	23 53 072	Bolt, Double Arming, 3/4"	2	2
	D	23 65 018	Eyenut, 3/4"	8	8
	E	23 68 181	Shackle - Deadend	3	3
	F	23 68 755	Static Support Bar, Galvanized	1	1
10,@	G	41 01 316	Fiberglass Deadend Arm Assembly, 24'	1	1
7,@	H	41 56 201	Vee Brace, 7'-6"	1	1
1,4,6,@	I	41 56 202	X-Brace, Fiberglass, 14'-8"	1	1
8,@	J	**06 00 11 06 @**	Static Wire Attachment - Deadend Tangent w/ Pole Ground	2	2
		18 05 ** ** @	OPGW Support	#	#
@	K	**07 00 25 00 @**	Clamp, PG*W	6	6
@	L	**07 00 80 00 @**	Lead Wire, LW*W, PLW*W	#	#
@	M	**07 00 20 00 @**	Clamp, Suspension, SC*W	3	3
9,@	N	**02 20 05 15 @**	Backfill and Reinforcement, Corner	2	2
@	O	**11 00 4* ** @**	Guying Unit	#	#
3,@	P	**12 00 10 ** @**	Grounding unit	2	2
	Q	252, 255, or 260	Op Code, Install Jumper	3	3

DESIGN NOTE(s):

3. Composite Pole has factory installed (internal) ground in the 45° quadrant.

4. Depending on structure height, additional X-braces may be needed.

5. See DCS **02 00 04 01** for composite pole sizes. Refer to (EDM) LS-25 for pole size requirements.

6. Center clamps and hardware are included with X-brace assembly.

7. Both sets of vee braces are included with Stock #41 56 201.

8. Refer to DCS Section 18 for OPGW applications.

9. Each pole must have (8) total angle brackets per DCS **02 20 05 15**.

10. Stock #41 01 316 is to only be used for composite pole structures.

REV	DATE	ENG	DESCRIPTION
1	10/01/23	AEP	New Standard

NOTES

CROSS ARMS 04

FIBERGLASS ASSEMBLY LOADING CRITERIA.....04 00 01 01

WOOD ASSEMBLY LOADING CRITERIA.....04 00 01 02

WOOD TANGENT ARM ASSEMBLY..... 04 00 20 **

WOOD SINGLE ALLEY ARM ASSEMBLY..... 04 00 24 **

WOOD DOUBLE ALLEY ARM ASSEMBLY..... 04 00 25 **

FIBERGLASS TANGENT ASSEMBLY..... 04 00 41 **

FIBERGLASS DEADEND ASSEMBLY..... 04 00 42 **

FIBERGLASS ALLEY ARM ASSEMBLY..... 04 00 43 **

FIBERGLASS SLABBED ALLEY ARM ASSEMBLY..... 04 00 44 **

Fiberglass Crossarm Loadings									
Description	DCS #	Crossarm STK #	Ultimate Transverse Load (lbs/wire)	No. Wire	Ultimate Longitudinal Load (lbs/wire)	No. Wire	Ultimate Vertical Load (lbs/wire)	No. Wire	Weight
8' Tangent Arm	04 00 41 14	41 01 286	1,750	4	1,375	4	1750	4	41
10' Tangent Arm	04 00 41 16	41 01 285	3,500	4	1,375	4	1750	4	48
12' Tangent Arm	04 00 41 20	41 01 309	4,375	6	2,250	2	3125	2	74
			-	-	1,125	6	1625	6	74
16' Tangent Arm	04 00 41 21	41 01 312	4,375	6	1,625	2	2500	2	91
			-	-	875	6	1625	6	91
6' Dead End Arm	04 00 42 01	41 01 291	4,625	2	6,000	2	-	-	47
8' Dead End Arm	04 00 42 02	41 01 189	4,625	2	5,250	2	-	-	54
10' Dead End Arm	04 00 42 03	41 01 295	3,375	4	4,000	4	1,313	4	69
12' Dead End Arm	04 00 42 04	41 01 307	6,375	3	7,500	3	-	-	107
9' Double Stack HD Dead End Arm	04 00 42 05	41 01 301	6,813	4	7,875	4	-	-	159
11' Double Stack HD Dead End Arm	04 00 42 06	41 01 302	6,813	4	8,000	4	-	-	142
12' Double Stack HD Dead End Arm	04 00 42 07	41 01 308	13,625	2	10,000	2	-	-	167
			6,813	4	7,375	4	-	-	167
8' Alley Arm	04 00 43 01	41 01 293	625	2	500	2	675	2	54
10' Alley Arm	04 00 43 02	41 01 294	312.5	4	275	4	375	4	63

REV	DATE	ENG	DESCRIPTION
2	01/01/21	KR	Converted to new format
1	04/11/11	MJ	

This standard covers working clearances, electrical insulation levels, and Vertical (V), Horizontal (H), and Transverse (T) loads during "Continuous" and "Intermittent"conditions. These values are listed in DCS **04 00 20 **, 04 00 24 **, and 04 00 25 ****.

Vertical (V) Loadings

1. ”Continuous” loading, normally the 60°F loadings, are those applied day in and day out for years at a time. This compares to the ”Intermittent” loadings or short term loadings as experienced during NESC Heavy Loading conditions due to ice, winds, plus at times, a lineman’s weight on the extremity of the crossarm.

2. Due to the inherent characteristics of wood, it behaves differently under the various types of loads. With a continuous load applied to the arm, deflection will occur and in time, a permanent set takes place. The degree of set is dependent upon the amount of applied load. It is from this condition, that as the intermittent loads are applied, further arm deflections or bending take place. However, as the intermittent loads reduce and return to the normal continuous loading the arm deflections also return to normal. Both of these conditions must be checked, and below Example illustrates the use of the table in this standard.

   EXAMPLE:

   Given a straight and level (4.16kV) line with 150ft spans and 3 x 556.5 kcmil bare AAC conductors carried on crossarms in the top pole gain. Neutral is attached on body of pole.

   The bare weight of the conductor (without ice) is 0.5224 lbs/ft. The load on the pin is 78 lbs. Assume the conductors are placed on two end pins and a pin 29 inches in from one of the end pins. On an 8’ arm, the Equivalent Continuous Vertical Load (VCont) located 4 inches in from the end of the arm is obtained by taking moments about the crossarm through bolt for the heavier loaded half of the crossarm.

   VCont x 44 inches = 78 lbs x 44 inches + 78 lbs x 15 inches
   VCont = 105 lbs

   The portion of NESC ”Heavy Loading” contributed by the conductor (with ice) is 1.366 lbs/ft or 205 lbs per pin. This gives a Partial Equivalent Intermittent Vertical Loading (VPint).

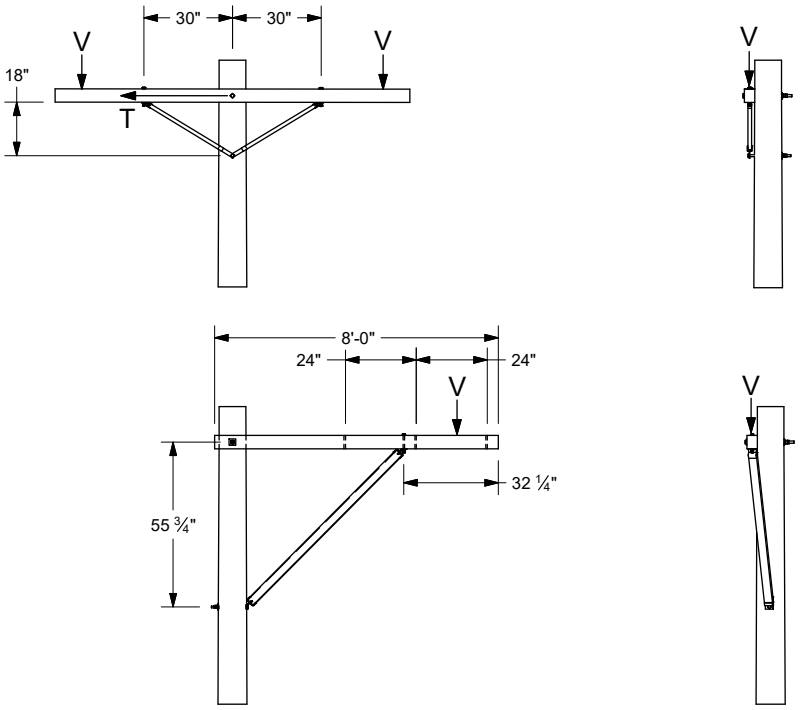
   VPint x 44 inches = 205 lbs x 44 inches + 205 lbs x 15 inches
   VPint = 275 lbs

   All braced wood crossarms shall be capable of supporting a vertical load of 300 lbs (Lineman’s weight, plus harness, tools, and equipment supported by the lineman) at either extremity in addition to the weight of the conductor. Thus, the total Equivalent Intermittent Vertical Load (VInt) is:

   VInt = 275 lbs + 300 lbs = 575 lbs

   In this construction standard, an 8’ single wood arm, DCS **04 00 20 02**, is good for 300 lbs ”Continuous Loading” and 900 lbs ”Intermittent Loading” which is adequate for the calculated loads in both conditions. Overload capacity factors are built into the loading tables in this standard.

REV	DATE	ENG	DESCRIPTION
9	04/01/22	KR	Removed Problems 2 & 3; Revised Note 3; Updated Loading table
8	04/01/19	KR	



V = Equivalent Vertical Load on Crossarm 4" From End of Arm
T = Transverse Load on Crossarm Due to Line Angles or Wind Loads

Wood Crossarm Loadings											
DCS #	Crossarm Length (ft)	No. of Arms	Type Braces (Wood)	Allowable Continuous (60 F Initial) Loadings (lbs/wire)				Allowable Intermittent (NESC Heavy Final) Loadings (lbs/wire)			
				V	H ◇1	T ◇2	T ◇3	V	H ◇1	T ◇2	T ◇3
Crossarm Units											
04 00 20 01	6	Single	V	300	–	–	–	900	–	–	–
04 00 20 02	8	Single	V	300	–	–	–	900	–	–	–
04 00 20 03	10	Single	V	225	–	–	–	675	–	–	–
Side Arm Units											
04 00 24 01	6	Single	Heel	350	200	400	–	1050	400	1200	–
04 00 25 01	6	Double	Heel	350	400	800	1400	1050	800	2400	4000
04 00 24 02	8	Single	Heel	250	200	400	–	750	400	1200	–
04 00 25 02	8	Double	Heel	250	400	800	1400	750	800	2400	4000

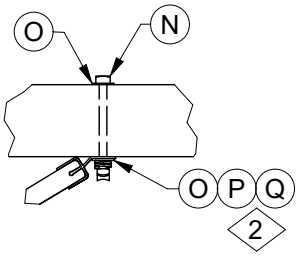
DESIGN NOTE(s):

◇1. The "Allowable Continuous Loading" for one insulator pin is 170 lbs, and the "Allowable Intermittent Loading" is 500 lbs.

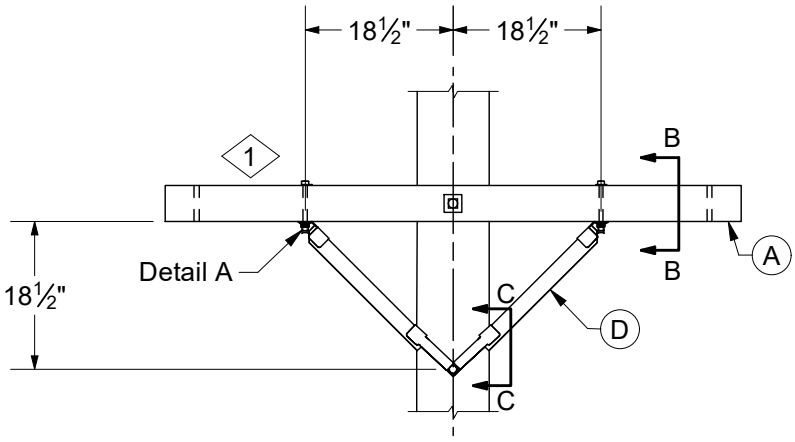
◇2. The loadings shown are based on arm strength. Where more than two conductors are used per arm the total of pin loadings must not exceed the loadings given.

◇3. Double wood arm criteria is for existing conditions.

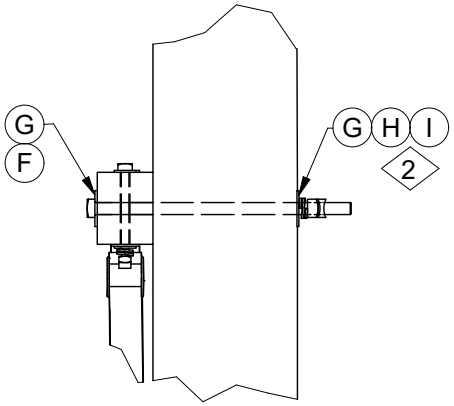
REV	DATE	ENG	DESCRIPTION
9	04/01/22	KR	Removed Problems 2 & 3; Revised Note 3; Updated Loading table
8	04/01/19	KR	



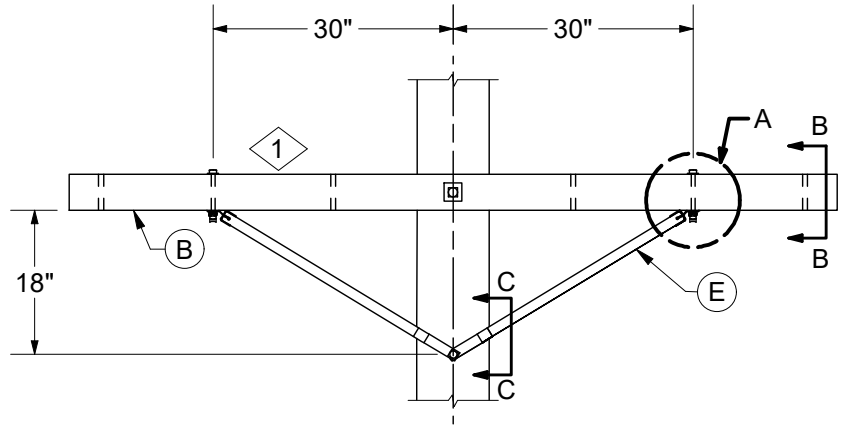
DETAIL A



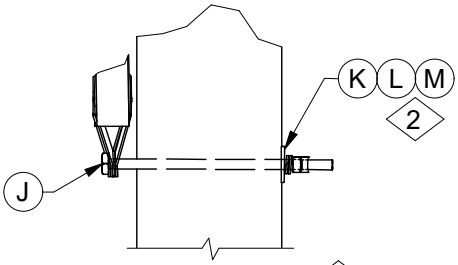
04 00 20 01
6' Single Wood Arm



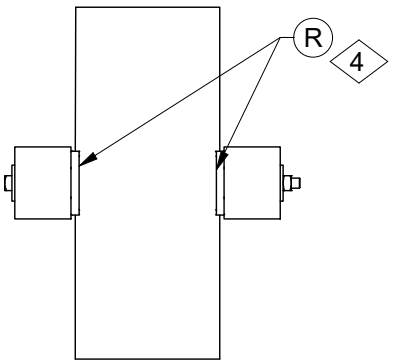
SECTION B-B 3



04 00 20 02
8' Single Wood Arm

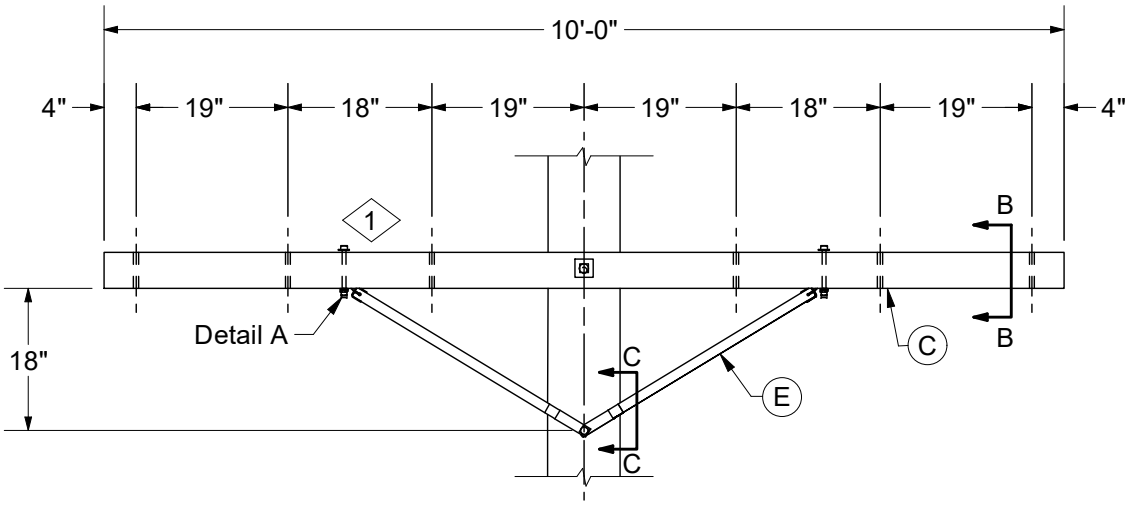


SECTION C-C 3



Double Arm Grid Gain Plate

REV	DATE	ENG	DESCRIPTION
016	01/01/21	KR	Removed double crossarm standards
015	03/11/16	WYW	



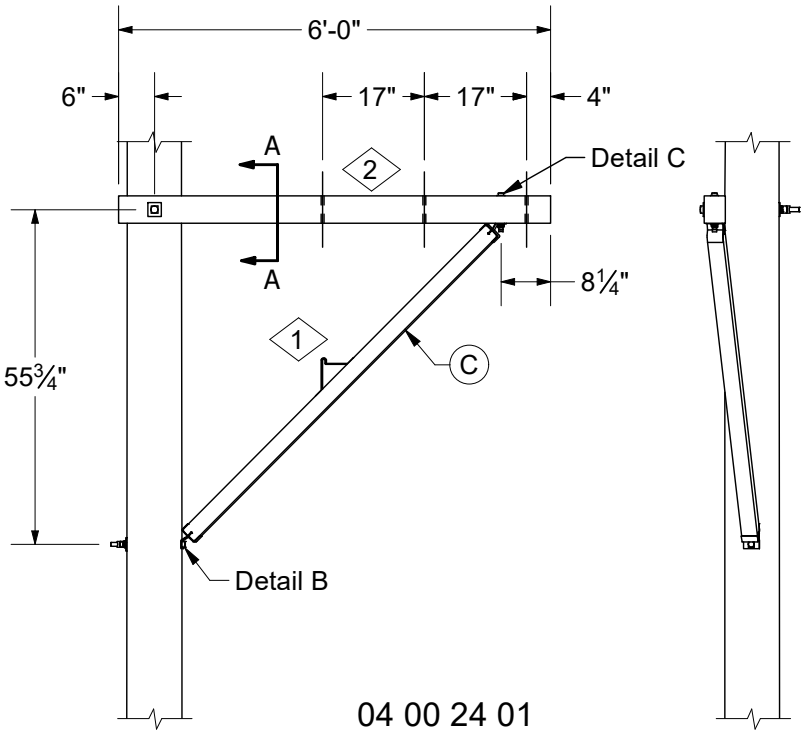
04 00 20 03
10' Single Wood Arm

CONSTRUCTION NOTE(s):

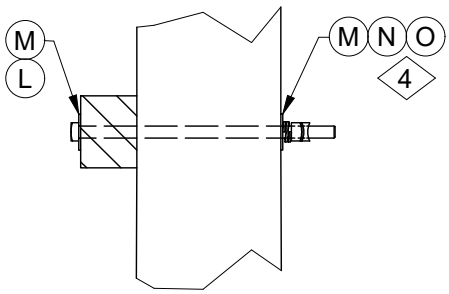
1. Field drill if required.
2. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles.Lock nuts must be placed after nut included with bolt stock code number.
3. Always load the non-threaded portion of the bolt with arms and braces.
4. If back to back arms are needed, include item R. (Maintenance Only)
5. Use longer machine bolts for larger wood or composite poles if required.

	ITEM	STK / DCS #	DESCRIPTION 04 00 20 **	01	02	03
	A	41 01 006	6' Crossarm - 3-1/2" x 4-1/2"	1	-	-
	B	41 01 014	8' Crossarm - 3-1/2" x 4-1/2"	-	1	-
	C	41 01 008	10' Crossarm - 3-1/2" x 4-1/2"	-	-	1
	D	41 56 063	Brace - 37" V	1	-	-
	E	41 56 016	Brace - 60" V	-	1	1
	F	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	1	1	1
	G	23 66 131	Washer, Square, 3/4"	2	2	2
	H	23 66 135	Lock Washer - 3/4" Double Coil	1	1	1
	I	23 65 042	Lock Nut - 3/4" Square	1	1	1
	J	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	1	1	1
	K	23 66 027	Washer - Square 5/8"	1	1	1
	L	23 66 134	Lock Washer - 5/8" Double Coil	1	1	1
	M	23 65 043	Lock Nut - 5/8" Square	1	1	1
	N	23 52 038	Bolt, Mach., 1/2" x 6" w/ square nut	2	2	2
	O	23 66 017	Washer - Round 1/2"	4	4	4
	P	23 66 133	Lock Washer - Double Coil 1/2"	2	2	2
	Q	23 65 056	Lock Nut - 1/2" Square	2	2	2
@4	R	23 77 218	Plate, Grain, Grid, Crossarm	2	2	2

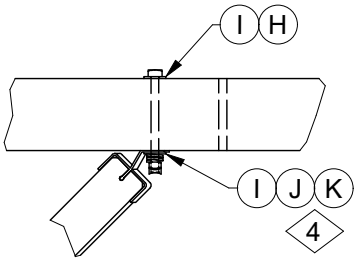
REV	DATE	ENG	DESCRIPTION
016	01/01/21	KR	Removed double crossarm standards
015	03/11/16	WYW	



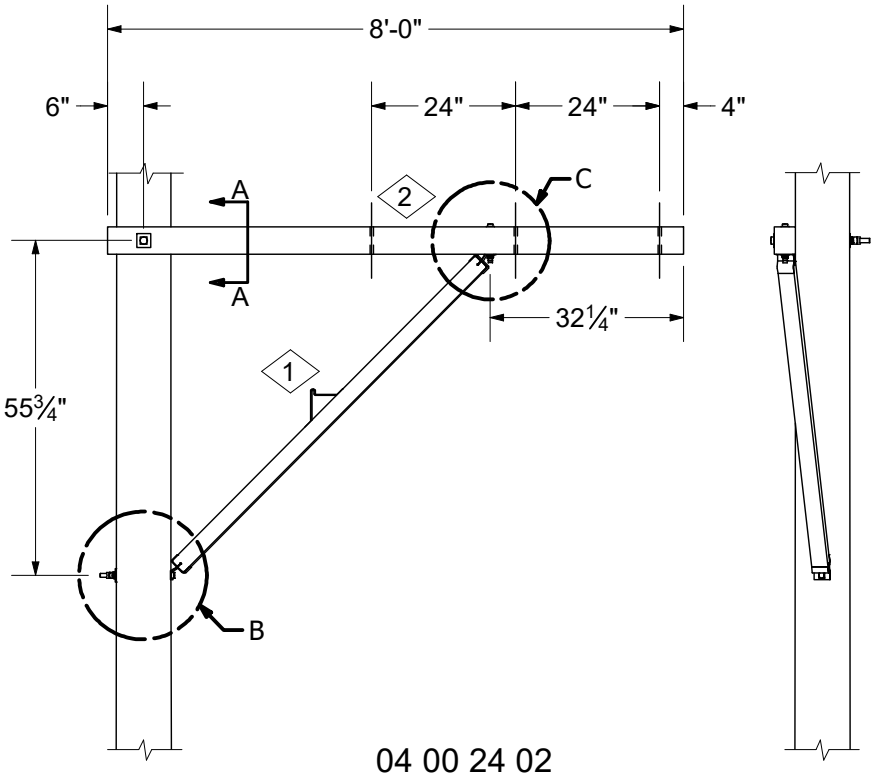
04 00 24 01
6' Single Alley Arm

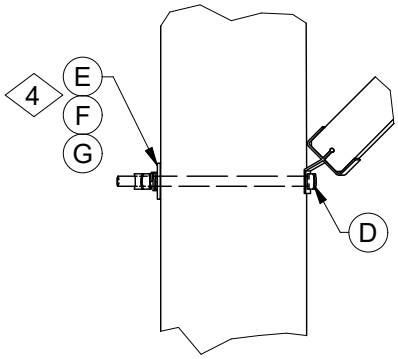


SECTION A-A 3



DETAIL C





DETAIL B 3

04 00 24 02
8' Single Alley Arm

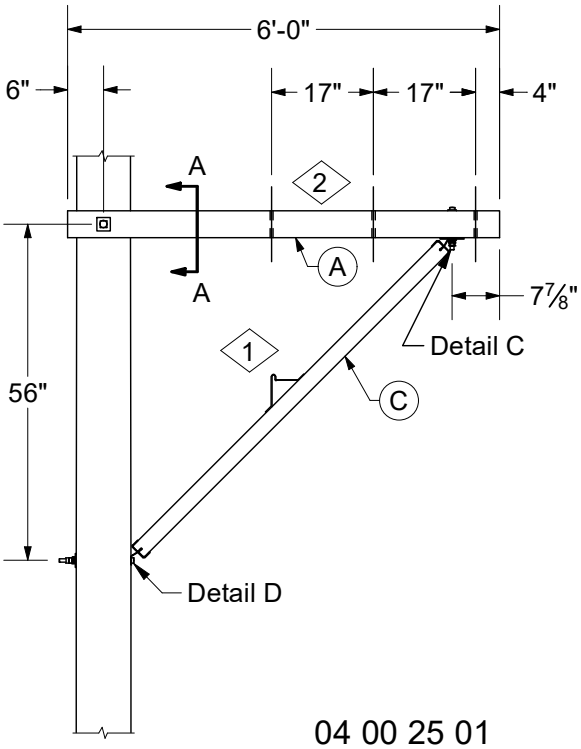
REV	DATE	ENG	DESCRIPTION
5	01/01/21	KR	Modified Drawing, added note 3
4	04/12/11	MJ	

CONSTRUCTION NOTE(s):

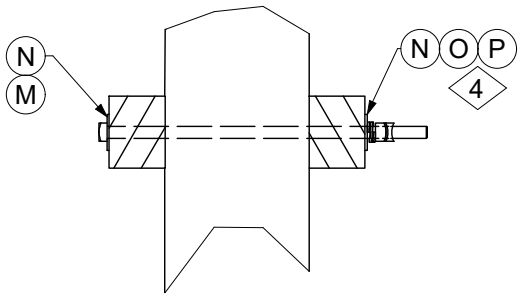
1. Heel brace step, Stock #23 67 064 is optional and is not shown in material list.
2. Field drill, if required.
3. Always load the non-threaded portion of the bolt with arms and braces.
4. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock code number.
5. Use longer machine bolts for larger wood or composite poles if required.

ITEM	STK / DCS #	DESCRIPTION 04 00 24 **	01	02
A	41 01 006	6' Crossarm - 3-1/2" x 4-1/2"	1	-
B	41 01 014	8' Crossarm - 3-1/2" x 4-1/2"	-	1
C	41 56 023	Heel Brace - 6'-0"	1	1
D	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	1	1
E	23 66 027	Washer - Square 5/8"	1	1
F	23 66 134	Lock Washer - 5/8" Double Coil	1	1
G	23 65 043	Lock Nut - 5/8" Square	1	1
H	23 52 038	Bolt, Mach., 1/2" x 6" w/ square nut	1	1
I	23 66 017	Washer - Round 1/2"	2	2
J	23 66 133	Lock Washer - Double Coil 1/2"	1	1
K	23 65 056	Lock Nut - 1/2" Square	1	1
L	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	1	1
M	23 66 131	Washer, Square, 3/4"	2	2
N	23 66 135	Lock Washer - 3/4" Double Coil	1	1
O	23 65 042	Lock Nut - 3/4" Square	1	1

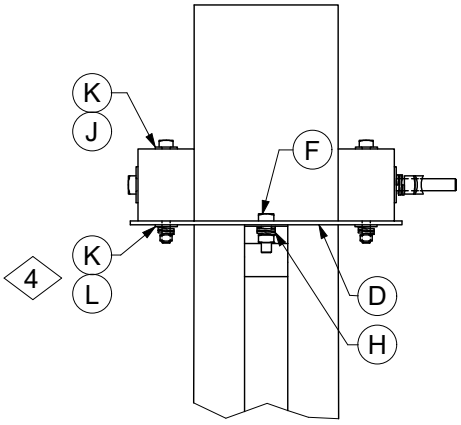
REV	DATE	ENG	DESCRIPTION
5	01/01/21	KR	Modified Drawing, added note 3
4	04/12/11	MJ	



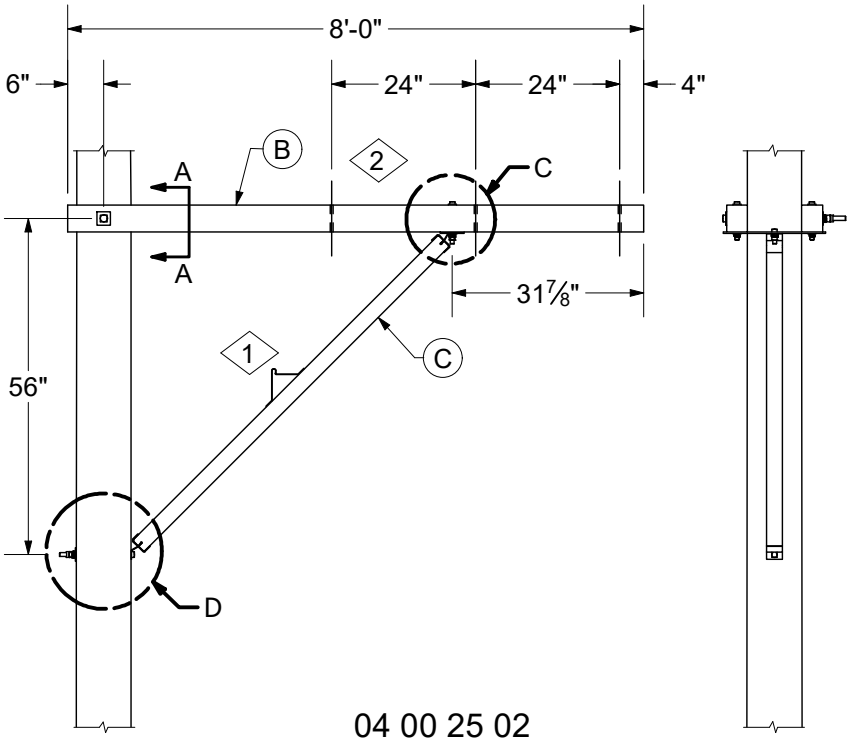
04 00 25 01
6' Double Alley Arm



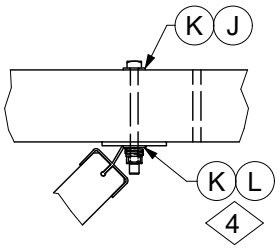
SECTION A-A



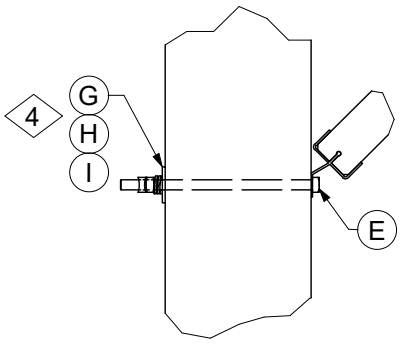
DETAIL B



04 00 25 02
8' Double Alley Arm



DETAIL C



DETAIL D 3

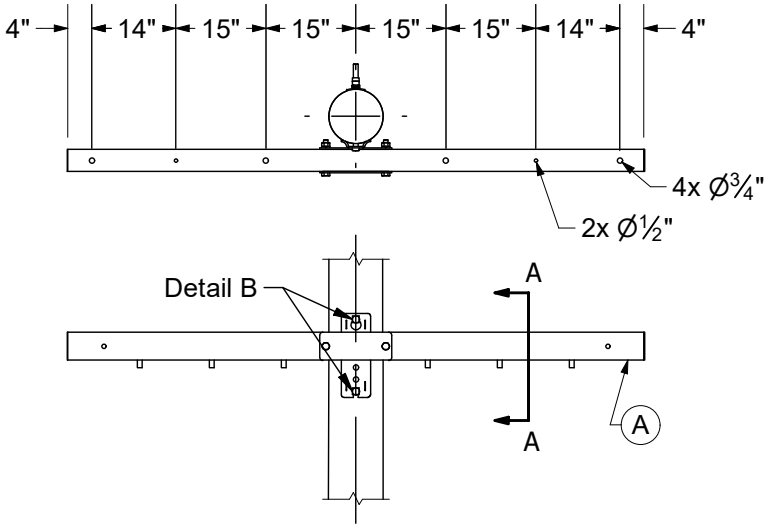
REV	DATE	ENG	DESCRIPTION
0	01/01/21	KR	New Issued Standard

CONSTRUCTION NOTE(s):

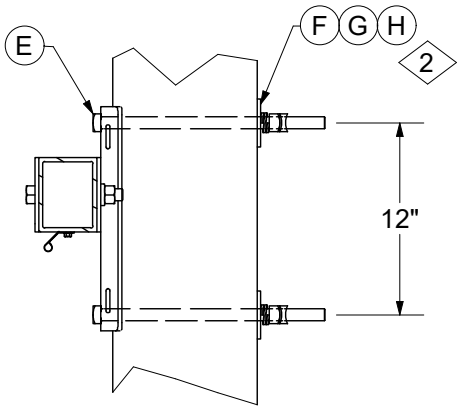
1. Heel brace step, Stk. # 23-67-064 is optional and is not shown in material list.
2. Field drill, if required.
3. Always load the non-threaded portion of the bolt with arms and braces.
4. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.
5. Use longer machine bolts for larger wood or composite poles if required.

ITEM	STK / DCS #	DESCRIPTION 04 00 25 **	01	02
A	41 01 006	6' Crossarm - 3-1/2" x 4-1/2"	2	-
B	41 01 014	8' Crossarm - 3-1/2" x 4-1/2"	-	2
C	41 56 023	Heel Brace - 6'-0"	1	1
D	23 77 212	Plate Heel Brace - 8-3/4" to 13-3/8"	1	1
E	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	1	1
F	23 52 049	Bolt, Mach., 5/8" x 2" w/ square nut	1	1
G	23 66 027	Washer - Square 5/8"	1	1
H	23 66 134	Lock Washer - 5/8" Double Coil	2	2
I	23 65 043	Lock Nut - 5/8" Square	1	1
J	23 52 038	Bolt, Mach., 1/2" x 6" w/ square nut	2	2
K	23 66 017	Washer - Round 1/2"	4	4
L	23 66 133	Lock Washer - Double Coil 1/2"	2	2
M	23 52 118	Bolt, Mach., 3/4" x 20" w/ square nut	1	1
N	23 66 131	Washer, Square, 3/4"	2	2
O	23 66 135	Lock Washer - 3/4" Double Coil	1	1
P	23 65 042	Lock Nut - 3/4" Square	1	1

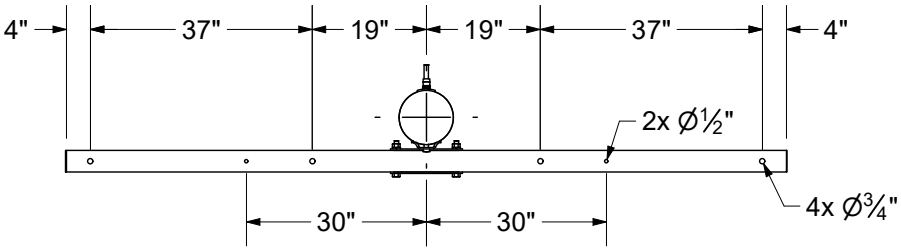
REV	DATE	ENG	DESCRIPTION
0	01/01/21	KR	New Issued Standard

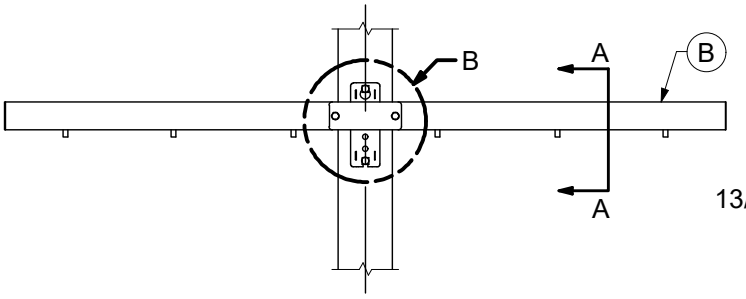


04 00 41 14
8' Tangent

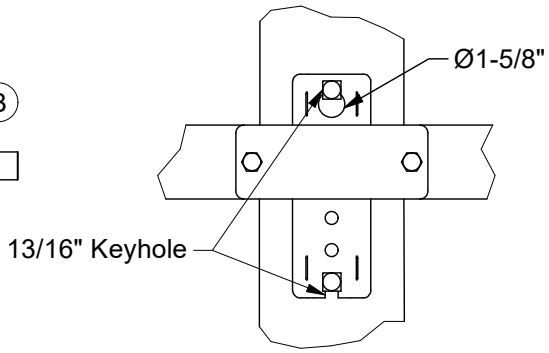


SECTION A-A 5



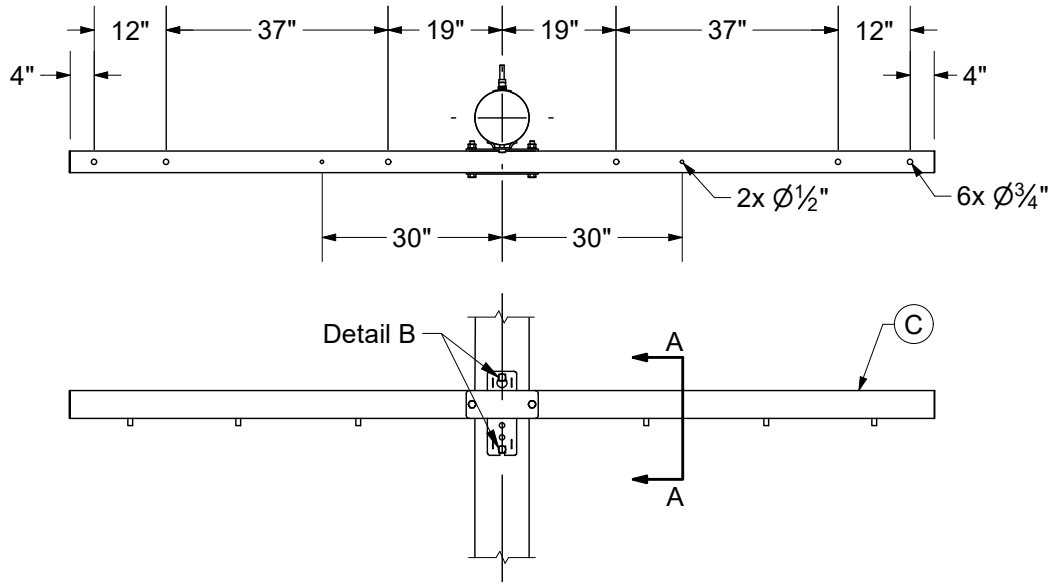


04 00 41 16
10' Tangent

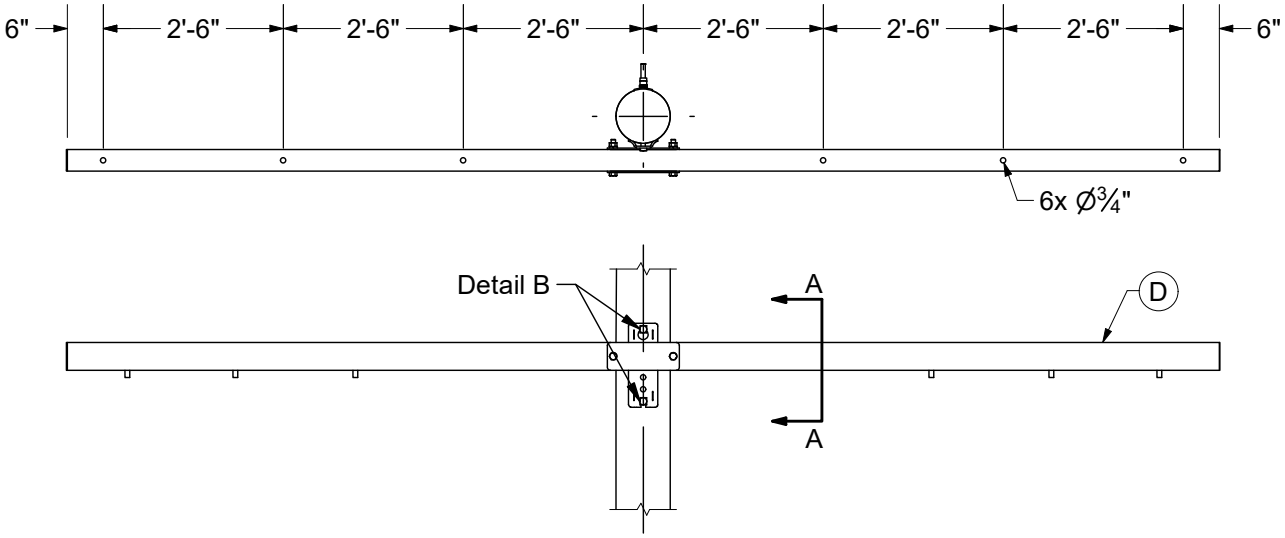


DETAIL B 5

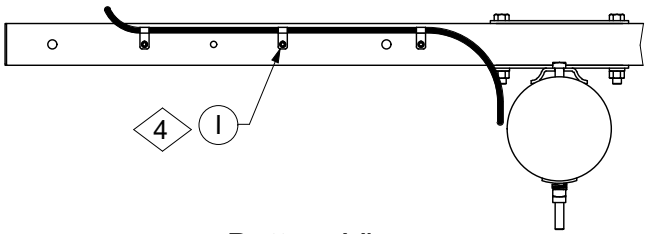
REV	DATE	ENG	DESCRIPTION
13	01/01/21	KR	Moved all fiberglass arms into new standards beside tangent arms.
12	03/10/16	WYW	



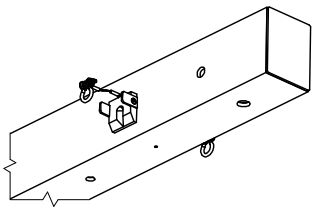
04 00 41 20
12' Tangent

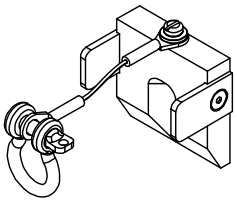


04 00 41 21
16' Tangent



Bottom View





Hot Arm Block 3

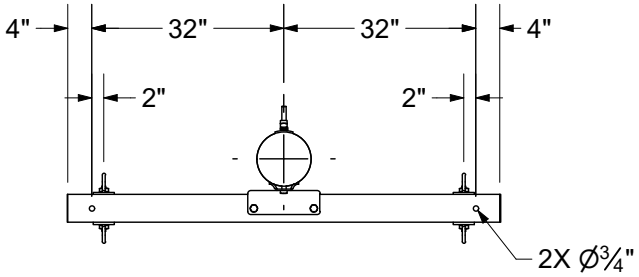
REV	DATE	ENG	DESCRIPTION
13	01/01/21	KR	Moved all fiberglass arms into new standards beside tangent arms.
12	03/10/16	WYW	

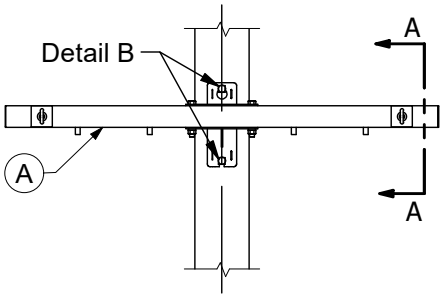
CONSTRUCTION NOTE(s):

1. Unbalanced loads require arm guys.
2. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.
3. When using fiberglass arms with hot arms a protective block to prevent the pin from fracturing the fiberglass arm is available (Stock #86 06 346).
4. When using a fiberglass arm with different devices a groundwire clip can be used below the arm to train the ground wire to the pole.
5. Always load the non-threaded portion of the bolt with arms and braces.
6. Use longer machine bolts for larger wood or composite poles if required.

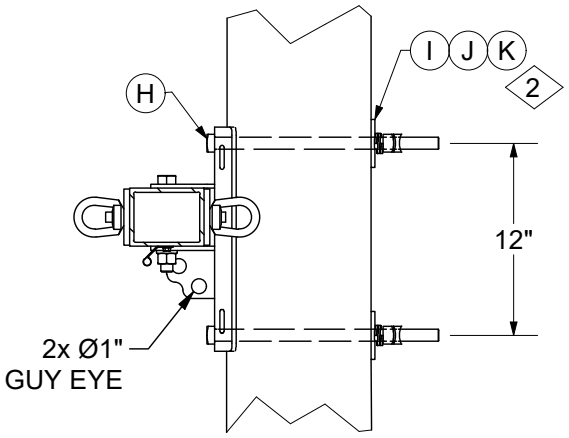
	ITEM	STK / DCS #	DESCRIPTION 04 00 41 **	14	16	20	21
	A	41 01 286	Crossarm - Tangent, F/G 8'	1	-	-	-
	B	41 01 285	Crossarm - Tangent, F/G 10'	-	1	-	-
	C	41 01 309	Crossarm - Tangent F/G 12'	-	-	1	-
	D	41 01 312	Crossarm - Tangent F/G 16'	-	-	-	1
	E	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	2	2	2	2
	F	23 66 031	Washer, Curved, 3/4"	2	2	2	2
	G	23 66 135	Lock Washer - 3/4" Double Coil	2	2	2	2
	H	23 65 042	Lock Nut - 3/4" Square	2	2	2	2
@4	I	23 68 746	Grounding Clip Qty. 6	1	1	1	1

REV	DATE	ENG	DESCRIPTION
13	01/01/21	KR	Moved all fiberglass arms into new standards beside tangent arms.
12	03/10/16	WYW	

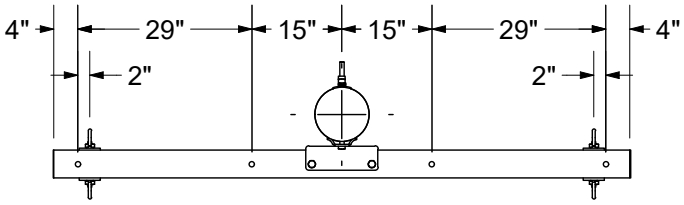


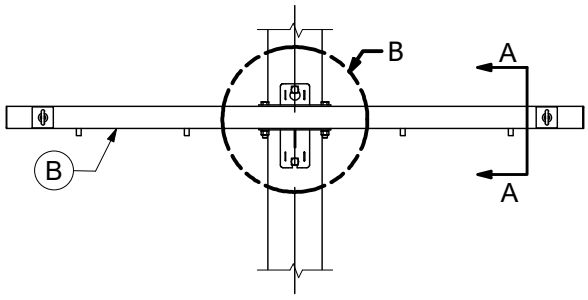


04 00 42 01
6' Deadend

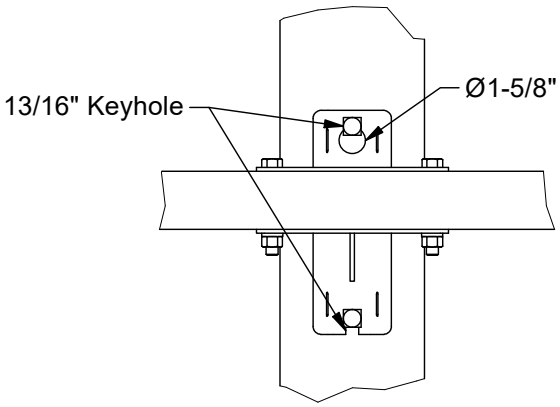


SECTION A-A 5



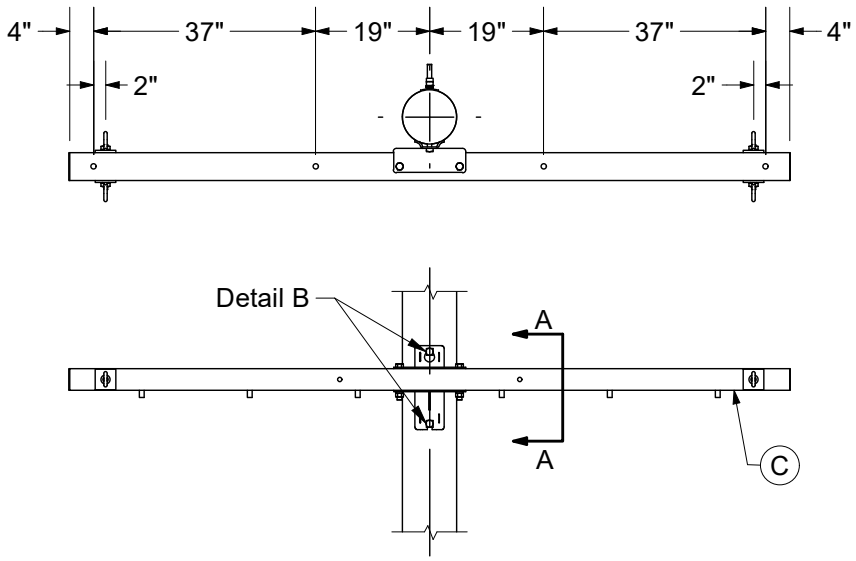


04 00 42 02
8' Deadend

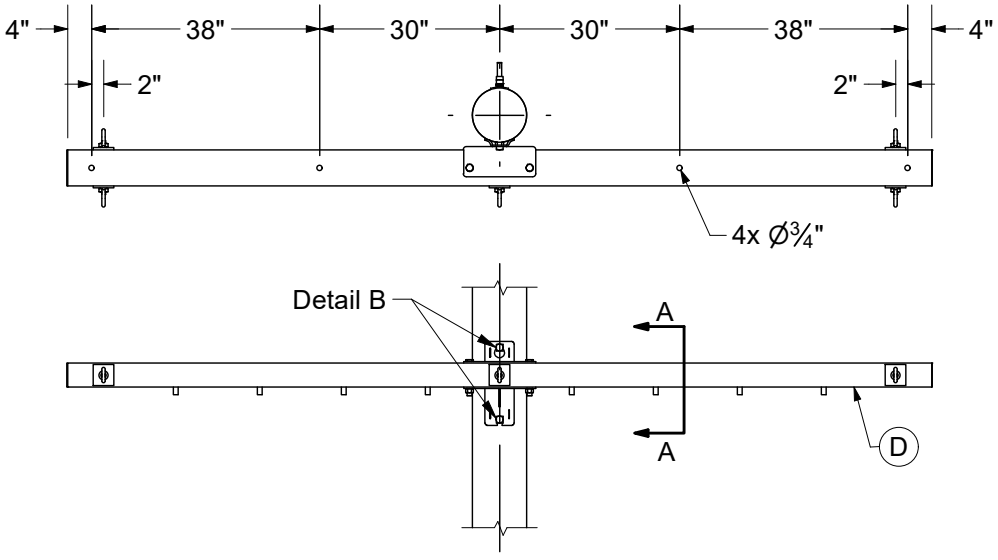


DETAIL B 5

REV	DATE	ENG	DESCRIPTION
0	01/01/21	KR	New Issued Standard

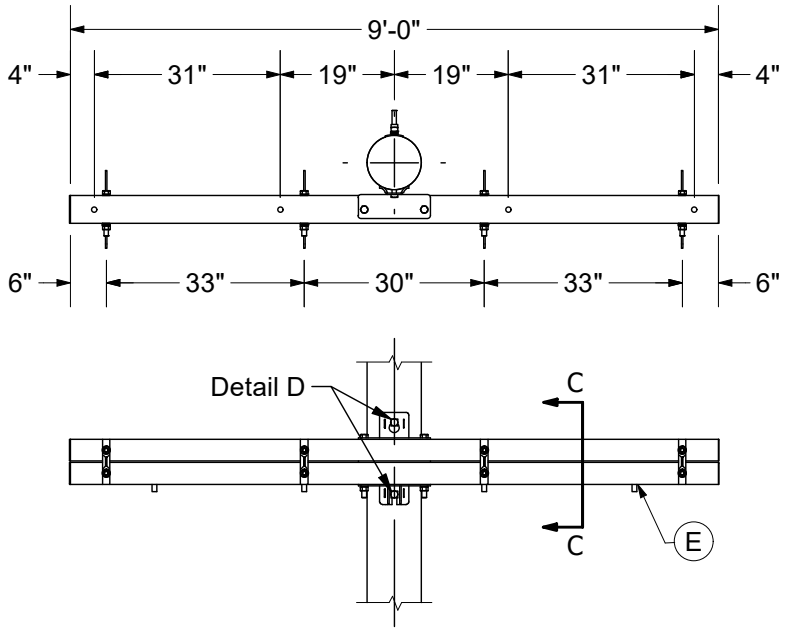


04 00 42 03
10' Deadend

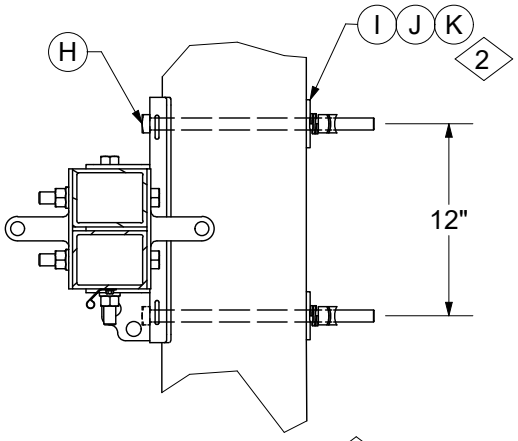


04 00 42 04
12' Deadend

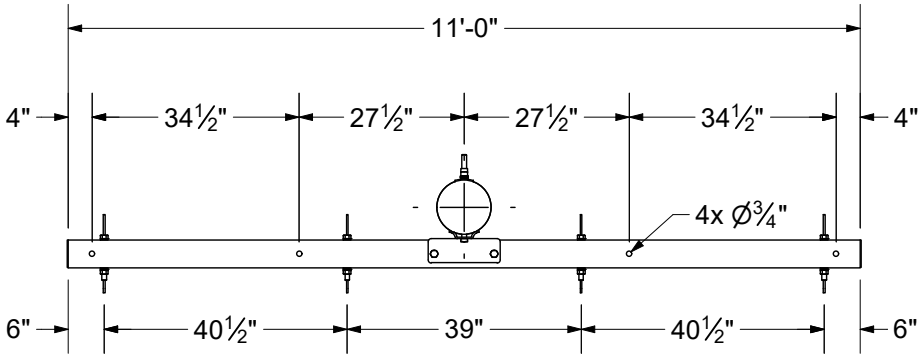
REV	DATE	ENG	DESCRIPTION
0	01/01/21	KR	New Issued Standard

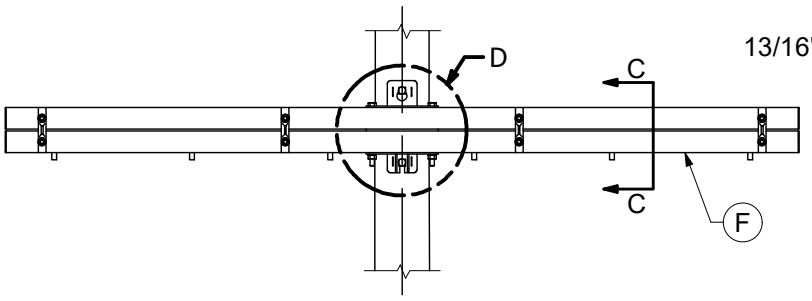


04 00 42 05
9' Double Stack HD Deadend

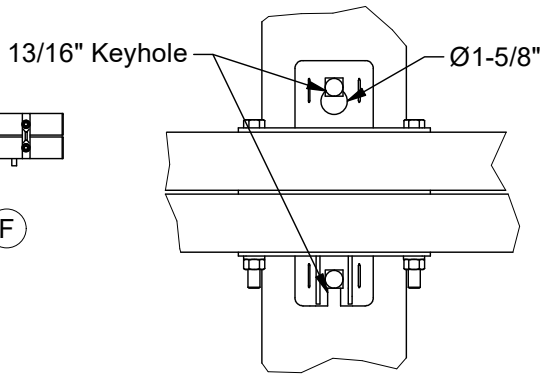


SECTION C-C 5



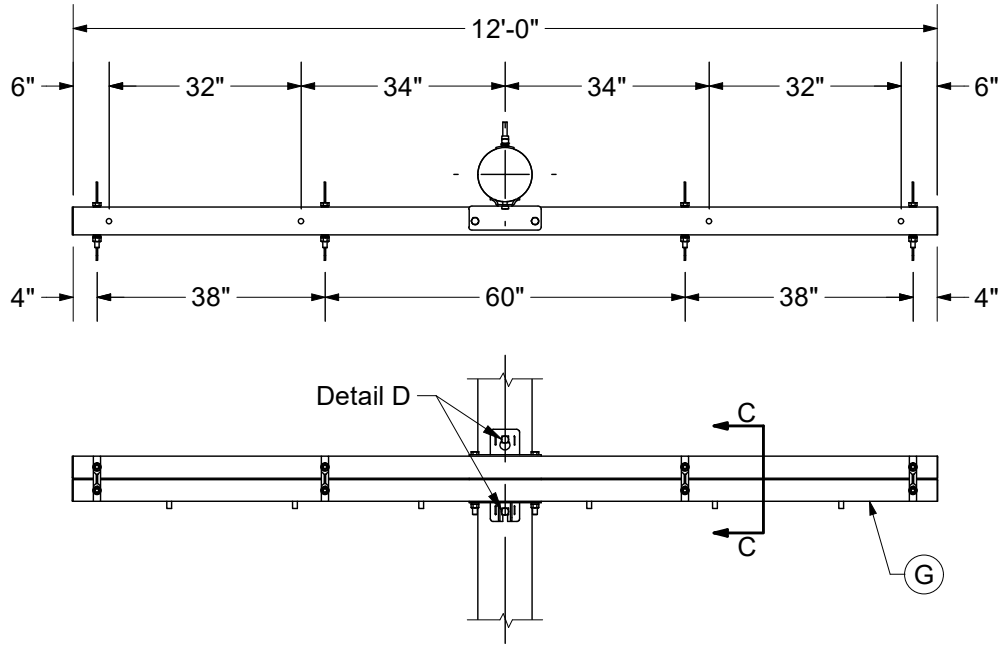


04 00 42 06
11' Double Stack HD Deadend



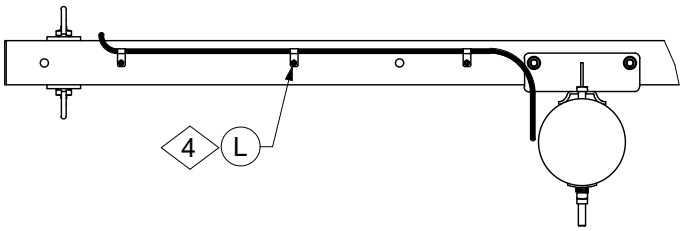
DETAIL D 5

REV	DATE	ENG	DESCRIPTION
0	01/01/21	KR	New Issued Standard

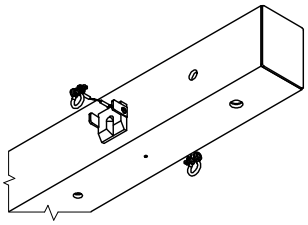


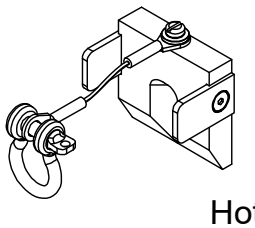
04 00 42 07

12' Double Stack HD Deadend



Bottom View





Hot Arm Block 3

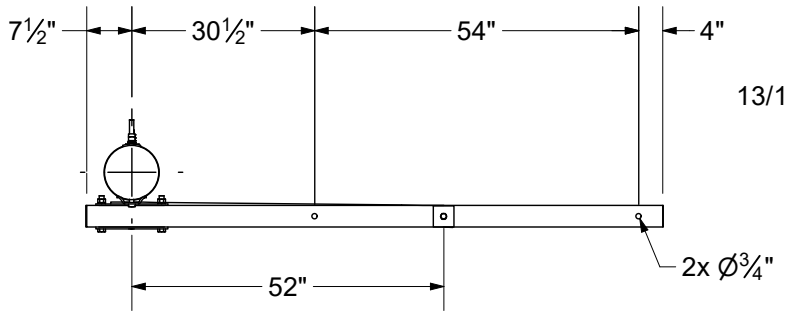
REV	DATE	ENG	DESCRIPTION
0	01/01/21	KR	New Issued Standard

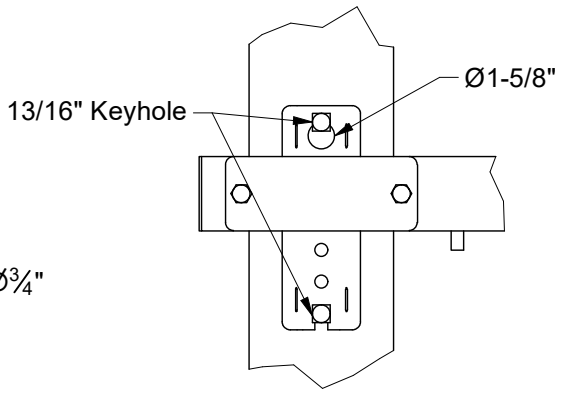
CONSTRUCTION NOTE(s):

1. Unbalanced loads require arm guys.
2. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.
3. When using fiberglass arms with hot arms a protective block to prevent the pin from fracturing the fiberglass arm is available (Stock #86 06 346).
4. When using a fiberglass arm with different devices a groundwire clip can be used below the arm to train the ground wire to the pole.
5. Always load the non-threaded portion of the bolt with arms and braces.
6. Use longer machine bolts for larger wood or composite poles if required.

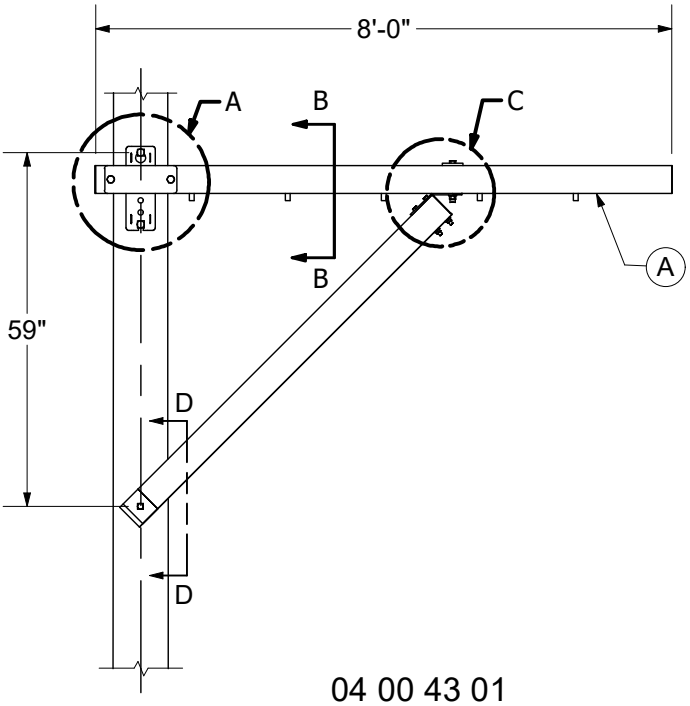
	ITEM	STK / DCS #	DESCRIPTION 04 00 42 **	01	02	03	04	05	06	07
	A	41 01 291	Crossarm - Deadend, F/G 6'	1	-	-	-	-	-	-
	B	41 01 189	Crossarm - Deadend, F/G 8'	-	1	-	-	-	-	-
	C	41 01 295	Crossarm - Deadend, F/G 10'	-	-	1	-	-	-	-
	D	41 01 307	Crossarm - Deadend, F/G 12'	-	-	-	1	-	-	-
	E	41 01 301	Crossarm - Double Stack HD Deadend 9'	-	-	-	-	1	-	-
	F	41 01 302	Crossarm - Double Stack HD Deadend 11'	-	-	-	-	-	1	-
	G	41 01 308	Crossarm - Double Stack HD Deadend 12'	-	-	-	-	-	-	1
	H	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	2	2	2	2	2	2	2
	I	23 66 031	Washer, Curved, 3/4"	2	2	2	2	2	2	2
	J	23 66 135	Lock Washer - 3/4" Double Coil	2	2	2	2	2	2	2
	K	23 65 042	Lock Nut - 3/4" Square	2	2	2	2	2	2	2
@4	L	23 68 746	Grounding Clip Qty. 6	1	1	1	2	1	1	1

REV	DATE	ENG	DESCRIPTION
0	01/01/21	KR	New Issued Standard

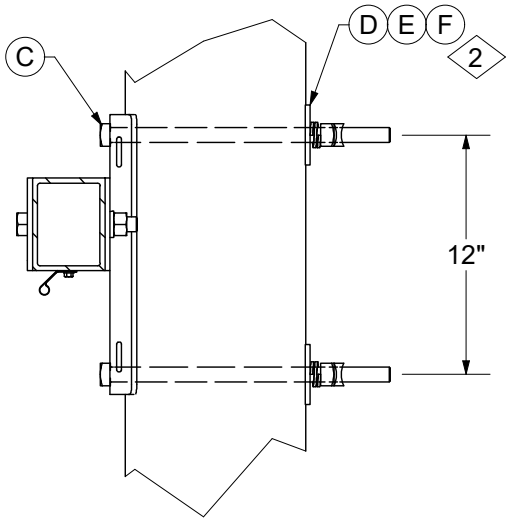




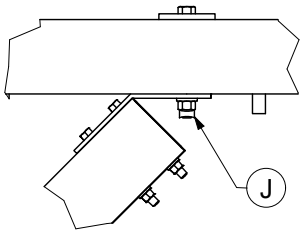
DETAIL A ◇5



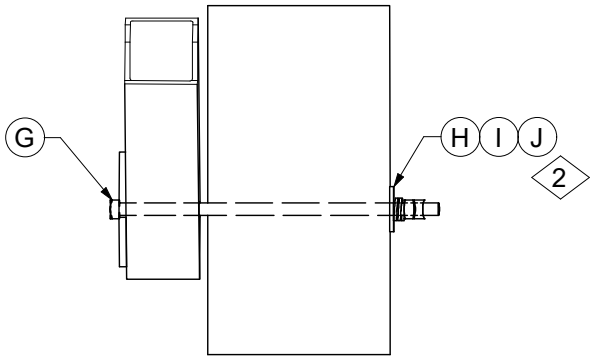
04 00 43 01
8' Alley Arm



SECTION B-B ◇5

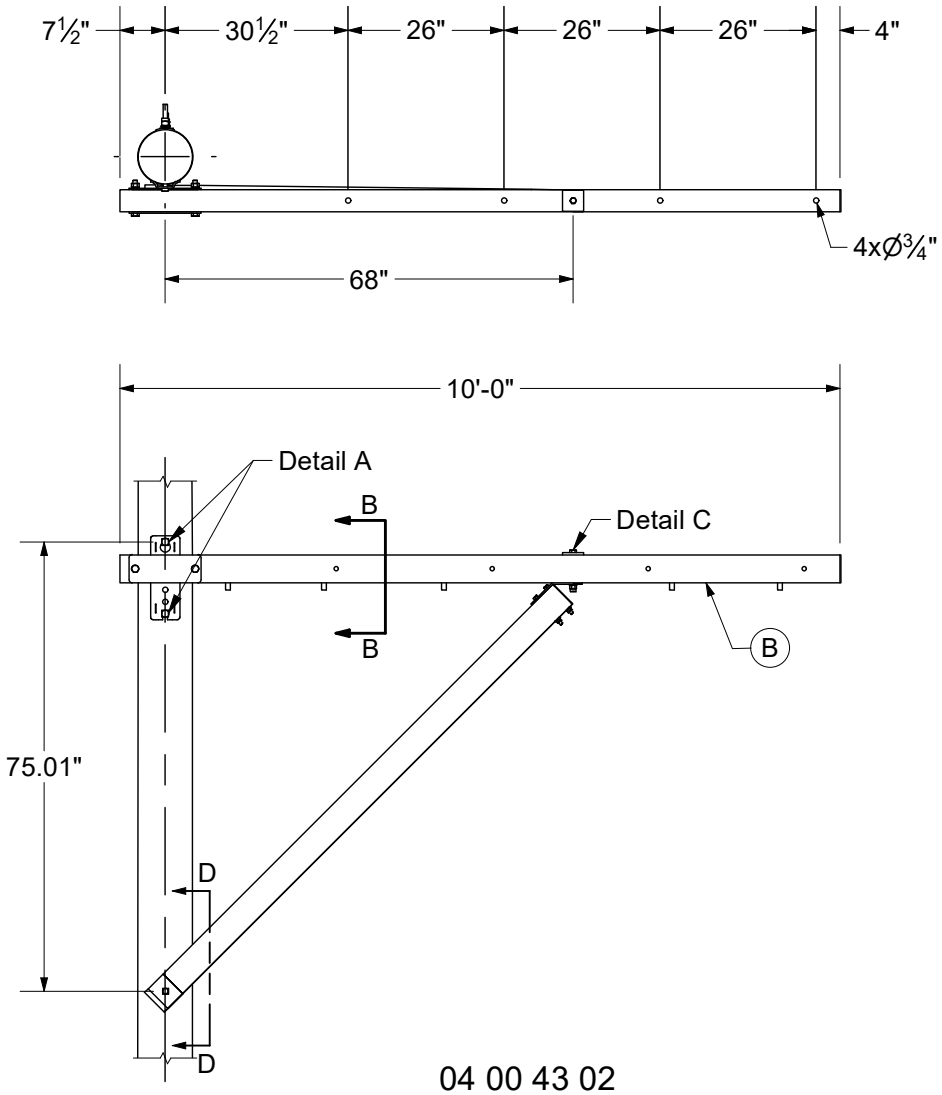


DETAIL C

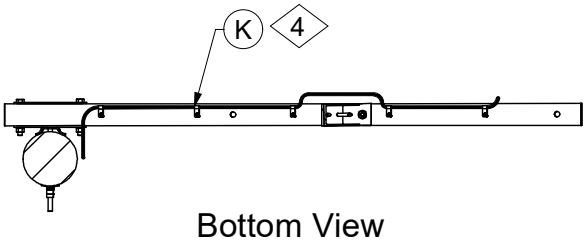


SECTION D-D ◇5

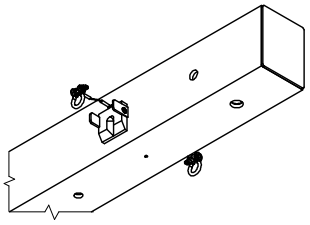
REV	DATE	ENG	DESCRIPTION
0	01/01/21	KR	New Issued Standard

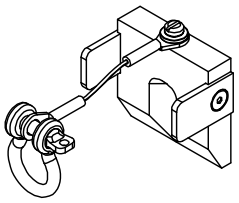


04 00 43 02
10' Alley Arm



Bottom View





Hot Arm Block 3

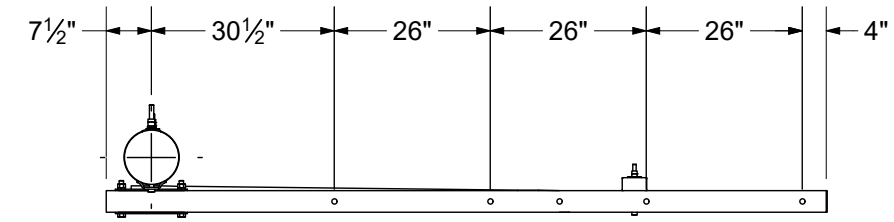
REV	DATE	ENG	DESCRIPTION
0	01/01/21	KR	New Issued Standard

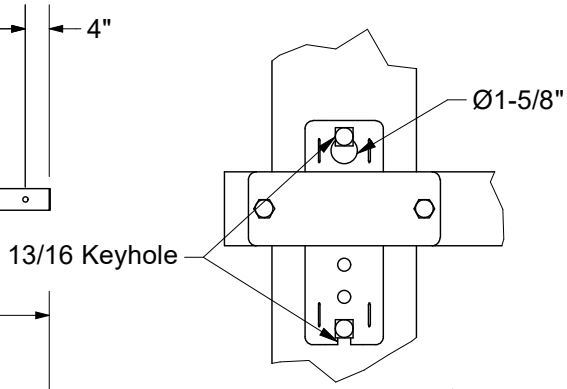
CONSTRUCTION NOTE(s):

1. Unbalanced loads require arm guys.
2. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.
3. When using fiberglass arms with hot arms a protective block to prevent the pin from fracturing the fiberglass arm is available (Stock #86 06 346).
4. When using a fiberglass arm with different devices a groundwire clip can be used below the arm to train the ground wire to the pole.
5. Always load the non-threaded portion of the bolt with arms and braces.
6. Use longer machine bolts for larger wood or composite poles if required.

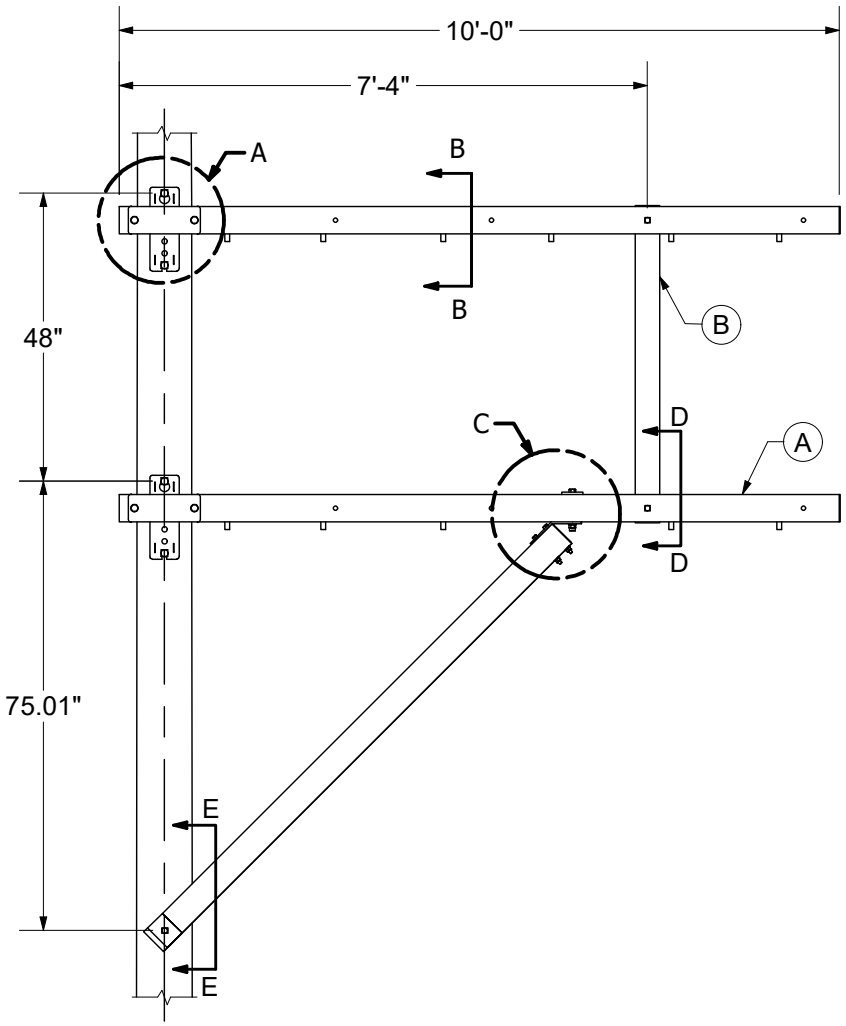
	ITEM	STK / DCS #	DESCRIPTION 04 00 43 **	01	02
	A	41 01 293	Crossarm - Alley, F/G 8'	1	-
	B	41 01 294	Crossarm - Alley, F/G 10'	-	1
	C	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	2	2
	D	23 66 031	Washer, Curved, 3/4"	2	2
	E	23 66 135	Lock Washer - 3/4" Double Coil	2	2
	F	23 65 042	Lock Nut - 3/4" Square	2	2
	G	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	1	1
	H	23 66 027	Washer - Square 5/8"	1	1
	I	23 66 134	Lock Washer - 5/8" Double Coil	1	1
	J	23 65 043	Lock Nut - 5/8" Square	2	2
@4	K	23 68 746	Grounding Clip Qty. 6	1	1

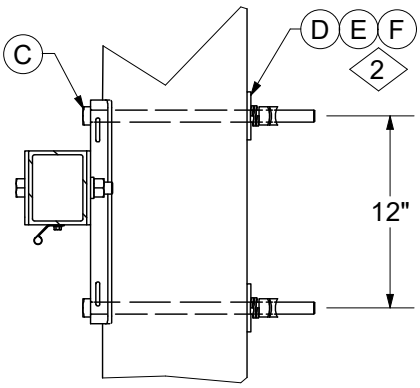
REV	DATE	ENG	DESCRIPTION
0	01/01/21	KR	New Issued Standard



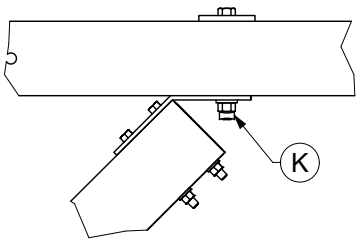


DETAIL A 5

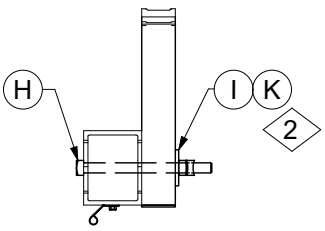




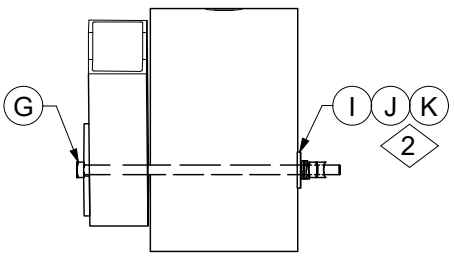
SECTION B-B 5



DETAIL C

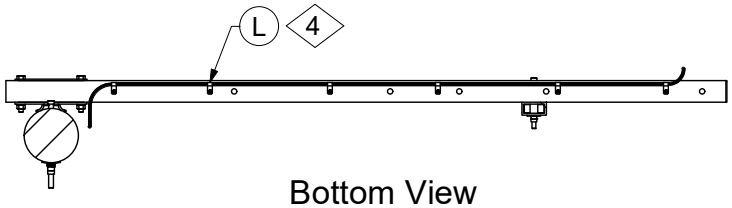


SECTION D-D 5

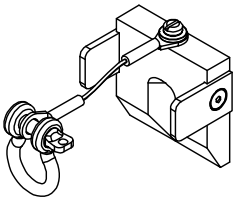


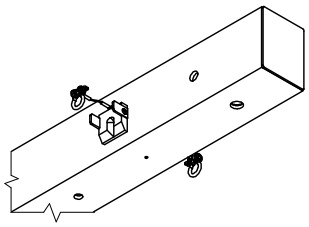
Section E-E 5

REV	DATE	ENG	DESCRIPTION
0	01/01/21	KR	New Issued Standard



Bottom View





Hot Arm Block 3

CONSTRUCTION NOTE(s):

1. Unbalanced loads require arm guys.
2. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles.Lock nuts must be placed after nut included with bolt stock number.
3. When using fiberglass arms with hot arms a protective block to prevent the pin from fracturing the fiberglass arm is available (Stock #86 06 346).
4. When using a fiberglass arm with different devices a groundwire clip can be used below the arm to train the ground wire to the pole.
5. Always load the non-threaded portion of the bolt with arms and braces.
6. Use longer machine bolts for larger wood or composite poles if required.

	ITEM	STK / DCS #	DESCRIPTION 04 00 44 **	01
	A	41 01 294	Crossarm - Alley, F/G 10'	2
	B	41 01 314	Crossarm - Alley Arm Brace F/G	1
	C	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	4
	D	23 66 031	Washer, Curved, 3/4"	4
	E	23 66 135	Lock Washer - 3/4" Double Coil	4
	F	23 65 042	Lock Nut - 3/4" Square	4
	G	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	1
	H	23 52 061	Bolt, Mach., 5/8" x 8" w/ square nut	2
	I	23 66 027	Washer - Square 5/8"	3
	J	23 66 134	Lock Washer - 5/8" Double Coil	1
	K	23 65 043	Lock Nut - 5/8" Square	4
@4	L	23 68 746	Grounding Clip Qty. 6	2

REV	DATE	ENG	DESCRIPTION
0	01/01/21	KR	New Issued Standard

WILDLIFE PROTECTION 05

PRACTICE AND REGULATIONS.....05 00 00 02

INSTALLATION OF CRITTER LINE GUARDS.....05 00 00 04

TANK MOUNTED LIGHTNING ARRESTER BRACKET GUARD - 15kV.....05 00 00 05

EXISTING STRUCTURE MODIFICATION - 15kV.....05 11 10 **

TRANSFORMER COVER - 15kV.....05 12 10 01

RECLOSER & SECTIONALIZER RETROFIT - 15kV.....05 14 10 **

CUTOUT COVER - 15kV.....05 15 10 01

CONDUCTOR COVER - SINGLE PIN - 15kV.....05 16 10 **

CONDUCTOR COVER - DOUBLE PIN - 15kV.....05 16 11 **

CONDUCTOR COVER - DEADEND - 15kV.....05 16 12 **

POLE WRAP.....05 16 13 **

600 AMP VERTICAL SWITCH COVER - 15kV.....05 16 14 **

CONDUCTOR COVER - SINGLE PIN - 35kV.....05 17 01 **

TERMINATOR COVER - 15kV, 35kV.....05 18 01 **

FLIGHT DIVERTER.....05 20 01 **

This section covers the current products and construction practices for the protection of avian species common to Ameren's service areas in Illinois and Missouri. In addition, the wildlife guards for prevention of animal caused outages are included to improve reliability of distribution facilities.

Ameren's first approach is to maintain minimum horizontal and vertical conductor separation unless economics or existing conditions force the use of other methods. The areas intended for new overhead lines shall be evaluated for risk to the protected birds (resident or migratory). Lines scheduled for repair or replacement shall also be evaluated for this same risk.

All Divisions must follow Ameren standards for new construction and existing retrofit to provide avian friendly facilities. Alternative suggested practices or products are not acceptable unless evaluated and approved by Standards.

Wood or composite poles are preferred because the insulating nature of these materials reduces the clearances required for avian protection to less than those required for metal structures. After completion of construction all leftover scrap or reusable material shall be removed and disposed of in an appropriate manner.

All legal procedures must be followed by the Ameren Division when there is evidence of an avian injury or fatality in the vicinity of an Ameren overhead line (69 kV and below). In addition, the Division shall be proactive in correcting or modifying existing structures to eliminate the possibility of further injury or fatalities to avian species. This commitment is to meet the regulatory requirements for protecting avian species on new and existing circuits. The laws that are applicable are:

1. The Migratory Bird Treaty Act (MBTA; 16 U.S.C. 703-712).
2. The Endangered Species Act (ESA; 1531-1544).
3. The Bald and Golden Eagle Protection Act (BGEPA; 16 U.S.C. 668-668d)
4. Ameren Avian Protection Plan

The critter line guard (Stock #71 25 216) is used to prevent animals from crossing a section of overhead conductor leading to a substation or other distribution equipment. If the line guard is installed on an energized conductor, proper protective clothing, equipment and procedures must be followed. The line guard includes five (5) rollers, two (2) wheels, two (2) “L” brackets, and six (6) cable ties. When properly installed the five rollers are placed between the two wheels and secured in place with the “L” brackets. When an animal (squirrel) tries to cross over the installed line guard, the rollers will rotate and the animal will be rolled off of the conductor. Line guard can be applied to lines with a voltage level of 69kV or less.

INSTRUCTIONS:

1. For substation applications, place the line guard at least 5' outside the substation fence.

2. For other applications, place the line guard at least 2' from the pole or standing structure.

3. Verify the size (OD) of the conductor that the line guard will be installed on. The line guard rollers are fabricated with a 1” OD hole and two cutouts, one for 2” OD and another for 3” OD. The first groove on each roller represents 2”, and the second groove represents 3”. The cutouts can be easily removed with a knife.

4. Position one of the “L” brackets closest to the point the line guard will be protecting. If this work is being done with the conductor energized the “L” bracket can be replaced with a hot line clamp from the table on Sheet 2 of this standard. The hot line clamp can be installed with a “shotgun” hot stick. If the “L” bracket is used place it on the conductor and secure it into place with two cable ties. The cable ties must be placed through the holes provided and around the conductor. Pull the ties tight to hold the “L” bracket in place.

   NOTE: The stainless steel cable ties will have sharp edges if the ties are cut off. Therefore, the ends of the ties should be bent over to remove any sharp edges.

5. Position the halves of the rollers around the conductor and snap them together. Each roller will have a series of four snaps. All of the snaps must be fastened.

   NOTE: On conductors larger than 2” OD, the rollers will have only two snaps. If the cutout for a 3” hole is removed, the end snaps will also be removed. This will not affect the integrity or operation of the product.

6. While assembling the first and last rollers the wheels must be installed. Spread apart a wheel and place it on the end of the roller that faces the “L” bracket. Tightly fasten one cable tie at the base of the wheel (See Figure 1) to secure it to the roller.

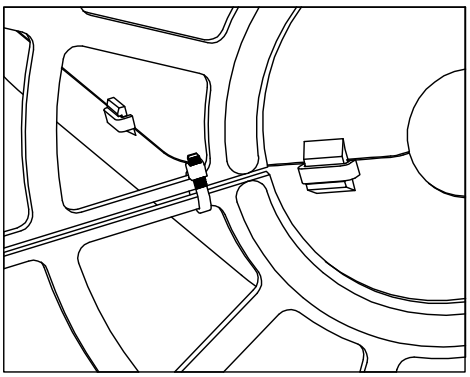


Figure 1 - Cable Ties Connecting Roller

7. After all of the rollers have been snapped around the conductor, push the line guard assembly along the conductor until it is snug against the installed "L" bracket.

8. Position the remaining “L” bracket (or hot line clamp) at the opposite end of the line guard assembly and secure it in place with two cable ties as described in Instruction #4. Remember to bend the ends of the stainless steel ties to eliminate any sharp edges.

9. When the line guard installation is complete, it should appear as shown in Figure 2.

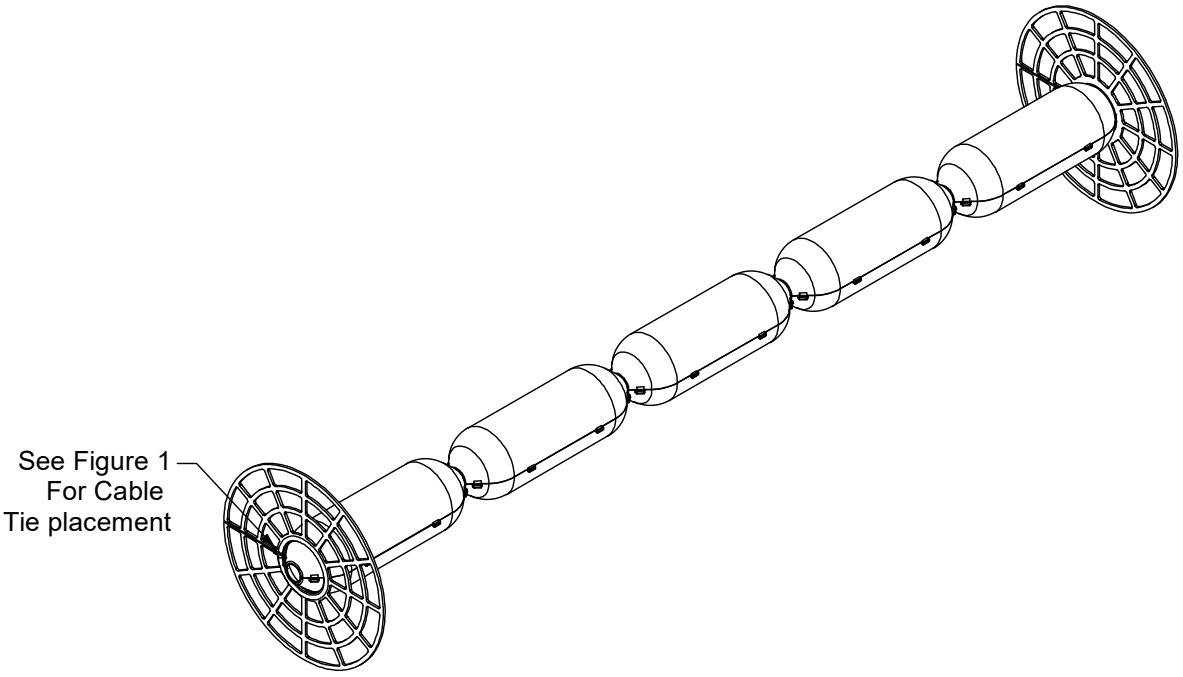


Figure 2 - Completed Line Guard

Stock Number	Material	Conductor Range (Inches)	DOJM Code
23 78 394	Copper	0.128 − 0.414	HLC10C
23 78 183	Copper	0.162 − 0.745	HLC350C
17 62 088	Aluminum	0.157 − 0.905	HLC336A
17 62 112	Aluminum	0.502 − 1.031	HLC556A
17 62 143	Aluminum	0.939 − 1.490	HLC954A

The lightning arrester mounting bracket guard is used to prevent bird caused outages associated with birds perched on the grounded LA bracket making contact with an energized line lead. The LA bracket guard covers the grounded metal mounting bracket and arrester mounting bolt on tank mounted arresters. The guards have flexible fingers that securely hold the guards in place. The guard is designed to fit brackets from all common polymer arrester suppliers. The guard has been tested to withstand 21kV to ground without a flashover. The smooth, rounded profile of the guard acts as a perch deterent.

Arrester Bracket Guard

INSTRUCTIONS:

1. Make sure that the arrester is positioned properly and securely attached to the tank mounting bracket.
2. Place the wildlife guard over the last insulating rib on the polymer arrester mounting bracket and over the tank mounting bracket and bolt.
3. Push down on the wildlife guard until the flexible fingers, at the base of the guard, snap into place and securely hold the guard. No external ties or tape are required to hold the wildlife guard in place.

Installed Arrester Bracket Guard

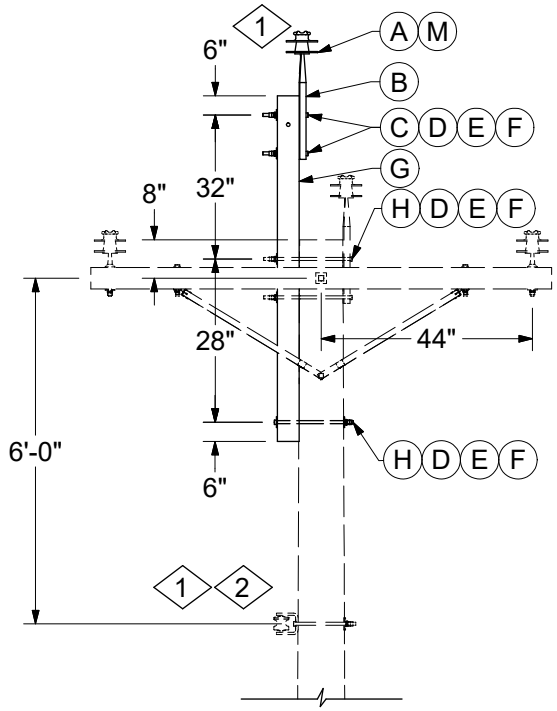
ITEM	STK / DCS #	DESCRIPTION 05 00 05 **	05
A	69 56 037	Guard, Wildlife, for Covering LA Tank Bracket	1
B	111	Wildlife Guards Installation	1

WILDLIFE PROTECTION

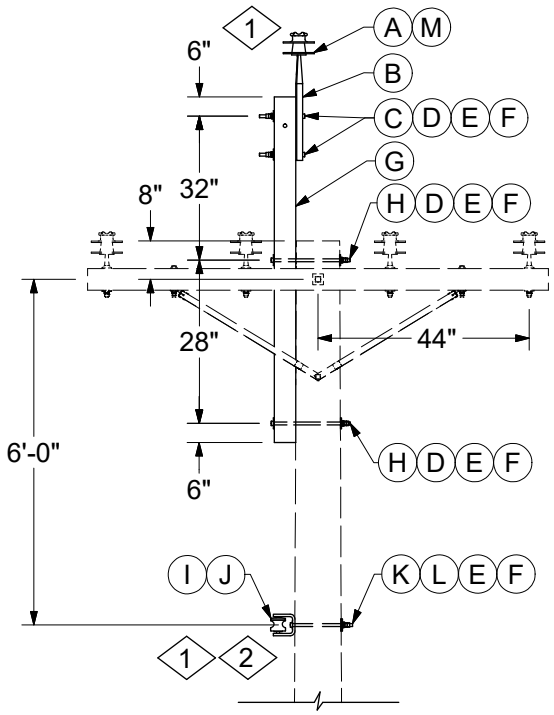
Existing Structure Modification

05 11 10 **
15kV
1 of 1

This standard provides modification of existing structures to increase spacing between conductors to reduce the likelihood of injury to or death of protected avian species. The 3-wire and 4-wire modification achieves mandated conductor spacing, while retaining the eight foot crossarm used in the standard configuration.



05 11 10 01 - Three Wire Modification



05 11 10 02 - Four Wire Modification

CONSTRUCTION NOTE(s):

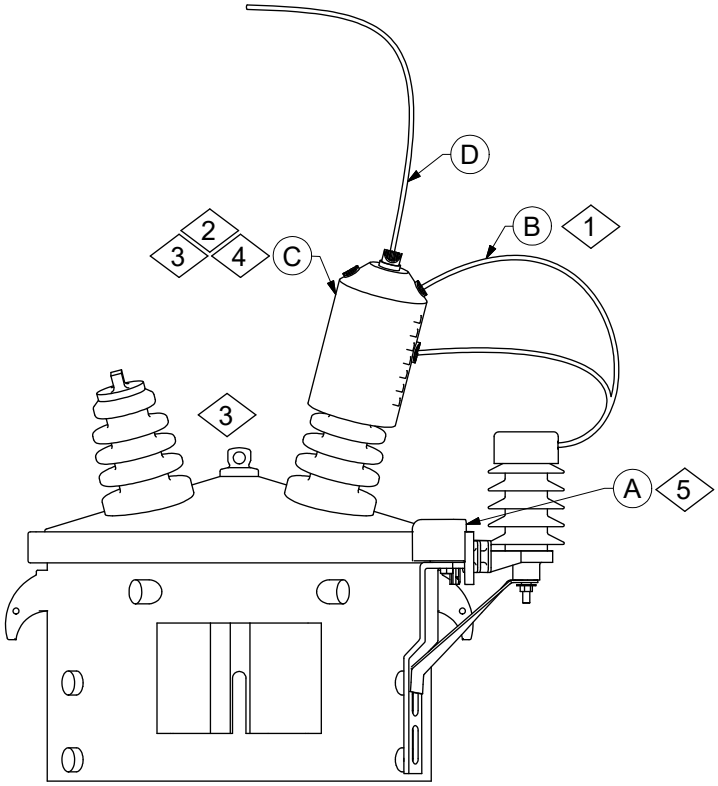
1. See DCS **06 12 01 02** for insulator detail and DCS **06 01 01 **** for secondary clevis detail.

2. See DCS **29 00 17 02** for neutral ground clearance.

	ITEM	STK / DCS #	DESCRIPTION 05 11 10 **	01	02
	A	25 05 069	Insulator, Pin Type, 12kV	1	1
	B	23 62 156	Pin - Insulator, Pole Top, 24"	1	1
	C	23 52 255	Bolt, Mach., 5/8" x 9" w/ square nut	2	2
	D	23 66 027	Washer, Flat, Square 5/8"	4	4
	E	23 66 134	Lock Washer - 5/8" Double Coil	4	5
	F	23 65 043	Lock Nut - 5/8" Square	4	5
	G	41 01 006	6' Crossarm - 3-1/2" x 4-1/2"	1	1
	H	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	2	2
1,2	I	23 06 040	Clevis - Secondary	-	1
	J	25 59 044	Insulator, Spool	-	1
	K	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	-	1
	L	23 66 207	Washer, Curved, Square, 5/8"	-	1
@	M	TT*W	Top Tie, See DCS **07 00 41 00**	1	1
		ST*W	Side Tie, See DCS **07 00 41 00**	-	1

REV	DATE	ENG	DESCRIPTION
2	04/01/22	KR	Converted to new format
1	04/29/10	MJ	

The covers described in this standard are for wildlife contact only and NOT intended for personal protection.



CONSTRUCTION NOTE(s):

1. Bolt the arrester lead away from the transformer to keep the lead opening in the arrester guard away from animals.

2. Be sure the bushing guard completely covers the terminal and only the top bushing skirt.

3. On Delta Primary Systems, wildlife guards must be installed on both HV bushings.

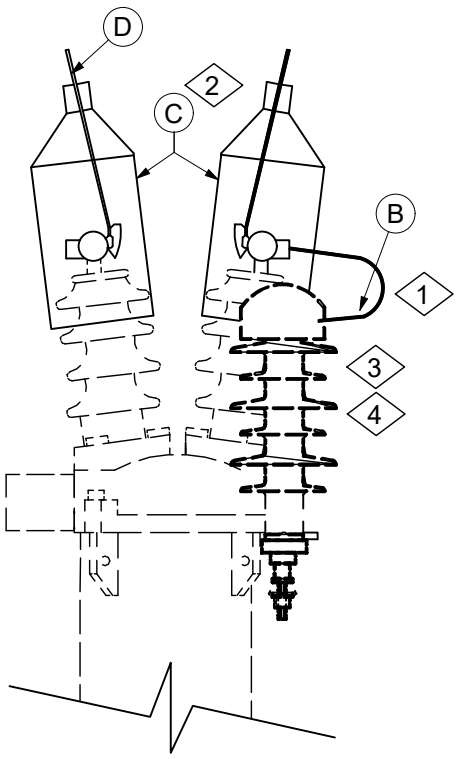
4. When transformers are banked, install the arrester lead in the side of the guard so that the primary leads can be installed in the top holes.

5. Refer to DCS **05 00 00 05** if arrester bracket guard has not been placed.

	ITEM	STK / DCS #	DESCRIPTION 05 12 10 **	01
	A	69 56 037	Wildlife Guard - Transformer Arrester Bracket	1
1	B	69 58 178	Wire, Lead, Arrester w/ terms	1
2	C	69 58 296	Guard, Clam−Shell, Wildlife	1
	D	18 51 025	Wire, Transformer Riser (ft)	6
	E	111	Wildlife Guard Installation	1

REV	DATE	ENG	DESCRIPTION
2	04/01/22	KR	Revised intro; Removed old note 3, added new notes 3,4 & 5
1	10/15/15	MJ	

The covers described in this standard are for wildlife contact only and NOT intended for personal protection.



CONSTRUCTION NOTE(s):

1. Bolt the arrester lead away from the tank to keep the lead opening in the arrester guard away from animals.

2. Be sure the bushing guard completely covers the terminal and only the top bushing skirt.

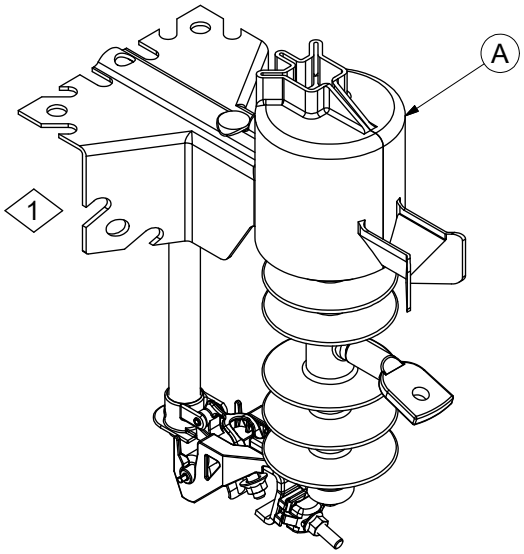
3. An arrester should be installed if one is not present.

4. Refer to DCS **05 00 00 05** if arrester bracket guard has not been placed.

	ITEM	STK / DCS #	DESCRIPTION 05 14 10 **	01	02	03
3,4	A	10 01 145	Arrester 10kV w/o Bracket	1	1	1
1	B	69 58 178	Wire−Lead, Arrester w/terms	1	1	1
2	C	69 58 296	Guard, Clam−Shell, Wildlife	2	2	2
	D	18 51 025	Wire, SD., #4 Cu., Poly (ft)	12	-	-
@		18 51 024	Wire, SD., #1/0 Cu., Poly (ft)	-	12	-
		18 51 023	Wire, SD., #4/0 Cu., Poly (ft)	-	-	12
	E	111	Wildlife Guard Installation	1	1	1

REV	DATE	ENG	DESCRIPTION
2	04/01/22	KR	Revised intro; Removed old note 3; Added new note 4
1	09/28/15	MJ	

The cover described in this standard are for wildlife contact only and NOT intended for personal protection.



CONSTRUCTION NOTE(s):

1. Cover can be installed with live line tools.

2. Refer to DCS **10 12 01 **** for cutout installation.

3. Install the cutout cover from the front side. Push the cutout cover around the conductors. Pull the cover down until the interior fingers fully engage the sleet hood.

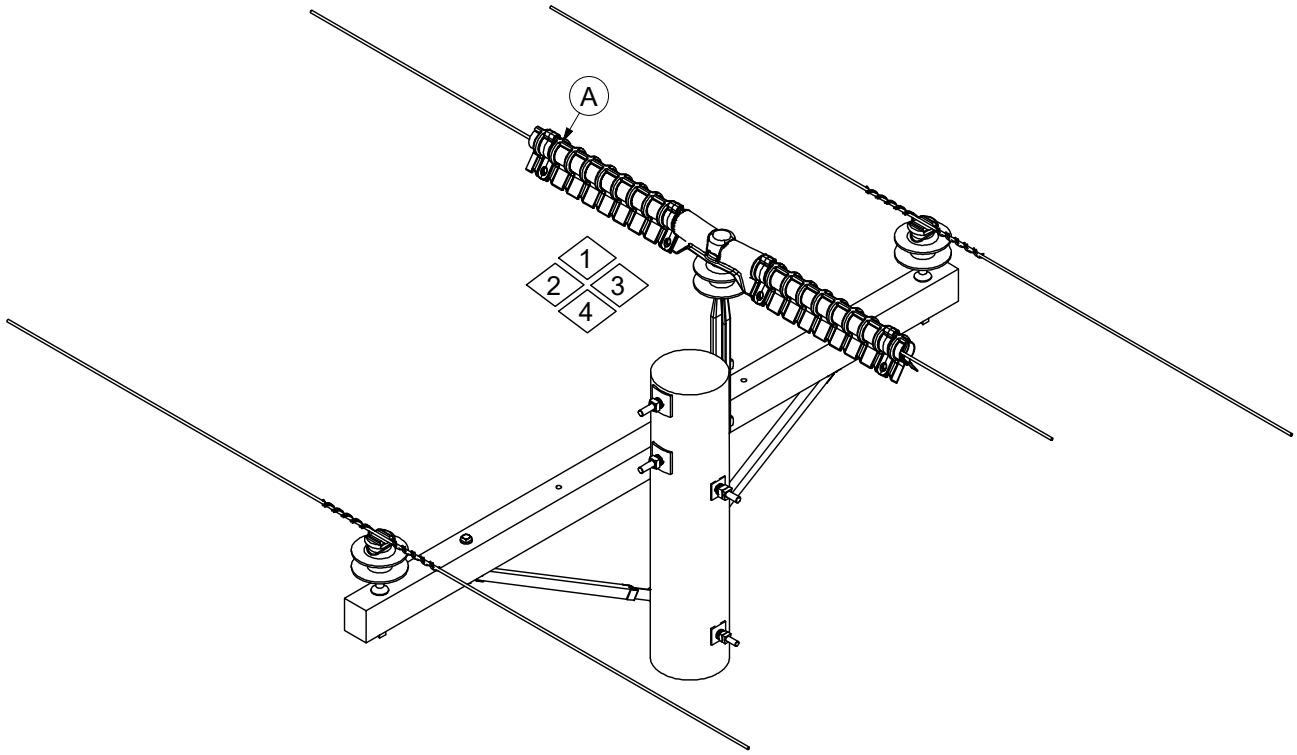
4. Caution: At temperatures below 0° F the cutout covers become rigid and lose their flexibility. Installing the covers with a hotstick may cause the covers to break.

ITEM	STK / DCS #	DESCRIPTION 05 15 10 **	01
A	23 17 411	Wildlife Guard - Cover Cutout	1
B	111	Cutout cover Installation	1

REV	DATE	ENG	DESCRIPTION
2	04/01/22	KR	Revised intro; Removed old note 3; Added new note 4
1	10/21/15	JWC	

The covers described in this standard are for wildlife contact only and NOT intended for personal protection.

The conductor and insulator cover shown in this standard shall be used where horizontal conductor spacing is less than five feet.



CONSTRUCTION NOTE(s):

1. The cover can be installed with live line tools.

2. Cover fits #6 Cu to 556 AAC conductor.

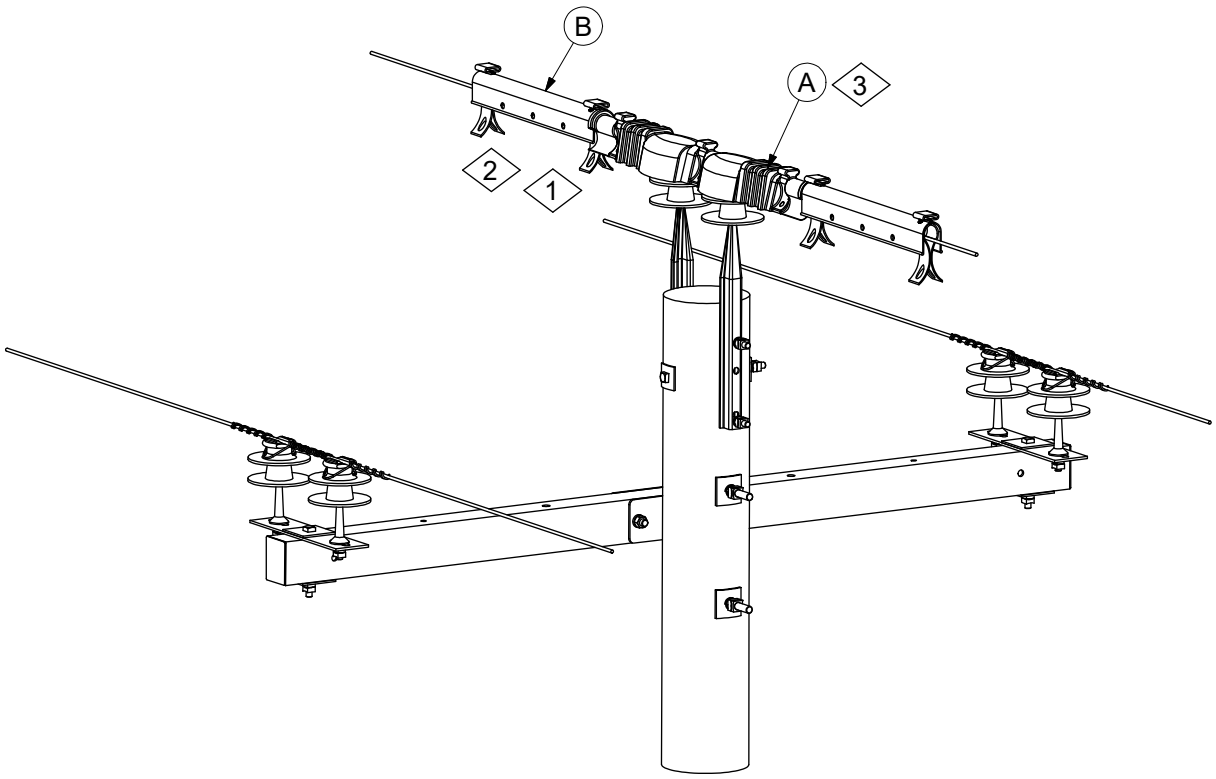
3. Install two covers on two interior positions when existing arm has four conductor configuration.

4. If preference is to use the three piece cover utilize DCS **05 16 10 02.**

	ITEM	STK / DCS #	DESCRIPTION 05 16 10 **	01	02
1	A	23 17 600	Wildlife Guard - Tangent Cover	1	-
1	B	23 17 406	Cover, Single Pin Configuration	-	1
1	C	23 17 416	Cover, Extension Arm	-	2
	D	111	Wildlife cover Installation	1	1

The covers described in this standard are for wildlife contact only and NOT intended for personal protection.

The conductor and insulator cover shown in this standard shall be used where horizontal conductor spacing is less than five feet.



CONSTRUCTION NOTE(s):

1. The cover can be installed with live line tools.

2. Install two covers on two interior positions when existing arm has four conductor configuration.

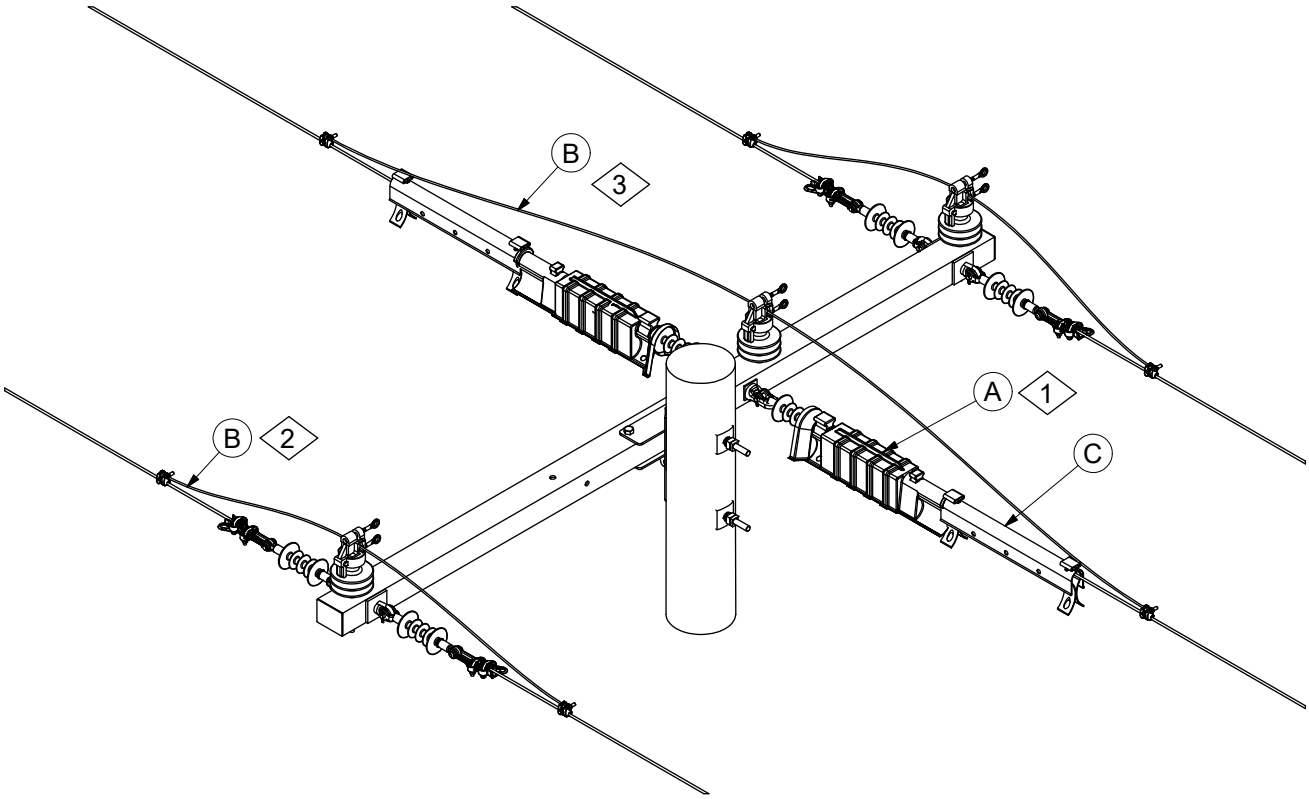
3. Cover fits #6 Cu to 556 AAC conductor.

	ITEM	STK / DCS #	DESCRIPTION 05 16 11 **	01	02
1	A	23 17 408	Cover, Double pin configuration	1	2
1	B	23 17 416	Cover, Extension Arm	2	4
	C	111	Wildlife Cover Installation	1	2

REV	DATE	ENG	DESCRIPTION
2	04/01/22	KR	Revised intro & note 1; Added new note 3
1	09/29/11	MJ	

The covers described in this standard are for wildlife contact only and NOT intended for personal protection.

The conductor and insulator cover shown in this standard shall be used where horizontal conductor spacing is less than five feet.



CONSTRUCTION NOTE(s):

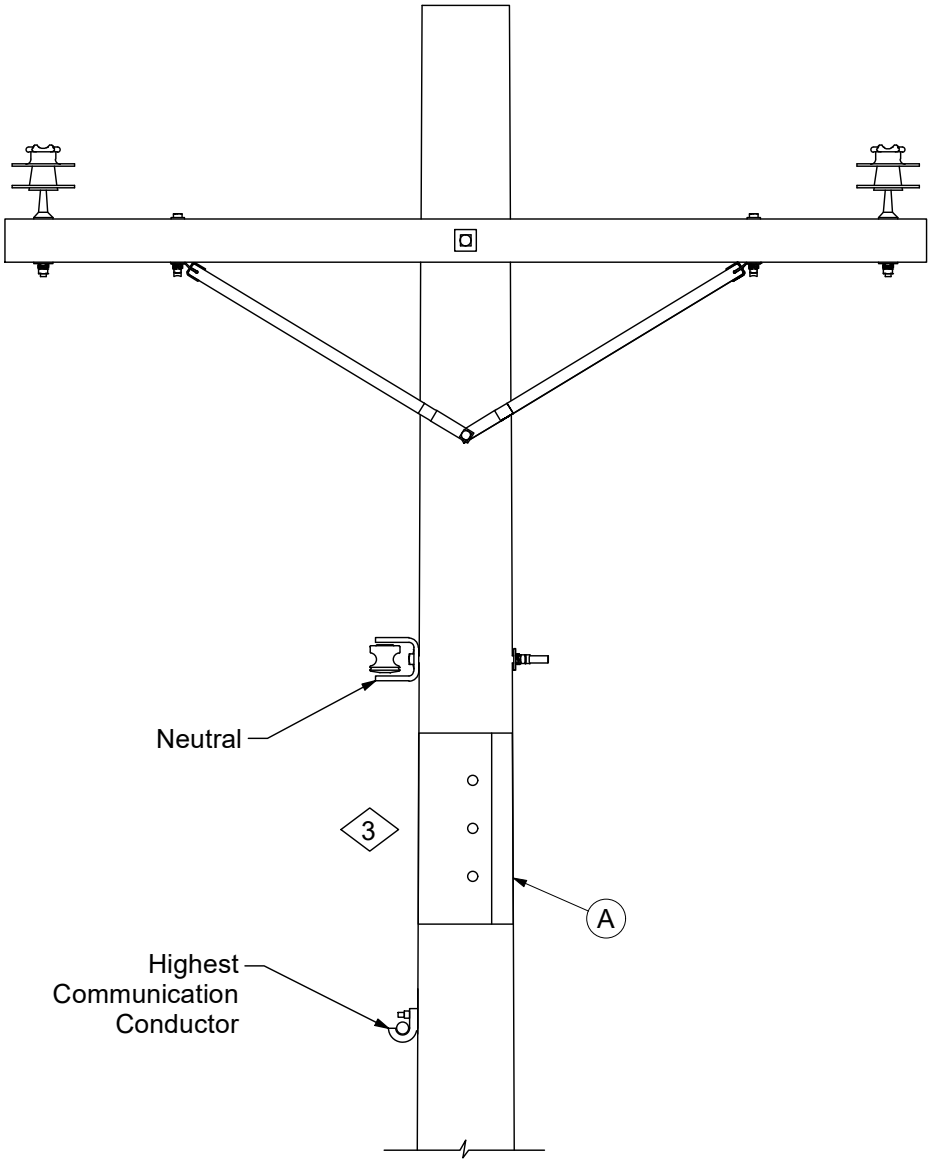
1. The cover can be installed using live line tools.

2. If configuration has two wood cross arms, use standard DCS **05 16 12 02**.

3. Line hose is required if the jumper is bare conductor.

	ITEM	STK / DCS #	DESCRIPTION 05 16 12 **	01	02
1	A	23 17 409	Cover, DE	2	4
3,@	B	23 17 413	Cover, Loopover, up to 0.5” Cond. Diameter (ft)	10	20
		23 17 414	Cover, Loopover, 0.5” to 0.856” Cond. Diameter (ft)	10	20
	C	23 17 416	Cover, Extension Arm	2	4
	D	111	Wildlife cover Installation	1	2

REV	DATE	ENG	DESCRIPTION
3	04/01/22	KR	Rev. intro & notes; Removed tape from BOM; Added 23 17 416 to BOM
2	03/07/17	JC	



CONSTRUCTION NOTE(s):

1. Pole wrap may be installed on poles requiring additional animal protection.
2. Pole wrap is received in 100' roles.

Rough side of wrap is placed against pole to allow water to evaporate against pole.

ITEM	STK / DCS #	DESCRIPTION 05 16 13 **	01
A	23 17 473	Animal Guard - Pole Wrap 30"	1
B	111	Wildlife Cover Installation	1

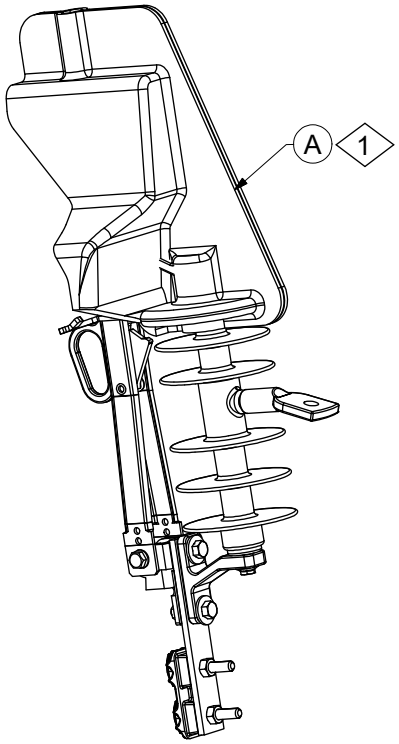
REV	DATE	ENG	DESCRIPTION
2	04/01/22	KR	New format, Moved pole wrap between neutral & comm & revised notes 2 & 3
1	04/18/18	KR	

WILDLIFE PROTECTION

600 Amp Vertical Switch Cover

05 16 14 **
15kV
1 of 1

The cover described in this standard is for wildlife contact only and NOT intended for personal protection.



CONSTRUCTION NOTE(s):

1. Caution: At temperatures below 0° F the cutout covers become rigid and lose their flexibility.

ITEM	STK / DCS #	DESCRIPTION 05 16 14 **	01
A	23 17 512	Wildlife Guard - Vertical Switch 600 Amp	1
B	111	Cutout cover Installation	1

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
1	04/01/22	KR	New Standard

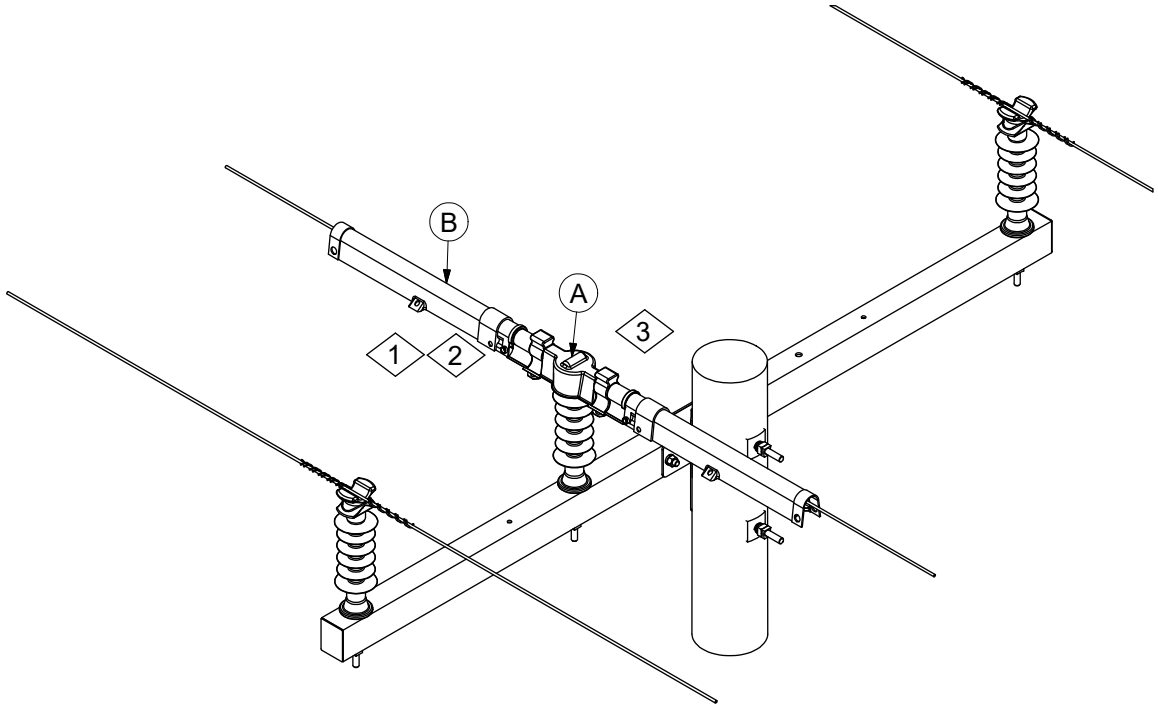
WILDLIFE PROTECTION

Conductor Cover - Single Pin

05 17 01 **
35kV
1 of 1

The covers described in this standard are for wildlife contact only and NOT intended for personal protection.

The conductor and insulator cover shown in this standard shall be used where horizontal conductor spacing is less than five feet.



CONSTRUCTION NOTE(s):

1. The cover can be installed with live line tools.

2. Cover fits #6 Cu to 795 AAC conductor.

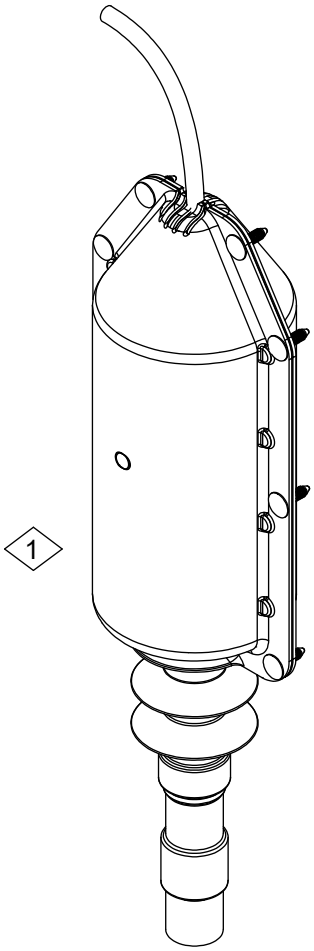
3. This cover can only be installed on crossarm pin insulator Stock #25 05 203.

	ITEM	STK / DCS #	DESCRIPTION 05 17 01 **	01
1	A	23 17 526	Cover, Single Pin Configuration	1
	B	23 17 527	Cover, Extension Arm	2
	C	111	Wildlife Cover Installation	1

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
1	04/01/22	KR	New Standard

The cover described in this standard is for wildlife contact only and NOT intended for personal protection.



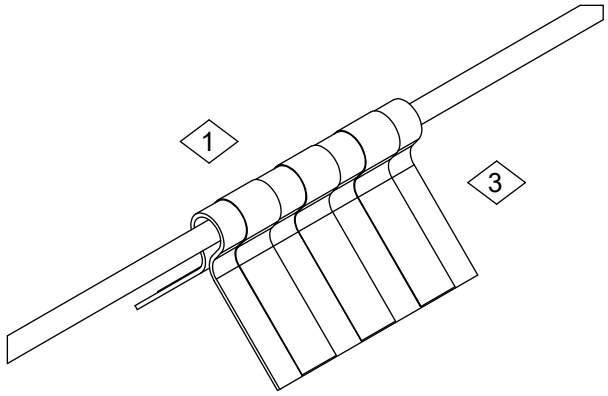
CONSTRUCTION NOTE(s):

1. This cover goes over the top shed only.

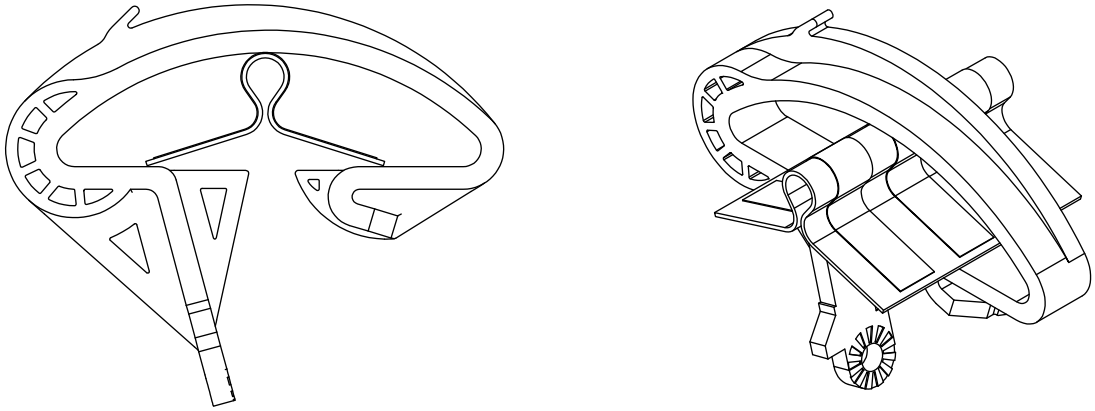
	ITEM	STK / DCS #	DESCRIPTION 05 18 01 **	01
1	A	23 17 417	Guard - Wildlife, Cover, Termination, #1 to 750 kcmil	1
	B	111	Cutout cover Installation	1

REV	DATE	ENG	DESCRIPTION
1	04/01/22	KR	New Standard

Avian flight diverters provide maximum visibility in low light conditions from all angles to prevent avian outages and collisions on distribution conductors.



Flight Diverter Installed



Hotstick Adapter With Diverter

CONSTRUCTION NOTE(s):

1. First flight diverter is 15' away from pole.

2. Flight diverters can be installed using live line tools. Hot stick adapter Stock #86 11 444 is available for conductor diameters 0.2"-1.05" and Stock #86 11 445 for conductor diameters 1.10"-1.60".

3. If bird collisions have been reported each diverter is spaced 15' apart. If these are being placed as precautionary measures each diverter is placed 30' apart.

	ITEM	STK / DCS #	DESCRIPTION 05 20 01 **	01
3,@	A	23 17 471	Cover, Flight Diverter, 0.2" - 0.56" Cond. Diameter	#
		23 17 470	Cover, Flight Diverter, 0.57" - 1.05" Cond. Diameter	#
		23 67 543	Cover, Flight Diverter, 1.10" - 1.60" Cond. Diameter	#
@	B	111	Wildlife Cover Installation	#

REV	DATE	ENG	DESCRIPTION
1	04/01/22	KR	New Standard

INSULATORS & SUPPORTS 06

STATIC WIRE ATTACHMENT - 35kV, 69kV.....06 00 11 **

SECONDARY CLEVIS - 600V.....06 01 01 **

3-WIRE SECONDARY ASSEMBLY - 600V.....06 01 03 **

4-WIRE SECONDARY ASSEMBLY - 600V.....06 01 07 **

PIN INSULATORS - CROSSARMS & POLE TOP - 15kV.....06 12 01 **

WIRE TRAINING ASSEMBLY - 15kV.....06 12 20 04

FIBERGLASS STANDOFF ASSEMBLY - 15kV.....06 12 21 **

DEADENDS, FLOATING ANGLES, AND LOOPS ON POLES - 15kV.....06 12 30 **

DEADENDS & LOOPS ON FIBERGLASS CROSSARMS - 15kV.....06 12 35 **

VERTICAL LINE POST INSULATORS - 35kV.....06 34 01 **

HORIZONTAL LINE POST INSULATORS - 35kV.....06 34 03 **

DEADENDS, FLOATING ANGLES, AND LOOPS ON POLES - 35kV, 69kV.....06 34 60 **

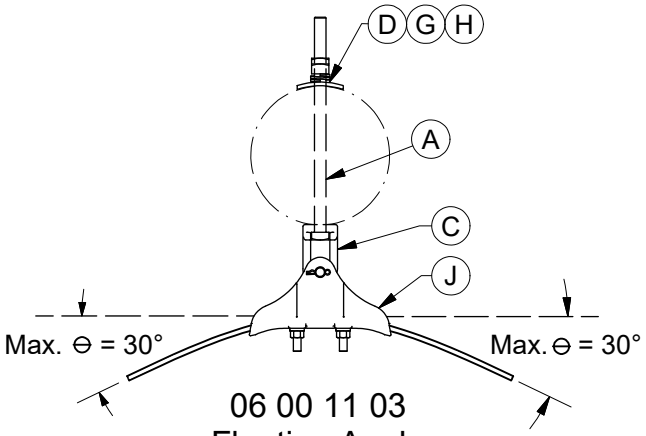
DEADENDS & LOOPS ON FIBERGLASS CROSSARMS - 35kV, 69kV.....06 34 68 **

T2 STANDARD CONDUCTORS - DEADENDS - 35kV, 69 kV.....06 34 73 **

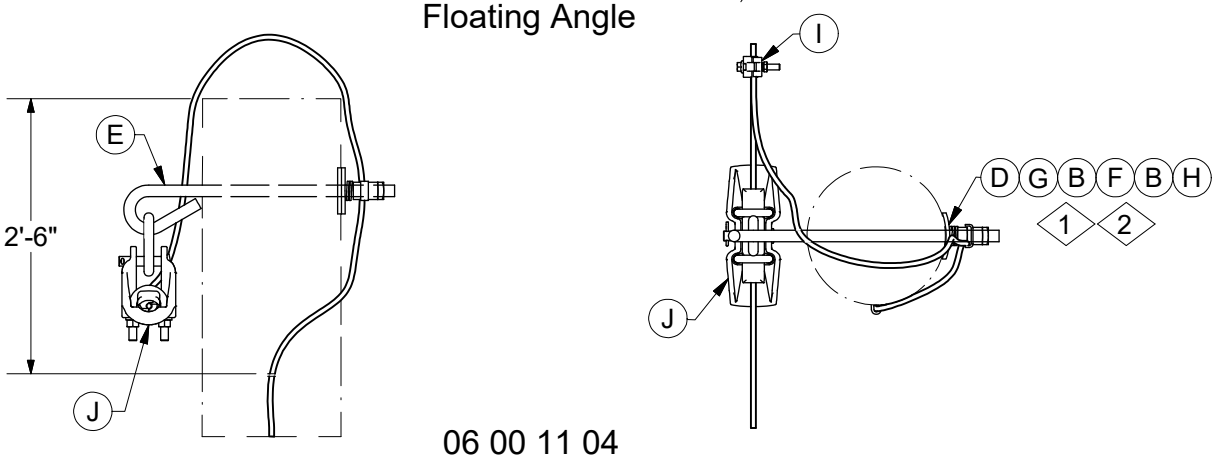
T2 STANDARD CONDUCTORS - SUSPENSION - 35kV, 69kV.....06 34 74 **

VERTICAL LINE POST INSULATORS - 69kV.....06 69 01 **

HORIZONTAL LINE POST INSULATORS - 69kV.....06 69 03 **



06 00 11 03
Floating Angle



06 00 11 04
Tangent and Angle

CONSTRUCTION NOTE(s):

1. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

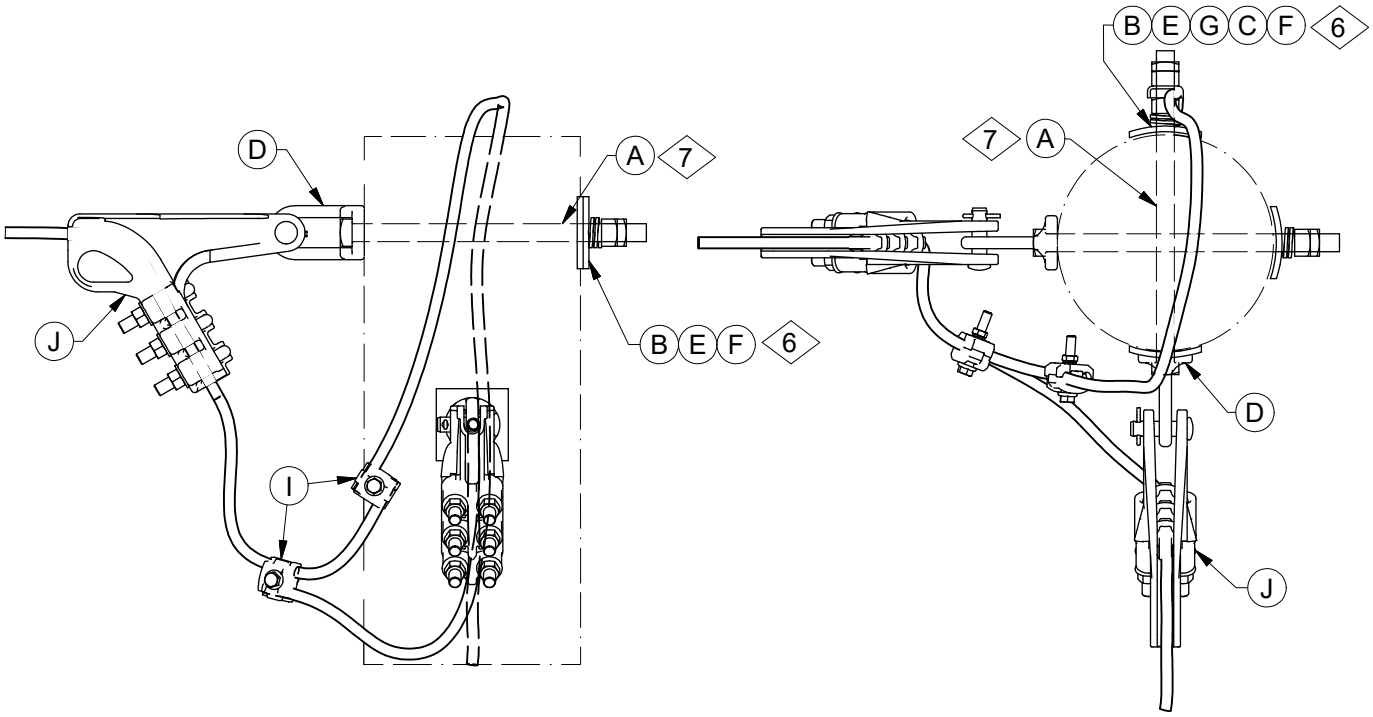
2. For larger wood poles or composite poles 16" static support (Stock #23 68 459), 18" static support (Stock #23 68 460), or 20" static support (Stock #23 68 614) will be required.

	ITEM	STK / DCS #	DESCRIPTION 06 00 11 **	03	04
	A	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	1	-
	B	23 15 001	Nut, Square, 3/4"	-	2
	C	23 59 095	Eyelet, 3/4"	1	-
	D	23 66 031	Washer, Curved, Square, 3/4"	1	1
1,2	E	23 68 458	Static Support, 3/4" X 14"	-	1
	F	23 68 496	Clip, Bonding, 3/4" Bolt Dia.	-	1
	G	23 66 135	Lock Washer - 3/4" Double Coil	1	1
	H	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	1	1
@	I	23 68 234	Clamp, Guy Wire, 1/2", for 110.8 (12/7) ACSR Static	1	1
		17 51 032	Clamp, Parallel Groove, for 1/0 (7) AAAC Static	1	1
@	J	SC*W	Clamp, Suspension	1	1

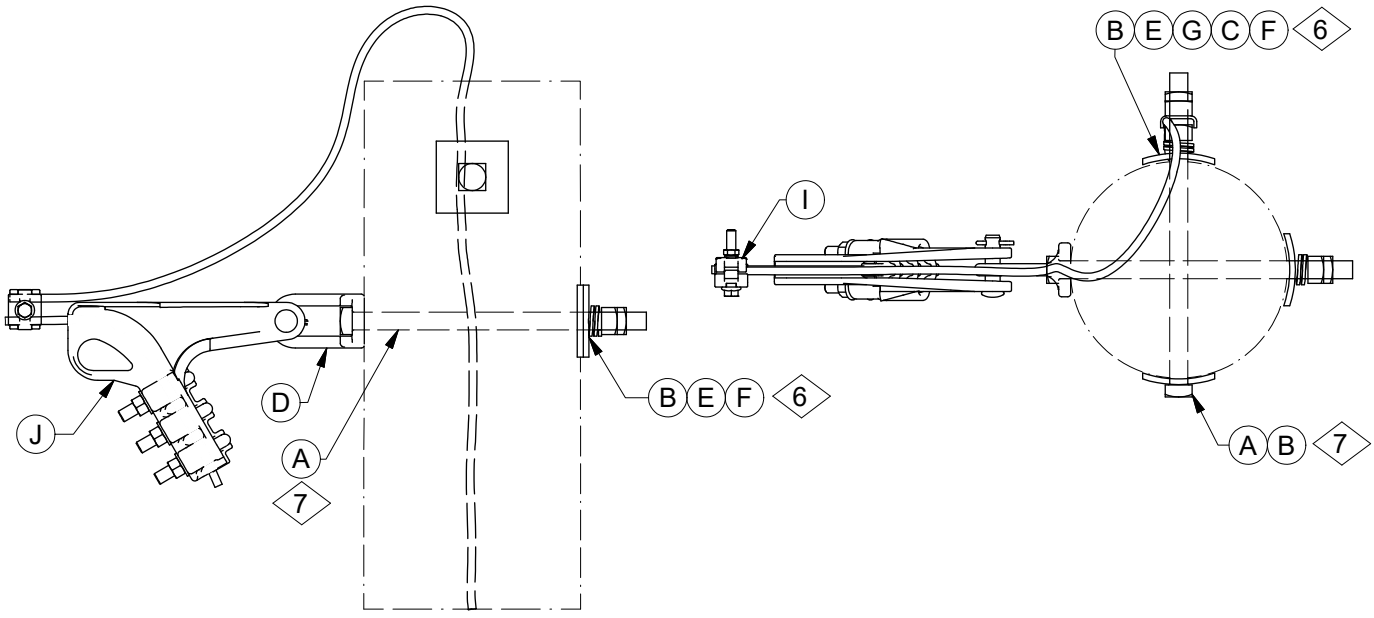
DESIGN NOTE(s):

3. For pole top static, see DCS **06 12 01 02**, **06 12 01 13**
4. For OPGW static attachment see DCS **Section 18**.
5. Use Stock #17 52 235 for OPGW to 110.8 ACSR and Stock #17 52 233 for OPGW to 1/0 AAAC connections.

REV	DATE	ENG	DESCRIPTION
8	07/01/21	NH	Added Notes 1-10; Renamed DCSs; Added Locking Hardware
7	01/19/12	DCG	

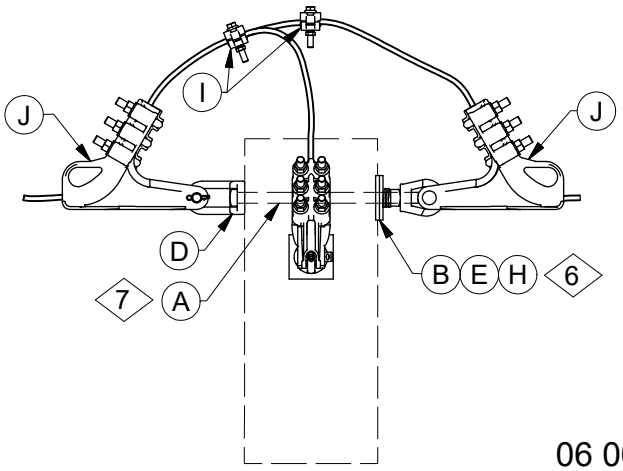


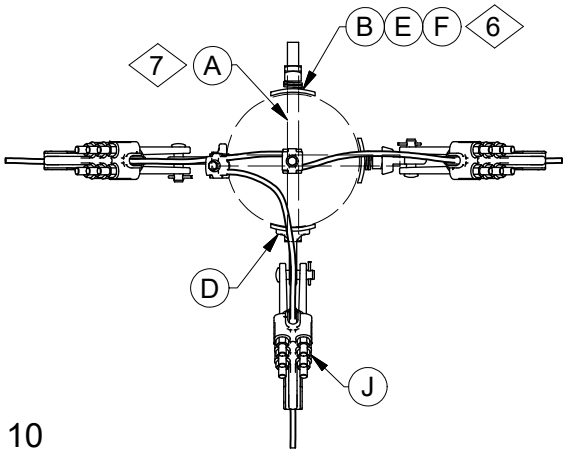
06 00 11 05
Corner Deadend w/ Pole Ground



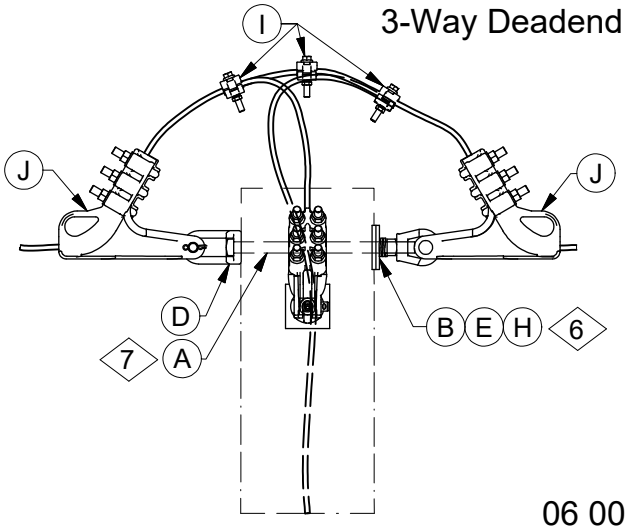
06 00 11 08
Deadend Endline w/ Pole Ground

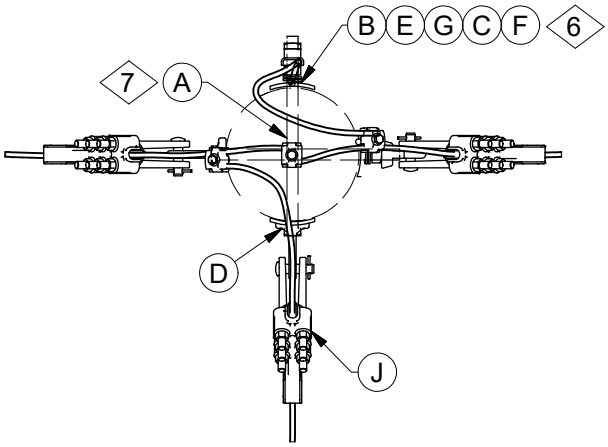
REV	DATE	ENG	DESCRIPTION
8	07/01/21	NH	Added Notes 1-10; Renamed DCSs; Added Locking Hardware
7	01/19/12	DCG	





06 00 11 10
3-Way Deadend w/o Pole Ground





06 00 11 11
3-Way Deadend w/ Pole Ground

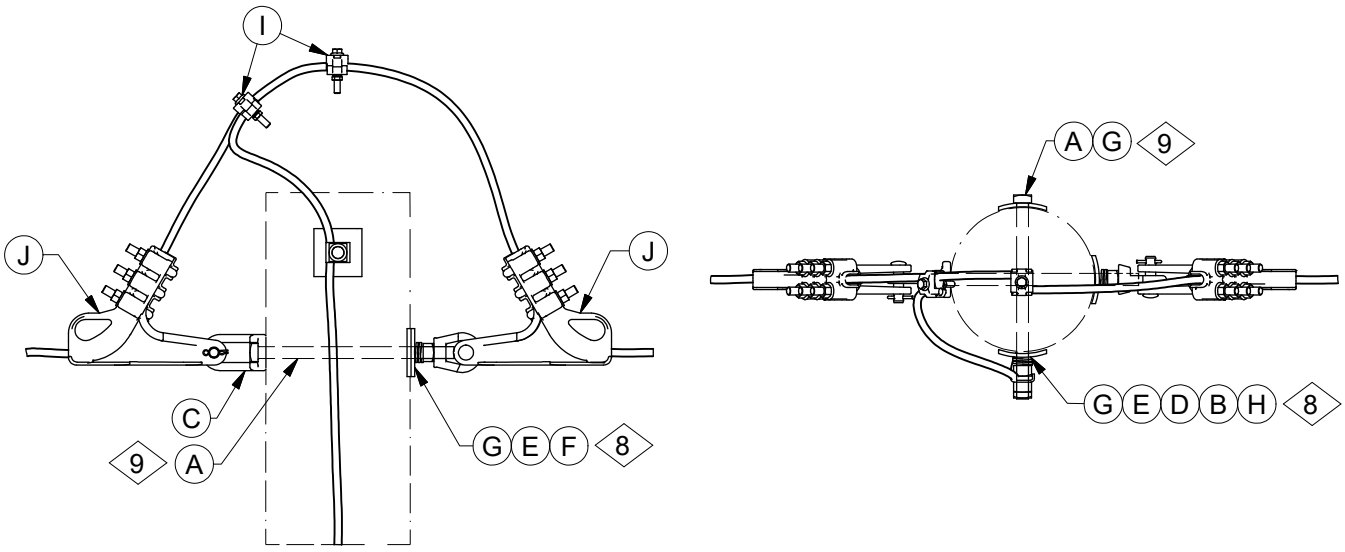
CONSTRUCTION NOTE(s):

6. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

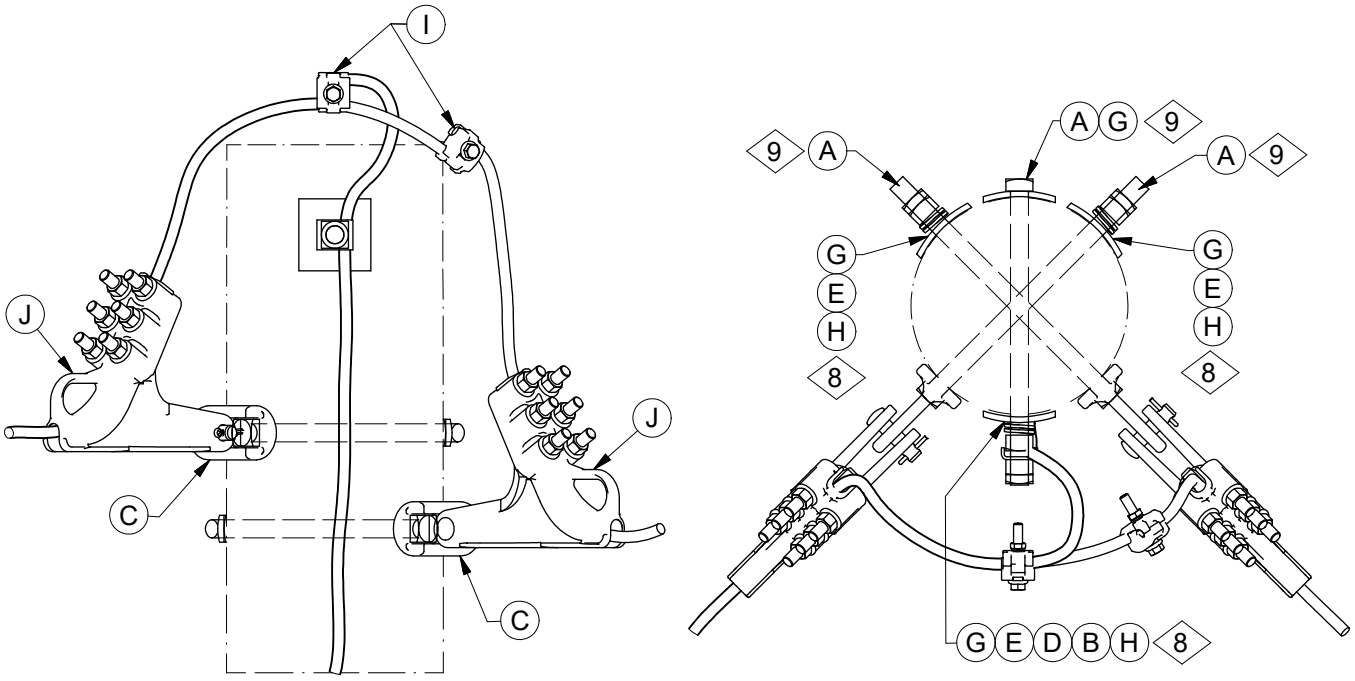
7. Use longer machine bolts for larger wood or composite poles if required.

	ITEM	STK / DCS #	DESCRIPTION 06 00 11 **	05	08	10	11
6,7	A	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	2	2	2	2
	B	23 66 031	Washer, Curved, Square, 3/4"	3	3	3	3
	C	23 15 001	Nut, Square, 3/4"	1	1	-	1
	D	23 59 095	Eyelet, 3/4"	2	1	2	2
	E	23 66 135	Lock Washer - 3/4" Double Coil	2	2	2	2
	F	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	2	2	1	1
	G	23 68 496	Clip, Bonding, 3/4" Bolt Dia.	1	1	-	1
	H	23 65 018	Eyenut, 3/4"	-	-	1	1
@	I	23 68 234	Clamp, Guy Wire, 1/2", for 110.8 (12/7) ACSR Static	2	1	2	3
		17 51 032	Clamp, Parallel Groove, for 1/0 (7) AAAC Static	2	1	2	3
@	J	DEC*W	Clamp, Deadend	2	1	3	3

REV	DATE	ENG	DESCRIPTION
8	07/01/21	NH	Added Notes 1-10; Renamed DCSs; Added Locking Hardware
7	01/19/12	DCG	

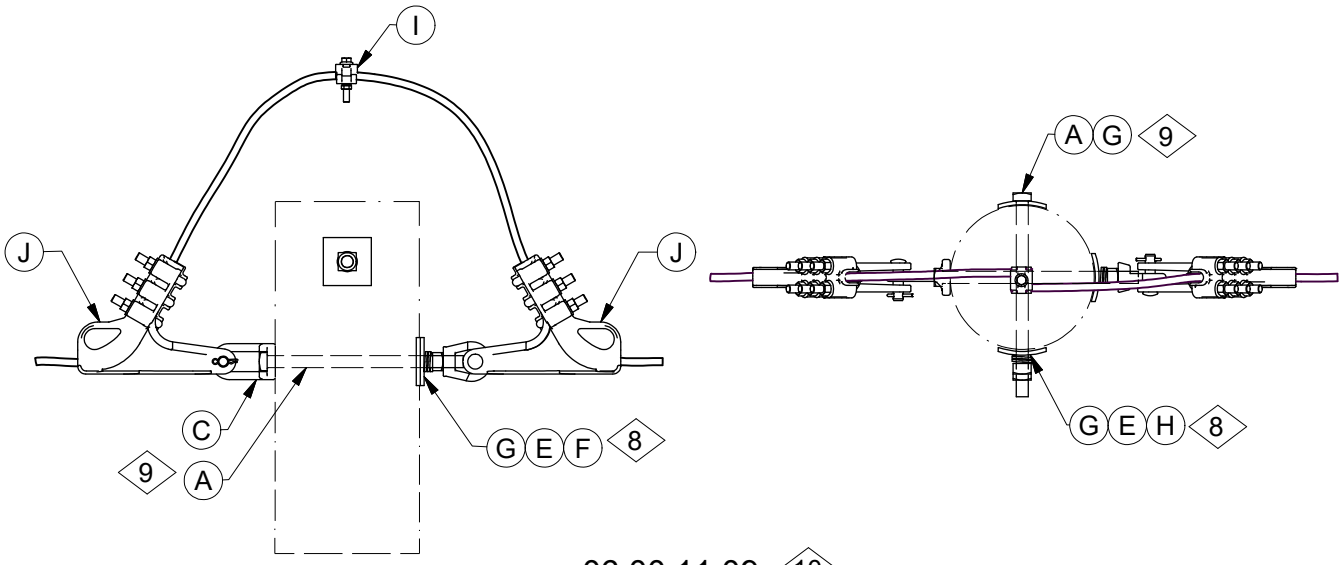


06 00 11 06
Deadend Tangent w/ Pole Ground



06 00 11 07
Deadend Angle w/ Pole Ground

REV	DATE	ENG	DESCRIPTION
8	07/01/21	NH	Added Notes 1-10; Renamed DCSs; Added Locking Hardware
7	01/19/12	DCG	



06 00 11 09 ◇10◇
Deadend Tangent w/o Pole Ground

CONSTRUCTION NOTE(s):

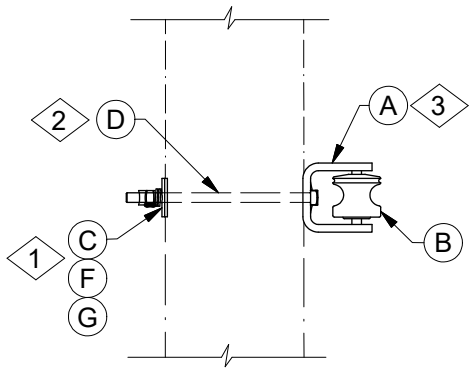
◇8.◇ Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

◇9.◇ Use longer machine bolts for larger wood or composite poles if required.

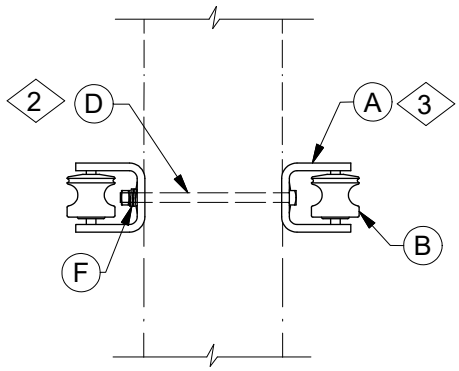
	ITEM	STK / DCS #	DESCRIPTION 06 00 11 **	06	07	09
8,9	A	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	2	3	2
	B	23 15 001	Nut, Square, 3/4"	1	1	-
	C	23 59 095	Eyelet, 3/4"	1	2	1
	D	23 68 496	Clip, Bonding, 3/4" Bolt Dia.	1	1	-
	E	23 66 135	Lock Washer - 3/4" Double Coil	2	3	2
	F	23 65 018	Eyenut, 3/4"	1	-	1
	G	23 66 031	Washer, Curved, Square, 3/4"	3	4	3
	H	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	1	3	1
@	I	23 68 234	Clamp, Guy Wire, 1/2", for 110.8 (12/7) ACSR Static	2	2	1
		17 51 032	Clamp, Parallel Groove, for 1/0 (7) AAAC Static	2	2	1
@	J	DEC*W	Clamp, Deadend	2	2	2

DESIGN NOTE(s):

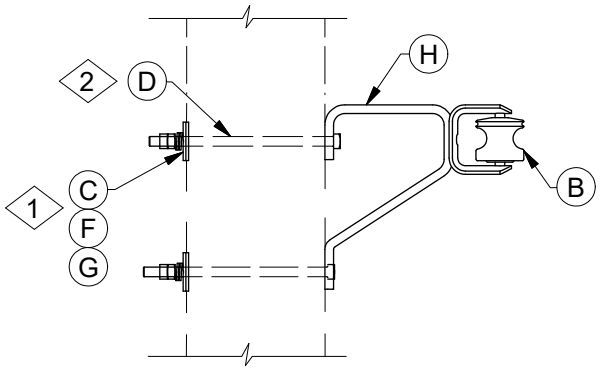
◇10.◇ DCS 06 00 11 09 used on switch and recloser poles if ground wire is not bonded to the static.



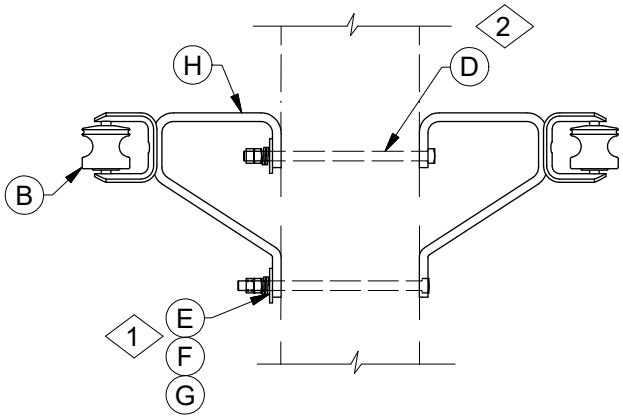
06 01 01 01
Single Clevis



06 01 01 02
Double Clevis



06 01 01 03
Single Clevis w/ Extension Bracket



06 01 01 04
Double Clevis w/ Extension Bracket

CONSTRUCTION NOTE(s):

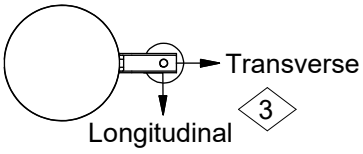
1. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

2. Use longer machine bolts for larger wood or composite poles if required.

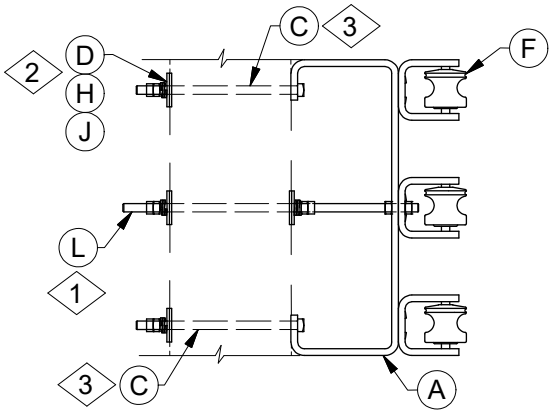
	ITEM	STK / DCS #	DESCRIPTION 06 01 01 **	01	02	03	04
3	A	23 06 040	Clevis - Secondary	1	2	-	-
	B	25 59 044	Insulator, Spool	1	2	1	2
	C	23 66 207	Washer, Curved, Square, 5/8"	1	-	2	-
	D	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	1	1	2	2
	E	23 66 027	Washer, Flat, Square 5/8"	-	-	-	2
	F	23 66 134	Lock Washer - 5/8" Double Coil	1	1	2	2
	G	23 65 043	Lock Nut - 5/8" Square	1	-	2	2
	H	23 06 067	Bracket, Ext. 1 Clevis	-	-	1	2

DESIGN NOTE(s):

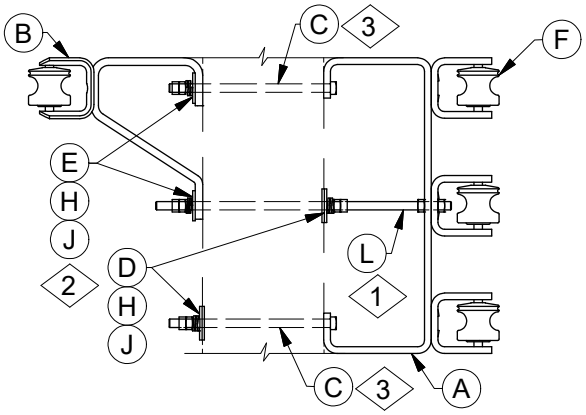
3. Working loads for secondary clevis:
   - Transverse = 2000 lbs
   - Longitudinal = 650 lbs



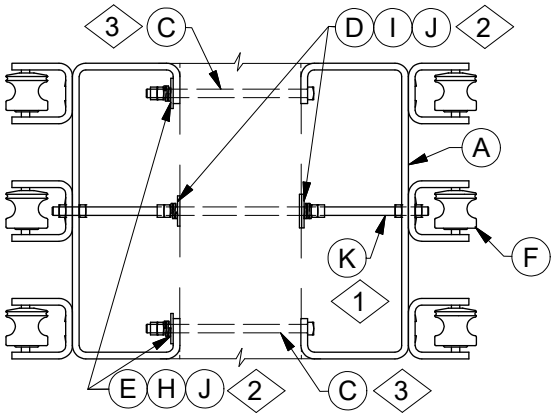
REV	DATE	ENG	DESCRIPTION
2	07/01/21	NH	Added Notes 1-3; Renamed DCSs
1	09/18/00	DCG	



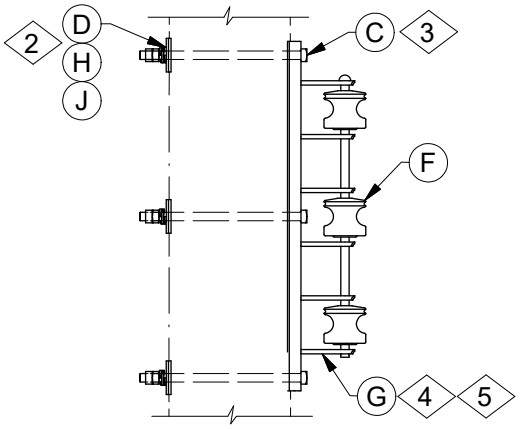
06 01 03 01



06 01 03 02



06 01 03 03



06 01 03 04

DCS #	DESCRIPTION
06 01 03 01	Single 3-Wire Rack w/ Extension Bracket
06 01 03 02	3-Wire Rack w/ Single Clevis & Extension Bracket
06 01 03 03	Double 3-Wire Rack w/ Extension Bracket
06 01 03 04	Single 3-Wire Rack

CONSTRUCTION NOTE(s):

1. Reinforce with DA bolt for deadends, span guys, side strain, or line angles in excess of 5°.

2. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

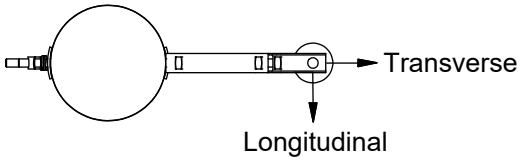
3. Use longer machine bolts for larger wood or composite poles if required.

	ITEM	STOCK #	DESCRIPTION 06 01 03 **	01	02	03	04
	A	23 06 054	Bracket, Ext. 3 Clevis	1	1	2	-
	B	23 06 067	Bracket, Ext. 1 Clevis	-	1	-	-
	C	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	2	2	2	3
	D	23 66 207	Washer, Curved, Square, 5/8"	4	2	1	3
	E	23 66 027	Washer, Flat, Square 5/8"	-	2	3	-
5	F	25 59 044	Insulator, Spool	3	4	6	3
	G	23 11 001	Rack, Secondary, 3 Spool	-	-	-	1
	H	23 66 134	Lock Washer - 5/8" Double Coil	4	4	4	3
	I	23 65 011	Nut, Square, 5/8"	-	-	2	-
	J	23 65 043	Lock Nut - 5/8" Square	4	4	4	3
1@	K	23 53 047	Bolt, DA, 5/8" Dia x 28" w/ 4 square nuts	-	-	1	-
1@	L	23 53 006	Bolt, DA, 5/8" Dia x 22" w/ 4 square nuts	1	1	-	-

DESIGN NOTE(s):

4. Rack mounted directly on pole should be used in all cases unless climbing space requires use of the extension.

5. Working loads for 3-wire secondary rack:
   - Transverse = 1000 lbs (per position)
   - Longitudinal = 650 lbs (per position)

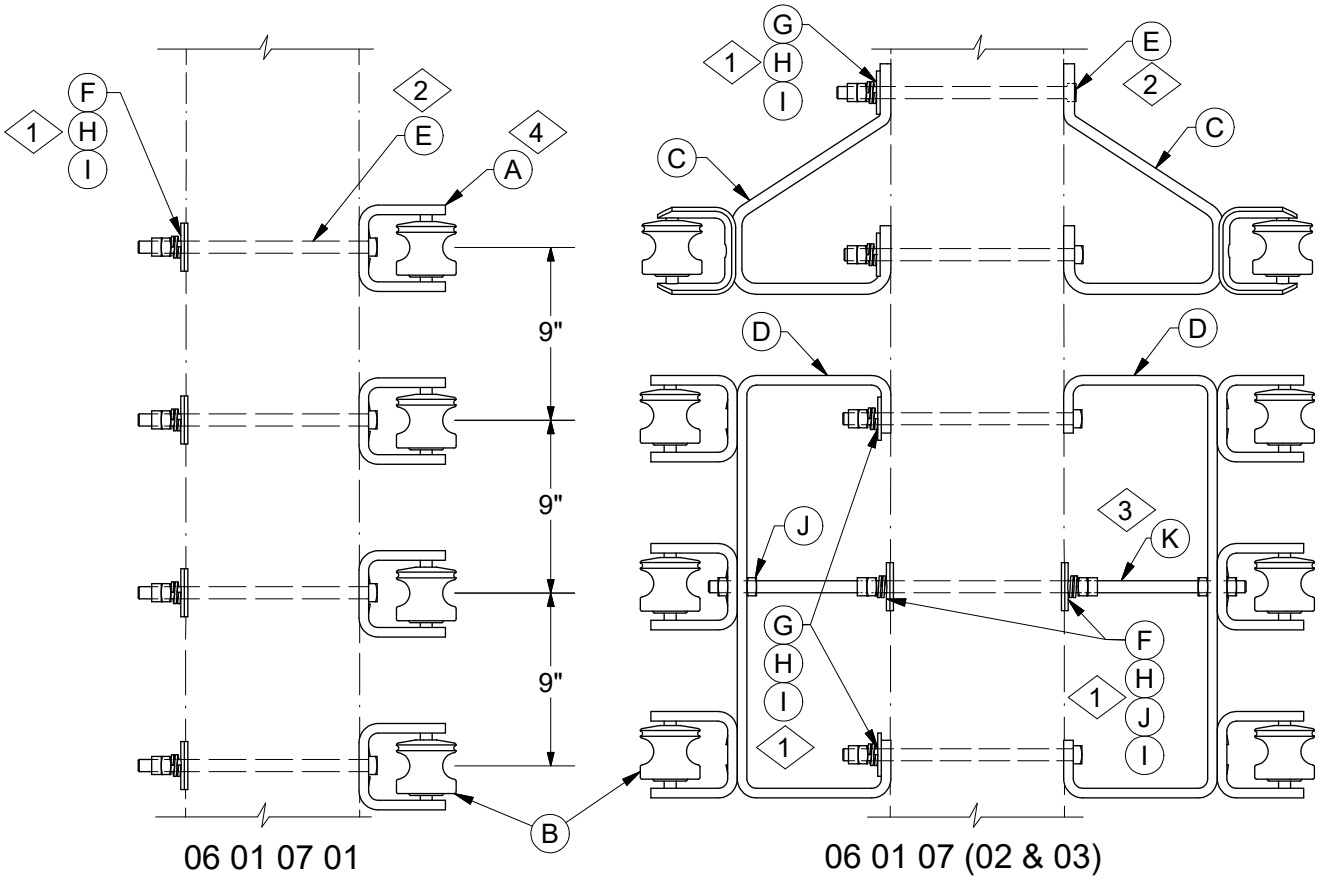


REV	DATE	ENG	DESCRIPTION
5	07/01/21	NH	Title change; Added description table & notes 2,3,5
4	7/5/11	DCG	

INSULATORS AND SUPPORTS

4-Wire Secondary Assembly

06 01 07 **
600V
1 of 1



06 01 07 01 06 01 07 (02 & 03)

CONSTRUCTION NOTE(s):

1. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

2. Use longer machine bolts for larger wood or composite poles if required.

3. Reinforce with DA bolt for deadends, span guys, side strain, or line angles in excess of 5°.

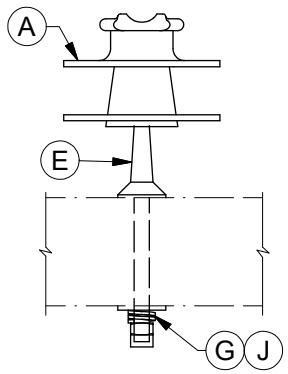
	ITEM	STK / DCS #	DESCRIPTION 06 01 07 **	01	02	03
	A	23 06 040	Clevis - Secondary	4	-	-
	B	25 59 044	Insulator, Spool	4	4	8
	C	23 06 067	Bracket, Ext. 1 Clevis	-	1	2
	D	23 06 054	Bracket, Ext. 3 Clevis	-	1	2
1,2	E	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	4	4	4
	F	23 66 207	Washer, Curved, Square, 5/8"	4	6	2
	G	23 66 027	Washer, Flat, Square 5/8"	-	-	4
	H	23 66 134	Lock Washer - 5/8" Double Coil	4	6	6
	I	23 65 043	Lock Nut - 5/8" Square	4	6	6
	J	23 65 011	Nut, Square, 5/8"	-	-	2
1,3 @	K	23 53 047	Bolt, DA, 5/8" Dia x 28" w/ 4 square nuts	-	-	1
		23 53 006	Bolt, DA, 5/8" Dia x 22" w/ 4 square nuts	-	1	-

DESIGN NOTE(s):

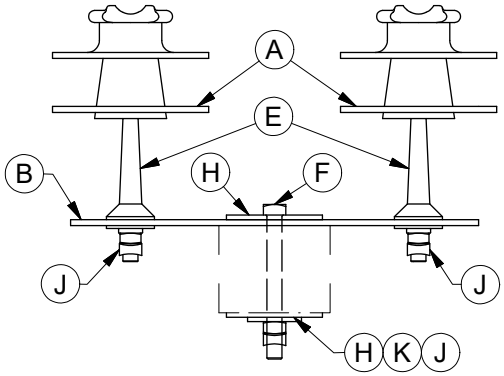
4. Working loads for secondary clevis:
   - Transverse = 2000 lbs
   - Longitudinal = 650 lbs

DISTRIBUTION CONSTRUCTION STANDARDS

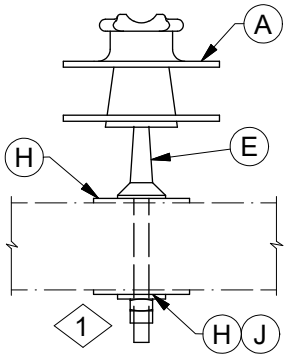
REV	DATE	ENG	DESCRIPTION
4	07/01/21	NH	Title change; Added notes 1,2,4; Replcd 4-wire w/ (4) 1-wire assemblies
3	8/5/08	DCG	



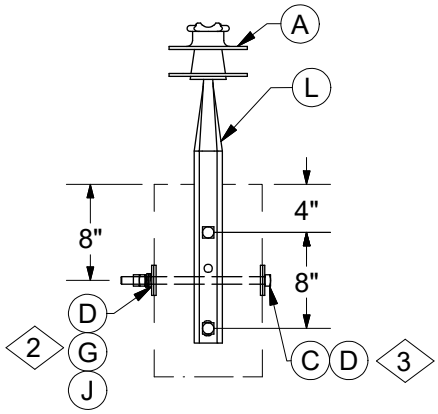
06 12 01 01



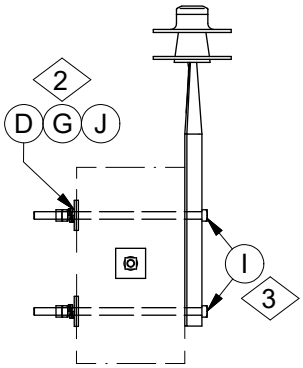
06 12 01 11



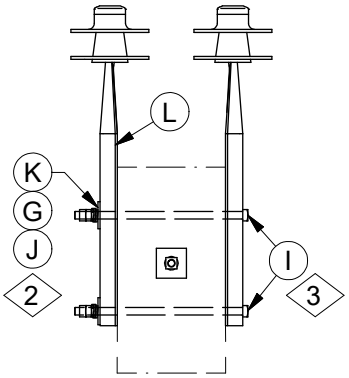
06 12 01 12



06 12 01 (02 & 13)



06 12 01 02
(Front View)



06 12 01 13
(Front View)

DCS#	DESCRIPTION
06 12 01 01	Single Pin & Insulator - Wood Crossarm
06 12 01 11	Double Pin & Insulator - FG Crossarm
06 12 01 12	Single Pin & Insulator - FG Crossarm
06 12 01 02	Single Pole Top Pin & Insulator - 24" and 30"
06 12 01 13	Double Pole Top Pin & Insulator - 24" and 30"

CONSTRUCTION NOTE(s):

1. The 2" washer received with the pin should be used after the 4" washer.

2. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

3. Use longer machine bolts for larger wood or composite poles if required.

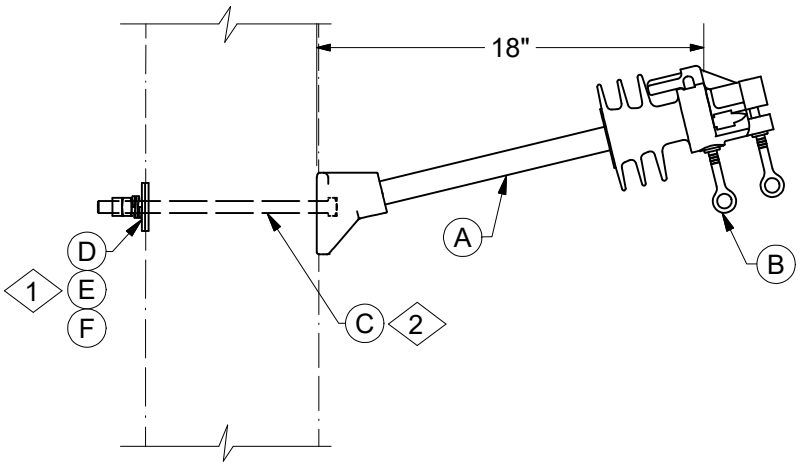
REV	DATE	ENG	DESCRIPTION
13	07/01/21	NH	Title change; Added description table & notes 2,3 & 4
12	9/11/17	KP	

	ITEM	STK / DCS #	DESCRIPTION 06 12 01 **	01	11	12	02	13
	A	25 05 069	Insulator, Pin Type, 12kV	1	2	1	1	2
	B	23 77 212	Plate Heel Brace - 8-3/4" to 13-3/8"	-	1	-	-	-
2,3	C	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	-	-	-	1	1
	D	23 66 207	Washer, Curved, Square, 5/8"	-	-	-	4	2
	E	23 62 136	Pin, Insulator, Short Shank	-	2	-	-	-
		23 62 028	Pin, Insulator, Long Shank	1	-	1	-	-
	F	23 52 318	Bolt, Mach., 5/8" x 6" w/ square nut	-	1	-	-	-
	G	23 66 134	Lock Washer - 5/8" Double Coil	1	-	-	3	3
	H	23 66 132	Washer, Flat, Sq., 4" x 4", w/ 13/16" Hole	-	2	2	-	-
2,3	I	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	-	-	-	2	2
	J	23 65 043	Lock Nut - 5/8" Square	1	3	1	3	3
	K	23 66 027	Washer, Flat, Square 5/8"	-	1	-	-	2
4	L	23 62 156	Pin - Insulator, Pole Top, 24"	-	-	-	1	2

DESIGN NOTE(s):

4. Use the 30" pole top pin (Stock #23 62 115) when additional clearance is required.

REV	DATE	ENGR	DESCRIPTION
13	07/01/21	NH	Title change; Added description table & notes 2,3 & 4
12	9/11/17	KP	



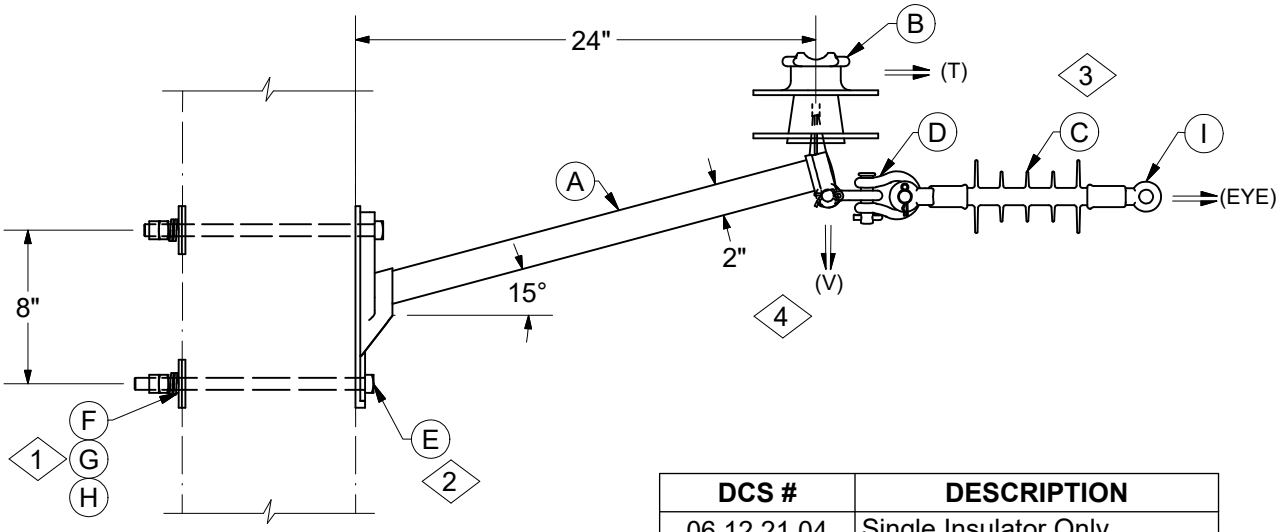
CONSTRUCTION NOTE(s):

1. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

2. Use longer machine bolts for larger wood or composite poles if required.

	ITEM	STK / DCS #	DESCRIPTION 06 12 20 **	04
1,2	A	23 12 123	Bracket, FG, Standoff, LD, 18"	1
	B	25 05 143	Insulator, Vice Top, 12kV	1
	C	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	1
	D	23 66 207	Washer, Curved, Square, 5/8"	1
	E	23 66 134	Lock Washer - 5/8" Double Coil	1
	F	23 65 043	Lock Nut - 5/8" Square	1

REV	DATE	ENG	DESCRIPTION
5	07/01/21	NH	Title change; added notes 1 & 2 , locking hardware
4	11/05/15	DCG	



DCS #	DESCRIPTION
06 12 21 04	Single Insulator Only
06 12 21 05	Single Insulator & Deadend
06 12 21 06	Single Deadend Only

CONSTRUCTION NOTE(s):

1. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

2. Use longer machine bolts for larger wood or composite poles if required.

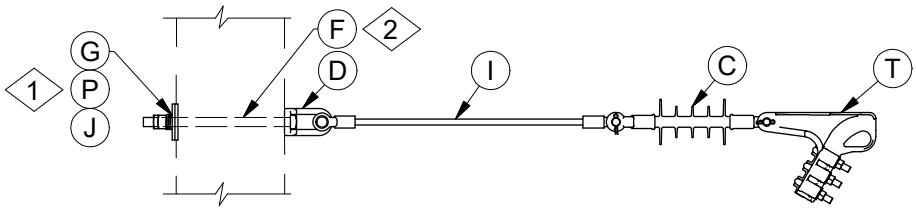
	ITEM	STK / DCS #	DESCRIPTION 06 12 21 **	04	05	06
	A	23 06 085	Bracket, Standoff, 24" Fiberglass	1	1	1
	B	25 05 069	Insulator, Pin Type, 12kV	1	1	-
	C	25 06 052	Insulator, Deadend, 12kV	-	1	1
	D	23 68 181	Shackle - Deadend	-	2	2
1,2	E	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	2	2	2
	F	23 66 207	Washer, Curved, Square, 5/8"	2	2	2
	G	23 66 134	Lock Washer - 5/8" Double Coil	2	2	2
	H	23 65 043	Lock Nut - 5/8" Square	2	2	2
@	I	DEC*W	Clamp, Deadend	-	1	1

DESIGN NOTE(s):

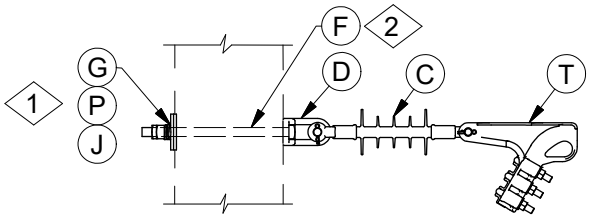
3. Working load for deadend insulator = 7500 lb.

4. Working loads for standoff bracket:
   a) Vertical (V) = 1000 lb
   b) Transverse (T) = 1000 lb
   c) Take-off (EYE) = 5000 lb

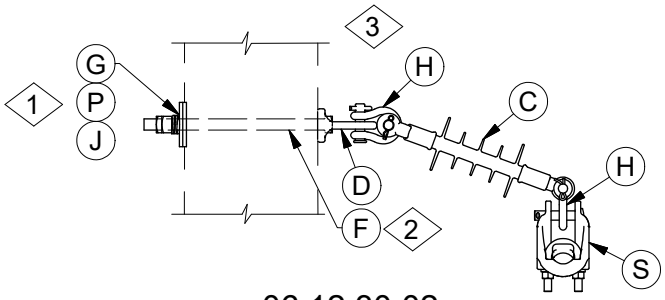
REV	DATE	ENG	DESCRIPTION
7	07/01/21	NH	Title change; Added notes 1-4 & description table
6	04/09/02	DCG	



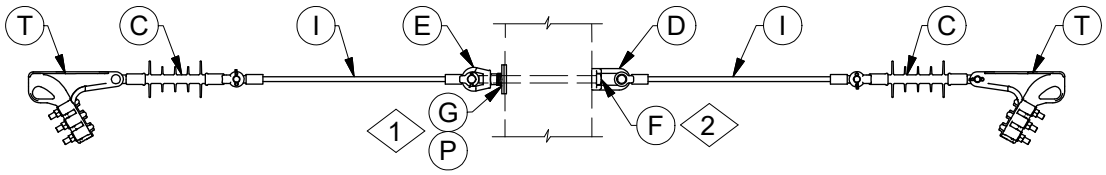
06 12 30 01
Straight Deadend w/ FG Extension



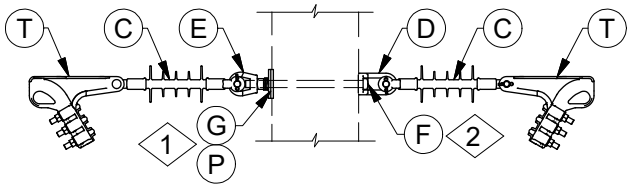
06 12 30 11
Straight Deadend w/o FG Extension



06 12 30 02
Floating Angle

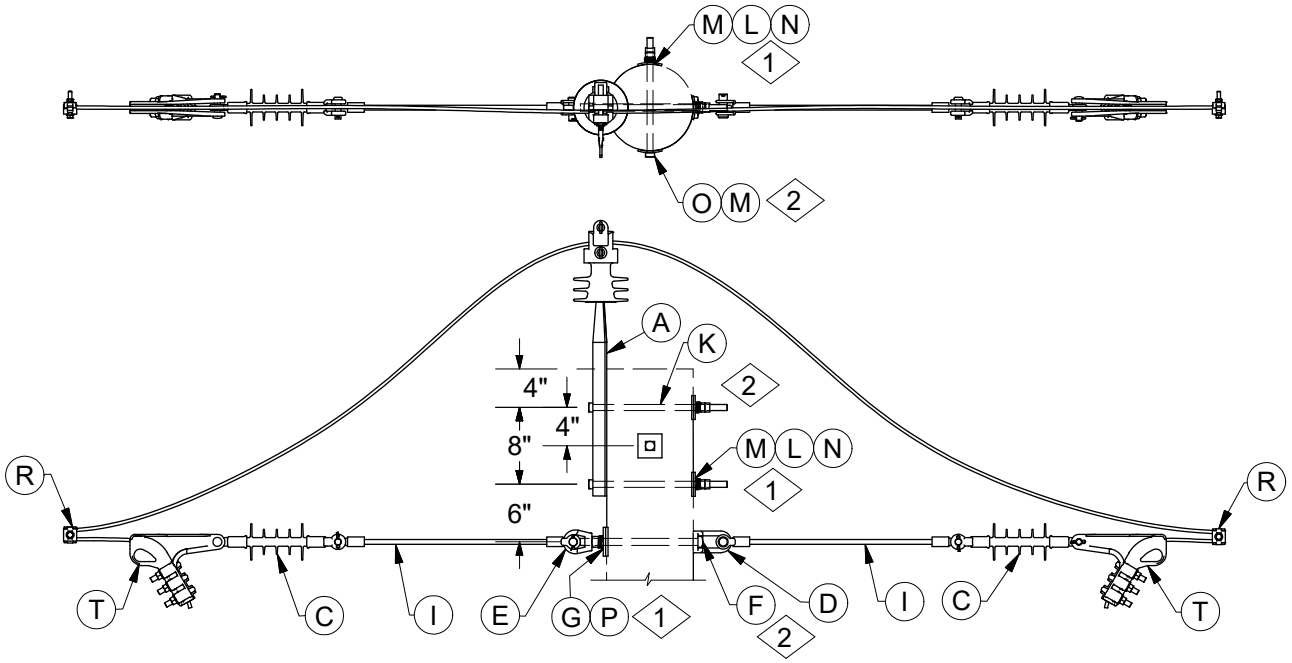


06 12 30 03
Double Deadend w/ FG Extensions

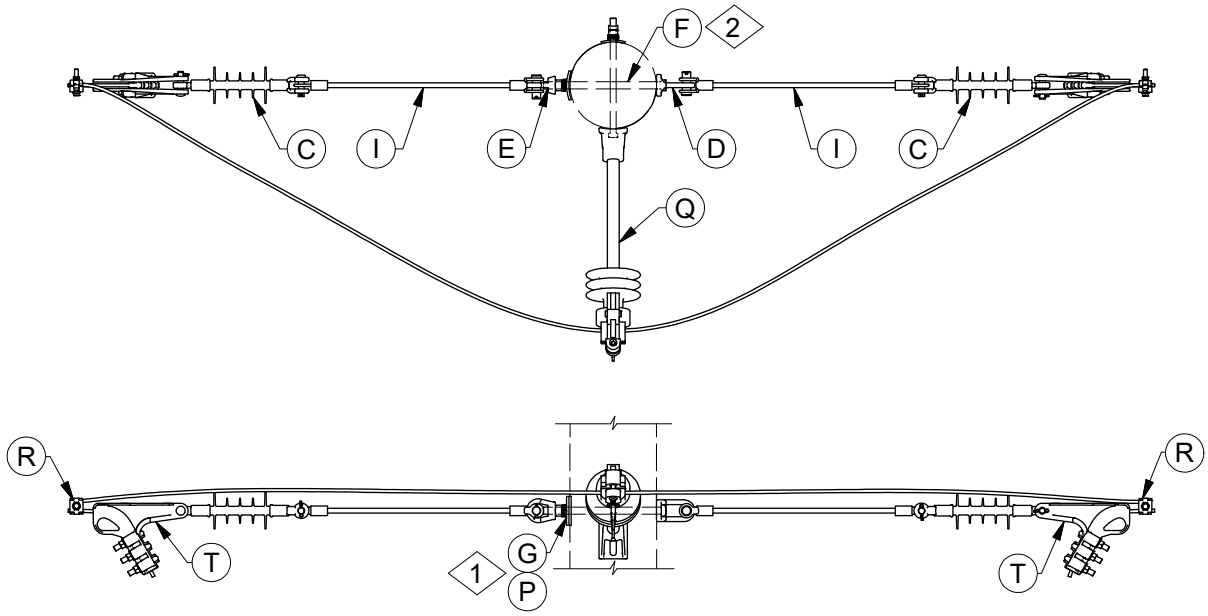


06 12 30 13
Double Deadend w/o FG Extensions

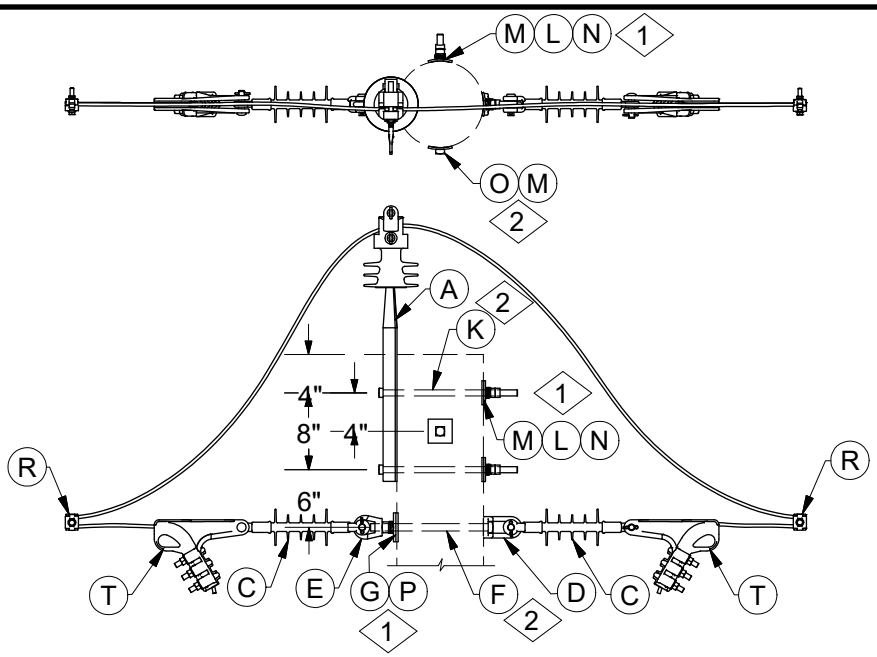
REV	DATE	ENG	DESCRIPTION
9	07/01/21	NH	Title change: Added 06 12 30 05, notes 1 & 2
8	05/25/18	KR	



06 12 30 04
Pole Top Loopover w/ FG Extensions



06 12 30 05
Looparound w/ FG Extensions



06 12 30 14

Pole Top Loopover w/o FG Extensions

CONSTRUCTION NOTE(s):

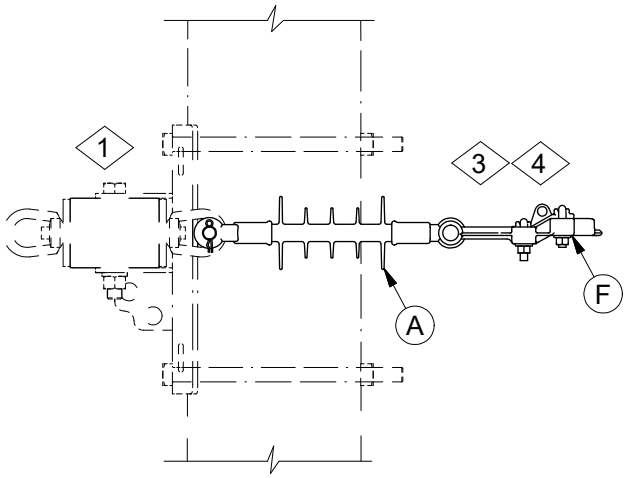
1. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

2. Use longer machine bolts for larger wood or composite poles if required.

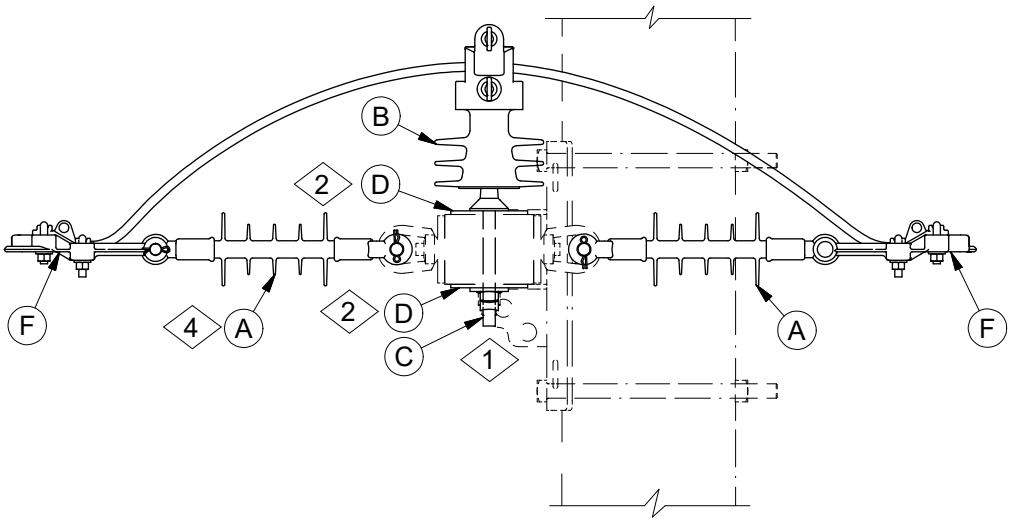
3. For AIC only, add strain insulator (Stock # 25 56 076) to all floating angle and deadend applications.

	ITEM	STK / DCS #	DESCRIPTION 06 12 30 **	01	02	03	04	05	11	13	14
	A	23 62 156	Pin - Insulator, Pole Top, 24"	-	-	-	1	-	-	-	1
	B	25 05 143	Insulator, Vice Top, 12kV	-	-	-	1	-	-	-	1
	C	25 06 052	Insulator, Deadend, 12kV	1	1	2	2	2	1	2	2
	D	23 59 095	Eyelet, 3/4"	1	1	1	1	1	1	1	1
	E	23 65 018	Eyenut, 3/4"	-	-	1	1	1	-	1	1
1,2	F	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	1	1	1	1	1	1	1	1
	G	23 66 031	Washer, Curved, Square, 3/4"	1	1	1	1	1	1	1	1
	H	23 68 181	Shackle - Deadend	-	2	-	-	-	-	-	-
	I	25 56 076	Insulator, Guy Strain, 26"	1	-	2	2	2	-	-	-
	J	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	1	1	-	-	-	1	-	-
1,2	K	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	-	-	-	2	-	-	-	2
	L	23 66 134	Lock Washer - 5/8" Double Coil	-	-	-	3	-	-	-	3
	M	23 66 207	Washer, Curved, Square, 5/8"	-	-	-	4	-	-	-	4
	N	23 65 043	Lock Nut - 5/8" Square	-	-	-	3	-	-	-	3
1,2	O	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	-	-	-	1	-	-	-	1
	P	23 66 135	Lock Washer - 3/4" Double Coil	1	1	1	1	1	1	1	1
	Q	**06 12 20 04**	Wire Training Assembly	-	-	-	-	1	-	-	-
@	R	PG*W	Clamp, PG	-	-	-	2	2	-	-	2
@	S	SC*W	Suspension Clamp	-	1	-	-	-	-	-	-
@	T	DEC*W	Clamp, Deadend	1	-	2	2	2	1	2	2

REV	DATE	ENG	DESCRIPTION
9	07/01/21	NH	Title change: Added 06 12 30 05, notes 1 & 2
8	05/25/18	KR	



06 12 35 (01 & 03)



06 12 35 (02, 04, & 05)

DCS #	DESCRIPTION
06 12 35 01	Single Deadend
06 12 35 02	Double Deadend
06 12 35 03	Single Deadend w/ FG Extension
06 12 35 04	Double Deadend w/ FG Extension
06 12 35 05	Double Deadend w/ Loopover

CONSTRUCTION NOTE(s):

1. FG crossarms come with eyenuts for deadend applications on the two outside positions. When deadending on the inside two positions on the FG crossarm, use Stock #23 65 012 (5/8" eyenut), Stock #23 52 318 (5/8" x 6" machine bolt), and Stock #23 59 005 (5/8" eyelet).

2. The 2" square washer received with the pin should be used after the 4" square washer.

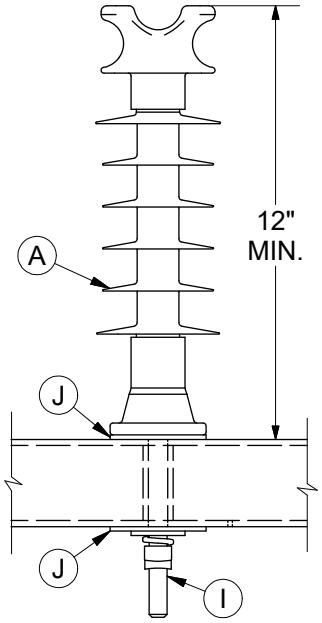
	ITEM	STOCK #	DESCRIPTION	01	02	03	04	05
	A	25 06 052	Insulator, Deadend, 12kV	1	2	1	2	2
	B	25 05 143	Insulator, Vice Top, 12kV	-	-	-	-	1
	C	23 62 028	Pin, Insulator, Long Shank	-	-	-	-	1
	D	23 66 132	Washer, Flat, Sq., 4" x 4", w/ 13/16" Hole	-	-	-	-	2
3	E	25 56 076	Insulator, Guy Strain, 26"	-	-	1	2	-
@	F	DEC*W	Clamp, Deadend	1	2	1	2	2

DESIGN NOTE(s):

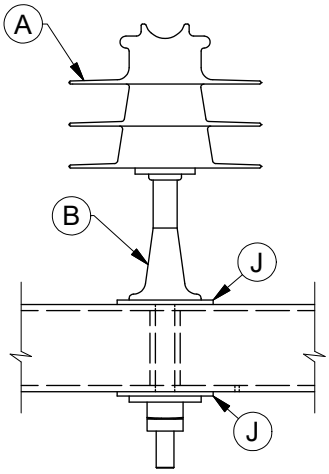
3. If extension is needed for clearance purposes, insert strain insulator (Stock #25 56 076) between eyelet and deadend insulator.

4. Working load of deadend insulator = 7500 lb.

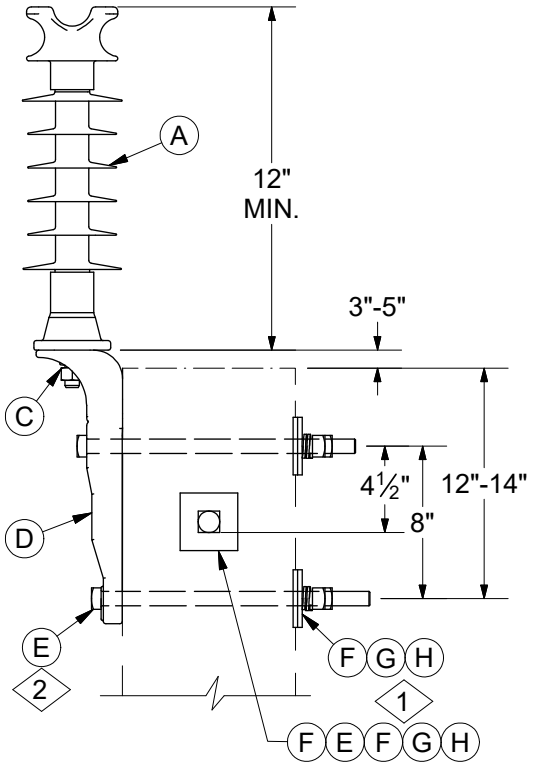
REV	DATE	ENG	DESCRIPTION
2	07/01/21	NH	Title change; Added 06 12 35 (03, 04, & 05) & notes 1-4
1	03/11/16	WYW	



06 34 01 (02 & 06)
Cross Arm Mounting



06 34 01 03
Pin Cross Arm Mounting



06 34 01 (05 & 08)
Pole Top Mounting

CONSTRUCTION NOTE(s):

1. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

2. Use longer machine bolts for larger wood or composite poles if required.

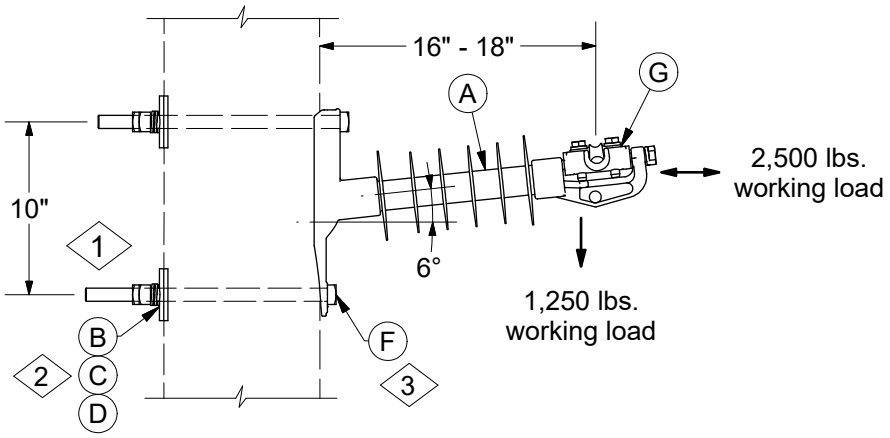
	ITEM	STK / DCS #	DESCRIPTION 06 34 01 **	02	03	05	06	08
	A	25 05 144	Insulator, Vertical L.P., 34kV, Clamptop	-	-	-	1	1
		25 05 080	Insulator, Pin Type, 34kV, F-Neck	-	1	-	-	-
		25 05 203	Insulator, Vertical L.P., 34kV, F-Neck	1	-	1	-	-
	B	23 12 126	Pin, 3/4" x 7"	-	1	-	-	-
	C	23 64 008	Stud, 3/4" x 1-3/4"	-	-	1	-	1
	D	23 06 021	Bracket, Pole Top	-	-	1	-	1
1,2	E	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	-	-	3	-	3
	F	23 66 031	Washer, Curved, Square, 3/4"	-	-	4	-	4
	G	23 66 135	Lock Washer - 3/4" Double Coil	-	-	3	-	3
	H	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	-	-	3	-	3
	I	23 64 023	Stud, 3/4" x 7" w/ hardware	1	-	-	1	-
	J	23 66 132	Washer, Flat, Sq., 4" x 4", w/ 13/16" Hole	2	2	-	2	-
@	K	TC*W	Clamp, Trunnion	-	-	-	1	1

DESIGN NOTE(s):

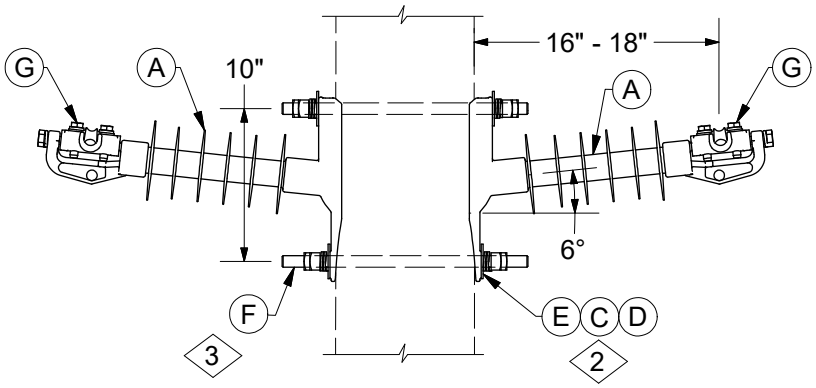
3. In 34kV industrial atmosphere where experience shows possible problems, use 69kV installation.

4. On angle poles, install insulator on side of pole that pulls bracket against pole.

REV	DATE	ENG	DESCRIPTION
6	07/01/21	NH	Moved 69kV to new DCS 06 69 01 **; Added notes 1 & 2
5	06/26/07	MJ	



06 34 03 03
Single Insulator



06 34 03 06
Double Insulator

CONSTRUCTION NOTE(s):

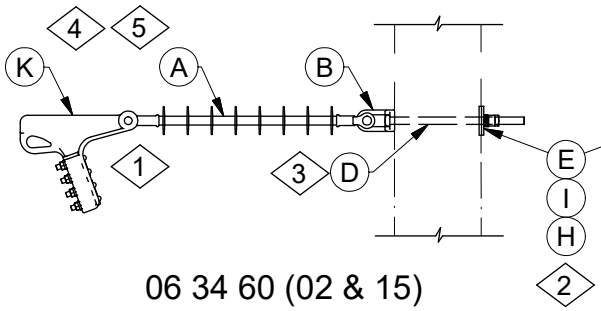
1. Reverse bolt position if guy wire is attached to bottom bolt.

2. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

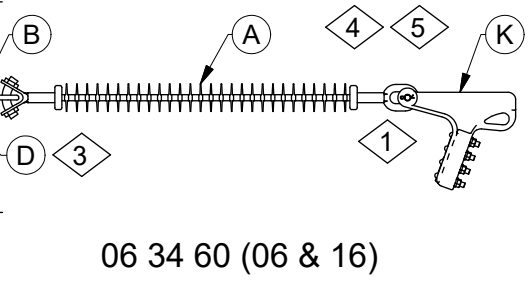
3. Use longer machine bolts for larger wood or composite poles if required.

	ITEM	STK / DCS #	DESCRIPTION 06 34 03 **	03	06
	A	25 05 145	Insulator, Horizontal L.P., 34kV, Clamptop	1	2
	B	23 66 031	Washer, Curved, Square, 3/4"	2	-
	C	23 66 135	Lock Washer - 3/4" Double Coil	2	4
	D	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	2	4
	E	23 66 131	Washer, Square, 3/4"	-	4
2,3	F	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	2	-
		23 53 058	Bolt, DA, 3/4" Dia x 16" w/ 4 square nuts	-	2
@	G	TC*W	Clamp, Trunnion	1	2

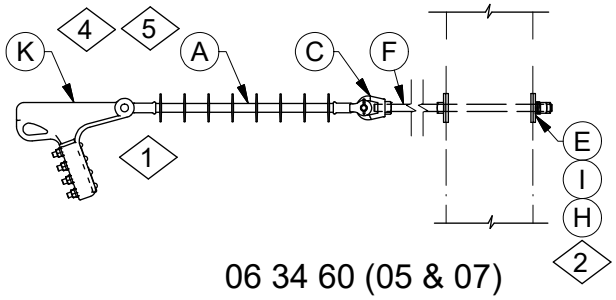
REV	DATE	ENG	DESCRIPTION
15	07/01/21	NH	Added drawing for 06 34 03 06, notes 2 and 3
14	11/24/15	KSP	



06 34 60 (02 & 15)



06 34 60 (06 & 16)



06 34 60 (05 & 07)

DCS#	DESCRIPTION
06 34 60 02	34kV Single Deadend
06 34 60 06	69kV Single Deadend
06 34 60 15	34kV Single Deadend w/ FG Extension
06 34 60 16	69kV Single Deadend w/ FG Extension
06 34 60 05	34kV Single Deadend w/ DA Bolt Extension - Slack Span Only
06 34 60 07	69kV Single Deadend w/ DA Bolt Extension - Slack Span Only

CONSTRUCTION NOTE(s):

1. Use shackle (Stock #23 68 181) to position deadend clamp properly, if required.

2. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

3. Use longer machine bolts for larger wood or composite poles if required.

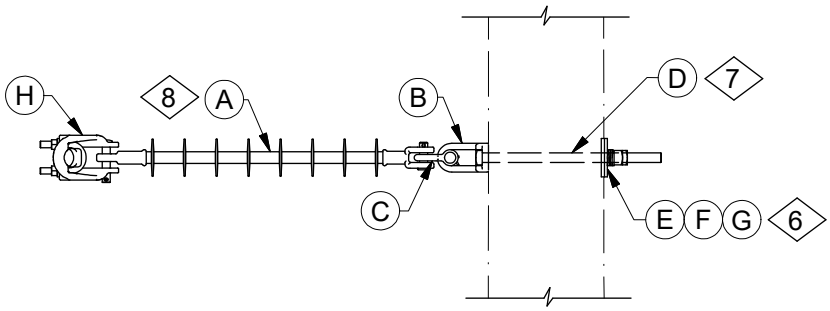
	ITEM	STK / DCS #	DESCRIPTION 06 34 60 **	02	06	15	16	05	07
5	A	25 06 113	Insulator, Suspension, 69kV	-	1	-	1	-	1
		25 06 053	Insulator, Suspension, 34kV	1	-	1	-	1	-
	B	23 59 095	Eyelet, 3/4"	1	1	1	1	-	-
	C	23 65 018	Eyenut, 3/4"	-	-	-	-	1	1
2,3	D	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	1	1	1	1	-	-
	E	23 66 031	Washer, Curved, Square, 3/4"	1	1	1	1	2	2
	F	23 53 072	Bolt, DA, 3/4" Dia x 32" w/ 4 square nuts	-	-	-	-	1	1
1	G	23 68 181	Shackle - Deadend	-	-	-	1	-	1
	H	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	1	1	1	1	1	1
	I	23 66 135	Lock Washer - 3/4" Double Coil	1	1	1	1	1	1
4, @	J	25 56 076	Insulator, Guy Strain, 26"	-	-	1	1	-	-
@	K	DEC*W	Clamp, Deadend	1	1	1	1	1	1

DESIGN NOTE(s):

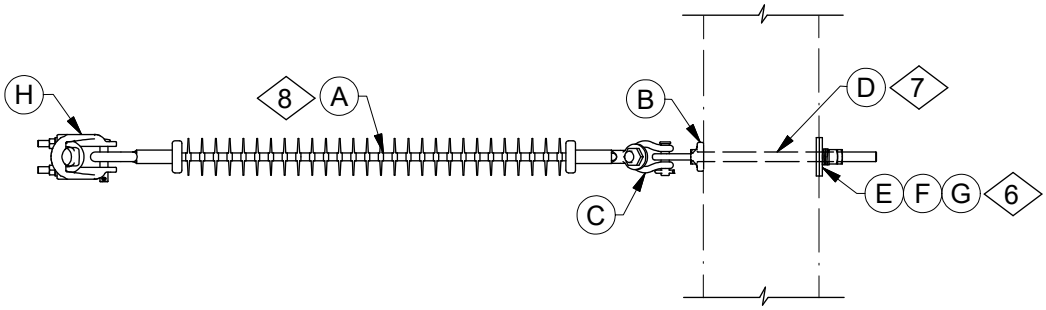
4. If extension is needed for clearance purposes, insert strain insulator (Stock #25 56 076) between eyelet and deadend insulator, except on slack span applications use DA bolt (Stock #23 53 072).

5. Working load of deadend insulators = 7500 lb.

REV	DATE	ENG	DESCRIPTION
7	07/01/21	NH	Title change; Combined w/ 06 34 68 & 72; Added notes 1-20
6	10/12/11	DCG	



06 34 60 08
34kV Floating Angle



06 34 60 28
69kV Floating Angle

CONSTRUCTION NOTE(s):

6. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

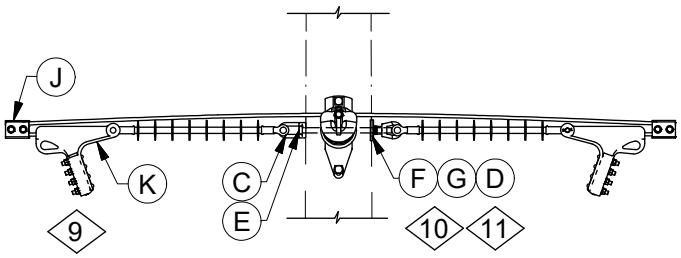
7. Use longer machine bolts for larger wood or composite poles if required.

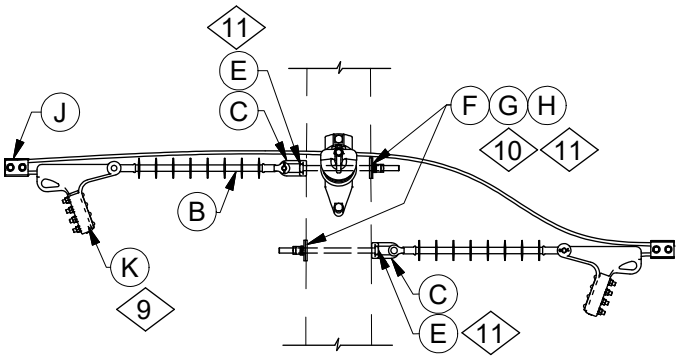
	ITEM	STK / DCS #	DESCRIPTION 06 34 60 **	08	28
8	A	25 06 053	Insulator, Suspension, 34kV	1	-
		25 06 113	Insulator, Suspension, 69kV	-	1
	B	23 59 095	Eyelet, 3/4"	1	1
	C	23 68 181	Shackle - Deadend	1	1
6,7	D	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	1	1
	E	23 66 031	Washer, Curved, Square, 3/4"	1	1
	F	23 66 135	Lock Washer - 3/4" Double Coil	1	1
	G	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	1	1
@	H	SC*W	Clamp, Suspension	1	1

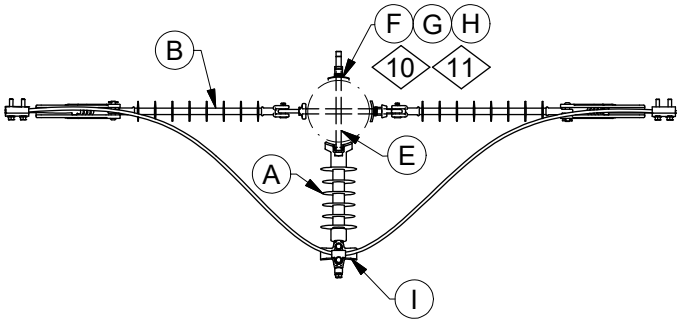
DESIGN NOTE(s):

8. Working load of deadend insulators = 7500 lb.

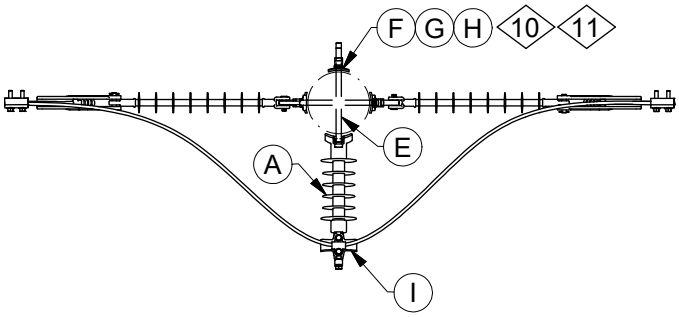
REV	DATE	ENG	DESCRIPTION
7	07/01/21	NH	Title change; Combined w/ 06 34 68 & 72; Added notes 1-20
6	10/12/11	DCG	







06 34 60 (01 & 25)
Looparound - Straight



06 34 60 (03 & 26)
Looparound - Offset

CONSTRUCTION NOTE(s):

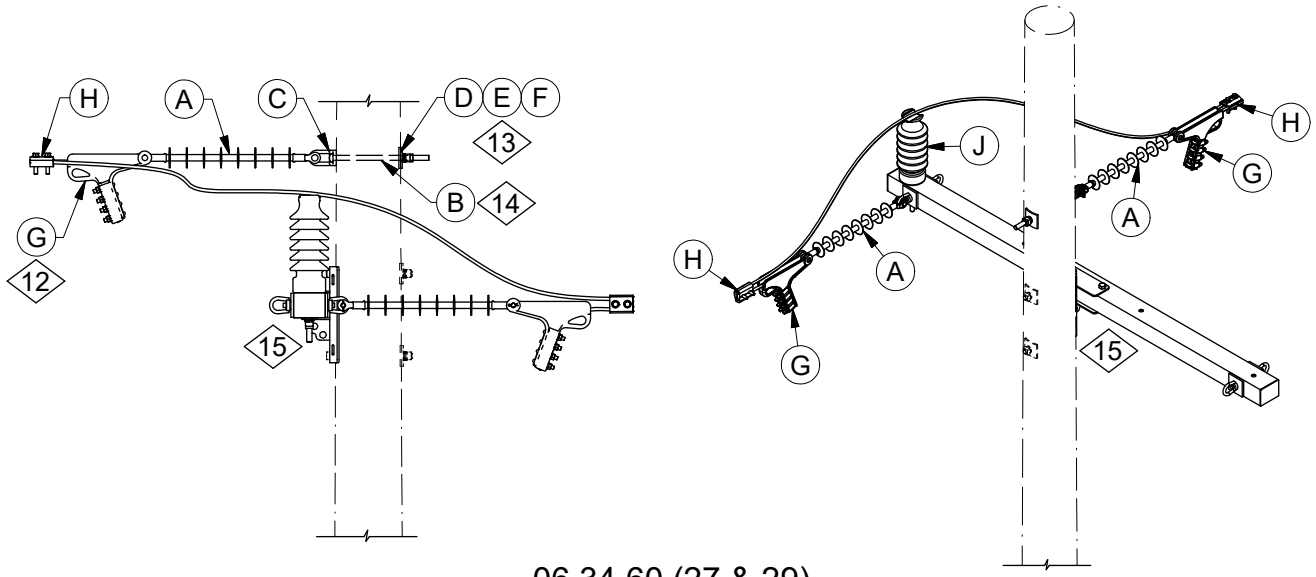
9. Use shackle (Stock #23 68 181) to position deadend clamp properly if required.

10. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

11. Use longer machine bolts for larger wood or composite poles if required.

	ITEM	STK / DCS #	DESCRIPTION 06 34 60 **	01	03	25	26
	A	25 05 095	Insulator, Horizontal L.P., 69kV, Clamptop	1	1	-	-
		25 05 145	Insulator, Horizontal L.P., 34kV, Clamptop	-	-	1	1
	B	25 06 113	Insulator, Suspension, 69kV	2	2	-	-
		25 06 053	Insulator, Suspension, 34kV	-	-	2	2
	C	23 59 095	Eyelet, 3/4"	1	2	1	2
	D	23 65 018	Eyenut, 3/4"	1	-	1	-
10,11	E	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	3	4	3	4
	F	23 66 031	Washer, Curved, Square, 3/4"	3	4	3	4
	G	23 66 135	Lock Washer - 3/4" Double Coil	3	4	3	4
	H	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	2	4	2	4
@	I	TCA*W	Clamp, Trunnion	1	1	1	1
@	J	PG*W	Clamp, Parallel Groove	2	2	2	2
@	K	DEC*W	Clamp, Deadend	2	2	2	2

REV	DATE	ENG	DESCRIPTION
7	07/01/21	NH	Title change; Combined w/ 06 34 68 & 72; Added notes 1-20
6	10/12/11	DCG	



06 34 60 (27 & 29)
Loopover - Offset

CONSTRUCTION NOTE(s):

12. Use shackle (Stock #23 68 181) to position deadend clamp properly if required.

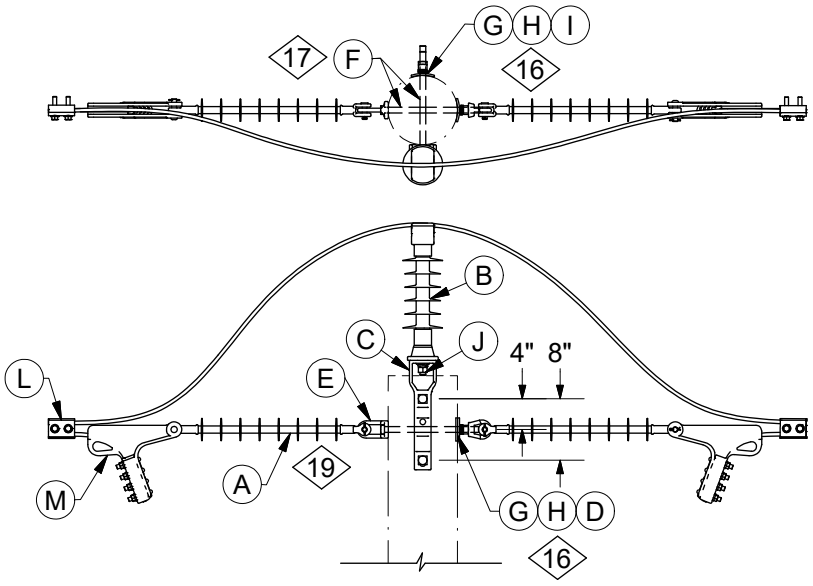
13. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

14. Use longer machine bolts for larger wood or composite poles if required.

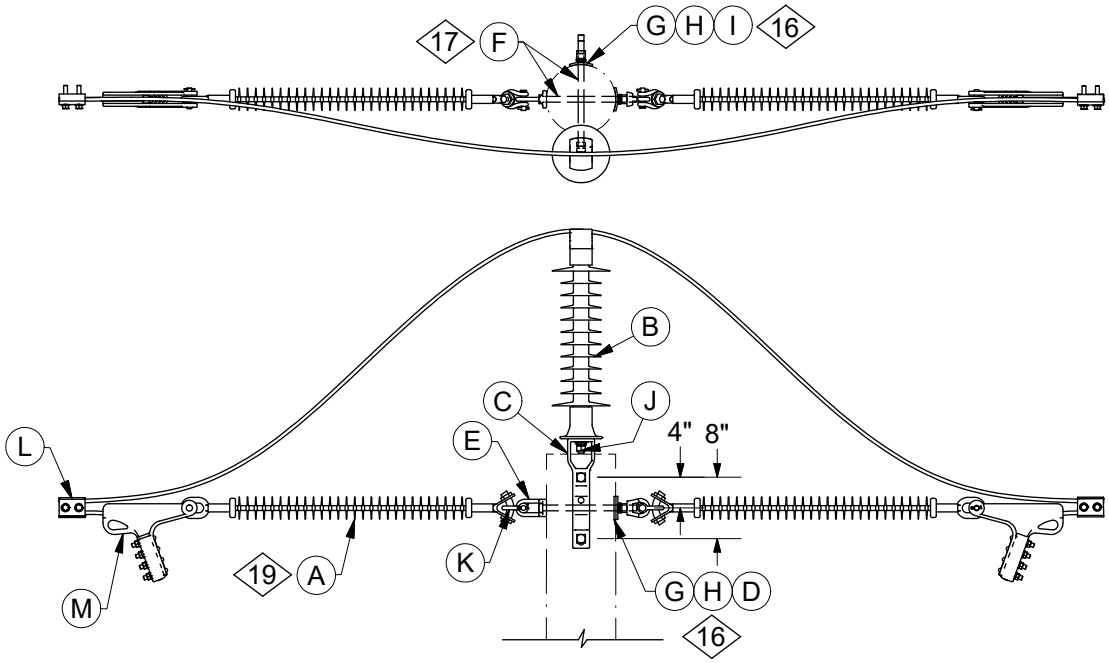
15. FG crossarms come with eyenuts for deadend applications on the two outside positions. When deadending on the inside two positions on the FG crossarm, use Stock #23 65 012 (5/8" eyenut), Stock #23 52 318 (5/8" x 6" machine bolt), and Stock #23 59 005 (5/8" eyelet).

	ITEM	STK / DCS #	DESCRIPTION 06 34 60 **	27	29
	A	25 06 113	Insulator, Suspension, 69kV	2	-
		25 06 053	Insulator, Suspension, 34kV	-	2
13, 14	B	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	1	1
	C	23 59 095	Eyelet, 3/4"	1	1
	D	23 66 031	Washer, Curved, Square, 3/4"	3	3
	E	23 66 135	Lock Washer - 3/4" Double Coil	3	3
	F	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	1	1
@	G	DEC*W	Clamp, Deadend	2	4
@	H	PG*W	Clamp, Parallel Groove	2	4
@	I	TT*W	Tie, Top − Preformed	1	-
		Hand Tie	Tie, Conductor	-	1
	J	**06 69 01 01**	Insulator, Vertical L.P., 69kV, F-Neck	1	-
		06 69 01 02	Insulator, Vertical L.P., 69kV, Clamptop	1	-
@		**06 69 01 03**	Insulator, Vertical L.P., 69kV, Universal Clamptop	1	-
		06 34 01 02	Insulator, Vertical L.P., 34kV, F-Neck	-	1
		06 34 01 03	Insulator, 34kV, Pin Type, F-Neck	-	1
		06 34 01 06	Insulator, Vertical L.P., 34kV, Clamptop	-	1

REV	DATE	ENG	DESCRIPTION
7	07/01/21	NH	Title change; Combined w/ 06 34 68 & 72; Added notes 1-20
6	10/12/11	DCG	



06 34 60 (21 & 22)



06 34 60 (23 & 24)

DCS #	DESCRIPTION
06 34 60 21	34kV Double Deadend
06 34 60 22	34kV Double Deadend w/ Loopover
06 34 60 23	69kV Double Deadend w/ Loopover
06 34 60 24	69kV Double Deadend

REV	DATE	ENG	DESCRIPTION
7	07/01/21	NH	Title change; Combined w/ 06 34 68 & 72; Added notes 1-20
6	10/12/11	DCG	

CONSTRUCTION NOTE(s):

16. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

17. Use longer machine bolts for larger wood or composite poles if required.

	ITEM	STK / DCS #	DESCRIPTION 06 34 60 **	21	22	23	24
	A	25 06 053	Insulator, Suspension, 34kV	2	2	-	-
		25 06 113	Insulator, Suspension, 69kV	-	-	2	2
	B	25 05 203	Insulator, Vertical L.P., 34kV, F-Neck	-	1	-	-
		25 05 098	Insulator, Vertical L.P., 69kV, F-Neck	-	-	1	-
	C	23 06 021	Bracket, Pole Top	-	1	1	-
	D	23 65 018	Eyenut, 3/4"	1	1	1	1
	E	23 59 095	Eyelet, 3/4"	1	1	1	1
16, 17	F	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	-	3	3	-
	G	23 66 031	Washer, Curved, Square, 3/4"	1	3	3	1
	H	23 66 135	Lock Washer - 3/4" Double Coil	1	3	3	1
	I	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	-	2	2	-
	J	23 64 008	Stud, 3/4" x 1-3/4"	-	1	1	-
	K	23 68 181	Shackle - Deadend	-	-	2	2
@	L	PG*W	Clamp, Parallel Groove	2	2	2	2
@	M	DEC*W	Clamp, Deadend	2	2	2	2

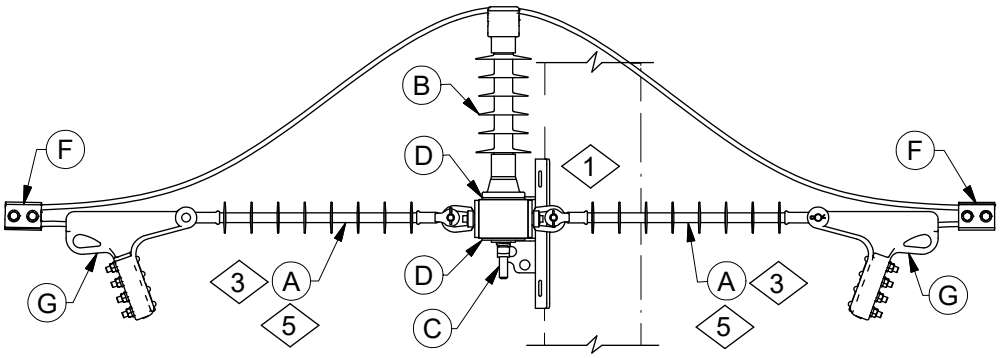
DESIGN NOTE(s):

18. In 34kV industrial atmosphere where experience shows possible problems, use 69kV installation.

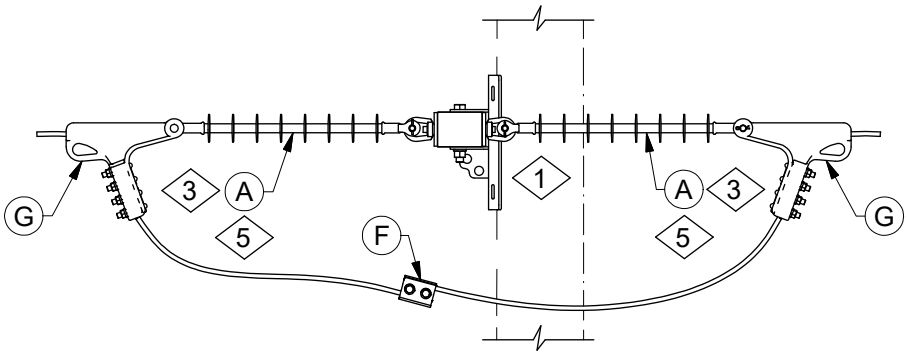
19. If extension is needed for clearance purposes, insert strain insulator (Stock #25 56 076) between eyelet and deadend insulator, except on slack span applications use DA bolt (Stock #23 53 072).

20. Working load of suspension insulator = 7500 lb.

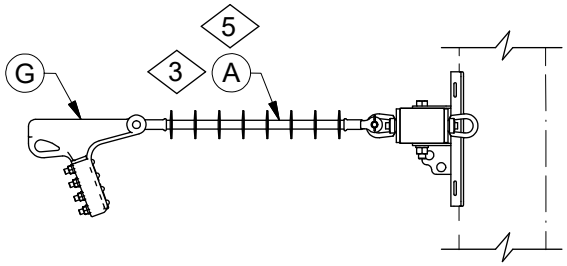
REV	DATE	ENG	DESCRIPTION
7	07/01/21	NH	Title change; Combined w/ 06 34 68 & 72; Added notes 1-20
6	10/12/11	DCG	

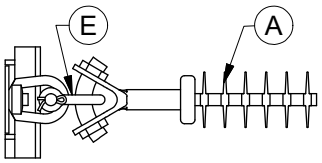


06 34 68 (05 & 07)



06 34 68 (13 & 14)





69kV Installation

06 34 68 (08, 10, 11 & 12)

DCS #	DESCRIPTION
06 34 68 05	34kV Double Deadend Loopover
06 34 68 07	69kV Double Deadend Loopover
06 34 68 08	34kV Double Deadend on Arm
06 34 68 10	69kV Double Deadend on Arm
06 34 68 11	34kV Single Deadend on Arm
06 34 68 12	69kV Single Deadend on Arm
06 34 68 13	34kV Double Deadend Loopunder
06 34 68 14	69kV Double Deadend Loopunder

REV	DATE	ENG	DESCRIPTION
5	07/01/21	NH	Title change; Combined with 06 34 66 02 & 04; Added notes 1-6
4	02/08/11	DCG	

CONSTRUCTION NOTE(s):

1. FG crossarms come with eyenuts for deadend applications on the two outside positions. When deadending on the inside two positions on the FG crossarm, use Stock #23 65 012 (5/8" eyenut), Stock #23 52 318 (5/8" x 6" machine bolt), and Stock #23 59 005 (5/8" eyelet).

	ITEM	STK / DCS #	DESCRIPTION 06 34 68 **	05	07	08	10	11	12	13	14
	A	25 06 113	Insulator, Suspension, 69kV	-	2	-	2	-	1	-	2
		25 06 053	Insulator, Suspension, 34kV	2	-	2	-	1	-	2	-
	B	25 05 098	Insulator, Vertical L.P., 69kV, F-Neck	-	1	-	-	-	-	-	-
		25 05 203	Insulator, Vertical L.P., 34kV, F-Neck	1	-	-	-	-	-	-	-
	C	23 64 023	Stud, 3/4" x 7" w/ hardware	1	1	-	-	-	-	-	-
	D	23 66 132	Washer, Flat, Sq., 4" x 4", w/ 13/16" Hole	2	2	-	-	-	-	-	-
	E	23 68 181	Shackle - Deadend	-	2	-	2	-	1	-	2
@	F	PG*W	Clamp, Parallel Groove	2	2	-	-	-	-	1	1
@	G	DEC*W	Clamp, Deadend	2	2	2	2	1	1	2	2

DESIGN NOTE(s):

2. In 34kV industrial atmosphere where experience shows possible problems, use 69kV installation.

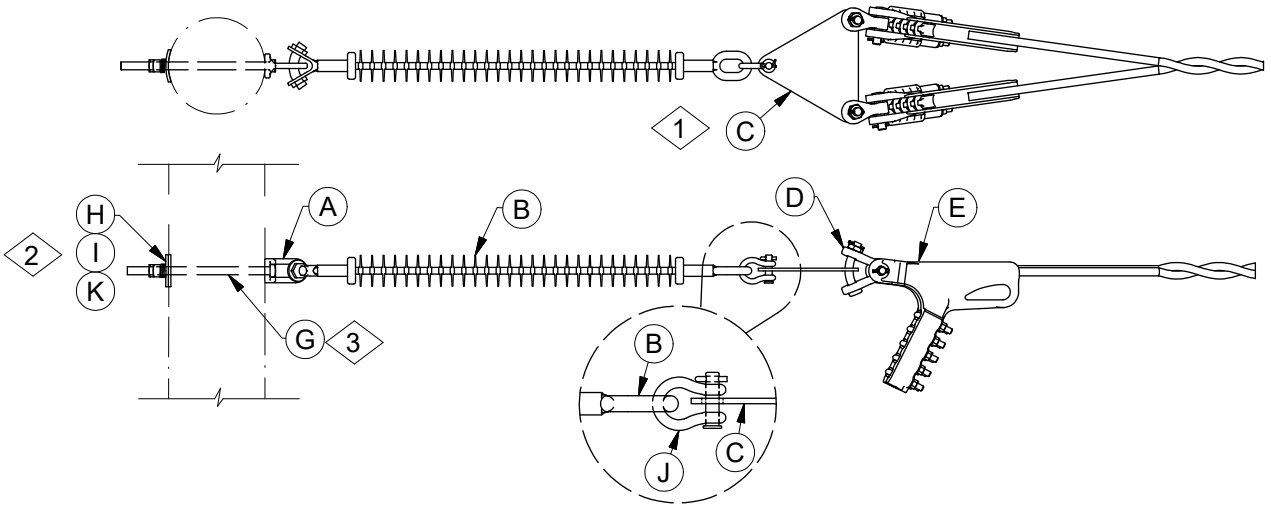
3. If extension is needed for clearance purposes, insert strain insulator (Stock #25 56 076) between eyelet and deadend insulator.

4. Only to be used for recloser bypass to mount disconnect switches.

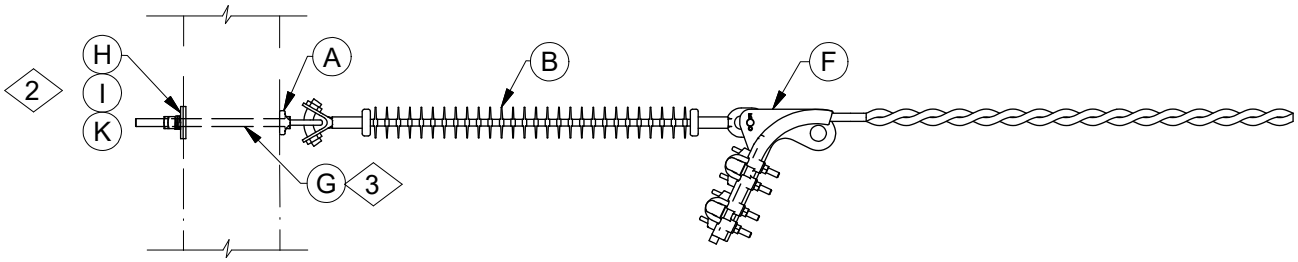
5. Working load of 34kV deadend insulator = 7,500 lbs.
   Working load of 69kV deadend insulator = 12,500 lbs.

6. Slack span Maximum = 1,000 lbs Tension.

REV	DATE	ENG	DESCRIPTION
5	07/01/21	NH	Title change; Combined with 06 34 66 02 & 04; Added notes 1-6
4	02/08/11	DCG	



06 34 73 02



06 34 73 (03 & 04)

DCS #	DESCRIPTION
06 34 73 02	T2-954 (45/7) ACSR (Rail)
06 34 73 03	T2-4/0 (6/1) ACSR (Penguin) - 69kV
	T2-336.4 (6/1) ACSR (Merlin) - 69kV
	T2-556 (19) AAC (Dahlia) - 69kV
06 34 73 04	T2-4/0 (6/1) ACSR (Penguin) - 34kV
	T2-336.4 (6/1) ACSR (Merlin) - 34kV
	T2-556 (19) AAC (Dahlia) - 34kV

CONSTRUCTION NOTE(s):

1. Yoke plate not required for sizes other than 954 (45/7) ACSR (Rail).

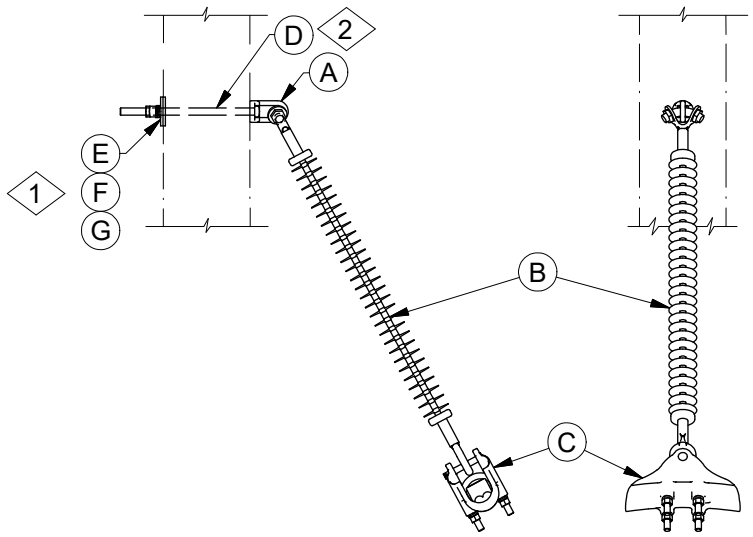
2. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

3. Use longer machine bolts for larger wood or composite poles if required.

REV	DATE	ENG	DESCRIPTION
1	07/01/21	NH	Title change; Added 06 34 72 04, notes 2 & 3, description table
0	03/28/16	KSP	

	ITEM	STK / DCS #	DESCRIPTION 06 34 73 **	02	03	04
	A	23 59 095	Eyelet, 3/4"	1	1	1
	B	25 06 113	Insulator, Suspension, 69kV	1	1	-
		25 06 053	Insulator, Suspension, 34kV	-	-	1
1	C	23 67 388	Plate, Yoke, Triangular	1	-	-
	D	23 58 134	Wye-Clevis - Eye	2	-	-
	E	23 18 436	Clamp, Deadend, Quadrant Style	2	-	-
	F	23 18 406	Clamp, Deadend, T2, Double Groove	-	1	1
2,3	G	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	1	1	1
	H	23 66 031	Washer, Curved, Square, 3/4"	1	1	1
	I	23 66 135	Lock Washer - 3/4" Double Coil	1	1	1
	J	23 68 181	Shackle - Deadend	1	-	1
	K	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	1	1	1

REV	DATE	ENG	DESCRIPTION
1	07/01/21	NH	Title change; Added 06 34 72 04, notes 2 & 3, description table
0	03/28/16	KSP	



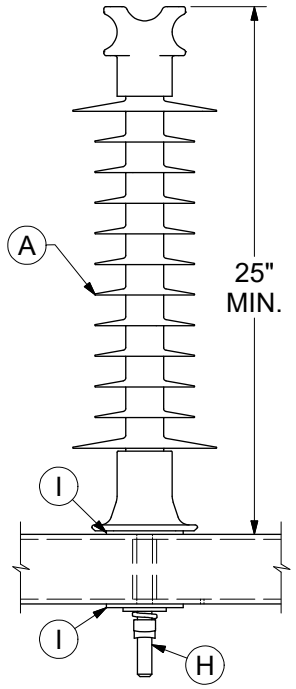
CONSTRUCTION NOTE(s):

1. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Machine bolts are furnished with 1 square nut and DA bolts are furnished with 4 square nuts.

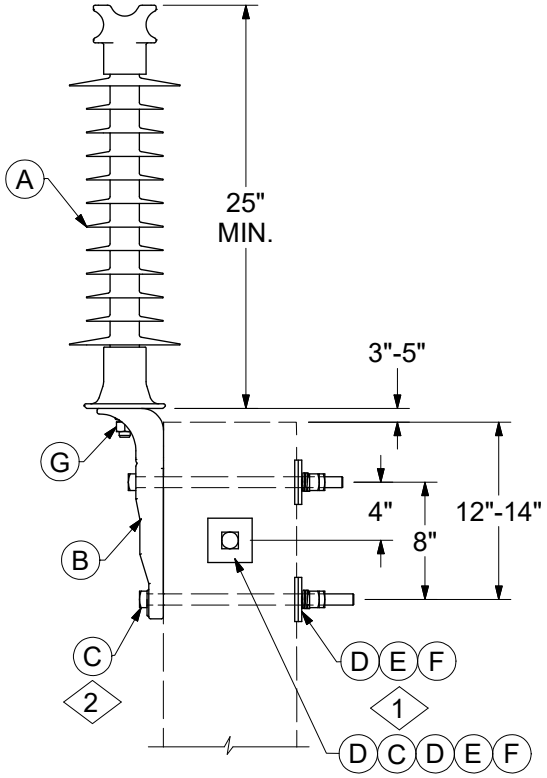
2. Use longer machine bolts for larger wood or composite poles if required.

	ITEM	STK / DCS #	DESCRIPTION 06 34 74 **	01	02	03	04
	A	23 59 095	Eyelet, 3/4"	1	1	1	1
	B	25 06 113	Insulator, Suspension, 69kV	1	1	1	1
3	C	23 78 455	Clamp, Suspension, T2, 4/0 ACSR	1	-	-	-
		23 78 456	Clamp, Suspension, T2, 336 ACSR	-	1	-	-
		17 02 176	Clamp, Suspension, T2, 556 AAC	-	-	1	-
		23 78 451	Clamp, Suspension, T2, 954 (45/7 ACSR (Rail)	-	-	-	1
1,2	D	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	1	1	1	1
	E	23 66 031	Washer, Curved, Square, 3/4"	1	1	1	1
	F	23 66 135	Lock Washer - 3/4" Double Coil	1	1	1	1
	G	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	1	1	1	1

REV	DATE	ENG	DESCRIPTION
1	07/01/21	NH	Title change; Added notes 1 & 2
0	02/23/16	KSP	



06 69 01 (01, 02 & 03)
Cross Arm Mounting



06 69 01 (04, 05 & 06)
Pole Top Mounting

CONSTRUCTION NOTE(s):

1. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

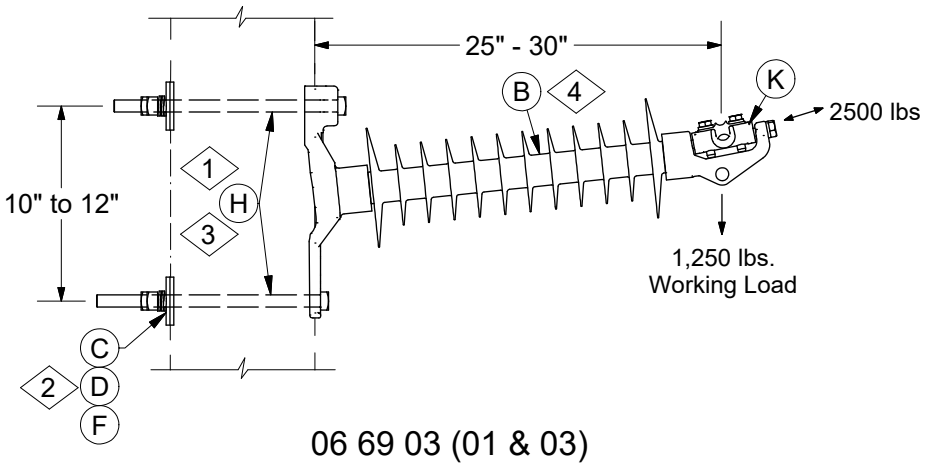
2. Use longer machine bolts for larger wood or composite poles if required.

	ITEM	STK / DCS #	DESCRIPTION 06 69 01 **	01	02	03	04	05	06
	A	25 05 219	Insulator, Vertical L.P., 69kV, Universal Clamptop	-	-	1	-	-	1
		25 05 227	Insulator, Vertical L.P., 69kV, Clamptop	-	1	-	-	1	-
		25 05 098	Insulator, Vertical L.P., 69kV, F-Neck	1	-	-	1	-	-
	B	23 06 021	Bracket, Pole Top	-	-	-	1	1	1
1,2	C	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	-	-	-	3	3	3
	D	23 66 031	Washer, Curved, Square, 3/4"	-	-	-	4	4	4
	E	23 66 135	Lock Washer - 3/4" Double Coil	-	-	-	3	3	3
	F	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	-	-	-	3	3	3
	G	23 64 008	Stud, 3/4" x 1-3/4"	-	-	-	1	1	1
	H	23 64 023	Stud, 3/4" x 7" w/ hardware	1	1	1	-	-	-
	I	23 66 132	Washer, Flat, Sq., 4" x 4", w/ 13/16" Hole	2	2	2	-	-	-
@	J	TC*W	Clamp, Trunnion	-	1	-	-	1	-

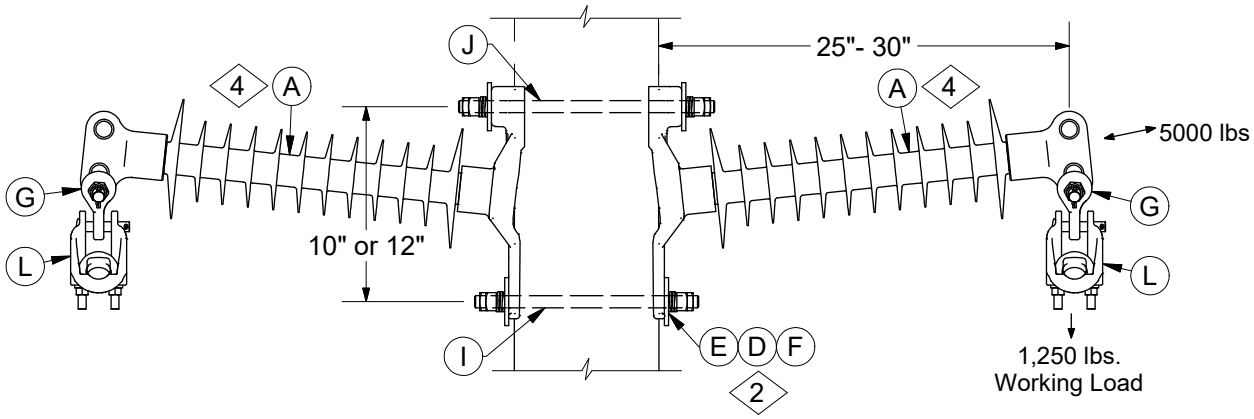
DESIGN NOTE(s):

3. On angle poles, install insulator on side of pole that pulls bracket against pole.

REV	DATE	ENG	DESCRIPTION
0	07/01/21	NH	New Standard



06 69 03 (01 & 03)



06 69 03 (02 & 04)

DCS #	DESCRIPTION
06 69 03 01	Polymer Insulators for use w/ Suspension Clamp (SINGLE)
06 69 03 02	Polymer Insulators for use w/ Suspension Clamp (DOUBLE)
06 69 03 03	Polymer Insulators for use w/ Trunnion Clamp (SINGLE)
06 69 03 04	Polymer Insulators for use w/ Trunnion Clamp (DOUBLE)

CONSTRUCTION NOTE(s):

1. Reverse bolt position if guy wire is attached to bottom bolt.

2. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

3. Use longer machine bolts for larger wood or composite poles if required.

REV	DATE	ENG	DESCRIPTION
5	07/01/21	NH	Title change; Added notes 2-4, description table
4	09/10/13	MJ	

	ITEM	STK / DCS #	DESCRIPTION 06 69 03 **	01	02	03	04
4	A	25 05 184	Insulator, Horizontal L.P., 69kV, Suspension	1	2	-	-
4	B	25 05 095	Insulator, Horizontal L.P., 69kV, Clamptop	-	-	1	2
	C	23 66 031	Washer, Curved, Square, 3/4"	2	-	2	-
	D	23 66 135	Lock Washer - 3/4" Double Coil	2	4	2	4
	E	23 66 030	Washer, 3/4" Square	-	4	-	4
	F	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	2	4	2	4
	G	23 58 088	Wye Clevis-Eye, 3/4" Pin Dia.	1	2	-	-
2,3	H	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	2	-	2	-
	I	23 53 070	Bolt, DA, 3/4" Dia x 14" w/ 4 square nuts	-	1	-	1
	J	23 53 058	Bolt, DA, 3/4" Dia x 16" w/ 4 square nuts	-	1	-	1
@	K	TC*W	Clamp, Trunnion	-	-	1	2
@	L	SC*W	Clamp, Suspension	1	2	-	-

DESIGN NOTE(s):

4. Clamptop style insulators may be used in both compression and tension applications, and the suspension style insulators should be used in tension applications within allowable line angles.

REV	DATE	ENG	DESCRIPTION
5	07/01/21	NH	Title change; Added notes 2-4, description table
4	09/10/13	MJ	

PRIMARIES 07

STANDARD CONDUCTOR DATA..... 07 00 01 01

NON-STANDARD CONDUCTOR DATA..... 07 00 01 03

STANDARD T2 CONDUCTOR DATA..... 07 00 01 05

SAGGING METHOD..... 07 00 07 03

SLACK SPAN..... 07 00 07 04

ADSS - SAG & TENSION..... 07 00 07 05

OPGW - SAG & TENSION DNO-11706 OGPW..... 07 00 07 06

PREFORMED ARMOR RODS AND LINE GUARDS..... 07 00 08 01

STANDARD CONDUCTOR MATERIAL REFERENCE..... 07 00 09 01

NON-STANDARD CONDUCTOR MATERIAL REFERENCE 07 00 09 02

DEADENDS - SUSPENSION INSULATORS..... 07 00 11 00

AIR FLOW SPOILERS..... 07 00 14 **

SUSPENSION & FLOATING CORNERS (LIMITED USE)..... 07 00 16 00

CONDUCTOR CLAMPS - 34kV & 69kV..... 07 00 20 00

STIRRUP & HOT LINE CLAMPS..... 07 00 21 00

CONNECTORS..... 07 00 25 00

TAPE..... 07 00 27 00

CONNECTING LUGS..... 07 00 30 00

CONDUCTOR TIES..... 07 00 41 00

SPACER - CONDUCTOR PHASE..... 07 00 45 00

LEAD WIRE - SOFT DRAWN COPPER OR ALUMINUM CONDUCTORS..... 07 00 80 00

LEAD WIRE - INSULATED SOFT DRAWN COPPER, 5kV..... 07 00 81 00

This Standard covers stock numbers, ampacities, mechanical properties, and applications of Standard Distribution and Sub-transmission conductors.

Bare wire is the standard conductor for all overhead distribution feeders (up to 15kV) and sub-transmission lines (34kV & 69kV). It is to be used for both vertical and horizontal constructions, which includes both re-conductoring and addition of phases where covered wire had been previously installed. T2 conductor consist of two (2) identical conductors twisted together at approximately 9ft. intervals. The values in parentheses next to the conductor size refer to conductor stranding.

Covered conductors (DCS **07 00 01 03**) may be used in 15kV or less installations where one of the following applies:

a. In extremely heavy tree conditions where excessive trimming permission cannot be obtained, or where the aesthetic of the trees are important to the area.
b. Where climbing or working space on the pole is restricted by being too close to a building or other obstacles.

Table 1 - Standard Conductors (Bare)

Conductor Size, Type and Stranding	Cond. Code Name	Ameren Stk No.	Overall Dia. (in)	Wire Area (in²)	Ultimate Strength (lbs)	Cond. Wt. (lbs/ft)	Vert. Wt. Of Cond. +1/2" Ice (lbs/ft)	Horiz. 4Lbs Wind on 1/2" Ice (lbs/ft)	Resultant Wt. + C = 0.30 Heavy Loaded Wt. (lbs/ft)	Common Use
1/0 (7) AAAC	Azusa	18 05 060 18 05 088	0.398	0.0968	4,460	0.1157	0.6743	0.466	1.1197	Line & Static Wire
110.8 kcmil (12/7) ACSR	Minorca	18 05 117	0.481	0.1378	11,300	0.2763	0.8865	0.4937	1.3147	Static Wire
336.4 kcmil (18/1) ACSR	Merlin	18 05 120	0.684	0.2789	8,680	0.3653	1.1017	0.5613	1.5365	Line Wire
556.5 kcmil (19) AAC	Dahlia	18 05 047 18 05 082 18 05 092	0.856	0.437	9,750	0.5224	1.3658	0.6187	1.7994	Line Wire
954 kcmil (45/7) ACSR	Rail	18 05 173	1.165	0.801	25,900	1.076	2.111	0.7217	2.531	Line Wire
1272 kcmil (45/7) ACSR	Bittern	18 05 246	1.345	1.0678	34,100	1.431	2.578	0.782	2.994	Line Wire
T2-4/0 (6/1) ACSR	T2-Penguin	18 05 241	0.922	0.3878	16,700	0.582	1.485	0.641	1.917	Line Wire
T2-336.4 kcmil (18/1) ACSR	T2-Merlin	18 05 243	1.12	0.5578	17,360	0.73	1.737	0.706	2.175	Line Wire
T2-556.5 kcmil (19) AAC	T2-Dahlia	18 05 250	1.401	0.8738	19,500	1.045	2.265	0.8003	2.702	Line Wire
T2-954 kcmil (45/7) ACSR	T2-Rail	18 05 210	1.907	1.6022	51,800	2.15	3.711	0.969	4.136	Line Wire

REV	DATE	ENG	DESCRIPTION
8	07/01/23	PER	Converted to new format
7	11/22/10	DCG	

Overhead current ratings listed in Table 3 cover single and T2 conductor used in open overhead construction.
CLPU stands for Cold Load PickUp.
Ratings are based on following:

a. 2 ft/s crosswind;
b. Emissive of 0.5 for bare and 0.91 for covered conductors;
c. Absorptiveness of 0.5 for bare and 0.95 for covered conductions;

Table 2 - Temperatures (°C)				
Conductor Type	Normal	Emergency	Ambient	
#6 and #4 COPPER	80	90	Summer	40
COPPER (other)	90	100	Spring/Fall	10
AAC & AAAC	90	100	Winter	-13
ACSR	90	120	CLPU	0

Table 3 - Ampacities for Standard Conductors								
CONDUCTOR TYPE & SIZE		RATING (AMP)						
LINE CONDUCTORS	CODE NAME	SN	SE	S/F N	S/F E	W N	W E	CLPU
1/0 (7) AAAC	Azusa	252	276	323	341	369	383	361
336.4 kcmil (18/1) ACSR	Merlin	511	645	659	759	754	835	795
556.5 kcmil (19) AAC	Dahlia	693	763	896	947	1026	1067	1004
954 kcmil (45/7) ACSR	Rail	981	1255	1273	1476	1460	1625	1548
1272 kcmil (45/7) ACSR	Bittern	1173	1506	1523	1773	1749	1952	1859
T2 LINE CONDUCTORS	CODE NAME	SN	SE	S/F N	S/F E	W N	W E	CLPU
T2-4/0 (6/1) ACSR	T2-Penguin	535	652	692	767	793	844	804
T2-336.4 kcmil (18/1) ACSR	T2-Merlin	820	1048	1063	1233	1219	1357	1292
T2-556.5 kcmil (19) AAC	T2-Dahlia	1108	1227	1441	1528	1654	1723	1623
T2-954 kcmil (45/7) ACSR	T2-Rail	1587	2054	2070	2419	2381	2664	2538
STATIC (SHIELD) WIRES	CODE NAME	SN	SE	S/F N	S/F E	W N	W E	CLPU
110.8 kcmil (12/7) ACSR	Minorca	234	281	301	330	344	363	346
1/0 (7) AAAC	Azusa	252	276	323	341	369	383	361

REV	DATE	ENG	DESCRIPTION
8	07/01/23	PER	Converted to new format
7	11/22/10	DCG	

This Standard covers stock numbers, ampacities, and mechanical properties for non-standard aluminum and copper conductors. For 4kV lead wire size, refer to DCS **10 00 01 01**.

Overhead current ratings cover single and T2 conductors used in open overhead construction.
CLPU stands for Cold Load PickUp.
Ratings are based on following:

a) 2 ft/s crosswind;
b) Emissivity of 0.5 for bare and 0.91 for covered conductors;
c) Absorptiveness of 0.5 for bare and 0.95 for covered conductors;

Table 1 - Temperatures (°C)

Conductor Type	Normal	Emergency	Ambient	
#6 and #4 COPPER	80	90	Summer	40
COPPER (other)	90	100	Spring/Fall	10
AAC & AAAC	90	100	Winter	-13
ACSR	90	120	CLPU	0

REV	DATE	ENG	DESCRIPTION
4	07/01/23	PER	Converted to new format
3	03/13/18	DT	

Table 2 - Ampacities for Non-Standard Bare Aluminum Conductors

SIZE	CODE NAME	RATING (AMP)						
		SN	SE	S/F N	S/F E	W N	W E	CLPU
#6 ACSR (6/1)	Turkey	102	125	130	147	148	161	154
#4 ACSR (7/1)	Swanate	135	165	173	194	197	214	203
#2 ACSR (6/1)	Sparrow	178	219	229	257	261	282	269
#2 ACSR (7/1)	Sparate	178	219	229	257	261	282	269
1/0 ACSR (6/1)	Raven	235	288	302	338	345	372	354
134.6 kcmil ACSR (12/7)	Leghorn	259	310	333	364	381	401	382
2/0 ACSR (6/1)	Quail	269	329	346	387	395	426	405
3/0 ACSR (6/1)	Pigeon	308	377	396	443	453	488	464
3/0 AAAC (7)	Amherst	337	370	433	458	495	515	485
4/0 AAAC (7)	Alliance	390	428	502	530	574	597	562
4/0 ACSR (6/1)	Penguin	353	432	454	507	520	558	532
266.8 kcmil ACSR (18/1)	Waxwing	441	556	569	654	651	720	685
266.8 kcmil ACSR (26/7)	Partridge	450	568	580	667	664	734	699
336.4 kcmil ACSR (26/7)	Linnet	520	658	672	774	769	852	811
336.4 kcmil ACSR (30/7)	Oriole	526	666	680	784	778	862	821
394.9 kcmil AAAC (19)	Canton	526	579	678	718	777	808	761
397.5 kcmil ACSR (26/7)	Ibis	578	733	747	862	856	949	903
397.5 kcmil ACSR (30/7)	Lark	585	742	756	873	866	961	914
477 kcmil ACSR (18/1)	Pelican	636	807	822	949	942	1045	995
477 kcmil ACSR (26/7)	Hawk	649	824	839	969	961	1067	1016
477 kcmil ACSR (30/7)	Hen	657	834	849	981	973	1080	1028
556.5 kcmil ACSR (18/1)	Osprey	701	891	907	1048	1039	1153	1098
556.5 kcmil ACSR (26/7)	Dove	715	910	926	1069	1061	1178	1122
636 kcmil ACSR (24/7)	Rook	773	985	1001	1158	1147	1275	1214
636 kcmil ACSR (26/7)	Grosbeak	778	991	1007	1166	1155	1284	1222
795 kcmil ACSR (26/7)	Drake	896	1145	1161	1347	1332	1483	1412
795 kcmil ACSR (45/7)	Tern	875	1116	1134	1313	1301	1446	1377
954 kcmil ACSR (54/7)	Cardinal	982	1251	1274	1472	1462	1620	1543
477 kcmil AAC (19)	Cosmos	629	692	813	859	931	967	911
636 kcmil AAC (37)	Orchid	754	831	976	1032	1118	1162	1095
795 kcmil AAC (37)	Arbutus	867	956	1122	1188	1287	1338	1260
954 kcmil AAC (37)	Magnolia	970	1071	1258	1333	1443	1502	1414
1272 kcmil AAC (61)	Narcissus	1156	1279	1501	1592	1723	1795	1690
T2-3/0 (or T2-335.6 kcmil) ACSR (6/1)	T2-Pigeon	474	580	613	683	702	751	715
T2-266.8 kcmil ACSR (26/7)	T2-Partridge	720	918	933	1081	1070	1190	1133
T2-477 kcmil ACSR (18/1)	T2-Pelican	1019	1309	1323	1540	1519	1696	1615
T2-477 kcmil ACSR (26/7)	T2-Hawk	1036	1333	1347	1569	1547	1727	1645
T2-477 kcmil ACSR (30/7)	T2-Hen	1046	1346	1360	1585	1562	1744	1662
T2-795 kcmil AAC (37)	T2-Arbutus	1402	1554	1826	1939	2098	2187	2060
T2-3/0 AAAC (7)	T2-Amherst	503	554	649	688	744	774	729

REV	DATE	ENG	DESCRIPTION
4	07/01/23	PER	Converted to new format
3	03/13/18	DT	

Table 3 - Ampacities for Non-Standard Bare Copper Conductors							
SIZE	RATING (AMP)						
	SN	SE	S/F N	S/F E	W N	W E	CLPU
#6 Cu SOL	126	137	161	169	183	190	178
#4 Cu SOL	168	183	215	226	245	254	239
#4 Cu (7)	171	186	218	230	249	258	243
#2 Cu SOL	225	246	288	303	329	341	321
#2 Cu (7)	228	250	293	308	334	347	326
#1 Cu SOL	261	285	334	352	381	395	372
#1 Cu (7)	264	289	339	357	387	401	378
1/0 Cu SOL	299	327	384	404	438	454	428
1/0 Cu (7)	306	335	393	414	448	465	438
2/0 Cu SOL	347	380	446	470	509	528	497
2/0 Cu (7)	356	390	457	482	523	542	511
3/0 Cu SOL	402	440	516	544	590	612	576
3/0 Cu (7)	410	449	527	556	602	625	588
4/0 Cu SOL	465	509	598	630	683	709	667
4/0 Cu (7)	474	520	610	644	698	724	682
250 kcmil Cu (19)	528	579	680	718	778	808	760
350 kcmil Cu (12)	660	726	851	900	975	1013	954
350 kcmil Cu (19)	652	717	841	889	963	1000	942
500 kcmil Cu (37)	817	899	1055	1116	1209	1256	1183
750 kcmil Cu (61)	1046	1155	1354	1435	1553	1617	1522
800 kcmil Cu (37)	1087	1201	1408	1493	1615	1686	1584
1000 kcmil Cu (61)	1241	1373	1609	1708	1846	1925	1812

Table 4 - Ampacities for Non-Standard Aluminum (Polyethylene - Covered) Conductors								
SIZE	CODE NAME	RATING (AMP)						
		SN	SE	S/F N	S/F E	W N	W E	CLPU
#4 ACSR (7/1)	Hickory	140	153	179	188	205	210	198
1/0 AAAC (7)	Oilnut	230	255	299	320	344	357	337
4/0 AAC (7)	Olive	369	409	481	516	554	575	542
336.4 kcmil AAC (19)	Anona	497	553	650	699	749	779	735
397.5 kcmil AAC (19)	Moiles	543	606	714	769	824	857	808
556.5 kcmil AAC (37)	Paw Paw	670	749	883	953	1020	1062	1001

REV	DATE	ENG	DESCRIPTION
4	07/01/23	PER	Converted to new format
3	03/13/18	DT	

Table 5 - Ampacities for Non-Standard Copperweld-Copper Conductors							
SIZE	RATING (AMP)						
	SN	SE	S/F N	S/F E	W N	W E	CLPU
8A	103	113	132	139	151	156	147
6A	135	147	173	181	197	204	184
4A	180	196	230	242	263	272	256
2A	239	261	307	323	351	363	342
2/0 F	349	381	448	471	512	530	499
4/0 E	471	516	607	639	695	719	677

Table 6 - Ampacities for Non-Standard Copper (Polyethylene - Covered) Conductors							
SIZE	RATING (AMP)						
	SN	SE	S/F N	S/F E	W N	W E	CLPU
#6 Cu SOL	104	132	134	180	194	201	190
#4 Cu SOL	136	174	178	240	258	267	252
#2 Cu SOL	230	253	296	315	339	351	331
1/0 Cu (7)	306	338	396	424	455	472	445
4/0 Cu (7)	469	520	611	656	703	731	689
500 kcmil Cu (37)	788	882	1038	1121	1199	1249	1178

Table 7 - Ampacities for 2.4kV Insulated Wire				
SIZE	1−3 Conductors in Conduit or Triplexed in Air		Single Conductor in Air	
	Normal	Emergency	Normal	Emergency
#6 Cu	80	90	96	112
#2 Cu	140	165	167	195
1/0 Cu	185	220	222	260
4/0 Cu	290	340	343	400
350 kcmil Cu	395	465	470	575
500 kcmil Cu	485	570	589	688
750 kcmil Cu	600	710	760	889

REV	DATE	ENG	DESCRIPTION
4	07/01/23	PER	Converted to new format
3	03/13/18	DT	

This Standard covers stock numbers, ampacities, mechanical properties, and application of Standard Distribution and Sub-transmission conductors.

T2 conductors consist of two (2) Identical conductors twisted together at approximately 9ft intervals. Because of its aerodynamic and mechanical properties, the conductor is resistant to both galloping and aeolian vibration. The values in parentheses next to the conductor size refer to conductor stranding.

Certain T2 conductors (DCS **07 00 01 05**) may be used in 15kV installations to combat galloping if necessary. T2-4/0 is the preferred T2 conductor in 15kV installations should it be required. For T2-336 applications in 15 kV installations, consult with Standards.

Table 1 - Standard T2 Conductors (Bare)

Conductor Size, Type and Stranding	Cond. Code Name	Ameren Stk No.	Overall Dia. (in)	Wire Area (in^2)	Ultimate Strength (lbs)	Cond. Wt. (lbs/ft)	Vert. Wt. Of Cond. +1/2" Ice (lbs/ft)	Horiz. 4Lbs Wind on 1/2" Ice (lbs/ft)	Resultant Wt. + C = 0.30 Heavy Loaded Wt. (lbs/ft)	Common Use
T2-4/0 (6/1) ACSR	T2-Penguin	18 05 241	0.922	0.388	16,700	0.582	1.485	0.641	1.917	Line Wire
T2-336.4 kcmil (18/1) ACSR	T2-Merlin	18 05 243	1.12	0.558	17,360	0.73	1.737	0.706	2.175	Line Wire
T2-556.5 kcmil (19) AAC	T2-Dahlia	18 05 250	1.401	0.874	19,500	1.045	2.265	0.8003	2.702	Line Wire
T2-954 kcmil (45/7) ACSR	T2-Rail	18 05 210	1.907	1.602	51,800	2.15	3.711	0.969	4.136	Line Wire

Overhead current ratings Listed in Table 3 cover T2 conductors used in open overhead construction.
CLPU stands for Cold Load PickUp.
Ratings are based on following:

a) 2ft/s crosswind;
b) Emissivity of 0.5 for bare and 0.91 for covered conductors;
c) Absorptiveness of 0.5 for bare and 0.95 for covered conductors;

Table 2 - Temperatures (°C)

Conductor Type	Normal	Emergency	Ambient	
AAC & AAAC	90	100	Winter	-13
ACSR	90	120	CLPU	0

Table 3 - Ampacities for Standard T2 Conductors

T2 LINE CONDUCTORS	CODE NAME	SN	SE	S/F N	S/F E	W N	W E	CLPU
T2-4/0 (6/1) ACSR	T2-Penguin	535	652	692	767	793	844	804
T2-336.4 kcmil (18/1) ACSR	T2-Merlin	820	1048	1063	1233	1219	1357	1292
T2-556.5 kcmil (19) AAC	T2-Dahlia	1108	1227	1441	1528	1654	1723	1623
T2-954 kcmil (45/7) ACSR	T2-Rail	1587	2054	2070	2419	2381	2664	2538

REV	DATE	ENG	DESCRIPTION
0	07/01/23	PER	New Standard

Table 4 - Ampacities for Non-Standard Bare Aluminum Conductors								
SIZE	CODE NAME	RATING (AMP)						
		SN	SE	S/F N	S/F E	W N	W E	CLPU
T2-3/0 (or T2-335.6 kcmil) ACSR (6/1)	T2-Pigeon	474	580	613	683	702	751	715
T2-266.8 kcmil ACSR (26/7)	T2-Partridge	720	918	933	1081	1070	1190	1133
T2-477 kcmil ACSR (18/1)	T2-Pelican	1019	1309	1323	1540	1519	1696	1615
T2-477 kcmil ACSR (26/7)	T2-Hawk	1036	1333	1347	1569	1547	1727	1645
T2-477 kcmil ACSR (30/7)	T2-Hen	1046	1346	1360	1585	1562	1744	1662
T2-795 kcmil AAC (37)	T2-Arbutus	1402	1554	1826	1939	2098	2187	2060
T2-3/0 AAAC (7)	T2-Amherst	503	554	649	688	744	774	729

Table 5 - Standard T2 Conductor Material Reference						
Wire Size	Code Name	STK #	Compression Sleeves	Presses (12 Ton Hand or Power Press)	Triangular Yoke Plate	Wye-Clevis - Eye
T2-4/0 (6/1) ACSR	(T2-Penguin)	18 05 241	626	86 03 864	-	-
T2-336.4 kcmil (18/1) ACSR	(T2-Merlin)	18 05 260	254	86 11 139	-	-
		18 05 243			-	-
T2-556.5 kcmil (19) AAC	(T2-Dahlia)	18 05 250	195	86 11 131	-	-
		18 05 262			-	-
T2-954 kcmil (45/7) ACSR	(T2-Rail)	18 05 210	739	TBD	23 67 388	23 58 134

CONSTRUCTION NOTE(s):

1. Automatic splices do not apply to T2 conductors.

2. Conductors are joined by separately splicing each component conductor. Splices should be staggered a minimum of 5 feet apart.

3. Ameren defines a highway as a roadway with 2 or more through lanes in each direction, divided or undivided with partial access control at a minimum.

REV	DATE	ENG	DESCRIPTION
0	07/01/23	PER	New Standard

Table 6 - Standard T2 Conductor Clamp Reference						
Wire Size	Code Name	Deadend Clamps	Suspension Clamps	Trunnion Clamps	Stirrup Clamp	Hot Line Clamp
T2-4/0 (6/1) ACSR	(T2-Penguin)	23 18 404	23 78 455	23 78 458	17 62 295	17 62 088
T2-336.4 kcmil (18/1) ACSR	(T2-Merlin)	23 18 406	23 78 456	23 78 457	17 62 295	17 62 088
T2-556.5 kcmil (19) AAC	(T2-Dahlia)	23 18 406	17 02 176	23 78 457	17 62 186	17 62 112
T2-954 kcmil (45/7) ACSR	(T2-Rail)	23 18 436	23 78 451	-	17 62 167	17 62 143

Table 7 - Preformed Ties							
Conductor Size	Code Name	Top Tie	Side Tie	Dbl. Top Tie	Dbl. Side Tie	Post Top Tie	Color Code
T2-4/0 (6/1) ACSR	(T2-Penguin)	23 68 344 (C-pin) 23 68 348 (F-neck)	23 68 333 (C-pin) -	23 68 374 (C- and F-neck)	23 68 375 (C- and F-neck)	TBD	TBD
T2-336.4 kcmil (18/1) ACSR	(T2-Merlin)	23 68 349 (F-neck)	23 68 827 (F-neck)	23 68 828 (F-neck)	23 68 829 (F-neck)	TBD	TBD

REV	DATE	ENG	DESCRIPTION
0	07/01/23	PER	New Standard

This standard covers conduction installation using the sagging method.

Sag tables are divided by ruling span per conductor.

The ruling spans are:

- Super Short =100 ft.
- Short =150 ft.
- Medium =200 ft.
- Long =250 ft.
- Extra Long =300 ft.
- Super Long =350 ft.

All sags given for "Initial Sag" are for stringing of new conductors. For this reason, maximum operating temperature in "Final Sag" tables for All Aluminum Conductor (AAC) is limited to 212° F, and for Aluminum Conductor Steel Reinforced (ACSR) is limited to 248° F.

Sags given for "Final Sag" indicate the maximum sag for a conductor at the particular condition.

The National Electrical Safety Code (NESC) requires that maximum sag (for vertical clearance above ground) be checked at:

- Necessary clearance to structures adjacent to the line:

  a. FINAL: 32° F (0° C) with 0.5" ice, NO wind,OR
  FINAL: 120° F (48.9° C) with 6 psf wind:

  b. Maximum operating design temperature of the line (NO Wind).

- Conductor blowout:

  a. FINAL: 60° F (16° C) FINAL with 6 psf wind.

- Conductor separation during galloping must not be less than the 60 Hz flashover distance at:

  a. FINAL: 32°F (0° C) with 0.5" ice, 2 psf wind.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

Hillside Construcion or Inclined Spans

INSTRUCTION(s):
The sag tables published in the 07 00 07 section of the Distribution Construction Standards are primarily intended for use on level or nearly level terrain where the difference in support elevations of the various spans is relatively minor (Say zero to five foot in most cases, with an occasional maximum difference of 10 ft.).

In hillside construction, care must be taken to prevent conductor uplift on poles, crossarms, etc. This condition may be eliminated by increasing conductor sags, span lengths, raising of the lower support, or relocation of the supports. If none of these remedies are feasible, it may be necessary to deadend the conductors on the lower supports or on both structures.

Normally suspension type insulators should be used with wood cross-arms or fiberglass standoffs on hillside construction rather than clamp type vertical line post insulators because of the limited amount of rotation available in the suspension clamp. Uplift should also be avoided on suspension type strings to prevent insulator curl and radio interference noise. The insulator swing must be checked at:

a) INITIAL: 0° F, 4 psf wind, NO ice, AND
b) FINAL: 60° F, 6 psf wind.

The use of topographical maps, profile plots and conductor sag templates will permit the determination of what will occur throughout the line once the pole elevations and locations are established.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

1/0 AWG (7) AAAC "Azusa"

DE Tension = 1,000 Lbs **RBS = 4,460 Lbs**

Super Short Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇2◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	50	60	70	80	90	100	110	120	130	140	150	
15°, 1" ice, 4 psf wind		6	9	12	15	20	24	29	35	41	47	54	1,258
15°, 0.8" ice, 4 psf wind		5	7	10	13	17	21	25	30	35	41	47	1,060
0°, 0.5" ice, 4 psf wind + k		4	6	8	11	14	17	20	24	28	33	38	1,000
0		1	1	1	2	2	3	3	4	4	5	6	647
10		1	1	2	2	3	3	4	4	5	6	7	564
20		1	1	2	2	3	4	4	5	6	7	8	485
30		1	2	2	3	3	4	5	6	7	8	9	410
40		1	2	3	3	4	5	6	7	9	10	12	340
50		2	2	3	4	5	6	8	9	11	12	14	278
60° F, 21 psf wind		5	7	9	12	15	19	23	27	32	37	42	563
60° F, 6 psf wind		3	4	6	7	9	11	14	16	19	22	26	302
60° F, 4 psf wind		2	4	5	6	8	10	12	14	17	20	22	267
60		2	3	4	5	6	8	9	11	13	15	17	225
70		2	3	5	6	8	9	11	14	16	19	21	184
80		3	4	6	7	9	11	14	16	19	22	26	153
90		3	5	7	9	11	13	16	19	23	26	30	131
100		4	5	7	10	12	15	18	22	26	30	34	115

Super Short Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇2◇						R.S.						
	Span (Ft)	50	60	70	80	90	100	110	120	130	140	150	
-20		1	1	1	1	2	2	3	3	4	4	5	772
0		1	1	2	2	3	3	4	4	5	6	7	554
0°, 0.5" ice, 4 psf wind + k		4	6	8	11	14	17	20	24	28	33	38	1,000
30		2	2	3	4	5	6	8	9	11	13	15	268
32°, 0.5" ice,		4	6	8	11	13	16	20	24	28	32	37	617
32°, 0.5" ice, 2 psf wind		4	6	8	11	14	17	20	24	28	33	38	638
40		2	3	4	5	7	9	10	12	14	17	19	204
50		3	4	5	7	9	11	13	16	18	21	24	162
60		3	5	6	8	10	13	16	19	22	25	29	134
60° F, 6 psf wind		4	5	7	10	12	15	18	22	25	29	34	230
70		4	5	7	10	12	15	18	22	25	29	34	116
80		4	6	8	11	14	17	20	24	29	33	38	103
90		5	7	9	12	15	19	23	27	32	37	42	93
100		5	7	10	13	17	20	25	29	34	40	46	86
120		6	8	11	15	19	23	28	34	40	46	53	75
212		9	12	17	22	28	34	41	49	58	67	77	51

DESIGN NOTE(s):

1. See comments in front of section for conditions including wind and ice.
◇2.◇ Ruling span range is for initial line design between 75' to 124' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

1/0 AWG (7) AAAC "Azusa"

DE Tension = 1,200 Lbs **RBS = 4,460 Lbs**

Short Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇4◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	100	110	120	130	140	150	160	170	180	190	200	
15°, 1" ice, 4 psf wind		19	23	28	33	38	43	49	56	62	70	77	1579
15°, 0.8" ice, 4 psf wind		17	20	24	28	33	38	43	48	54	60	67	1315
0°, 0.5" ice, 4 psf wind + k		14	17	20	24	27	32	36	41	45	51	56	1200
0		3	3	4	5	5	6	7	8	9	10	11	649
10		3	4	4	5	6	7	8	9	10	11	12	569
20		4	4	5	6	7	8	9	10	11	13	14	494
30		4	5	6	7	8	9	11	12	13	15	16	424
40		5	6	7	8	9	11	12	14	16	17	19	361
50		6	7	8	10	11	13	15	16	18	21	23	306
60° F, 21 psf wind		15	18	21	25	29	33	38	43	48	53	59	720
60° F, 6 psf wind		9	11	14	16	18	21	24	27	30	34	38	369
60° F, 4 psf wind		8	10	12	14	16	19	21	24	27	30	33	320
60		7	8	10	11	13	15	17	19	22	24	27	261
70		8	9	11	13	15	18	20	23	25	28	31	224
80		9	11	13	15	17	20	23	26	29	32	36	196
90		10	12	14	17	20	23	26	29	32	36	40	174
100		11	13	16	19	22	25	28	32	36	40	44	157

Short Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇4◇						R.S.						
	Span (Ft)	100	110	120	130	140	150	160	170	180	190	200	
-20		2	3	3	4	5	5	6	7	8	9	10	725
0		3	4	5	6	7	8	9	10	11	12	13	519
0°, 0.5" ice, 4 psf wind + k		14	17	20	24	27	32	36	41	45	51	56	1200
30		6	8	9	11	12	14	16	18	20	23	25	280
32°, 0.5" ice,		13	16	19	22	26	30	34	38	43	48	53	763
32°, 0.5" ice, 2 psf wind		14	16	20	23	27	30	35	39	44	49	54	791
40		8	9	11	13	15	17	19	22	24	27	30	232
50		9	11	13	15	17	20	23	25	29	32	35	198
60		10	12	15	17	20	23	26	29	33	36	40	173
60° F, 6 psf wind		12	14	17	20	23	26	30	34	38	42	47	297
70		11	14	16	19	22	25	29	33	37	41	45	154
80		12	15	18	21	24	28	32	36	40	45	50	140
90		13	16	19	23	26	30	35	39	44	49	54	129
100		15	18	21	25	28	33	37	42	47	52	58	120
120		16	20	24	28	32	37	42	47	53	59	65	106
212		23	28	34	39	46	52	60	67	76	84	93	75

DESIGN NOTE(s):

3. See comments in front of section for conditions including wind and ice.

◇4.◇ Ruling span range is for initial line design between 125' to 174' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

1/0 AWG (7) AAAC "Azusa"

DE Tension = 1,400 Lbs **RBS = 4,460 Lbs**

Medium Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇6◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	150	160	170	180	190	200	210	220	230	240	250	
15°, 1" ice, 4 psf wind		36	41	47	52	58	65	71	78	86	93	101	1877
15°, 0.8" ice, 4 psf wind		32	36	41	46	51	57	62	69	75	82	89	1558
0°, 0.5" ice, 4 psf wind + k		27	31	35	39	43	48	53	58	64	69	75	1400
0		6	7	7	8	9	10	11	12	13	15	16	680
10		6	7	8	9	10	12	13	14	15	17	18	603
20		7	8	9	11	12	13	14	16	17	19	20	531
30		8	10	11	12	14	15	17	18	20	22	23	464
40		10	11	12	14	16	17	19	21	23	25	27	404
50		11	13	14	16	18	20	22	24	26	29	31	352
60° F, 21 psf wind		27	31	35	39	44	49	54	59	64	70	76	872
60° F, 6 psf wind		18	20	23	25	28	31	35	38	41	45	49	442
60° F, 4 psf wind		16	18	20	22	25	28	31	34	37	40	43	381
60		13	14	16	18	20	23	25	27	30	32	35	308
70		14	16	19	21	23	26	28	31	34	37	40	272
80		16	18	21	23	26	29	32	35	38	41	45	242
90		18	20	23	26	29	32	35	38	42	46	50	219
100		20	22	25	28	32	35	38	42	46	50	55	200

Medium Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇6◇						R.S.						
	Span (Ft)	150	160	170	180	190	200	210	220	230	240	250	
-20		5	6	7	8	9	10	11	12	13	14	15	720
0		7	8	10	11	12	13	15	16	17	19	21	527
0°, 0.5" ice, 4 psf wind + k		27	31	35	39	43	48	53	58	64	69	75	1400
30		12	14	16	18	20	22	24	27	29	32	35	315
32°, 0.5" ice,		25	29	32	36	40	45	49	54	59	64	70	908
32°, 0.5" ice, 2 psf wind		26	29	33	37	41	45	50	55	60	65	71	941
40		14	16	19	21	23	26	28	31	34	37	40	272
50		16	19	21	24	26	29	32	35	39	42	46	239
60		18	21	24	26	29	33	36	39	43	47	51	213
60° F, 6 psf wind		21	24	27	31	34	38	42	46	50	55	59	365
70		20	23	26	29	32	36	40	44	48	52	56	194
80		22	25	28	32	35	39	43	47	52	56	61	178
90		24	27	31	34	38	42	47	51	56	61	66	165
100		25	29	33	37	41	45	50	55	60	65	71	155
120		28	32	36	41	45	50	56	61	67	73	79	138
212		40	45	51	57	64	71	78	86	93	102	110	99

DESIGN NOTE(s):

5. See comments in front of section for conditions including wind and ice.

◇6.◇ Ruling span range is for initial line design between 175' to 224' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

1/0 AWG (7) AAAC "Azusa"

DE Tension = 1,650 Lbs **RBS = 4,460 Lbs**

Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (in)											Tension Lbs
	R.S. Range ◇8◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	200	210	220	230	240	250	260	270	280	290	300	
15º, 1" ice, 4 psf wind		55	61	67	73	80	86	93	101	108	116	124	2201
15º, 0.8" ice, 4 psf wind		48	53	58	63	69	75	81	87	94	101	108	1839
0º, 0.5" ice, 4 psf wind + k		41	45	49	54	59	64	69	74	80	86	92	1650
0		8	9	10	11	12	13	14	15	16	18	19	831
10		9	10	11	12	13	15	16	17	18	20	21	751
20		10	11	12	14	15	16	17	19	20	22	23	674
30		12	13	14	15	17	18	20	21	23	24	26	601
40		13	14	16	17	19	20	22	24	26	27	29	534
50		15	16	18	20	21	23	25	27	29	31	33	473
60º F, 21 psf wind		40	44	48	53	57	62	67	73	78	84	90	1064
60º F, 6 psf wind		24	27	29	32	35	38	41	44	48	51	55	567
60º F, 4 psf wind		21	23	26	28	31	33	36	39	42	45	48	499
60		17	18	20	22	24	26	28	30	33	35	37	419
70		19	21	23	25	27	29	32	34	37	39	42	372
80		21	23	25	28	30	33	35	38	41	44	47	333
90		23	26	28	31	33	36	39	42	45	49	52	300
100		26	28	31	34	37	40	43	47	50	54	58	273

Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇8◇						R.S.						
	Span (Ft)	200	210	220	230	240	250	260	270	280	290	300	
-20		8	9	10	11	12	13	14	15	16	17	18	856
0		11	12	13	14	15	17	18	19	21	22	24	659
0°, 0.5" ice, 4 psf wind + k		41	45	49	54	59	64	69	74	80	86	92	1650
30		17	18	20	22	24	26	28	30	32	35	37	422
32°, 0.5" ice,		37	41	45	49	53	58	62	67	72	78	83	1097
32°, 0.5" ice, 2 psf wind		38	42	46	50	54	59	64	69	74	79	85	1136
40		19	21	23	25	27	30	32	35	37	40	43	366
50		22	24	26	29	31	34	37	39	42	46	49	321
60		24	27	29	32	35	38	41	44	48	51	55	286
60° F, 6 psf wind		30	33	36	39	43	46	50	54	58	62	67	468
70		27	30	33	36	39	42	46	49	53	57	61	259
80		29	32	36	39	42	46	50	54	58	62	66	237
90		32	35	39	42	46	50	54	58	62	67	72	219
100		34	38	41	45	49	53	58	62	67	72	77	204
120		39	43	47	51	56	60	65	70	76	81	87	181
212		55	61	67	73	79	86	93	100	108	116	124	127

DESIGN NOTE(s):

7. See comments in front of section for conditions including wind and ice.

◇8.◇ Ruling span range is for initial line design between 225' to 274' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

1/0 AWG (7) AAAC "Azusa"

DE Tension = 1,850 Lbs **RBS = 4,460 Lbs**

Extra Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇10◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	250	260	270	280	290	300	310	320	330	340	350	
15º, 1" ice, 4 psf wind		77	83	90	96	103	111	118	126	134	142	151	2470
15º, 0.8" ice, 4 psf wind		67	72	78	84	90	96	103	109	116	123	131	2070
0º, 0.5" ice, 4 psf wind + k		57	61	66	71	76	82	87	93	99	105	111	1850
0		12	13	14	15	16	17	18	20	21	22	23	916
10		13	14	15	16	17	19	20	21	23	24	25	835
20		14	16	17	18	19	21	22	23	25	27	28	757
30		16	17	19	20	21	23	24	26	28	29	31	683
40		18	19	21	22	24	25	27	29	31	33	35	615
50		20	21	23	25	27	28	30	32	34	37	39	551
60º F, 21 psf wind		54	59	63	68	73	78	84	89	95	100	106	1221
60º F, 6 psf wind		33	35	38	41	44	47	50	54	57	61	64	660
60º F, 4 psf wind		28	31	33	36	38	41	44	46	49	52	56	583
60		22	24	26	28	30	32	34	36	38	41	43	494
70		25	26	29	31	33	35	38	40	43	45	48	444
80		27	29	32	34	37	39	42	45	47	50	53	400
90		30	32	35	38	40	43	46	49	52	55	59	363
100		33	36	38	41	44	47	50	54	57	61	64	332

Extra Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇10◇						R.S.						
	Span (Ft)	250	260	270	280	290	300	310	320	330	340	350	
-20		12	13	14	15	16	17	18	20	21	22	23	912
0		15	16	18	19	20	22	23	25	26	28	30	719
0°, 0.5" ice, 4 psf wind + k		57	61	66	71	76	82	87	93	99	105	111	1850
30		23	24	26	28	30	32	35	37	39	42	44	484
32°, 0.5" ice,		51	55	59	64	68	73	78	83	89	94	100	1245
32°, 0.5" ice, 2 psf wind		52	56	61	65	70	75	80	85	91	96	102	1289
40		26	28	30	32	34	37	39	42	45	47	50	426
50		29	31	34	36	39	41	44	47	50	53	56	378
60		32	35	37	40	43	46	49	52	56	59	63	340
60° F, 6 psf wind		40	43	46	50	53	57	61	65	69	73	78	545
70		35	38	41	44	47	51	54	58	61	65	69	309
80		38	42	45	48	52	55	59	63	67	71	75	283
90		42	45	48	52	56	60	64	68	72	77	81	262
100		44	48	52	56	60	64	68	73	77	82	87	245
120		50	54	58	63	67	72	77	82	87	92	98	218
212		71	77	83	90	96	103	110	117	124	132	140	153

DESIGN NOTE(s):

9. See comments in front of section for conditions including wind and ice.

◇10◇ Ruling span range is for initial line design between 275' to 324' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

1/0 AWG (7) AAAC "Azusa"

DE Tension = 2,200 Lbs **RBS = 4,460 Lbs**

Super Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇12◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	300	310	320	330	340	350	360	370	380	390	400	
15º, 1" ice, 4 psf wind		96	103	110	117	124	131	139	147	155	163	171	2841
15º, 0.8" ice, 4 psf wind		82	87	93	99	105	111	118	125	131	138	146	2426
0º, 0.5" ice, 4 psf wind + k		69	74	78	83	88	94	99	105	110	116	122	2200
0		12	13	14	15	15	16	17	18	19	20	21	1309
10		13	14	15	15	16	17	18	19	21	22	23	1222
20		14	15	16	17	18	19	20	21	22	23	24	1136
30		15	16	17	18	19	20	21	23	24	25	26	1051
40		16	17	18	20	21	22	23	25	26	27	29	968
50		18	19	20	21	23	24	25	27	28	30	31	888
60º F, 21 psf wind		63	67	71	76	81	85	90	95	101	106	112	1521
60º F, 6 psf wind		33	35	37	40	42	45	47	50	53	55	58	948
60º F, 4 psf wind		27	29	31	33	35	37	39	41	43	46	48	880
60		19	21	22	23	25	26	28	29	31	33	34	811
70		21	23	24	26	27	29	31	32	34	36	38	738
80		23	25	27	28	30	32	34	36	38	40	42	669
90		26	28	29	31	33	35	37	39	41	44	46	606
100		29	31	33	35	37	39	41	43	46	48	51	548

Super Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇12◇						R.S.						
	Span (Ft)	300	310	320	330	340	350	360	370	380	390	400	
-20		12	13	14	15	16	17	18	19	20	21	22	1291
0		14	15	16	17	19	20	21	22	23	24	26	1080
0°, 0.5" ice, 4 psf wind + k		69	74	78	83	88	94	99	105	110	116	122	2200
30		20	21	23	24	26	27	29	30	32	34	35	787
32°, 0.5" ice,		59	63	68	72	76	81	85	90	95	100	105	1537
32°, 0.5" ice, 2 psf wind		61	65	69	74	78	83	88	93	98	103	108	1584
40		22	24	25	27	29	30	32	34	36	38	40	700
50		25	27	29	31	32	34	36	38	40	43	45	620
60		28	30	32	34	37	39	41	43	46	48	51	550
60° F, 6 psf wind		41	44	46	49	52	56	59	62	65	69	73	762
70		32	34	36	39	41	44	46	49	51	54	57	490
80		36	38	41	43	46	49	51	54	57	60	63	439
90		39	42	45	48	51	54	57	60	63	67	70	396
100		43	46	49	52	56	59	62	66	70	73	77	362
120		51	54	58	61	65	69	73	77	81	86	90	309
212		80	85	91	96	102	108	115	121	128	135	142	197

DESIGN NOTE(s):

11. See comments in front of section for conditions including wind and ice.

◇12◇ Ruling span range is for initial line design between 325' to 374' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

110.8 kcmil (12/7) ACSR "Minorca"

DE Tension = 1,000 Lbs **RBS = 11,300 Lbs**

Super Short Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇14◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	50	60	70	80	90	100	110	120	130	140	150	
15º, 1" ice, 4 psf wind		6	9	12	15	19	24	29	35	41	47	54	1423
15º, 0.8" ice, 4 psf wind		6	8	11	14	18	22	27	32	38	44	50	1143
0º, 0.5" ice, 4 psf wind + k		5	7	10	13	16	20	24	29	33	39	45	1000
0		3	5	7	9	11	14	17	20	23	27	31	301
10		4	5	7	10	12	15	18	22	26	30	34	275
20		4	6	8	11	13	16	20	24	28	32	37	254
30		4	6	9	11	14	18	21	25	30	35	40	237
40		5	7	9	12	15	19	23	27	32	37	42	222
50		5	7	10	13	16	20	24	29	33	39	45	210
60º F, 21 psf wind		6	8	11	15	19	23	28	34	39	46	52	572
60º F, 6 psf wind		5	8	10	14	17	21	26	31	36	42	48	259
60º F, 4 psf wind		5	8	10	13	17	21	25	30	35	41	47	228
60		5	8	10	13	17	21	25	30	35	41	47	200
70		5	8	11	14	18	22	26	31	37	43	49	191
80		6	8	11	15	18	23	27	33	38	44	51	184
90		6	8	11	15	19	23	28	34	40	46	53	178
100		6	9	12	15	19	24	29	35	41	47	54	173

Super Short Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇14◇						R.S.						
	Span (Ft)	50	60	70	80	90	100	110	120	130	140	150	
-20		3	4	6	7	9	11	14	16	19	22	26	363
0		4	5	7	9	12	14	17	21	24	28	32	290
0°, 0.5" ice, 4 psf wind + k		5	7	10	13	16	20	24	29	33	39	45	1000
30		5	7	9	12	15	18	22	26	31	36	41	229
32°, 0.5" ice,		5	8	10	13	17	21	25	30	35	41	47	633
32°, 0.5" ice, 2 psf wind		5	8	10	14	17	21	26	30	36	41	48	653
40		5	7	9	12	16	19	23	28	33	38	43	216
50		5	7	10	13	17	20	25	29	34	40	46	204
60		5	8	10	14	17	21	26	31	36	42	48	195
60° F, 6 psf wind		5	8	11	14	18	22	26	31	37	43	49	253
70		6	8	11	14	18	22	27	32	37	43	50	189
80		6	8	11	15	18	23	28	33	39	45	51	183
90		6	8	12	15	19	24	28	34	40	46	53	177
100		6	9	12	15	20	24	29	35	41	47	54	172
120		6	9	12	16	21	25	31	37	43	50	57	163
248		8	12	16	21	27	33	40	47	56	64	74	127

DESIGN NOTE(s):

13. See comments in front of section for conditions including wind and ice.

◇14◇ Ruling span range is for initial line design between 75' to 124' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

110.8 kcmil (12/7) ACSR "Minorca"

DE Tension = 1,500 Lbs **RBS = 11,300 Lbs**

Short Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇16◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	100	110	120	130	140	150	160	170	180	190	200	
15º, 1" ice, 4 psf wind		17	20	24	28	32	37	42	48	54	60	66	2064
15º, 0.8" ice, 4 psf wind		15	18	22	26	30	34	39	44	49	54	60	1693
0º, 0.5" ice, 4 psf wind + k		13	16	19	22	26	30	34	38	43	48	53	1500
0		7	9	11	13	15	17	19	21	24	27	30	559
10		8	10	12	14	16	19	21	24	27	30	33	502
20		9	11	13	15	18	21	23	26	30	33	36	457
30		10	12	14	17	19	22	25	29	32	36	40	419
40		11	13	15	18	21	24	27	31	35	39	43	388
50		11	14	17	19	22	26	29	33	37	41	46	363
60º F, 21 psf wind		15	18	21	25	29	33	38	43	48	54	59	899
60º F, 6 psf wind		13	15	18	21	25	29	32	37	41	46	51	434
60º F, 4 psf wind		12	15	18	21	24	28	32	36	40	45	50	386
60		12	15	18	21	24	27	31	35	40	44	49	341
70		13	16	19	22	25	29	33	37	42	47	52	322
80		14	16	20	23	27	31	35	39	44	49	54	306
90		14	17	20	24	28	32	36	41	46	51	57	293
100		15	18	21	25	29	33	38	42	48	53	59	284

Short Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇16◇						R.S.						
	Span (Ft)	100	110	120	130	140	150	160	170	180	190	200	
-20		6	7	9	10	12	14	16	18	20	22	24	682
0		8	9	11	13	15	18	20	23	25	28	31	532
0°,0.5" ice, 4 psf wind + k		13	16	19	22	26	30	34	38	43	48	53	1500
30		10	13	15	18	20	23	27	30	34	38	42	400
32°, 0.5" ice,		13	16	19	23	26	30	34	39	44	49	54	991
32°, 0.5" ice, 2 psf wind		14	16	20	23	27	30	35	39	44	49	54	1020
40		11	14	16	19	22	25	29	32	36	40	45	372
50		12	14	17	20	23	27	31	35	39	43	48	348
60		13	15	18	21	25	29	32	37	41	46	51	327
60° F, 6 psf wind		13	16	19	22	26	30	34	38	43	47	52	420
70		13	16	19	23	26	30	34	39	43	48	53	312
80		14	17	20	23	27	31	35	40	45	50	55	301
90		14	17	21	24	28	32	37	41	46	52	57	291
100		15	18	21	25	29	33	38	43	48	53	59	282
120		16	19	23	26	31	35	40	45	51	57	63	265
248		21	25	30	35	41	47	53	60	67	75	83	201

DESIGN NOTE(s):

15. See comments in front of section for conditions including wind and ice.

◇16◇ Ruling span range is for initial line design between 125' to 174' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

110.8 kcmil (12/7) ACSR "Minorca"

DE Tension = 2,000 Lbs **RBS = 11,300 Lbs**

Medium Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇18◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	150	160	170	180	190	200	210	220	230	240	250	
15º, 1" ice, 4 psf wind		29	33	37	41	46	51	56	62	68	74	80	2677
15º, 0.8" ice, 4 psf wind		26	29	33	37	41	46	50	55	60	66	71	2232
0º, 0.5" ice, 4 psf wind + k		22	25	29	32	36	39	44	48	52	57	62	2000
0		10	12	13	15	16	18	20	22	24	26	29	912
10		11	13	15	16	18	20	22	25	27	29	32	820
20		13	14	16	18	20	22	25	27	30	32	35	741
30		14	16	18	20	22	25	27	30	33	36	39	674
40		15	17	20	22	24	27	30	33	36	39	42	617
50		16	19	21	24	26	29	32	35	39	42	46	569
60º F, 21 psf wind		24	27	31	34	38	42	47	51	56	61	66	1253
60º F, 6 psf wind		19	22	24	27	30	34	37	41	44	48	53	654
60º F, 4 psf wind		18	21	23	26	29	33	36	39	43	47	51	590
60		18	20	23	25	28	31	35	38	42	45	49	529
70		19	22	24	27	30	34	37	41	44	48	53	495
80		20	23	26	29	32	36	39	43	47	51	56	465
90		21	24	27	31	34	38	42	46	50	54	59	440
100		22	25	29	32	36	40	44	48	53	57	62	418

Medium Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇18◇						R.S.						
	Span (Ft)	150	160	170	180	190	200	210	220	230	240	250	
-20		9	10	11	12	14	15	17	19	20	22	24	1086
0		11	12	14	16	17	19	21	23	26	28	30	861
0°, 0.5" ice, 4 psf wind + k		22	25	29	32	36	39	44	48	52	57	62	2000
30		15	17	19	21	24	26	29	32	35	38	41	632
32°, 0.5" ice,		22	25	28	31	35	39	43	47	51	56	61	1374
32º, 0.5" ice, 2 psf wind		22	25	28	32	35	39	43	47	52	57	61	1410
40		16	18	21	23	26	29	32	35	38	41	45	580
50		17	20	22	25	28	31	34	38	41	45	49	536
60		19	21	24	27	30	33	37	40	44	48	52	499
60º F, 6 psf wind		20	23	25	29	32	35	39	43	47	51	55	625
70		20	23	26	29	32	36	39	43	47	51	56	468
80		21	24	27	30	34	37	41	45	49	54	58	447
90		22	25	28	31	35	39	43	47	51	56	60	430
100		23	26	29	32	36	40	44	48	53	58	63	415
120		24	27	31	35	39	43	47	52	57	62	67	387
248		33	38	42	48	53	59	65	71	78	85	92	284

DESIGN NOTE(s):

17. See comments in front of section for conditions including wind and ice.

◇18◇ Ruling span range is for initial line design between 175' to 224' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

110.8 kcmil (12/7) ACSR "Minorca"

DE Tension = 2,500 Lbs **RBS = 11,300 Lbs**

Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇20◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	200	210	220	230	240	250	260	270	280	290	300	
15º, 1" ice, 4 psf wind		42	46	51	55	60	65	71	76	82	88	94	3266
15º, 0.8" ice, 4 psf wind		37	41	45	49	53	58	62	67	72	78	83	2764
0º, 0.5" ice, 4 psf wind + k		32	35	38	42	45	49	53	58	62	66	71	2500
0		12	14	15	16	18	19	21	23	24	26	28	1343
10		14	15	16	18	20	21	23	25	27	29	31	1225
20		15	16	18	20	21	23	25	27	29	31	34	1116
30		16	18	20	22	24	26	28	30	32	34	37	1017
40		18	20	22	24	26	28	30	33	35	38	40	929
50		20	22	24	26	28	30	33	36	38	41	44	851
60º F, 21 psf wind		32	36	39	43	47	51	55	59	64	68	73	1637
60º F, 6 psf wind		24	26	29	31	34	37	40	43	46	50	53	933
60º F, 4 psf wind		22	25	27	30	32	35	38	41	44	47	50	858
60		21	23	26	28	31	33	36	39	42	45	48	784
70		23	25	28	30	33	36	39	42	45	48	51	727
80		25	27	30	33	35	38	42	45	48	52	55	677
90		26	29	32	35	38	41	44	48	51	55	59	634
100		28	31	34	37	40	44	47	51	55	59	63	597

Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇20◇						R.S.						
	Span (Ft)	200	210	220	230	240	250	260	270	280	290	300	
-20		11	12	13	14	16	17	18	20	21	23	24	1536
0		13	14	16	17	19	21	22	24	26	28	30	1264
0°, 0.5" ice, 4 psf wind + k		32	35	38	42	45	49	53	58	62	66	71	2500
30		18	20	21	23	26	28	30	32	35	37	40	939
32°, 0.5" ice,		30	33	36	40	43	47	51	55	59	63	67	1778
32°, 0.5" ice, 2 psf wind		30	34	37	40	44	48	51	55	60	64	68	1819
40		19	21	24	26	28	30	33	35	38	41	44	856
50		21	23	26	28	31	33	36	39	42	45	48	785
60		23	25	28	30	33	36	39	42	45	48	52	724
60° F, 6 psf wind		25	28	30	33	36	39	42	46	49	53	57	878
70		25	27	30	33	36	39	42	45	48	52	56	672
80		26	29	32	35	38	41	45	48	52	56	60	628
90		28	30	33	37	40	43	47	50	54	58	62	602
100		29	32	35	38	41	45	49	52	56	61	65	578
120		31	34	38	41	45	48	52	57	61	65	70	536
248		44	49	53	58	63	69	74	80	86	93	99	379

DESIGN NOTE(s):

19. See comments in front of section for conditions including wind and ice.

◇20◇ Ruling span range is for initial line design between 225' to 274' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

110.8 kcmil (12/7) ACSR "Minorca"

DE Tension = 3,000 Lbs **RBS = 11,300 Lbs**

Extra Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇22◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	250	260	270	280	290	300	310	320	330	340	350	
15º, 1" ice, 4 psf wind		56	60	65	70	75	80	86	91	97	103	109	3834
15º, 0.8" ice, 4 psf wind		49	52	57	61	65	70	75	79	85	90	95	3289
0º, 0.5" ice, 4 psf wind + k		41	45	48	52	55	59	63	67	72	76	81	3000
0		14	15	17	18	19	21	22	23	25	26	28	1825
10		15	17	18	19	21	22	24	25	27	28	30	1693
20		17	18	19	21	22	24	25	27	29	31	33	1565
30		18	19	21	23	24	26	28	29	31	33	35	1444
40		20	21	23	25	26	28	30	32	34	36	38	1329
50		21	23	25	27	29	31	33	35	37	39	42	1223
60º F, 21 psf wind		41	44	47	51	55	58	62	66	71	75	80	2050
60º F, 6 psf wind		27	29	31	34	36	39	41	44	47	50	53	1283
60º F, 4 psf wind		25	27	29	31	34	36	38	41	44	46	49	1203
60		23	25	27	29	31	33	35	38	40	43	45	1127
70		25	27	29	31	34	36	38	41	44	46	49	1040
80		27	29	31	34	36	39	42	44	47	50	53	963
90		29	31	34	36	39	42	45	48	51	54	57	896
100		31	34	36	39	42	45	48	51	54	57	61	836

Extra Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇22◇						R.S.						
	Span (Ft)	250	260	270	280	290	300	310	320	330	340	350	
-20		13	14	15	16	17	19	20	21	23	24	25	2009
0		15	16	18	19	20	22	23	25	26	28	30	1708
0°, 0.5" ice, 4 psf wind + k		41	45	48	52	55	59	63	67	72	76	81	3000
30		20	21	23	25	27	28	30	32	34	37	39	1314
32°, 0.5" ice,		38	41	44	47	51	54	58	62	66	70	74	2199
32°, 0.5" ice, 2 psf wind		39	42	45	48	52	55	59	63	67	71	75	2244
40		22	23	25	27	29	31	33	35	38	40	42	1203
50		24	26	28	30	32	34	36	39	41	44	46	1103
60		26	28	30	32	34	37	39	42	45	47	50	1014
60° F, 6 psf wind		29	31	34	36	39	42	45	48	51	54	57	1183
70		28	30	32	35	37	40	43	45	48	51	54	936
80		30	32	35	38	40	43	46	49	52	55	59	869
90		32	35	37	40	43	46	49	52	56	59	63	815
100		33	36	39	42	45	48	51	54	58	61	65	781
120		36	39	42	45	49	52	55	59	63	67	71	720
248		53	58	62	67	72	77	82	87	93	98	104	489

DESIGN NOTE(s):

21. See comments in front of section for conditions including wind and ice.

◇22◇ Ruling span range is for initial line design between 275' to 324' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

110.8 kcmil (12/7) ACSR "Minorca"

DE Tension = 3,250 Lbs **RBS = 11,300 Lbs**

Super Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇24◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	300	310	320	330	340	350	360	370	380	390	400	
15º, 1" ice, 4 psf wind		74	79	84	89	94	100	106	112	118	124	131	4184
15º, 0.8" ice, 4 psf wind		64	68	73	78	82	87	92	97	103	108	114	3586
0º, 0.5" ice, 4 psf wind + k		55	58	62	66	70	74	79	83	88	92	97	3250
0		20	21	22	24	25	27	28	30	31	33	35	1914
10		21	22	24	25	27	28	30	32	34	35	37	1787
20		22	24	26	27	29	31	32	34	36	38	40	1663
30		24	26	28	29	31	33	35	37	39	41	43	1545
40		26	28	30	32	34	36	38	40	42	44	46	1434
50		28	30	32	34	36	38	40	43	45	48	50	1331
60º F, 21 psf wind		53	57	60	64	68	72	76	81	85	90	94	2262
60º F, 6 psf wind		35	38	40	43	45	48	51	54	56	59	63	1410
60º F, 4 psf wind		33	35	37	40	42	45	47	50	52	55	58	1321
60		30	32	34	37	39	41	44	46	49	51	54	1236
70		33	35	37	39	42	44	47	49	52	55	58	1150
80		35	37	40	42	45	48	50	53	56	59	62	1073
90		37	40	42	45	48	51	54	57	60	63	66	1004
100		40	42	45	48	51	54	57	60	64	67	71	943

Super Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇24◇						R.S.						
	Span (Ft)	300	310	320	330	340	350	360	370	380	390	400	
-20		18	19	21	22	23	25	26	28	29	31	32	2062
0		21	22	24	25	27	29	30	32	34	36	37	1773
0°, 0.5" ice, 4 psf wind + k		55	58	62	66	70	74	79	83	88	92	97	3250
30		27	29	30	32	34	36	39	41	43	45	48	1396
32°, 0.5" ice,		50	53	57	60	64	68	72	76	80	84	89	2396
32°, 0.5" ice, 2 psf wind		51	54	58	62	65	69	73	77	82	86	90	2446
40		29	31	33	35	37	39	42	44	47	49	52	1290
50		31	34	36	38	40	43	45	48	50	53	56	1193
60		34	36	38	41	43	46	49	51	54	57	60	1107
60° F, 6 psf wind		38	41	44	46	49	52	55	58	61	65	68	1295
70		36	39	41	44	47	49	52	55	58	61	65	1031
80		39	42	44	47	50	53	56	59	62	66	69	963
90		41	44	47	50	53	56	59	63	66	70	73	908
100		43	46	49	52	55	58	62	65	69	72	76	874
120		46	49	52	56	59	63	66	70	74	78	82	811
248		66	71	76	80	85	90	96	101	107	112	118	564

DESIGN NOTE(s):

23. See comments in front of section for conditions including wind and ice.

◇24◇ Ruling span range is for initial line design between 325' to 374' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

336.4 kcmil (18/1) ACSR "Merlin"

DE Tension = 1,300 Lbs **RBS = 8,680 Lbs**

Super Short Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇26◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	50	60	70	80	90	100	110	120	130	140	150	
15º, 1" ice, 4 psf wind		6	8	11	15	18	23	27	33	38	44	51	1737
15º, 0.8" ice, 4 psf wind		5	8	10	13	17	21	25	30	35	41	47	1427
0º, 0.5" ice, 4 psf wind + k		4	6	9	11	14	18	21	26	30	35	40	1300
0		3	4	6	7	9	12	14	17	19	23	26	473
10		3	5	7	9	11	14	16	20	23	27	31	404
20		4	6	8	10	13	15	19	22	26	30	35	355
30		4	6	8	11	14	17	21	25	29	34	39	319
40		5	7	9	12	15	19	23	27	32	37	42	291
50		5	7	10	13	17	20	25	29	34	40	46	269
60º F, 21 psf wind		6	9	12	15	20	24	29	35	41	47	54	778
60º F, 6 psf wind		6	8	11	14	18	22	27	32	38	44	50	338
60º F, 4 psf wind		5	8	11	14	18	22	27	32	37	43	49	294
60		5	8	11	14	18	22	26	31	37	43	49	251
70		6	8	11	15	19	23	28	33	39	45	52	237
80		6	9	12	16	20	24	30	35	41	48	55	224
90		6	9	13	16	21	26	31	37	43	50	58	213
100		7	10	13	17	22	27	33	39	45	53	60	204

Super Short Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇26◇						R.S.						
	Span (Ft)	50	60	70	80	90	100	110	120	130	140	150	
-20		2	3	4	5	7	8	10	12	14	16	19	652
0		3	5	6	8	10	13	15	18	21	25	28	435
0°, 0.5" ice, 4 psf wind + k		5	7	9	12	15	18	22	26	31	36	41	1277
30		5	7	9	12	15	18	22	26	31	36	41	303
32°, 0.5" ice,		5	8	10	13	17	21	25	30	35	41	47	792
32°, 0.5" ice, 2 psf wind		5	8	10	13	17	21	25	30	35	41	47	813
40		5	7	10	13	16	20	24	28	33	39	44	279
50		5	8	10	14	17	21	26	30	36	41	48	259
60		6	8	11	14	18	23	27	32	38	44	51	243
60° F, 6 psf wind		6	8	11	15	19	23	28	33	39	45	52	328
70		6	9	12	15	19	24	29	34	40	47	54	230
80		6	9	12	16	20	25	30	36	42	49	56	218
90		7	9	13	17	21	26	32	38	44	52	59	208
100		7	10	13	18	22	27	33	40	46	54	62	200
120		7	10	14	19	24	29	35	42	49	57	65	189
248		9	13	17	23	28	35	43	51	59	69	79	156

DESIGN NOTE(s):

25. See comments in front of section for conditions including wind and ice.

◇26◇ Ruling span range is for initial line design between 75' to 124' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

336.4 kcmil (18/1) ACSR "Merlin"

DE Tension = 1,800 Lbs **RBS = 8,680 Lbs**

Short Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇28◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	100	110	120	130	140	150	160	170	180	190	200	
15º, 1" ice, 4 psf wind		16	20	24	28	32	37	42	48	53	59	66	2386
15º, 0.8" ice, 4 psf wind		15	18	22	25	29	34	39	43	49	54	60	1988
0º, 0.5" ice, 4 psf wind + k		13	15	18	22	25	29	33	37	41	46	51	1800
0		7	9	11	13	15	17	19	22	24	27	30	732
10		9	10	12	15	17	19	22	25	28	31	35	632
20		10	12	14	17	19	22	25	28	32	35	39	557
30		11	13	16	18	21	25	28	32	35	39	44	500
40		12	15	17	20	24	27	31	35	39	43	48	456
50		13	16	19	22	26	29	33	38	42	47	52	420
60º F, 21 psf wind		16	20	24	28	32	37	42	47	53	59	65	1150
60º F, 6 psf wind		14	17	21	24	28	32	37	42	47	52	58	521
60º F, 4 psf wind		14	17	20	24	28	32	36	41	46	51	57	455
60		14	17	20	24	27	32	36	41	45	51	56	392
70		15	18	22	25	29	34	38	43	48	54	60	368
80		16	19	23	27	31	36	40	46	51	57	63	347
90		17	20	24	28	33	37	43	48	54	60	67	330
100		17	21	25	29	34	39	45	50	57	63	70	315

Short Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇28◇						R.S.						
	Span (Ft)	100	110	120	130	140	150	160	170	180	190	200	
-20		6	7	9	10	12	14	16	18	20	22	25	893
0		9	10	12	14	17	19	22	25	28	31	34	642
0°, 0.5" ice, 4 psf wind + k		13	16	19	22	26	29	33	38	42	47	52	1767
30		12	14	17	20	23	27	31	35	39	43	48	460
32°, 0.5" ice,		14	17	21	24	28	32	37	42	47	52	58	1148
32°, 0.5" ice, 2 psf wind		15	18	21	25	28	33	37	42	47	52	58	1177
40		13	16	19	22	25	29	33	37	42	47	52	424
50		14	17	20	24	27	31	36	40	45	50	56	394
60		15	18	21	25	29	33	38	43	48	54	59	370
60° F, 6 psf wind		15	18	22	26	30	34	39	44	49	55	61	495
70		16	19	23	26	31	35	40	45	51	57	63	349
80		17	20	24	28	32	37	42	48	54	60	66	332
90		17	21	25	29	34	39	44	50	56	63	69	316
100		18	22	26	31	35	41	46	52	59	65	72	303
120		20	24	28	33	38	44	50	57	63	71	78	281
248		24	29	34	40	47	54	61	69	77	86	96	230

DESIGN NOTE(s):

27. See comments in front of section for conditions including wind and ice.

◇28◇ Ruling span range is for initial line design between 125' to 174' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

336.4 kcmil (18/1) ACSR "Merlin"

DE Tension = 2,300 Lbs **RBS = 8,680 Lbs**

Medium Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇30◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	150	160	170	180	190	200	210	220	230	240	250	
15º, 1" ice, 4 psf wind		29	34	38	42	47	52	58	63	69	76	82	3002
15º, 0.8" ice, 4 psf wind		27	30	34	38	43	47	52	57	63	68	74	2535
0º, 0.5" ice, 4 psf wind + k		23	26	29	32	36	40	44	48	53	58	63	2300
0		12	13	15	17	19	21	23	25	27	30	32	1064
10		13	15	17	19	21	24	26	29	31	34	37	926
20		15	17	19	22	24	27	30	33	36	39	42	816
30		17	19	22	24	27	30	33	36	40	43	47	729
40		19	21	24	27	30	33	37	40	44	48	52	660
50		20	23	26	29	33	36	40	44	48	52	57	605
60º F, 21 psf wind		27	31	35	40	44	49	54	59	65	70	76	1540
60º F, 6 psf wind		23	26	30	33	37	41	45	50	54	59	64	734
60º F, 4 psf wind		23	26	29	32	36	40	44	48	53	58	63	646
60		22	25	28	32	35	39	43	47	52	56	61	560
70		24	27	30	34	38	42	46	51	56	60	66	523
80		25	29	32	36	40	45	49	54	59	64	70	491
90		27	30	34	38	43	47	52	57	62	68	74	465
100		28	32	36	40	45	50	55	60	66	72	78	442

Medium Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇30◇						R.S.						
	Span (Ft)	150	160	170	180	190	200	210	220	230	240	250	
-20		10	12	13	15	16	18	20	22	24	26	28	1210
0		14	16	18	20	22	24	27	29	32	35	38	898
0°, 0.5" ice, 4 psf wind + k		23	26	29	33	37	41	45	49	54	59	64	2262
30		19	22	25	28	31	34	38	41	45	49	53	643
32°, 0.5" ice,		25	28	31	35	39	44	48	53	58	63	68	1518
32°, 0.5" ice, 2 psf wind		25	28	32	36	40	44	48	53	58	63	69	1555
40		21	24	27	30	33	37	41	45	49	53	58	590
50		22	26	29	32	36	40	44	48	53	58	62	548
60		24	27	31	35	39	43	47	52	56	62	67	513
60° F, 6 psf wind		25	28	32	36	40	44	49	54	59	64	69	679
70		26	29	33	37	41	45	50	55	60	65	71	483
80		27	31	35	39	43	48	53	58	63	69	75	457
90		28	32	36	41	45	50	56	61	67	73	79	435
100		30	34	38	43	48	53	58	64	70	76	82	416
120		32	37	41	46	52	57	63	69	76	82	89	384
248		41	46	52	58	65	72	79	87	95	104	113	305

DESIGN NOTE(s):

29. See comments in front of section for conditions including wind and ice.

◇30◇ Ruling span range is for initial line design between 175' to 224' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

336.4 kcmil (18/1) ACSR "Merlin"

DE Tension = 2,800 Lbs **RBS = 8,680 Lbs**

Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇32◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	200	210	220	230	240	250	260	270	280	290	300	
15º, 1" ice, 4 psf wind		44	48	53	58	63	68	74	80	86	92	98	3592
15º, 0.8" ice, 4 psf wind		39	43	47	52	56	61	66	71	76	82	88	3071
0º, 0.5" ice, 4 psf wind + k		33	36	40	44	47	51	56	60	65	69	74	2800
0		15	16	18	20	21	23	25	27	29	31	34	1470
10		17	19	20	22	24	26	29	31	33	36	38	1299
20		19	21	23	25	27	30	32	35	37	40	43	1151
30		21	24	26	28	31	33	36	39	42	45	48	1027
40		24	26	29	31	34	37	40	43	47	50	53	924
50		26	29	32	35	38	41	44	48	51	55	59	840
60º F, 21 psf wind		39	43	47	51	56	60	65	70	76	81	87	1950
60º F, 6 psf wind		30	34	37	40	44	48	51	55	60	64	68	988
60º F, 4 psf wind		29	32	36	39	42	46	50	54	58	62	66	879
60		28	31	34	38	41	44	48	52	56	60	64	772
70		31	34	37	41	44	48	52	56	60	64	69	715
80		33	36	40	43	47	51	56	60	64	69	74	667
90		35	39	42	46	50	55	59	64	68	73	79	627
100		37	41	45	49	53	58	63	67	73	78	83	593

Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇32◇						R.S.						
	Span (Ft)	200	210	220	230	240	250	260	270	280	290	300	
-20		14	15	17	18	20	22	23	25	27	29	31	1582
0		18	20	22	24	26	28	31	33	36	38	41	1205
0°, 0.5" ice, 4 psf wind + k		33	37	40	44	48	52	56	61	65	70	75	2766
30		25	28	31	34	37	40	43	46	50	54	57	860
32°, 0.5" ice,		35	38	42	46	50	54	59	63	68	73	78	1905
32°, 0.5" ice, 2 psf wind		35	39	42	46	50	55	59	64	69	74	79	1949
40		28	31	34	37	40	44	47	51	55	59	63	787
50		30	33	37	40	43	47	51	55	59	63	68	727
60		32	36	39	43	47	51	55	59	64	68	73	677
60° F, 6 psf wind		34	37	41	45	49	53	57	62	67	71	76	885
70		35	38	42	46	50	54	58	63	68	73	78	635
80		37	40	44	48	53	57	62	67	72	77	82	600
90		39	43	47	51	56	60	65	70	76	81	87	569
100		40	45	49	54	58	63	68	74	79	85	91	542
120		44	49	53	58	63	69	75	80	86	93	99	498
248		57	63	70	76	83	90	97	105	113	121	129	382

DESIGN NOTE(s):

31. See comments in front of section for conditions including wind and ice.

◇32◇ Ruling span range is for initial line design between 225' to 274' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

336.4 kcmil (18/1) ACSR "Merlin"

DE Tension = 3,300 Lbs **RBS = 8,680 Lbs**

Extra Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇34◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	250	260	270	280	290	300	310	320	330	340	350	
15º, 1" ice, 4 psf wind		59	64	69	74	80	85	91	97	103	109	116	4158
15º, 0.8" ice, 4 psf wind		52	56	61	65	70	75	80	85	91	96	102	3598
0º, 0.5" ice, 4 psf wind + k		44	47	51	55	59	63	67	72	76	81	86	3300
0		18	19	21	22	24	25	27	29	31	33	35	1941
10		20	21	23	25	26	28	30	32	34	36	38	1749
20		22	24	25	27	29	31	33	36	38	40	43	1571
30		24	26	28	30	33	35	37	40	42	45	48	1410
40		27	29	31	34	36	39	42	44	47	50	53	1269
50		30	32	35	37	40	43	46	49	52	55	58	1149
60º F, 21 psf wind		49	53	58	62	66	71	76	81	86	91	97	2382
60º F, 6 psf wind		36	39	42	45	49	52	56	59	63	67	71	1298
60º F, 4 psf wind		34	37	40	43	46	50	53	56	60	64	67	1172
60		33	35	38	41	44	47	50	54	57	60	64	1047
70		36	38	42	45	48	51	55	58	62	66	70	962
80		38	42	45	48	52	55	59	63	67	71	75	891
90		41	45	48	52	56	59	63	68	72	76	81	830
100		44	48	51	55	59	63	68	72	77	81	86	779

Extra Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇34◇						R.S.						
	Span (Ft)	250	260	270	280	290	300	310	320	330	340	350	
-20		17	18	20	21	23	25	26	28	30	32	33	2002
0		22	24	25	27	29	31	34	36	38	40	43	1566
0°, 0.5" ice, 4 psf wind + k		44	48	51	55	59	63	68	72	77	81	86	3279
30		31	33	36	38	41	44	47	50	53	57	60	1121
32°, 0.5" ice,		28	30	33	35	38	40	43	46	49	52	55	2312
32°, 0.5" ice, 2 psf wind		45	49	53	57	61	65	69	74	79	84	89	2361
40		34	36	39	42	45	48	52	55	59	62	66	1021
50		37	39	43	46	49	53	56	60	64	68	72	938
60		39	43	46	49	53	57	61	65	69	73	77	869
60° F, 6 psf wind		42	45	49	53	57	60	65	69	73	78	82	1118
70		42	46	49	53	57	61	65	69	73	78	83	812
80		45	49	52	56	60	65	69	74	78	83	88	763
90		48	51	55	60	64	68	73	78	83	88	93	721
100		50	54	58	63	67	72	77	82	87	93	98	685
120		55	59	64	69	74	79	84	90	96	102	108	625
248		74	80	87	93	100	107	114	122	130	137	146	481

DESIGN NOTE(s):

33. See comments in front of section for conditions including wind and ice.

◇34◇ Ruling span range is for initial line design between 275' to 324' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

336.4 kcmil (18/1) ACSR "Merlin"

DE Tension = 3,800 Lbs **RBS = 8,680 Lbs**

Super Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇36◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	300	310	320	330	340	350	360	370	380	390	400	
15º, 1" ice, 4 psf wind		75	80	86	91	97	102	108	115	121	127	134	4703
15º, 0.8" ice, 4 psf wind		65	70	74	79	84	89	94	100	105	111	116	4117
0º, 0.5" ice, 4 psf wind + k		55	58	62	66	70	74	79	83	88	92	97	3800
0		20	21	23	24	26	27	29	30	32	34	36	2460
10		22	23	25	26	28	30	31	33	35	37	39	2261
20		24	25	27	29	31	32	34	36	38	40	42	2068
30		26	28	30	32	34	36	38	40	42	44	47	1883
40		29	31	33	35	37	39	42	44	46	49	51	1710
50		32	34	36	38	41	43	46	48	51	54	56	1553
60º F, 21 psf wind		60	64	68	72	77	81	86	91	96	101	106	2838
60º F, 6 psf wind		40	43	46	49	52	55	58	61	65	68	72	1679
60º F, 4 psf wind		38	40	43	46	48	51	54	57	60	64	67	1545
60		35	37	40	42	45	48	50	53	56	59	62	1413
70		38	41	43	46	49	52	55	58	61	65	68	1292
80		42	44	47	50	53	57	60	63	67	70	74	1187
90		45	48	51	54	58	61	65	68	72	76	80	1097
100		48	52	55	58	62	66	70	73	78	82	86	1021

Super Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇36◇						R.S.						
	Span (Ft)	300	310	320	330	340	350	360	370	380	390	400	
-20		20	21	23	24	26	27	29	30	32	34	36	2458
0		25	27	28	30	32	34	36	38	40	42	44	1975
0°, 0.5" ice, 4 psf wind + k		55	58	62	66	70	74	79	83	88	92	97	3800
30		34	37	39	42	44	47	50	52	55	58	61	1430
32°, 0.5" ice,		54	58	62	66	70	74	78	83	87	92	97	2735
32°, 0.5" ice, 2 psf wind		55	59	63	67	71	75	79	84	88	93	98	2790
40		38	41	43	46	49	52	55	58	61	64	68	1299
50		42	44	47	50	53	57	60	63	67	70	74	1189
60		45	48	51	54	58	61	65	68	72	76	80	1096
60° F, 6 psf wind		49	52	56	59	63	67	70	74	79	83	87	1381
70		48	52	55	59	62	66	70	74	78	82	86	1018
80		52	55	59	63	67	71	75	79	83	88	92	952
90		55	59	63	67	71	75	79	84	88	93	98	896
100		58	62	66	71	75	79	84	89	94	98	104	847
120		64	69	73	78	83	88	93	98	103	109	114	767
248		90	97	103	109	116	123	130	138	145	153	161	547

DESIGN NOTE(s):

35. See comments in front of section for conditions including wind and ice.

◇36◇ Ruling span range is for initial line design between 325' to 374' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 4/0 AWG (6/1) ACSR "Penguin"

DE Tension = 1,000 Lbs **RBS = 16,700 Lbs**

Super Short Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇38◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	50	60	70	80	90	100	110	120	130	140	150	
15º, 1" ice, 4 psf wind		8	11	15	20	25	31	38	45	53	61	70	1507
15º, 0.8" ice, 4 psf wind		8	11	15	20	25	30	37	44	52	60	69	1206
0º, 0.5" ice, 4 psf wind + k		7	10	14	18	23	29	35	41	48	56	64	1000
0		6	9	13	17	21	26	31	37	44	51	58	338
10		7	10	13	17	22	27	33	39	46	53	61	323
20		7	10	14	18	23	28	34	41	48	56	64	309
30		7	11	14	19	24	29	36	42	50	58	66	297
40		8	11	15	20	25	31	37	44	52	60	69	286
50		8	11	15	20	25	31	38	45	53	62	71	278
60º F, 21 psf wind		8	12	16	21	27	33	40	48	56	65	75	773
60º F, 6 psf wind		8	12	16	21	26	33	39	47	55	64	73	344
60º F, 4 psf wind		8	12	16	21	26	32	39	47	55	64	73	306
60		8	12	16	21	26	32	39	46	55	63	73	271
70		8	12	16	21	27	33	40	48	56	65	75	264
80		8	12	17	22	28	34	41	49	57	67	76	258
90		9	12	17	22	28	35	42	50	59	68	78	253
100		9	13	17	23	28	35	43	51	59	69	79	249

Super Short Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇38◇						R.S.						
	Span (Ft)	50	60	70	80	90	100	110	120	130	140	150	
-20		6	9	12	16	20	24	30	35	41	48	55	358
0		7	10	13	17	22	27	33	39	46	53	61	324
0º, 0.5" ice, 4 psf wind + k		7	10	14	19	24	29	35	42	49	57	65	986
30		8	11	15	19	25	30	37	44	51	60	68	288
32º, 0.5" ice,		8	11	15	20	25	31	38	45	53	62	71	702
32º, 0.5" ice, 2 psf wind		8	11	15	20	25	31	38	45	53	62	71	718
40		8	11	15	20	25	31	38	45	53	61	70	279
50		8	12	16	21	26	32	39	46	54	63	72	272
60		8	12	16	21	27	33	40	48	56	65	75	265
60º F, 6 psf wind		8	12	16	21	27	33	40	48	56	65	75	336
70		8	12	17	22	27	34	41	49	57	66	76	259
80		9	12	17	22	28	34	42	49	58	67	77	255
90		9	13	17	22	28	35	42	50	59	68	78	252
100		9	13	17	23	29	35	43	51	60	69	79	248
120		9	13	18	23	29	36	44	52	61	71	82	242
248		10	15	20	27	34	42	51	60	71	82	94	210

DESIGN NOTE(s):

37. See comments in front of section for conditions including wind and ice.

◇38◇ Ruling span range is for initial line design between 75' to 124' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 4/0 AWG (6/1) ACSR "Penguin"

DE Tension = 2,000 Lbs **RBS = 16,700 Lbs**

Short Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇40◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	100	110	120	130	140	150	160	170	180	190	200	
15º, 1" ice, 4 psf wind		17	21	25	29	33	38	44	49	55	62	68	2752
15º, 0.8" ice, 4 psf wind		16	19	23	27	32	36	41	47	52	58	64	2281
0º, 0.5" ice, 4 psf wind + k		14	17	21	24	28	32	36	41	46	51	57	2000
0		11	13	16	19	22	25	28	32	36	40	44	796
10		12	15	17	20	24	27	31	35	39	43	48	729
20		13	16	19	22	25	29	33	37	42	46	51	680
30		14	17	20	23	27	31	35	39	44	49	55	639
40		14	17	21	24	28	33	37	42	47	52	58	604
50		15	18	22	26	30	34	39	44	49	55	61	574
60º F, 21 psf wind		18	21	25	30	35	40	45	51	57	64	71	1456
60º F, 6 psf wind		16	20	23	27	32	37	42	47	53	59	65	686
60º F, 4 psf wind		16	19	23	27	32	36	41	47	52	58	64	614
60		16	19	23	27	31	36	41	46	52	58	64	547
70		17	20	24	28	33	38	43	48	54	60	67	524
80		17	21	25	29	34	39	45	50	56	63	70	503
90		18	22	26	30	35	41	46	52	58	65	72	485
100		19	23	27	32	37	42	48	54	61	68	75	468

Short Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇40◇						R.S.						
	Span (Ft)	100	110	120	130	140	150	160	170	180	190	200	
-20		10	12	14	17	19	22	25	28	32	35	39	891
0		12	14	17	20	23	27	30	34	39	43	48	734
0°, 0.5" ice, 4 psf wind + k		14	17	21	24	28	33	37	42	47	52	58	1973
30		15	18	21	25	28	33	37	42	47	52	58	603
32°, 0.5" ice,		16	19	23	27	31	36	41	46	52	58	64	1373
32°, 0.5" ice, 2 psf wind		16	19	23	27	32	36	41	47	52	58	64	1401
40		15	19	22	26	30	34	39	44	50	55	61	572
50		16	19	23	27	31	36	41	46	52	58	64	545
60		17	20	24	28	33	38	43	49	54	61	67	521
60° F, 6 psf wind		17	21	24	29	33	38	44	49	55	61	68	656
70		17	21	25	30	34	39	45	51	57	63	70	500
80		18	22	26	31	36	41	47	53	59	66	73	481
90		19	23	27	31	36	42	48	54	60	67	74	470
100		19	23	27	32	37	43	49	55	62	69	76	460
120		20	24	28	33	39	45	51	57	64	71	79	443
248		24	29	34	40	47	54	61	69	78	86	96	366

DESIGN NOTE(s):

39. See comments in front of section for conditions including wind and ice.

◇40◇ Ruling span range is for initial line design between 125' to 174' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 4/0 AWG (6/1) ACSR "Penguin"

DE Tension = 3,000 Lbs **RBS = 16,700 Lbs**

Medium Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇42◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	150	160	170	180	190	200	210	220	230	240	250	
15º, 1" ice, 4 psf wind		27	31	35	39	44	48	53	59	64	70	76	3883
15º, 0.8" ice, 4 psf wind		25	28	32	36	40	44	49	54	59	64	69	3310
0º, 0.5" ice, 4 psf wind + k		21	24	27	31	34	38	42	46	50	55	59	3000
0		13	15	17	19	21	23	25	28	30	33	36	1519
10		14	16	18	21	23	26	28	31	34	37	40	1364
20		16	18	20	23	26	28	31	34	37	41	44	1236
30		17	20	22	25	28	31	34	37	41	45	48	1129
40		19	22	24	27	30	34	37	41	44	48	53	1041
50		20	23	26	29	33	36	40	44	48	52	56	967
60º F, 21 psf wind		27	30	34	38	43	47	52	57	63	68	74	2178
60º F, 6 psf wind		23	26	29	32	36	40	44	48	53	58	63	1111
60º F, 4 psf wind		22	25	28	32	36	39	43	48	52	57	62	1005
60		22	25	28	31	35	39	43	47	51	56	60	905
70		23	26	30	33	37	41	45	50	54	59	64	852
80		24	28	31	35	39	43	48	52	57	62	68	807
90		26	29	33	37	41	46	50	55	60	66	71	767
100		27	31	35	39	43	48	53	58	63	69	75	732

Medium Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇42◇						R.S.						
	Span (Ft)	150	160	170	180	190	200	210	220	230	240	250	
-20		11	13	14	16	18	20	22	24	26	29	31	1752
0		14	16	19	21	23	26	28	31	34	37	40	1360
0°, 0.5" ice, 4 psf wind + k		21	24	28	31	34	38	42	46	50	55	60	2988
30		19	22	25	28	31	34	38	42	45	49	54	1019
32°, 0.5" ice,		24	27	30	34	38	42	46	51	55	60	65	2104
32°, 0.5" ice, 2 psf wind		24	27	30	34	38	42	46	51	56	61	66	2142
40		21	24	27	30	33	37	41	45	49	53	58	946
50		22	25	29	32	36	40	44	48	52	57	62	884
60		24	27	30	34	38	42	46	51	56	60	66	832
60° F, 6 psf wind		24	28	31	35	39	43	48	52	57	62	68	1033
70		25	28	32	36	40	44	49	54	59	64	69	787
80		26	30	34	38	42	47	51	56	62	67	73	749
90		28	31	35	40	44	49	54	59	65	71	77	715
100		29	32	37	41	46	51	56	61	67	73	79	689
120		30	34	38	43	48	53	58	64	70	76	83	660
248		37	42	48	54	60	66	73	80	88	96	104	528

DESIGN NOTE(s):

41. See comments in front of section for conditions including wind and ice.

◇42◇ Ruling span range is for initial line design between 175' to 224' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 4/0 AWG (6/1) ACSR "Penguin"

DE Tension = 4,000 Lbs **RBS = 16,700 Lbs**

Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇44◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	200	210	220	230	240	250	260	270	280	290	300	
15º, 1" ice, 4 psf wind		38	42	46	50	55	59	64	69	74	80	85	4958
15º, 0.8" ice, 4 psf wind		34	38	41	45	49	53	57	62	67	72	77	4319
0º, 0.5" ice, 4 psf wind + k		28	31	34	38	41	45	48	52	56	60	64	4000
0		14	15	17	18	20	22	24	25	27	29	31	2505
10		15	17	19	20	22	24	26	28	30	32	35	2264
20		17	19	21	23	25	27	29	31	33	36	38	2046
30		19	21	23	25	27	30	32	34	37	40	43	1851
40		21	23	25	27	30	32	35	38	41	44	47	1682
50		23	25	28	30	33	36	38	41	45	48	51	1537
60º F, 21 psf wind		35	38	42	46	50	54	59	63	68	73	78	2962
60º F, 6 psf wind		27	29	32	35	38	42	45	49	52	56	60	1674
60º F, 4 psf wind		26	28	31	34	37	40	43	47	50	54	58	1539
60		25	27	30	33	36	39	42	45	48	52	56	1413
70		27	29	32	35	38	42	45	49	52	56	60	1308
80		29	32	35	38	41	45	48	52	56	60	64	1219
90		31	34	37	40	44	48	52	56	60	64	69	1143
100		32	36	39	43	47	51	55	59	64	68	73	1077

Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇44◇						R.S.						
	Span (Ft)	200	210	220	230	240	250	260	270	280	290	300	
-20		12	14	15	16	18	19	21	23	24	26	28	2824
0		16	17	19	21	23	25	27	29	31	33	36	2207
0°, 0.5" ice, 4 psf wind + k		28	31	34	38	41	45	48	52	56	60	64	4000
30		22	24	27	29	32	35	37	40	43	47	50	1579
32°, 0.5" ice,		30	34	37	40	44	48	52	56	60	64	69	2887
32°, 0.5" ice, 2 psf wind		31	34	37	41	44	48	52	56	60	65	69	2933
40		24	27	29	32	35	38	41	44	48	51	55	1438
50		26	29	32	35	38	41	45	48	52	56	59	1321
60		29	31	35	38	41	45	48	52	56	60	64	1224
60° F, 6 psf wind		30	33	36	40	43	47	51	55	59	63	67	1488
70		31	34	37	40	44	48	52	56	60	64	69	1143
80		33	36	39	43	47	51	55	59	64	68	73	1074
90		34	38	42	46	50	54	58	63	67	72	77	1015
100		36	40	44	48	52	57	61	66	71	76	82	964
120		38	42	47	51	55	60	65	70	75	81	87	909
248		49	54	60	65	71	77	83	90	97	104	111	709

DESIGN NOTE(s):

43. See comments in front of section for conditions including wind and ice.

◇44◇ Ruling span range is for initial line design between 225' to 274' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 4/0 AWG (6/1) ACSR "Penguin"

DE Tension = 5,000 Lbs **RBS = 16,700 Lbs**

Extra Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇46◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	250	260	270	280	290	300	310	320	330	340	350	
15º, 1" ice, 4 psf wind		49	53	57	61	66	70	75	80	85	90	96	6,001
15º, 0.8" ice, 4 psf wind		43	47	50	54	58	62	66	71	75	80	84	5,320
0º, 0.5" ice, 4 psf wind + k		36	39	42	45	48	51	55	58	62	66	70	5,000
0		15	16	18	19	20	22	23	25	26	28	30	3,589
10		16	18	19	21	22	24	25	27	29	30	32	3,316
20		18	19	21	22	24	26	28	29	31	33	35	3,051
30		20	21	23	24	26	28	30	32	34	36	38	2,797
40		21	23	25	27	29	31	33	35	37	39	42	2,558
50		23	25	27	29	31	34	36	38	41	43	46	2,338
60º F, 21 psf wind		42	46	49	53	57	61	65	69	74	78	83	3,811
60º F, 6 psf wind		29	31	34	36	39	42	44	47	50	53	57	2,414
60º F, 4 psf wind		27	29	32	34	37	39	42	45	47	50	53	2,272
60		26	28	30	32	34	37	39	42	44	47	50	2,139
70		28	30	32	35	37	40	43	46	48	51	55	1,962
80		30	33	35	38	41	44	47	50	53	56	59	1,807
90		33	35	38	41	44	47	50	54	57	60	64	1,672
100		35	38	41	44	47	51	54	57	61	65	69	1,555

Extra Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇46◇						R.S.						
	Span (Ft)	250	260	270	280	290	300	310	320	330	340	350	
-20		14	15	16	18	19	20	22	23	24	26	27	3,907
0		17	19	20	22	23	25	27	28	30	32	34	3,170
0°, 0.5" ice, 4 psf wind + k		36	39	42	45	48	51	55	58	62	66	70	5,000
30		24	26	28	30	32	34	37	39	42	44	47	2,290
32°, 0.5" ice,		37	40	43	47	50	53	57	61	65	69	73	3,711
32°, 0.5" ice, 2 psf wind		37	40	44	47	50	54	58	61	65	69	73	3,762
40		26	29	31	33	36	38	41	43	46	49	52	2,068
50		29	31	34	36	39	42	45	48	51	54	57	1,880
60		32	34	37	40	43	46	49	52	55	59	62	1,722
60° F, 6 psf wind		34	37	40	43	46	49	53	56	60	63	67	2,034
70		34	37	40	43	46	50	53	56	60	64	67	1,588
80		37	40	43	46	50	53	57	61	64	68	73	1,476
90		40	43	46	50	53	57	61	65	69	73	78	1,381
100		42	46	49	53	57	61	65	69	73	78	82	1,299
120		46	50	54	58	62	66	71	75	80	85	90	1,188
248		60	65	70	75	81	87	93	99	105	111	118	909

DESIGN NOTE(s):

45. See comments in front of section for conditions including wind and ice.

◇46◇ Ruling span range is for initial line design between 275' to 324' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 4/0 AWG (6/1) ACSR "Penguin"

DE Tension = 6,000 Lbs **RBS = 16,700 Lbs**

Super Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇48◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	300	310	320	330	340	350	360	370	380	390	400	
15º, 1" ice, 4 psf wind		60	64	69	73	77	82	87	92	97	102	107	7019
15º, 0.8" ice, 4 psf wind		52	56	59	63	67	71	75	80	84	88	93	6316
0º, 0.5" ice, 4 psf wind + k		43	46	49	52	55	58	62	65	69	72	76	6000
0		17	18	19	20	22	23	24	25	27	28	30	4693
10		18	19	20	22	23	24	26	27	29	30	32	4416
20		19	20	22	23	24	26	27	29	30	32	34	4140
30		20	22	23	25	26	28	29	31	33	34	36	3866
40		22	23	25	26	28	30	31	33	35	37	39	3597
50		24	25	27	28	30	32	34	36	38	40	42	3335
60º F, 21 psf wind		49	52	56	59	63	67	71	75	79	83	87	4719
60º F, 6 psf wind		30	32	34	36	39	41	43	46	48	51	54	3329
60º F, 4 psf wind		28	30	32	34	36	38	40	42	45	47	49	3200
60		25	27	29	31	33	35	37	39	41	43	45	3083
70		28	29	31	33	35	38	40	42	44	47	49	2844
80		30	32	34	36	39	41	43	46	48	51	53	2622
90		33	35	37	39	42	44	47	49	52	55	58	2419
100		35	38	40	43	45	48	51	54	56	59	63	2235

Super Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇48◇						R.S.						
	Span (Ft)	300	310	320	330	340	350	360	370	380	390	400	
-20		16	17	18	19	20	21	23	24	25	27	28	4978
0		19	20	21	23	24	26	27	29	30	32	33	4180
0°, 0.5" ice, 4 psf wind + k		43	46	49	52	55	58	62	65	69	72	76	6000
30		25	27	29	30	32	34	36	38	40	42	45	3131
32°, 0.5" ice,		43	46	49	52	56	59	62	66	69	73	77	4573
32°, 0.5" ice, 2 psf wind		44	47	50	53	56	60	63	67	70	74	78	4627
40		28	30	31	33	36	38	40	42	44	47	49	2837
50		31	33	35	37	39	42	44	46	49	52	54	2575
60		34	36	38	41	43	46	48	51	54	57	60	2347
60° F, 6 psf wind		37	40	43	45	48	51	54	57	60	63	66	2684
70		37	39	42	44	47	50	53	56	59	62	65	2149
80		40	42	45	48	51	54	57	60	64	67	71	1980
90		43	46	49	52	55	58	62	65	69	72	76	1835
100		46	49	52	56	59	63	66	70	74	78	82	1712
120		52	56	59	63	67	71	75	79	83	88	92	1513
248		69	74	79	84	89	94	100	105	111	117	123	1135

DESIGN NOTE(s):

47. See comments in front of section for conditions including wind and ice.

◇48◇ Ruling span range is for initial line design between 325' to 374' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

556.5 kcmil (19) AAC "Dahlia"

DE Tension = 1,000 Lbs **RBS = 9,750 Lbs**

Super Short Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇50◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	50	60	70	80	90	100	110	120	130	140	150	
15º, 1" ice, 4 psf wind		8	11	15	19	25	30	37	44	51	60	68	1481
15º, 0.8" ice, 4 psf wind		7	11	14	19	24	29	36	42	50	58	66	1184
0º, 0.5" ice, 4 psf wind + k		7	10	13	17	22	27	33	39	46	53	61	1000
0		6	9	12	16	20	25	30	36	42	48	56	317
10		7	9	13	17	21	26	32	37	44	51	59	301
20		7	10	13	18	22	27	33	39	46	54	62	287
30		7	10	14	18	23	29	35	41	48	56	64	275
40		7	11	15	19	24	30	36	43	50	58	67	264
50		8	11	15	20	25	31	37	44	52	60	69	255
60º F, 21 psf wind		8	12	16	21	27	33	40	48	56	65	75	720
60º F, 6 psf wind		8	12	16	21	26	32	39	46	54	63	72	317
60º F, 4 psf wind		8	12	16	21	26	32	39	46	54	63	72	280
60		8	11	16	20	26	32	39	46	54	63	72	246
70		8	12	16	21	27	33	40	48	56	65	74	238
80		8	12	17	22	28	34	41	49	57	67	76	231
90		9	13	17	22	28	35	42	50	59	68	79	225
100		9	13	18	23	29	36	43	52	61	70	81	219

Super Short Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇50◇						R.S.						
	Span (Ft)	50	60	70	80	90	100	110	120	130	140	150	
-20		6	8	11	14	18	22	27	32	38	44	50	350
0		6	9	12	16	20	25	30	36	43	49	57	311
0°, 0.5" ice, 4 psf wind + k		7	10	13	17	22	27	33	39	46	53	61	1000
30		7	10	14	19	23	29	35	42	49	57	65	271
32°, 0.5" ice,		8	11	15	19	24	30	36	43	51	59	68	681
32°, 0.5" ice, 2 psf wind		8	11	15	19	24	30	36	43	51	59	68	698
40		8	11	15	19	24	30	36	43	51	59	68	261
50		8	11	15	20	25	31	38	45	53	61	70	252
60		8	12	16	21	26	32	39	46	55	63	73	243
60° F, 6 psf wind		8	12	16	21	26	32	39	47	55	64	73	313
70		8	12	16	21	27	33	40	48	56	65	75	236
80		9	12	17	22	28	34	42	49	58	67	77	229
90		9	13	17	23	29	35	43	51	60	69	79	223
100		9	13	18	23	29	36	44	52	61	71	82	217
120		10	14	19	24	31	38	46	55	64	75	86	206
212		11	16	22	29	37	46	55	66	77	90	103	172

DESIGN NOTE(s):

49. See comments in front of section for conditions including wind and ice.

◇50◇ Ruling span range is for initial line design between 75' to 124' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

556.5 kcmil (19) AAC "Dahlia"

DE Tension = 2,500 Lbs **RBS = 9,750 Lbs**

Short Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇52◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	100	110	120	130	140	150	160	170	180	190	200	
15º, 1" ice, 4 psf wind		15	18	21	25	29	33	37	42	47	53	58	3081
15º, 0.8" ice, 4 psf wind		13	16	19	22	26	30	34	38	43	48	53	2638
0º, 0.5" ice, 4 psf wind + k		11	13	16	18	21	24	28	31	35	39	43	2500
0		5	7	8	9	11	12	14	16	18	20	22	1424
10		7	8	9	11	13	15	17	19	21	24	26	1193
20		8	9	11	13	15	17	20	22	25	28	31	1012
30		9	11	13	15	18	20	23	26	29	32	36	875
40		10	12	15	17	20	23	26	29	33	37	41	772
50		11	14	16	19	22	25	29	33	37	41	45	694
60º F, 21 psf wind		15	18	22	26	30	34	39	44	49	54	60	1581
60º F, 6 psf wind		13	16	19	22	25	29	33	37	42	46	51	788
60º F, 4 psf wind		13	15	18	21	25	28	32	37	41	46	51	707
60		12	15	18	21	24	28	32	36	40	45	49	632
70		13	16	19	23	26	30	34	39	44	49	54	583
80		14	17	21	24	28	33	37	42	47	52	58	543
90		15	19	22	26	30	35	39	44	50	55	61	510
100		16	20	23	27	32	37	42	47	53	59	65	482

Short Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇52◇						R.S.						
	Span (Ft)	100	110	120	130	140	150	160	170	180	190	200	
-20		4	5	6	7	8	10	11	12	14	15	17	1826
0		6	8	9	11	13	15	17	19	21	23	26	1211
0°, 0.5" ice, 4 psf wind + k		11	13	16	18	21	25	28	32	35	39	44	2469
30		10	12	15	17	20	23	26	30	33	37	41	760
32°, 0.5" ice,		13	15	18	22	25	29	33	37	41	46	51	1599
32°, 0.5" ice, 2 psf wind		13	16	19	22	25	29	33	37	42	47	52	1631
40		12	14	17	19	23	26	29	33	37	42	46	682
50		13	15	18	21	25	28	32	37	41	46	51	621
60		14	17	20	23	27	31	35	39	44	49	55	573
60° F, 6 psf wind		14	17	20	24	27	32	36	41	45	51	56	724
70		15	18	21	25	29	33	38	42	48	53	59	534
80		16	19	23	26	31	35	40	45	51	56	63	502
90		17	20	24	28	32	37	42	48	54	60	66	475
100		17	21	25	29	34	39	45	50	56	63	70	451
120		19	23	27	32	37	43	49	55	62	69	76	413
212		25	31	36	43	50	57	65	73	82	91	101	311

DESIGN NOTE(s):

51. See comments in front of section for conditions including wind and ice.

◇52◇ Ruling span range is for initial line design between 125' to 174' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

556.5 kcmil (19) AAC "Dahlia"

DE Tension = 3,500 Lbs **RBS = 9,750 Lbs**

Medium Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇54◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	150	160	170	180	190	200	210	220	230	240	250	
15º, 1" ice, 4 psf wind		24	28	31	35	39	43	48	53	57	63	68	4126
15º, 0.8" ice, 4 psf wind		22	25	28	31	35	38	42	46	51	55	60	3629
0º, 0.5" ice, 4 psf wind + k		17	20	22	25	28	31	34	37	41	44	48	3500
0		7	8	9	10	11	13	14	15	17	18	20	2476
10		8	9	10	12	13	14	16	17	19	21	23	2167
20		9	11	12	14	15	17	18	20	22	24	26	1880
30		11	12	14	16	17	19	21	23	26	28	30	1624
40		12	14	16	18	20	22	24	27	29	32	35	1408
50		14	16	18	21	23	25	28	31	34	37	40	1231
60º F, 21 psf wind		23	26	30	33	37	41	45	50	54	59	64	2312
60º F, 6 psf wind		18	20	23	25	28	31	34	38	41	45	49	1299
60º F, 4 psf wind		17	19	22	24	27	30	33	36	40	43	47	1192
60		16	18	21	23	26	29	32	35	38	41	45	1090
70		18	21	23	26	29	32	35	39	42	46	50	978
80		20	23	25	29	32	35	39	43	47	51	55	890
90		22	24	28	31	35	38	42	46	51	55	60	818
100		23	26	30	33	37	41	46	50	55	59	65	759

Medium Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇54◇						R.S.						
	Span (Ft)	150	160	170	180	190	200	210	220	230	240	250	
-20		7	8	8	10	11	12	13	14	16	17	18	2650
0		9	11	12	13	15	17	18	20	22	24	26	1895
0°, 0.5" ice, 4 psf wind + k		18	21	24	26	29	33	36	39	43	47	51	3314
30		15	17	19	21	24	27	29	32	35	38	41	1180
32°, 0.5" ice,		21	24	27	30	33	37	40	44	49	53	57	2234
32°, 0.5" ice, 2 psf wind		21	24	27	30	33	37	41	45	49	53	58	2273
40		17	19	22	24	27	30	33	36	40	43	47	1042
50		19	21	24	27	30	33	37	41	44	48	52	935
60		21	24	27	30	33	37	41	45	49	53	58	852
60° F, 6 psf wind		22	24	28	31	35	38	42	46	51	55	60	1058
70		22	26	29	32	36	40	44	48	53	58	62	786
80		24	27	31	35	39	43	47	52	57	62	67	731
90		26	29	33	37	41	46	50	55	60	66	71	686
100		27	31	35	39	44	48	53	59	64	70	76	648
120		30	34	39	43	48	54	59	65	71	77	84	586
212		41	47	53	59	66	73	80	88	96	105	114	431

DESIGN NOTE(s):

53. See comments in front of section for conditions including wind and ice.

◇54◇ Ruling span range is for initial line design between 175' to 224' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

556.5 kcmil (19) AAC "Dahlia"

DE Tension = 4,000 Lbs **RBS = 9,750 Lbs**

Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇56◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	200	210	220	230	240	250	260	270	280	290	300	
15º, 1" ice, 4 psf wind		38	42	46	50	54	59	64	69	74	79	85	4752
15º, 0.8" ice, 4 psf wind		33	37	40	44	48	52	56	60	65	70	75	4195
0º, 0.5" ice, 4 psf wind + k		27	30	33	36	39	42	46	49	53	57	61	4000
0		11	12	13	15	16	17	19	20	22	23	25	2821
10		12	14	15	16	18	19	21	23	24	26	28	2520
20		14	15	17	19	20	22	24	26	28	30	32	2234
30		16	18	19	21	23	25	27	29	31	33	36	1973
40		18	20	22	24	26	28	30	33	35	38	40	1743
50		20	22	25	27	29	32	34	37	40	43	46	1546
60º F, 21 psf wind		34	38	41	45	49	53	58	62	67	72	77	2787
60º F, 6 psf wind		25	28	30	33	36	39	42	45	49	52	56	1624
60º F, 4 psf wind		24	26	29	31	34	37	40	43	47	50	54	1500
60		23	25	27	30	33	35	38	41	44	48	51	1382
70		25	28	30	33	36	39	42	46	49	53	57	1248
80		28	30	33	36	40	43	47	50	54	58	62	1138
90		30	33	36	40	43	47	51	55	59	63	67	1047
100		32	36	39	43	46	50	55	59	63	68	73	972

Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇56◇						R.S.						
	Span (Ft)	200	210	220	230	240	250	260	270	280	290	300	
-20		11	12	14	15	16	18	19	21	22	24	25	2778
0		15	17	18	20	22	24	26	28	30	32	34	2069
0°, 0.5" ice, 4 psf wind + k		29	32	35	38	41	45	49	52	56	61	65	3754
30		23	25	28	30	33	36	38	41	45	48	51	1381
32°, 0.5" ice,		31	35	38	42	45	49	53	57	62	66	71	2609
32°, 0.5" ice, 2 psf wind		32	35	38	42	46	50	54	58	62	67	71	2654
40		25	28	31	34	36	40	43	46	50	53	57	1238
50		28	31	34	37	40	44	47	51	55	59	63	1124
60		30	33	37	40	44	47	51	55	59	64	68	1032
60° F, 6 psf wind		32	35	38	42	46	50	54	58	62	67	72	1276
70		33	36	40	43	47	51	55	60	64	69	74	957
80		35	39	42	46	50	55	59	64	69	74	79	895
90		37	41	45	49	54	58	63	68	73	78	84	842
100		39	43	48	52	57	61	66	72	77	83	88	797
120		43	48	52	57	62	68	73	79	85	91	97	725
212		59	65	71	78	84	92	99	107	115	123	132	536

DESIGN NOTE(s):

55. See comments in front of section for conditions including wind and ice.

◇56◇ Ruling span range is for initial line design between 225' to 274' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

556.5 kcmil (19) AAC "Dahlia"

DE Tension = 4,500 Lbs **RBS = 9,750 Lbs**

Extra Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇58◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	250	260	270	280	290	300	310	320	330	340	350	
15º, 1" ice, 4 psf wind		52	57	61	66	71	75	81	86	91	97	103	5348
15º, 0.8" ice, 4 psf wind		46	50	53	57	62	66	70	75	80	85	90	4746
0º, 0.5" ice, 4 psf wind + k		38	41	44	47	50	54	58	61	65	69	74	4500
0		15	16	18	19	21	22	23	25	27	28	30	3213
10		17	18	20	21	23	24	26	27	29	31	33	2916
20		19	20	22	23	25	27	29	30	32	34	36	2631
30		21	22	24	26	28	30	32	34	36	38	41	2362
40		23	25	27	29	31	33	35	38	40	43	45	2117
50		26	28	30	32	35	37	40	42	45	48	50	1900
60º F, 21 psf wind		46	49	53	57	61	66	70	75	79	84	89	3266
60º F, 6 psf wind		32	35	37	40	43	46	49	52	56	59	63	1978
60º F, 4 psf wind		30	33	35	38	41	44	47	50	53	56	59	1841
60		29	31	33	36	38	41	44	47	50	53	56	1712
70		32	34	37	40	42	45	49	52	55	58	62	1552
80		35	37	40	43	46	50	53	57	60	64	68	1418
90		38	41	44	47	50	54	58	61	65	69	74	1305
100		40	44	47	51	54	58	62	66	70	75	79	1211

Extra Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇58◇						R.S.						
	Span (Ft)	250	260	270	280	290	300	310	320	330	340	350	
-20		16	18	19	21	22	24	25	27	29	30	32	2989
0		21	23	25	27	29	31	33	35	37	39	42	2300
0°, 0.5" ice, 4 psf wind + k		40	43	47	50	54	58	62	66	70	74	79	4212
30		31	33	36	38	41	44	47	50	53	57	60	1603
32°, 0.5" ice,		43	46	50	54	58	62	66	70	75	79	84	2994
32°, 0.5" ice, 2 psf wind		43	47	50	54	58	62	66	71	75	80	85	3044
40		34	37	39	42	45	49	52	55	59	62	66	1450
50		37	40	43	46	50	53	57	61	64	68	73	1325
60		40	43	47	50	54	58	62	66	70	74	79	1223
60° F, 6 psf wind		42	46	49	53	57	61	65	69	73	78	82	1504
70		43	47	50	54	58	62	66	71	75	80	84	1138
80		46	50	54	58	62	66	71	75	80	85	90	1067
90		49	53	57	61	66	70	75	80	85	90	96	1006
100		51	56	60	64	69	74	79	84	90	95	101	953
120		57	61	66	71	76	81	87	93	98	105	111	868
212		76	83	89	96	103	110	117	125	133	141	150	644

DESIGN NOTE(s):

57. See comments in front of section for conditions including wind and ice.

◇58◇ Ruling span range is for initial line design between 275' to 324' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

556.5 kcmil (19) AAC "Dahlia"

DE Tension = 4,750 Lbs **RBS = 9,750 Lbs**

Super Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇60◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	300	310	320	330	340	350	360	370	380	390	400	
15º, 1" ice, 4 psf wind		70	75	80	85	90	96	101	107	113	119	125	5731
15º, 0.8" ice, 4 psf wind		62	66	70	75	79	84	89	94	99	104	110	5073
0º, 0.5" ice, 4 psf wind + k		51	55	58	62	66	70	74	78	82	86	91	4750
0		22	23	25	26	28	30	31	33	35	37	39	3234
10		24	26	27	29	31	33	34	36	38	40	42	2953
20		26	28	30	32	34	36	38	40	42	44	47	2685
30		29	31	33	35	37	39	42	44	46	49	51	2435
40		32	34	36	39	41	43	46	49	51	54	57	2209
50		35	37	40	42	45	48	51	53	56	59	62	2007
60º F, 21 psf wind		60	64	69	73	78	82	87	92	97	102	107	3554
60º F, 6 psf wind		43	46	49	52	55	58	62	65	69	72	76	2128
60º F, 4 psf wind		41	43	46	49	52	55	59	62	65	69	72	1976
60		39	41	44	47	49	52	55	59	62	65	68	1832
70		42	45	48	51	54	57	60	64	67	71	75	1680
80		45	49	52	55	58	62	66	69	73	77	81	1551
90		49	52	56	59	63	67	70	74	79	83	87	1441
100		52	56	60	63	67	71	75	80	84	89	93	1347

Super Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇60◇						R.S.						
	Span (Ft)		310	320	330	340	350	360	370	380	390	400	
-20		24	26	28	30	31	33	35	37	39	41	43	2886
0		31	33	35	37	40	42	45	47	50	52	55	2281
0°, 0.5" ice, 4 psf wind + k		54	58	62	66	70	74	78	83	87	92	97	4466
30		42	45	48	51	54	57	61	64	67	71	75	1676
32°, 0.5" ice,		57	61	65	69	74	78	83	87	92	97	102	3221
32°, 0.5" ice, 2 psf wind		58	62	66	70	74	79	83	88	93	98	103	3277
40		46	49	52	55	59	62	66	70	74	77	82	1538
50		50	53	56	60	64	67	71	75	79	84	88	1424
60		53	57	60	64	68	72	77	81	85	90	95	1328
60° F, 6 psf wind		56	59	63	67	72	76	80	85	89	94	99	1637
70		57	60	64	68	73	77	82	86	91	96	101	1246
80		60	64	68	73	77	82	86	91	96	101	107	1176
90		63	67	72	76	81	86	91	96	101	107	112	1116
100		66	71	76	80	85	90	96	101	107	112	118	1063
120		72	77	82	88	93	99	104	110	116	122	129	975
212		96	103	109	116	123	131	138	146	154	162	171	736

DESIGN NOTE(s):

59. See comments in front of section for conditions including wind and ice.

◇60◇ Ruling span range is for initial line design between 325' to 374' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 336.4 kcmil (18/1) ACSR "Merlin"

DE Tension = 2,000 Lbs **RBS = 17,360 Lbs**

Super Short Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇62◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	50	60	70	80	90	100	110	120	130	140	150	
15º, 1" ice, 4 psf wind		5	7	10	13	17	21	25	30	35	40	46	2,564
15º, 0.8" ice, 4 psf wind		5	7	10	12	16	19	24	28	33	38	44	2,152
0º, 0.5" ice, 4 psf wind + k		4	6	8	10	13	16	20	24	28	32	37	2,000
0		3	4	6	8	10	12	15	18	21	24	28	899
10		4	5	7	9	11	14	17	20	24	28	32	775
20		4	6	8	10	13	16	19	23	27	31	36	686
30		4	6	9	11	14	18	21	25	30	35	40	619
40		5	7	9	12	16	19	23	28	33	38	43	568
50		5	7	10	13	17	21	25	30	35	41	47	527
60º F, 21 psf wind		6	9	12	15	19	24	29	35	41	47	54	1,307
60º F, 6 psf wind		6	8	11	14	18	23	27	32	38	44	51	614
60º F, 4 psf wind		6	8	11	14	18	22	27	32	38	44	50	551
60		6	8	11	14	18	22	27	32	38	44	50	493
70		6	8	12	15	19	24	28	34	40	46	53	465
80		6	9	12	16	20	25	30	36	42	49	56	441
90		7	9	13	17	21	26	32	37	44	51	59	421
100		7	10	13	17	22	27	33	39	46	53	61	402

Super Short Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇62◇						R.S.						
	Span (Ft)	50	60	70	80	90	100	110	120	130	140	150	
-20		2	3	4	6	7	9	11	13	15	17	20	1,226
0		3	5	6	8	11	13	16	19	22	26	30	833
0°, 0.5" ice, 4 psf wind + k		4	6	8	11	14	17	20	24	29	33	38	1,936
30		5	7	9	12	15	19	23	27	31	36	42	590
32°, 0.5" ice,		5	7	10	13	17	21	25	30	35	40	46	1,267
32°, 0.5" ice, 2 psf wind		5	7	10	13	17	21	25	30	35	40	46	1,290
40		5	7	10	13	16	20	24	29	34	40	45	545
50		5	8	11	14	17	22	26	31	37	42	49	509
60		6	8	11	15	19	23	28	33	39	45	52	478
60° F, 6 psf wind		6	8	11	15	19	23	28	33	39	45	52	596
70		6	9	12	16	20	24	29	35	41	48	55	453
80		6	9	12	16	21	25	31	37	43	50	57	431
90		7	10	13	17	22	27	32	38	45	52	60	411
100		7	10	14	18	23	28	34	40	47	55	63	394
120		7	11	14	19	24	29	35	42	49	57	66	375
248		9	13	17	23	29	36	43	51	60	70	80	310

DESIGN NOTE(s):

61. See comments in front of section for conditions including wind and ice.

◇62◇ Ruling span range is for initial line design between 75' to 124' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 336.4 kcmil (18/1) ACSR "Merlin"

DE Tension = 3,000 Lbs **RBS = 17,360 Lbs**

Short Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇64◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	100	110	120	130	140	150	160	170	180	190	200	
15º, 1" ice, 4 psf wind		14	17	20	24	28	32	36	41	46	51	57	3,740
15º, 0.8" ice, 4 psf wind		13	16	19	22	26	29	33	38	42	47	52	3,201
0º, 0.5" ice, 4 psf wind + k		11	13	16	18	21	24	28	31	35	39	44	3,000
0		7	8	10	12	14	16	18	20	22	25	28	1,585
10		8	10	12	14	16	18	21	23	26	29	32	1,355
20		9	11	13	16	18	21	24	27	30	34	37	1,182
30		10	13	15	18	20	23	27	30	34	38	42	1,052
40		12	14	17	19	23	26	29	33	37	42	46	952
50		13	15	18	21	25	28	32	36	41	45	50	873
60º F, 21 psf wind		15	19	22	26	30	35	40	45	50	56	62	2,027
60º F, 6 psf wind		14	17	20	23	27	31	35	40	45	50	55	998
60º F, 4 psf wind		14	17	20	23	27	31	35	40	44	49	55	900
60		14	16	20	23	27	30	35	39	44	49	54	810
70		14	17	21	24	28	33	37	42	47	52	58	757
80		15	19	22	26	30	35	39	44	50	55	61	714
90		16	20	23	27	32	36	42	47	53	59	65	676
100		17	21	25	29	33	38	44	49	55	62	68	644

Short Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇64◇						R.S.						
	Span (Ft)	100	110	120	130	140	150	160	170	180	190	200	
-20		6	7	8	9	11	13	14	16	18	20	22	1,948
0		8	10	11	13	16	18	20	23	26	29	32	1,374
0°, 0.5" ice, 4 psf wind + k		11	14	16	19	22	26	29	33	37	41	45	2,876
30		11	14	16	19	22	26	29	33	37	41	46	958
32°, 0.5" ice,		13	16	19	23	26	30	34	39	43	48	54	1,947
32°, 0.5" ice, 2 psf wind		13	16	19	23	26	30	34	39	44	49	54	1,979
40		12	15	18	21	24	28	32	36	40	45	50	878
50		13	16	19	23	26	30	35	39	44	49	54	814
60		14	17	21	24	28	32	37	42	47	52	58	761
60° F, 6 psf wind		15	18	21	25	29	33	38	42	48	53	59	941
70		15	19	22	26	30	34	39	44	50	55	61	717
80		16	20	23	27	32	36	41	47	52	58	65	301
90		17	21	24	29	33	38	43	49	55	61	68	291
100		18	21	26	30	35	40	45	51	58	64	71	282
120		19	23	28	33	38	43	49	56	62	70	77	265
248		24	29	34	40	46	53	60	68	77	85	95	465

DESIGN NOTE(s):

63. See comments in front of section for conditions including wind and ice.

◇64◇ Ruling span range is for initial line design between 125' to 174' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 336.4 kcmil (18/1) ACSR "Merlin"

DE Tension = 4,000 Lbs **RBS = 17,360 Lbs**

Medium Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇66◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	150	160	170	180	190	200	210	220	230	240	250	
15º, 1" ice, 4 psf wind		24	28	31	35	39	43	48	53	57	63	68	4,870
15º, 0.8" ice, 4 psf wind		22	25	29	32	36	40	44	48	52	57	62	4,239
0º, 0.5" ice, 4 psf wind + k		18	21	24	26	29	33	36	39	43	47	51	4,000
0		10	12	13	15	16	18	20	22	24	26	28	2,436
10		12	13	15	17	19	21	23	25	27	30	32	2,107
20		13	15	17	19	22	24	26	29	32	34	37	1,836
30		15	17	20	22	24	27	30	33	36	39	42	1,619
40		17	19	22	24	27	30	33	37	40	44	47	1,448
50		19	21	24	27	30	33	37	40	44	48	52	1,312
60º F, 21 psf wind		25	29	32	36	41	45	49	54	59	65	70	2,796
60º F, 6 psf wind		21	24	27	31	34	38	42	46	50	55	59	1,459
60º F, 4 psf wind		21	24	27	30	33	37	41	45	49	53	58	1,326
60		21	23	26	30	33	36	40	44	48	53	57	1,203
70		22	25	28	32	36	39	43	48	52	57	62	1,114
80		24	27	30	34	38	42	46	51	56	61	66	1,041
90		25	29	32	36	40	45	49	54	59	64	70	979
100		27	30	34	38	43	47	52	57	63	68	74	926

Medium Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇66◇						R.S.						
	Span (Ft)	150	160	170	180	190	200	210	220	230	240	250	
-20		9	10	11	13	14	16	17	19	21	23	25	2,772
0		12	14	16	17	19	22	24	26	29	31	34	2,024
0°, 0.5" ice, 4 psf wind + k		23	26	29	32	36	40	44	48	53	58	63	3,817
30		18	20	23	25	28	31	35	38	42	45	49	1,393
32°, 0.5" ice,		22	25	28	32	35	39	43	47	52	57	61	2,661
32°, 0.5" ice, 2 psf wind		22	25	28	32	36	39	43	48	52	57	62	2,701
40		19	22	25	28	31	35	38	42	46	50	54	1,267
50		21	24	27	30	34	38	41	45	50	54	59	1,166
60		23	26	29	33	36	40	45	49	53	58	63	1,084
60° F, 6 psf wind		23	27	30	34	38	42	46	50	55	60	65	1,328
70		24	28	31	35	39	43	48	52	57	62	68	1,015
80		26	29	33	37	41	46	51	55	61	66	72	957
90		27	31	35	39	44	48	53	59	64	70	76	908
100		29	32	37	41	46	51	56	61	67	73	79	865
120		31	35	40	45	50	55	61	67	73	80	86	793
248		40	45	51	57	64	71	78	85	93	102	110	623

DESIGN NOTE(s):

65. See comments in front of section for conditions including wind and ice.

◇66◇ Ruling span range is for initial line design between 175' to 224' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 336.4 kcmil (18/1) ACSR "Merlin"

DE Tension = 5,000 Lbs **RBS = 17,360 Lbs**

Long Span - Feet

Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇68◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	200	210	220	230	240	250	260	270	280	290	300	
15º, 1" ice, 4 psf wind		35	39	43	47	51	55	60	65	70	75	80	5,963
15º, 0.8" ice, 4 psf wind		32	35	38	42	46	50	54	58	62	67	72	5,265
0º, 0.5" ice, 4 psf wind + k		26	29	32	35	38	41	44	48	51	55	59	5,000
0		13	14	16	17	19	20	22	24	25	27	29	3,401
10		15	16	18	19	21	23	25	26	28	31	33	3,014
20		16	18	20	22	24	26	28	30	32	35	37	2,663
30		19	20	22	25	27	29	31	34	36	39	42	2,356
40		21	23	25	28	30	33	35	38	41	44	47	2,098
50		23	26	28	31	34	36	39	42	46	49	52	1,885
60º F, 21 psf wind		35	38	42	46	50	54	59	63	68	73	78	3,617
60º F, 6 psf wind		27	30	33	36	39	43	46	50	53	57	61	2,025
60º F, 4 psf wind		26	29	32	35	38	41	45	48	52	56	59	1,862
60		26	28	31	34	37	40	43	47	50	54	58	1,710
70		28	31	34	37	40	44	47	51	55	59	63	1,567
80		30	33	37	40	44	47	51	55	59	64	68	1,449
90		32	36	39	43	47	51	55	59	64	68	73	1,351
100		35	38	42	46	50	54	58	63	68	73	78	1,268

Long Span - Feet

Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇68◇						R.S.						
	Span (Ft)	200	210	220	230	240	250	260	270	280	290	300	
-20		12	13	14	16	17	19	20	22	23	25	27	3,649
0		16	17	19	21	23	25	27	29	31	33	36	2,767
0°, 0.5" ice, 4 psf wind + k		27	30	33	36	39	43	46	50	54	58	62	4,765
30		23	25	28	30	33	36	39	42	45	48	52	1,909
32°, 0.5" ice,		31	34	37	40	44	48	52	56	60	64	69	3,409
32°, 0.5" ice, 2 psf wind		31	34	37	41	44	48	52	56	60	65	69	3,457
40		25	28	31	34	37	40	43	46	50	53	57	1,726
50		28	31	34	37	40	43	47	51	54	58	63	1,578
60		30	33	36	40	43	47	51	55	59	63	68	1,457
60° F, 6 psf wind		31	35	38	41	45	49	53	57	61	66	71	1,763
70		32	36	39	43	47	51	55	59	63	68	73	1,357
80		34	38	42	46	50	54	58	63	68	73	78	1,273
90		36	40	44	48	53	57	62	66	72	77	82	1,201
100		38	42	47	51	55	60	65	70	75	81	87	1,140
120		42	47	51	56	61	66	71	77	83	89	95	1,039
248		56	62	68	74	81	88	95	102	110	118	126	784

DESIGN NOTE(s):

67. See comments in front of section for conditions including wind and ice.

◇68◇ Ruling span range is for initial line design between 225' to 274' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 336.4 kcmil (18/1) ACSR "Merlin"

DE Tension = 6,000 Lbs **RBS = 17,360 Lbs**

Extra Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇70◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	250	260	270	280	290	300	310	320	330	340	350	
15º, 1" ice, 4 psf wind		47	51	55	59	63	68	72	77	82	87	92	7,024
15º, 0.8" ice, 4 psf wind		42	45	49	52	56	60	64	68	73	77	82	6,284
0º, 0.5" ice, 4 psf wind + k		34	37	40	43	46	49	52	56	59	63	67	6,000
0		15	17	18	19	21	22	24	25	27	29	30	4,432
10		17	18	20	21	23	24	26	28	30	31	33	4,025
20		19	20	22	24	25	27	29	31	33	35	37	3,632
30		21	23	24	26	28	30	32	34	37	39	41	3,264
40		23	25	27	29	32	34	36	38	41	43	46	2,928
50		26	28	30	33	35	37	40	43	45	48	51	2,632
60º F, 21 psf wind		44	47	51	55	59	63	67	72	76	81	86	4,490
60º F, 6 psf wind		32	34	37	40	43	46	49	52	55	59	62	2,728
60º F, 4 psf wind		30	33	35	38	41	43	46	49	53	56	59	2,546
60		29	31	34	36	39	42	44	47	50	53	57	2,377
70		32	34	37	40	43	46	49	52	55	59	62	2,160
80		35	37	40	43	47	50	53	57	60	64	68	1,979
90		38	41	44	47	50	54	58	61	65	69	74	1,827
100		40	44	47	51	54	58	62	66	70	75	79	1,700

Extra Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇70◇						R.S.						
	Span (Ft)	250	260	270	280	290	300	310	320	330	340	350	
-20		15	16	17	19	20	22	23	25	26	28	29	4,565
0		19	21	22	24	26	27	29	31	33	35	37	3,586
0°, 0.5" ice, 4 psf wind + k		36	39	42	45	48	51	55	58	62	66	70	5,722
30		27	29	32	34	37	39	42	45	47	50	53	2,513
32°, 0.5" ice,		39	42	45	49	52	56	60	64	68	72	76	4,193
32°, 0.5" ice, 2 psf wind		39	42	46	49	53	56	60	64	68	72	77	4,247
40		30	33	35	38	41	44	47	50	53	56	59	2,265
50		33	36	39	42	45	48	51	54	58	61	65	2,060
60		36	39	42	45	49	52	56	59	63	67	71	1,892
60° F, 6 psf wind		38	41	45	48	51	55	59	63	67	71	75	2,255
70		39	42	46	49	53	56	60	64	68	72	77	1,752
80		42	45	49	53	56	60	64	69	73	78	82	1,634
90		45	48	52	56	60	64	69	73	78	83	88	1,535
100		47	51	55	59	64	68	73	77	82	87	93	1,450
120		52	57	61	66	70	75	80	86	91	97	102	1,312
248		72	78	84	91	97	104	111	119	126	134	142	949

DESIGN NOTE(s):

69. See comments in front of section for conditions including wind and ice.

◇70◇ Ruling span range is for initial line design between 275' to 324' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 336.4 kcmil (18/1) ACSR "Merlin"

DE Tension = 7,000 Lbs **RBS = 17,360 Lbs**

Super Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇72◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	300	310	320	330	340	350	360	370	380	390	400	
15º, 1" ice, 4 psf wind		59	63	67	71	76	80	85	90	95	100	105	8,059
15º, 0.8" ice, 4 psf wind		52	55	59	63	66	70	74	79	83	87	92	7,294
0º, 0.5" ice, 4 psf wind + k		42	45	48	51	54	57	60	64	67	71	75	7,000
0		18	19	20	22	23	24	26	27	29	30	32	5,501
10		19	21	22	23	25	26	28	29	31	33	34	5,098
20		21	22	24	25	27	29	30	32	34	35	37	4,697
30		23	24	26	28	29	31	33	35	37	39	41	4,302
40		25	27	29	30	32	34	36	38	40	42	45	3,923
50		28	30	31	33	36	38	40	42	44	47	49	3,564
60º F, 21 psf wind		52	56	59	63	67	71	75	79	84	88	93	5,415
60º F, 6 psf wind		35	37	39	42	45	47	50	53	56	59	62	3,586
60º F, 4 psf wind		33	35	37	39	42	44	47	49	52	55	58	3,403
60		31	33	35	37	39	42	44	46	49	52	54	3,235
70		34	36	38	41	43	46	48	51	54	57	60	2,940
80		37	39	42	44	47	50	53	56	59	62	65	2,681
90		40	43	46	49	52	55	58	61	64	68	71	2,457
100		44	47	50	53	56	59	63	66	70	74	77	2,266

Super Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇72◇						R.S.						
	Span (Ft)	300	310	320	330	340	350	360	370	380	390	400	
-20		18	19	20	22	23	24	26	27	29	30	32	5,513
0		22	24	25	27	28	30	32	34	35	37	39	4,465
0°, 0.5" ice, 4 psf wind + k		44	47	50	53	56	60	63	67	70	74	78	6,692
30		31	33	35	37	40	42	44	47	49	52	55	3,209
32°, 0.5" ice,		47	50	53	57	60	64	67	71	75	79	83	5,010
32°, 0.5" ice, 2 psf wind		47	50	54	57	61	64	68	72	76	80	84	5,069
40		34	36	39	41	44	46	49	52	55	58	61	2,892
50		38	40	43	45	48	51	54	57	60	63	67	2,624
60		41	44	47	50	53	56	59	62	66	69	73	2,399
60° F, 6 psf wind		44	47	50	54	57	60	64	67	71	75	79	2,810
70		45	48	51	54	57	61	64	68	72	75	79	2,211
80		48	51	55	58	62	65	69	73	77	81	85	2,052
90		51	55	59	62	66	70	74	78	83	87	92	1,917
100		55	58	62	66	70	75	79	83	88	93	97	1,803
120		61	65	69	74	78	83	88	93	98	103	108	1,618
248		88	94	101	107	113	120	127	134	142	149	157	1,120

DESIGN NOTE(s):

71. See comments in front of section for conditions including wind and ice.

◇72◇ Ruling span range is for initial line design between 325' to 374' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

954.0 kcmil (45/7) ACSR "Rail"

DE Tension = 1,500 Lbs **RBS = 25,900 Lbs**

Super Short Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇74◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	50	60	70	80	90	100	110	120	130	140	150	
15º, 1" ice, 4 psf wind		7	10	14	18	23	28	34	40	47	55	63	2099
15º, 0.8" ice, 4 psf wind		7	10	13	18	22	27	33	40	46	54	62	1729
0º, 0.5" ice, 4 psf wind + k		6	9	12	16	21	25	31	36	43	50	57	1500
0		6	9	12	15	19	24	29	34	40	47	54	676
10		6	9	12	16	20	25	30	36	43	49	57	640
20		7	10	13	17	21	27	32	38	45	52	60	609
30		7	10	14	18	22	28	34	40	47	54	62	582
40		7	10	14	18	23	29	35	41	49	56	65	560
50		7	11	15	19	24	30	36	43	50	59	67	541
60º F, 21 psf wind		8	11	15	20	26	32	38	45	53	62	71	1098
60º F, 6 psf wind		8	11	15	20	25	31	37	45	52	61	70	593
60º F, 4 psf wind		8	11	15	20	25	31	37	45	52	61	70	555
60		8	11	15	20	25	31	37	45	52	61	70	523
70		8	11	16	20	26	32	39	46	54	63	72	507
80		8	12	16	21	27	33	40	47	56	64	74	492
90		8	12	17	22	27	34	41	49	57	66	76	478
100		9	12	17	22	28	35	42	50	58	68	78	467

Super Short Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇74◇						R.S.						
	Span (Ft)	50	60	70	80	90	100	110	120	130	140	150	
-20		5	8	10	13	17	21	25	30	35	41	47	769
0		6	9	12	15	19	24	29	34	40	47	54	676
0°, 0.5" ice, 4 psf wind + k		6	9	12	16	21	25	31	36	43	50	57	1498
30		7	10	14	18	22	28	34	40	47	54	62	582
32°, 0.5" ice,		7	10	14	18	23	29	35	41	48	56	65	1106
32°, 0.5" ice, 2 psf wind		7	10	14	18	23	29	35	41	48	56	65	1121
40		7	10	14	19	23	29	35	42	49	57	65	560
50		7	11	15	19	24	30	36	43	50	59	67	540
60		8	11	15	20	25	31	37	45	52	61	70	523
60° F, 6 psf wind		8	11	15	20	25	31	37	45	52	61	70	593
70		8	11	16	20	26	32	39	46	54	63	72	507
80		8	12	16	21	27	33	40	47	56	64	74	492
90		8	12	17	22	27	34	41	49	57	66	76	478
100		9	12	17	22	28	35	42	50	59	68	78	467
120		9	13	17	23	29	36	43	51	60	70	80	454
248		10	15	20	26	33	41	50	59	70	81	93	394

DESIGN NOTE(s):

73. See comments in front of section for conditions including wind and ice.

◇74◇ Ruling span range is for initial line design between 75' to 124' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

954.0 kcmil (45/7) ACSR "Rail"

DE Tension = 3,000 Lbs **RBS = 25,900 Lbs**

Short Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇76◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	100	110	120	130	140	150	160	170	180	190	200	
15º, 1" ice, 4 psf wind		15	18	22	26	30	34	39	44	49	55	61	3858
15º, 0.8" ice, 4 psf wind		15	18	21	25	29	33	37	42	47	53	58	3272
0º, 0.5" ice, 4 psf wind + k		13	15	18	21	25	28	32	37	41	46	51	3000
0		11	13	15	18	21	24	27	30	34	38	42	1539
10		12	14	17	20	23	26	30	34	38	42	47	1391
20		13	15	18	21	25	28	32	36	41	45	50	1280
30		14	16	20	23	27	30	35	39	44	49	54	1189
40		15	18	21	25	28	33	37	42	47	52	58	1115
50		15	19	22	26	30	35	39	44	50	55	61	1051
60º F, 21 psf wind		17	21	25	29	34	39	44	50	56	62	69	2018
60º F, 6 psf wind		16	20	24	28	32	37	42	47	53	59	65	1126
60º F, 4 psf wind		16	20	23	27	32	37	42	47	53	59	65	1057
60		16	20	23	27	32	36	42	47	53	59	65	997
70		17	21	24	29	33	38	44	49	55	61	68	950
80		18	21	26	30	35	40	45	51	58	64	71	909
90		19	22	27	31	36	42	47	53	60	67	74	873
100		19	23	28	33	38	43	49	56	62	70	77	840

Short Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇76◇						R.S.						
	Span (Ft)	100	110	120	130	140	150	160	170	180	190	200	
-20		9	10	12	14	17	19	22	25	28	31	34	1894
0		11	13	16	18	21	24	28	31	35	39	44	1487
0°, 0.5" ice, 4 psf wind + k		13	16	19	22	25	29	33	37	42	47	52	2938
30		14	17	20	24	27	31	36	40	45	50	56	1161
32°, 0.5" ice,		15	18	22	26	30	34	39	44	49	55	61	2095
32°, 0.5" ice, 2 psf wind		15	18	22	26	30	34	39	44	49	55	61	2122
40		15	18	21	25	29	33	38	43	48	53	59	1092
50		16	19	23	26	31	35	40	45	51	56	63	1032
60		16	20	24	28	32	37	42	48	53	59	66	982
60° F, 6 psf wind		17	20	24	28	33	37	42	48	54	60	66	1108
70		17	21	25	29	34	39	44	50	56	62	69	937
80		18	22	26	30	35	40	46	52	58	65	72	898
90		19	23	27	32	37	42	48	54	61	68	75	863
100		19	23	28	33	38	44	50	56	63	70	78	832
120		21	25	30	35	41	47	53	60	67	75	83	779
248		25	30	36	42	49	56	64	72	81	90	100	650

DESIGN NOTE(s):

75. See comments in front of section for conditions including wind and ice.

◇76◇ Ruling span range is for initial line design between 125' to 174' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

954.0 kcmil (45/7) ACSR "Rail"

DE Tension = 4,000 Lbs **RBS = 25,900 Lbs**

Medium Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇78◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	150	160	170	180	190	200	210	220	230	240	250	
15º, 1" ice, 4 psf wind		26	30	34	38	42	47	51	56	62	67	73	5053
15º, 0.8" ice, 4 psf wind		25	28	32	36	40	44	48	53	58	63	69	4336
0º, 0.5" ice, 4 psf wind + k		21	24	27	31	34	38	42	46	50	55	59	4000
0		17	19	21	24	27	30	33	36	39	43	46	2180
10		18	21	24	26	29	33	36	39	43	47	51	1977
20		20	23	26	29	32	36	39	43	47	51	56	1812
30		22	25	28	31	35	39	42	47	51	55	60	1678
40		23	26	30	33	37	41	46	50	55	59	65	1566
50		25	28	32	36	40	44	48	53	58	63	69	1472
60º F, 21 psf wind		28	32	37	41	46	51	56	61	67	73	79	2743
60º F, 6 psf wind		26	30	34	38	42	47	52	57	62	68	73	1565
60º F, 4 psf wind		26	30	34	38	42	47	51	56	62	67	73	1472
60		26	30	34	38	42	46	51	56	61	67	73	1392
70		27	31	35	40	44	49	54	59	65	70	76	1322
80		29	33	37	42	46	51	56	62	68	74	80	1262
90		30	34	39	43	48	54	59	65	71	77	84	1208
100		31	36	40	45	50	56	61	67	74	80	87	1161

Medium Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇78◇						R.S.						
	Span (Ft)	150	160	170	180	190	200	210	220	230	240	250	
-20		15	17	19	21	23	26	29	31	34	37	41	2491
0		18	21	23	26	29	32	35	39	43	46	50	2010
0°, 0.5" ice, 4 psf wind + k		22	25	29	32	36	39	44	48	52	57	62	3844
30		23	26	29	33	37	41	45	49	54	59	64	1586
32°, 0.5" ice,		26	29	33	37	41	45	50	55	60	65	71	2795
32°, 0.5" ice, 2 psf wind		26	29	33	37	41	45	50	55	60	65	71	2829
40		24	28	31	35	39	43	48	52	57	62	68	1490
50		26	29	33	37	41	46	51	55	61	66	72	1408
60		27	31	35	39	44	48	53	59	64	70	76	1337
60° F, 6 psf wind		27	31	35	40	44	49	54	59	65	70	76	1505
70		28	32	37	41	46	51	56	61	67	73	79	1275
80		30	34	38	43	48	53	58	64	70	76	83	1221
90		31	35	40	45	50	55	61	67	73	79	86	1173
100		32	37	41	46	52	57	63	69	76	82	89	1130
120		34	39	44	50	55	61	68	74	81	88	96	1055
248		42	48	54	61	68	75	83	91	99	108	117	863

DESIGN NOTE(s):

77. See comments in front of section for conditions including wind and ice.

◇78◇ Ruling span range is for initial line design between 175' to 224' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

954.0 kcmil (45/7) ACSR "Rail"

DE Tension = 5,000 Lbs **RBS = 25,900 Lbs**

Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇80◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	200	210	220	230	240	250	260	270	280	290	300	
15º, 1" ice, 4 psf wind		38	42	46	50	55	59	64	69	74	80	85	6215
15º, 0.8" ice, 4 psf wind		35	39	43	47	51	55	60	64	69	74	79	5390
0º, 0.5" ice, 4 psf wind + k		30	34	37	40	44	48	51	55	60	64	68	5000
0		22	24	27	29	32	35	38	40	44	47	50	2912
10		24	27	30	32	35	38	41	45	48	51	55	2640
20		27	29	32	35	38	42	45	49	52	56	60	2415
30		29	32	35	38	42	45	49	53	57	61	65	2228
40		31	34	38	41	45	49	53	57	61	66	70	2072
50		33	37	40	44	48	52	56	61	65	70	75	1941
60º F, 21 psf wind		40	44	48	52	57	62	67	72	78	83	89	3499
60º F, 6 psf wind		36	40	43	47	52	56	61	65	70	75	81	2047
60º F, 4 psf wind		36	39	43	47	51	56	60	65	70	75	80	1930
60		35	39	43	47	51	55	60	64	69	74	79	1829
70		37	41	45	49	54	58	63	68	73	78	84	1732
80		39	43	47	52	56	61	66	71	77	82	88	1648
90		41	45	50	54	59	64	69	75	80	86	92	1575
100		43	47	52	57	62	67	72	78	84	90	96	1509

Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇80◇						R.S.						
	Span (Ft)	200	210	220	230	240	250	260	270	280	290	300	
-20		20	23	25	27	29	32	35	37	40	43	46	3161
0		25	28	30	33	36	39	42	46	49	53	56	2576
0°, 0.5" ice, 4 psf wind + k		32	35	39	42	46	50	54	59	63	67	72	4738
30		32	35	38	42	46	50	54	58	62	67	71	2035
32°, 0.5" ice,		36	40	44	48	52	57	61	66	71	76	81	3502
32°, 0.5" ice, 2 psf wind		36	40	44	48	52	57	61	66	71	76	82	3542
40		34	37	41	45	49	53	57	62	66	71	76	1910
50		36	40	43	47	52	56	61	65	70	75	81	1803
60		38	42	46	50	54	59	64	69	74	79	85	1710
60° F, 6 psf wind		38	42	46	51	55	60	65	70	75	80	86	1919
70		40	44	48	52	57	62	67	72	78	83	89	1630
80		41	46	50	55	60	65	70	76	81	87	93	1559
90		43	48	52	57	62	68	73	79	85	91	97	1496
100		43	47	52	57	62	67	72	78	84	90	96	1440
120		48	53	58	64	69	75	81	88	94	101	108	1343
248		60	66	73	79	86	94	101	109	118	126	135	1078

DESIGN NOTE(s):

79. See comments in front of section for conditions including wind and ice.

◇80◇ Ruling span range is for initial line design between 225' to 274' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

954.0 kcmil (45/7) ACSR "Rail"

DE Tension = 7,500 Lbs **RBS = 25,900 Lbs**

Extra Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇82◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	250	260	270	280	290	300	310	320	330	340	350	
15º, 1" ice, 4 psf wind		50	54	58	63	67	72	77	82	87	92	98	7346
15º, 0.8" ice, 4 psf wind		46	50	54	58	62	66	71	76	80	85	90	6435
0º, 0.5" ice, 4 psf wind + k		40	43	46	50	53	57	61	65	69	73	78	6000
0		27	29	32	34	36	39	42	44	47	50	53	3724
10		30	32	35	37	40	43	46	49	52	55	58	3386
20		33	35	38	41	44	47	50	53	57	60	64	3097
30		35	38	41	44	48	51	54	58	62	65	69	2853
40		38	41	45	48	51	55	59	63	67	71	75	2646
50		41	44	48	51	55	59	63	67	71	76	80	2470
60º F, 21 psf wind		51	55	59	63	68	73	78	83	88	93	99	4287
60º F, 6 psf wind		45	48	52	56	60	64	68	73	78	82	87	2581
60º F, 4 psf wind		44	48	51	55	59	63	68	72	77	81	86	2441
60		44	47	51	55	59	63	67	71	76	80	85	2319
70		46	50	54	58	62	66	71	76	80	85	90	2190
80		49	53	57	61	65	70	75	80	85	90	95	2077
90		51	55	59	64	69	73	78	84	89	94	100	1978
100		53	58	62	67	72	77	82	88	93	99	105	1891

Extra Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇82◇						R.S.						
	Span (Ft)	250	260	270	280	290	300	310	320	330	340	350	
-20		26	28	30	33	35	38	40	43	45	48	51	3861
0		32	34	37	40	43	46	49	52	55	59	62	3176
0°, 0.5" ice, 4 psf wind + k		42	46	49	53	57	61	65	69	73	78	83	5629
30		40	43	47	50	54	58	62	66	70	74	79	2512
32°, 0.5" ice,		47	51	55	59	63	68	72	77	82	87	92	4220
32°, 0.5" ice, 2 psf wind		47	51	55	59	63	68	72	77	82	87	92	4267
40		43	46	50	54	58	62	66	70	75	79	84	2356
50		46	50	54	58	62	66	71	76	80	85	90	2221
60		48	52	56	60	64	69	74	79	83	89	94	2105
60° F, 6 psf wind		49	53	57	61	66	70	75	80	85	90	96	2355
70		50	55	59	63	68	73	78	83	88	93	99	2004
80		53	57	62	66	71	76	81	86	92	98	103	1915
90		55	59	64	69	74	79	85	90	96	102	108	1835
100		57	62	67	72	77	82	88	94	100	106	112	1764
120		62	67	72	77	83	89	95	101	107	114	121	1643
248		78	85	91	98	105	113	120	128	136	145	153	1293

DESIGN NOTE(s):

81. See comments in front of section for conditions including wind and ice.

◇82◇ Ruling span range is for initial line design between 275' to 324' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

954.0 kcmil (45/7) ACSR "Rail"

DE Tension = 6,000 Lbs **RBS = 25,900 Lbs**

Super Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇84◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	300	310	320	330	340	350	360	370	380	390	400	
15º, 1" ice, 4 psf wind		60	64	68	72	77	81	86	91	96	101	106	8856
15º, 0.8" ice, 4 psf wind		54	58	62	66	70	74	78	82	87	92	96	7900
0º, 0.5" ice, 4 psf wind + k		46	49	52	55	59	62	66	69	73	77	81	7500
0		27	29	31	33	35	37	39	42	44	46	49	5291
10		30	32	34	36	39	41	43	46	48	51	53	4831
20		33	35	37	40	42	45	47	50	53	56	58	4412
30		36	38	41	44	46	49	52	55	58	61	64	4037
40		39	42	45	47	50	53	56	60	63	66	70	3709
50		42	45	48	51	54	58	61	65	68	72	75	3425
60º F, 21 psf wind		57	61	65	69	74	78	83	87	92	97	102	5436
60º F, 6 psf wind		47	51	54	57	61	64	68	72	76	80	84	3488
60º F, 4 psf wind		46	50	53	56	60	63	67	71	75	79	83	3323
60		46	49	52	55	59	62	66	69	73	77	81	3180
70		49	52	56	59	63	67	70	74	79	83	87	2969
80		52	56	59	63	67	71	75	79	84	88	93	2787
90		55	59	63	67	71	75	80	84	89	93	98	2629
100		58	62	66	71	75	79	84	89	94	99	104	2491

Super Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇84◇						R.S.						
	Span (Ft)	300	310	320	330	340	350	360	370	380	390	400	
-20		28	30	32	34	36	38	40	42	45	47	49	5221
0		34	36	39	41	44	46	49	52	54	57	60	4283
0°, 0.5" ice, 4 psf wind + k		49	53	56	60	63	67	71	75	79	83	87	6944
30		44	47	50	53	56	60	63	67	70	74	78	3312
32°, 0.5" ice,		54	58	62	66	70	74	78	82	87	92	96	5261
32°, 0.5" ice, 2 psf wind		54	58	62	66	70	74	78	83	87	92	97	5314
40		47	50	54	57	61	64	68	72	76	80	84	3080
50		50	54	57	61	65	69	73	77	81	85	90	2881
60		54	57	61	65	69	73	77	82	86	91	95	2711
60° F, 6 psf wind		55	59	62	66	71	75	79	84	88	93	98	3009
70		57	61	64	69	73	77	82	86	91	96	101	2563
80		60	64	68	72	77	81	86	91	96	101	106	2434
90		63	67	71	76	81	85	90	95	101	106	111	2320
100		66	70	75	79	84	89	94	100	105	111	116	2219
120		71	76	81	86	91	97	102	108	114	120	126	2049
248		94	100	107	113	120	128	135	143	150	158	167	1554

DESIGN NOTE(s):

83. See comments in front of section for conditions including wind and ice.

◇84◇ Ruling span range is for initial line design between 325' to 374' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 556.5 kcmil (19) AAC "Dahlia"

DE Tension = 2,000 Lbs **RBS = 19,500 Lbs**

Super Short Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇86◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	50	60	70	80	90	100	110	120	130	140	150	
15º, 1" ice, 4 psf wind		6	9	12	15	19	24	29	34	40	46	53	2,654
15º, 0.8" ice, 4 psf wind		6	8	11	15	19	23	28	33	39	45	52	2,222
0º, 0.5" ice, 4 psf wind + k		5	7	10	13	16	20	24	29	34	39	45	2,000
0		4	6	9	11	14	18	21	25	30	34	39	897
10		5	7	9	12	16	19	23	28	32	38	43	817
20		5	7	10	13	17	21	25	30	35	41	47	755
30		6	8	11	14	18	22	27	32	38	44	50	704
40		6	9	12	15	19	24	29	34	40	47	53	662
50		6	9	12	16	20	25	30	36	42	49	56	626
60º F, 21 psf wind		7	10	14	18	22	28	34	40	47	54	62	1,445
60º F, 6 psf wind		7	10	13	17	21	27	32	38	45	52	60	712
60º F, 4 psf wind		7	10	13	17	21	27	32	38	45	52	60	650
60		7	10	13	17	21	26	32	38	45	52	59	595
70		7	10	14	18	22	28	33	40	47	54	62	569
80		7	10	14	18	23	29	35	41	49	56	65	545
90		8	11	15	19	24	30	36	43	51	59	68	525
100		8	11	15	20	25	31	38	45	53	61	70	506

Super Short Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇86◇						R.S.						
	Span (Ft)	50	60	70	80	90	100	110	120	130	140	150	
-20		4	5	7	9	11	14	17	20	24	28	32	1,108
0		5	6	9	12	15	18	22	26	30	35	41	874
0°, 0.5" ice, 4 psf wind + k		5	7	10	13	16	20	24	29	34	39	45	2,000
30		6	8	11	15	18	23	28	33	39	45	51	690
32°, 0.5" ice,		6	9	12	15	20	24	29	35	41	47	54	1,389
32°, 0.5" ice, 2 psf wind		6	9	12	15	20	24	29	35	41	47	54	1,410
40		6	9	12	15	20	24	29	35	41	47	54	650
50		6	9	13	16	21	26	31	37	43	50	58	616
60		7	10	13	17	22	27	32	39	45	52	60	586
60° F, 6 psf wind		7	10	13	17	22	27	33	39	46	53	61	702
70		7	10	14	18	23	28	34	40	47	55	63	561
80		7	10	14	19	24	29	35	42	49	57	66	538
90		8	11	15	19	25	30	37	44	51	60	68	518
100		8	11	15	20	25	31	38	45	53	62	71	500
120		8	12	16	22	27	34	41	48	57	66	76	469
212		10	15	21	27	34	42	51	60	71	82	94	376

DESIGN NOTE(s):

85. See comments in front of section for conditions including wind and ice.

◇86◇ Ruling span range is for initial line design between 75' to 124' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 556.5 kcmil (19) AAC "Dahlia"

DE Tension = 4,000 Lbs **RBS = 19,500 Lbs**

Short Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇88◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	100	110	120	130	140	150	160	170	180	190	200	
15º, 1" ice, 4 psf wind		13	16	19	22	26	30	34	38	43	48	53	4,737
15º, 0.8" ice, 4 psf wind		12	15	18	21	24	28	32	36	40	44	49	4,130
0º, 0.5" ice, 4 psf wind + k		10	12	14	17	20	23	26	29	32	36	40	4,000
0		6	8	9	11	12	14	16	18	21	23	25	2,477
10		7	9	11	13	15	17	19	22	24	27	30	2,095
20		9	11	13	15	17	20	22	25	28	31	35	1,804
30		10	12	14	17	19	22	25	29	32	36	40	1,585
40		11	13	16	19	22	25	28	32	36	40	44	1,418
50		12	15	18	21	24	27	31	35	39	44	49	1,289
60º F, 21 psf wind		15	18	22	26	30	34	39	44	49	55	61	2,636
60º F, 6 psf wind		14	16	20	23	27	30	35	39	44	49	54	1,397
60º F, 4 psf wind		13	16	19	23	26	30	34	39	43	48	54	1,286
60		13	16	19	22	26	30	34	38	43	48	53	1,186
70		14	17	21	24	28	32	36	41	46	51	57	1,103
80		15	18	22	26	30	34	39	44	49	55	61	1,034
90		16	19	23	27	32	36	41	47	52	58	64	975
100		17	21	24	29	33	38	43	49	55	61	68	925

Short Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇88◇						R.S.						
	Span (Ft)	100	110	120	130	140	150	160	170	180	190	200	
-20		5	6	7	8	10	11	13	14	16	18	20	3,198
0		7	9	11	12	14	16	19	21	24	26	29	2,151
0°, 0.5" ice, 4 psf wind + k		10	12	15	17	20	23	26	30	33	37	41	3,878
30		11	13	16	19	22	25	28	32	36	40	44	1,416
32°, 0.5" ice,		13	16	19	22	25	29	33	37	42	46	51	2,600
32°, 0.5" ice, 2 psf wind		13	16	19	22	25	29	33	37	42	47	52	2,634
40		12	15	18	21	24	27	31	35	40	44	49	1,284
50		13	16	19	22	26	30	34	38	43	48	53	1,180
60		14	17	21	24	28	32	37	41	46	52	57	1,096
60° F, 6 psf wind		15	18	21	25	29	33	37	42	47	53	58	1,300
70		15	19	22	26	30	34	39	44	50	55	61	1,027
80		16	20	23	27	32	36	42	47	53	59	65	969
90		17	21	25	29	33	38	44	49	55	62	68	919
100		18	22	26	30	35	40	46	52	58	65	72	876
120		20	24	28	33	38	44	50	56	63	70	78	805
212		26	31	37	43	50	58	66	74	83	93	103	613

DESIGN NOTE(s):

87. See comments in front of section for conditions including wind and ice.

◇88◇ Ruling span range is for initial line design between 125' to 174' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 556.5 kcmil (19) AAC "Dahlia"

DE Tension = 5,000 Lbs **RBS = 19,500 Lbs**

Medium Span - Feet

Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇90◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	150	160	170	180	190	200	210	220	230	240	250	
15º, 1" ice, 4 psf wind		24	27	31	34	38	42	47	51	56	61	66	5,937
15º, 0.8" ice, 4 psf wind		22	25	28	32	35	39	43	47	52	56	61	5,215
0º, 0.5" ice, 4 psf wind + k		18	21	23	26	29	32	35	39	42	46	50	5,000
0		11	12	14	16	18	19	21	24	26	28	30	3,220
10		13	14	16	18	20	22	25	27	30	32	35	2,792
20		14	16	19	21	23	26	28	31	34	37	40	2,443
30		16	19	21	23	26	29	32	35	38	42	45	2,165
40		18	21	23	26	29	32	36	39	43	46	50	1,946
50		20	23	26	29	32	35	39	43	47	51	55	1,771
60º F, 21 psf wind		26	29	33	37	42	46	51	56	61	66	72	3,471
60º F, 6 psf wind		22	25	29	32	36	40	44	48	53	57	62	1,902
60º F, 4 psf wind		22	25	28	32	35	39	43	47	52	56	61	1,758
60		22	25	28	31	35	39	42	47	51	55	60	1,629
70		23	27	30	34	37	42	46	50	55	60	65	1,513
80		25	28	32	36	40	44	49	54	59	64	69	1,416
90		26	30	34	38	42	47	52	57	62	68	74	1,335
100		28	32	36	40	45	50	55	60	66	72	78	1,265

Medium Span - Feet

Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇90◇						R.S.						
	Span (Ft)	150	160	170	180	190	200	210	220	230	240	250	
-20		10	11	13	14	16	18	20	21	23	26	28	3,537
0		14	16	18	20	22	24	27	30	32	35	38	2,566
0°, 0.5" ice, 4 psf wind + k		19	22	25	28	31	34	38	42	45	49	54	4,661
30		20	22	25	28	31	35	38	42	46	50	54	1,800
32°, 0.5" ice,		23	26	30	33	37	41	45	50	54	59	64	3,266
32°, 0.5" ice, 2 psf wind		23	26	30	33	37	41	45	50	54	59	64	3,307
40		21	24	27	31	34	38	42	46	50	55	59	1,649
50		23	26	30	33	37	41	45	50	54	59	64	1,526
60		25	28	32	36	40	44	49	53	58	63	69	1,425
60° F, 6 psf wind		25	29	32	36	41	45	49	54	59	65	70	1,685
70		26	30	34	38	42	47	52	57	62	67	73	1,341
80		28	32	36	40	45	50	55	60	66	71	77	1,269
90		29	33	38	42	47	52	57	63	69	75	81	1,207
100		31	35	39	44	49	54	60	66	72	78	85	1,152
120		33	38	43	48	53	59	65	72	78	85	92	1,062
212		44	50	56	63	70	77	85	94	102	111	121	814

DESIGN NOTE(s):

89. See comments in front of section for conditions including wind and ice.

◇90◇ Ruling span range is for initial line design between 175' to 224' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 556.5 kcmil (19) AAC "Dahlia"

DE Tension = 6,000 Lbs **RBS = 19,500 Lbs**

Long Span - Feet

Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇92◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	200	210	220	230	240	250	260	270	280	290	300	
15º, 1" ice, 4 psf wind		35	39	43	47	51	55	60	65	69	74	80	7,098
15º, 0.8" ice, 4 psf wind		32	36	39	43	47	51	55	59	64	68	73	6,282
0º, 0.5" ice, 4 psf wind + k		27	29	32	35	38	42	45	49	52	56	60	6,000
0		16	17	19	21	22	24	26	28	31	33	35	4,032
10		18	19	21	23	25	27	30	32	34	37	40	3,560
20		20	22	24	26	29	31	34	36	39	42	45	3,155
30		22	25	27	29	32	35	38	41	44	47	50	2,817
40		25	27	30	33	36	39	42	45	48	52	56	2,539
50		27	30	33	36	39	42	46	49	53	57	61	2,311
60º F, 21 psf wind		37	41	45	49	53	58	63	67	73	78	83	4,323
60º F, 6 psf wind		31	34	37	41	44	48	52	56	60	65	69	2,456
60º F, 4 psf wind		30	33	36	40	43	47	51	55	59	63	68	2,282
60		30	33	36	39	43	46	50	54	58	62	67	2,125
70		32	35	39	42	46	50	54	58	62	67	72	1,970
80		34	38	41	45	49	53	58	62	67	72	77	1,840
90		36	40	44	48	52	57	61	66	71	76	82	1,730
100		38	42	46	51	55	60	65	70	75	81	86	1,636

Long Span - Feet

Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇92◇						R.S.						
	Span (Ft)	200	210	220	230	240	250	260	270	280	290	300	
-20		16	17	19	21	22	24	26	28	31	33	35	4,021
0		21	23	25	27	30	32	35	38	40	43	46	3,047
0°, 0.5" ice, 4 psf wind + k		29	32	35	39	42	46	49	53	57	62	66	5,474
30		28	31	34	38	41	44	48	52	56	60	64	2,210
32°, 0.5" ice,		34	37	41	45	49	53	57	62	67	71	76	3,944
32°, 0.5" ice, 2 psf wind		34	38	41	45	49	53	57	62	67	72	77	3,993
40		31	34	37	41	44	48	52	56	61	65	69	2,034
50		33	37	40	44	48	52	56	61	65	70	75	1,890
60		35	39	43	47	51	55	60	65	70	75	80	1,769
60° F, 6 psf wind		36	40	44	48	52	57	61	66	71	76	82	2,084
70		38	41	46	50	54	59	64	69	74	79	85	1,667
80		40	44	48	53	57	62	67	73	78	84	90	1,580
90		42	46	51	55	60	65	71	76	82	88	94	1,504
100		44	48	53	58	63	68	74	80	86	92	98	1,438
120		47	52	57	63	68	74	80	86	93	100	107	1,327
212		62	68	75	82	89	97	104	113	121	130	139	1,018

DESIGN NOTE(s):

91. See comments in front of section for conditions including wind and ice.

◇92◇ Ruling span range is for initial line design between 225' to 274' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 556.5 kcmil (19) AAC "Dahlia"

DE Tension = 7,000 Lbs **RBS = 19,500 Lbs**

Extra Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇94◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	250	260	270	280	290	300	310	320	330	340	350	
15º, 1" ice, 4 psf wind		48	52	56	60	64	69	73	78	83	88	94	8,227
15º, 0.8" ice, 4 psf wind		43	47	51	54	58	62	67	71	76	80	85	7,336
0º, 0.5" ice, 4 psf wind + k		36	39	42	45	48	51	55	59	62	66	70	7,000
0		20	22	23	25	27	29	31	33	35	37	39	4,906
10		22	24	26	28	30	32	34	36	39	41	44	4,399
20		25	27	29	31	33	36	38	41	43	46	49	3,944
30		28	30	32	35	37	40	43	45	48	51	54	3,548
40		31	33	36	38	41	44	47	50	53	56	60	3,210
50		34	36	39	42	45	48	52	55	58	62	66	2,925
60º F, 21 psf wind		48	52	56	60	65	69	74	79	84	89	94	5,197
60º F, 6 psf wind		39	42	45	48	52	55	59	63	67	71	75	3,069
60º F, 4 psf wind		37	40	44	47	50	54	58	61	65	69	73	2,868
60		37	39	43	46	49	53	56	60	64	68	72	2,686
70		40	43	46	50	53	57	61	65	69	73	77	2,485
80		42	46	49	53	57	61	65	69	74	78	83	2,316
90		45	49	53	57	61	65	69	74	79	84	89	2,172
100		48	52	56	60	64	69	74	79	83	89	94	2,049

Extra Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇94◇						R.S.						
	Span (Ft)	250	260	270	280	290	300	310	320	330	340	350	
-20		21	23	25	27	29	31	33	35	37	39	42	4,587
0		27	30	32	34	37	39	42	45	48	51	54	3,575
0°, 0.5" ice, 4 psf wind + k		40	43	46	50	53	57	61	65	69	73	78	6,306
30		37	40	43	47	50	53	57	61	65	69	73	2,647
32°, 0.5" ice,		45	49	53	57	61	65	69	74	79	83	88	4,637
32°, 0.5" ice, 2 psf wind		45	49	53	57	61	65	70	74	79	84	89	4,692
40		40	43	47	50	54	58	62	66	70	74	79	2,443
50		43	47	50	54	58	62	66	71	75	80	85	2,274
60		46	50	54	58	62	66	71	75	80	85	90	2,132
60° F, 6 psf wind		47	51	55	59	64	68	73	77	82	87	93	2,502
70		49	53	57	61	66	70	75	80	85	90	96	2,011
80		52	56	60	65	69	74	79	84	90	95	101	1,906
90		54	58	63	68	73	78	83	89	94	100	106	1,815
100		57	61	66	71	76	81	87	93	99	105	111	1,735
120		61	66	72	77	83	88	94	100	107	113	120	1,601
212		80	87	93	100	108	115	123	131	140	148	157	1,228

DESIGN NOTE(s):

93. See comments in front of section for conditions including wind and ice.

◇94◇ Ruling span range is for initial line design between 275' to 324' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 556.5 kcmil (19) AAC "Dahlia"

DE Tension = 8,000 Lbs **RBS = 19,500 Lbs**

Super Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇96◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	300	310	320	330	340	350	360	370	380	390	400	
15º, 1" ice, 4 psf wind		61	65	69	74	78	83	87	92	97	103	108	9,324
15º, 0.8" ice, 4 psf wind		55	58	62	66	70	74	79	83	88	92	97	8,378
0º, 0.5" ice, 4 psf wind + k		45	48	51	55	58	61	65	69	72	76	80	8,000
0		24	26	27	29	31	33	35	37	39	41	43	5,836
10		27	28	30	32	34	36	38	41	43	45	47	5,304
20		29	31	33	36	38	40	42	45	47	50	52	4,811
30		32	35	37	39	42	44	47	49	52	55	58	4,364
40		36	38	41	43	46	48	51	54	57	60	63	3,968
50		39	42	44	47	50	53	56	59	63	66	69	3,623
60º F, 21 psf wind		59	63	67	72	76	81	85	90	95	100	105	6,095
60º F, 6 psf wind		45	48	52	55	58	62	65	69	73	77	81	3,752
60º F, 4 psf wind		44	47	50	53	56	60	63	67	70	74	78	3,529
60		42	45	48	51	54	58	61	65	68	72	75	3,327
70		46	49	52	56	59	63	66	70	74	78	82	3,074
80		49	53	56	60	63	67	71	75	79	83	88	2,858
90		53	56	60	64	68	72	76	80	85	89	94	2,673
100		56	60	64	68	72	76	81	85	90	95	100	2,514

Super Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇96◇						R.S.						
	Span (Ft)	300	310	320	330	340	350	360	370	380	390	400	
-20		27	29	31	33	35	37	39	41	43	46	48	5,215
0		34	36	39	41	44	46	49	52	55	58	60	4,149
0°, 0.5" ice, 4 psf wind + k		50	54	57	61	65	69	72	77	81	85	89	7,153
30		45	48	52	55	58	62	65	69	73	77	81	3,115
32°, 0.5" ice,		56	60	64	68	72	77	81	86	90	95	100	5,346
32°, 0.5" ice, 2 psf wind		57	60	64	68	73	77	82	86	91	96	101	5,408
40		49	52	56	59	63	67	71	75	79	83	87	2,880
50		53	56	60	64	68	72	76	80	84	89	94	2,683
60		56	60	64	68	72	76	81	85	90	95	100	2,516
60° F, 6 psf wind		58	62	66	70	74	79	83	88	93	98	103	2,940
70		60	64	68	72	76	81	86	91	95	101	106	2,373
80		63	67	71	76	81	85	90	95	101	106	112	2,250
90		66	70	75	80	85	90	95	100	106	111	117	2,142
100		69	74	79	84	89	94	99	105	111	117	123	2,047
120		75	80	85	91	96	102	108	114	120	127	133	1,888
212		98	105	112	119	126	134	141	149	157	166	174	1,444

DESIGN NOTE(s):

95. See comments in front of section for conditions including wind and ice.

◇96◇ Ruling span range is for initial line design between 325' to 374' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

1272 kcmil (45/7) ACSR "Bittern"

DE Tension = 1,500 Lbs **RBS = 34,100 Lbs**

Super Short Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇98◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	50	60	70	80	90	100	110	120	130	140	150	
15º, 1" ice, 4 psf wind		8	12	16	21	26	32	39	46	54	63	72	2098
15º, 0.8" ice, 4 psf wind		8	11	16	20	26	32	38	46	54	62	72	1749
0º, 0.5" ice, 4 psf wind + k		8	11	15	19	24	30	36	43	51	59	68	1500
0		7	10	14	19	23	29	35	42	49	57	65	744
10		8	11	15	19	24	30	36	43	51	59	68	716
20		8	11	15	20	25	31	38	45	53	61	70	691
30		8	12	16	21	26	32	39	46	54	63	72	671
40		8	12	16	21	27	33	40	48	56	65	75	652
50		9	12	17	22	28	34	41	49	58	67	77	634
60º F, 21 psf wind		9	13	17	23	29	35	43	51	60	69	80	1171
60º F, 6 psf wind		9	13	17	22	28	35	42	50	59	68	79	682
60º F, 4 psf wind		9	13	17	22	28	35	42	50	59	68	79	647
60		9	13	17	22	28	35	42	50	59	68	79	618
70		9	13	18	23	29	36	43	51	60	70	80	603
80		9	13	18	23	30	37	44	53	62	72	82	589
90		9	13	18	24	30	37	45	54	63	73	84	576
100		9	14	19	24	31	38	46	55	64	74	85	569

Super Short Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇98◇						R.S.						
	Span (Ft)	50	60	70	80	90	100	110	120	130	140	150	
-20		7	10	13	17	22	27	32	39	45	52	60	804
0		7	10	14	19	24	29	35	42	49	57	66	739
0°, 0.5" ice, 4 psf wind + k		8	11	15	19	24	30	36	43	51	59	68	1500
30		8	12	16	21	26	32	39	47	55	64	73	667
32°, 0.5" ice,		8	12	16	21	27	33	40	48	56	65	74	1178
32°, 0.5" ice, 2 psf wind		8	12	16	21	27	33	40	48	56	65	74	1191
40		8	12	16	21	27	33	40	48	56	65	75	648
50		9	12	17	22	28	34	41	49	58	67	77	631
60		9	13	17	22	28	35	42	50	59	69	79	615
60° F, 6 psf wind		9	13	17	23	28	35	43	51	59	69	79	678
70		9	13	18	23	29	36	44	52	61	71	81	600
80		9	13	18	24	30	37	44	53	62	72	83	587
90		9	13	18	24	30	37	45	54	63	73	84	576
100		9	14	19	24	31	38	46	55	64	74	85	569
120		10	14	19	25	31	39	47	56	66	76	87	557
248		11	16	22	28	36	44	53	63	74	86	99	492

DESIGN NOTE(s):

97. See comments in front of section for conditions including wind and ice.

◇98◇ Ruling span range is for initial line design between 75' to 124' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

1272 kcmil (45/7) ACSR "Bittern"

DE Tension = 1,500 Lbs **RBS = 34,100 Lbs**

Short Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇100◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	100	110	120	130	140	150	160	170	180	190	200	
15º, 1" ice, 4 psf wind		17	21	25	29	34	39	44	50	56	62	69	3929
15º, 0.8" ice, 4 psf wind		17	20	24	28	33	37	43	48	54	60	67	3341
0º, 0.5" ice, 4 psf wind + k		15	18	22	25	29	34	38	43	49	54	60	3000
0		13	16	19	23	26	30	35	39	44	49	54	1595
10		14	17	21	24	28	32	37	42	47	52	58	1496
20		15	18	22	26	30	34	39	44	49	55	61	1413
30		16	19	23	27	31	36	41	46	52	58	64	1342
40		17	20	24	28	33	38	43	49	55	61	67	1279
50		18	21	25	30	34	40	45	51	57	64	70	1224
60º F, 21 psf wind		19	23	27	32	37	43	49	55	62	69	76	2168
60º F, 6 psf wind		18	22	26	31	36	41	47	53	60	66	74	1292
60º F, 4 psf wind		18	22	26	31	36	41	47	53	60	66	74	1229
60		18	22	26	31	36	41	47	53	59	66	73	1176
70		19	23	27	32	37	43	49	55	62	69	76	1132
80		20	24	28	33	39	44	51	57	64	71	79	1093
90		20	25	29	34	40	46	52	59	66	74	81	1058
100		21	25	30	36	41	47	54	61	68	76	84	1026

Short Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇100◇						R.S.						
	Span (Ft)	100	110	120	130	140	150	160	170	180	190	200	
-20		12	14	17	20	23	26	30	34	38	42	47	1832
0		14	17	20	23	27	31	35	40	45	50	55	1560
0°, 0.5" ice, 4 psf wind + k		15	18	22	25	29	34	38	43	49	54	60	3000
30		16	20	24	28	32	37	42	47	53	59	65	1315
32°, 0.5" ice,		17	21	25	29	34	39	44	50	56	62	69	2253
32°, 0.5" ice, 2 psf wind		17	21	25	29	34	39	44	50	56	62	69	2276
40		17	21	25	29	34	39	44	50	56	62	69	1255
50		18	22	26	30	35	40	46	52	58	65	72	1202
60		19	23	27	32	37	42	48	54	60	67	75	1155
60° F, 6 psf wind		19	23	27	32	37	42	48	54	61	68	75	1271
70		19	23	28	33	38	44	50	56	63	70	77	1113
80		20	24	29	34	39	45	51	58	65	72	80	1075
90		21	25	30	35	41	47	53	60	67	75	83	1041
100		21	26	31	36	42	48	55	62	69	77	86	1010
120		22	27	32	38	44	50	57	64	72	80	89	969
248		26	32	38	44	51	59	67	76	85	94	105	827

DESIGN NOTE(s):

99. See comments in front of section for conditions including wind and ice.

◇100◇ Ruling span range is for initial line design between 125' to 174' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

1272 kcmil (45/7) ACSR "Bittern"

DE Tension = 1,500 Lbs **RBS = 34,100 Lbs**

Medium Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇102◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	150	160	170	180	190	200	210	220	230	240	250	
15º, 1" ice, 4 psf wind		27	31	35	39	43	48	53	58	63	69	75	5636
15º, 0.8" ice, 4 psf wind		26	29	33	37	41	46	50	55	60	66	71	4879
0º, 0.5" ice, 4 psf wind + k		22	26	29	32	36	40	44	48	53	58	62	4500
0		18	21	24	27	30	33	36	40	43	47	51	2624
10		20	23	26	29	32	36	39	43	47	51	56	2418
20		22	25	28	31	35	38	42	46	51	55	60	2246
30		23	26	30	33	37	41	45	50	54	59	64	2102
40		25	28	31	35	39	44	48	53	58	63	68	1979
50		26	29	33	37	41	46	51	56	61	66	72	1874
60º F, 21 psf wind		29	33	38	42	47	52	57	63	69	75	81	3180
60º F, 6 psf wind		27	31	35	40	44	49	54	59	65	70	76	1950
60º F, 4 psf wind		27	31	35	39	44	49	54	59	64	70	76	1859
60		27	31	35	39	44	48	53	59	64	70	76	1782
70		28	32	37	41	46	51	56	61	67	73	79	1702
80		30	34	38	43	48	53	58	64	70	76	83	1630
90		31	35	40	45	50	55	61	67	73	79	86	1567
100		32	37	41	46	52	57	63	69	76	82	89	1510

Medium Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇102◇						R.S.						
	Span (Ft)	150	160	170	180	190	200	210	220	230	240	250	
-20		16	18	21	23	26	29	32	35	38	41	45	2994
0		20	22	25	28	31	35	38	42	46	50	54	2470
0°, 0.5" ice, 4 psf wind + k		23	26	29	33	37	41	45	49	54	58	63	4442
30		24	28	31	35	39	43	48	52	57	62	68	1995
32°, 0.5" ice,		26	30	34	38	42	47	52	57	62	68	73	3307
32°, 0.5" ice, 2 psf wind		26	30	34	38	42	47	52	57	62	68	73	3339
40		26	29	33	37	41	46	50	55	60	66	71	1884
50		27	31	35	39	44	48	53	58	64	69	75	1788
60		28	32	37	41	46	51	56	61	67	73	79	1705
60° F, 6 psf wind		29	33	37	41	46	51	56	62	67	73	80	1870
70		30	34	38	43	48	53	58	64	70	76	83	1632
80		31	35	40	45	50	55	61	67	73	79	86	1567
90		32	37	41	46	52	57	63	69	76	82	89	1509
100		33	38	43	48	53	59	65	72	78	85	92	1457
120		36	40	46	51	57	63	70	76	83	91	99	1366
248		43	48	55	61	68	76	83	91	100	109	118	1143

DESIGN NOTE(s):

101. See comments in front of section for conditions including wind and ice.

◇102◇ Ruling span range is for initial line design between 175' to 224' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

1272 kcmil (45/7) ACSR "Bittern"

DE Tension = 1,500 Lbs **RBS = 34,100 Lbs**

Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇104◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	200	210	220	230	240	250	260	270	280	290	300	
15º, 1" ice, 4 psf wind		37	41	45	49	53	58	63	68	73	78	83	7280
15º, 0.8" ice, 4 psf wind		35	38	42	46	50	54	59	63	68	73	78	6396
0º, 0.5" ice, 4 psf wind + k		30	33	36	40	43	47	51	55	59	63	68	6000
0		22	25	27	30	32	35	38	41	44	47	50	3832
10		25	27	30	33	35	38	42	45	48	52	55	3503
20		27	29	32	35	38	42	45	49	52	56	60	3225
30		29	32	35	38	41	45	49	52	56	61	65	2989
40		31	34	37	41	44	48	52	56	61	65	69	2789
50		33	36	40	43	47	51	56	60	64	69	74	2619
60º F, 21 psf wind		39	43	47	52	56	61	66	71	76	82	88	4243
60º F, 6 psf wind		35	39	43	47	51	55	60	65	69	74	80	2689
60º F, 4 psf wind		35	39	42	46	51	55	59	64	69	74	79	2571
60		35	38	42	46	50	54	59	64	68	73	78	2471
70		37	41	45	49	53	57	62	67	72	77	83	2343
80		39	43	47	51	56	60	65	70	76	81	87	2232
90		40	45	49	53	58	63	68	74	79	85	91	2133
100		42	46	51	56	61	66	71	77	83	89	95	2045

Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇104◇						R.S.						
	Span (Ft)	200	210	220	230	240	250	260	270	280	290	300	
-20		21	23	25	27	30	32	35	38	40	43	46	4175
0		25	28	31	33	36	39	43	46	50	53	57	3405
0°, 0.5" ice, 4 psf wind + k		31	34	38	41	45	49	53	57	61	65	70	5782
30		32	35	39	42	46	50	54	58	63	67	72	2694
32°, 0.5" ice,		36	39	43	47	52	56	60	65	70	75	81	4331
32°, 0.5" ice, 2 psf wind		36	40	43	47	52	56	61	65	70	75	81	4371
40		34	38	41	45	49	53	58	62	67	72	77	2529
50		36	40	44	48	52	56	61	66	71	76	81	2388
60		38	42	46	50	55	59	64	69	75	80	86	2267
60° F, 6 psf wind		38	42	46	51	55	60	65	70	75	81	86	2479
70		40	44	48	53	57	62	67	73	78	84	90	2161
80		42	46	50	55	60	65	70	76	82	88	94	2067
90		43	48	53	57	63	68	73	79	85	91	98	1984
100		45	50	55	60	65	71	76	82	89	95	102	1910
120		48	53	59	64	70	76	82	88	95	102	109	1782
248		59	65	72	78	85	93	100	108	116	124	133	1459

DESIGN NOTE(s):

103. See comments in front of section for conditions including wind and ice.

◇104◇ Ruling span range is for initial line design between 225' to 274' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

1272 kcmil (45/7) ACSR "Bittern"

DE Tension = 1,500 Lbs **RBS = 34,100 Lbs**

Extra Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇106◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	250	260	270	280	290	300	310	320	330	340	350	
15º, 1" ice, 4 psf wind		48	51	55	60	64	68	73	78	83	88	93	8882
15º, 0.8" ice, 4 psf wind		44	48	51	55	59	63	68	72	77	81	86	7903
0º, 0.5" ice, 4 psf wind + k		38	41	44	47	50	54	58	61	65	69	74	7500
0		26	28	30	33	35	37	40	42	45	48	51	5187
10		28	31	33	36	38	41	44	46	49	52	56	4746
20		31	33	36	39	41	44	47	51	54	57	60	4360
30		33	36	39	42	45	48	51	55	58	62	65	4024
40		36	39	42	45	48	52	55	59	63	67	71	3735
50		39	42	45	48	52	56	59	63	67	71	76	3485
60º F, 21 psf wind		48	52	56	61	65	69	74	79	84	89	95	5368
60º F, 6 psf wind		42	46	49	53	57	61	65	69	73	78	82	3531
60º F, 4 psf wind		42	45	49	52	56	60	64	68	72	77	82	3390
60		41	45	48	52	55	59	63	67	72	76	81	3269
70		44	47	51	55	59	63	67	72	76	81	86	3082
80		46	50	54	58	62	66	71	76	80	85	90	2918
90		49	52	57	61	65	70	75	79	85	90	95	2775
100		51	55	59	64	68	73	78	83	89	94	100	2648

Extra Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇106◇						R.S.						
	Span (Ft)	250	260	270	280	290	300	310	320	330	340	350	
-20		25	27	29	31	34	36	39	41	44	46	49	5361
0		31	33	36	39	41	44	47	50	54	57	60	4380
0°, 0.5" ice, 4 psf wind + k		40	43	46	50	53	57	61	65	69	74	78	7080
30		39	42	46	49	53	56	60	64	68	72	77	3432
32°, 0.5" ice,		45	49	53	57	61	65	70	74	79	84	89	5358
32°, 0.5" ice, 2 psf wind		45	49	53	57	61	65	70	74	79	84	89	5405
40		42	45	49	53	56	60	64	69	73	78	82	3210
50		45	48	52	56	60	64	69	73	78	82	87	3021
60		47	51	55	59	63	68	72	77	82	87	92	2858
60° F, 6 psf wind		48	52	56	60	64	69	73	78	83	88	94	3115
70		50	54	58	62	67	71	76	81	86	92	97	2716
80		52	56	61	65	70	75	80	85	91	96	102	2591
90		54	59	63	68	73	78	84	89	95	100	106	2481
100		57	61	66	71	76	81	87	93	99	105	111	2382
120		61	66	71	76	82	88	94	100	106	113	119	2214
248		76	82	88	95	102	109	117	124	132	140	149	1779

DESIGN NOTE(s):

105. See comments in front of section for conditions including wind and ice.

◇106◇ Ruling span range is for initial line design between 275' to 324' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

1272 kcmil (45/7) ACSR "Bittern"

DE Tension = 1,500 Lbs **RBS = 34,100 Lbs**

Super Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇108◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	300	310	320	330	340	350	360	370	380	390	400	
15º, 1" ice, 4 psf wind		58	62	66	70	75	79	84	88	93	98	103	10455
15º, 0.8" ice, 4 psf wind		53	57	60	64	68	72	77	81	85	90	95	9405
0º, 0.5" ice, 4 psf wind + k		45	48	51	54	58	61	65	68	72	76	80	9000
0		29	31	33	35	37	40	42	44	47	49	52	6639
10		32	34	36	38	41	43	46	48	51	53	56	6117
20		34	37	39	42	44	47	50	52	55	58	61	5640
30		37	40	42	45	48	51	54	57	60	63	66	5210
40		40	43	46	49	52	55	58	61	64	68	71	4828
50		43	46	49	52	55	59	62	66	69	73	77	4492
60º F, 21 psf wind		57	61	65	69	73	77	82	86	91	96	101	6557
60º F, 6 psf wind		48	51	54	58	61	65	69	72	76	80	85	4494
60º F, 4 psf wind		47	50	53	57	60	64	67	71	75	79	83	4334
60		46	49	53	56	59	63	67	70	74	78	82	4196
70		49	53	56	60	63	67	71	75	79	83	87	3938
80		52	56	59	63	67	71	75	79	84	88	93	3712
90		55	59	63	67	71	75	79	84	89	93	98	3513
100		58	62	66	70	75	79	84	88	93	98	103	3337

Super Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇108◇						R.S.						
	Span (Ft)	300	310	320	330	340	350	360	370	380	390	400	
-20		30	32	34	36	38	40	43	45	48	50	53	6546
0		36	38	41	44	46	49	52	55	58	61	64	5391
0°, 0.5" ice, 4 psf wind + k		48	52	55	59	62	66	70	74	78	82	86	8352
30		46	49	52	56	59	63	66	70	74	78	82	4215
32°, 0.5" ice,		55	58	62	66	70	74	79	83	88	92	97	6394
32°, 0.5" ice, 2 psf wind		55	58	62	66	70	75	79	83	88	93	97	6446
40		49	53	56	60	63	67	71	75	79	83	88	3933
50		52	56	60	63	67	71	76	80	84	89	93	3692
60		56	59	63	67	71	76	80	85	89	94	99	3484
60° F, 6 psf wind		57	60	64	68	73	77	82	86	91	96	101	3783
70		59	63	67	71	75	80	85	89	94	99	104	3302
80		62	66	70	75	79	84	89	94	99	104	110	3144
90		65	69	73	78	83	88	93	98	104	109	115	3003
100		67	72	77	82	87	92	97	102	108	114	120	2879
120		73	78	83	88	93	99	105	111	117	123	129	2667
248		92	99	105	112	119	126	133	140	148	156	164	2105

DESIGN NOTE(s):

107. See comments in front of section for conditions including wind and ice.

◇108◇ Ruling span range is for initial line design between 325' to 374' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 954.0 kcmil (45/7) ACSR "Rail"

DE Tension = 2,500 Lbs **RBS = 51,800 Lbs**

Super Short Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇110◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	50	60	70	80	90	100	110	120	130	140	150	
15º, 1" ice, 4 psf wind		7	10	13	17	22	27	33	39	46	53	61	3,287
15º, 0.8" ice, 4 psf wind		7	10	13	17	22	27	32	38	45	52	60	2,805
0º, 0.5" ice, 4 psf wind + k		6	9	12	16	20	24	30	35	41	48	55	2,500
0		6	8	12	15	19	24	28	34	40	46	53	1,376
10		6	9	12	16	20	25	30	36	42	49	56	1,301
20		7	9	13	17	21	26	32	38	44	51	59	1,236
30		7	10	13	18	22	27	33	39	46	54	62	1,180
40		7	10	14	18	23	28	34	41	48	56	64	1,135
50		7	11	14	19	24	30	36	43	50	58	66	1,094
60º F, 21 psf wind		8	11	15	20	25	31	38	45	53	61	70	1,922
60º F, 6 psf wind		8	11	15	20	25	31	37	44	52	60	69	1,155
60º F, 4 psf wind		8	11	15	20	25	31	37	44	52	60	69	1,102
60		8	11	15	20	25	31	37	44	52	60	69	1,057
70		8	11	15	20	26	32	38	45	53	62	71	1,024
80		8	12	16	21	26	33	39	47	55	64	73	994
90		8	12	16	21	27	33	41	48	57	66	75	966
100		9	12	17	22	28	34	42	49	58	67	77	942

Super Short Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇110◇						R.S.						
	Span (Ft)	50	60	70	80	90	100	110	120	130	140	150	
-20		5	7	10	13	17	21	25	30	35	40	46	1,574
0		6	8	12	15	19	24	28	34	40	46	53	1,376
0°, 0.5" ice, 4 psf wind + k		6	9	12	16	20	24	30	35	41	48	55	2,498
30		7	10	13	18	22	27	33	39	46	54	62	1,180
32°, 0.5" ice,		7	10	14	18	23	28	34	41	48	55	63	1,947
32°, 0.5" ice, 2 psf wind		7	10	14	18	23	28	34	41	48	55	63	1,964
40		7	10	14	18	23	29	35	41	48	56	64	1,134
50		7	11	14	19	24	30	36	43	50	58	66	1,093
60		8	11	15	20	25	31	37	44	52	60	69	1,057
60° F, 6 psf wind		8	11	15	20	25	31	37	44	52	60	69	1,154
70		8	11	15	20	26	32	38	45	53	62	71	1,024
80		8	12	16	21	26	33	39	47	55	64	73	994
90		8	12	16	21	27	33	41	48	57	66	75	966
100		9	12	17	22	28	34	42	49	58	67	77	941
120		9	13	17	23	29	35	43	51	60	69	79	916
248		10	15	20	26	33	41	50	59	69	80	92	793

DESIGN NOTE(s):

109. See comments in front of section for conditions including wind and ice.

◇110◇ Ruling span range is for initial line design between 75' to 124' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 954.0 kcmil (45/7) ACSR "Rail"

DE Tension = 4,000 Lbs **RBS = 51,800 Lbs**

Short Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇112◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	100	110	120	130	140	150	160	170	180	190	200	
15º, 1" ice, 4 psf wind		17	21	25	29	34	39	44	50	56	62	69	5,168
15º, 0.8" ice, 4 psf wind		17	20	24	28	33	38	43	49	55	61	67	4,448
0º, 0.5" ice, 4 psf wind + k		15	19	22	26	30	34	39	44	50	55	61	4,000
0		14	17	20	24	28	32	36	41	46	51	57	2,274
10		15	18	22	26	30	34	39	44	49	55	61	2,131
20		16	19	23	27	31	36	41	46	52	58	64	2,012
30		17	20	24	28	33	38	43	49	55	61	67	1,916
40		18	21	25	30	35	40	45	51	57	64	71	1,832
50		18	22	26	31	36	41	47	53	60	66	74	1,758
60º F, 21 psf wind		20	24	28	33	38	44	50	57	64	71	79	3,037
60º F, 6 psf wind		19	23	28	32	38	43	49	55	62	69	77	1,845
60º F, 4 psf wind		19	23	28	32	38	43	49	55	62	69	77	1,762
60		19	23	27	32	37	43	49	55	62	69	76	1,692
70		20	24	28	33	39	45	51	57	64	71	79	1,632
80		20	25	29	35	40	46	52	59	66	74	82	1,579
90		21	26	30	36	41	48	54	61	68	76	84	1,530
100		22	26	31	37	43	49	56	63	71	79	87	1,485

Short Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇112◇						R.S.						
	Span (Ft)	100	110	120	130	140	150	160	170	180	190	200	
-20		12	15	18	21	24	28	31	35	40	44	49	2,626
0		14	17	21	24	28	32	37	41	46	52	57	2,254
0°, 0.5" ice, 4 psf wind + k		15	19	22	26	30	35	40	45	50	56	62	3,960
30		17	21	24	29	33	38	44	49	55	61	68	1,901
32°, 0.5" ice,		18	21	25	30	35	40	45	51	57	64	71	3,094
32°, 0.5" ice, 2 psf wind		18	21	25	30	35	40	45	51	57	64	71	3,120
40		18	21	26	30	35	40	45	51	58	64	71	1,820
50		19	22	27	31	36	42	47	53	60	67	74	1,748
60		19	23	28	32	38	43	49	55	62	69	77	1,683
60° F, 6 psf wind		19	23	28	33	38	43	49	56	62	70	77	1,835
70		20	24	29	34	39	45	51	57	64	72	80	1,625
80		21	25	30	35	40	46	53	59	67	74	82	1,573
90		21	26	31	36	42	48	54	61	69	77	85	1,525
100		22	26	31	37	43	49	56	63	71	79	87	1,481
120		23	28	33	39	45	52	59	67	75	83	92	1,404
248		27	32	39	45	53	60	69	78	87	97	107	1,208

DESIGN NOTE(s):

111. See comments in front of section for conditions including wind and ice.

◇112◇ Ruling span range is for initial line design between 125' to 174' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 954.0 kcmil (45/7) ACSR "Rail"

DE Tension = 5,500 Lbs **RBS = 51,800 Lbs**

Medium Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇114◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	150	160	170	180	190	200	210	220	230	240	250	
15º, 1" ice, 4 psf wind		29	33	37	41	46	51	56	62	67	73	80	6,986
15º, 0.8" ice, 4 psf wind		28	32	36	40	45	49	55	60	65	71	77	6,060
0º, 0.5" ice, 4 psf wind + k		25	28	32	36	40	45	49	54	59	64	70	5,500
0		23	26	29	33	36	40	44	49	53	58	63	3,203
10		24	28	31	35	39	43	47	52	57	62	67	2,997
20		26	29	33	37	41	46	50	55	60	66	71	2,830
30		27	31	35	39	43	48	53	58	64	69	75	2,685
40		28	32	37	41	46	51	56	61	67	73	79	2,559
50		30	34	38	43	48	53	58	64	70	76	83	2,449
60º F, 21 psf wind		32	37	41	46	52	57	63	69	76	83	90	4,165
60º F, 6 psf wind		31	35	40	45	50	55	61	67	73	80	86	2,559
60º F, 4 psf wind		31	35	40	45	50	55	61	67	73	79	86	2,446
60		31	35	40	45	50	55	61	67	73	79	86	2,350
70		32	37	41	46	52	57	63	69	76	82	89	2,263
80		33	38	43	48	53	59	65	72	78	85	92	2,184
90		34	39	44	50	55	61	67	74	81	88	96	2,112
100		36	40	46	51	57	63	70	77	84	91	99	2,047

Medium Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇114◇						R.S.						
	Span (Ft)	150	160	170	180	190	200	210	220	230	240	250	
-20		20	23	26	29	32	36	40	44	48	52	56	3,590
0		24	27	30	34	38	42	46	51	55	60	65	3,082
0°, 0.5" ice, 4 psf wind + k		26	29	33	37	41	46	50	55	60	66	71	5,346
30		28	32	36	40	45	49	55	60	65	71	77	2,611
32°, 0.5" ice,		29	33	38	42	47	52	58	63	69	75	82	4,196
32°, 0.5" ice, 2 psf wind		29	33	38	42	47	52	58	63	69	75	82	4,229
40		29	33	37	42	47	52	57	63	69	75	81	2,495
50		30	35	39	44	49	54	60	65	71	78	84	2,393
60		32	36	41	45	51	56	62	68	74	81	88	2,302
60° F, 6 psf wind		32	36	41	46	51	56	62	68	75	81	88	2,506
70		33	37	42	47	53	58	64	70	77	84	91	2,220
80		34	39	44	49	54	60	66	73	80	87	94	2,146
90		35	40	45	50	56	62	69	75	82	90	97	2,079
100		36	41	46	52	58	64	71	78	85	92	100	2,017
120		38	43	49	55	61	68	75	82	90	98	106	1,908
248		45	51	58	65	73	80	89	97	106	116	126	1,612

DESIGN NOTE(s):

113. See comments in front of section for conditions including wind and ice.

◇114◇ Ruling span range is for initial line design between 175' to 224' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 954.0 kcmil (45/7) ACSR "Rail"

DE Tension = 7,000 Lbs **RBS = 51,800 Lbs**

Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇116◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	200	210	220	230	240	250	260	270	280	290	300	
15º, 1" ice, 4 psf wind		41	45	49	54	58	63	69	74	79	85	91	8,764
15º, 0.8" ice, 4 psf wind		39	43	47	52	56	61	66	71	77	82	88	7,658
0º, 0.5" ice, 4 psf wind + k		35	39	42	46	50	55	59	64	68	73	79	7,000
0		31	34	37	41	44	48	52	56	60	65	69	4,198
10		33	36	40	43	47	51	56	60	64	69	74	3,928
20		35	39	42	46	50	55	59	64	68	73	79	3,698
30		37	41	45	49	53	58	62	67	72	78	83	3,500
40		39	43	47	51	56	61	66	71	76	82	87	3,328
50		41	45	49	54	59	64	69	74	80	86	92	3,177
60º F, 21 psf wind		45	50	54	59	65	70	76	82	88	94	101	5,316
60º F, 6 psf wind		43	47	52	57	62	67	72	78	84	90	96	3,307
60º F, 4 psf wind		43	47	52	56	61	67	72	78	84	90	96	3,164
60		42	47	51	56	61	66	72	77	83	89	96	3,043
70		44	49	54	59	64	69	75	81	87	93	100	2,924
80		46	51	56	61	66	72	78	84	90	97	103	2,817
90		48	52	58	63	68	74	80	87	93	100	107	2,721
100		49	54	59	65	71	77	83	90	96	103	111	2,633

Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇116◇						R.S.						
	Span (Ft)	200	210	220	230	240	250	260	270	280	290	300	
-20		28	31	34	38	41	45	48	52	56	60	64	4,526
0		33	36	40	43	47	51	56	60	64	69	74	3,932
0°, 0.5" ice, 4 psf wind + k		37	40	44	48	53	57	62	67	72	77	82	6,698
30		39	43	47	51	56	61	66	71	76	82	87	3,333
32°, 0.5" ice,		41	46	50	55	60	65	70	75	81	87	93	5,291
32°, 0.5" ice, 2 psf wind		41	46	50	55	60	65	70	76	81	87	93	5,331
40		41	45	49	54	59	63	69	74	80	85	91	3,182
50		42	47	51	56	61	66	72	77	83	89	95	3,049
60		44	49	53	58	63	69	75	80	86	93	99	2,931
60° F, 6 psf wind		44	49	54	59	64	69	75	81	87	93	100	3,187
70		46	50	55	61	66	72	77	83	90	96	103	2,824
80		47	52	57	63	68	74	80	86	93	100	107	2,728
90		49	54	59	65	71	77	83	89	96	103	110	2,641
100		51	56	61	67	73	79	85	92	99	106	114	2,561
120		53	59	65	71	77	84	90	97	105	112	120	2,420
248		64	71	78	85	93	101	109	117	126	135	145	2,012

DESIGN NOTE(s):

115. See comments in front of section for conditions including wind and ice.

◇116◇ Ruling span range is for initial line design between 225' to 274' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 954.0 kcmil (45/7) ACSR "Rail"

DE Tension = 9,000 Lbs **RBS = 51,800 Lbs**

Extra Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range 118	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	250	260	270	280	290	300	310	320	330	340	350	
15º, 1" ice, 4 psf wind		51	55	59	64	68	73	78	83	88	94	99	10,956
15º, 0.8" ice, 4 psf wind		48	52	56	61	65	69	74	79	84	89	95	9,687
0º, 0.5" ice, 4 psf wind + k		43	46	50	53	57	61	65	70	74	79	83	9,000
0		35	38	41	44	47	51	54	58	61	65	69	5,734
10		38	41	44	48	51	55	58	62	66	70	74	5,317
20		41	44	47	51	55	59	63	67	71	75	80	4,963
30		43	47	51	54	58	62	67	71	76	80	85	4,659
40		46	50	54	58	62	66	71	75	80	85	90	4,398
50		48	52	56	61	65	70	74	79	84	90	95	4,171
60º F, 21 psf wind		55	60	64	69	74	79	85	90	96	102	108	6,765
60º F, 6 psf wind		51	56	60	64	69	74	79	84	89	95	101	4,302
60º F, 4 psf wind		51	55	60	64	69	74	79	84	89	94	100	4,123
60		51	55	59	64	68	73	78	83	89	94	100	3,972
70		53	58	62	67	72	77	82	87	93	98	104	3,796
80		56	60	65	70	75	80	85	91	97	103	109	3,640
90		58	62	67	72	78	83	89	94	100	107	113	3,500
100		60	65	70	75	81	86	92	98	104	111	117	3,374

Extra Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range 118						R.S.						
	Span (Ft)	250	260	270	280	290	300	310	320	330	340	350	
-20		34	36	39	42	45	48	52	55	59	62	66	6,007
0		39	42	46	49	53	56	60	64	68	72	77	5,150
0°, 0.5" ice, 4 psf wind + k		45	49	53	57	61	65	70	74	79	84	89	8,440
30		47	51	55	59	63	68	72	77	82	87	92	4,290
32°, 0.5" ice,		51	56	60	64	69	74	79	84	90	95	101	6,664
32°, 0.5" ice, 2 psf wind		52	56	60	65	69	74	79	84	90	95	101	6,712
40		50	54	58	62	67	71	76	81	86	92	97	4,078
50		52	56	61	65	70	75	80	85	90	96	102	3,891
60		54	59	63	68	73	78	83	89	94	100	106	3,725
60° F, 6 psf wind		55	59	64	69	74	79	84	90	95	101	107	4,041
70		56	61	66	71	76	81	87	92	98	104	111	3,578
80		59	63	68	73	79	84	90	96	102	108	115	3,446
90		61	66	71	76	82	87	93	100	106	112	119	3,326
100		63	68	73	79	85	90	97	103	109	116	123	3,218
120		67	72	78	84	90	96	103	109	116	123	131	3,028
248		82	89	96	103	111	119	127	135	144	152	162	2,455

DESIGN NOTE(s):

117. See comments in front of section for conditions including wind and ice.

118. Ruling span range is for initial line design between 275' to 324' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

T2 - (2) 954.0 kcmil (45/7) ACSR "Rail"

DE Tension = 12,000 Lbs **RBS = 51,800 Lbs**

Super Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇120◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	300	310	320	330	340	350	360	370	380	390	400	
15º, 1" ice, 4 psf wind		57	61	65	69	74	78	83	87	92	97	102	13,929
15º, 0.8" ice, 4 psf wind		54	57	61	65	69	73	77	82	86	91	95	12,556
0º, 0.5" ice, 4 psf wind + k		46	49	52	55	59	62	66	70	74	77	82	12,000
0		34	36	38	41	43	46	49	51	54	57	60	8,594
10		37	39	42	45	47	50	53	56	59	62	66	7,877
20		40	43	46	48	51	54	58	61	64	68	71	7,249
30		43	46	49	52	56	59	62	66	69	73	77	6,705
40		47	50	53	56	60	63	67	71	75	79	83	6,237
50		50	53	57	60	64	68	72	76	80	84	89	5,833
60º F, 21 psf wind		61	65	69	73	78	83	87	92	97	103	108	8,854
60º F, 6 psf wind		54	58	61	65	69	73	78	82	87	91	96	5,893
60º F, 4 psf wind		53	57	61	65	69	73	77	81	86	90	95	5,671
60		53	57	60	64	68	72	76	81	85	90	94	5,483
70		56	60	64	68	72	76	81	85	90	95	100	5,180
80		59	63	67	72	76	81	85	90	95	100	105	4,914
90		62	66	71	75	80	84	89	94	100	105	110	4,681
100		65	69	74	79	83	88	94	99	104	110	116	4,474

Super Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇120◇						R.S.						
	Span (Ft)	300	310	320	330	340	350	360	370	380	390	400	
-20		34	36	38	41	43	46	49	51	54	57	60	8,608
0		40	43	46	49	52	55	58	61	65	68	72	7,201
0°, 0.5" ice, 4 psf wind + k		50	54	57	61	65	68	72	76	81	85	89	10,953
30		50	54	57	61	65	68	72	76	81	85	89	5,782
32°, 0.5" ice,		57	61	65	69	74	78	83	87	92	97	102	8,602
32°, 0.5" ice, 2 psf wind		57	61	65	69	74	78	83	87	92	97	102	8,660
40		53	57	61	65	69	73	77	81	86	90	95	5,438
50		57	60	64	68	73	77	81	86	91	96	100	5,140
60		60	64	68	72	77	81	86	91	96	101	106	4,880
60° F, 6 psf wind		60	64	69	73	78	82	87	92	97	102	107	5,269
70		63	67	71	76	80	85	90	95	100	106	111	4,651
80		65	70	74	79	84	89	94	99	105	110	116	4,449
90		68	73	78	82	88	93	98	104	109	115	121	4,268
100		71	76	81	86	91	96	102	108	114	120	126	4,107
120		76	81	86	92	98	103	109	116	122	128	135	3,828
248		98	104	111	118	126	133	141	149	157	165	174	2,981

DESIGN NOTE(s):

119. See comments in front of section for conditions including wind and ice.

◇120◇ Ruling span range is for initial line design between 325' to 374' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	11/06/15	ZSD	

This Standard provides sag and tension at 50ft ruling span (RS) for all applications on distribution circuits and sub-transmission lines. The unguyed (self-sustaining) composite pole is covered in DCS **02 00 04 02**.

The below tables show the sags to which conductors are to be strung and clearances to be verified.

Table 1 - 50ft Ruling Span Tensions

Conductor	Tension (Lbs)							
	DE	Initial (Stringing)			Final (Clearance)			
		30° F	60° F	90° F	0° F	60° F	212° F	248° F
1/0 AWG (7) AAAC "Azusa"	175	18	17	17	19	17	14	-
110.8 kcmil (12/7) ACSR "Minorca"	207	43	42	41	45	42	-	37
336.4 kcmil (18/1) ACSR "Merlin"	243	56	54	52	58	54	-	48
T2 - (2) 4/0 AWG (6/1) ACSR "Penguin"	293	87	84	82	90	83	-	75
556.5 kcmil (19) AAC "Dahlia"	285	80	77	74	83	77	65	-
T2 - (2) 336.4 kcmil (18/1) ACSR "Merlin"	342	111	107	105	115	107	-	96
954.0 kcmil (45/7) ACSR "Rail"	403	165	158	154	172	158	-	141
T2 - (2) 556.5 kcmil (19) AAC "Dahlia"	425	160	154	148	167	160	130	-
1272 kcmil (45/7) ACSR "Bittern"	462	213	206	202	222	206	-	186
T2 - (2) 954.0 kcmil (45/7) ACSR "Rail"	627	318	307	302	332	307	-	277

Table 2 - Initial Sag for 50ft RS

Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)										
	R.S. Range ◇2◇	Not Recommended			R.S.					Not Recommended		
	Span (Ft)	0	10	20	30	40	50	60	70	80 ◇1◇	90 ◇1◇	100 ◇1◇
0°, 0.5" ice, 4 psf wind + k		0	1	4	9	15	24	34	46	61	77	95
0		0	1	4	8	15	24	34	46	60	76	94
30		0	1	4	9	16	25	36	49	64	81	100
60		0	1	4	9	17	26	37	51	66	84	103
90		0	1	4	10	17	27	38	52	68	86	106
100		0	1	4	10	17	27	39	52	69	87	107

DESIGN NOTE(s):

◇1.◇ Horizontal configuration is not recommended on span length greater than 75 feet.

◇2.◇ Ruling span range is for initial line design between 25' to 74' for conductor sag accuracy.

3. Automatic deadends or splices shall **ONLY** be installed on full tension spans. Automatic dead-ends or splices shall **NOT** be installed on slack spans, partial tension, or NESC Grade B crossing (highways, rivers, railroads). For slack span, partial tensions, or NESC Grade B crossing (highways, rivers, railroads) applications use bolted deadends or compression splices

4. Ameren defines a highway as a roadway with 2 or more through lanes in each direction, divided or undivided, with partial access control at a minimum.

REV	DATE	ENG	DESCRIPTION
5	07/01/23	PER	Converted to new format
4	10/01/20	KSP	

Table 3 - Final Sag for 50ft RS												
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)										
		R.S.										
	Span (Ft)	0	10	20	30	40	50	60	70	80 <5>	90 <5>	100 <5>
0		0	1	4	8	15	24	34	46	60	76	94
30		0	1	4	9	16	25	36	49	64	81	100
32°, 0.5" ice,		0	1	4	9	16	25	36	49	65	82	101
60		0	1	4	9	17	26	37	51	67	84	104
90		0	1	4	10	17	27	38	52	68	86	106
100		0	1	4	10	17	27	38	52	68	86	107
120		0	1	4	10	17	27	39	53	69	87	108
212		0	1	5	11	19	30	43	58	76	96	118
248		0	1	5	11	19	30	43	59	77	98	120

DESIGN NOTE(s):

<5> Horizontal configuration is not recommended on span length greater than 75 feet.

6. Ruling span range is for initial line design between 25' to 74' for conductor sag accuracy.

7. Automatic deadends or splices shall **ONLY** be installed on full tension spans. Automatic dead-ends or splices shall **NOT** be installed on slack spans, partial tension, or NESC Grade B crossing (highways, rivers, railroads). For slack span, partial tensions, or NESC Grade B crossing (highways, rivers, railroads) applications use bolted deadends or compression splices

8. Ameren defines a highway as a roadway with 2 or more through lanes in each direction, divided or undivided, with partial access control at a minimum.

This Standard sag & tension values at varying span lengths for 48-ct and 72-ct ADSS conductor (see DCS section 18 for additional conductor information and installation).

Table 1 - 48-ct ADSS properties						
Conductor ◇1	STK #	Diameter	Maximum Rated Conductor Limit (MRCL)	Weight	Weight ½" Ice, 4psf Wind K=0.30	Weight 1" ice
DNA-28144 48−count ADSS	16 16 274	0.528"	2960	0.093 lbs/ft	1.192 lbs/ft	1.993 lbs/ft

Table 2 - 48-ct ADSS Sag & Tension				
100' Span				
Temperature	Ice	Wind	Sag (ft)	Tension (lbs)
0°	½"	4psf + k	1	1615
32°F	1"	0	1.7	1675
60°F	0	0	0.1	1482
200' Span				
Temperature	Ice	Wind	Sag (ft)	Tension (lbs)
0°	½"	4psf + k	3.8	1759
32°F	1"	0	5.4	1974
60°F	0	0	0.1	1482
300' Span				
Temperature	Ice	Wind	Sag (ft)	Tension (lbs)
0°	½"	4psf + k	7.5	1934
32°F	1"	0	10.3	2285
60°F	0	0	0.9	1481
400' Span				
Temperature	Ice	Wind	Sag (ft)	Tension (lbs)
0°	½"	4psf + k	12	2117
32°F	1"	0	16	2585
60°F	0	0	1.5	1479
500' Span				
Temperature	Ice	Wind	Sag (ft)	Tension (lbs)
0°	½"	4psf + k	17	2299
32°F	1"	0	22.4	2871
60°F	0	0	2.35	1478

DESIGN NOTE(s):

◇1. The 48-ct ADSS tables are to be used to check clearance with existing ADSS installations. All new ADSS installation shall be 72-ct ADSS.

REV	DATE	ENG	DESCRIPTION
2	07/01/23	PER	Converted to new format
1	10/01/20	KR	

Table 3 - 72-ct ADSS properties						
Conductor ◇2	STK #	Diameter	Maximum Rated Conductor Limit (MRCL)	Weight	½" Ice, 4psf Wind K=0.30	Weight 1" ice
DNA−27718 72-count ADSS	27 59 084	0.559"	3150	0.108 lbs/ft	1.226 lbs/ft	2.217 lbs/ft

Table 4 - 72-ct ADSS Sag & Tension				
100' Span				
Temperature (°F)	Ice (in)	Wind	Sag (ft)	Tension (lbs)
0	0.5	4 psf + k	1	1672
32	0.5	2	0.6	1587
60	0	0	0.1	1511
200' Span				
Temperature (°F)	Ice (in)	Wind	Sag (ft)	Tension (lbs)
0	0.5	4 psf + k	3.4	1822
32	0.5	2	2.4	1666
60	0	0	0.4	1511
300' Span				
Temperature (°F)	Ice (in)	Wind	Sag (ft)	Tension (lbs)
0	0.5	4 psf + k	6.9	2005
32	0.5	2	5.1	1774
60	0	0	0.8	1510
400' Span				
Temperature (°F)	Ice (in)	Wind	Sag (ft)	Tension (lbs)
0	0.5	4 psf + k	11	2194
32	0.5	2	9	1893
60	0	0	1.4	1508
500' Span				
Temperature (°F)	Ice (in)	Wind	Sag (ft)	Tension (lbs)
0	0.5	4 psf + k	16	2384
32	0.5	2	12.6	2019
60	0	0	2.24	1507

DESIGN NOTE(s):

◇2. The 48-ct ADSS tables are to be used to check clearance with existing ADSS installations. All new ADSS installation shall be 72-ct ADSS.

This Standard provides sag & tension values at varying span lengths for 72-ct OPGW conductor (see DCS Section 18 for additional conductor information and installation).

DE Tension = 250 Lbs

RBS = 19,800 Lbs

Slack Span - 50 feet							
Temp. Deg. F	Condition						Tension Lbs
	R.S. Range ◇2◇			R.S.			
	Span (Ft)	30	40	50	60	70	
15º, 1" ice, 4 psf wind		14	18	22	26	31	413
0º, 0.5" ice, 4 psf wind + k		13	17	21	25	30	250
0		13	17	21	25	30	63
30		14	17	22	26	31	61
60		14	18	22	27	32	59
90		15	19	23	28	33	57

DE Tension = 500 Lbs

RBS = 19,800 Lbs

Slack Span - 100 feet							
Temp. Deg. F	Condition						Tension Lbs
	R.S. Range ◇2◇			R.S.			
	Span (Ft)	80	90	100	110	120	
15º, 1" ice, 4 psf wind		28	35	44	53	63	819
0º, 0.5" ice, 4 psf wind + k		27	34	42	51	61	500
0		26	33	41	50	59	128
30		26	33	41	50	59	123
60		28	36	44	53	64	119
90		29	37	46	55	66	115

DESIGN NOTE(s):

1. See DCS **07 00 07 03** for conditions including wind and ice.

◇2.◇ Ruling span range for initial line design between 75' and 124' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
2	07/01/23	PER	Converteed to new format
1	07/01/20	NH	

DE Tension = 1,900 Lbs

RBS = 19,800 Lbs

Super Short Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇4◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	50	60	70	80	90	100	110	120	130	140	150	
15º, 1" ice, 4 psf wind		4	6	8	10	13	16	19	23	27	32	36	2,242
15º, 0.8" ice, 4 psf wind		3	5	7	9	11	14	17	20	24	27	31	1,961
0º, 0.5" ice, 4 psf wind + k		3	4	5	7	9	11	13	16	19	22	25	1,933
0		1	1	2	2	3	4	5	6	6	8	9	1,469
10		1	2	2	3	3	4	5	6	7	8	10	1,297
20		1	2	2	3	4	5	6	7	8	10	11	1,133
30		1	2	3	4	5	6	7	8	10	11	13	979
40		2	2	3	4	5	7	8	10	11	13	15	840
50		2	3	4	5	6	8	9	11	13	15	18	720
60º F, 21 psf wind		3	5	7	9	11	14	16	20	23	27	31	1,066
60º F, 6 psf wind		2	4	5	6	8	10	12	14	17	19	22	688
60º F, 4 psf wind		2	3	5	6	8	9	11	14	16	19	21	653
60		2	3	4	6	7	9	11	13	15	18	20	621
70		3	4	5	7	8	10	12	15	17	20	23	543
80		3	4	6	8	10	12	14	17	20	23	26	481
90		3	5	6	8	11	13	16	19	22	26	29	432
100		4	5	7	9	12	14	17	21	24	28	32	394

Super Short Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇4◇						R.S.						
	Span (Ft)	50	60	70	80	90	100	110	120	130	140	150	
-20		1	1	2	2	3	3	4	5	5	6	7	1,756
0		1	2	2	3	3	4	5	6	7	8	9	1,346
0º, 0.5" ice, 4 psf wind + k		3	4	6	7	9	11	14	16	19	22	25	1,900
30		2	2	3	4	6	7	8	10	12	13	15	824
32º, 0.5" ice,		3	4	6	8	10	12	14	17	20	23	27	1,264
32º, 0.5" ice, 2 psf wind		3	4	6	8	10	12	15	17	20	24	27	1,285
40		2	3	4	5	7	8	10	12	14	16	18	696
50		2	3	5	6	8	9	11	14	16	19	21	595
60		3	4	5	7	9	11	13	16	18	21	25	518
60º F, 6 psf wind		3	4	6	7	9	12	14	17	19	23	26	591
70		3	4	6	8	10	12	15	18	21	24	28	459
80		3	5	7	9	11	14	16	20	23	27	31	414
90		4	5	7	10	12	15	18	21	25	29	33	378
100		4	6	8	10	13	16	19	23	27	32	36	349
120		5	7	9	12	15	18	22	26	31	36	41	306
212		7	11	15	19	24	30	36	43	50	58	67	190

DESIGN NOTE(s):

3. See comments in front of section for conditions including wind and ice.

◇4.◇ Ruling span range is for initial line design between 75' to 124' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
2	07/01/23	PER	Converteed to new format
1	07/01/20	NH	

DE Tension = 2,200 Lbs

RBS = 19,800 Lbs

Short Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇6◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	100	110	120	130	140	150	160	170	180	190	200	
15º, 1" ice, 4 psf wind		13	16	19	22	26	29	33	38	42	47	52	2,754
15º, 0.8" ice, 4 psf wind		12	14	17	19	23	26	29	33	37	42	46	2,374
0º, 0.5" ice, 4 psf wind + k		9	11	14	16	19	21	24	27	31	34	38	2,248
0		4	5	5	6	7	8	10	11	12	13	15	1,507
10		4	5	6	7	8	9	11	12	13	15	17	1,350
20		5	6	7	8	9	11	12	14	15	17	19	1,204
30		5	6	8	9	10	12	14	15	17	19	21	1,070
40		6	7	9	10	12	13	15	17	19	21	24	952
50		7	8	10	11	13	15	17	19	21	24	26	849
60º F, 21 psf wind		11	13	15	18	21	24	27	31	35	39	43	1,352
60º F, 6 psf wind		8	10	12	14	16	18	20	23	26	29	32	852
60º F, 4 psf wind		8	9	11	13	15	17	20	22	25	28	31	805
60		7	9	11	12	14	17	19	21	24	27	29	762
70		8	10	12	14	16	18	21	24	26	29	33	690
80		9	11	13	15	18	20	23	26	29	32	36	630
90		10	12	14	16	19	22	25	28	31	35	39	580
100		10	13	15	18	20	24	27	30	34	38	42	538

Short Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇6◇						R.S.						
	Span (Ft)	100	110	120	130	140	150	160	170	180	190	200	
-20		3	4	5	6	6	7	8	10	11	12	13	1,694
0		4	5	6	7	8	10	11	12	14	15	17	1,327
0º, 0.5" ice, 4 psf wind + k		10	12	14	16	19	22	25	28	31	35	39	2,200
30		6	8	9	11	12	14	16	18	20	23	25	899
32º, 0.5" ice,		10	12	14	17	19	22	25	29	32	36	39	1,524
32º, 0.5" ice, 2 psf wind		10	12	14	17	20	22	26	29	32	36	40	1,552
40		7	9	10	12	14	16	18	20	23	25	28	798
50		8	10	11	13	15	18	20	23	26	28	32	715
60		9	11	13	15	17	20	22	25	28	31	35	647
60º F, 6 psf wind		9	11	13	16	18	21	23	27	30	33	37	742
70		9	11	14	16	19	21	24	27	31	34	38	592
80		10	12	15	17	20	23	26	30	33	37	41	547
90		11	13	16	19	22	25	28	32	36	40	44	510
100		12	14	17	20	23	27	30	34	38	43	47	478
120		13	16	19	22	26	30	34	38	43	48	53	428
212		20	24	29	34	40	45	52	58	65	73	81	279

DESIGN NOTE(s):

5. See comments in front of section for conditions including wind and ice.

◇6◇ Ruling span range is for initial line design between 125' to 174' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
2	07/01/23	PER	Converteed to new format
1	07/01/20	NH	

DE Tension = 2,500 Lbs

RBS = 19,800 Lbs

Medium Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇8◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	150	160	170	180	190	200	210	220	230	240	250	
15º, 1" ice, 4 psf wind		25	29	32	36	40	45	49	54	59	64	70	3,227
15º, 0.8" ice, 4 psf wind		22	25	29	32	36	39	44	48	52	57	62	2,762
0º, 0.5" ice, 4 psf wind + k		19	21	24	27	30	33	37	40	44	48	52	2,560
0		8	9	10	12	13	14	16	17	19	21	22	1,578
10		9	10	11	13	14	16	17	19	21	23	25	1,435
20		10	11	12	14	16	17	19	21	23	25	27	1,302
30		11	12	14	15	17	19	21	23	25	27	30	1,181
40		12	13	15	17	19	21	23	25	28	30	33	1,074
50		13	15	17	19	21	23	25	28	30	33	36	980
60º F, 21 psf wind		20	23	26	29	32	36	40	43	47	52	56	1,615
60º F, 6 psf wind		15	17	20	22	24	27	30	33	36	39	42	1,008
60º F, 4 psf wind		15	17	19	21	24	26	29	32	34	37	41	950
60		14	16	18	20	23	25	28	30	33	36	39	899
70		15	17	20	22	24	27	30	33	36	39	42	829
80		16	19	21	24	26	29	32	35	39	42	46	769
90		18	20	23	25	28	31	35	38	42	45	49	717
100		19	21	24	27	30	33	37	41	44	48	52	673

Medium Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇8◇						R.S.						
	Span (Ft)	150	160	170	180	190	200	210	220	230	240	250	
-20		7	9	10	11	12	13	15	16	18	19	21	1,687
0		9	11	12	13	15	17	18	20	22	24	26	1,362
0º, 0.5" ice, 4 psf wind + k		19	22	25	28	31	34	38	41	45	49	53	2,500
30		13	14	16	18	20	23	25	27	30	32	35	995
32º, 0.5" ice,		19	22	25	28	31	34	37	41	45	49	53	1,771
32º, 0.5" ice, 2 psf wind		19	22	25	28	31	34	38	42	45	49	54	1,805
40		14	16	18	20	22	25	27	30	33	36	39	906
50		15	17	20	22	24	27	30	33	36	39	42	831
60		16	19	21	24	26	29	32	35	39	42	46	768
60º F, 6 psf wind		17	20	22	25	28	31	34	37	41	44	48	883
70		18	20	23	25	28	31	35	38	42	45	49	715
80		19	22	24	27	30	34	37	41	44	48	53	669
90		20	23	26	29	32	36	39	43	47	51	56	630
100		21	24	27	31	34	38	42	46	50	54	59	597
120		23	27	30	34	38	42	46	50	55	60	65	541
212		35	40	45	50	56	62	68	75	82	89	97	364

DESIGN NOTE(s):

7. See comments in front of section for conditions including wind and ice.

◇8.◇ Ruling span range is for initial line design between 175' to 224' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
2	07/01/23	PER	Converteed to new format
1	07/01/20	NH	

DE Tension = 2,800 Lbs

RBS = 19,800 Lbs

Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇10◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	200	210	220	230	240	250	260	270	280	290	300	
15º, 1" ice, 4 psf wind		39	43	47	52	57	61	66	72	77	83	88	3,679
15º, 0.8" ice, 4 psf wind		35	38	42	46	50	54	59	63	68	73	78	3,138
0º, 0.5" ice, 4 psf wind + k		30	33	36	39	43	46	50	54	58	62	67	2,871
0		13	15	16	18	19	21	23	24	26	28	30	1,683
10		15	16	18	19	21	23	25	26	28	31	33	1,548
20		16	17	19	21	23	25	27	29	31	33	36	1,424
30		17	19	21	23	25	27	29	31	34	36	39	1,310
40		19	21	23	25	27	29	32	34	37	39	42	1,208
50		20	22	24	27	29	31	34	37	39	42	45	1,118
60º F, 21 psf wind		31	34	38	41	45	48	52	57	61	65	70	1,870
60º F, 6 psf wind		23	26	28	31	34	36	39	43	46	49	53	1,165
60º F, 4 psf wind		23	25	27	30	32	35	38	41	44	47	51	1,098
60		22	24	26	29	31	34	37	39	42	46	49	1,038
70		23	26	28	31	34	36	39	42	46	49	52	968
80		25	27	30	33	36	39	42	45	49	52	56	906
90		26	29	32	35	38	41	45	48	52	56	59	853
100		28	31	34	37	40	44	47	51	55	59	63	805

Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇10◇						R.S.						
	Span (Ft)	200	210	220	230	240	250	260	270	280	290	300	
-20		13	14	16	17	19	20	22	24	25	27	29	1,731
0		16	17	19	21	23	24	26	29	31	33	35	1,437
0º, 0.5" ice, 4 psf wind + k		30	34	37	40	44	48	52	56	60	64	69	2,800
30		20	22	25	27	29	32	34	37	40	43	46	1,105
32º, 0.5" ice,		30	33	36	40	43	47	50	54	59	63	67	2,013
32º, 0.5" ice, 2 psf wind		30	33	37	40	43	47	51	55	59	63	68	2,053
40		22	24	27	29	32	34	37	40	43	46	50	1,022
50		24	26	29	31	34	37	40	43	47	50	53	950
60		25	28	31	34	36	40	43	46	50	53	57	888
60º F, 6 psf wind		27	29	32	35	38	42	45	49	52	56	60	1,021
70		27	30	33	36	39	42	46	49	53	57	61	835
80		29	31	35	38	41	45	48	52	56	60	64	788
90		30	33	36	40	43	47	51	55	59	63	68	747
100		32	35	38	42	46	49	53	58	62	67	71	711
120		35	38	42	46	50	54	58	63	68	73	78	651
212		50	55	61	67	72	79	85	92	99	106	113	448

DESIGN NOTE(s):

9. See comments in front of section for conditions including wind and ice.

◇10◇ Ruling span range is for initial line design between 225' to 274' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
2	07/01/23	PER	Converteed to new format
1	07/01/20	NH	

DE Tension = 3,100 Lbs

RBS = 19,800 Lbs

Extra Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇12◇	Not Recommended					R.S.			Not Recommended			
	Span (Ft)	250	260	270	280	290	300	310	320	330	340	350	
15º, 1" ice, 4 psf wind		55	59	64	69	74	79	84	90	95	101	107	4,117
15º, 0.8" ice, 4 psf wind		49	53	57	61	65	70	75	80	85	90	95	3,506
0º, 0.5" ice, 4 psf wind + k		42	45	49	53	56	60	64	69	73	78	82	3,183
0		19	21	23	24	26	28	30	32	34	36	38	1,815
10		21	23	24	26	28	30	32	34	36	39	41	1,685
20		23	24	26	28	30	32	35	37	39	42	44	1,565
30		24	26	28	30	33	35	37	40	42	45	47	1,455
40		26	28	30	33	35	37	40	43	45	48	51	1,354
50		28	30	32	35	37	40	43	46	48	51	55	1,264
60º F, 21 psf wind		43	46	50	54	57	61	66	70	74	79	84	2,121
60º F, 6 psf wind		32	35	37	40	43	46	49	52	56	59	63	1,326
60º F, 4 psf wind		31	33	36	39	41	44	47	51	54	57	60	1,251
60		30	32	35	37	40	43	46	49	52	55	58	1,183
70		32	34	37	40	43	46	49	52	55	59	62	1,112
80		34	36	39	42	45	48	52	55	59	62	66	1,048
90		36	38	41	45	48	51	55	58	62	66	70	991
100		37	40	44	47	50	54	58	61	65	69	73	940

Extra Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇12◇						R.S.						
	Span (Ft)	250	260	270	280	290	300	310	320	330	340	350	
-20		19	21	23	24	26	28	30	32	34	36	38	1,812
0		23	25	27	29	31	33	35	37	40	42	45	1,538
0º, 0.5" ice, 4 psf wind + k		43	47	50	54	58	62	66	70	75	80	84	3,100
30		29	31	34	36	39	41	44	47	50	53	56	1,224
32º, 0.5" ice,		42	45	49	52	56	60	64	68	73	77	82	2,254
32º, 0.5" ice, 2 psf wind		42	46	49	53	57	61	65	69	73	78	83	2,299
40		31	33	36	39	41	44	47	50	54	57	60	1,143
50		33	36	38	41	44	47	50	54	57	61	64	1,072
60		35	38	41	44	47	50	54	57	61	64	68	1,010
60º F, 6 psf wind		37	40	43	46	49	53	56	60	64	68	72	1,160
70		37	40	43	46	50	53	57	60	64	68	72	955
80		39	42	45	49	52	56	60	64	68	72	76	907
90		41	44	48	51	55	59	63	67	71	75	80	864
100		43	46	50	54	57	61	66	70	74	79	84	826
120		46	50	54	58	62	67	71	76	81	86	91	761
212		66	72	77	83	89	95	102	108	115	122	130	533

DESIGN NOTE(s):

11. See comments in front of section for conditions including wind and ice.

◇12◇ Ruling span range is for initial line design between 275' to 324' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
2	07/01/23	PER	Converteed to new format
1	07/01/20	NH	

DE Tension = 3,400 Lbs

RBS = 19,800 Lbs

Super Long Span - Feet													
Temp. Deg. F	Condition	INITIAL (Stringing) SAG (inches)											Tension Lbs
	R.S. Range ◇14◇	Not Recommended					R.S.				Not Recommended		
	Span (Ft)	300	310	320	330	340	350	360	370	380	390	400	
15º, 1" ice, 4 psf wind		72	76	81	87	92	97	103	109	115	121	127	4,544
15º, 0.8" ice, 4 psf wind		64	68	72	77	82	87	92	97	102	107	113	3,869
0º, 0.5" ice, 4 psf wind + k		55	59	62	66	71	75	79	84	88	93	98	3,496
0		26	27	29	31	33	35	37	39	41	44	46	1,968
10		28	29	31	33	35	37	40	42	44	46	49	1,841
20		29	31	34	36	38	40	42	45	47	50	52	1,722
30		31	34	36	38	40	43	45	48	50	53	56	1,612
40		34	36	38	41	43	46	48	51	54	57	60	1,511
50		36	38	41	43	46	49	51	54	57	60	63	1,420
60º F, 21 psf wind		55	59	62	66	71	75	79	84	88	93	98	2,374
60º F, 6 psf wind		41	44	47	49	53	56	59	62	66	69	73	1,495
60º F, 4 psf wind		39	42	45	48	51	54	57	60	63	67	70	1,412
60		38	40	43	46	49	52	55	58	61	64	67	1,337
70		40	43	46	49	52	55	58	61	64	68	71	1,262
80		42	45	48	51	54	58	61	65	68	72	75	1,195
90		45	48	51	54	57	61	64	68	72	76	79	1,134
100		47	50	53	57	60	64	68	71	75	79	83	1,080

Super Long Span - Feet													
Temp. Deg. F	Condition	FINAL (Clearance) SAG (inches)											Tension Lbs
	R.S. Range ◇14◇						R.S.						
	Span (Ft)	300	310	320	330	340	350	360	370	380	390	400	
-20		26	28	30	32	34	36	38	40	42	45	47	1,920
0		31	33	35	37	39	42	44	47	49	52	54	1,657
0º, 0.5" ice, 4 psf wind + k		57	60	64	68	73	77	81	86	91	96	100	3,400
30		37	40	43	45	48	51	54	57	60	63	67	1,351
32º, 0.5" ice,		54	58	62	66	70	74	78	83	87	92	97	2,495
32º, 0.5" ice, 2 psf wind		55	59	62	66	70	75	79	83	88	93	97	2,545
40		40	43	45	48	51	54	57	61	64	67	71	1,270
50		42	45	48	51	54	58	61	64	68	72	75	1,198
60		45	48	51	54	57	61	64	68	72	76	79	1,135
60º F, 6 psf wind		47	50	53	57	60	64	68	71	75	79	84	1,302
70		47	50	53	57	60	64	68	71	75	79	84	1,078
80		49	53	56	60	63	67	71	75	79	83	88	1,027
90		52	55	59	63	66	70	74	79	83	87	92	982
100		54	58	61	65	69	73	78	82	86	91	96	941
120		58	62	66	70	75	79	84	89	93	98	103	871
212		82	88	94	100	106	112	118	125	132	139	146	617

DESIGN NOTE(s):

13. See comments in front of section for conditions including wind and ice.

◇14◇ Ruling span range is for initial line design between 325' to 374' for conductor sag accuracy.

REV	DATE	ENG	DESCRIPTION
2	07/01/23	PER	Converteed to new format
1	07/01/20	NH	

INSTRUCTION(s):

Preformed line guards and armor rods shall be used to protect ACSR, AAAC, and AAC conductors from damage at an insulator or in suspension and angle clamps as indicated below. Armor rods and line guards do not need to be installed when preformed ties are used. Therefore, preformed ties should be used in all possible applications.

The following guidelines shall apply:

1. Line Guards shall be used:
   - A) In all hand tied applications where the conductor spans exceed 300' in length (on either side of the pin insulator).
2. Armor Rods shall be used:
   - A) In all hand tied applications and suspension clamps where the conductor spans less than 300' in length (on either side of the insulator).
   - B) In all clamp top post insulators and suspension clamps where the conductor spans exceed 300' in length (on either side or the insulator).

Line Guards and armor rods may be used as patch rods (with a hot line clamp) are acceptable. However, they should not be installed for the sole purpose of making a tap. A stirrup clamp should be used for this application.

CONSTRUCTION NOTE(s):

◇1. These Copperweld line guards shall be used to protect #6 copper conductors on 2.4/4. 16kV circuits that are being converted to 7.2/12.47kV operation. They shall be installed at the time of conversion. These guards shall not be installed hot on circuits energized at 12kV.

The following size Line Guards are available:

Table 1 - Line Guards

Wire Size		Rod O.D. (Inches)	No. Rods Per Set	Length (Inches)	Color Code	STK #
6 ◇1	Solid Cu.	0.102	7	19	Green	17 59 076
4 ACSR	7/1 Str.	0.121	8	19	Orange	17 59 032
2 ACSR	7/1 Str.	0.121	9	21	Red	17 59 033
1/0 ACSR	6/1 Str.	0.121	12	25	Yellow	17 59 034
3/0 ACSR	6/1 Str.	0.121	14	29	Orange	17 59 035
336.4 ACSR	18/1 Str.	0.146	15	35	Blue	17 59 036
336.4 ACSR	26/7 Str.	0.146	16	37	Green	17 59 044
477 ACSR	18/1 Str.	0.146	18	41	Purple	17 59 037
556.5 AAC	19 Str.	0.146	19	41	Blue	17 59 071
795 AAC	37 Str.	0.182	18	47	Brown	17 59 084
954 AAC	37 Str.	0.250	15	49	Orange	17 59 059
954 ACSR	45/7 Str.	0.250	15	51	Purple	17 59 104

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	10/01/20	DCG	

Table 2 - Armor Rods							
Wire Size	Rod O.D.(Inches)	# of Rods Per Set	Length (Inches)		Color Code	STK #	
			Single	Double		Single	Double
3#7 A.W. (3)	0.114	10	46	–	Black	17 59 085	–
#4 ACSR (7/1)	0.146	7	40	–	Orange	17 59 020	–
#2 ACSR (7/1)	0.146	9	44	–	Red	17 59 021	–
1/0 AAAC (7)	0.167	9	52	64	Yellow	17 59 022	17 59 025
1/0 ACSR (6/1)	0.167	9	52	64	Yellow	17 59 022	17 59 025
110.8 ACSR (29/7)	0.167	10	54	-	Green	17 59 164	-
3/0 ACSR (6/1)	0.167	11	56	68	Orange	17 59 023	17 59 026
4/0 ACSR (6/1)	0.182	11	60	-	Red	17 59 039	-
336.4 kcmil ACSR (18/1)	0.204	12	68	–	Blue	17 59 040	–
336.4 kcmil ACSR (26/7)	0.204	12	72	–	Green	17 59 028	–
477 kcmil ACSR (18/1)	0.25	11	76	–	Blue	17 59 061	–
556.5 kcmil AAC (19)	0.25	12	70	–	Blue	17 59 061	–
954 kcmil ACSR (45/7)	0.31	13	100	-	Red	17 59 125	-
1272 kcmil ACSR (45/7)	0.365	13	100	-	Yellow	17 59 161	-

REV	DATE	ENG	DESCRIPTION
6	07/01/23	PER	Converted to new format
5	10/01/20	DCG	

This standard covers various conductor materials for standard conductors.

Table 1 - Splices and Sleeves

Conductor	STK #	Conductor OD (in)	Automatic Splices 2	Compression Sleeves	
				Full Tension	Jumper or Loop
1/0 AAAC (7) - Bare	18 05 060	0.398	17 60 340	17 60 260	-
110.8 kcmil ACSR (12/7) - Bare	18 05 117	0.481	-	17 60 389	-
336.4 kcmil ACSR (18/1) - Bare	18 05 036	0.684	17 60 333	17 60 254	17 60 209
556.5 kcmil AAC (19) - Bare	18 05 047	0.856	17 60 327	17 60 195	17 60 196
954 kcmil ACSR (45/7) Bare	18 05 173	1.165	-	17 60 700	17 60 291
1272 kcmil ACSR (45/7) Bare	18 05 246	1.345	-	17 60 434	17 60 475

CONSTRUCTION NOTE(s):

1. Use 1/0 AAAC or 110.8 (12/7) ACSR for new static wire construction.

2. Automatic deadends or splices or shall **ONLY** be installed on full tension spans. Automatic deadends or splices shall **NOT** be installed on slack spans, partial tensions, or NESC Grade B crossings (highways, rivers, railroads). For slck span, partial tensions, or NESC Grade B crossings (highways, rivers, railroads) applications use bolted deadends or compression splices.

3. Ameren defines a highway as a roadway with 2 or more through lanes in each direction, divided or undivided, with partial access control at a minimum.

4. This die for full tension sleeves only. All other dies work on both full tension and loop sleeves for a given conductor.

5. Policy for splice installation:

   a) New conductor installations - Maximum of 1 splice per mile per phase.

   b) Existing/Emergency conductor repair - Maximum of 3 splices per phase per span.

   c) Minimum of 3x the splice length between the conductor support and first splice.

   d) Minimum of 3x the splice length between splices.

   e) All new or existing conductors shall be wire brushed before splicing or installing connectors or clamps.

REV	DATE	ENG	DESCRIPTION
5	07/01/23	PER	Converted to new format
4	10/01/20	NH	

Table 2 - Clamps

Conductor	STK #	Conductor OD (in)	Deadends		Angle Clamps	Armor Rod		Line Guard ◇11◇	Stirrup Clamp	Hot Line Clamp
			Automatic ◇8◇	Bolted		Single	Double			
						17 59		17 59	17 62	
1/0 AAAC (7) Bare	18 05 060	0.398	23 78 362	23 18 294	23 18 040 ◇10◇	22	25	34	166	088 ◇12◇
110.8 kcmil ACSR (12/7) Bare	18 05 117	0.481	-	23 18 397	23 78 401	-	-	127	166	183
336.4 kcmil ACSR (18/1) Bare	18 05 036	0.684	-	23 18 292	23 18 264 ◇10◇	40	-	36	167	112 ◇11◇
556.5 kcmil AAC (19) Bare	18 05 047	0.856	-	23 18 292	23 18 302 ◇10◇	61	-	71	167	-
954.0 kcmil ACSR (45/7) Bare	18 05 173	1.165	-	23 68 368		125	-	104	167	-
1272 kcmil (45/7) ACSR Bare	18 05 246	1.345	-	23 18 411		161	-	110	-	-

CONSTRUCTION NOTE(s):

6. Use 1/0 AAAC or 110.8 (12/7) ACSR for new static wire construction.

7. Performed grip.

◇8◇ Automatic deadends or splices shall **ONLY** be installed on full tension spans. Automatic deadends or splices shall **NOT** be installed on slack spans, partial tensions, or NESC Grade B Crossings (highways, rivers, railroads). For slack span, partial tensions, or NESC Grade B Crossings (highways, rivers, railroads) applications use bolted or compression splices.

9. Ameren defines a highway as a roadway with 2 or more through lanes in each direction, divided or undivided, with partial access control at a minimum.

◇10◇ Also suitable for suspension construction.

◇11◇ May be used for repairing conductor where less than 25% of strands are damaged.

◇12◇ For use with stirrup clamps.

REV	DATE	ENG	DESCRIPTION
5	07/01/23	PER	Converted to new format
4	10/01/20	NH	

Table 1 - Splices and Sleeves					
Conductor	STK #	Conductor OD (in)	Automatic Splices ◇1	Compression Sleeves	
				Full Tension	Jumper or Loop
#6 Bare Cu, SOL	18 02 010	0.162	17 63 038	17 60 006	-
#6 Poly Cu, SOL	18 01 012	0.23			-
#4 Bare Cu, SOL	18 02 017	0.204	17 63 040	17 60 103	-
#4 Poly Cu, SOL	18 01 017	0.27			-
#2 Bare Cu, SOL	18 02 020	0.258	17 63 043	17 60 104	-
#2 Poly Cu, SOL	18 01 020	0.35			-
#1/0 Bare Cu (7)	18 02 022	0.368	17 63 044	17 60 121	17 60 207
#1/0 Poly Cu (7)	18 01 022	0.49			
#4/0 Bare Cu (7)	18 02 027	0.522	17 63 046	17 60 123	17 60 155
#4/0 Poly Cu (7)	18 01 025	0.64			
350 kcmil Bare Cu (12)	18 02 064	0.71	-	17 60 124	-
#4 ACSR (7/1) - Bare	18 05 005	0.257	17 60 332	17 60 258	-
#4 ACSR (7/1) - Poly	18 05 068	0.317			-
1/0 AAAC (7) - Poly	18 05 067	0.518	17 60 340	17 60 260	-
1/0 ACSR (6/1) - Bare	18 05 113	0.398			-
3/0 ACSR (6/1)	18 05 010	0.502	17 60 354	17 60 253	17 60 270
4/0 ACSR (6/1) - Bare	18 05 011	0.563	17 60 354	17 60 626	17 60 420
336.4 kcmil (19) AAC - Poly	18 05 052	0.665	-	17 60 170	17 60 209
336.4 kcmil (26/7) ACSR	18 05 014	0.72	17 60 769	AL 17 60 565	-
				ST 17 60 133	
477 kcmil (18/1) ACSR	18 05 035	0.814	17 60 327	AL 17 60 169	17 60 732
				ST 17 60 134	
556.5 kcmil AAC (37) - Poly	18 05 053	0.992		-	17 60 196
795 kcmil AAC (37) - Bare	18 05 032	1.026	17 60 335	17 60 286	17 60 287
954 kcmil AAC (37) - Bare	18 05 043	1.124	17 60 753	17 60 185	17 60 291
3 #7AW (1)	27 09 099	0.311	-	17 60 272	-

CONSTRUCTION NOTE(s):

◇1. Automatic deadends or splices shall **ONLY** be installed on full tension spans. Automatic deadends or splices shall **NOT** be installed on slack spans, partial tensions, or NESC Grade B Crossings (highways, rivers, railroads). For slack span, partial tensions, or NESC Grade B Crossings (highways, rivers, railroads) applications use bolted or compression splices.

2. Ameren defines a highway as a roadway with 2 or more through lanes in each direction, divided or undivided, with partial access control at a minimum.

3. Refer to DCS #**07 00 09 01** Table 1 Note 5 for spacing policy.

Table 2 - Clamps

Conductor	STK #	Conductor OD (in)	Deadends			Angle Clamp	Armor Rod ◇8◇		Line Guard ◇8◇	Stirrup Clamp	Hot Line Clamp
			Automatic ◇4◇	Straight	Quadrant		Single	Double			
							17 59		17 59	17 62	
#6 Bare Cu, SOL	18 02 010	0.162	23 78 375	23 18 394	23 68 670	17 02 016	-	–	–	165	23 78 183 ◇9◇
#6 Poly Cu, SOL	18 01 012	0.23					-	–	–		
#4 Bare Cu, SOL	18 02 017	0.204	23 78 374				-	–	–		
#4 Poly Cu, SOL	18 01 017	0.27					-	–	–		
#2 Bare Cu, SOL	18 02 020	0.258	23 78 373				-	–	–		
#2 Poly Cu, SOL	18 01 020	0.35					-	–	–		
#1/0 Bare Cu (7)	18 02 022	0.368	–				79	–	–		
#1/0 Poly Cu (7)	18 01 022	0.49	–					–	–		
#4/0 Bare Cu (7)	18 02 027	0.522	–	23 18 395		17 62 006 ◇7◇	–	–	–	153	
#4/0 Poly Cu (7)	18 01 025	0.64	–				046 ◇6◇	–	–		
350 kcmil Bare Cu (12)	18 02 064	0.71	–		23 78 050 ◇6◇	–	–	–	–	–	–
#4 ACSR (7/1) - Bare	18 05 005	0.257	23 78 365	-	23 18 294	17 02 016 ◇6◇	20	-	32	166	17 62 088 ◇9◇
#4 ACSR (7/1) - Poly	18 05 068	0.317		-			-	-	-		
1/0 ACSR (6/1) - Bare	18 05 113	0.398	-	-			-	-	-	-	-
1/0 AAAC (7) - Poly	18 05 067	0.518	23 78 362	-	23 18 290 ◇6◇	–	-	-	-	-	-
3/0 ACSR (6/1)	18 05 010	0.502	–	23 18 292	–	23 18 040 ◇6◇	23	26	35	167	17 62 088 ◇9◇
4/0 ACSR (6/1) - Bare	18 05 011.	0.563	-		-		-	-	128	-	
336.4 kcmil (19) AAC - Poly	18 05 052	0.665	-		-		-	-	-	167	
336.4 kcmil (26/7) ACSR	18 05 014	0.72	–		–	23 18 264 ◇6◇	40	–	44		
477 kcmil (18/1) ACSR	18 05 035	0.814	–		–		58	–	37		
556.5 kcmil AAC (37) - Poly	18 05 053	0.992	-		-	23 18 040 ◇7◇	-	-	-		-
795 kcmil AAC (37) - Bare	18 05 032	1.026	-		-	23 18 302 ◇6◇	-	-	84		17 62 143 ◇10◇
954 kcmil AAC (37) - Bare	18 05 043	1.124	-	23 68 637	-		-	-	59		
3 #7AW (1)	27 09 099	0.311	-	23 68 325 ◇6◇	-	17 02 016	-	-	85	-	-

REV	DATE	ENG	DESCRIPTION
5	07/01/23	PER	Converted to new format
4	10/01/20	NH	

CONSTRUCTION NOTE(s):

4. Automatic deadends or splices shall **ONLY** be installed on full tension spans. Automatic deadends or splices shall **NOT** be installed on slack spans, partial tensions, or NESC Grade B Crossings (highways, rivers, railroads). For slack span, partial tensions, or NESC Grade B Crossings (highways, rivers, railroads) applications use bolted or compression splices.

5. Ameren defines a highway as a roadway with 2 or more through lanes in each direction, divided or undivided, with partial access control at a minimum.

6. Use with tension over 4,000 lbs.

7. Suitable for suspension construction also.

8. Preformed line guards and patch rods preferred for repairing conductors.

9. For use with stirrup clamp.

10. For use over bare conductor.

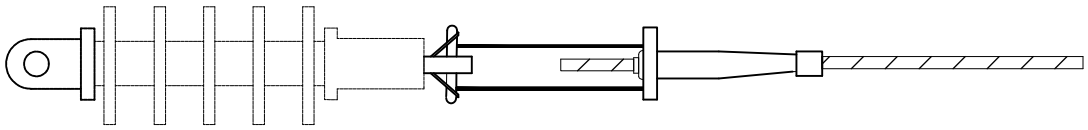


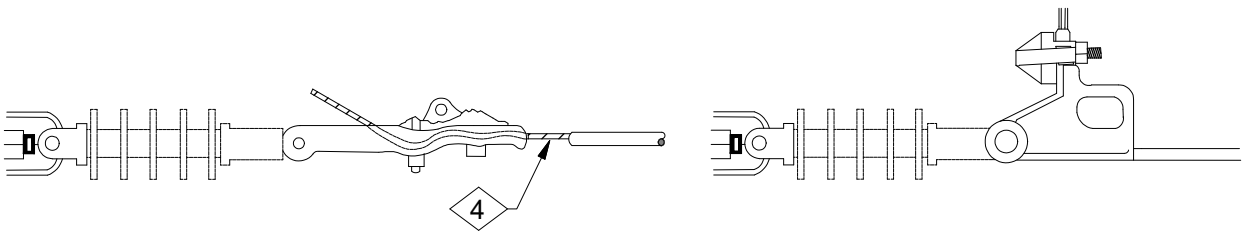
Table 1 - Automatic Deadends		
STK #	DESCRIPTION	NEW (N)/ MAINTENANCE (M)
23 78 365	Clamp, Deadend, Auto, #4 ACSR	N
23 78 364	Clamp, Deadend, Auto, #2 ACSR	N
23 78 362	Clamp, Deadend, Auto, 1/0 AAAC	N
23 78 375	Clamp, Deadend, Auto, #6 CU	M
23 78 374	Clamp, Deadend, Auto, #4 CU	M
23 78 373	Clamp, Deadend, Auto, #2 CU	M

CONSTRUCTION NOTE(s):

1. The wire shall be fed completely through the automatic deadend chuck. The jaws of the deadend shall be set by applying a sharp heavy pull on the line conductor. Do not strike deadend body to set the deadend chuck.

2. Automatic deadends or splices shall **ONLY** be installed on full tension spans. Automatic deadends or splices shall **NOT** be installed on slack spans, partial tensions, or NESC Grade B Crossings (highways, rivers, railroads). For slack span, partial tensions, or NESC Grade B Crossings (highways, rivers, railroads) applications use bolted or compression splices.

3. Ameren defines a highway as a roadway with 2 or more through lanes in each direction, divided or undivided, with partial access control at a minimum.



STYLE A

STYLE B

Table 2 - Bolted Deadends			
STK #	DESCRIPTION	NEW (N)/ MAINTENANCE (M)	STYLE
23 18 394	Clamp, Deadend, 3 #7 A.W.	M	A
	Clamp, Deadend, #6 CU	M	A
	Clamp, Deadend, #4 CU	M	A
	Clamp, Deadend, #2 CU	M	A
	Clamp, Deadend, #1/0 CU	M	A
23 18 395	Clamp, Deadend, #4/0 CU	M	A
	Clamp, Deadend, 350 CU	M	A
	Clamp, Deadend, 500 CU	M	A
23 18 399	Clamp, Deadend, 750 CU	M	A
	Clamp, Deadend, 1000 CU	M	A
23 18 394	Clamp, Deadend, 6A CWC	M	A
	Clamp, Deadend, 4A CWC	M	A
	Clamp, Deadend, 2A CWC	M	A
23 18 400	Clamp, Deadend, #4 ACSR	M	B
	Clamp, Deadend, #2 ACSR	M	B
	Clamp, Deadend, 1/0 ACSR or 1/0 AAAC	N	B
23 18 292	Clamp, Deadend, 3/0 ACSR	N	A
	Clamp, Deadend, 4/0 ACSR	N	A
	Clamp, Deadend, 110 ACSR	N	A
	Clamp, Deadend, 336 ACSR	N	A
	Clamp, Deadend, 477 ACSR	N	A
	Clamp, Deadend, 556 AA	N	A
23 18 404	Clamp, Deadend, 335.6 ACSR T−2	N	B
	Clamp, Deadend, 432−2 ACSR T−2	N	B
23 68 637	Clamp, Deadend, 795 AA	N	A
	Clamp, Deadend, 954 AA	N	A

CONSTRUCTION NOTE(s):

4. Tape according to DCS **07 00 27 00**.

REV	DATE	ENG	DESCRIPTION
9	07/01/23	PER	Converted to new format
8	10/01/20	NH	

This Standard covers the application and installation of Air Flow Spiolers (AFS), which are used to help eliminate known galloping of conductors.

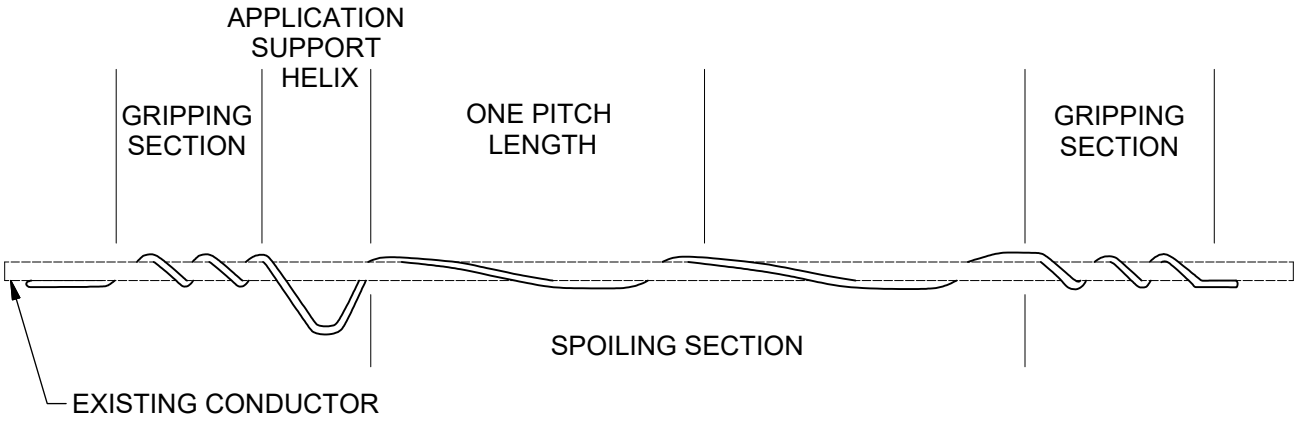


Table 1 - Number of Spoilers per Span			
SPAN LENGTH (FT)	SPOILERS / SPAN	SPAN LENGTH (FT)	SPOILERS / SPAN
<140	3	431 - 480	10
141 - 190	4	481 - 530	11
191 - 240	5	531 - 575	12
241 − 290	6	576 - 625	13
291 - 335	7	626 - 670	14
336 - 380	8	671 - 720	15
381 - 430	9	721 - 770	16

TABLE 2							
STK #	DESCRIPTION	01	02	03	04	06
17 63 181	Spoiler, Airflow 1/0 AAAC (7) or 1/0 ACSR (6/1)	#	-	-	-	-
17 63 240	Spoiler, Airflow 3/0 (6/1), 4/0 (6/1), or 110.8 (12/7) ACSR	-	-	-	-	#
17 63 182	Spoiler, Airflow 336.4 ACSR (18/1)	-	#	-	-	-
17 63 183	Spoiler, Airflow 556.5 AAC (19)	-	-	#	-	-
17 63 184	Spoiler, Airflow 795 (37) AAC, 954 (37) AAC or 954 (45/7) ACSR	-	-	-	#	-
296	Operation Code	#	#	#	#	#

REV	DATE	ENG	DESCRIPTION
5	07/01/23	PER	Converted to new format
4	05/10/12	DCG	

INSTRUCTION(s):

1. Leave 15' between each AFS.

2. Each AFS is approximately 15' in length.

3. For a span requiring an EVEN number of AFS, install per Figure 1.

4. For a span requiring an ODD number of AFS, install per Figure 2.

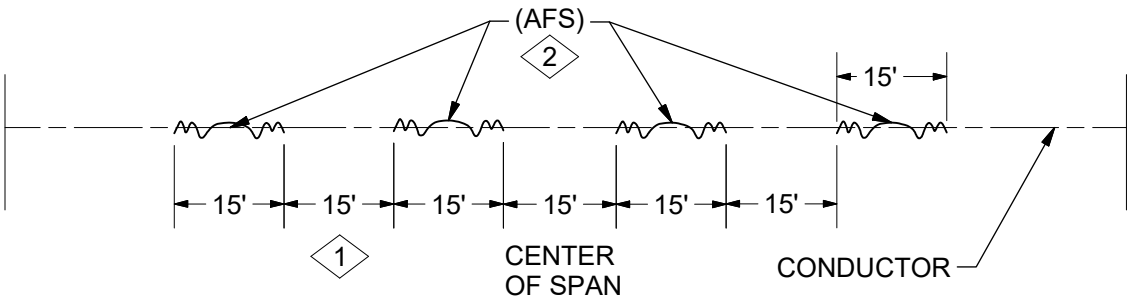


Figure 1 - EVEN Number of AFS 3

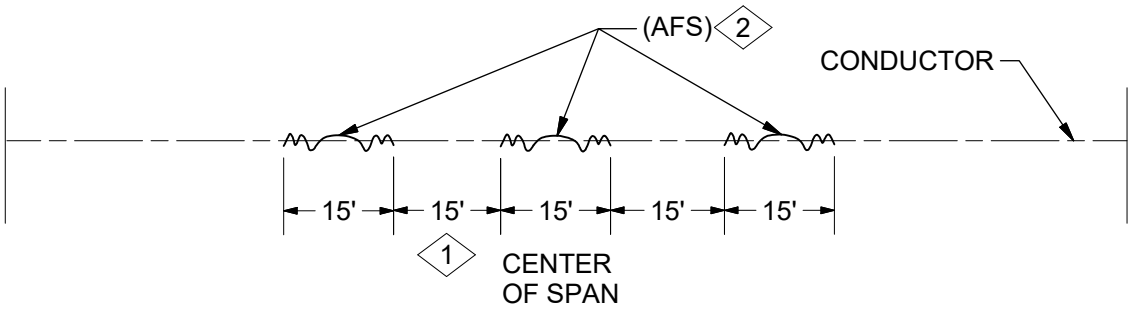
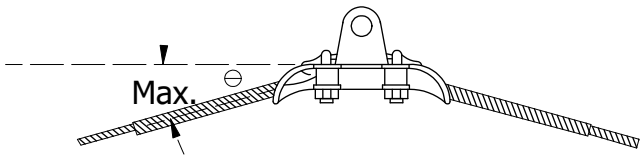


Figure 2 - ODD Number of AFS 4

REV	DATE	ENG	DESCRIPTION
5	07/01/23	PER	Converted to new format
4	05/10/12	DCG	



Max.Θ = 30°
Up to 477 ACSR

Max.Θ = 22.5°
For 556 and larger

SPANS 300' AND SHORTER

Table 1 - Spans < 300’	
STK #	DESCRIPTION
23 78 417	Clamp, Susp., #2 CU
	Clamp, Susp., #1/0 CU
	Clamp, Susp., #2/0 CU
	Clamp, Susp., #4/0 CU
	Clamp, Susp., #6A CWC
	Clamp, Susp., #4A CWC
	Clamp, Susp., #2A CWC
	Clamp, Susp., 3-#7 AW
23 18 342	Clamp, Susp., #4 ACSR
	Clamp, Susp., #2 ACSR
	Clamp, Susp., 3/0 ACSR
	Clamp, Susp., 4/0 ACSR
23 78 414	Clamp, Susp., 335.6 ACSR T-2
23 78 402	Clamp, Susp., 477 ACSR

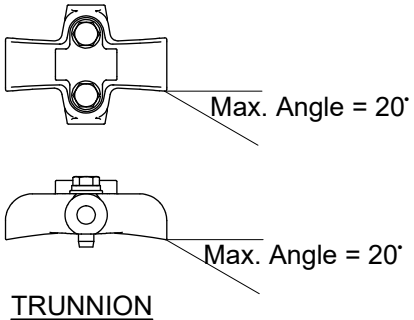
SPANS GREATER THAN 300'

Table 2 - Spans > 300	
STK #	DESCRIPTION ◇1
23 18 342	Clamp, Susp. #4 ACSR
17 59 020	Rod, Armor, #4 ACSR
23 18 342	Clamp, Susp. #2 ACSR
17 59 021	Rod, Armor, #2 ACSR
23 78 402	Clamp, Susp. 3/0 ACSR
17 59 023	Rod, Armor, 3/0 ACSR
23 18 372	Clamp, Susp. 4/0 ACSR
17 59 039	Rod, Armor, 4/0 ACSR
23 18 302	Clamp, Susp. 477 ACSR
17 59 058	Rod, Armor, 477 ACSR
23 18 302	Clamp, Susp. 795 AA
17 59 068	Rod, Armor, 795 AA

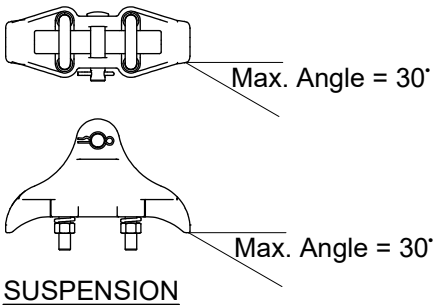
DESIGN NOTE(s):

◇1. Armor rods not required for spans 300' and shorter.

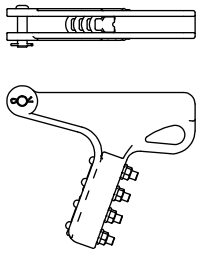
REV	DATE	ENG	DESCRIPTION
5	07/01/23	PER	Converted to new format
7	10/01/20	MJ	



TRUNNION



SUSPENSION



DEADEND

Table 1 - Trunnion Clamps		
Conductor	Span ≤ 300'	Span > 300'
	STK #	STK #
Clamp, Trunnion, 1/0 AAAC	23 78 401	23 78 401
Rod, Armor, 1/0 AAAC	-	17 59 022
Clamp, Trunnion, 336.4 ACSR	23 78 331	23 78 332
Rod, Armor, 336.4 ACSR	-	17 59 125
Clamp, Trunnion, 556 AAC	23 78 331	23 78 332
Rod, Armor, 556 AAC	-	17 59 061
Clamp, Trunnion, 954 ACSR	23 78 332	23 78 330
Rod, Armor, 954 ACSR	-	17 59 125
Clamp, Trunnion, 1272 ACSR	23 78 332	-
Rod, Armor, 1272 ACSR	-	17 59 161
Clamp, Trunnion, T2, 4/0 ACSR	23 78 458	
Clamp, Trunnion, T2, 336.4 ACSR	23 78 457	
Clamp, Trunnion, T2, 556 AAC	23 78 457	
Clamp, Trunnion, T2, 954 ACSR	-	

Table 2 - Suspension Clamps		
Conductor	Span ≤ 300'	Span > 300'
	STK #	STK #
Clamp, Suspension, 1/0 AAAC	23 18 342	23 78 402
Rod, Armor, 1/0 AAAC	-	17 59 022
Clamp, Suspension, 110.8 ACSR	23 18 342	23 78 311
Rod, Armor, 110.8 ACSR	-	17 59 164
Clamp, Suspension, 556 AAC	23 18 372	23 18 302
Rod, Armor, 556 AAC	-	17 59 061
Clamp, Suspension, 954 ACSR	23 18 302	23 18 396
Rod, Armor, 954 ACSR	-	17 59 125
Clamp, Suspension, 1272 ACSR	23 18 302	23 68 688
Rod, Armor, 1272 ACSR	-	17 59 161
Clamp, Suspension, T2, 4/0 ACSR	23 78 455	
Clamp, Suspension, T2, 336.4 ACSR	23 78 456	
Clamp, Suspension, T2, 556 AAC	17 02 176	
Clamp, Suspension, T2, 954 ACSR	23 78 451	

REV	DATE	ENG	DESCRIPTION
4	07/01/23	PER	Converted to new format
3	02/23/16	KSP	

Table 3 - Deadend Clamps	
Conductor	All Spans
	STK #
Clamp, Deadend, 1/0 AAAC	23 68 529
Clamp, Deadend, 110.8 ACSR	23 68 529
Clamp, Deadend, 336.4 ACSR	23 18 405
Clamp, Deadend, 556 AAC	23 18 405
Clamp, Deadend, 954 ACSR	23 18 436
Clamp, Deadend, 1272 ACSR	23 68 676
Clamp, Deadend, T2, 4/0 ACSR	23 18 404
Clamp, Deadend, T2, 336.4 ACSR	23 18 406
Clamp, Deadend, T2, 556 AAC	
Clamp, Deadend, T2, 954 ACSR (x2)	23 18 436

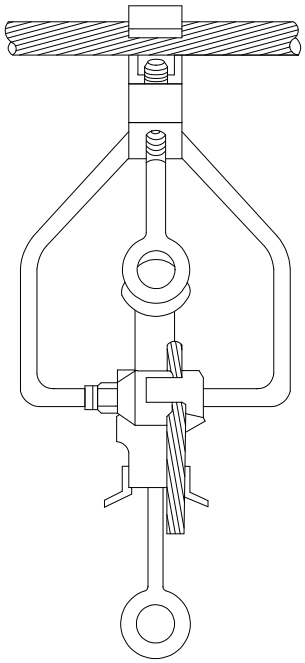
REV	DATE	ENG	DESCRIPTION
4	07/01/23	PER	Converted to new format
3	02/23/16	KSP	

Hot line clamps shall be used to make connections on lines rated over 5000 volts phase to phase where the connection must be made "hot" or where it is likely that the connection will have to be disconnected and reconnected with some degree of frequency. **Avoid the use of hot line clamps where currents exceed 250 amps** (i.e. 1/0 AAAC taps maximum), except with T-2 conductors.

Bronze hot line clamps shall be installed on aluminum stirrup clamps. Aluminum hot line clamps shall be installed on line conductors protected with existing armor rod or line guard. (Do not install additional rods or guards; use a new stirrup clamp). However, aluminum and bronze hot line clamps shall be connected directly to unprotected line conductors of like material (Al. to Al. or Cu. to Cu.) **when making no load taps**. This includes switches and lightning arresters.

INSTALLATION OF HOT LINE CLAMPS AND STIRRUP CLAMPS

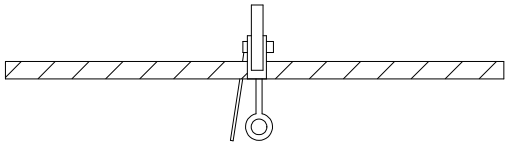
a. Use the proper size and type of clamps as shown in the following tables.
b. Install the hot line clamps over armor rods where present (keeping the clamps at least one loop (or pitch) length in from the end of the rods), or onto bails of stirrup clamps.
c. Wire brush aluminum conductors and supply corrosion resistance inhibitor STK #31 59 058 prior to installing stirrup hot line clamps. Wire brush copper conductors prior to installation.
d. Stirrup clamps in combination with hot line clamps are acceptable for use on conductors 1/0 and smaller.



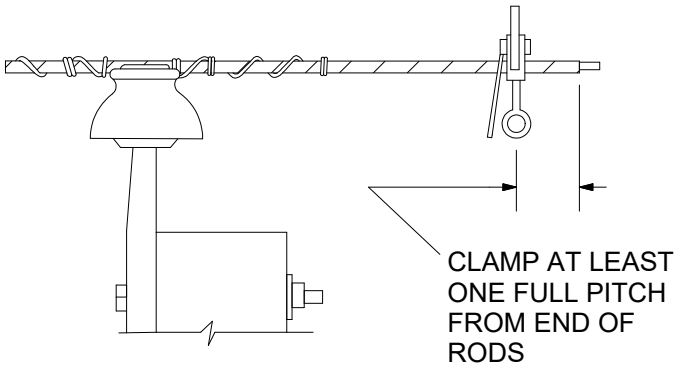
REV	DATE	ENG	DESCRIPTION
10	07/01/23	PER	Converted to new format
9	10/01/20	DCG	

Table 1 - Clamp on Stirrup	
STK #	DESCRIPTION
17 62 165 23 78 394	Clamp, Stirrup, #6 Cu
	Clamp, Hot Line, Cu.
	Clamp, Stirrup, #4 Cu
	Clamp, Hot Line,Cu.
	Clamp, Stirrup, #2 Cu
	Clamp, Hot Line, Cu.
	Clamp, Stirrup, 1/0 Cu
	Clamp, Hot Line, Cu.
17 62 153 23 78 394	Clamp, Stirrup, 4/0 Cu
	Clamp, Hot Line, Cu.
	Clamp, Stirrup, 350 Cu
	Clamp, Hot Line, Cu.
	Clamp, Stirrup, 500 Cu
	Clamp, Hot Line, Cu.
17 62 166 23 78 394	Clamp, Stirrup, #4 Al.
	Clamp, Hot Line, Cu.
	Clamp, Stirrup, #2 Al.
	Clamp, Hot Line, Cu.
	Clamp, Stirrup, 1/0 Al.
	Clamp, Hot Line, Cu.
	Clamp, Stirrup, 2/0 ACSR
	Clamp, Hot Line, Cu.
	Clamp, Stirrup, 3/0 ACSR
	Clamp, Hot Line, Cu.
	Clamp, Stirrup, 4/0 ACSR
	Clamp, Hot Line, Cu.
17 62 186 23 78 394	Clamp, Stirrup, 335.6 ACSR T−2
	Clamp, Hot Line, Cu.
	Clamp, Stirrup, 336 ACSR
	Clamp, Hot Line, Cu.
	Clamp, Stirrup, 477 ACSR
	Clamp, Hot Line, Cu.
	Clamp, Stirrup, 556 AA
	Clamp, Hot Line, Cu.
17 62 167 23 78 394	Clamp, Stirrup, 795 AA
	Clamp, Hot Line, Cu.
	Clamp, Stirrup, 954 AA

REV	DATE	ENG	DESCRIPTION
10	07/01/23	PER	Converted to new format
9	10/01/20	DCG	



FOR NO LOAD TAPS -
FUSED SWITCHES AND
LIGHTNING ARRESTORS



EXISTING ARMOR

Table 2 - Clamp on Bare Conductor	
STK #	DESCRIPTION
23 78 394	Clamp, Hot Line, #6 Cu, BARE
	Clamp, Hot Line, #4 Cu, BARE
	Clamp, Hot Line, #2 Cu, BARE
	Clamp, Hot Line, 1/0 Cu, BARE
23 78 183	Clamp, Hot Line, 4/0 Cu, BARE
	Clamp, Hot Line, 350 Cu, BARE
17 62 088	Clamp, Hot Line, #4 ACSR, BARE
	Clamp, Hot Line, #2 ACSR, BARE
	Clamp, Hot Line, 1/0 AL, BARE
	Clamp, Hot Line, 2/0 ACSR, BARE
	Clamp, Hot Line, 3/0 ACSR, BARE
	Clamp, Hot Line, 4/0 ACSR, BARE
	Clamp, Hot Line, 336 ACSR, BARE
17 62 190	Clamp, Hot Line, 335.6 ACSR T - 2
17 62 112	Clamp, Hot Line, 477 ACSR, BARE
	Clamp, Hot Line, 556 AA, BARE
17 62 143	Clamp, Hot Line, 795 AA, BARE

Table 3 - Clamp on Conductor with Existing Armor Rods.	
STK #	DESCRIPTION
17 62 088	Clamp, Hot Line, #4 ACSR, w/Armor
	Clamp, Hot Line, #2 ACSR, w/ Armor
	Clamp, Hot Line, 1/0 AL, w/Armor
	Clamp, Hot Line, 2/0 ACSR, w/Armor
	Clamp, Hot Line, 3/0 ACSR, w/Armor
17 62 143	Clamp, Hot Line, 4/0 ACSR, w/Armor
	Clamp, Hot Line, 336 ACSR, w/Armor
	Clamp, Hot Line, 477 ACSR, w/Armor
	Clamp, Hot Line, 556 AA, w/Armor

REV	DATE	ENG	DESCRIPTION
10	07/01/23	PER	Converted to new format
9	10/01/20	DCG	

This section covers the various connectors to be used in making copper to copper, aluminum to aluminum, and aluminum to copper connections. Each connector shall be used only on the types and ranges of conductors for which it is shown.

a. **Copper to Copper Connectors**

The following sizes of split bolt and two bolt connectors shall be standard for use in making copper to copper conductor connections.

Table 1 - Copper to Copper connectors

Stock #	Type of Connector	Conductor Range		Alternative options to Split Bolt
		Main	Tap	Vice connectors
17 54 001	Split Bolt	10 Str	12 Sol	–
17 54 002	Split Bolt	8 Str	10 Sol	–
17 54 003	Split Bolt	6 Sol	10 sol	–
17 54 004	Split Bolt	4 Sol	8 Sol	17 54 962
17 54 005	Split Bolt	2 Sol	6 Sol	17 04 251
17 54 182	Split Bolt	2 Str	4 Sol	
17 54 145	Two Bolt	4 AWG − 1/0	8 AWG − 1/0	17 04 252
17 54 139	Two Bolt	3 AWG − 2/0	8 AWG − 2/0	
17 54 140	Two Bolt	1 AWG − 4/0	8 AWG − 4/0	–
17 54 132	Two Bolt	2/0 − 350	8 AWG − 350	–
17 54 141	Two Bolt	3/0 − 500	8 AWG − 500	–
17 54 142	Two Bolt	500 − 1000	8 AWG − 1000	–

b. **Aluminum to Aluminum and Aluminum to Copper Connectors**

The table below lists the appropriate parallel grove clamps to be used for aluminum to aluminum or aluminum to copper connections as required. In no instance shall these connectors be used for making copper to copper connections. When making aluminum to copper connections the copper wire should be on the low side to prevent soluble copper salts from eroding the aluminum connector.

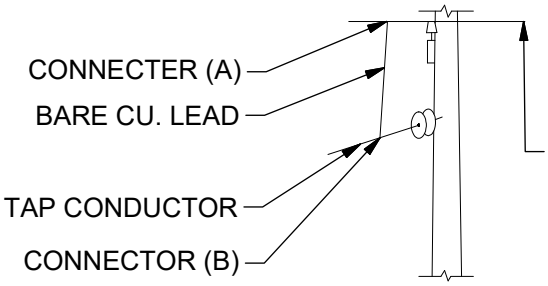
Table 2 - Al to Al, and Al to Cu Connectors

Stock #	Conductor Range			
	Main (ACSR & AAC)		Tap (ACSR, AAC, & Cu)	
	ACSR	AWG & CM	ACSR	AWG & CM
17 51 032	06/01/2000	6 Sol - 1/0 Str	06/01/2000	6 Sol - 1/0 Str
17 51 137	1/0 - 336.4 kcmil	1/0 Str - 350 kcmil	06/01/2000	6 Sol - 1/0 Str
17 51 138	1/0 - 336.4 kcmil	1/0 Str - 350 kcmil	1/0 - 336.4 kcmil	1/0 Str - 350 kcmil
17 51 139	336.4 - 795 kcmil	397.5 - 954 kcmil	06/02/2000	6 Sol - 2/0 Str
17 51 136	397.5 - 795 kcmil	400 - 1000 kcmil	3/0 - 397.5 kcmil	3/0 Str - 350 kcmil
17 51 135	397.5 - 795 kcmil	400 - 1000 kcmil	397.5 - 795 kcmil	400 - 1000 kcmil

c. **Applications**

The following shall be used to select both the line (A) and tap (B) connectors when making a tap, connecting a loop (over or around), or connecting switch. The table below also indicates the copper lead wire to be used. However, this must be indicated with the appropriate Stock # following DCS # 07 00 80 00 (bare conductor) or DCS # 07 00 81 00 (covered conductor).

Where a small tap to a large line combination has no connector shown (such as a 1/0 AAAC tap from a 954 AAC line), use the next larger lead wire. For example, use a 4/0 cu. rather than 1/0 cu. for 1/0 AAAC to 954 AAC).



CONNECTER (A)	STOCK NUMBER
CONNECTER (B)	STOCK NUMBER

Table 3

Conductor Size - TAP	Wire Size Bare S.D. Cu. Lead	Conductor Size - MAIN						
		954 AAC	795 AAC	556 AAC	477 ACSR	336 ACSR	1/0 AAAC or 1/0 ACSR	4 ACSR
4 ACSR	4	-	-	1751139	1751139	1751137	1751032	1751032
Bare or Poly				1751032	1751032	1751032	1751032	1751032
1/0 AAAC, ACSR	1/0	-	-	1751139	1751139	1751137	1751032	1751032
Bare or Poly				1751032	1751032	1751032	1751032	1751032
336 ACSR	350	1751136	1751136	1751136	1751136	1751138	-	-
Bare or Poly		1751138	1751138	1751138	1751138	1751138		
477 ACSR	350	1751136	1751136	1751136	1751136	1751138	-	-
Bare or Poly		1751136	1751136	1751136	1751136	1751136		
556 AA Bare or Poly	350	1751136	1751136	1751136	1751136	-	-	-
		1751136	1751136	1751136	1751136			
795 AA Bare or Poly	500	1751135	1751135	1751135	-	-	-	-
		1751135	1751135	1751135				
954 AA Bare or Poly	750	1751135	1751135	-	-	-	-	-
		1751135	1751135					
6 Cu.	4	-	-	1751139	1751139	1751137	1751032	1751032
Bare or Poly				1754004	1754004	1754004	1754004	1754004
4 Cu.	4	-	-	1751139	1751139	1751137	1751032	1751032
Bare or Poly				1754004	1754004	1754004	1754004	1754004
2 Cu.	2	-	-	1751139	1751139	1751137	1751032	1751032
Bare or Poly				1754005	1754005	1754005	1754005	1754005
1/0 Cu. Bare or Poly	Jan-00	-	-	1751136	1751136	1751137	1751032	1751032
				1754145	1754145	1754145	1754145	1754145
4/0 Cu. Bare or Poly	Apr-00	1751136	1751136	1751136	1751136	1751138	1751137	-
		1754140	1754140	1754140	1754140	1754140	1754140	
350 Cu. Bare or Poly	350	1751136	1751136	1751136	1751136	1751138	-	-
		1754132	1754132	1754132	1754132	1754132		
500 Cu. Bare or Poly	500	1751135	1751135	1751135	1751135	-	-	-
		1754141	1754141	1754141	1754141			

CONSTRUCTION NOTE(s):

1. Where there is a choice of clamps available for a specific connection, the smallest clamp shall be selected.

2. A Service Entrance Clamp, Stock #17 51 146 (not listed above) shall be used for connecting #6 ACSR Duplex cable to #10 Cu Pole & Bracket Cable.

1. **Use of Rubber Tape**

There are two standard types of rubber tape as follows:

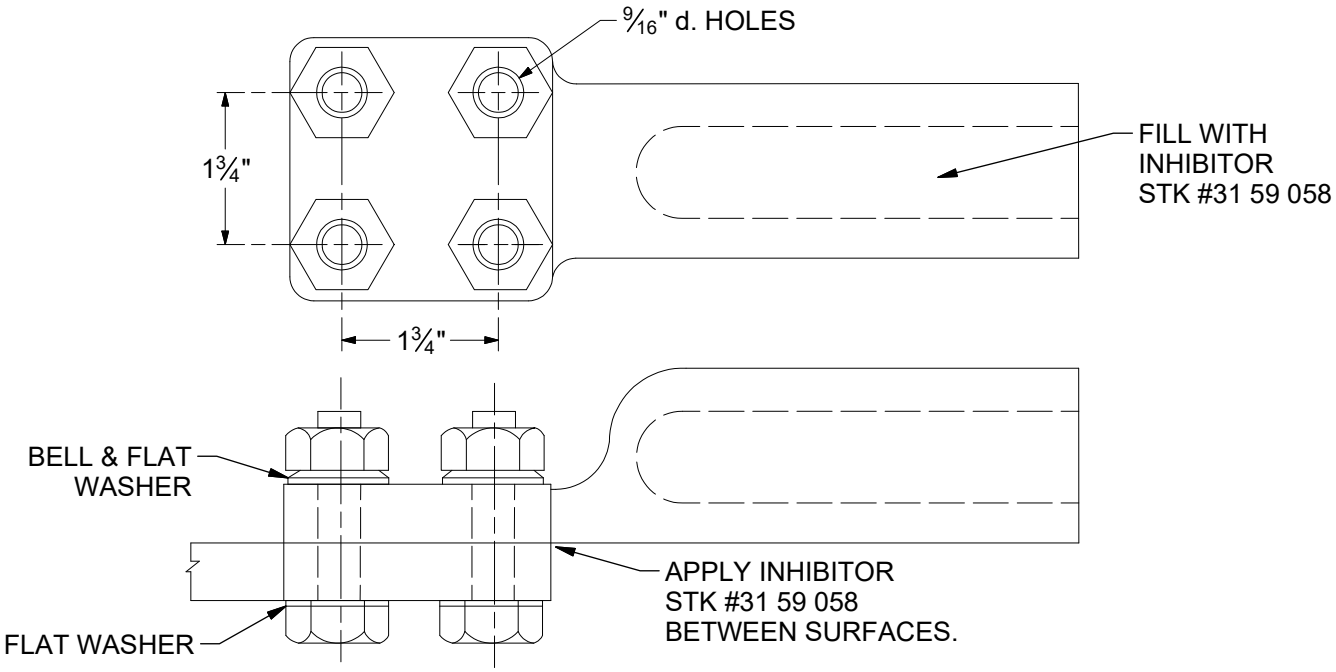
Rubber Base - Stock #25 53 080 used for voltages of 1000 Volts or less between phases. Its normal application is with rubber insulated wire. Use two layers half lapped and cover with same amount of friction tape.

Oil Base - Stock #25 53 070 (1" wide) or Stock #25 53 027 (1-1/2" wide) used for voltages 1000 Volts or more between phases. This tape is normally used with rubber insulated wire such as primary leads to transformers and for cable joints and terminals. Specific instructions for the use of this tape accompany standards on splices, joints, terminals, etc.

2. **Use of Friction Tape**

Friction tape Stock #25 53 003 (3/4" wide) or Stock #25 53 074 (1-1/2" wide) shall be used to cover taps, splices, etc., within the climbing and working spaces on Overhead Construction 5kV and below where weatherproof conductors are used. Apply two layers half lapped.

Tape will not adhere to corrosion resisting lubricant; therefore on aluminum taps it will be necessary to wipe the excess lubricant from the connection before taping. The tape must be securely anchored to the polyethylene jacket before taping over the coated connection.



STK#	Description	Note
17 55 311	Lug, Connecting, 1/0 ACSR, 2 Hole	1
17 55 315	Lug, Connecting, 335.5 ACSR T-2, 2 Hole	1
17 55 318	Lug, Connecting, 336 ACSR, 2 Hole	1
17 55 324	Lug, Connecting, 447 ACSR, 2 Hole	2
17 55 327	Lug, Connecting, 556 AA, 2 Hole	2
17 55 192	Lug, Connecting, 556 AA, 4 Hole	1
17 55 193	Lug, Connecting, 795 AA, 4 Hole	2
17 55 194	Lug, Connecting, 795 ACSR, 45/7, 4 Hole	2
17 55 211	Lug, Connecting, 954 AA, 4 Hole	2

DESIGN NOTE(s):

1. Install with 12 Ton Press and Burndy Die.
2. Install with 60 Ton Press and Alcoa Die.

REV	DATE	ENG	DESCRIPTION
7	07/01/23	PER	Converted to new format
6	10/01/20	JMW	

Preformed Ties

The preferred method of attaching aluminum conductors under tension to pin type or post type insulators on lines through 34kV is with preformed ties. Preformed top, side, double top, and double-sided ties are available for the following conductors listed in Table 1 below. Pads, when supplied with these ties must be used to insure a proper fit between the tie and conductor. For 600V conductors with polyethylene coating, the ties can be installed over the insulation.

Table 1 - Preformed Ties

Conductor Size	OD Range (in)	Top Tie (F-Neck)	Top Tie (C-Neck)	Side Tie (C-Neck)	Dbl. Top Tie (F- & C-Neck)	Dbl. Side Tie (F- & C-Neck)	Color Code
2/0 (6/1) ACSR, Bare	0.406 - 0.459	23 68 743	23 68 387	23 68 565	23 68 569	-	Blue
1/0 AAAC, Poly Covered	0.460 - 0.520	-	23 68 351	23 68 339	23 68 551	-	Orange
3/0 (7) AAAC, Bare							
3/0 (6/1) ACSR, Bare							
110.8 ACSR, Bare							
#4 ACSR, Tree Wire	0.521 - 0.588	23 68 506	23 68 390	23 68 331	23 68 383	23 68 392	Red
4/0 (6/1) ACSR, Bare							
1/0 AAAC, Tree Wire	0.666 - 0.755	23 68 362	23 68 343	23 68 332	23 68 395	23 68 391	Brown
336.4 (18/1) ACSR, Bare							
336.4 (25/7) ACSR, Bare							
477 (18/1) ACSR, Bare	0.756 - 0.858	-	23 68 491	23 68 492	23 68 494	23 68 493	Red
477 (26/7) ACSR, Bare							
556.5 (19) AAC, Bare							
556.5 (26/7) ACSR, Bare	0.859 - 0.968	23 68 348	23 68 344	23 68 338	23 68 374	23 68 375	Blue
556 AAC, Poly Covered	0.969 - 1.096	23 68 349	23 68 354	23 68 333	-	-	Green
795 (37) AAC, Bare							
954 (37) AAC, Bare	1.097 - 1.240	23 68 356	-	-	-	23 68 379	Yellow
954 (45/7) ACSR, Bare							
T2-3/0 or T2-335.6 (6/1) ACSR, Bare	0.859 - 0.968	23 68 348	23 68 344	23 68 338	23 68 374	23 68 375	Blue
T2-4/0 (6/1) ACSR, Bare							

REV	DATE	ENG	DESCRIPTION
8	07/01/23	PER	Converted to new format
7	10/01/20	DCG	

Conventional Hand Ties

Conventional hand ties are to be used only for those conductors on lines up through 34kV for which preformed ties are not specified, such as copper conductors, slack installations, and miscellaneous wire sizes and types which may be encountered on existing lines. Table II below specifies the correct tie wire for each type of conductor.

Table 2 - Hand Ties

Conductor Type/Size	Tie Wire	STK #	Unit	Top Tie	Side Tie	Dbl. Side Tie
Aluminum − AA, AAAC, ACSR Bare or Covered	#4 Al., Bare	18 55 028	Ft.	10	10	16
Copper−Bare, CW or CWC #6 thru 500 kcmil	#6 Cu, Bare, S.D. or	18 52 019	Ft.	10	10	16
	#8 Cu, Bare, S.D.	18 52 068				
Copper−Bare, CW or CWC #6 thru 500 kcmil	#6 Cu, Bare, S.D., 42” UE Only	18 52 009	Ea	1	1	2
Copper − Covered: #6 thru #2	#4 Cu, Poly, SD, SOL.	18 51 025	Ft.	5	5	10
#6 thru #2	#4 Al, Poly, 42” (MO Only)	18 55 040	Ea	1	1	2
1/0 thru 500 kcmil	#6 Cu, Poly, SD, SOL.	18 51 021	Ft.	5	5	10

1. Armor Rods or Line Guards are required for all bare aluminum hand ties.

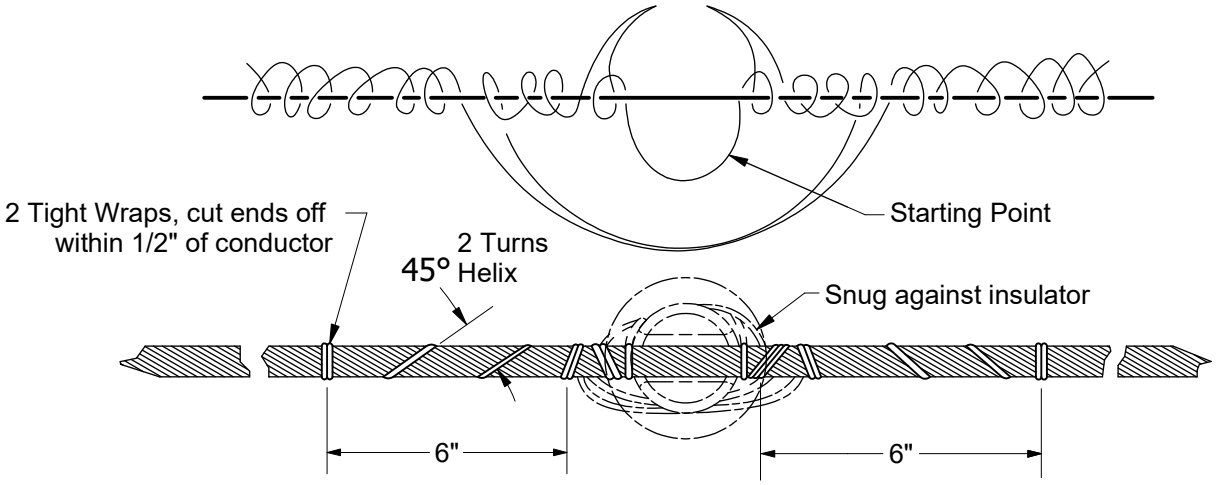
Conductor	Armor Rod Stock #
#4 ACSR	17 59 020
1/0 AAAC	17 59 022
336.4 ACSR	17 59 040
556.5 AA	17 59 071

2. On aluminum conductor make the tie as snug and tight as possible by hand up to the last two turns (buttons), and then use pliers to cinch these last two buttons continuously. Use the flat face of the pliers against the conductor and avoid nicking the tie wire by using a continuous cinch rather than a bite.

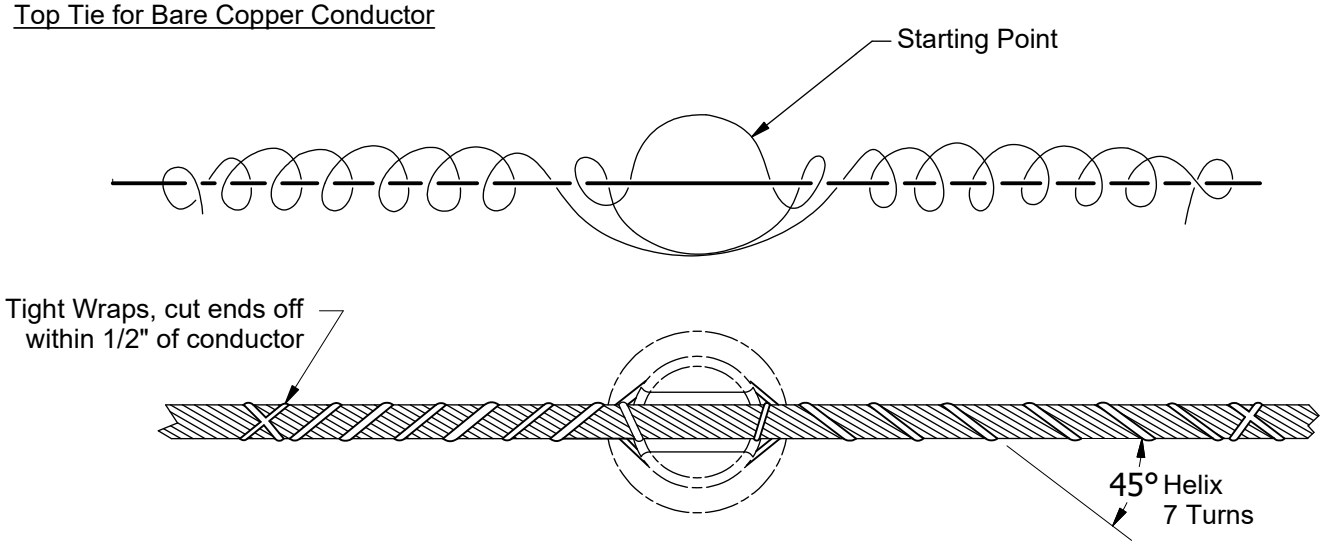
3. The cottonbraid or polyethylene covering on covered copper conductor used for primary voltages must be removed at all insulator ties to a point 6" beyond the ends of the tie wires. The conductor shall then be tied in as if a bare copper conductor.

Conventional Hand Top Ties

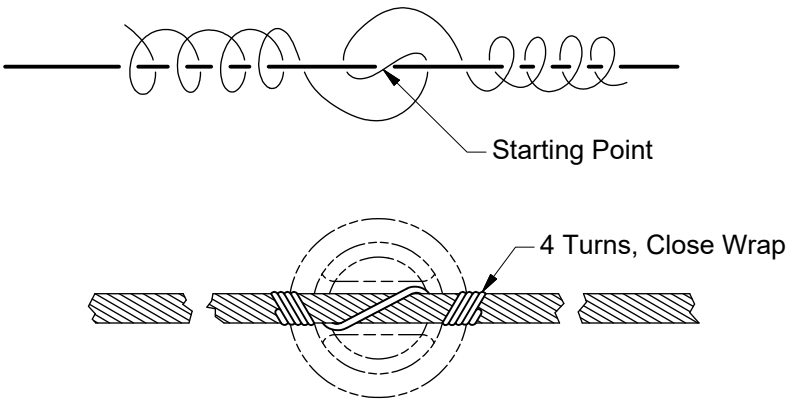
Top Tie for Aluminum Conductor - Bare or Covered



Top Tie for Bare Copper Conductor



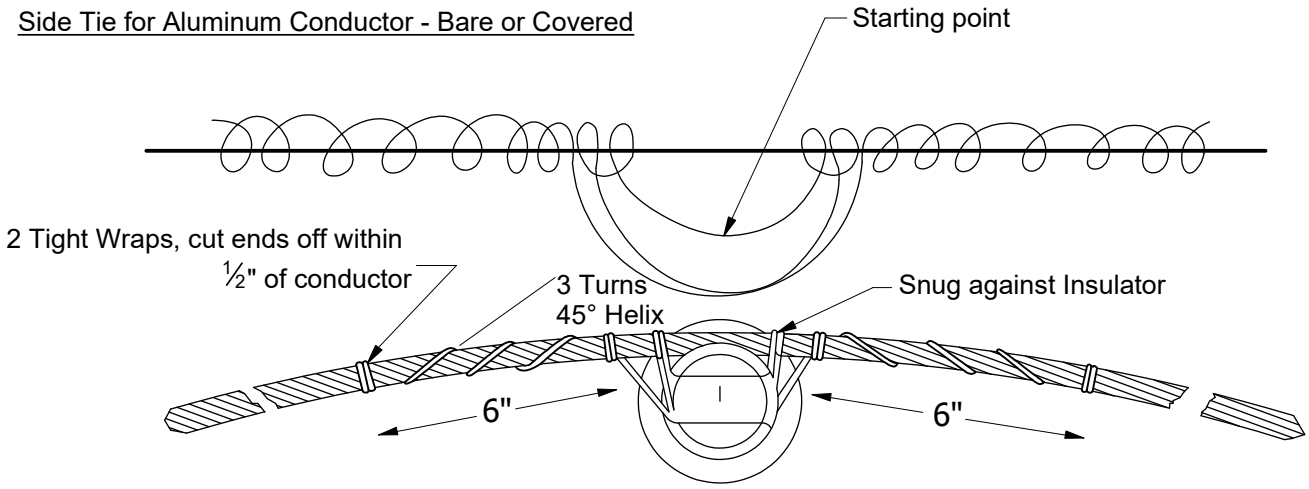
Top Tie for Covered Copper Conductor - 4kV



REV	DATE	ENG	DESCRIPTION
8	07/01/23	PER	Converted to new format
7	10/01/20	DCG	

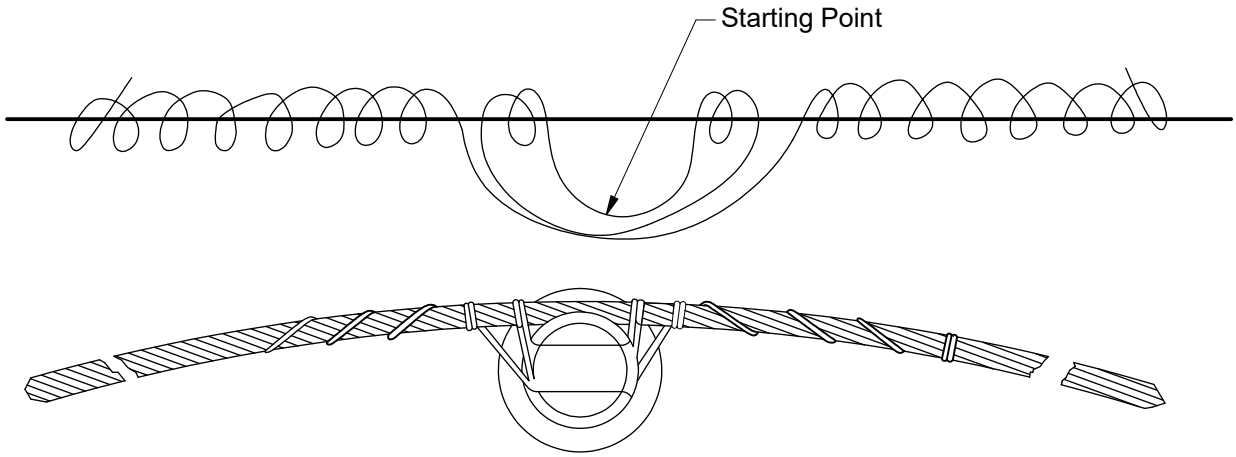
Conventional Hand Side Ties

Side Tie for Aluminum Conductor - Bare or Covered



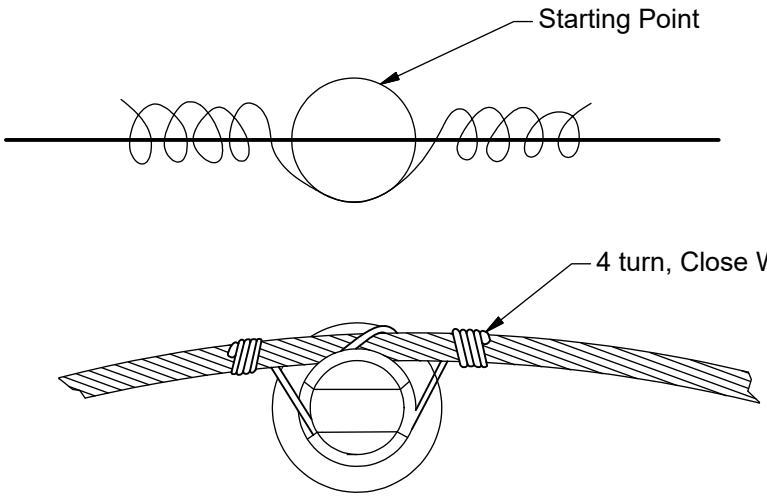
Double Ties: Make Two Single Ties - Reduce spiral length between insulators as necessary.

Side Tie for Bare Copper Conductor



Double Ties: Make Two Single Ties - Reduce spiral length between insulators as necessary.

Side Tie for Covered Copper Condcutor - 4kV



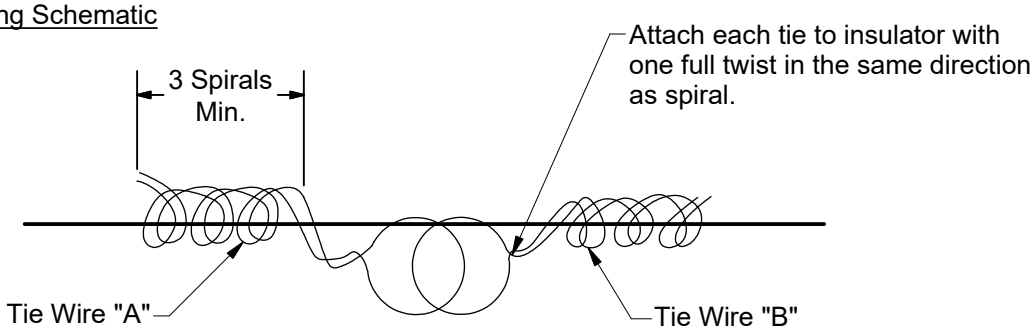
REV	DATE	ENG	DESCRIPTION
8	07/01/23	PER	Converted to new format
7	10/01/20	DCG	

Live Line Ties

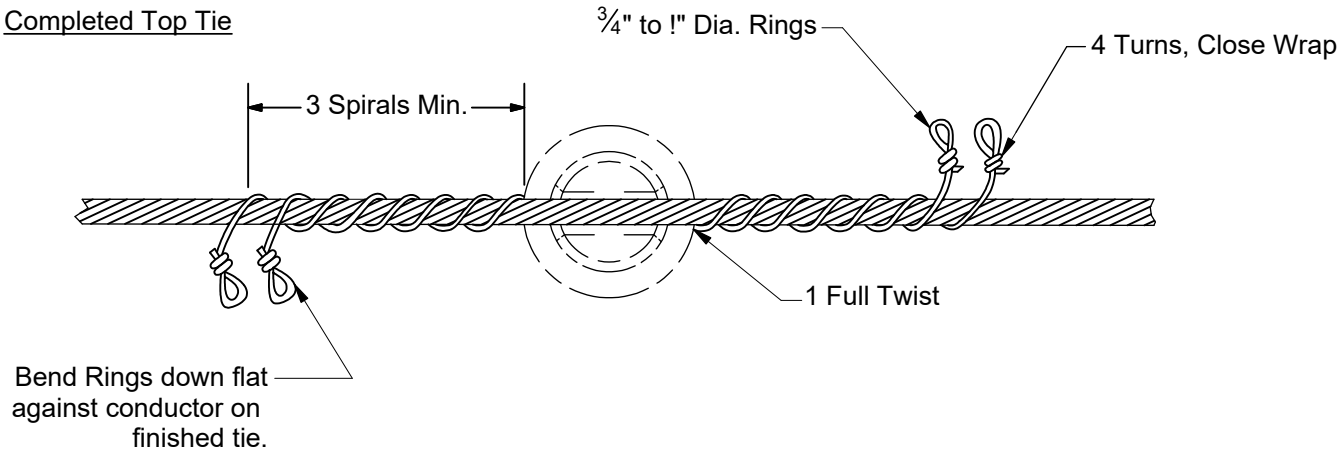
For Use on Bare Aluminum or Copper Conductors

This same tie may be used as either a Hot Tap Tie or Hot Side Tie as shown below.

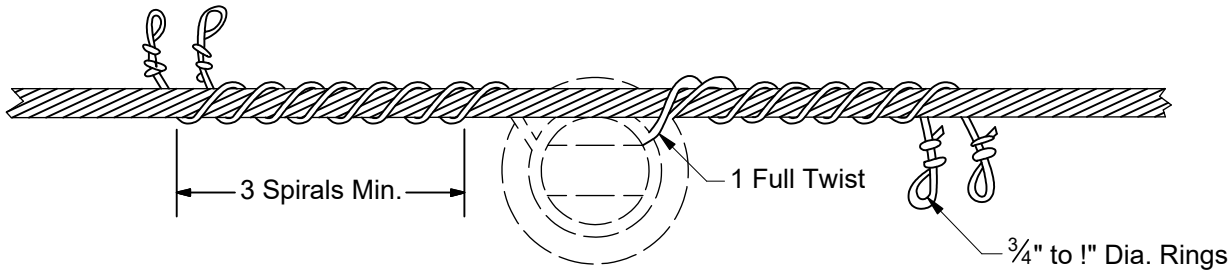
Live Line Tying Schematic



Completed Top Tie

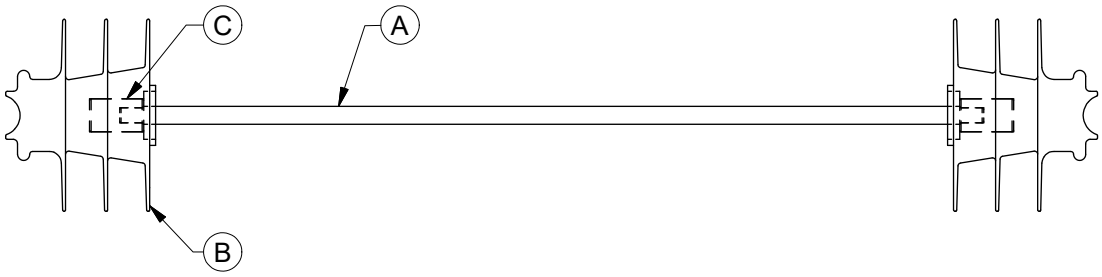


Completed Side Tie



Double Ties: Same as single tie except that only one tie is installed on each insulator.

REV	DATE	ENG	DESCRIPTION
8	07/01/23	PER	Converted to new format
7	10/01/20	DCG	



DCS#	DESCRIPTION
07 00 45 01	Spacer 36" 12kV
07 00 45 02	Spacer 48" 12kV
07 00 45 03	Spacer 36" 34kV
07 00 45 04	Spacer 48" 34kV

CONSTRUCTION NOTE(s):

1. Rod lengths are selected based on the normal separation between phases.

2. Conductors may be hand-tied to the insulators in either the top or the side groove, with the top groove position preferred.

ITEM	STK / DCS #	DESCRIPTION 07 00 45 **	01	02	03	04
A	23 17 290	Spacer Rod - 36"	1	-	1	-
A	23 17 278	Spacer Rod - 48"	-	1	-	1
B	25 05 069	Insulator, Pin Type, 12kV	2	2	-	-
B	25 05 080	Insulator, Pin Type, 34kV, F-Neck	-	-	2	2
C	23 62 125	Adapter - 1" to 1-3/8"	-	-	2	2
D	18 55 028	Wire - Tie, Al, #4 AWG	20	20	20	20

DESIGN NOTE(s):

3. Spacers are to be used at known problem locations to prevent phases from coming in contact with each other.

REV	DATE	ENG	DESCRIPTION
4	07/01/23	PER	Converted to new format
3	10/01/20	WYW	

Tap or Line Conductor	Lead - S.D. Bare Copper or AA		Lead - Poly Covered S.D. Cu or AA
	Size	STK #	STK # ◇3
4 ACSR Bare	4 Cu	18 52 020	18 51 025
1/0 AAAC, ACSR, Bare	1/0 Cu	18 52 026	18 51 024
336.4 ACSR Bare	350 Cu	18 52 023	18 51 052
477 ACSR Bare	350 Cu	18 52 023	18 51 052
556.5 AA Bare	350 Cu	18 52 023	18 51 052
795 AA Bare	795 Cu	18 05 032	◇2
954 AA, ACSR, Bare	954 Cu	18 05 043	◇2
4 ACSR Poly.	4 Cu	18 52 020	18 51 025
1/0 AAAC Poly.	1/0 Cu	18 52 026	18 51 024
336.4 AA Poly.	4/0 Cu	18 52 024	18 51 052
556.5 AA Poly.	350 Cu	18 52 023	18 51 052
#6 Cu. Bare	4 Cu	18 52 020	18 51 025
#4 Cu. Bare	4 Cu	18 52 020	18 51 025
#2 Cu. Bare	2 Cu	18 52 025	18 51 019
#1/0 Cu. Bare	1/0 Cu	18 52 026	18 51 024
#4/0 Cu. Bare	4/0 Cu	18 52 024	18 51 023
350 Cu. Bare	350 Cu	18 52 023	18 51 052
500 Cu. Bare	500 Cu	18 52 021	18 51 022
#6 Cu. Poly.	4 Cu	18 51 020	18 51 025
#4 Cu. Poly.	4 Cu	18 51 020	18 51 025
#2 Cu. Poly.	2 Cu	18 52 025	18 51 019
#1/0 Cu. Poly.	1/0 Cu	18 52 026	18 51 024
#4/0 Cu. Poly.	4/0 Cu	18 52 024	18 51 023
500 Cu. Poly.	500 Cu	18 51 021	18 51 022

DESIGN NOTE(s):

1. Lead size is based on current capacity of tap for tap standards and of line for line sectionalizing. Line conductor (of equal size) may be used.

◇2 Applicable to 34.5kV air break switches. Use Stock #23 17 425 conductor cover.

◇3 Poly covered leads are to be used for jumpers to prevent wildlife outages.

Tap or Line Conductor	Lead - 2400 V. Insulated Copper ◇3◇	
	Size	STK #
4 ACSR Bare	◇2◇	18 53 018
1/0 AAAC, ACSR Bare	4/0	18 53 028
336.4 ACSR Bare	350 ◇2◇	18 53 102
477 ACSR Bare	350 ◇2◇	18 53 102
556.5 AA Bare	350 ◇2◇	18 53 102
4 ACSR Poly.	◇2◇	18 53 018
1/0 AAAC Poly.	1/0	18 53 022
336.4 AA Poly.	350	18 53 102
556.5 AA Poly.	350 ◇2◇	18 53 102
#6 Cu. Bare	◇2◇	18 53 018
#4 Cu. Bare	◇2◇	18 53 018
#2 Cu. Bare	1/0	18 53 022
#1/0 Cu. Bare	4/0	18 53 028
#4/0 Cu. Bare	350	18 53 102
350 Cu. Bare	350 ◇2◇	18 53 102
500 Cu. Bare	350 ◇2◇	18 53 102
#6 Cu. Poly.	◇2◇	18 53 018
#4 Cu. Poly.	◇2◇	18 53 018
#2 Cu. Poly.	1/0	18 53 022
#1/0 Cu. Poly.	4/0	18 53 028
#4/0 Cu. Poly.	350	18 53 102
350 Cu. Poly.	350 ◇2◇	18 53 102
500 Cu. Poly.	350 ◇2◇	18 53 102

DESIGN NOTE(s):

1. Lead size is based on current capacity of tap for tap standards and of line for line sectionalizing.

◇2◇ The 350 kcmil maximum size of the 2400kV lead has the same emergency rating as the highest rated substation exit cable. A larger size is not needed.

◇3◇ The lead wires on this standard are for use on 2.4/4.16 kV installations. For higher voltage installations refer to DCS **07 00 80 00**.

REV	DATE	ENG	DESCRIPTION
6	07/01/23	DCG	Converted to new format
5	10/01/20	DCG	

NOTES

cut

SECONDARIES 08

cut

CONDUCTOR DATA..... 08 00 01 00

OPEN WIRE - SAG TABLES..... 08 00 01 01

MULTIPLEX CABLE - SAG TABLES..... 08 00 01 02

TIES - WIRE, PREFORMED..... 08 01 01 **

TIES - COVERED & BARE CONDUCTORS..... 08 01 03 00

DEADENDS - COVERED & BARE CONDUCTORS..... 08 01 10 00

SECONDARY SPLIT - PRE-ASSEMBLED CABLE 08 01 20 00

SECONDARY SPLIT - WEATHERPROOF CU & POLY-COVERED AL - ALTERNATE..... 08 01 22 **

SECONDARY SPLIT - WEATHERPROOF CU & POLY-COVERED AL - PREFERRED..... 08 01 23 **

SECONDARY SPLIT - TRIPLEX ALUMINUM CABLE..... 08 01 24 **

This standard covers stock numbers, ampacities, and mechanical properties for secondary conductors and their use.

CONSTRUCTION NOTE(s):

1. Line-to-Ground insulation.

2. Triplex cable shall be used for new construction.

3. Open wire or parallel lashed cables can be used if rebuilding or if conditions warrant (example: transfer or existing conductor or short extension of span or two to match existing construction; large number of flying services required). If multiplex cable is used, the messenger will serve as the primary system neutral if the conductor is 1/0 or larger, if the messenger of multiplex cable is smaller than 1/0, a separate 1/0 AAAC neutral must be installed.

4. 1/0 AAAC may be looped around the pole to continue the neutral. If a jumper is required, the minimum size neutral conductor at the pole shall be #2 AWG Cu wire or the smaller of the two neutral wires being connected at the pole. 7#10 Copperweld shall not be used as a neutral conductor or to connect neutral conductors at a pole.

Table 1 - Triplex (Standard Conductor) 1

Phase Conductor	Messenger	Code Name	Stock Number	Current Rating (amps)	Weight (lb/ft)	R.B.S. (lbs)	Phase Dia. (inches)	Msgr Dia. (inches)
1/0 AAC XLP 300 V	1/0 ACSR	Neritina	18 05 095	Summer 205 Winter 265	0.420	4380	0.477	0.398
4/0 AAC XLP 300 V	4/0 ACSR	Zuzara	18 05 089	Summer 315 Winter 410	0.789	8350	0.626	0.563

Table 2 - Open Wire

Phase Conductor	Neutral	Code Name	Stock Number	Current Rating (amps)	Weight (lb/ft)	R.B.S. (lbs)	Phase Dia. (inches)	Msgr Dia. (inches)
4/0 AAC XLP	-	Olive	18 05 059	Summer 385 Winter 425	0.253	3440	0.626	-
-	1/0 AAAC bare	Azusa	18 05 060		0.116	4460	-	0.398
1/0 AAAC XLP	-	Oilnut	18 05 067	Summer 262 Winter 289	0.159	4010	0.518	-
-	1/0 AAAC bare	Azusa	18 05 060		0.116	4460	-	0.398

Table 3 - Parallel Lashed

Phase Conductor	Messenger	Code Name	Stock Number	Current Rating (amps)	Weight (lb/ft)	R.B.S. (lbs)	Phase Dia. (inches)	Msgr Dia. (inches)
4/0 AAC XLP 300V	1/0 AAAC bare	San Juan	18 05 069	Summer 315 Winter 410	0.624	4280	0.618	-
							-	0.398
3/0 AAC XLP 300V	3/0 AAAC bare	Padre Island	18 05 187	Summer 275 Winter 360	0.601	6790	0.571	-
							-	0.502

REV	DATE	ENG	DESCRIPTION
010	01/01/22	NH	Converted to new format
009	03/15/16	EJB	

Table 1 - 4/0 AAC, Poly Covered - Short Span (ft)												
Amb Temp. Deg. F	INITIAL (Stringing) SAG (in)											
	100	**110**	**120**	**130**	**140**	**150 R.S.**	**160**	**170**	**180**	**190**	**200**	**Initial Tension (lbs)**
0	20	25	29	34	40	46	52	59	66	74	81	183
30	23	27	32	38	44	51	58	65	73	81	90	166
40	23	28	33	39	45	52	59	67	75	84	93	161
50	24	29	34	40	47	54	61	69	77	86	95	157
60	24	30	35	41	48	55	63	71	79	88	98	153
70	25	30	36	42	49	56	64	72	81	90	100	149
80	26	31	37	43	50	58	66	74	83	93	103	146
90	26	32	38	44	51	59	67	76	85	95	105	143
100	27	32	39	45	53	60	69	78	87	97	107	140

Table 2 - 4/0 AAC, Poly Covered - Medium Span (ft)												
Amb Temp. Deg. F	INITIAL (Stringing) SAG (in)											
	150	**160**	**170**	**180**	**190**	**200 R.S.**	**210**	**220**	**230**	**240**	**250**	**Initial Tension (lbs)**
0	27	31	35	40	44	49	54	59	65	70	76	309
30	32	36	41	45	51	56	62	68	74	81	88	269
40	33	37	42	47	53	58	64	71	77	84	91	258
50	34	39	44	49	55	61	67	73	80	87	95	249
60	35	40	45	51	57	63	69	76	83	90	98	241
70	37	42	47	53	59	65	72	79	86	93	101	233
80	38	43	48	54	60	67	74	81	89	96	105	226
90	39	44	50	56	62	69	76	83	91	99	108	220
100	40	45	51	57	64	71	78	86	94	102	111	214

REV	DATE	ENG	DESCRIPTION
006	01/01/22	NH	Converted to new format
006	09/20/05	DCG	

Table 3 - 4/0 AAC, Poly Covered - Short Span (ft)											
DE Tension = 944 lbs											
Cond Temp. Deg. F	FINAL SAG (in)										
	100	**110**	**120**	**130**	**140**	**150 R.S.**	**160**	**170**	**180**	**190**	**200**
-20	19	23	28	33	38	43	49	56	62	70	77
0	21	25	30	35	41	47	53	60	67	75	83
32 + 1/2" ice	24	29	34	40	47	54	61	69	77	86	95
30	23	28	33	39	45	51	58	66	74	82	91
50	24	29	35	41	47	54	62	70	78	87	97
60	25	30	36	42	49	56	63	72	80	89	99
70	25	31	37	43	50	57	65	73	82	92	102
90	27	32	38	45	52	60	68	77	86	96	106
120	28	34	41	48	55	63	72	82	91	102	113
194	32	39	46	54	63	72	82	92	104	116	128

Table 4 - 4/0 AAC, Poly Covered - Medium Span (ft)											
DE Tension = 1306 lbs											
Cond Temp. Deg. F	FINAL SAG (in)										
	150	**160**	**170**	**180**	**190**	**200 R.S.**	**210**	**220**	**230**	**240**	**250**
-20	27	31	35	39	44	49	54	59	64	70	76
0	30	34	39	43	48	54	59	65	71	77	84
32 + 1/2" ice	38	43	49	55	61	68	74	82	89	97	106
30	34	39	44	49	55	60	67	73	80	87	95
50	36	41	47	52	58	65	71	78	86	93	101
60	38	43	48	54	60	67	74	81	88	96	104
70	39	44	50	56	62	69	76	83	91	99	107
90	41	46	52	59	66	73	80	88	96	105	113
120	44	50	56	63	70	78	86	94	103	112	122
194	51	58	65	73	81	90	99	109	119	130	141

REV	DATE	ENG	DESCRIPTION
006	01/01/22	NH	Converted to new format
006	09/20/05	DCG	

Table 5 - 1/0 AAAC, Poly Covered - Short Span (ft)												
Amb Temp. Deg. F	INITIAL (Stringing) SAG (in)											
	100	**110**	**120**	**130**	**140**	**150 R.S.**	**160**	**170**	**180**	**190**	**200**	**Initial Tension (lbs)**
0	5	6	8	9	10	12	14	15	17	19	21	474
30	8	9	11	13	15	18	20	23	25	28	31	320
40	9	11	13	15	17	20	22	25	28	32	35	284
50	10	12	14	16	19	22	25	28	32	35	39	255
60	11	13	16	18	21	24	28	31	35	39	43	234
70	12	14	17	20	23	27	30	34	38	43	47	211
80	13	15	18	22	25	29	33	37	41	46	51	195
90	14	17	20	23	27	31	35	40	44	49	55	182
100	15	18	21	25	29	33	37	42	47	53	58	171

Table 6 - 1/0 AAAC, Poly Covered - Medium Span (ft)												
Amb Temp. Deg. F	INITIAL (Stringing) SAG (in)											
	150	**160**	**170**	**180**	**190**	**200 R.S.**	**210**	**220**	**230**	**240**	**250**	**Initial Tension (lbs)**
0	11	13	15	17	18	20	22	25	27	29	32	489
30	16	18	20	23	25	28	31	34	37	40	44	355
40	17	20	22	25	28	31	34	37	41	44	48	323
50	19	22	24	27	30	34	37	41	44	48	53	297
60	20	23	26	29	33	36	40	44	48	52	57	274
70	22	25	28	32	35	39	43	47	52	56	61	255
80	23	27	30	34	38	42	46	51	55	60	65	239
90	25	28	32	36	40	44	49	54	59	64	69	225
100	26	30	34	38	42	47	52	57	62	68	73	213

REV	DATE	ENG	DESCRIPTION
006	01/01/22	NH	Converted to new format
006	09/20/05	DCG	

Table 7 - 1/0 AAAC, Poly Covered - Short Span (ft)											
DE Tension = 1152 lbs											
Cond Temp. Deg. F	FINAL SAG (in)										
	100	**110**	**120**	**130**	**140**	**150 R.S.**	**160**	**170**	**180**	**190**	**200**
-20	5	6	7	8	10	11	13	14	16	18	20
0	7	8	10	12	14	16	18	20	23	25	28
32 + 1/2" ice	16	19	23	27	31	36	41	46	52	58	64
30	10	13	15	18	20	23	27	30	34	38	42
50	13	15	18	21	25	28	32	36	41	45	50
60	14	16	20	23	27	31	35	39	44	49	54
70	15	18	21	25	29	33	37	42	47	53	58
90	16	20	24	28	32	37	42	47	53	59	66
120	19	23	27	32	37	42	48	55	61	68	76
194	24	29	35	41	47	54	61	69	78	87	96

Table 8 - 1/0 AAAC, Poly Covered - Medium Span (ft)											
DE Tension = 1348 lbs											
Cond Temp. Deg. F	FINAL SAG (in)										
	150	**160**	**170**	**180**	**190**	**200 R.S.**	**210**	**220**	**230**	**240**	**250**
-20	12	13	15	17	19	21	23	25	27	30	32
0	15	17	19	22	24	27	29	32	35	38	42
32 + 1/2" ice	30	34	39	43	48	54	59	65	71	77	84
30	20	23	A	29	32	36	40	44	48	52	56
50	24	27	30	34	38	42	46	51	55	60	65
60	25	29	32	36	40	45	49	54	59	64	70
70	27	30	34	38	43	47	52	57	63	68	74
90	29	34	38	42	47	52	58	63	69	76	82
120	33	38	43	48	54	59	65	72	79	86	93
194	42	47	54	60	67	74	82	90	98	107	116

REV	DATE	ENG	DESCRIPTION
006	01/01/22	NH	Converted to new format
006	09/20/05	DCG	

Table 1 - #6 AAC Duplex w/ #6 ACSR (6/1) Neutral 'Shepherd' - Short Span (ft)												
Cond. Temp. Deg. F	INITIAL (Stringing) SAG (in)											
	100	**110**	**120**	**130**	**140**	**150 R.S.**	**160**	**170**	**180**	**190**	**200**	**Initial Tension (lbs)**
0	4	4	5	6	7	8	9	10	11	13	14	330
10	4	5	5	6	7	8	10	11	12	13	15	311
20	4	5	6	7	8	9	10	11	13	14	16	292
30	4	5	6	7	8	9	11	12	14	15	17	273
40	5	5	7	8	9	10	12	13	15	16	18	253
50	5	6	7	8	10	11	13	14	16	18	20	234
60	5	7	8	9	11	12	14	16	17	19	22	215
70	6	7	8	10	11	13	15	17	19	21	23	196
80	6	8	9	11	13	15	17	19	21	23	26	179
90	7	9	10	12	14	16	18	20	23	26	28	162
100	8	9	11	13	15	18	20	23	25	28	31	148

FINAL SAG (in)											
Cond. Temp. Deg. F	**DE Tension = 714 lbs**										
	100	**110**	**120**	**130**	**140**	**150 R.S.**	**160**	**170**	**180**	**190**	**200**
-20	7	9	10	12	14	16	18	21	23	26	29
0	9	11	13	15	17	20	22	25	28	31	35
32 + 1/2" ice	21	26	31	36	42	48	55	62	69	77	86
20	10	12	14	16	19	22	25	28	31	35	39
30	10	12	14	17	20	23	26	29	32	36	40
40	10	13	15	17	20	23	26	30	34	37	41
50	11	13	15	18	21	24	27	31	35	39	43
60	11	13	16	19	22	25	28	32	36	40	44
70	11	14	16	19	22	26	29	33	37	41	45
80	12	14	17	20	23	26	30	34	38	42	47
90	12	15	17	20	24	27	31	35	39	44	48
100	12	15	18	21	24	28	32	36	40	45	49
120	13	16	19	22	26	30	34	38	43	47	52
194	16	19	23	27	31	36	40	46	51	57	63

REV	DATE	ENG	DESCRIPTION
006	01/01/22	NH	Converted to new format
005	08/12/15	EJB	

Table 2 - #2 AAC Triplex w/ #4 ACSR (6/1) Neutral 'Cockle' - Short Span (ft)												
Cond. Temp. Deg. F	INITIAL (Stringing) SAG (in)											
	100	**110**	**120**	**130**	**140**	**150 R.S.**	**160**	**170**	**180**	**190**	**200**	**Initial Tension (lbs)**
0	28	34	40	47	55	63	72	81	91	101	112	540
10	28	34	41	48	56	64	73	82	92	103	114	534
20	29	35	41	49	56	65	74	83	93	104	115	528
30	29	35	42	49	57	65	74	84	94	105	116	522
40	29	36	42	50	58	66	75	85	95	106	118	516
50	30	36	43	50	58	67	76	86	96	107	119	510
60	30	36	43	51	59	68	77	87	97	109	120	505
70	30	37	44	51	60	68	78	88	98	110	122	499
80	31	37	44	52	60	69	79	89	100	111	123	494
90	31	38	45	53	61	70	80	90	101	112	124	489
100	31	38	45	53	62	71	80	91	102	113	126	484

FINAL SAG (in)											
Cond. Temp. Deg. F	**DE Tension = 968 lbs**										
	100	**110**	**120**	**130**	**140**	**150 R.S.**	**160**	**170**	**180**	**190**	**200**
-20	30	36	43	50	58	67	76	86	97	108	119
0	31	37	44	52	60	69	78	88	99	110	122
32 + 1/2" ice	34	41	49	58	67	77	88	99	111	124	137
20	31	38	45	53	61	70	80	90	101	113	125
30	32	38	46	53	62	71	81	91	102	114	127
40	32	39	46	54	63	72	82	92	104	115	128
50	32	39	47	55	63	73	83	93	105	117	129
60	33	40	47	55	64	74	84	94	106	118	131
70	33	40	48	56	65	74	85	95	107	119	132
80	33	40	48	56	65	75	85	96	108	121	134
90	34	41	49	57	66	76	86	97	109	122	135
100	34	41	49	58	67	77	87	98	110	123	136
120	35	42	50	59	68	78	89	100	112	125	139
194	37	45	53	63	73	84	95	107	120	134	148

REV	DATE	ENG	DESCRIPTION
006	01/01/22	NH	Converted to new format
005	08/12/15	EJB	

Table 3 - 1/0 AAC Triplex w/ 1/0 ACSR (6/1) Neutral 'Neritina' - Short Span (ft)												
Cond. Temp. Deg. F	INITIAL (Stringing) SAG (in)											
	100	110	120	130	140	150 R.S.	160	170	180	190	200	Initial Tension (lbs)
0	19	22	27	31	36	42	48	54	60	67	74	815
10	19	23	27	32	37	43	49	55	62	69	76	794
20	20	24	28	33	38	44	50	56	63	70	78	775
30	20	24	29	34	39	45	51	58	65	72	80	756
40	20	25	29	35	40	46	52	59	66	74	82	739
50	21	25	30	35	41	47	54	60	68	75	84	722
60	21	26	31	36	42	48	55	62	69	77	86	707
70	22	26	31	37	43	49	56	63	71	79	87	692
80	22	27	32	38	44	50	57	64	72	80	89	678
90	23	28	33	38	45	51	58	66	74	82	91	664
100	23	28	33	39	46	52	60	67	75	84	93	651

FINAL SAG (in)											
Cond. Temp. Deg. F	DE Tension = 1495 lbs										
	100	110	120	130	140	150 R.S.	160	170	180	190	200
-20	19	23	27	32	37	42	48	55	61	68	76
0	20	24	29	34	39	45	51	58	65	72	80
32 + 1/2" ice	24	29	35	41	47	54	61	69	78	87	96
20	21	25	30	35	41	47	54	61	68	76	84
30	21	26	31	36	42	48	55	62	70	78	86
40	22	27	32	37	43	49	56	64	71	79	88
50	23	27	32	38	44	51	58	65	73	81	90
60	23	28	33	39	45	52	59	66	74	83	92
70	23	28	34	40	46	53	60	68	76	85	94
80	24	29	34	40	47	54	61	69	78	86	96
90	24	30	35	41	48	55	63	71	79	88	98
100	25	30	36	42	49	56	64	72	81	90	99
120	26	31	37	44	50	58	66	74	83	93	103
194	29	35	41	49	56	65	74	83	93	104	115

REV	DATE	ENG	DESCRIPTION
006	01/01/22	NH	Converted to new format
005	08/12/15	EJB	

Table 4 - 4/0 AAC Triplex w/ 4/0 ACSR (6/1) Neutral 'Zuzara' - Short Span (ft)												
Cond. Temp. Deg. F	INITIAL (Stringing) SAG (in)											
	100	**110**	**120**	**130**	**140**	**150 R.S.**	**160**	**170**	**180**	**190**	**200**	**Initial Tension (lbs)**
0	24	29	34	40	46	53	60	68	76	85	94	642
10	24	29	35	41	47	54	62	70	78	87	96	629
20	25	30	35	41	48	55	63	71	79	89	98	617
30	25	30	36	42	49	56	64	72	81	90	100	606
40	25	31	37	43	50	57	65	74	82	92	102	595
50	26	31	37	44	51	58	66	75	84	94	104	585
60	26	32	38	45	52	59	67	76	85	95	105	575
70	27	32	39	45	52	60	69	77	87	97	107	565
80	27	33	39	46	53	61	70	79	88	98	109	556
90	28	33	40	47	54	62	71	80	90	100	111	548
100	28	34	40	48	55	63	72	81	91	101	112	540

FINAL SAG (in)											
Cond. Temp. Deg. F	**DE Tension = 1495 lbs**										
	100	**110**	**120**	**130**	**140**	**150 R.S.**	**160**	**170**	**180**	**190**	**200**
-20	23	28	33	39	46	52	60	67	75	84	93
0	24	29	35	41	48	55	62	70	79	88	97
32 + 1/2" ice	27	33	39	46	53	61	69	78	88	98	108
20	25	31	36	43	50	57	65	73	82	91	101
30	26	31	37	43	50	58	66	74	83	93	103
40	26	32	38	44	51	59	67	76	85	95	105
50	27	32	38	45	52	60	68	77	86	96	107
60	27	33	39	46	53	61	69	78	88	98	108
70	28	33	40	47	54	62	71	80	89	100	110
80	28	34	40	47	55	63	72	81	91	101	112
90	28	34	41	48	56	64	73	82	92	103	114
100	29	35	42	49	57	65	74	83	93	104	115
120	30	36	43	50	58	67	76	86	96	107	119
194	31	38	45	53	62	71	81	91	102	114	126

REV	DATE	ENG	DESCRIPTION
006	01/01/22	NH	Converted to new format
005	08/12/15	EJB	

Table 5 - 1/0 AAC Quadruplex w/ 1/0 AAC Neutral 'Criollo' - Short Span (ft)												
Cond. Temp. Deg. F	INITIAL (Stringing) SAG (in)											
	100	**110**	**120**	**130**	**140**	**150 R.S.**	**160**	**170**	**180**	**190**	**200**	**Initial Tension (lbs)**
0	25	30	35	42	48	55	63	71	80	89	99	615
10	25	30	36	42	49	57	64	73	81	91	100	602
20	26	31	37	43	50	58	66	74	83	93	103	590
30	26	32	38	44	51	59	67	76	85	94	105	579
40	27	32	38	45	52	60	68	77	86	96	107	569
50	27	33	39	46	53	61	69	78	88	98	109	558
60	28	33	40	47	54	62	71	80	90	100	111	549
70	28	34	40	48	55	63	72	81	91	101	112	539
80	29	35	41	48	56	64	73	83	93	103	114	530
90	29	35	42	49	57	65	74	84	94	105	116	522
100	30	36	43	50	58	66	76	85	96	107	118	514

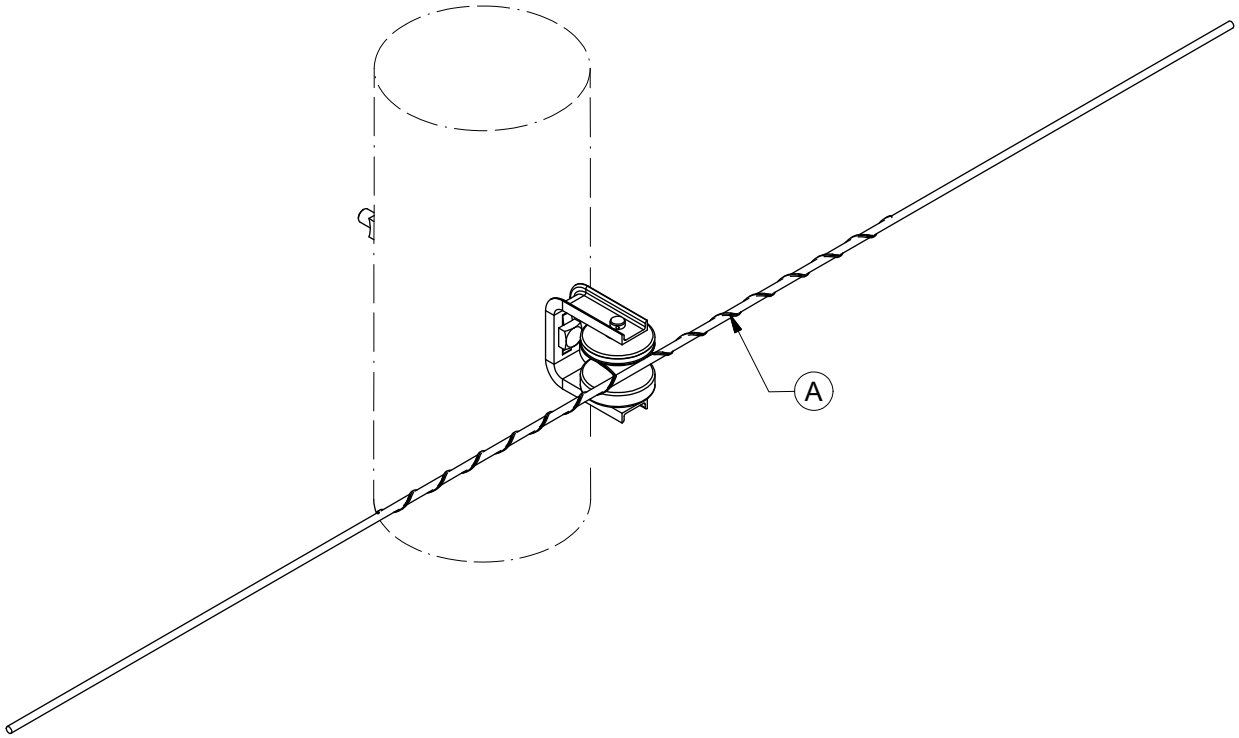
FINAL SAG (in)											
Cond. Temp. Deg. F	**DE Tension = 1194 lbs**										
	100	**110**	**120**	**130**	**140**	**150 R.S.**	**160**	**170**	**180**	**190**	**200**
-20	27	32	38	45	52	60	68	77	87	96	107
0	28	34	40	47	54	62	71	80	90	100	111
32 + 1/2" ice	32	38	45	53	62	71	81	91	102	114	126
20	29	35	41	48	56	65	73	83	93	104	115
30	29	35	42	49	57	66	75	84	95	105	117
40	30	36	43	50	58	67	76	86	96	107	119
50	30	36	43	51	59	68	77	87	98	109	121
60	31	37	44	52	60	69	78	88	99	111	122
70	31	38	45	53	61	70	80	90	101	112	124
80	32	38	45	53	62	71	81	91	102	114	126
90	32	39	46	54	63	72	82	92	104	116	128
100	32	39	47	55	64	73	83	94	105	117	130
120	33	40	48	56	65	75	85	96	108	120	133
194	36	44	52	62	71	82	93	105	118	132	146

REV	DATE	ENG	DESCRIPTION
006	01/01/22	NH	Converted to new format
005	08/12/15	EJB	

Table 6 - 4/0 AAC Quadruplex w/ 4/0 AAC Neutral 'Oldenburg' - Short Span (ft)												
Cond. Temp. Deg. F	INITIAL (Stringing) SAG (in)											
	100	**110**	**120**	**130**	**140**	**150 R.S.**	**160**	**170**	**180**	**190**	**200**	**Initial Tension (lbs)**
0	23	28	33	39	45	51	58	66	74	82	91	
10	23	28	34	40	46	53	60	68	76	85	94	625
20	24	29	35	41	47	54	61	69	78	87	96	610
30	25	30	35	42	48	55	63	71	80	89	98	596
40	25	30	36	42	49	57	64	73	81	91	100	582
50	26	31	37	43	50	58	66	74	83	93	103	570
60	26	32	38	44	51	59	67	76	85	95	105	558
70	27	32	39	45	52	60	69	77	87	97	107	547
80	27	33	39	46	54	61	70	79	88	99	109	537
90	28	34	40	47	55	63	71	80	90	101	111	527
100	28	34	41	48	56	64	73	82	92	102	113	532

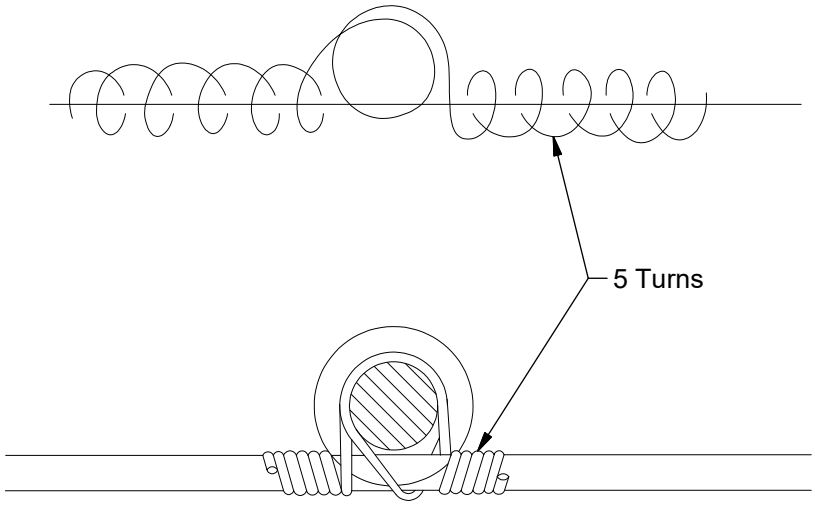
FINAL SAG (in)											
Cond. Temp. Deg. F	**DE Tension = 1495 lbs**										
	100	**110**	**120**	**130**	**140**	**150 R.S.**	**160**	**170**	**180**	**190**	**200**
-20	24	29	35	41	47	54	62	70	78	87	96
0	25	31	36	43	50	57	65	73	82	91	101
32	29	35	41	49	56	65	74	83	93	104	115
20	26	32	38	45	52	59	68	76	86	95	106
30	27	33	39	46	53	61	69	78	87	97	108
40	27	33	40	46	54	62	70	79	89	99	110
50	28	34	40	47	55	63	72	81	91	101	112
60	28	34	41	48	56	64	73	82	92	103	114
70	29	35	42	49	57	65	74	84	94	105	116
80	29	36	42	50	58	66	76	85	96	106	118
90	30	36	43	51	59	68	77	87	97	108	120
100	31	37	44	52	60	69	78	88	99	110	122
120	31	38	45	53	62	71	81	91	102	114	126
194	35	42	50	59	68	78	89	101	113	126	139

REV	DATE	ENG	DESCRIPTION
006	01/01/22	NH	Converted to new format
005	08/12/15	EJB	



ITEM	STK / DCS #	DESCRIPTION 08 01 01 **	01	02	03	04	05	DOJM Code
A	23 68 358	Tie - Preformed 1/0 AAAC or ACSR Bare, Neutral	1	-	-	-	-	SPT10A
	23 68 389	Tie - Preformed #4 ACSR Bare, Neutral	-	1	-	-	-	SPT4A
	23 68 388	Tie - Preformed 4/0 ACSR Bare	-	-	1	-	-	SPT40A
	23 68 401	Tie - Preformed 4/0 XLP	-	-	-	1	-	SPT40P
	23 68 485	Tie - Preformed 1/0 ACSR XLP	-	-	-	-	1	SPT10P

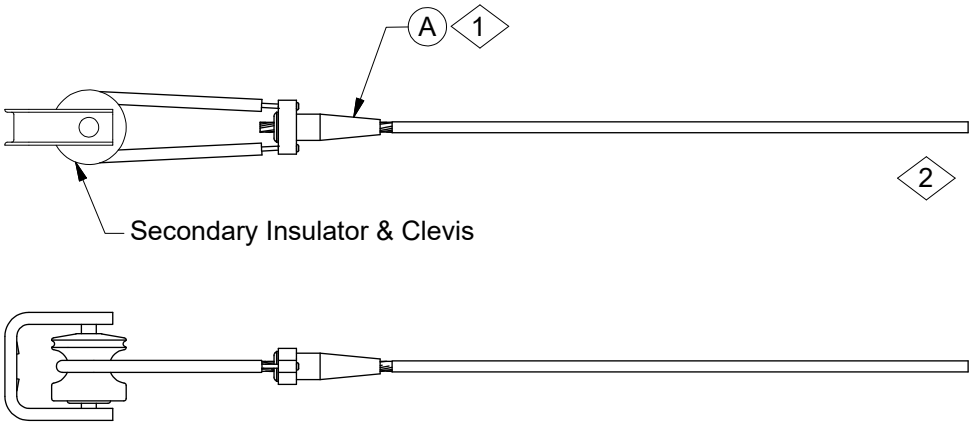
REV	DATE	ENG	DESCRIPTION
004	01/01/22	NH	Converted to new format
003	03/04/05	DCG	



Type of Conductor	Tie Wire	Stock #	DOJM	Units	Qty
#6 – #2 Cu, Poly	#4 Cu, Poly	18 01 017	HTP1	Ft	5
#6 – #2 Cu, Poly	#4 Al, Poly, 42”	18 55 040	HTP2	Ea	1
1/0 – 500 Cu, Poly	#6 Cu, Poly	18 51 021	HTP3	Ft	5
4/0 AAC, Poly					
#4 Cu, Bare	#6 Cu, Bare, 42”	18 52 009	HTC	Ea	1
1/0 AAAC, Bare	#4 Al, Bare	18 55 028	HTA	Ft	3

REV	DATE	ENG	DESCRIPTION
004	01/01/22	NH	Converted to new format
003	10/09/01	DCG	

PREFERRED



CONSTRUCTION NOTE(s):

1. The wire shall be fed completely through the automatic deadend chuck, and the jaws of the deadend shall be set by applying a sharp heavy pull on the line conductor.

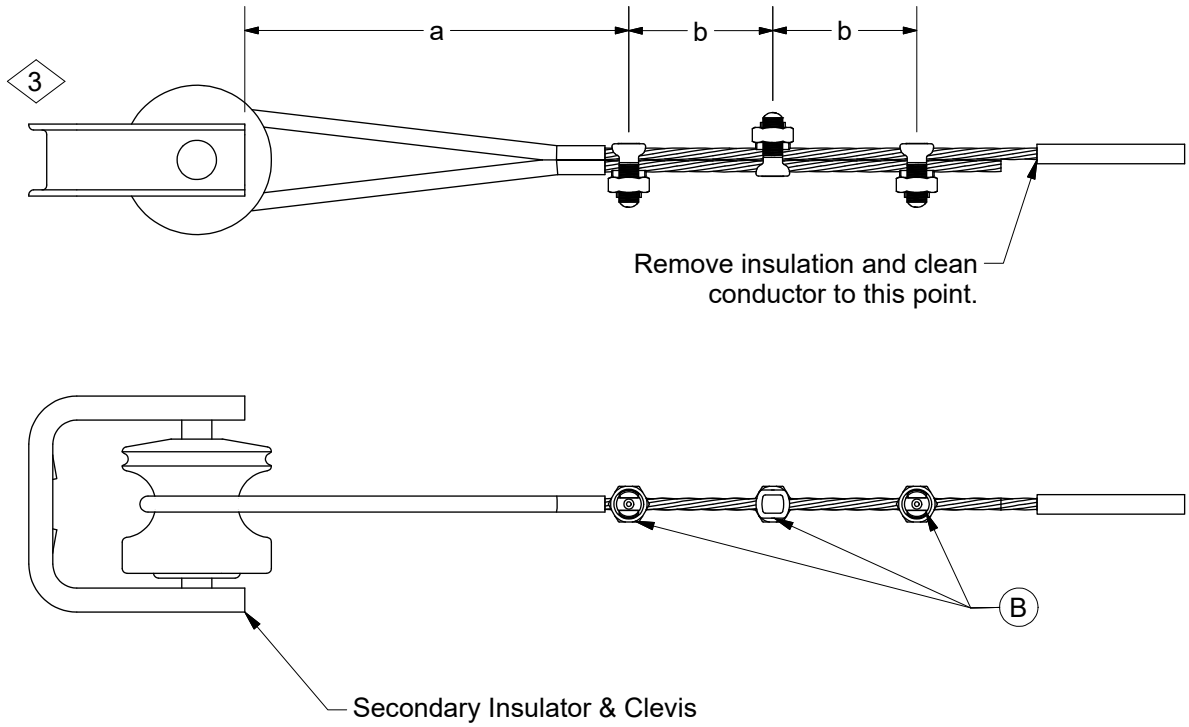
2. Conductor may be the messenger of triplex or a single wire, such as part of an open wire secondary.

Table 1 - Automatic Deadends

	Conductor	Description	Stock #	DOJM
A	#6 Cu SOL	Deadend, Automatic, Secondary Spool, #6 Cu	23 78 357	SDEA6C
	#4 Cu SOL	Deadend, Automatic, Secondary Spool, #4 Cu	23 78 353	SDEA4C
	#2 Cu SOL	Deadend, Automatic, Secondary Spool, #2 Cu	23 78 355	SDEA2C
	#2 Cu Str	Deadend, Automatic, Secondary Spool, #2 Str. Cu	23 78 388	SDEA2StrC
	#4 ACSR	Deadend, Automatic, Secondary Spool, #4 ACSR	23 78 358	SDEA4A
	#2 ACSR	Deadend, Automatic, Secondary Spool, #2 ACSR	23 78 359	SDEA2A
	1/0 AAAC	Deadend, Automatic, Secondary Spool, 1/0 AAAC (bare)	23 78 333	SDEA10A
	1/0 AAAC	Deadend, Automatic, Secondary Spool, 1/0 AAAC (poly covered)	23 68 532	SDEA10AP
	1/0 Cu Str	Deadend, Automatic, Secondary Spool, 1/0 Str. Cu	23 78 389	SDEA10StrC
	3/0 AAAC	Deadend, Automatic, Secondary Spool, 3/0 AAAC (PLAC Neutral)	23 68 533	SDEA30A
	4/0 Cu Str	Deadend, Automatic, Secondary Spool, 4/0 Str. Cu	23 68 534	SDEA40StrC
	4/0 AAC, AAAC, ACSR	Deadend, Automatic, Secondary Spool, 4/0 AAC, AAAC, ACSR	23 78 334	SDEA40A

REV	DATE	ENG	DESCRIPTION
13	01/01/22	NH	Converted to new format; added front view
12	06/22/15	EJB	

ALTERNATE



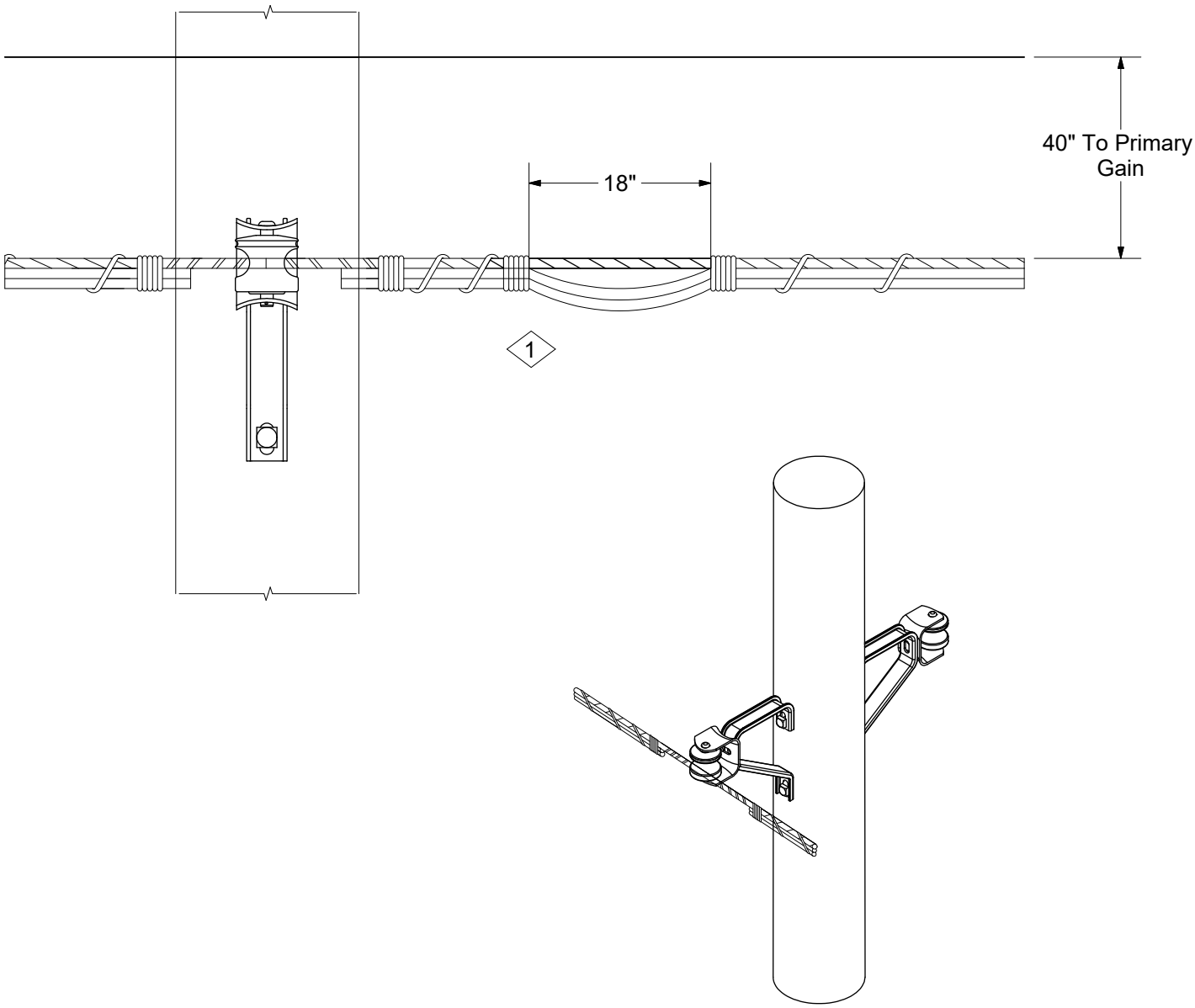
CONSTRUCTION NOTE(s):

3. This method shall be used when automatic type deadends are not available. Both aluminum and copper deadends are normally stocked.

Table 2 - Connectors

	Conductor	Description	Stock #	DOJM	Qty. Used	"a"dim.	"b" dim.
B	#6 Cu SOL	Connector, Split bolt. 2 − #6 Cu	17 54 003	SB6	3	7"	4"
	#4 Cu SOL	Connector, Split bolt, 2 − #4 Cu	17 54 004	SB4	3	7"	4"
	#2 Cu SOL	Connector, Split bolt, 2 − #2 Cu	17 54 005	SB2	3	7"	4"
	1/0 Cu	Connector, Two Bolt, 2 − 1/0 Cu	17 54 145	TB10	2	7"	4"
	2/0 Cu	Connector, Two Bolt, 2 − 2/0 Cu	17 54 139	TB20	2	7"	4"
	4/0 Cu	Connector, Two Bolt, 2 − 4/0 Cu	17 54 140	TB40	2	7"	4"
	500 Cu	Connector, Two Bolt, 2 − 500 Cu	17 54 141	TB500	2	18"	6"
	1000 Cu	Connector, Two Bolt, 2 − 1000 Cu	17 54 142	TB1000	2	18"	6"

REV	DATE	ENG	DESCRIPTION
13	01/01/22	NH	Converted to new format; added front view
12	06/22/15	EJB	



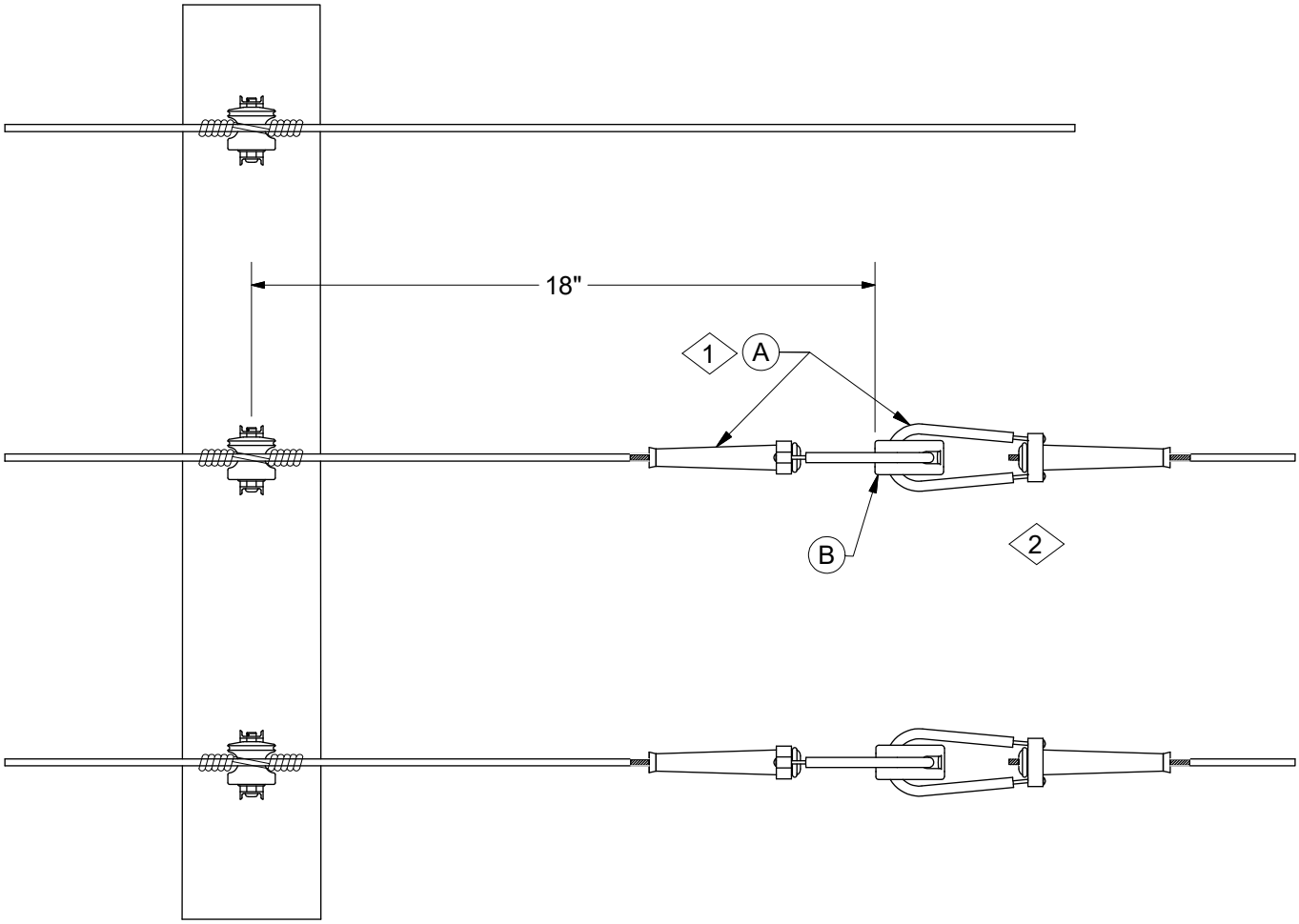
CONSTRUCTION NOTE(s):

1. Construction crew to open cable for distance of approximately 18" to allow room for making taps. Open cable only on side of pole where services are to be installed. Tape ends of conductors with rubber tape (Stock #25 53 080) followed by friction tape (Stock #25 53 003) and lash cable to messenger on both sides of opening with 5 close turns around entire cable and end on messenger with 2 turns and a half hitch.

2. For service construction details, see Section 9.

ITEM	STK / DCS #	DESCRIPTION 08 01 20 **	00
A	101	Install Secondary Split	1

REV	DATE	ENG	DESCRIPTION
3	01/01/22	NH	Converted to new format; added ISO view
2	09/22/11	DCG	



DCS #	DESCRIPTION
08 01 22 01	#4 Cu
08 01 22 02	#2 Cu
08 01 22 03	4/0 AAC

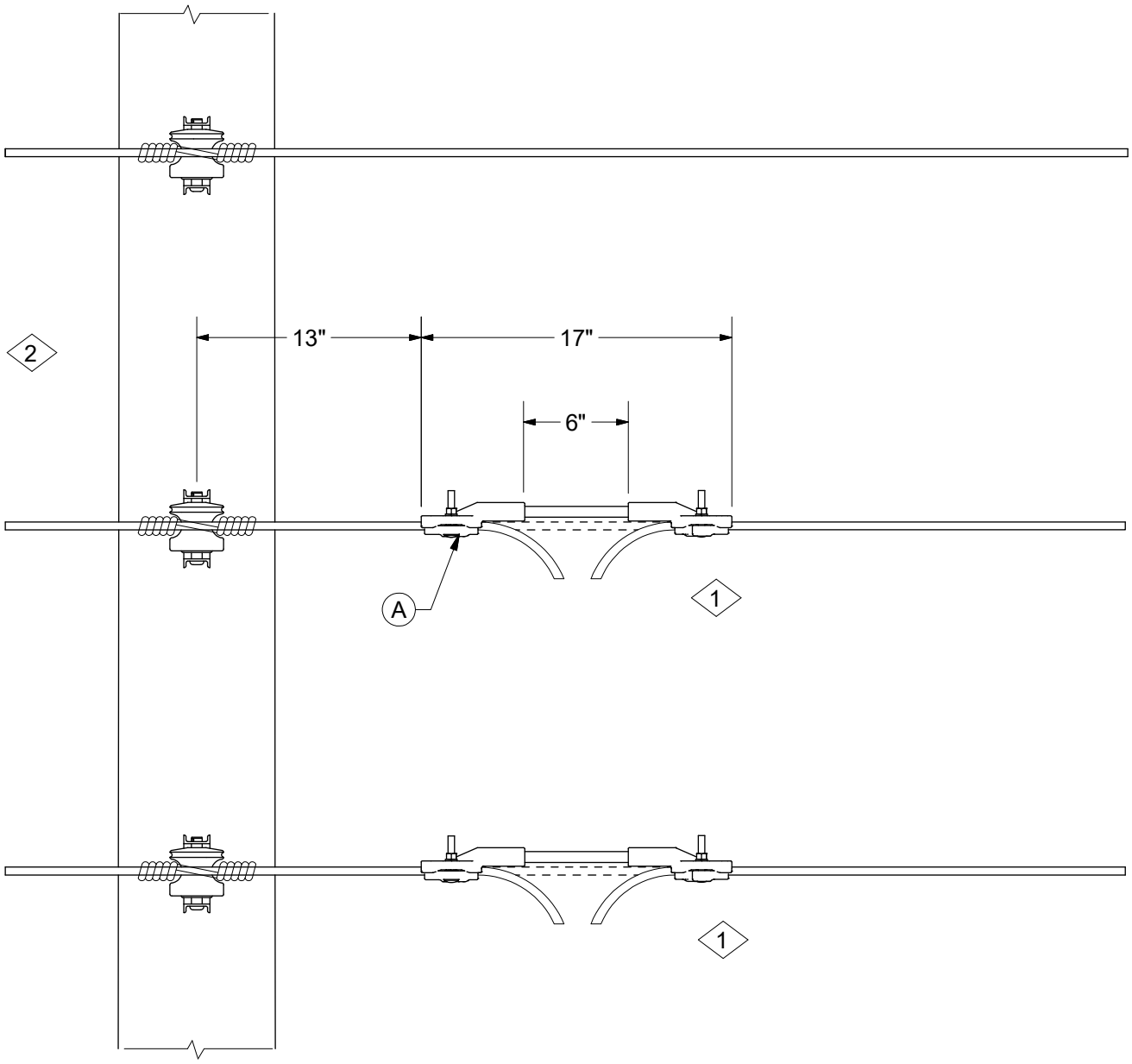
CONSTRUCTION NOTE(s):

1. The wire shall be fed completely through the automatic deadend chuck, and the jaws of the deadend shall be set by applying a sharp heavy pull on the line conductor.

2. For Preferred Construction see **DCS 08 01 23 ****.

ITEM	STK / DCS #	DESCRIPTION 08 01 22 **	01	02	03
A	23 78 334	Deadend - Automatic 4/0 AAC	-	-	4
	23 78 355	Deadend - Automatic #2 Cu	-	4	-
	23 78 353	Deadend - Automatic #4 Cu	4	-	-
B	25 56 070	Insulator - Guy	2	2	2
C	101	Install Secondary Split	2	2	2

REV	DATE	ENG	DESCRIPTION
4	01/01/22	NH	Converted to new format; updated stk # for item B
3	04/26/01	DCG	



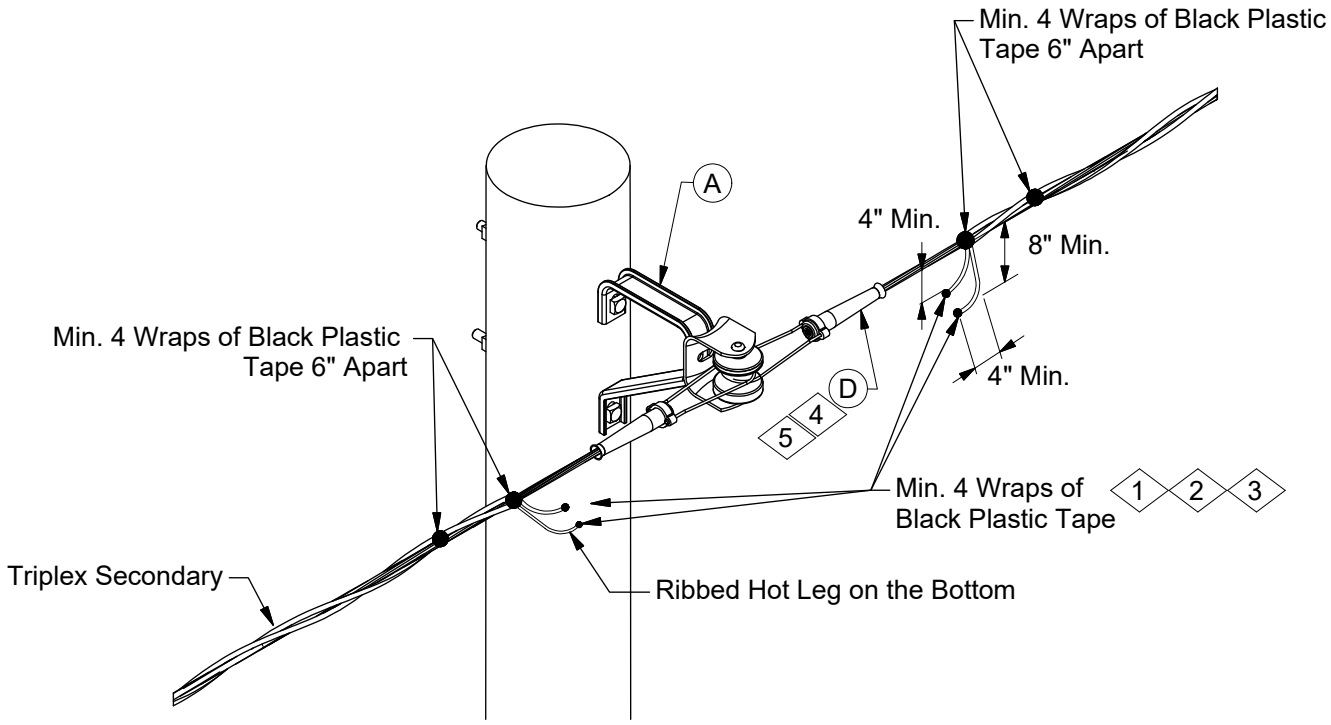
CONSTRUCTION NOTE(s):

1. To Install: Skin the wire, clamp the split to the wire, cut the conductor and fold legs back.
   To Remove: Unfold legs, connect two legs with appropriate compression sleeve, remove split.

2. Neutral may be on top or middle position of the rack depending on the operating company.

ITEM	STK / DCS #	DESCRIPTION 08 01 23 **	01
A	25 56 056	Insulator - Sec Split #4 Cu - 4/0 AAC	2
B	101	Install Secondary Split	2

REV	DATE	ENG	DESCRIPTION
4	01/01/22	NH	Converted to new format
3	12/16/07	MJ	



DCS #	DESCRIPTION
08 01 24 01	Straight-Thru
08 01 24 02	Deadend

CONSTRUCTION NOTE(s):

1. Wrap the ends of the wires with vinyl plastic tape (Stock #25 53 055).

2. Wrap the secondary legs to the messenger wire with plastic tape (Stock #25 53 055).

3. Stagger the ends of the wires by a minimum distance of 4" apart so that they cannot contact each other.

4. For triplex deadend split use use DCS 08 01 24 02 for applying an automatic deadend clamp to the messenger wire on each side of the spool insulator.

5. When closing the split, use the same size conductor with PG connectors. Do not use a jiffy jumper.

	ITEM	STK / DCS #	DESCRIPTION 08 01 24 **	01	02
	A	**06 01 01 03**	Single Clevis w/ Extension Bracket	1	1
1	B	25 53 055	Tape, Vinyl Plastic, Black, 3/4" x 66' (RL)	1	1
@	C	**08 01 03 00**	Tie Wire	1	-
@	D	SDEA*W	Deadend (See DCS 08 01 10 00)	-	2
5 @	E	PG*W	Clamp, Parallel Groove (See DCS 07 00 25 00)	-	1
	F	101	Install Secondary Split	1	1

REV	DATE	ENG	DESCRIPTION
1	01/01/22	NH	Converted to new format
0	09/12/16	EJB	

NOTES

cut

SERVICES 09

cut

STANDARD CONDUCTOR DATA.....09 00 01 01

EXPANSION SHIELDS.....09 00 01 02

POINT OF ATTACHMENT TO BUILDINGS.....09 00 02 03

ATTACHMENT CLEARANCE.....09 00 02 05

SERVICE INSTALLATION CLEARANCES.....09 00 03 01

UNGUYED SAG TABLES.....09 00 04 01

MULTIPLE SERVICE CABLE INSTALLATION TO HOUSE OR SERVICE MAST.....09 01 10 **

ATTACHMENTS AT POLES AND BUILDINGS - 500KCMIL TO 1000KCMIL.....09 01 12 00

SERVICE TAKEOFF AT POLE - TRIPLEX SECONDARY.....09 01 28 00

SERVICE TAKEOFF AT POLE - PARALLEL LASHED SECONDARY.....09 01 30 00

SERVICE TAKEOFF AT POLE - OPEN WIRE SECONDARY.....09 01 32 00

FLYING SERVICE - #2 TRIPLEX AND SMALLER - PARALLEL LASHED OR TRIPLEX SECONDARY.....09 01 34 00

FLYING SERVICE - #2 TRIPLEX AND SMALLER - OPEN WIRE SECONDARY.....09 01 36 **

FLYING SERVICE - 1/0 OR LARGER TRIPLEX.....09 01 38 **

SERVICE ATTACHMENT ON BUILDING - SECONDARY CLEVIS.....09 01 49 **

SERVICE CABLE ATTACHMENT ON BUILDING.....09 01 50 **

SERVICE ATTACHMENT ON BUILDING AND MAST - WIRE HOLDER.....09 01 51 **

SERVICE ATTACHMENT ON BUILDING - 1 & 2 - WIRE SECONDARY RACK.....09 01 53 **

SERVICE ATTACHMENT ON BUILDING - 3 & 4 - WIRE SECONDARY RACK.....09 01 54 **

BUS DUCT - OVER 800 AMP.....09 01 56 00

WEATHERHEAD ATTACHMENT - OVER 800 AMP.....09 01 58 00

TRIPLEX SERVICE CABLE SPLICES.....09 01 60 **

This standard covers standard conductor sizes, respective stock codes, and ampacities.

Table 1 - Triplex Cable						
Insul. Cond.	Messenger	Stock #	Dia. (in.)	Wt. (#/ft)	Summer	Winter
#2 AA - 7 Str.	#2 AA - 7 Str.	18 05 040	0.77	.241	150	195
1/0 AA - Str.	1/0 AA - 19 Str.	18 05 044	1.00	.381	205	265
4/0 AA - 19 Str.	4/0 AA - 19 Str.	18 05 064	1.31	.719	315	410

Table 2 - Quadruplex Cable						
Insul. Cond.	Messenger	Stock #	Dia. (in.)	Wt. (#/ft)	Summer	Winter
1/0 A.A. - 19 Str.	1/0 A.A. - 7 Str.	18 05 104	1.09	0.644	180	235
4/0 A.A. - 19 Str.	4/0 A.A. - 19 Str.	18 05 105	1.47	1.099	275	360

CONSTRUCTION NOTE(s):

1. Triplex cable shall be used for all new 3 wire service drop installations where its current rating is adequate and the voltage is less than 300 volts. Quadruplex cable should only be used on 4-wire services. Where the ratings of triplex and quadruplex cables are exceeded, open wire services shall be installed using covered conductors tabulated in DCS **08 00 01 00.** These conductors may also be used for repair and maintenance of existing open wire services.

2. #2 Triplex shall be used for most 200 Amp services. #1/0 and larger triplex and quadruplex are primarily for commercial or industrial customer where larger capacity is needed.

3. Triplex cable should not be used on 480 volt service. It is rated 600 volts phase to phase, not phase to ground. Quardruplex cable can be used for 277/480 volt service, but not for 480 volt, 3 wire service since the bare messenger must be grounded by NESC.

4. All connections of services to customer's service wires shall be adequately arranged to prevent moisture entrance at the weatherhead. Preferable construction is for the weatherhead to be above the service wire connections with a drip loop in the latter. For services larger than residential and small commercial, see DCS **09 01 12 00**.

5. Tree guards should be used on original installations of triplex service cables where the cables go through trees or where trees have become a problem since the original installation. These 2 piece plastic tree guards are stocked for #4 (Stock #25 54 047), #2 (Stock #25 54 048) and #1/0 (Stock #25 54 049) triplex cable. The tree guard for #4 triplex (Stock #25 54 047) may be used for #6 duplex cable if the ends of the guard are securely taped to the cable.

REV	DATE	ENG	DESCRIPTION
13	07/01/21	WYW	Revised note 1 for the reference to DCS 08 00 01 00
12	01/01/21	WYW	Moved Expansion Shields data to new standard 09 00 01 02

Table 1 - Standard Expansion Shields Stock Codes and Working Loads		
Expansion Shield		Safe Working Load (Tension) In Lbs
Size	Stock #	
1/4"	21 51 009	175 (with lag screw)
1/4"	21 51 010	300 (with machine bolt)
5/16"	21 51 181	350 (with lag screw)
3/8"	21 51 055	350 (with lag screw)
3/8"	21 51 016	865 (with machine bolt)
1/2"	21 51 017	920 (with lag screw)
1/2"	21 51 018	1370 (with machine bolt)
5/8"	21 51 019	2430 (with machine bolt)

Table 2 - Expansion Shields Used for House Knob					
Expansion Shield		Drill Size	Exp. Shield Used With Wood Screw Type Wireholder		Application
Size	Stock #		Screw Size	Wireholder Stock #	
3/8"	21 51 055	5/8"	#22 x 2-1/4" Woodscrew	23 06 077	Used to attach wireholder insulators to masonry walls.

2 Table 3 - Expansion Shields for Wood or Lag Screws						
Expansion Shield		Drill Size	Exp. Shield Used With			
Size	Stock #		Brass Screw		Lag	
			Size	Stock #	Size	Stock #
1/4"	21 51 009	1/2"	#14 x 2"	21 71 022	1/4" x 2" 1/4" x 2-1/2" 1/4" x 4"	21 65 017 21 65 018 23 60 002

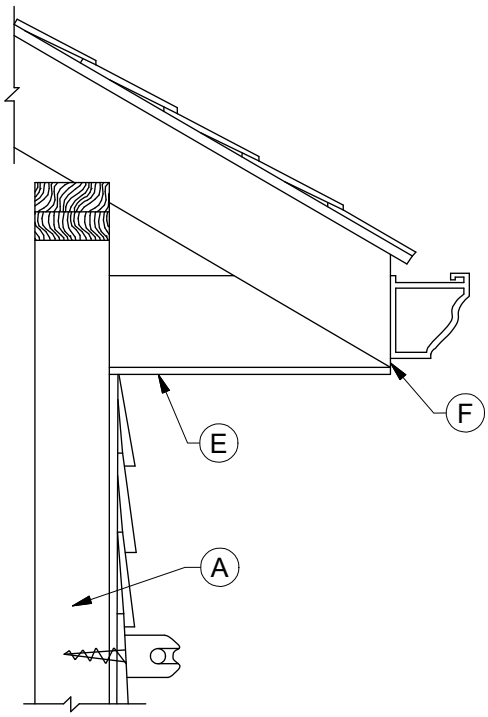
Table 4 - Expansion Shields for Machine Bolts					
Expansion Shield		Drill Size	Expansion Shield Used With		Application
Size	Stock #		Bolt Size	Bolt Stock #	
3/8"	21 51 016	5/8"	3/8" x 3"	23 52 194	Fastening clevises deadending up to #4 AWG services inclusive. Up to 750 kcmil on brackets along masonry walls.
1/2"	21 51 018	7/8"	1/2" x 4"	23 52 034	Fastening clevises deadending up to #2 to 4/0 AWG services inclusive
5/8"	21 51 019	1"	5/8" x 4"	23 52 200	Fastening clevises, deadending 500 kcmil and 750 kcmil services and network cable brackets on masonry walls.

REV	DATE	ENG	DESCRIPTION
1	01/01/21	WYW	Data moved from DCS 09 00 01 01
	xx/xx/xx	xxx	

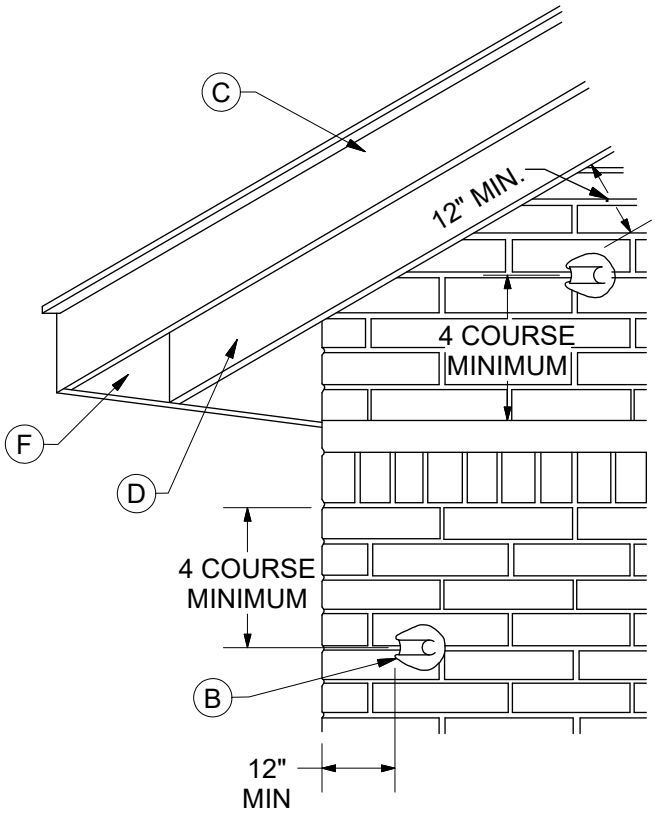
CONSTRUCTION NOTE(s):

1. Safe working loads given are for a good installation in a good grade of masonry. For expansion shields used with machine bolts (normally used for the heavier loads) this means placing the shield in brick or concrete or if a brick seam is used, it shall be narrow and preferably filled with a cement mortar.

◇2. The expansion shield shown in Table 3 is for use with wood screws and lag screws. This assembly is normally used to attach service entrance cable, corner brackets and service entrance boxes to masonry walls. The length of the lag screw used will depend on the condition of the masonry and how deep the shield is set in the wall. The #14 x 2" screw shown is also used to fasten meter, meter enclosures, service entrance cable, etc. to wood frame building. In masonry this screw with shield is convenient to use and provides good holding power in sound masonry walls for light loads.



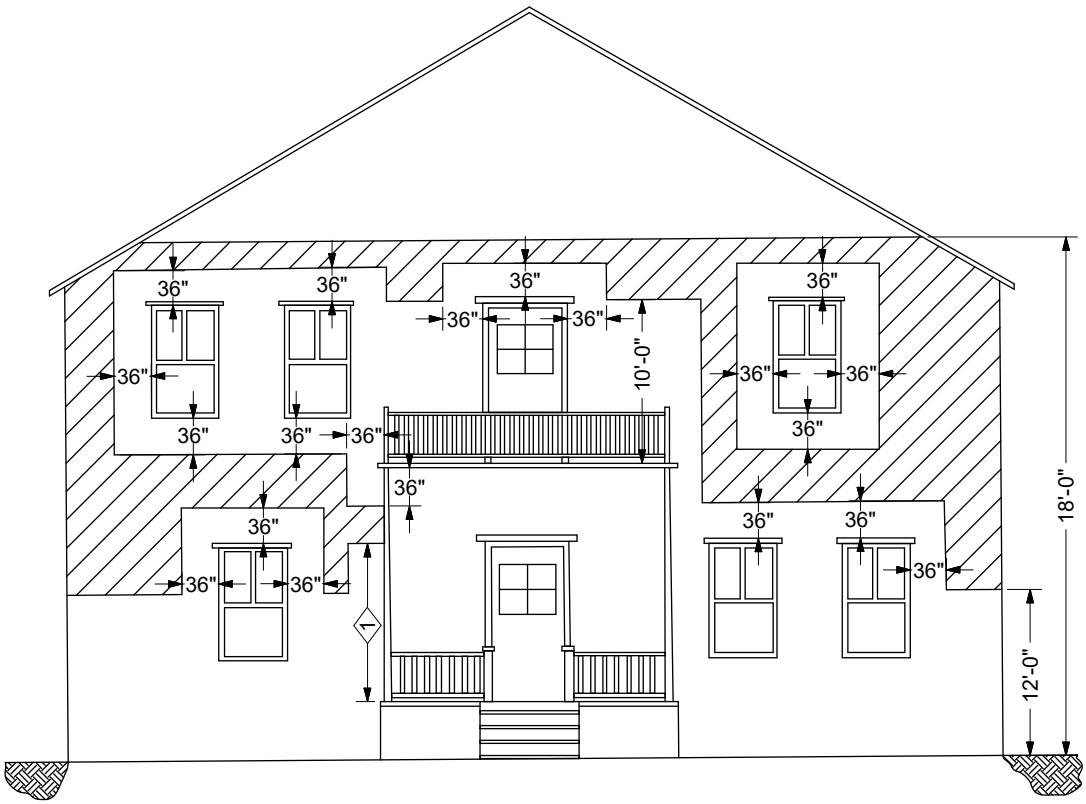
Frame-Composition Shingle or
Brick Veneer Construction



Brick or Solid Masonry Construction

ITEM	DESCRIPTION	Acceptable/Un-acceptable Point of Attachment
A	Building Studs	Acceptable
B	Mortar Joints	Acceptable
C	Outside Trim Board	Attachment allowed only if adequately reinforced
D	Inside Trim Board (Brick Building)	Attachment allowed only if adequately reinforced
E	Soffit Board	Attachment allowed only if adequately reinforced
F	Fascia Board	Un-Acceptable
G	Fire Walls, Parapet Walls or Chimneys	Un-Acceptable

REV	DATE	ENG	DESCRIPTION
1	01/01/21	WYW	Updated drawing and created description table
0	09/26/11	DCG	



CONSTRUCTION NOTE(s):

1. The first point of attachment for new electric service shall be in shaded spaces not less than 12' nor more than 18' above ground. It maybe necessary to attach services higher in order to meet minimum ground clearances on DCS **09 00 03 01**. Existing services may be reconductored to the original clearance or a minimum of 10' above ground. A service mast may be used if necessary to obtain the minimum clearances.

2. The customer's service outlet not be located above 18', but it may be necessary to attach services higher than 18' to meet the minimum ground clearances on DCS **09 00 03 01.**

3. Triplex cable or separate open wire service busses on buildings shall be placed in the spaces shown shaded.

4. Service conductors passing by doors, porches, fire escapes or similar locations, shall have a clearance of not less than 36 inches. Service conductors passing by windows shall have a clearance of not less than 36 inches.

5. Where the form of the building will not permit triplex cable or open wire service busses from the point of attachment to the service outlets, service entrance cable may be used for runs up to 15’. For runs in excess of 15’, the information must be submitted to Ameren project contact and must be approved by the appropriate Supervising Engineer before the project. Service entrance cable is only rated for 300 volts.

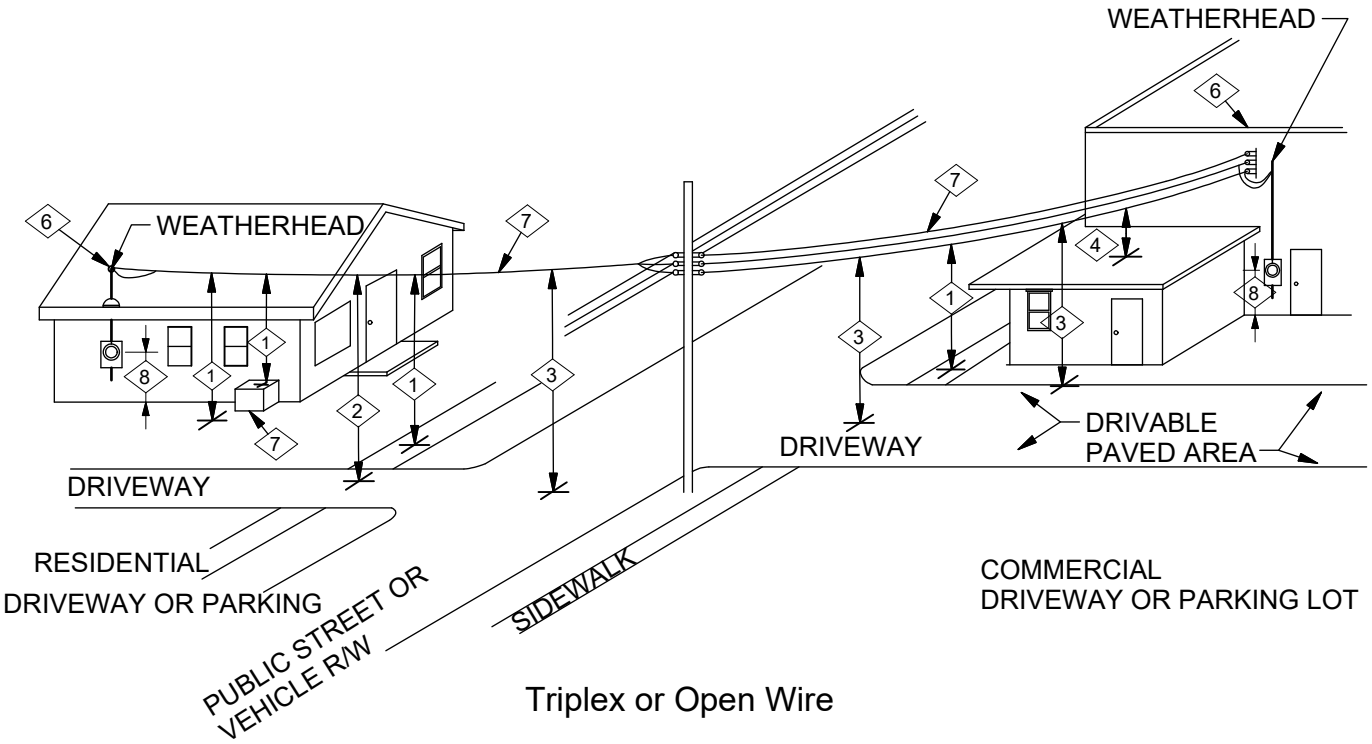
6. When service entrance cable is used, clearances between windows, openings, fire escapes, etc, and the service attachment or the service busses on the building may be reduced to 6 inches. This is a preferred minimum which may however be reduced if necessary.

7. Service conductors shall not be installed beneath openings through which materials may be moved, such as openings in farm and commercial buildings. Overhead wires shall not be run such that they obstruct entrance to these building openings.

8. In some instances the first set of wire attachments cannot be located in an acceptable space which will permit either direct connection or extension of a triplex cable or open wire bus to the service outlet. Examples of this are inadequate ground clearances in the service span, building materials that preclude fastenings being placed on them, load center being so placed that the service entrance location is confined to a specific part of the building, etc.

   In these cases, the use of Service Entrance Cable is permitted from the first point of attachment to the service entrance. Service Entrance Cable is only rated for 300 volt services

9. On existing services when the customer has not changed the original service entrance facilities, the service wires maybe replaced at the original clearances. If the customer has installed a new service entrance, then the new facilities and service wires must comply with the current requirements.



Triplex or Open Wire

DESIGN NOTE(s):

Over Ground (per 2017 NESC 232)

1. 12 ft. (triplex) or 12.5 ft. (open wire) over spaces and ways subject to pedestrian or restricted traffic only (no vehicles over 8 ft. high).

   EXCEPTION: Where height of a residential building does not allow these clearances, clearance may be reduced to 10 ft. at the drip loop or service drop for triplex cable limited to 150 volts to ground or 10.5 ft. for open wire limited to 300 volts to ground.

2. 16 ft. (triplex) or 16.5 ft. (open wire) over driveways, parking lots and alleys.

   EXCEPTION: Where height of a residential building does not allow these clearances, clearance may be reduced to 12 ft. for triplex service limited to 150 volts to ground or 12.5 ft. for open wire limited to 300 volts to ground.

3. 16 ft. (triplex) or 16.5 ft. (open wire) over roads, streets, alleys, non-residential driveways, parking lots and other areas subject to truck traffic.

   EXCEPTION: Services over state and federal commercial highways shall be no less than 18 ft. Services over Illinois limited access highways shall be no less than 20 ft.

Over Roofs (includes Parking Garages) (per 2017 NESC 234C)

4. Clearances from highest point in roof shall not be less than:

   A. 3.5 ft. (triplex) or 10.5 ft. (open wire) over roofs not accessible to pedestrians (see note 9).
   B. 11 ft. (triplex) or 11.5 ft. (open wire) over roofs accessible to pedestrians.
   C. 11 ft. (triplex) or 11.5 ft. (open wire) over roofs accessible to vehicles but not truck traffic.
   D. 16 ft. (triplex) or 16.5 ft. (open wire) over roofs accessible to truck traffic.

REV	DATE	ENG	DESCRIPTION
8	07/01/21	WYW	Revised design notes 6,7 & 8
7	01/01/21	WYW	Removed Fig 1, renumbered drawing and re-formatted notes

EXCEPTIONS:

A. For services attached to a building (including drip loops) and where voltage between conductors does not exceed 300 volts on a non-accessible roof, a reduction in clearance over the roof is permitted as follows:

   I. 3 ft.
   II. 18 in. within 6 ft. of and terminated at a through the roof raceway or approved support located not more than 4 ft. from the edge of roof.

5. Any equipment housing including air conditioning, platform or projection which a person might stand on.

6. Service mast, wire holder insulator, bracket attachment, and service attachment must be of adequate size and height to support services required.

7. Normally triplex service conductors, but may also be separate service conductors as shown for commercial services.

8. Center of meter glass shall be at a height of 3 ft. to 5.5 ft. except for 6.5 ft. over walkways less than 3 ft. wide.

9. A roof is considered accessible to pedestrians if there is a means of access through a doorway, ramp, stairway, or permanently mounted ladder.

REV	DATE	ENG	DESCRIPTION
8	07/01/21	WYW	Revised design notes 6,7 & 8
7	01/01/21	WYW	Removed Fig 1, renumbered drawing and re-formatted notes

The table below provides wire sag conditions that will result in 600 lbs. or less tension under NESC heavy loaded conditions. Sag values may be increased to reduce tension provided the minimum L-G clearance specified in DCS **09 00 03 01** is maintained. Sag values are based on an attachment height of 12 feet at the user's facility and 22 feet at the pole (or secondary if service is a flying loop) except where noted. In case of uneven terrain adjustments in the attachments heights may be necessary.

Conductor				Span (ft.) / Sag (in.)				
Stock #	Description	Rated Strength (Lbs)	Temperature Deg. F Initial	25	50	75	100	125
18 05 048	#6 Duplex (w/ #6 ACSR neutral) (Shepherd)	1,190	0 - 32	32	65	65	63	60
			33 - 50	32	65	66	64	62
			51 - 68	32	65	66	66	64
			69 - 85	32	65	66	66	65
			86 -100	32	65	67	66	65
18 05 040	#2 Triplex (w/ 1/0 AAC neutral) (Clam)	1,350	0 - 32	27	62	65	57	45
			33 - 50	27	62	66	59	48
			51 - 68	27	62	66	60	49
			69 - 85	27	63	67	61	51
			86 -100	28	63	67	62	53
18 05 044	1/0 Triplex (w/ 1/0 AAC neutral) (Purpura)	1,990	0 - 32	36	56	66	61	66 ◇4
			33 - 50	36	57	67	63	68 ◇4
			51 - 68	36	57	67	64	69 ◇4
			69 - 85	36	57	68	65	71 ◇4
			86 -100	37	58	68	66	72 ◇4
18 05 064	4/0 Triplex (w/ 4/0 AAC neutral) (Portunus)	4,020	0 - 32	29	69	56	62	91 ◇3
			33 - 50	29	70	57	64	92 ◇3
			51 - 68	29	70	57	65	93 ◇3
			69 - 85	30	70	58	66	94 ◇3
			86 -100	30	70	58	66	95 ◇3
18 05 104	1/0 Quadruplex (w/ 1/0 AAC neutral) (Criollo)	1,990	0 - 32	8	55	49	47	75 ◇5
			33 - 50	9	55	50	49	77 ◇5
			51 - 68	9	56	51	50	78 ◇5
			69 - 85	10	56	51	51	79 ◇5
			86 -100	10	56	52	52	80 ◇5
18 05 105	4/0 Quadruplex (w/ 4/0 AAC neutral) (Oldenburg)	4,020	0 - 32	28	54	49	67 ◇5	◇6
			33 - 50	29	54	50	68 ◇5	◇6
			51 - 68	29	55	51	69 ◇5	◇6
			69 - 85	29	55	51	70 ◇5	◇6
			86 -100	29	55	52	71 ◇5	◇6

CONSTRUCTION NOTE(s):

1. Maximum tension may be less than 600 lbs. when limited by conductor strength or minimum sags.
2. Maximum final sag may occur at either NESC heavy loaded conditions or at maximum conductor operating temperature of 90°C (194°F) at which all of these conductors are rated.

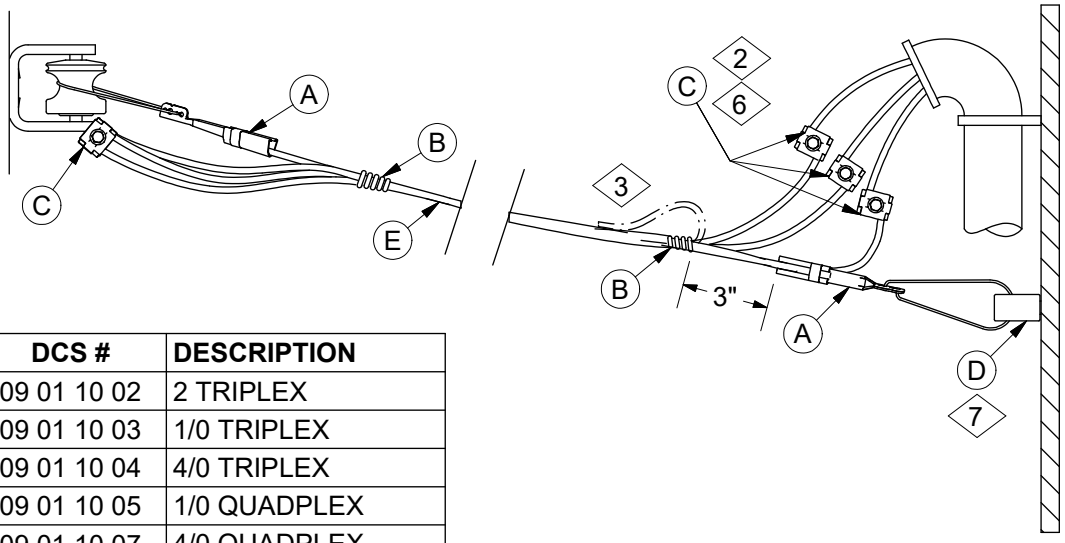
◇3 Minimum attachment height at pole (or secondary for flying loops): 30 feet.

◇4 Minimum attachment height at pole (or secondary for flying loops): 25 feet.

◇5 Minimum attachment height at pole (or secondary for flying loops): 26 feet.

◇6 For spans exceeding those in the table please contact Standards.

REV	DATE	ENG	DESCRIPTION
6	07/01/21	WYW	Added stk # and rated strength to each conductor
5	01/01/21	WYW	Converted to new format



DCS #	DESCRIPTION
09 01 10 02	2 TRIPLEX
09 01 10 03	1/0 TRIPLEX
09 01 10 04	4/0 TRIPLEX
09 01 10 05	1/0 QUADPLEX
09 01 10 07	4/0 QUADPLEX

CONSTRUCTION NOTE(s):

1. For #2, 1/0 and 4/0 Triplex, spans shall not exceed 140 feet.

◇2.◇ Use parallel groove clamps on 1/0 and larger services. Do not use insulated sleeves on bare messenger. Use bare sleeves or parallel groove clamps.

◇3.◇ For 2 wire service, tape house end of the unused lead. Fold back triplex cable and tape securely thereto.

4. See DCS **09 00 02 04** for maximum height of service masts.

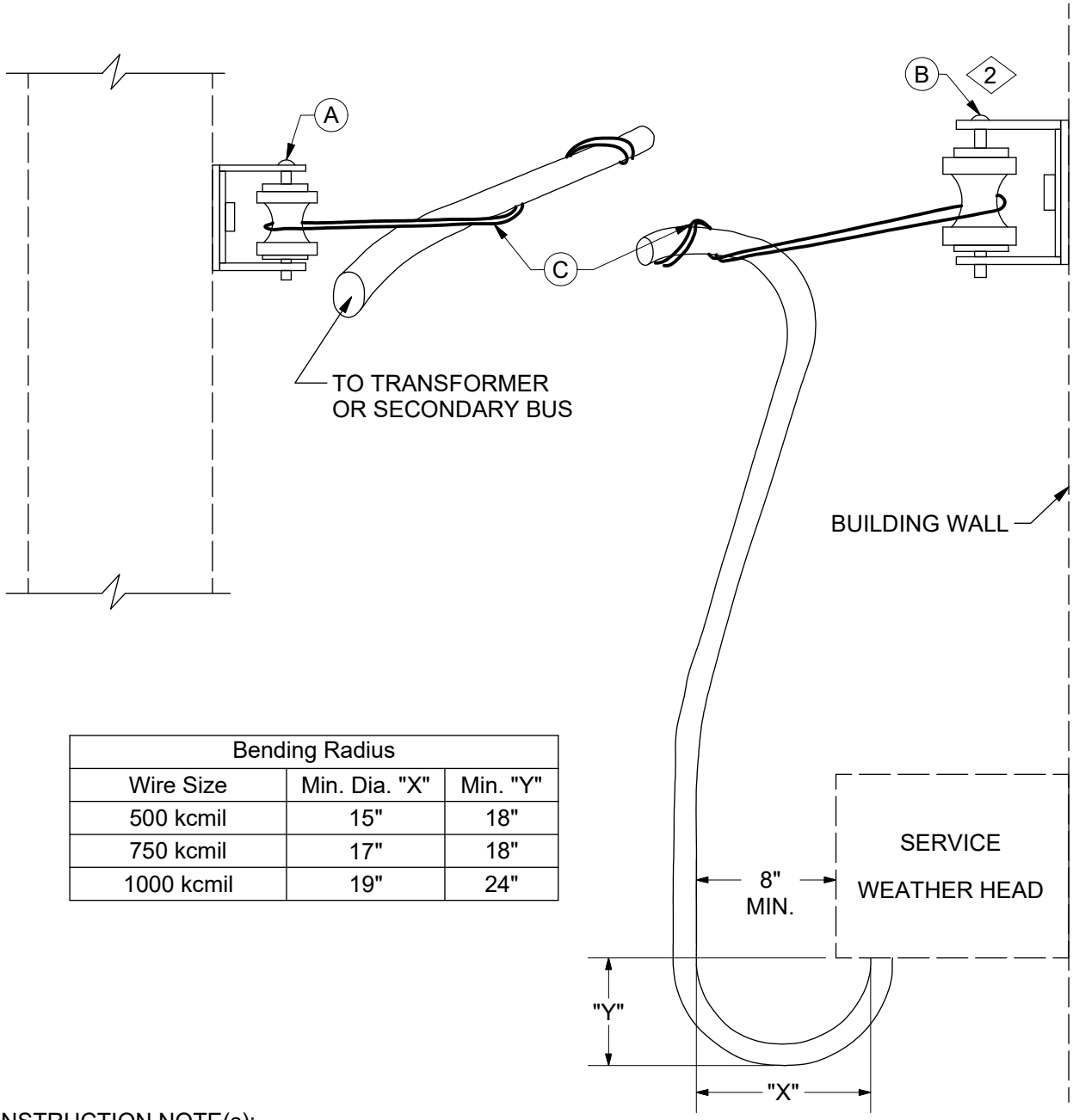
5. See DCS **09 00 04 01** for service sag table and **09 00 03 01** for service clearance chart.

◇6.◇ Use compression sleeve for smaller than 1/0 conductor. The available compression sleeves are shown as below:
   a. Stock #17 60 403 for #2 str to #2 str insulated (red/red)
   b. Stock #17 60 406 for #2 str to #4 str insulated (red/orange)
   c. Stock #17 60 404 for #2 solid to #4 str, non-insulated (orange/orange)

◇7.◇ Wire holder insulator is provided by Ameren and installed by customer in MO, and provided and installed by customer in IL.

	ITEM	STK / DCS #	DESCRIPTION 09 01 10 **	02	03	04	05	07
	A	17 51 123	Clamp, DE, #2 Triplex	2	-	-	-	-
		17 51 125	Clamp, DE, 1/0 Triplex & Quad.	-	2	-	2	-
		17 51 144	Clamp, DE, 4/0 Triplex & Quad.	-	-	2	-	2
	B	25 53 078	Tape, Plastic 1-1/2"	1	1	1	1	1
2,6 @	C	**07 00 25 00**	Clamp, Parallel Groove	6	6	6	8	8
7 @	D	**09 01 51 ** **	Service Attachment	1	1	1	1	1
	E	18 05 040	Cable, Triplex, #2	#	-	-	-	-
		18 05 044	Cable, Triplex, 1/0	-	#	-	-	-
@		18 05 064	Cable, Triplex, 4/0	-	-	#	-	-
		18 05 104	Cable, Quadplx., 1/0	-	-	-	#	-
		18 05 105	Cable, Quadplx., 4/0	-	-	-	-	#

REV	DATE	ENG	DESCRIPTION
9	07/01/21	WYW	Added note 7
8	01/01/21	WYW	Converted to new format; Added note 6



Bending Radius		
Wire Size	Min. Dia. "X"	Min. "Y"
500 kcmil	15"	18"
750 kcmil	17"	18"
1000 kcmil	19"	24"

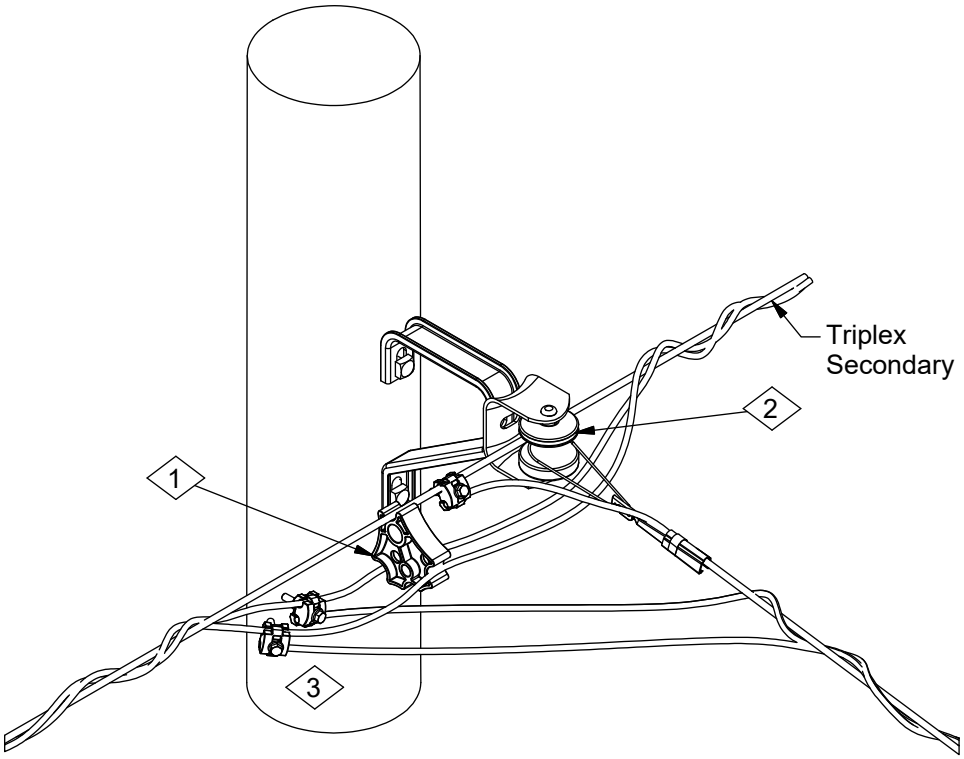
CONSTRUCTION NOTE(s):

1. Where more convenient, use DCS **08 01 10 **** for heavy services.

◇2. In Missouri, service attachment hardware is provided by Ameren and installed by customer.
In Illinois, service attachment hardware is provided and installed by customer.

	ITEM	STK / DCS #	DESCRIPTION 09 01 12 **	00
	A	**06 01 01 01**	Secondary Clevis	1
@	B	**09 01 49 ****	Service Attachment	1
		17 69 057	Grip, Preformed, Poly covered for 500 kcmil Cu	2
@	C	23 68 703	Grip, Preformed, Poly covered for 750 kcmil Cu	2
		23 68 700	Grip, Preformed, Poly covered for 1000 kcmil Cu	2

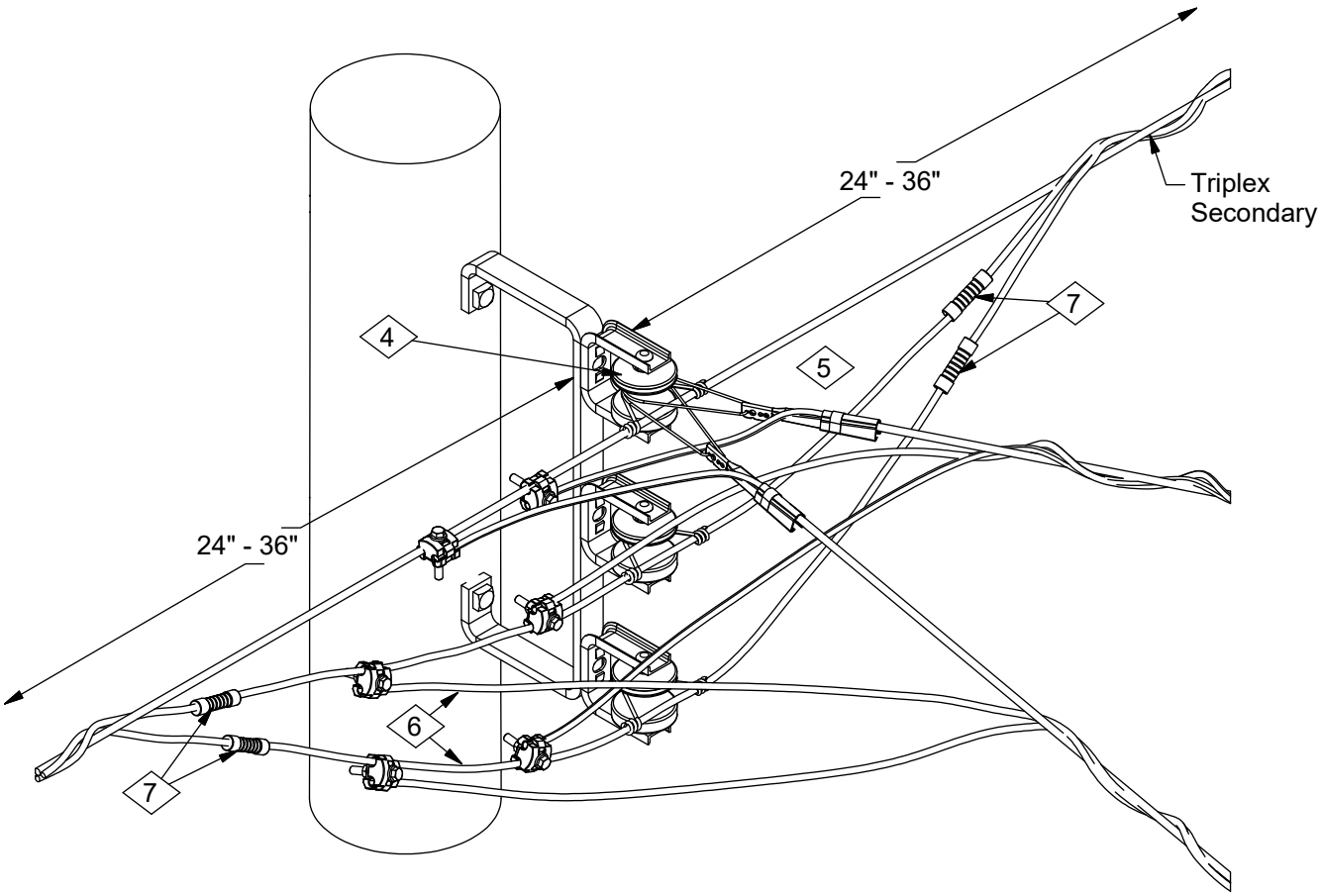
REV	DATE	ENG	DESCRIPTION
9	07/01/21	WYW	Added note 2; Replaced stk# 23 18 058 with 17 69 057 in BOM
8	01/01/21	WYW	Changed title

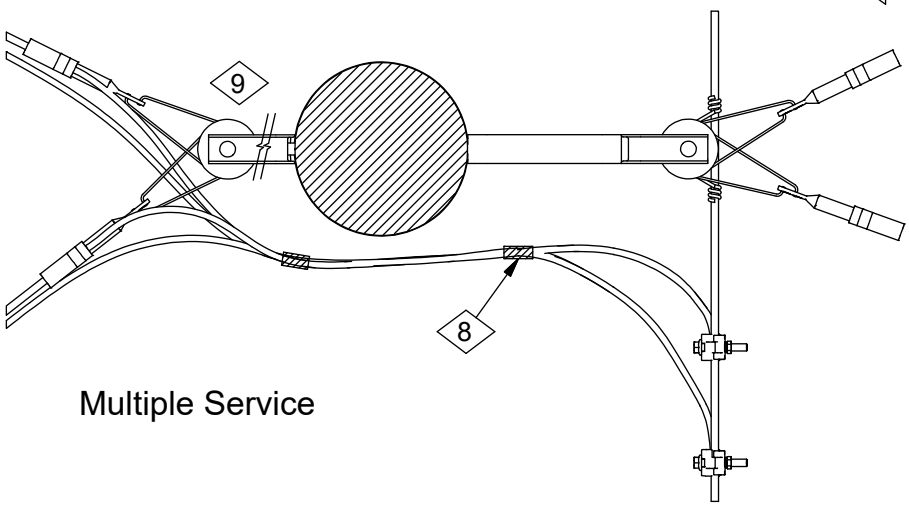


Single Service

CONSTRUCTION NOTE(s):

1. Insert triplex spacer Stock #23 17 227 between conductors.
2. Attach wedge clamp to the secondary insulator or triplex spacer.
3. Stagger the location of the connections to not allow the connections to contact one another.



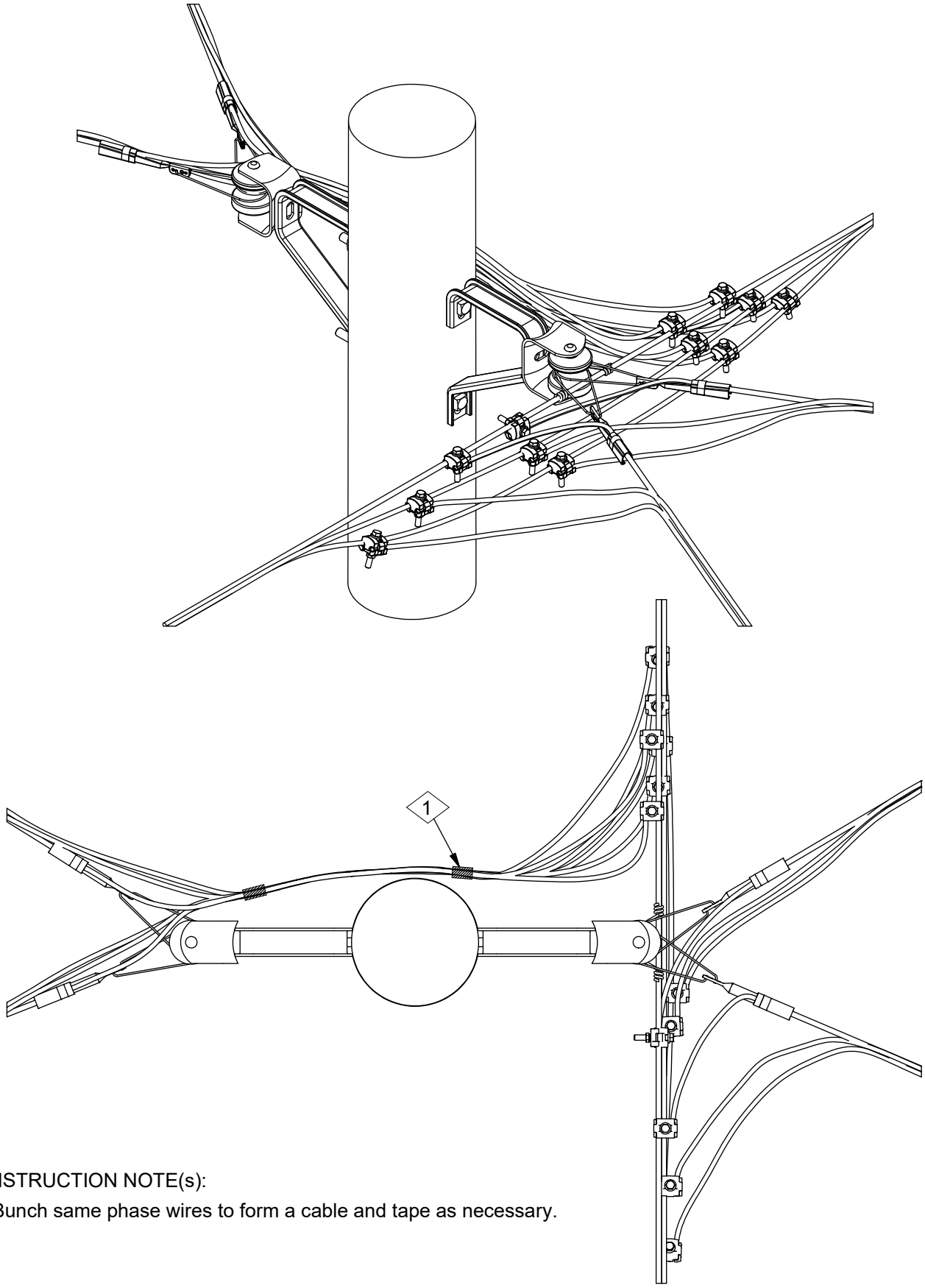


Multiple Service

CONSTRUCTION NOTE(s):

4. Neutral position on rack should be consistent with operating company practice.
5. Attach wedge clamp for service to the neutral conductor insulator.
6. Use 8 to 10 feet of new 600V wire (obtained from new triplex of same size) for extension to lower phase position or rack.
7. Use non-tension sleeves to splice the new insulated conductors into the triplex secondary (Stock #17 60 418) for 4/0 to 4/0Al.).
8. Bunch same phase wires to form a cable and tape as necessary.
9. When required, use extension bracket on both sides, DCS **06 01 03 ****.

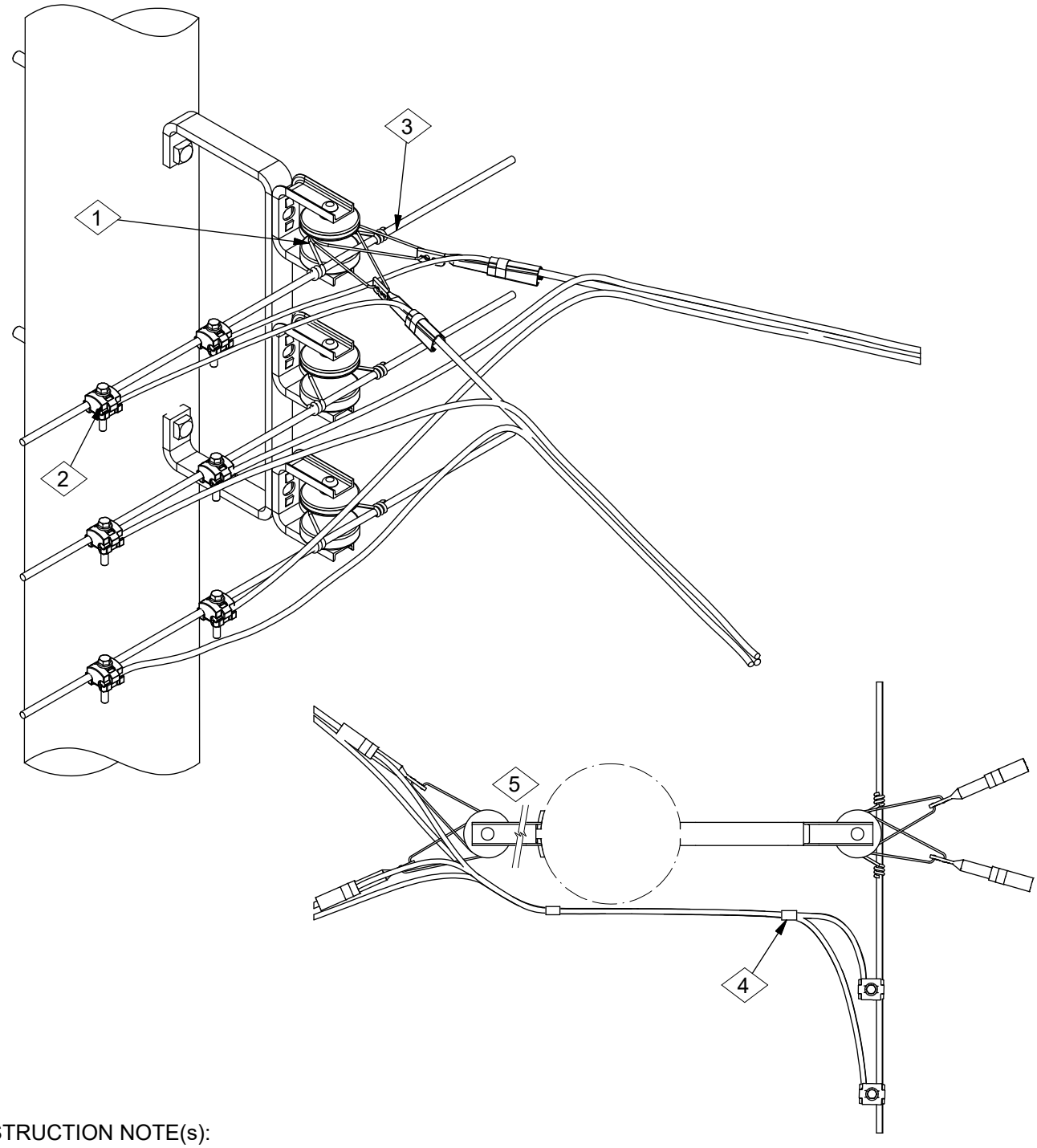
REV	DATE	ENG	DESCRIPTION
2	07/01/21	WYW	Revised note 3 to not allow; Revised note numbers on page 2
1	01/01/21	WYW	Converted to new format



CONSTRUCTION NOTE(s):

1. Bunch same phase wires to form a cable and tape as necessary.

REV	DATE	ENG	DESCRIPTION
2	01/01/21	WYW	Converted to new format
1	09/18/06	JMW	



CONSTRUCTION NOTE(s):

1. Attach wedge clamp to neutral conductor insulator (shown in the drawing). Neutral may be on top or middle position of the rack based on the operating company.

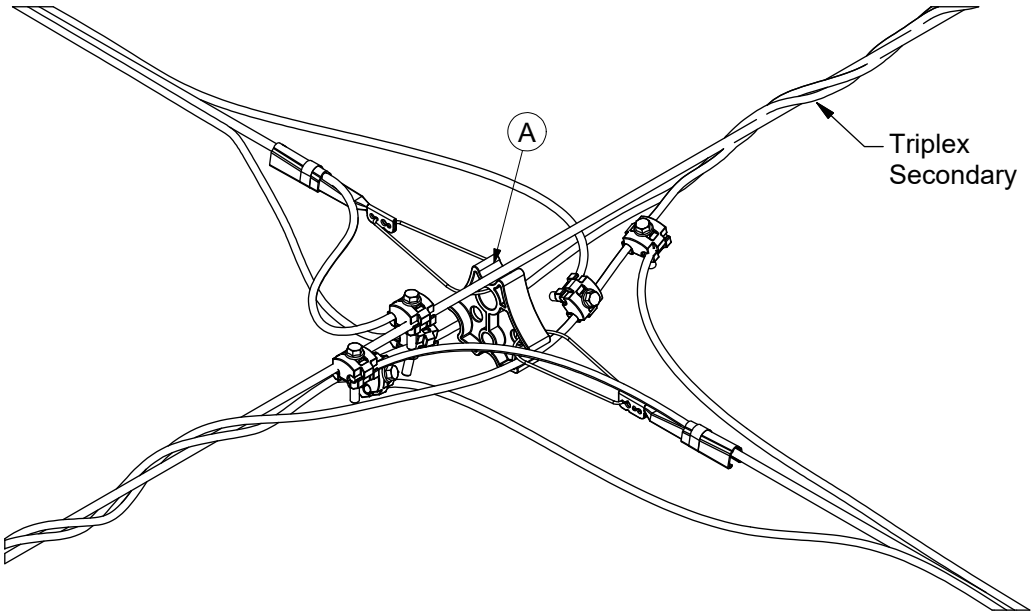
2. To prevent corrosion, apply lubricant before and after installing clamp, on voltage below 5kV tape connector.

3. Secondary conductor may be tied to either inside or outside of clevis.

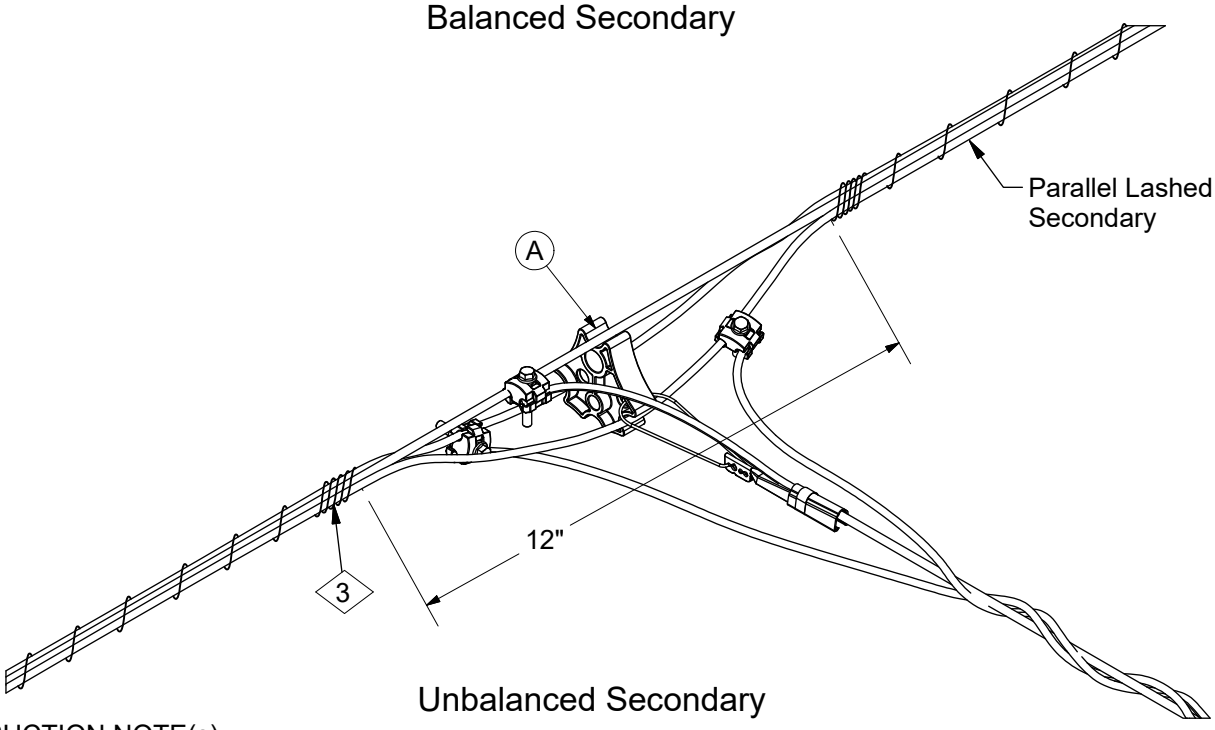
4. Bunch same phase wires to forma cable and tape as necessary.

5. When required, use extension bracket on both sides, DCS **06 01 03 **.**

REV	DATE	ENG	DESCRIPTION
5	07/01/21	WYW	Revised note 1 to add neutral installation
4	01/01/21	WYW	Converted to new format



Balanced Secondary



Unbalanced Secondary

CONSTRUCTION NOTE(s):

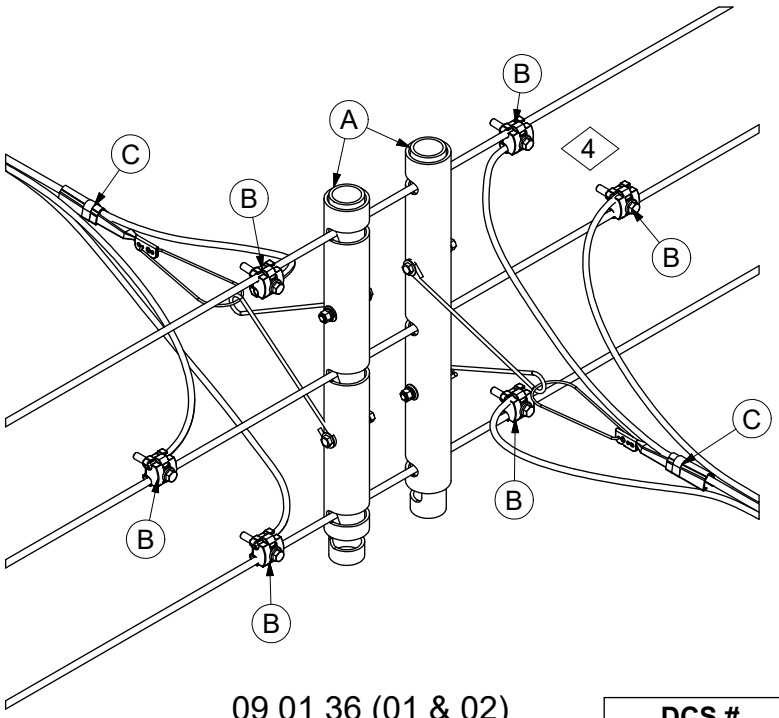
1. Pole separations in excess of 125 feet may require the installation of pole to pole or pole to anchor guying. For this condition or with 1/0 or larger services, use DCS **09 01 38 ****.

2. See DCS **09 01 10 ** ** for installation of service.

3. Terminate lashing ribbon with 5 close turns around entire cable and end on messenger with 2 turns and a half hitch. Train neatly and eliminate excess slack.

ITEM	STK / DCS #	DESCRIPTION 09 01 34 **	00
A	23 17 227	Spacer, Electrical Cable, 600v	1

REV	DATE	ENG	DESCRIPTION
3	07/01/21	WYW	Revised top drawing to balanced and bottom drawing to unbalanced
2	01/01/21	WYW	Converted to new format



09 01 36 (01 & 02)

DCS #	DESCRIPTION
09 01 36 01	Balanced
09 01 36 02	Unbalanced

CONSTRUCTION NOTES:

1. This type of flying service is preferred for open wire secondary. See DCS **09 01 38 02** for alternate method. Neutral position shown in the drawing may be on top or middle position of rack based on the operating company.

2. Installation of unbalanced flying services in spaces where the construction is light and pole separation is in excess of 125 feet may require the installation of pole to pole or pole to anchor guying. Refer to DCS **09 01 38 02**.

3. See DCS **09 01 10 **** for termination of cable at house.

4. To prevent corrosion, apply lubricant (Stock #31 59 058) before and after installing clamp. On voltages below 5 kV, tape connector.

5. #2 triplex can be used for spans up to 140 feet, providing clearances required between low point of triplex service cable and finished ground grade is maintained. Refer to DCS **09 00 03 01**.

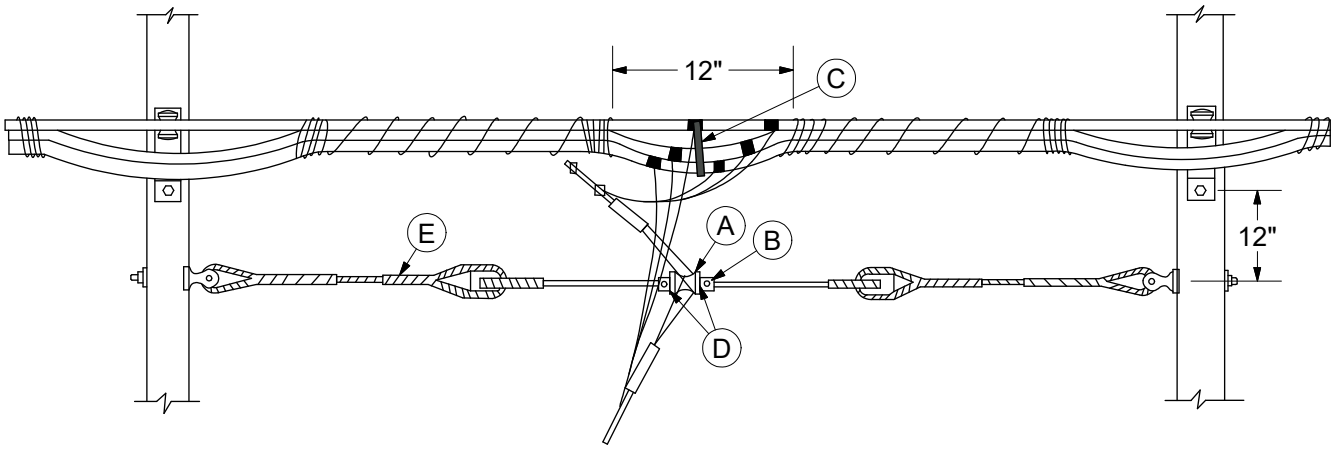
6. This type of flying service shall not be used for 1/0 or larger triplex. Use alternate construction, DCS **09 01 38 02**.

7. Secondary spreader includes telescoping tubes and one bridle to be used for unbalanced services. If a spare or salvaged bridle is available this can be added for balanced services (back-to-back). Otherwise, install a second unbalanced spreader facing the opposite direction.

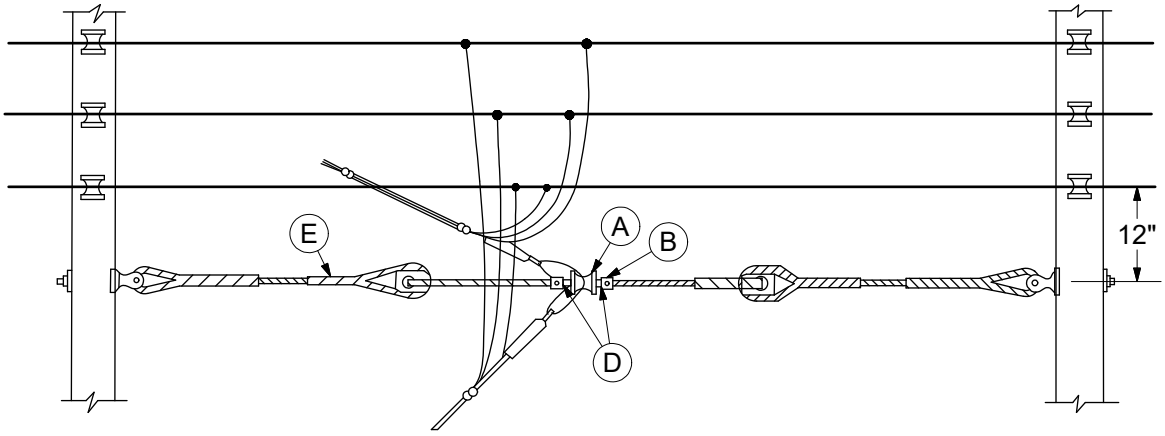
8. Aluminum duplex cable, Stock #18 05 048, used for multiple street lighting circuits, may be attached to secondary as shown above. Use Stock #17 51 123 for wedge clamp.

ITEM	STK / DCS #	DESCRIPTION 09 01 36 **	01	02
A	23 17 219	Spreader Sec. 2 Cu & 4/0 AA	2	1
B	17 51 032	Clamp, Parallel Groove	6	3
C	17 51 123	Clamp, DE, #2 Triplex	2	1

REV	DATE	ENG	DESCRIPTION
5	07/01/21	WYW	Revised note 1 to add neutral installation
4	01/01/21	WYW	Converted to new format



09 01 38 01
Parallel Lashed or Triplex Secondary

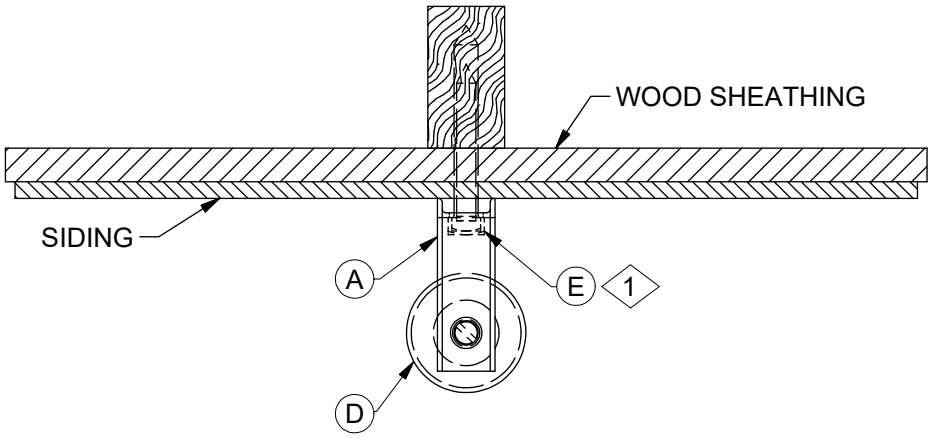


09 01 38 02
Open Wire Secondary

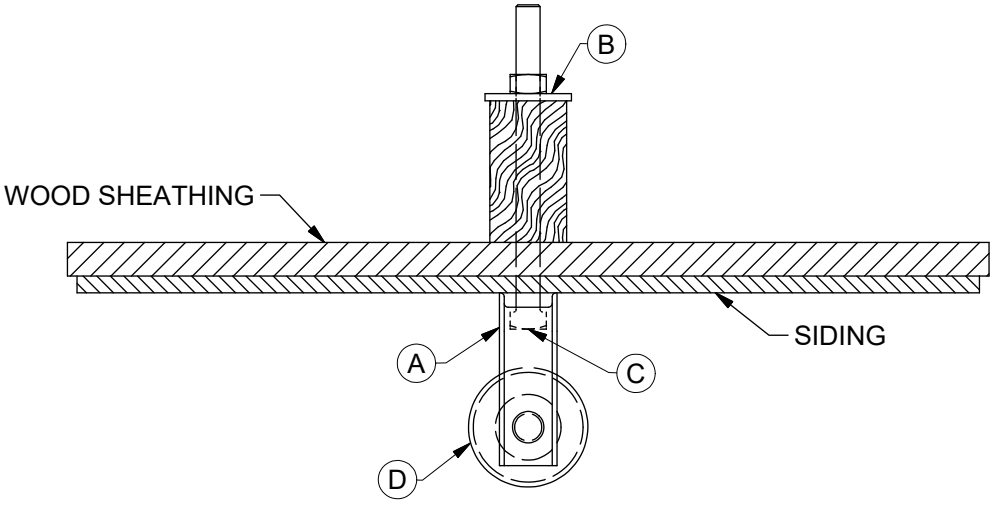
CONSTRUCTION NOTE(s):

1. Installation of unbalanced flying services in spaces where the construction is light and pole separation is in excess of 125 feet may require the use of these standards.

	ITEM	STK / DCS #	DESCRIPTION 09 01 38 **	01	02
	A	25 59 044	Insulator, Spool	1	1
	B	17 51 032	Clamp, Parallel Groove	2	2
	C	23 17 227	Spacer, Electrical Cable, 600v	1	-
	D	23 66 017	Washer - Round 1/2"	2	2
@	E	**11 00 46 03**	Insulated, Guy Unit	1	1



09 01 49 01 ◇3◇



09 01 49 02 ◇2◇ ◇3◇

CONSTRUCTION NOTE(s):

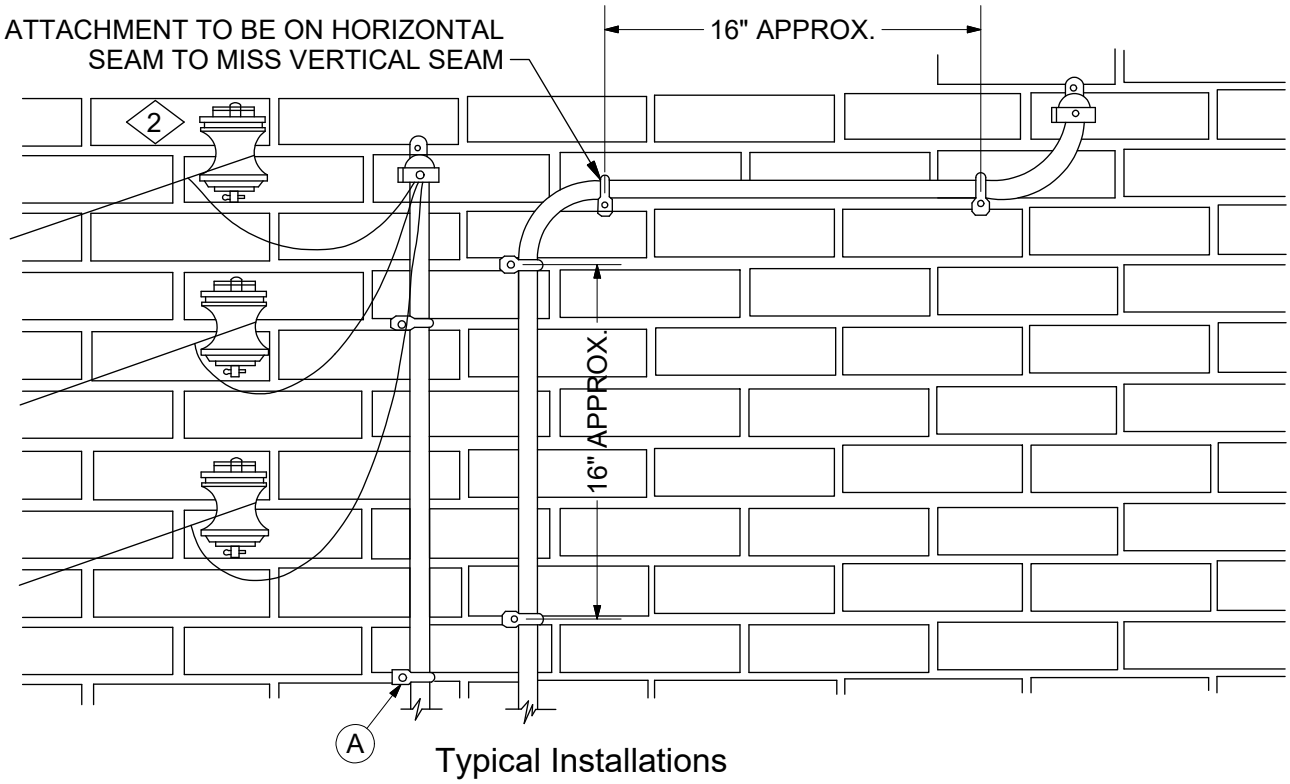
◇1.◇ Item E depends on thickness of sheathing:
a) Drill 3/8" lead hole for 1/2" x 4" lag screw
b) Drill 1/2" lead hole for 5/8" x 5" lag screw

◇2.◇ Normally used where stud is accessible from the inside.

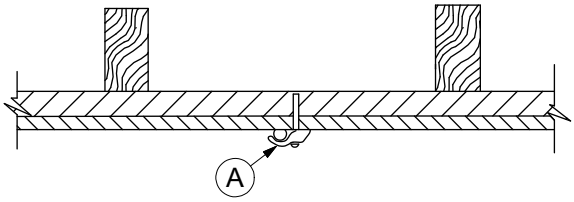
◇3.◇ Secondary clevis and spool insulator are provided by Ameren and installed by customer in MO, and provided and installed by customer in IL.

	ITEM	STOCK #	DESCRIPTION 09 01 49 **	01	02
3	A	23 06 040	Clevis - Secondary	1	1
	B	23 66 027	Washer, Flat, Square 5/8"	-	1
	C	23 52 061	Bolt, Mach., 5/8" x 8" w/ square nut	-	1
3	D	25 59 044	Insulator, Spool	1	1
1,@	E	23 60 011	Lag Screw - 5/8" x 5"	1	-
		23 60 007	Lag Screw - 1/2" x 4"	1	-

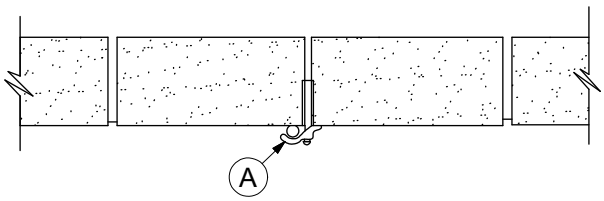
REV	DATE	ENG	DESCRIPTION
2	07/01/21	WYW	Added note 3; Revised bottom drawing description
1	01/01/21	WYW	Moved from DCS 06 01 56 & Moved text from drawing to const. notes



Typical Installations



09 01 50 01
Wood Siding Composition Shingles



09 01 50 02
Solid Masonry Brick - Brick Veneer or Cement

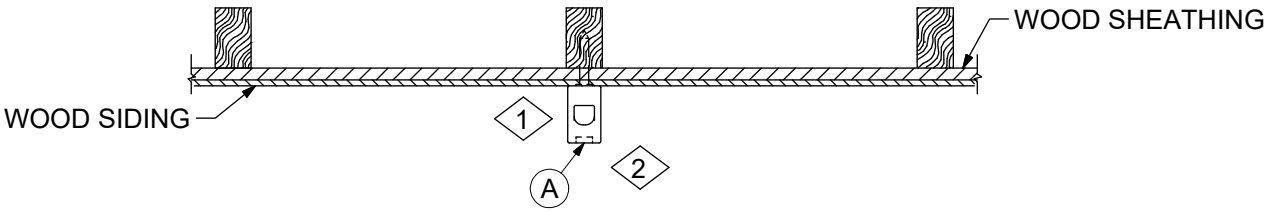
CONSTRUCTION NOTE(s):

1. Cable straps shall be installed in horizontal seams within 2 ft. of corner of building or side of window and shall be installed in vertical seams within 1 ft. of top of wall or upper or lower edge of window.

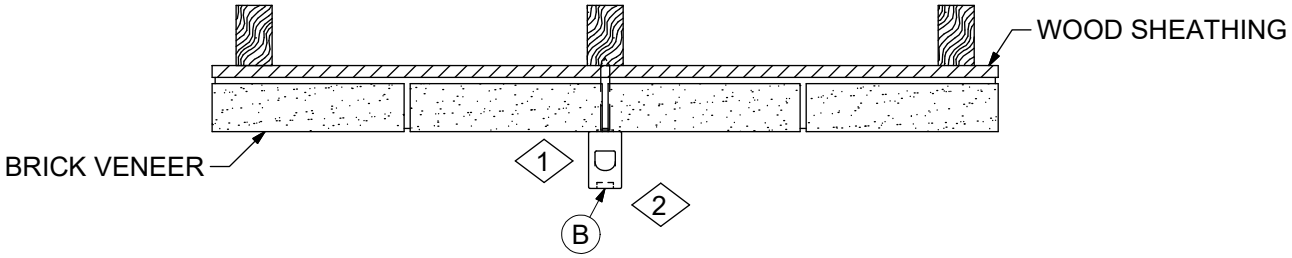
◇2. Secondary clevis and spool insulators are provided by Ameren and installed by customer in MO, and provided and installed by customer in IL.

	ITEM	STK / DCS #	DESCRIPTION 09 01 50 **	01 or 02
	A	21 71 022	Screw	#
		40 59 107	Cable Strap for #8-2	
		40 59 014	Cable Strap for #4 - 3 & #2-3	
		21 51 009	Shield Expansion	

REV	DATE	ENG	DESCRIPTION
4	07/01/21	WYW	Added note 2
3	01/01/21	WYW	Converted to new format



09 01 51 01
Wood Siding



09 01 51 02
Brick Veneer or Composition Shingles

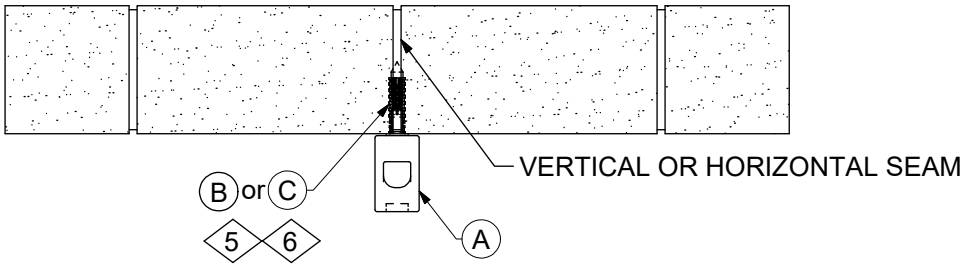
CONSTRUCTION NOTE(s):

1. Drill a lead hole 1/4" in diameter into stud or plate.

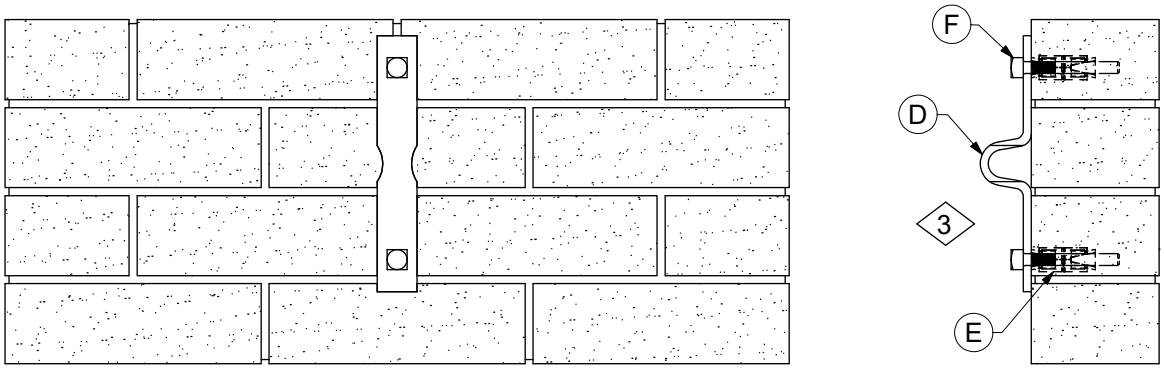
2. Wire holder insulator may be installed between studs where wall materials are sound. Wire holder insulator is provided by Ameren, and installed by customer in MO, and provided and installed by customer in IL.

	ITEM	STK / DCS #	DESCRIPTION 09 01 51 **	01	02
2	A	23 06 077	Insulator, Wire Holder - 2-1/4"	1	-
2	B	23 17 241	Insulator, Wire Holder - 3-1/2"	-	1

REV	DATE	ENG	DESCRIPTION
2	07/01/21	WYW	Revised note 2; Added note 7
1	01/01/21	WYW	Moved from DCS 06 01 50 **



09 01 51 (03 & 04) ◇7◇



09 01 51 (05 & 06) ◇4◇

DCS #	DESCRIPTION
09 01 51 03 09 01 51 04	#4 to #2 Triplex or Open Wire
09 01 51 05	1/0 Al Messenger
09 01 51 06	4/0 Al Messenger

CONSTRUCTION NOTE(s):

◇3.◇ Mount bracket vertically on seams so that it spans one brick.

◇4.◇ Also use for smaller services where due to nature of masonry porcelain knobs are unsatisfactory.

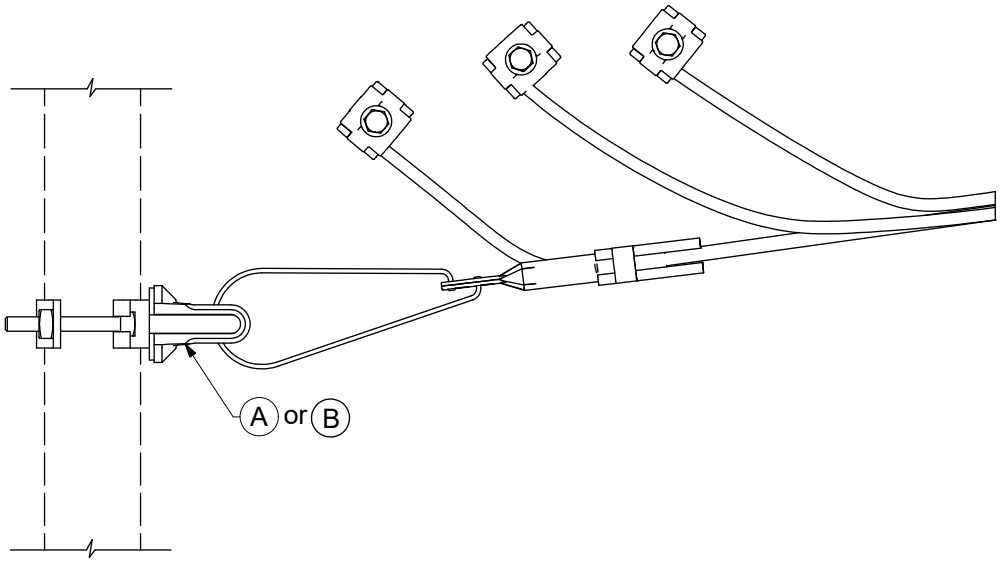
◇5.◇ To be used with porcelain body wire holder item A.

◇6.◇ To be used with nylon wire holder item A.

◇7.◇ Wire holder insulator is provided by Ameren and installed by customer in MO, and provided and installed by customer in IL.

	ITEM	STK / DCS #	DESCRIPTION 09 01 51 **	03	04	05	06
7	A	23 06 077	Insulator, Wire Holder - 2-1/4"	1	1	-	-
5	B	21 51 055	Shield, Exp,. #22 Screw	-	1	-	-
6	C	21 51 181	5/16" EXPANSION SHIELD	1	-	-	-
3	D	23 06 057	Bracket, Wall Triplex	-	-	1	1
	E	21 51 018	Shield, Exp., 1/2"	-	-	-	2
		21 51 016	Shield, Exp., 3/8"	-	-	2	-
	F	23 52 034	Bolt, Mach., 1/2" x 4" w/ square nut	-	-	-	2
		23 52 194	Bolt, Mach., 3/8" x 3" w/ square nut	-	-	2	-

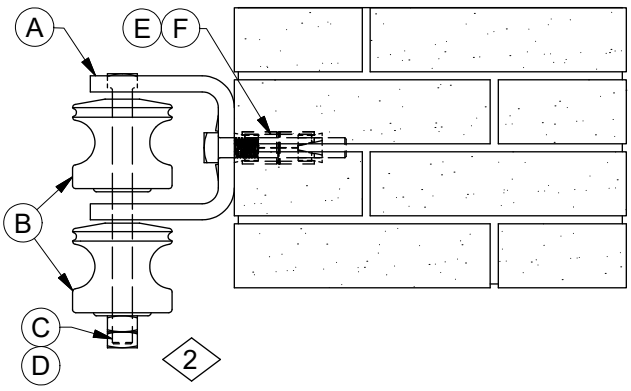
REV	DATE	ENG	DESCRIPTION
2	07/01/21	WYW	Revised note 2; Added note 7
1	01/01/21	WYW	Moved from DCS 06 01 50 **

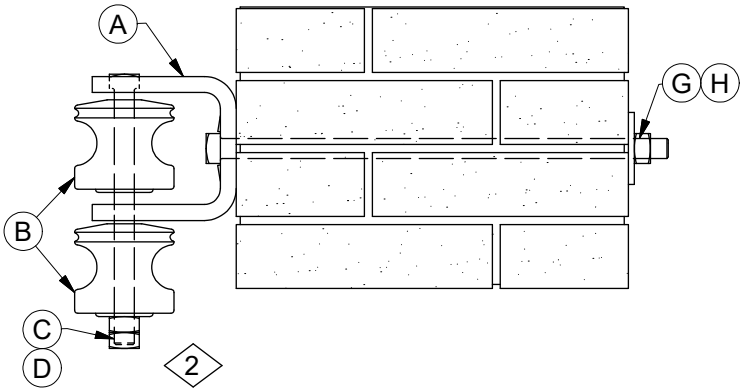


09 01 51 (07 & 08)

	ITEM	STK / DCS #	DESCRIPTION 09 01 51 **	07	08
7	A	23 06 075	Insulator, Wire Holder, 1-1/4" to 2-1/2" Mast	1	-
7	B	23 06 082	Insulator, Wire Holder, 3" to 4" Mast	-	1

REV	DATE	ENG	DESCRIPTION
2	07/01/21	WYW	Revised note 2; Added note 7
1	01/01/21	WYW	Moved from DCS 06 01 50 **





Solid Masonry - Brick Or Cement		
DCS #	Description	Conductor Range
09 01 53 01	1 Spool	Up to #4
09 01 53 02	1 Spool	#2 to #4/0
09 01 53 03	1 Spool	500 to 750 MCM
09 01 53 04	2 Spools ◇1	Up to #4
09 01 53 05	2 Spools ◇1	#2 to #4/0
09 01 53 06	2 Spools ◇1	500 to 750 MCM

Solid Masonry - Brick Or Cement		
DCS #	Description	Application
09 01 53 07	1 Spool	To be used when the stud is accesible from inside.
09 01 53 08	2 Spools ◇1	

CONSTRUCTION NOTE(s):

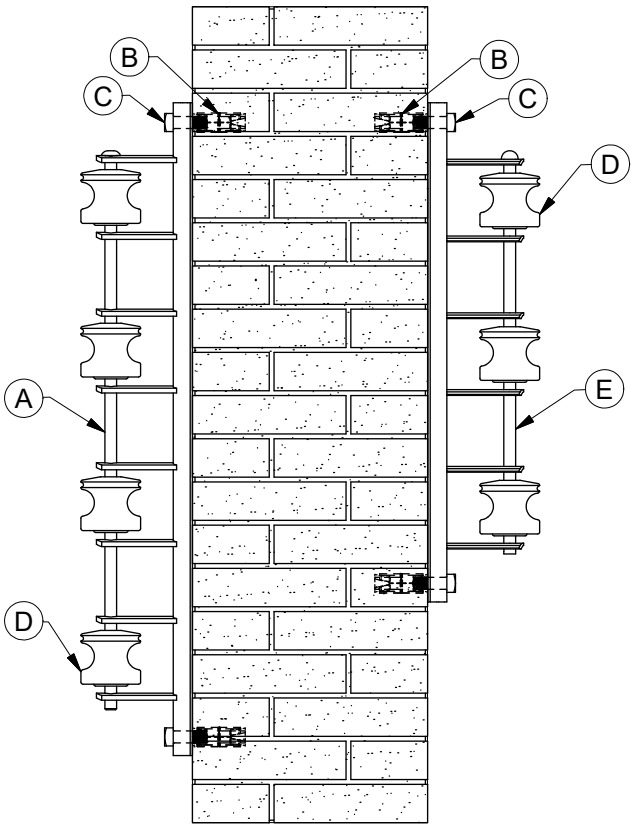
◇1. The double spool insulator is to be used only for attaching network cable to buildings excluding deadend constructions.

◇2. The 2 square nuts are jammed together.

◇3. Secondary clevis and spool insulator are provided by Ameren and installed by customer in MO, and provided and installed by customer in IL.

	ITEM	STOCK #	DESCRIPTION 09 01 53 **	01	02	03	04	05	06	07	08
3	A	23 06 040	Clevis - Secondary Insulator	1	1	1	1	1	1	1	1
3	B	25 59 044	Insulator, Spool	1	1	1	2	2	2	1	2
	C	23 52 061	Bolt, Mach., 5/8" x 8" w/ square nut	-	-	-	1	1	1	-	1
	D	23 65 011	Nut, Square, 5/8"	-	-	-	1	1	1	-	1
	E	21 51 016	Shield, Exp., 3/8"	1	-	-	1	-	-	-	-
		21 51 018	Shield, Exp., 1/2"	-	1	-	-	1	-	-	-
		21 51 019	Shield, Exp., 5/8"	-	-	1	-	-	1	-	-
	F	23 52 194	Bolt, Mach., 3/8" x 3" w/ square nut	1	-	-	1	-	-	-	-
		23 52 034	Bolt, Mach., 1/2" x 4" w/ square nut	-	1	-	-	1	-	-	-
		23 52 200	Bolt, Mach., 5/8" x 4" w/ square nut	-	-	1	-	-	1	-	-
	G	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	-	-	-	-	-	-	1	1
	H	23 66 027	Washer, Flat, Square 5/8"	-	-	-	-	-	-	1	1

REV	DATE	ENG	DESCRIPTION
2	07/01/21	WYW	Added note 3
1	01/01/21	WYW	Moved from DCS 06 01 58 ** & created table for clarification



DCS #	DESCRIPTION
09 01 54 01	4-Wire
09 01 54 02	3-Wire

CONSTRUCTION NOTE(s):

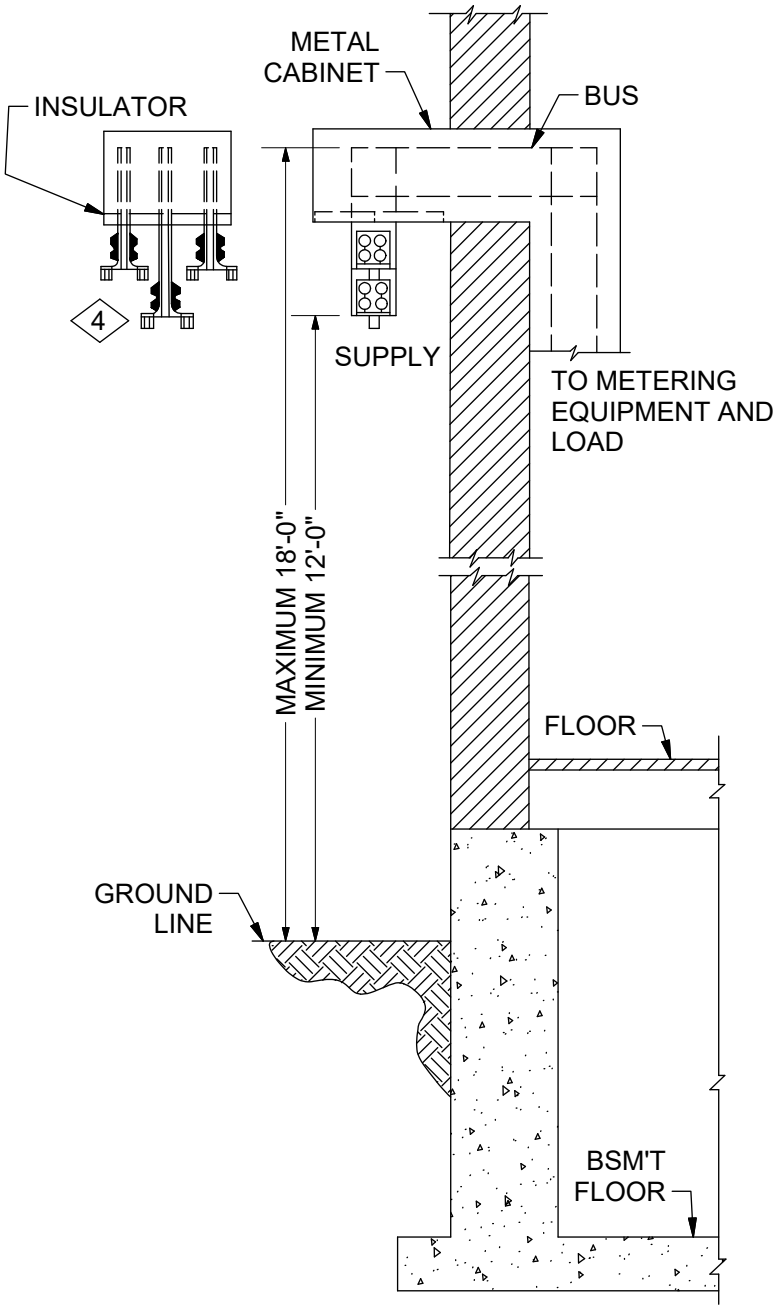
1. The square nut provided with machine bolt, is not used for this application.

2. Secondary wire rack and spool insulators are provided by Ameren and installed by customer in MO, and provided and installed by customer in IL.

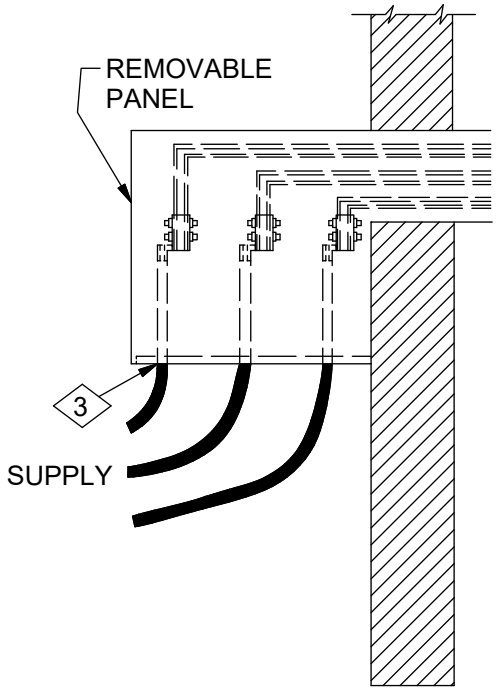
	ITEM	STOCK #	DESCRIPTION 09 01 54 **	01	02
2	A	23 11 004	Rack, Secondary, 4-Wire	1	-
	B	21 51 019	Shield, Exp., 5/8"	2	2
1	C	23 52 438	Bolt, Mach., 5/8" x 3" w/ square nut	2	2
2	D	25 59 044	Insulator, Spool	4	3
2	E	23 11 001	Rack, Secondary, 3-Wire	-	1

REV	DATE	ENG	DESCRIPTION
2	07/01/21	WYW	Added note 2
1	01/01/21	WYW	Moved from DCS 06 01 60 **

Method 1



Method 2
(Drawing shall be submitted for approval)



Metal Cabinet - Bolts & Lugs		
Service Size - Amps	NO.	Lug Size
0 - 1000	1	500 / 750
1001 - 2000	2	500 / 750
2001 - 3000	3	500 / 750
3001 - 4000	4	500 / 750

Equipment to be Furnished by Customer

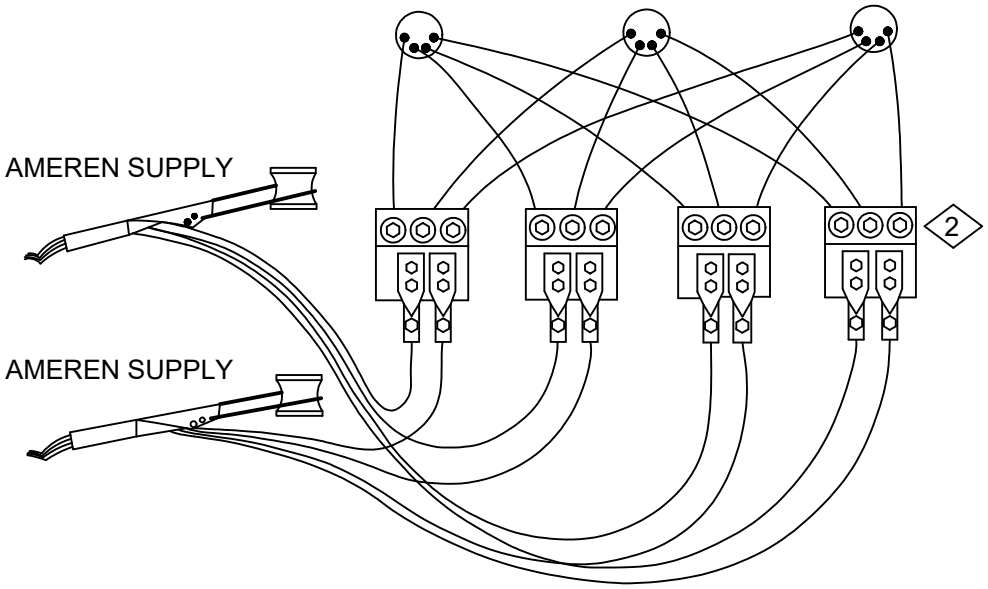
CONSTRUCTION NOTE(s):

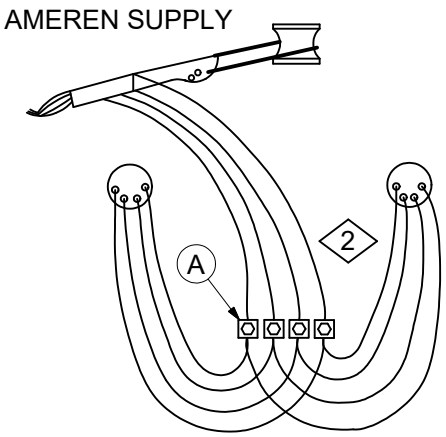
1. All equipment, including connector lugs and everdur bolts, shall be furnished and installed by customer. Ameren to make connection to service wires.
2. Any deviation from this standard shall be approved by Ameren Engineer prior to installation.

3. Insulator board to be drilled for conductors. Size to be determined by Ameren.

4. 3-Wire shown. For 4-Wire add 4th Bus.

REV	DATE	ENG	DESCRIPTION
2	01/01/21	WYW	Converted to new format
1	10/27/11	DCG	





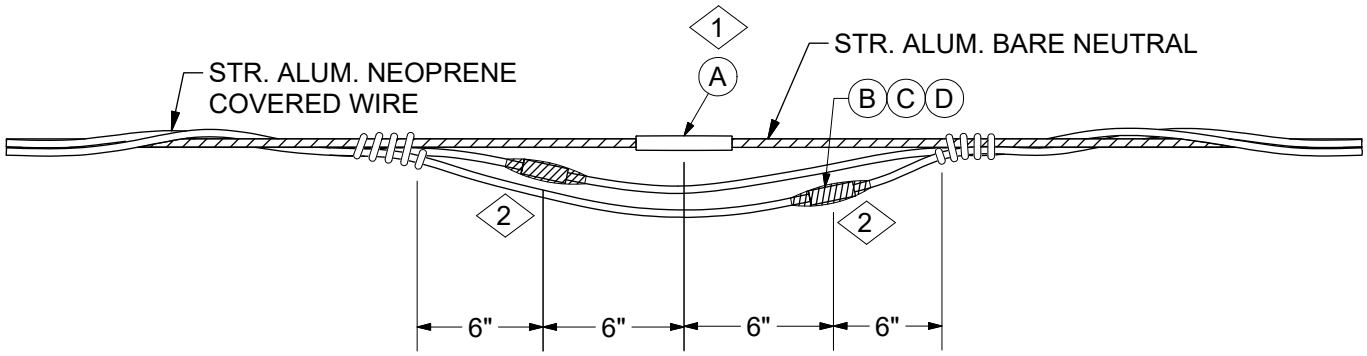
CONSTRUCTION NOTE(s):

1. This type of connection is undesirable and to be used only when a bus-bar outlet cannot be used. Each job shall be specifically approved and configuration agreed upon by Ameren Engineer prior to construction.

<2.> Customer:
- Gather service entrance conductors
- Provide 2 and 3 barrel NEMA 4-hole lugs and bolt together

Company:
- Make final connection and tape
- Tape conductors together for mechanical support

	ITEM	STK / DCS #	DESCRIPTION 09 01 58 **	00
@	A	17 64 244	Connector Insulated Set Screw, 6 Holes, #4 AWG to 600kcmil, Al or Cu	#
		17 64 245	Connector Insulated Set Screw, 6 Holes, 250kcmil to 750kcmil, Al or Cu	#



CONSTRUCTION NOTE(s):

1. Triplex splicing sleeve shall be used to make full tension splices in triplex cables.

2. Tape with two layers half lapped rubber based tape (Stock #25 53 080) and cover with same amount DF Friction tape (Stock #25 53 003).

ITEM	STK / DCS #	DESCRIPTION 09 01 60 **	01	02	03
A	17 60 188	Sleeve, Splicing, 4 Al.	1	-	-
	17 60 187	Sleeve - Compression Cu 1/0 to #2	-	1	-
	17 60 160	Sleeve, Full Tension, 1/0 Al.	-	-	1
B	17 60 180	Sleeve - Compression, Non Tension 5/8" O.D. #3 or #4	2	-	-
	17 60 182	Sleeve - #2 Al	-	2	-
	17 60 319	Sleeve - Compression 1/0 Str. to 1/0	-	-	2
C	25 53 080	Tape, Rubber, Insl.	1	1	1
D	25 53 003	Tape, Friction	1	1	1

REV	DATE	ENG	DESCRIPTION
4	07/01/21	WYW	Removed reference chart from note 1
3	01/01/21	WYW	Converted to new format

FUSES & SWITCHES 10

FUSE APPLICATION TABLES.....10 00 01 01

INFORMATION AND RATINGS.....10 00 10 01

SINGLE PHASE SECTIONALIZING, 100-300 AMP.....10 12 01 **

THREE PHASE SECTIONALIZING LINE ARM MOUNT, 100-600 AMP.....10 12 10 **

THREE PHASE SECTIONALIZING SWITCH ARM MOUNT, 100-600 AMP.....10 12 11 **

THREE PHASE SECTIONALIZING UNDERHUNG MOUNT, 600 AMP.....10 12 13 **

SINGLE PHASE SWITCHED TAP, 100-300 AMP.....10 12 22 **

TWO OR THREE PHASE SWITCHED TAP, 100-600 AMP.....10 12 23 **

THREE PHASE SWITCHED TAP UNDERHUNG MOUNT, 600 AMP.....10 12 24 **

TRIPSAVER II - SINGLE PHASE TAP.....10 12 25 **

TRIPSAVER II - TWO OR THREE PHASE TAP.....10 12 26 **

TRIPSAVER II TWO OR THREE PHASE SECTIONALIZING.....10 12 27 **

TRIPSAVER II SINGLE PHASE SECTIONALIZING.....10 12 28 **

THREE PHASE ELECTRONIC RECLOSER INTELLIRUPTER, 600 AMP.....10 12 33 01

DOUBLE CIRCUIT TIE SWITCH CROSSARM CONSTRUCTION, 600 AMP.....10 12 50 **

SINGLE PHASE HYDRAULIC RECLOSER, 25-280 AMP.....10 12 60 01

THREE PHASE HYDRAULIC RECLOSER, 1/0 AL AND SMALLER CONDUCTOR.....10 12 62 01

THREE PHASE HYDRAULIC RECLOSER - CONDUCTOR LARGER THAN 1/0.....10 12 62 03

GROUP OPERATED SWITCHES GROUNDING AND INSULATOR PLACEMENT INFORMATION.....10 34 01 01

SINGLE CIRCUIT GROUP OPERATED SWITCH VERTICAL CONSTRUCTION, 1200 AMP.....10 34 05 **

SINGLE CIRCUIT GROUP OPERATED SWITCH FLAT POLE TOP MOUNT, 1200 AMP.....10 34 07 **

DOUBLE CIRCUIT GROUP OPERATED TIE SWITCH VERTICAL CONSTRUCTION, 1200 AMP.....10 34 20 **

DOUBLE CIRCUIT GROUP OPERATED SWITCH VERTICAL CONSTRUCTION, 1200 AMP.....10 34 26 **

THREE PHASE ELECTRONIC RECLOSER VIPER, 800 AMP.....10 34 50 **

GROUP OPERATED SWITCH TRIANGULAR CONFIGURATION.....10 69 05 **

GROUP OPERATED SWITCH VERTICAL CONFIGURATION.....10 69 07 **

GROUP OPERATED SWITCH DELTA CONFIGURATION.....10 69 09 **

MOTOR OPERATOR.....10 69 10 **

Table 1 - Single Phase Transformers				
kVA	System Voltage ◇1◇			
	2400V Delta 4160V Grd. Y/2400V	7200V Delta 12470V Grd. Y/7200V 13200V Grd. Y/7620V 13800V Grd. Y/7970V	14400V Delta 24940V Grd. Y/14400V	34500V Grd. Y/19920V
1	-	3/4X	-	-
3	3-1/2X	3-1/2X	3-1/2X	-
5	3-1/2X	3-1/2X	3-1/2X	-
7.5	3-1/2X	3-1/2X	3-1/2X	-
10	6T	3-1/2X	3-1/2X	3/4X
15	7X	3-1/2X	3-1/2X	1X
25	15T	8T	3-1/2X	1-1/2X
37.5	25T	10T	3-1/2X	-
50	30T	10T	5-1/2X	3-1/2X
75	50T	15T	7X	4X
100	65T	20T	10T	7X
150	100T	30T	15T	-
167	100T	30T	15T	-
200	100T	40T	20T	-
250	140T	40T	25T	-
333	140T	50T	25T	-
500	-	80T	50K	-

DESIGN NOTE(s):

◇1.◇ Link fuses (T and X) shall be used in fused switches to isolate most Conventional (C), Protected (P), and Completely Self Protected (CSP) transformers which are: 1) pole mounted, or 2) pad mounted and isolated by a fused terminal pole. Power fuses shall be used to protect transformers when available fault current levels exceed the rating of a cutout.

2. Padmount transformers with bayonet fuses should have their upstream fuse sized with the largest fuse size that coordinates with upstream protection device.

REV	DATE	ENG	DESCRIPTION
14	01/01/24	JMW	Converted to new format
13	07/01/20	DT	

Table 2 - Three Phase Transformers - Single Unit or Banks				
kVA ◇3◇	System Voltage (Phase-to-Phase) ◇1◇			
	2400V	4160V	7200V	12470V, 12000V, 13200V, 13800V,14400V
9	3-1/2X	3-1/2X	3-1/2X	3-1/2X
15	5-1/2X	3-1/2X	3-1/2X	3-1/2X
30	10T	5-1/2X	3-1/2X	3-1/2X
45	15T	7X	5-1/2X	3-1/2X
75	25T	12T	7X	8T
112	40T	20T	12T	7X
150	50K	25T	15T	10T
225	65T	40T	25T	15T
300	100T	50T	30T	20T
450	140T	100T	50K	30T
500	140T	100T	50K	30T
600	200T	100T	65T	40T
750	200T	140T	65T	40T
1000	-	140T	100T	50T
1500	-	-	-	80T
2000	-	-	-	100T
2500	-	-	-	140T

DESIGN NOTE(s):

◇3.◇ Three-phase kVA or 3x single phase kVA.

4. For three-phase banks with closed delta secondary where one of the transformers is larger than the other two (grounded mid-tap 120/240 Volt), select fuse for each transformer from the above fuse link table based on the individual transformer kVA and system voltage.

   Example: 1-100kVA and 2-25kVA transformers on 4160 GrdY/2400V circuit
   From above fuse link chart:
   100kVA - use 300kVA row and 4160V column to select 50T fuse.
   2-25kVA - use 75kVA row and 4160V column to select 12T fuses.

REV	DATE	ENG	DESCRIPTION
14	01/01/24	JMW	Converted to new format
13	07/01/20	DT	

Table 3 - Power Fuses for Single-Phase Pole Mounted Transformers				
kVA	SMU-20 Fusing		SM-4 Fusing	SM-5 Fusing
	4.16kV	12.47kV	4.16kV	4.16kV
10	7 E Std.	5 E Std.	7 E Std.	7 E Std.
25	15 E Slow	10 E Std.	15 E Slow	15 E Slow
37.5	25 E Slow	10 E Std.	25 E Slow	25 E Slow
50	30 E Slow	10 E Std.	30 E Slow	30 E Slow
75	50 E Slow	15 E Slow	50 E Slow	50 E Slow
100	65 E Slow	20 E Slow	65 E Slow	65 E Slow
167	125 E Slow	30 E Slow	125 E Slow	125 E Slow
250	150 E Slow	40 E Slow	150 E Slow	150 E Slow
333	200 E Std.	50 E Slow	200 E Std.	200 E Std.
500	-	80 E Slow	-	300 E Std.

Table 4 - Power Fuses for Three-Phase Transformers				
kVA	SMU-20 Fusing		SM-4 Fusing	SM-5 Fusing
	4.16kV	12.47kV	4.16kV	4.16kV
75	15 E Slow	10 E Std.	15 E Slow	15 E Slow
150	25 E Slow	10 E Std.	25 E Slow	25 E Slow
300	50 E Slow	20 E Slow	50 E Slow	50 E Slow
500	80 E Slow	30 E Slow	80 E Slow	80 E Slow
750	150 E Slow	40 E Slow	150 E Slow	150 E Slow
1000	200 E Slow ◇5	50 E Slow	200 E Slow ◇5	200 E Std. ◇5
1500	◇5	80 E Slow ◇6	◇5	300 E Std. ◇5
2000	◇5	100 E Slow ◇6	◇5	400 E Std. ◇5
2500	◇5	150 E Slow ◇6	◇5	400 E Std. ◇5

DESIGN NOTE(s):

◇5. 4.16kV transformers over 750kVA, or feeders over 2 miles in length will require further review by Energy Delivery Technical Services.

◇6. 12.47kV transformers over 1000kVA, or feeders over 5 miles in length will require further review by Energy Delivery Technical Services.

7. Padmounted switchgear shall use SMU refills. For switchgear made prior to 2001, AmerenUE used SM-4 refills.

8. Bay-O-Net Fuses for Loop Feed Pad Mounted Transformers - See DCS **59 51 53 40**

REV	DATE	ENG	DESCRIPTION
14	01/01/24	JMW	Converted to new format
13	07/01/20	DT	

Table 5 - Three-Phase Pole Mounted Capacitor Banks								
Three Phase kVAR	Phase to Phase Voltage							
	2400 V	4160 V	7200 V	12470 V	13200 V	13800 V	14400 V	34500 V
150	40T	25T	12T	10T	10T	10T	-	-
300	100K	40T	25T	15T	15T	12T	12T	-
450	-	65T	-	25T	20T	-	-	-
600	140T	80T	50K	30T	30T	25T	25T	-
900 ◇12◇	-	-	65T	40T	40T	-	-	-
1200 ◇13◇	-	-	-	65T	65T	-	50K	-
2400	-	-	-	-	-	-	-	◇10◇
4500	-	-	-	-	-	-	-	◇11◇

DESIGN NOTE(s):

9. Capacitor banks should be fused with link fuses except when fault current exceeds rating of cutout or as otherwise noted.

◇10◇ If available fault current does not exceed 16kA asymm/ 10kA symm use a 50K fast refill, Stock #20 04 343, in a SMD-20 fused switch, Stock #54 06 052.

If available fault current is greater than 16kA asymm/ 10kA symm but less than 28kA asymm/ 17.5kA symm, use a 50 Std. refill, Stock #20 04 340, in a SMS fuse mounting, Stock #54 03 048, if available current is greater than 16kA asymm. Contact Distribution Standards for construction details. Symmetrical fault current ratings are based on x/r ratios of 15 or less.

◇11◇ If available fault current does not exceed 16kA asymm/ 10kA symm, use a 80 E Slow refill, Stock #20 04 355, in a SMD-20 fused switch, Stock #54 06 052.

If available fault current is greater than 16kA asymm/ 10kA symm but less than 28kA asymm/ 17.5kA symm, use a 80 E Slow refill, Stock #20 04 233, in a SMS fuse mounting, Stock #54 03 048.

Contact Distribution Standards for construction details. Symmetrical fault current ratings are based on x/r ratios of 15 or less.

◇12◇ Bank composed of 6 - 150 kVAR units.

◇13◇ Bank may be composed of 6 - 200 kVAR units.

REV	DATE	ENG	DESCRIPTION
14	01/01/24	JMW	Converted to new format
13	07/01/20	DT	

1. Fused Switches for 2.4kV - 14.4kV Circuits (for link type expulsion fuses)

   All fused switches are stocked with a cartridge (fuse tube). Cartridges are available for replacement only. The 15kV, 100A, 100kV BIL, open style fused switch, Stock #54 07 208, may be used on 2.4kV through 14.4kV circuits where symmetrical fault current does not exceed 16,000A asymmetricl / 8,000A symmetrical. This switch will be used in nearly all new installations and replacements where practical.

   The 15kV, 200A, 100kV BIL, open style fused switch, Stock #54 07 209, may be used on 2.4kV through 14.4kV circuits where symmetrical fault current does not exceed 12,000A asymmetricla/8,000A symmetrical. This switch will be used in nearly all new installations and replacements where practical.

   The 27kV, 100A, 125kV BIL, open style fused switch, Stock #54 07 240, may be used on 7.2kV through 14.4kV circuits where symmetrical fault current does not exceed 5kA. It shall not be used on 2.4/4.16kV circuits. This switch (for years the most commonly installed) will not be frequently used.

2. Solid Blade Switches for 2.4kV - 14.4kV Circuits

   The 15kV, 300A, 100kV BIL, open style switch, Stock #54 07 210, may be used on 2.4kV through 14.4kV circuits where symmetrical fault current does not exceed 7.5kA. The 15kV, 100 or 200 amp fused switch can be converted to a 300 amp device by removing the cartridge and inserting a solid blade, Stock #54 07 243.

   The 27kV, 100A fused switch, Stock #54 07 240, can be converted to a 300 amp device by removing the cartridge and inserting a solid blade, Stock #54 07 199 where symmetrical fault current does not exceed 7.5kA.

   The 15kV, 600A underslung switch,Stock #54 07 204, may be used on 2.4kV through 14.4kV circuits. The switch blade is attached and cannot be removed.

   The 15kV, 600A single insulator disconnect switch, Stock #54 07 296, may be used on 2.4kV through 14.4kV circuits. The switch blade is attached and cannot be removed.

   The 15kV, 600A open style in line switch, Stock #54 07 205, may be used on 2.4kV through 14.4kV circuits only where special conditions warrant.

3. Group Operated Switches for 2.4kV - 13.8kV Circuits

   The 15kV, 600A group operated switch, Stock #54 07 239, may be used on terminal poles serving padmount transformers to prevent ferroresonance, or on primary metering poles where three phase disconnection is required. The switch is equipped with load interrupters. The switch mounts on the face of the pole on a horizontal beam below the overhead connections. It may be used on 2.4kV through 13.8kV circuits.

4. Single Phase 19.9/34,5kV Switches

   The 27kV, 100A, 150kV BIL fused cutout, Stock #54 07 234, can be used for applications through 34.5kV for single and three phase line to neutral applications on effectively grounded WYE connected circuits. They may be used where symmetrical fault current does not exceed 7.5kA.

   The 34.5kV, 200A, SMD-20 fused switch, Stock #54 06 052, may be used on 19.9/34.5kV capacitor banks or conventional transformers if symmetrical fault current is greater tan 7.5kA but not more than 10kA. For symmetrical fault currents above 10kA contact Standards.

   The 34.5kV, 900A underslung switch, Stock #54 07 302, may be used on 14.4/24.8kV and 19.9/34.5kV circuits or lower distribution voltage circuits where loads in excess of 600 amps are anticipated and clearance permit. The switch blade is attached and cannot be removed.

5. 34.5kV Group Operated Switches

The 34.5kV, 1200A, group operated switches with loadbreak interrupters should be used on circuits where sectionalizing requires simultaneous interruption of all three phases. Standard switches listen in Table 1 come pre-assembled on a unitized frame.

An existing non-loadbreak switch may be converted to loadbreak interrupting by the addition of loadbreak interrupters. These switches have a mounting bracket to attach the load interrupter units. Installation instructions are included with each switch and kit.

Table 1 - 34.5kV Standard Group Operated Switches

Stock #	kV	Amp	Switch without or with interrupters	Weight (lbs.)
54 08 433	34.5	1200	Turner TS2, Three Phase with LBRK - Vertical Mount	999
54 08 437 ◇2◇	34.5	1200	Turner TS2, Three Phase with LBRK - Flat Top Mount	999
54 08 438	34.5	1200	Turner TS2, Three Phase with LBRK - Terminal Pole Mount	999
54 08 442	34.5	1200	Seeco, Three Phase with LBRK - Vertical Mount	1400
54 08 447 ◇1◇	34.5	1200	Seeco, Three Phase with LBRK - Flat Top Mount	1300
54 08 446	34.5	1200	Seeco, Three Phase with LBRK - Terminal Pole Mount	1150

6. 69kV Group Operated Switches

The 69kV, 1200A, group operated switches without loadbreak interrupter shall only be used on circuits that do not require load break switches.

The 69kV, 1200A, group operated switches with loadbreak interrupters shall be used on circuits where sectionalizing requires simultaneous interruption of all three phases and where interruption of load or circulating current is required.

The 69kV group operated switches come pre-assembled as as single phase assembly. Load break interrupers, if equipped, must be installed on each phase assembly and each phase assembly must be installed and adjusted.

2-way and 3-way 69kV group operated switches are also available.

Table 2 - 69kV Group Operated Switches

Stock #	kV	Amp	Switch Without or With Interrupters	Configuration
54 09 393	69	1200	Turner, CS2, Three-Phase GOP Switch without LBRK Interrupter	Triangle or Delta
54 09 395	69	1200	Turner, CS2, Three-Phase GOP Switch with LBRK Interrupter	Triangle or Delta
54 09 392	69	1200	Turner, CS2, Three-Phase GOP Switch without Interrupter	Phase over Phase
54 09 394	69	1200	Turner, CS2, Three-Phase GOP Switch with LBRK	Phase over Phase
54 09 369	69	1200	SEECO, Three-Phase GOP Switch without Interrupters	Triangle or Delta
54 09 035	69	1200	SEECO, Three-Phase GOP Switch with Interrupters	Triangle or Delta
54 09 368	69	1200	SEECO, Three-Phase Switch without Interrupters	Phase over Phase
54 09 370	69	1200	SEECO, Three-Phase Switch with Interrupters	Phase over Phase

REV	DATE	ENG	DESCRIPTION
0	01/01/24	JMW	New Standard

7. Switch Motor Operators for 34.5kV and 69kV Group Operated Switches

Motor operators include a 24V battery (or two 12V batteries in series), battery charger (powered by 120 VAC), a 24VDC to 12VDC converter (if single 24V battery provided) to power RTU and radio, a swing-out door to mount radio and RTU, remote/local switch with position terminal to provide dispatch status, low voltage DC and loss of AC alarm relays. Motor operators must be supplied with 120 VAC.

The following stock coded motor operators come pre-wired for an RTU. The RTU is optional and has to be ordered separately.

Table 3 - Switch Motor Operators and RTU's

Stock #	kV		Description
54 08 416	34	24VDC	Motor operator for Turner 34kV D switch
54 08 430	34 or 69	24VDC	Motor operator for Turner 34kV (TSB) or 69kV (CSB) switch
54 09 349	69	24VDC	Motor operator for Turner 69kV D switch
54 09 371	34 or 69	24VDC	Motor operator for SEECO 34kV or 69kV switch
54 02 011	-	-	GE Ibox RTU
54 02 031	-	-	Novatech Orion RTU

8. Standard Equipment Lead Size

When a switch is used for sectionalizing circuits, the tap conductor (load side of switch) will determine the size of the switch leads. Poly covered soft drawn copper wire shall be used for leads to open style switches, as indicated in DCS **07 00 80 00**. EPR, 2400V, insulated copper wire shall be used to connect porcelain enclosed switches, as indicated in DCS 07 00 81 00. Conductor size may be restricted in some applications due to the equipment connector.

When a switch is used for underground cable feeds, the lead from the open style switch to the line conductor shall be poly covered soft drawn copper wire, while the lead to the terminator shall be poly covered hard drawn or soft drawn copper wire as indicated in the appropriate terminal pole Standard.

When a fused switch is used to connect a device such as a transformer or capacitor, the lead size will be specified in that particular equipment section of the Standards books.

Group operated 34.5kV & 69kV, 1200A switch leads shall be the same as the line conductor, when line conductor is larger than 556 kcmil. The leads will be attached to the switch per DCS **07 00 30 00** with 556 kcmil or 954 kcmil lugs. When poly covered copper is used for switch leads a bolted bronze lug shall be used to attach to the switch.

9. Fuse Links - Expulsion Type

Fuse links are used in fused cutouts to protect the circuit by isolating overheard feeder taps, underground cable circuits, conventional transformers, and capacitor banks on the distribution system.

The use of 200A fuses shall be reviewed by a System Protection Engineer for coordination.

10. Power Fuses (Solid Material) and Mountings

Power fuses are used for higher current ratings, greater interrupting capacity, coordination requirements, and other special conditions such a contaminated atmosphere and limited space. See Table 4 for interrupting ratings.

The solid material fuse element is called a Refill. The Refill is held by a fuseholder, which is place in a Mounting. The stock number of the Mounting includes the Fuseholder.

Solid material fuses are specified by voltage and current. The Mountings are also specific to these Refills.

Liquid power fuses are no longer available.

Table 4 - Overhead and Switchgear Power Fuse Interrupting Ratings					
Refill Type	Rated Voltage	Refill Amperage Available	Interrupting Amps Asymm./Symm. ◇3◇	Overhead Mounting Stock #	Padmount Swgr. Mounting Stock #
SM-4	7.5kV	15-200	27,500/15,600	54 03 050	-
SM-4	14.4kV	20-200	20,000/12,500	54 03 060	◇5◇
SM-4	34.5kV	65-125	10,000/6,250	54 03 054	-
SM-5	7.5kV	50-400	44,500/26,000	54 03 051	-
SM-5	14.4kV	30-250	40,000/25,000	54 03 064	54 07 226/233
SM-5	25kV	30-250	32,000/20,000	54 03 053	-
SM-5	34.5kV	1-250	28,000/17,500	54 03 048	-
SMU ◇4◇	14.4kV	100-200	22,400/14,000	54 06 050	54 07 212/213/216/217
SMU ◇4◇	34.5kV	1-200	16,000/10,000	54 06 052	-

11. Reclosers

Reclosers are used to protect circuits by isolating a faulted section of a circuit. They shall be used on circuits 14.4kV and below. Available reclosers are identified in the applicable standards. Refer to EDD (Electrical Distribution Design) article PS-50 covering reclosers.

12. Tripsavers

Tripsavers are cutout mounted electronic reclosers that are powered by line current using an internal CT. There are 40A, 100A, and 200A models that can carry their rated current continuously. Common size fuse T-links have stock numbers for Tripsavers that are already programmed with T-link TCC curves. There are also stock numbers for Tripsavers that are not already programmed.

Tripsavers have a fault current rating of 6.3kA symmentrical. Ameren's standard 100A fused switch is rated 6,000A asymmetrical / 10,600A symmetrical. Ameren's standard 200A fused switch is rated 12,000A asymmetrical / 8,000 symmetrical.

Tripsaver requires a minimum level of current to power the LCD screen or the Local Manual Open function, if enabled: 1A for 40A model, 4A for 100A model, and 8 amps for 200A model. To power the control, the current must not fall below: 0.5A for 40A model, 1.5A for 100A model, and 3A for the 200A model. If the current falls below this threshold, the Tripsaver can rely on fault current to power up the Tripsaver, but there could be a delay in operation depending on the fault current level.

REV	DATE	ENG	DESCRIPTION
0	01/01/24	JMW	New Standard

13. Transformer Fusing

Types of Fuses

Link fuses (T and X) shall be used in fused switches to isolate most Conventional (C), Protected (P), and Completely Self Protected (CSP) transformers which are: 1) pole mounted, or 2) pad mounted and isolated by a fused terminal pole.

Power fuses (SMU, SM-4, or SM-5) shall be used to isolate Conventional (C), Protected (P), and Completely Self Protected (CSP) transformers when any of the following conditions exist.

1) The fault interrupting requirements are above the capacity of the link type fused switch
   -100A fused switch, Stock #54 07 208, 10,000A symmetrical
   -100A fused switch, Stock #54 07 234, 7,500A symmetrical
   -200A fused switch, Stock #54 07 209, 7,500A symmetrical

2) A pole mounted transformer and the fuse rating is greater than 100 amps (three phase transformers larger than 500kVA @4.16kV, or 1500kVA @12.47kV)

3) The transformer is fed by padmounted switchgear

Contact Distribution Standard Engineer for fuses rated above 100A.

External fuses shall be used to isolate Completely Self Protected (CSP) transformers, unless the transformer is not installed on the backbone, existing pole space does not allow for installation of a fused switch, and the number of customers that could be affected by transformer failure is deemed acceptable.

See DCS **10 00 01 01** for fuse application table

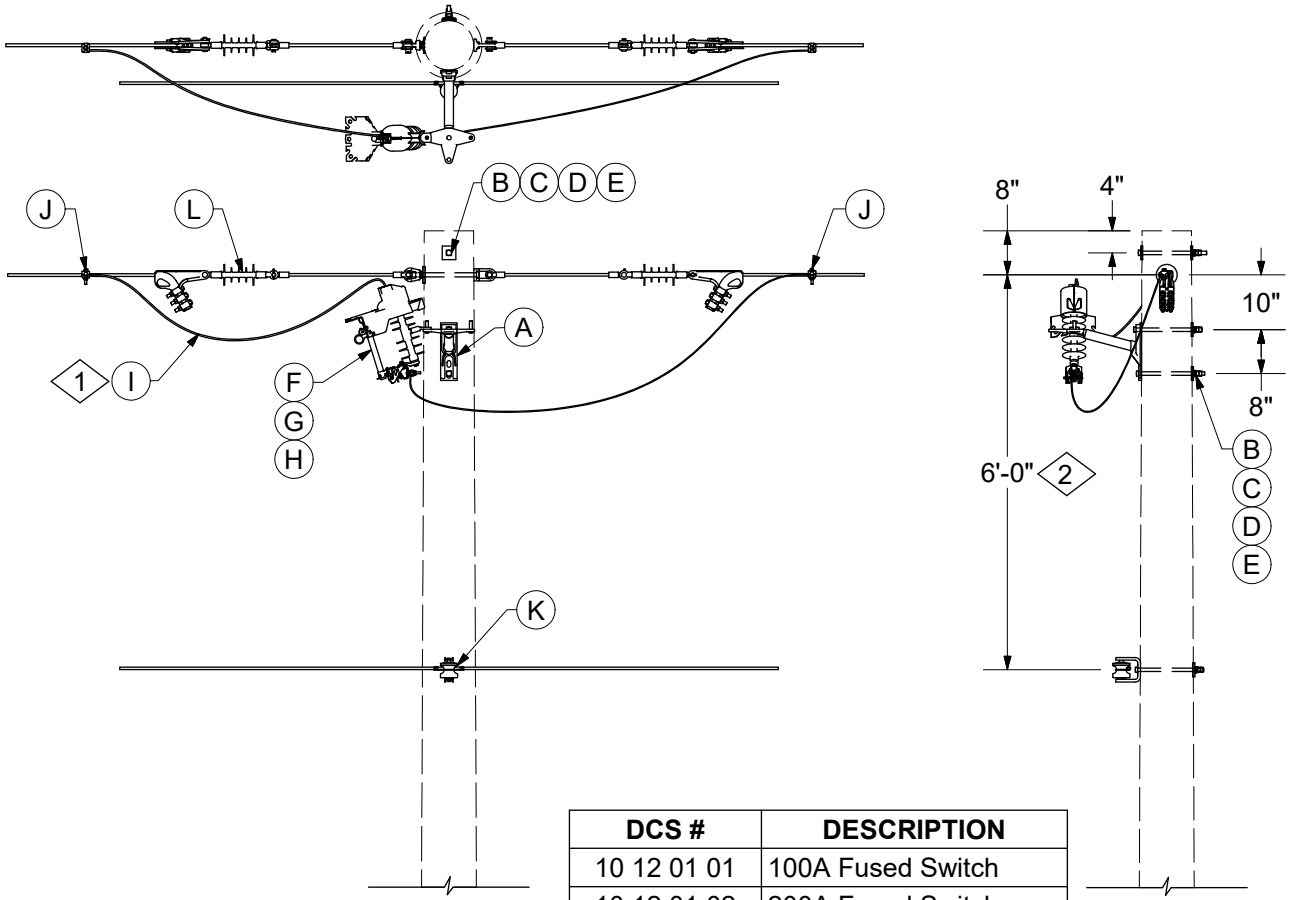
DESIGN NOTE(s):

1. Differential tension shall not exceed 333 pounds per phase using the DE tension listed in DCS **07 00 07 03**.
2. Differental tension shall not exceed 1,000 pounds per phase using the DE tension listed in DC **07 00 07 03**.
3. Asymmetrical amperages shown are at normal applied system voltages (2.4/4.16 kV, 7.2/12/47 kV, 14.4/24.9 kV, 19.9/34.5 kV), not the nominal rated voltage of the device.
4. The SMU Refills do not have separate fuseholders. They fit directly into the SMD-20 units. The end fittings on the old Refill is reused on the new Refill.
5. Ameren Missouri switchgear prior to 2001 contains SM-4 fusing.
6. The overhead SM-4 and SM-5 fuse holders are not loadbreak devices but may be opened and closed with a hook stick.
7. The 14.4kV, SMD-20 switch (which uses the SMU fuses) is a loadbreak device and may be opened and closed with a hook stick while using the Loadbuster tool. Mount spare refill holder (mounting: Stock #40 04 242) 10'-0" above ground on pole.

FUSES AND SWITCHES

Single Phase Sectionalizing
100-300 Amp

10 12 01 **
5,15kV
1 of 1



DCS #	DESCRIPTION
10 12 01 01	100A Fused Switch
10 12 01 02	200A Fused Switch
10 12 01 03	300A Solid Blade Switch

CONSTRUCTION NOTE(s):

1. Maximum lead size shall be 1/0 Cu.

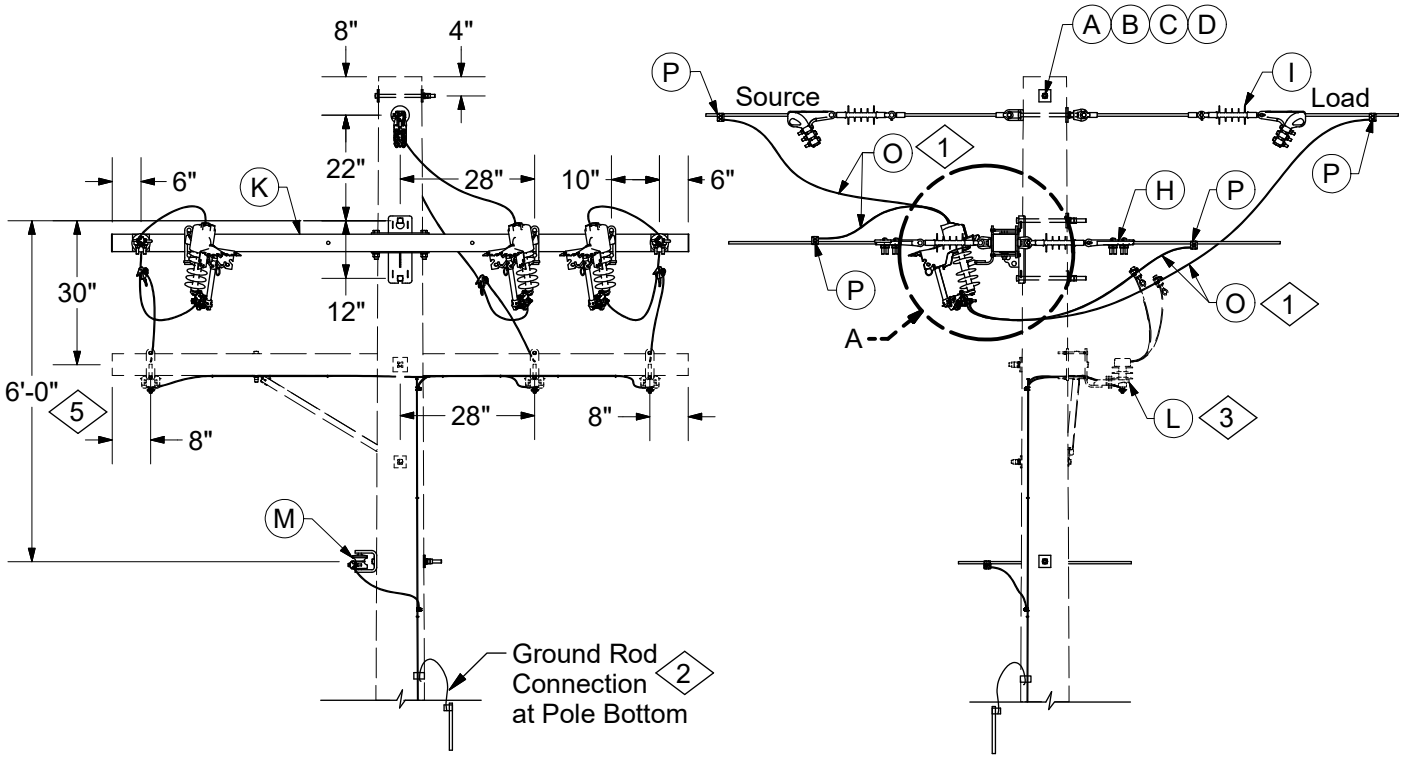
	ITEM	STK / DCS #	DESCRIPTION 10 12 01 **	01	02	03
	A	23 56 063	Bracket - Equipment Mount 3 Position	1	1	1
	B	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	3	3	3
	C	23 66 207	Washer, Curved, Square, 5/8"	3	3	3
	D	23 66 134	Lock Washer - 5/8" Double Coil	3	3	3
	E	23 65 043	Lock Nut - 5/8" Square	3	3	3
	F	23 17 411	Wildlife Guard - Cover Cutout	1	1	1
	G	54 07 208	Switch, Fused, 100A, 15kV	1	-	-
		54 07 209	Switch, Fused, 200A, 15kV	-	1	-
		54 07 210	Switch, Solid Blade, 300A 15kV	-	-	1
@	H	**10 00 01 01**	Link, Fuse (Sized by Engineer)	1	1	1
1,@	I	**07 00 80 00**	Wire, CU, Poly. SD. (ft.)	15	15	15
@	J	**07 00 21 00**	Hot Line Clamp	1	1	1
		07 00 25 00	Clamp, Parallel Groove	1	1	1
@	K	**03 01 ** ** @**	Neutral Configuration	1	1	1
@	L	**06 12 30 03 @**	Dbl Deadend on Pole w/ FG Extension	1	1	1
		06 12 30 13 @	Dbl Deadend on Pole w/o FG Extension	1	1	1

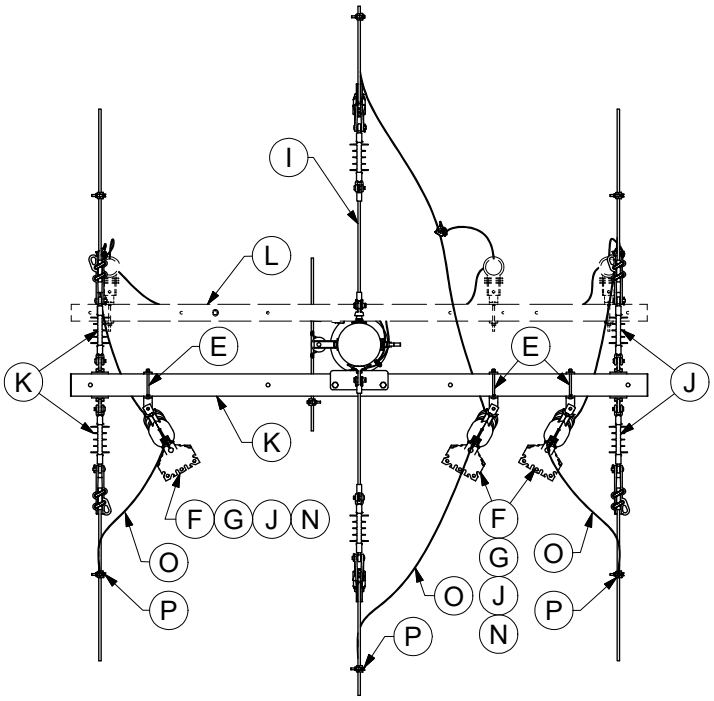
DESIGN NOTE(s):

2. This dimension may be reduced to 40" for existing poles to prevent replacement of otherwise serviceable poles.

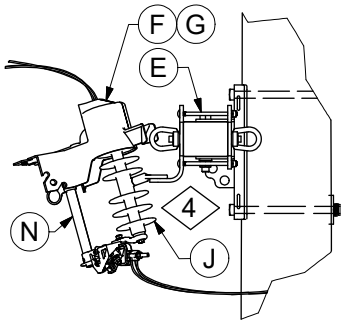
DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
11	01/01/24	DT	Converted to new format
10	06/29/16	WYW	





Top View



Detail A

DCS #	DESCRIPTION
10 12 10 01	100A Fused Switch
10 12 10 02	200A Fused Switch
10 12 10 03	300A Solid Blade Switch
10 12 10 04	600A Disconnect Switch

REV	DATE	ENG	DESCRIPTION
7	01/01/24	DT	Converted to new format
6	06/30/16	WYW	

CONSTRUCTION NOTE(s):

1. Minimum lead size shall be 1/0 Cu for 600A switch. Maximum lead size shall be 1/0 Cu for 100A, 200A, and 300A cutouts.

2. Pole ground is only required when arresters are installed on switch pole.

	ITEM	STK / DCS #	DESCRIPTION 10 12 10 **	01	02	03	04
	A	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	1	1	1	1
	B	23 66 207	Washer, Curved, Square, 5/8"	2	2	2	2
	C	23 66 134	Lock Washer - 5/8" Double Coil	1	1	1	1
	D	23 65 043	Lock Nut - 5/8" Square	1	1	1	1
	E	17 58 054	Bracket, Arrester/Cutout Mounting	6	6	6	6
	F	23 17 411	Wildlife Guard - Cover Cutout	3	3	3	-
	G	23 17 512	Wildlife Guard - Vertical Switch 600 Amp	-	-	-	3
	H	**06 12 35 02 @**	Double Deadend on FG Arm	2	2	2	2
	I	**06 12 30 13 @**	Dbl Deadend on Pole w/o FG Extension	1	1	1	1
	J	54 07 208	Open Type Fused Switch	3	-	-	-
		54 07 209	200A Fused Switch, 15kV	-	3	-	-
		54 07 210	300A Solid Blade Switch	-	-	3	-
		54 07 296	Switch - Disconnect 15kV 600 Amp	-	-	-	3
4,@	K	**04 00 42 02**	Crossarm - Deadend, F/G 8'	1	1	1	1
		04 00 42 03	Crossarm - Deadend, F/G 10'	1	1	1	1
3,@	L	**12 12 01 07 @**	Lightning Arrester Installation	#	#	#	#
@	M	**03 01 ** ** @**	Secondary Configuration	1	1	1	1
@	N	**10 00 01 01**	Link, Fuse (Sized by Designer)	3	3	-	-
1,@	O	**07 00 80 00**	Wire - Poly Covered, S.D. (ft)	30	30	30	30
@	P	**07 00 21 00**	Clamp, Hot Line	6	6	6	6
		07 00 25 00	Clamp, Parallel Groove	6	6	6	6
6,@	Q	60 55 041	FCI, Non Communicating, 8hr or 3A reset, 100A min Trip	#	#	#	#

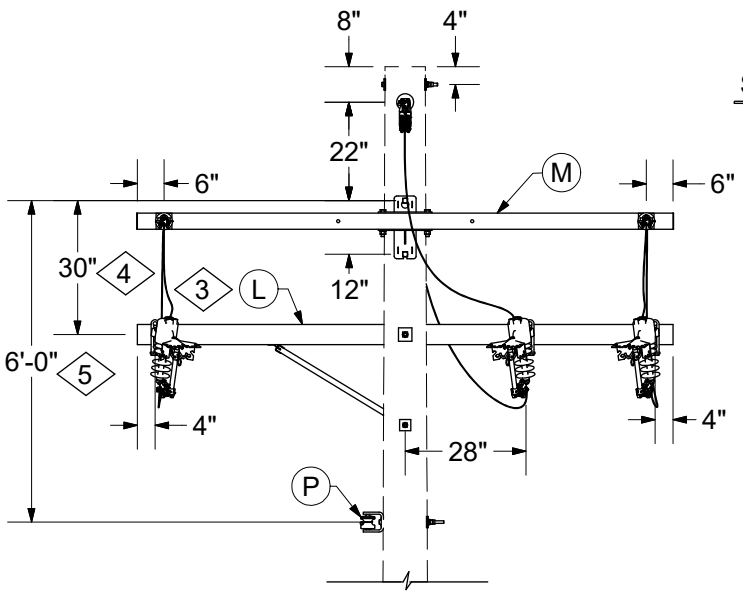
DESIGN NOTE(s):

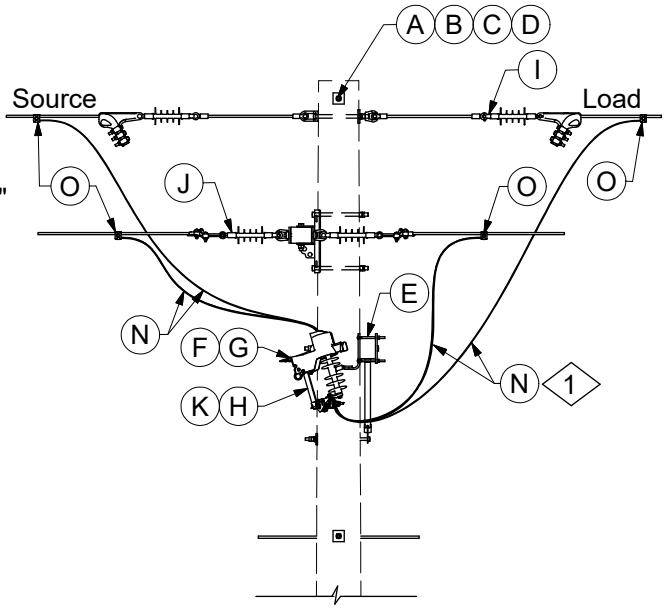
3. Arresters are not required for normally closed switch installations. Where switches are normally open, install arresters on adjacent poles on both sides of switch. When installing arresters on adjacent poles is not practical, arresters may be installed on a crossarm below the switch arm for one side of the switch. Refer to DCS **12 00 01 01** for arresters selection.

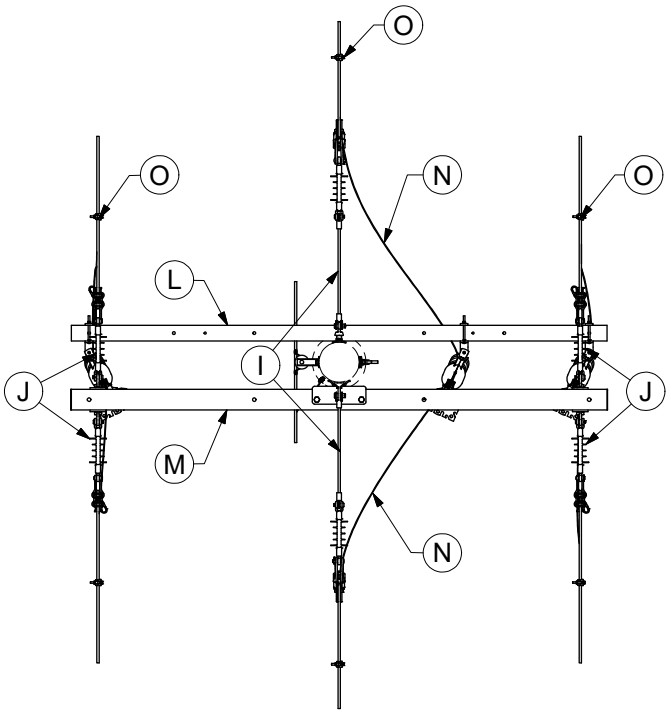
4. Switches may be installed on existing serviceable double wood arms.

5. This dimension may be reduced to 40" on existing poles to avoid replacing otherwise serviceable poles unless arresters are installed on same pole.

6. FCI's may be installed on line conductor from 1/0 and larger when solid blade switches are installed.







Top View

DCS #	DESCRIPTION
10 12 11 01	100A Fused Switch
10 12 11 02	200A Fused Switch
10 12 11 03	300A Fused Switch
10 12 11 04	600A Disconnect Switch

CONSTRUCTION NOTE(s):

1. Minimum lead size shall be 1/0 cu for 600A switches. Maximum lead size shall be 1/0 Cu for 100A, 200A, and 300A switches.

	ITEM	STK / DCS #	DESCRIPTION 10 12 11 **	01	02	03	04
	A	23 52 065	Bolt - Mach., 5/8" x 12" w/ square nut	1	1	1	1
	B	23 66 207	Washer - Curved, Square, 5/8"	2	2	2	2
	C	23 66 134	Lock Washer - 5/8" Double Coil	1	1	1	1
	D	23 65 043	Lock Nut - 5/8" Square	1	1	1	1
	E	17 58 054	Bracket, Arrester/Cutout Mounting	3	3	3	3
	F	23 17 411	Wildlife Guard - Cover Cutout	3	3	3	-
	G	23 17 512	Wildlife Guard - Vertical Switch 600 Amp	-	-	-	3
	H	54 07 208	100A Fused Switch	3	-	-	-
		54 07 209	200A Fused Switch	-	3	-	-
		54 07 210	300A Solid Blade Switch	-	-	3	-
		54 07 296	600A Disconnect Switch	-	-	-	3
	I	**06 12 30 03 @**	Dbl Deadend on Pole w/ FG Extension	1	1	1	1
	J	**06 12 35 02 @**	Dbl Deadend on F/G Crossarm	2	2	2	2
@	K	**10 00 01 01**	Link - Fuse (Sized by Engineer)	3	3	-	-
3,@	L	**04 00 20 03**	Crossarm - Wood, 10' (use only half of V-brace)	1	1	1	1
		04 00 41 16	Crossarm - Tangent, F/G 10'	1	1	1	1
@	M	**04 00 42 03**	Crossarm - Deadend, F/G 10'	1	1	1	1
1,@	N	**07 00 80 00**	Wire - Poly Covered, S.D. (ft.)	30	30	30	30
@	O	**07 00 25 00**	Clamp - Parallel Groove	6	6	6	6
		07 00 21 00	Clamp - Hot Line	6	6	6	6
@	P	**03 01 ** ** @**	Secondary Configuration	1	1	1	1
6,@	Q	60 55 041	FCI, Non Communicating, 8hr or 3A reset, 100A min Trip	#	#	#	#

DESIGN NOTE(s):

2. Arresters are not required for normally closed switch installations. For normally open switches, install a set of arresters on adjacent poles on both sides of the switch. Refer to DCS **12 00 01 01** for arresters selection.

3. 8'-0" crossarms may be substituted when required.

4. This dimension may be reduced to 24" on existing poles to avoid replacing otherwise serviceable poles.

5. If switch crossarm is installed at 24", this dimension may be reduced to 40" on existing poles to avoid replacing otherwise serviceable poles.

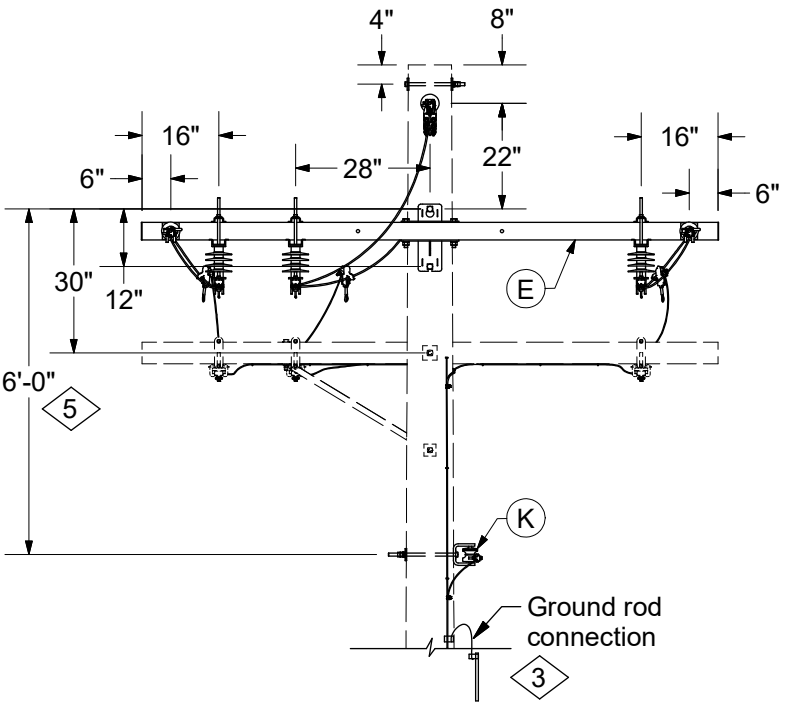
6. FCI's may be installed on line conductor from 1/0 and larger when solid blade switches are installed.

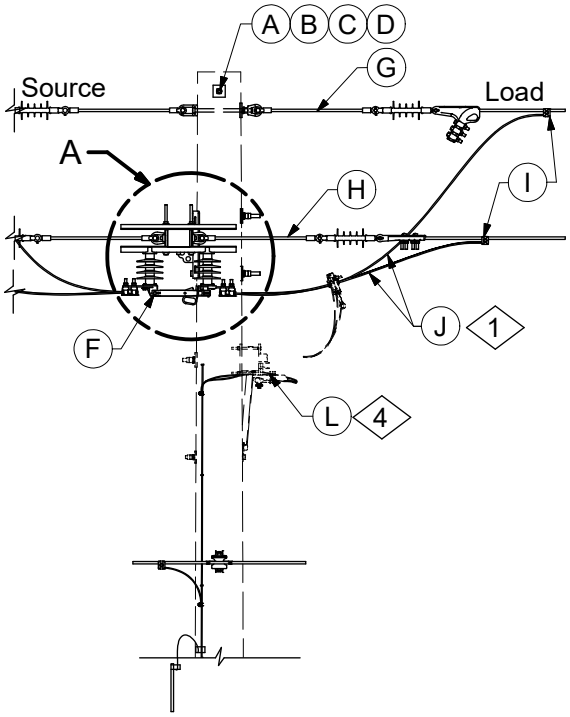
REV	DATE	ENG	DESCRIPTION
14	01/01/24	DT	Converted to new format
13	08/30/16	WYW	

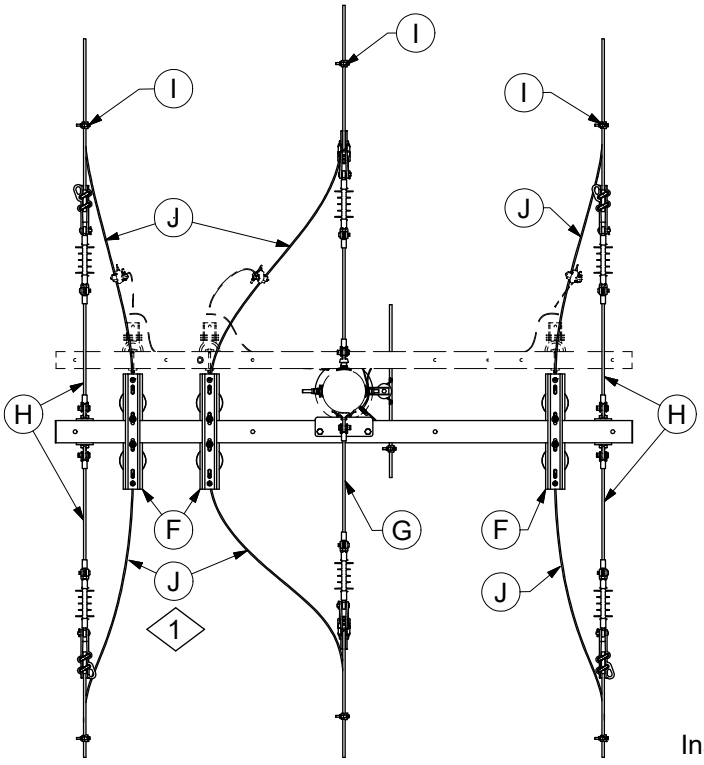
FUSES AND SWITCHES

Three Phase Sectionalizing
Underhung Mount, 600 Amp

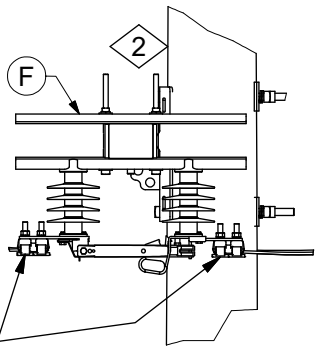
10 12 13 **
5, 15kV
1 of 2







Top View



Detail A

DCS#	DESCRIPTION
10 12 13 01	600A, on 8' FG Crossarm
10 12 13 02	600A, on 10' FG Crossarm

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
5	01/01/24	DT	Converted to new format
4	06/30/16	WYW	

CONSTRUCTION NOTE(s):

1. Minimum lead size shall be 1/0 Cu.

2. Outer mounting bolts for switch shall not be installed when switch is installed on single crossarm. Inner mounting bolts should be installed in closest position to crossarm possible.

3. Pole ground is only required when arresters are installed on switch pole.

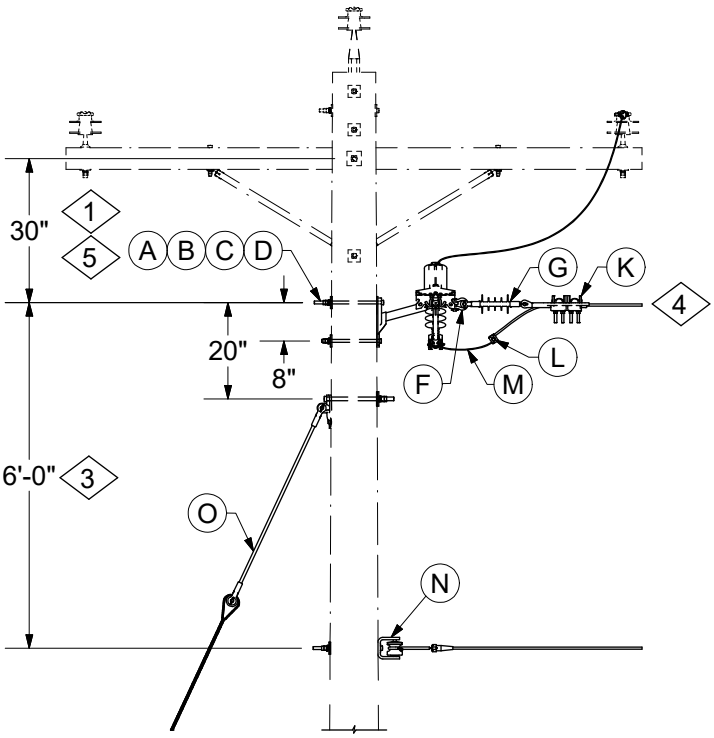
	ITEM	STK / DCS #	DESCRIPTION 10 12 13 **	01	02
	A	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	2	2
	B	23 66 207	Washer, Curved, Square, 5/8"	2	2
	C	23 66 134	Lock Washer - 5/8" Double Coil	1	1
	D	23 65 043	Lock Nut - 5/8" Square	1	1
	E	**04 00 42 02**	Crossarm - Deadend, F/G 8'	1	-
		04 00 42 03	Crossarm - Deadend, F/G 10'	-	1
	F	54 07 204	Switch, Disc. 600A., 15 kV	3	3
	G	**06 12 30 03 @**	Dbl Deadend on Pole w/ FG Extension	1	1
	H	**06 12 35 04 @**	Dbl Deadend on FG Crossarm w/ FG Extension	2	2
@	I	**07 00 25 00**	Clamp, Parallel Groove	6	6
1,@	J	**07 00 80 00**	Wire, Poly Covered (ft.)	15	15
@	K	**03 01 ** ** @**	Secondary Configuration	1	1
@	L	**12 12 01 07 @**	Lightning Arrester Installation	-	-
6,@	M	60 55 041	FCI, Non Communicating, 8hr or 3A reset, 100A min Trip	#	#

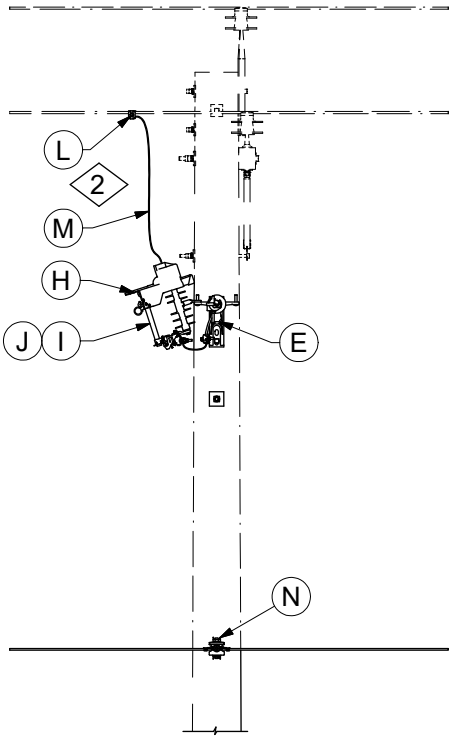
DESIGN NOTE(s):

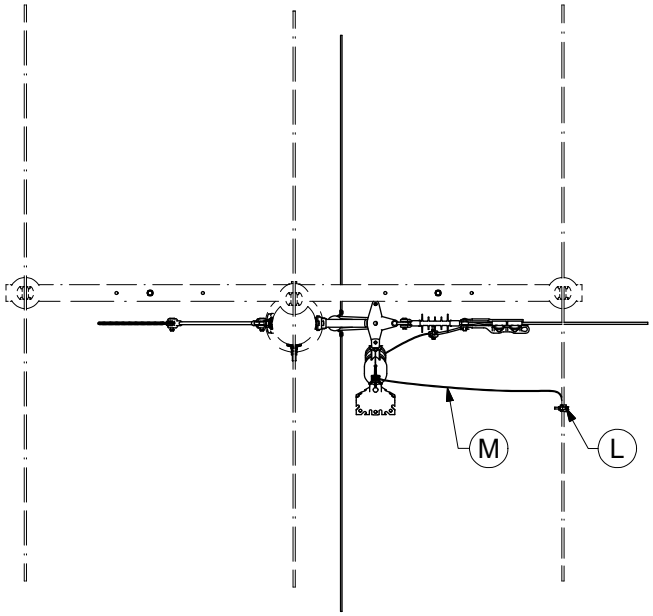
4. Arresters are not required for normally closed switch installations. Where switches are normally open, install arresters on adjacent poles on both sides of the switch. When installing arresters on adjacent poles is not practical, arresters may be installed on a crossarm 24" below deadend crossarm for one side of the switch as long as there is 6'-0" of clearance between deadend crossarm and neutral. See DCS **12 00 01 01** for arresters selection.

5. This dimension may be reduced to 40" on existing poles to avoid replacing otherwise serviceable poles.

6. FCI's may be installed on line conductor from 1/0 and larger when switches are installed.







Top View

DCS #	DESCRIPTION
10 12 22 01	100A Fused Switch
10 12 22 02	200A Fused Switch
10 12 22 03	300A Solid Blade Switch

REV	DATE	ENG	DESCRIPTION
12	01/01/24	DT	Converted to new format
11	03/21/17	WYW	

CONSTRUCTION NOTE(s):

1. For armless construction, apply dimension shown to upper bolt of lowest insulator. For single phase pole, use 36" from the top of the pole.

2. Maximum lead size shall be 1/0 Cu.

	ITEM	STK / DCS #	DESCRIPTION 10 12 22 **	01	02	03
	A	23 52 065	Bolt - Mach., 5/8" x 12" w/ square nut	2	2	2
	B	23 66 207	Washer - Curved, Square, 5/8"	2	2	2
	C	23 66 134	Lock Washer - 5/8" Double Coil	2	2	2
	D	23 65 043	Lock Nut - 5/8" Square	2	2	2
4	E	23 56 063	Bracket - Equipment Mount 3 Position	1	1	1
	F	23 68 181	Shackle - Deadend	1	1	1
	G	25 06 052	Insulator - Deadend, 12kV	1	1	1
	H	23 17 411	Wildlife Guard - Cover Cutout	1	1	1
	I	54 07 208	100A Fused Switch	1	-	-
		54 07 209	200A Fused Switch	-	1	-
		54 07 210	300A Solid Blade Switch	-	-	1
@	J	**10 00 01 01 @**	Link - Fused (Sized by Engineer)	1	1	1
@	K	**07 00 11 00**	Clamp - Deadend	1	1	1
@	L	**07 00 21 00**	Clamp - Hot Line	1	1	1
		07 00 25 00	Clamp - Parallel Groove	2	2	2
2,@	M	**07 00 80 00**	Wire - Poly Covered (ft.)	10	10	10
@	N	**03 01 ** ** @**	Secondary Configuration	1	1	1
@	O	**11 00 ** ** @**	Guy Unit	1	1	1
6,@	P	60 55 041	FCI, Non Communicating, 8hr or 3A reset, 100A min Trip	#	#	#

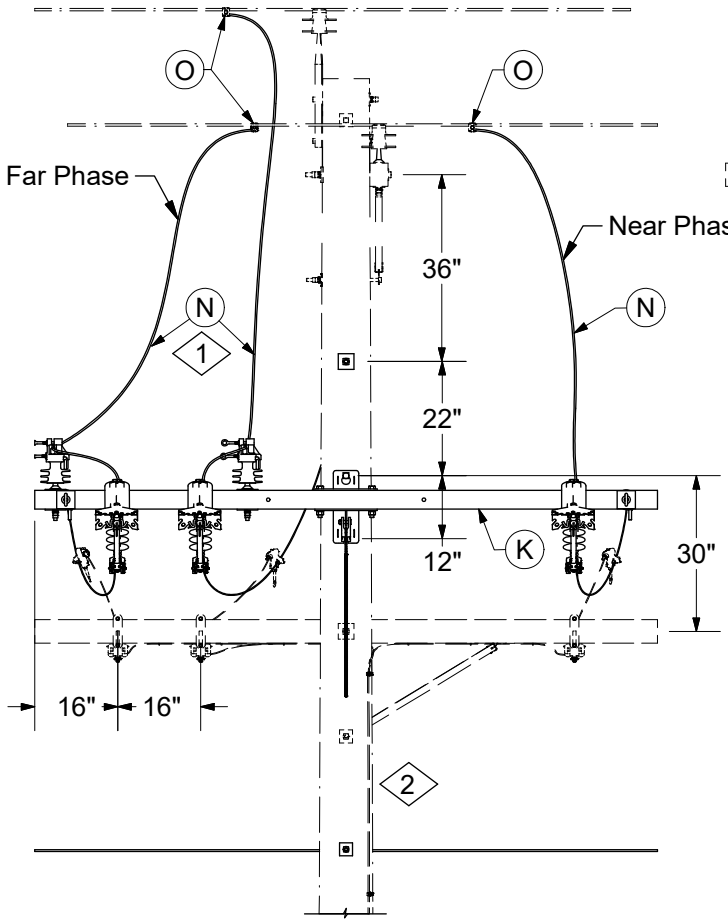
DESIGN NOTE(s):

3. This dimension may be reduced to 40" for an existing pole to prevent replacement of otherwise serviceable poles.

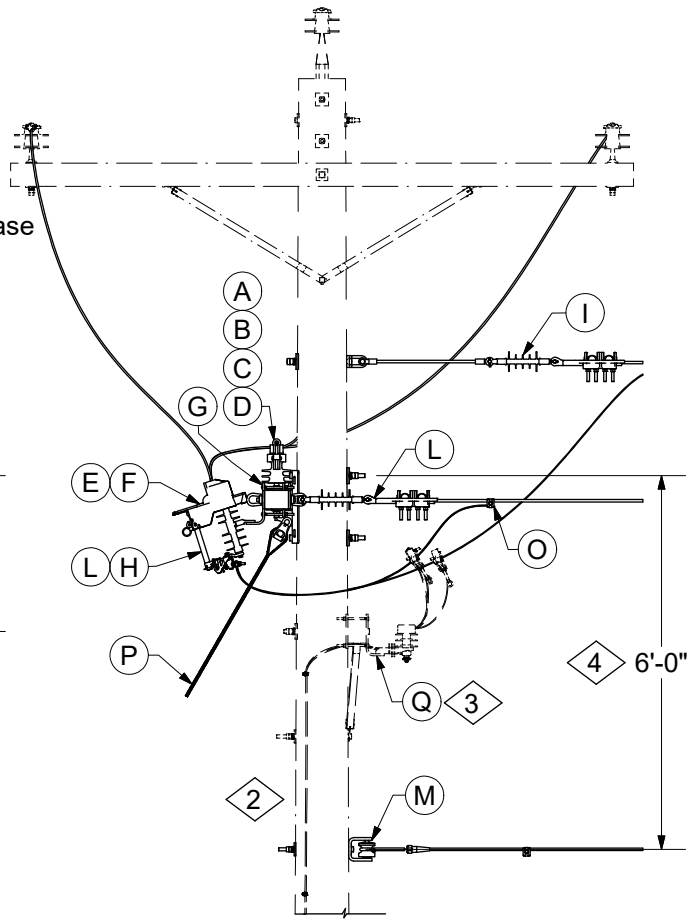
4. Maximum line tension of 5,000 pounds for Item E.

5. This dimension may be reduced to 24" for an existing pole to prevent replacement of otherwise serviceable poles.

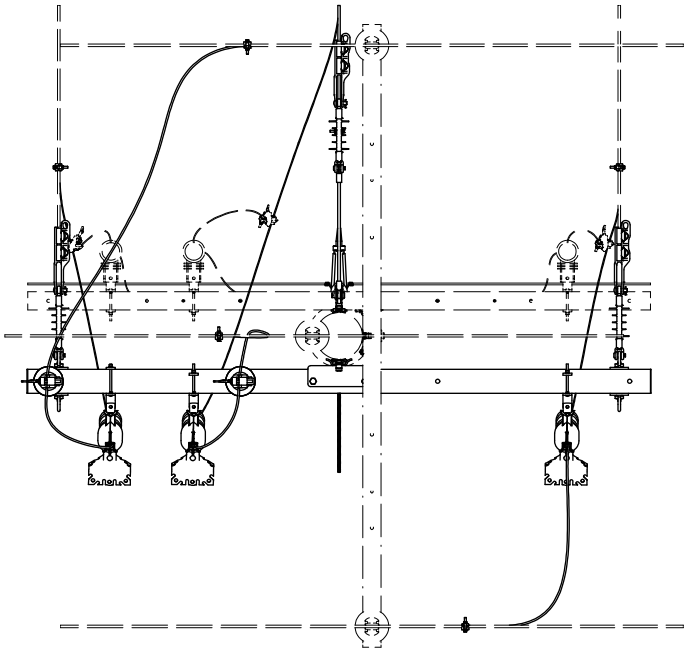
6. FCI's may be installed on line conductors from 1/0 and larger when solid blade switches are installed.



Front View



Side View



Top View

DCS #	Description
10 12 23 01	2-Phase, 100A Switch, Fused
10 12 23 02	2-Phase, 200A Switch, Fused
10 12 23 03	2-Phase, 300A Switch, Solid Blade
10 12 23 04	2-Phase, 600A Disconnect Switch
10 12 23 05	3-Phase, 100A Switch, Fused
10 12 23 06	3-Phase, 200A Switch, Fused
10 12 23 07	3-Phase, 300A Switch, Solid Blade
10 12 23 08	3-Phase, 600A Disconnect Switch

REV	DATE	ENG	DESCRIPTION
12	01/01/24	DT	Converted to new format
11	06/01/17	WYW	

CONSTRUCTION NOTE(s):

1. Maximum lead size for 100-300A switches shall be 1/0 Cu. Minimum lead size for 600A switches shall be 1/0 Cu.

2. Pole ground is only required when arresters are installed on switch pole.

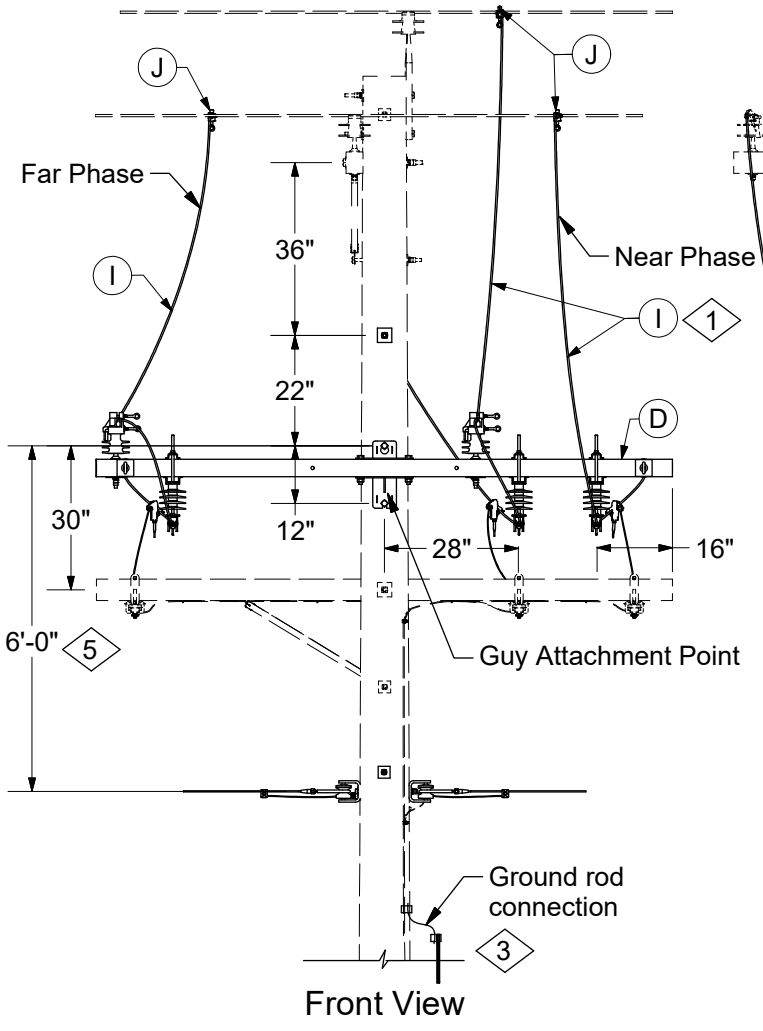
	ITEM	STK / DCS #	DESCRIPTION 10 12 23 **	01	02	03	04	05	06	07	08
	A	25 05 143	Insulator, Vice Top, 12kV	1	1	1	1	2	2	2	2
	B	23 62 028	Pin, Insulator, Long Shank	1	1	1	1	2	2	2	2
	C	23 66 132	Washer, Flat, Sq., 4" x 4", w/ 13/16" Hole	2	2	2	2	4	4	4	4
	D	23 65 043	Lock Nut - 5/8" Square	1	1	1	1	2	2	2	2
	E	23 17 411	Wildlife Guard - Cover Cutout	2	2	2	-	3	3	3	-
	F	23 17 512	Wildlife Guard - Vertical Switch 600 Amp	-	-	-	2	-	-	-	3
	G	10 01 133	Bracket NEMA, Switch	2	2	2	2	3	3	3	3
	H	54 07 208	100A Fused Switch, 15kV	2	-	-	-	3	-	-	-
		54 07 209	200A Fused Switch, 15kV	-	2	-	-	-	3	-	-
		54 07 210	300A Solid Body Switch, 15kV	-	-	2	-	-	-	3	-
		54 07 296	Switch - Disconnect 15kV 600 Amp	-	-	-	2	-	-	-	3
	I	**06 12 30 01 @**	Deadend on Pole w/ F/G Extension	1	1	1	1	1	1	1	1
	J	**06 12 35 01 @**	Single Deadend on F/G Arm	2	2	2	2	2	2	2	2
@	K	**04 00 42 02**	Crossarm - Deadend, F/G 8'	1	1	1	1	1	1	1	1
		04 00 42 03	Crossarm - Deadend, F/G 10'	1	1	1	1	1	1	1	1
@	L	**10 00 01 01 @**	Link - Fused (Sized by Designer)	2	2	-	-	3	3	-	-
1,@	M	**03 01 ** ** @**	Secondary Configuration	1	1	1	1	1	1	1	1
@	N	**07 00 80 00**	Wire, Poly Covered, S.D. (ft.)	20	20	20	20	30	30	30	30
	O	**07 00 21 00**	Clamp - Hot Line	4	4	4	4	6	6	6	6
@		**07 00 25 00**	Clamp, Parallel Groove	4	4	4	4	6	6	6	6
@	P	**11 00 4* ** @**	Guying Unit (Down, Span, or Sidewalk)	1	1	1	1	1	1	1	1
@	Q	**12 12 01 07 @**	Lightning Arrester Installation	1	1	1	1	1	1	1	1
5,@	R	60 55 041	FCI, Non Communicating, 8hr or 3A reset, 100A min Trip	#	#	#	#	#	#	#	#

DESIGN NOTE(s):

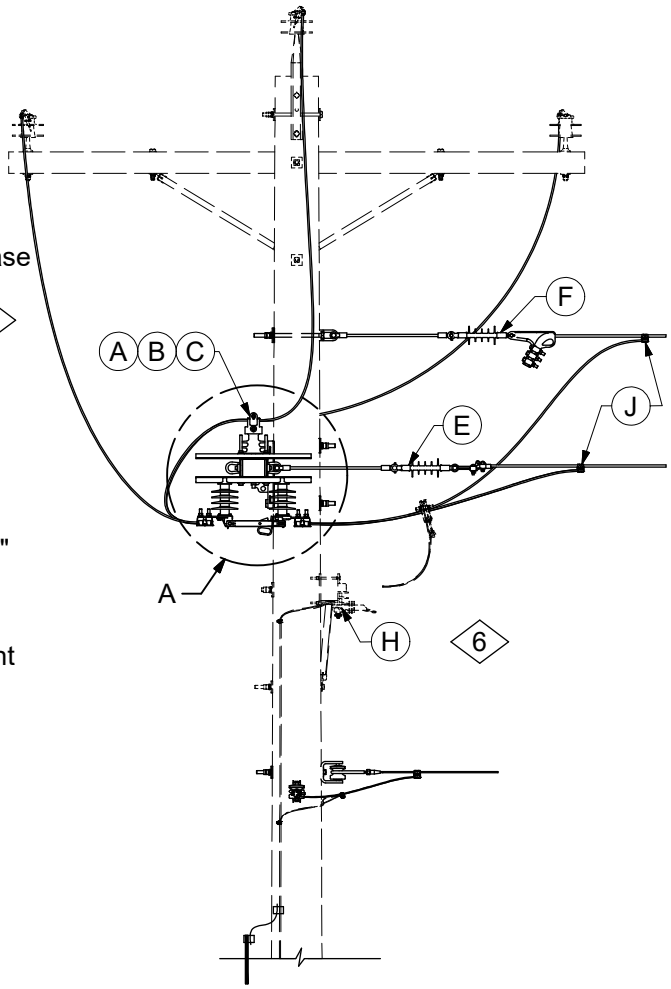
3. Arresters are not required for normally closed switch installations. Where switches are normally open, install arresters on adjacent pole if the circuit on that side of the switch does not extend in both directions. When installing arresters on adjacent pole for lower circuit is not practical, arresters may be installed on a crossarm 30" below the buckarm for that side of the switch if there is 6'-0" of clearance between buckarm and neutral. See DCS **12 00 01 01** for arresters selection.

4. This dimension may be reduced to 40" on existing poles to avoid replacing otherwise serviceable poles.

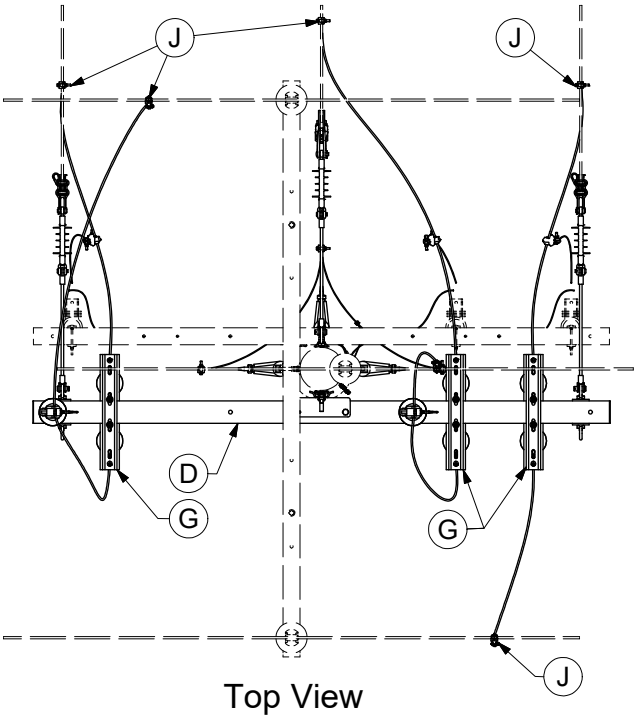
5. FCI's may be installed on line conductor from 1/0 and larger when solid blade switches are installed.



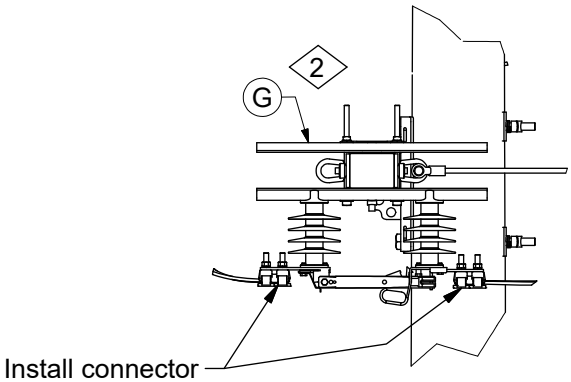
Front View



Side View



Top View



Detail A

REV	DATE	ENG	DESCRIPTION
10	01/01/24	DT	Converted to new format
9	06/30/16	WYW	

CONSTRUCTION NOTE(s):

1. Minimum lead wire size shall be 1/0 Cu.

2. Outer mounting bolts for switch shall not be installed when switch is mounted on single crossarm. Inner mounting bolts should be installed in closest position to crossarm possible.

3. Pole ground is only required when arresters are installed on switch pole.

	ITEM	STK / DCS #	DESCRIPTION 10 12 24 **	02
	A	23 62 028	Pin, Insulator, Long Shank	2
	B	23 66 132	Washer, Flat, Sq., 4" x 4", w/ 13/16" Hole	4
	C	25 05 143	Insulator, Vice Top, 15kV	2
	D	**04 00 42 03**	Crossarm - Deadend, F/G 10'	1
	E	**06 12 35 03 @**	Single Deadend on Crossarm with FG Extention	2
	F	**06 12 30 01 @**	Deadend on Pole with FG Extention	1
2,4	G	54 07 204	Switch, Disc. 600A., 15 kV	3
6,@	H	**12 12 01 07 @**	Arrester Installation	1
@	I	**07 00 80 00**	Wire, Poly covered	20
@	J	**07 00 25 00**	Clamp, Parallel Groove	3
7,@	K	60 55 041	FCI, Non Communicating, 8hr or 3A reset, 100A min Trip	#

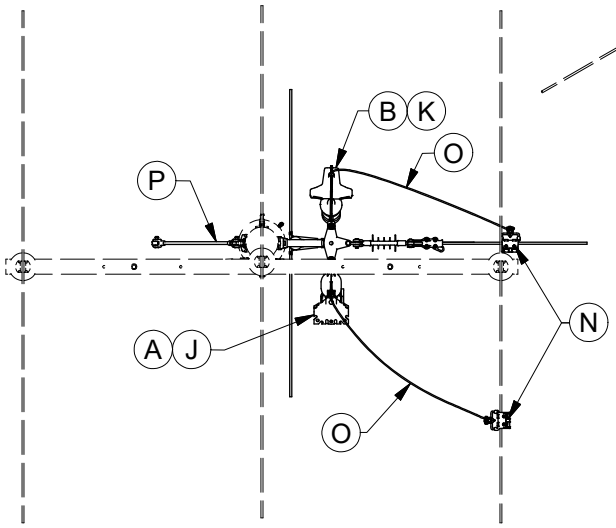
DESIGN NOTE(s):

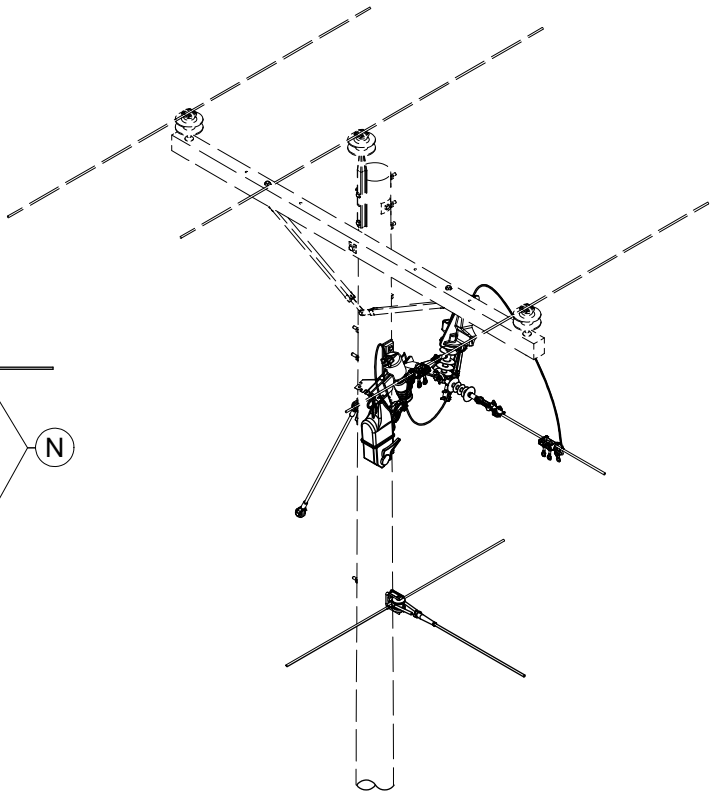
4. Switches may be installed on existing serviceable double wood crossarms.

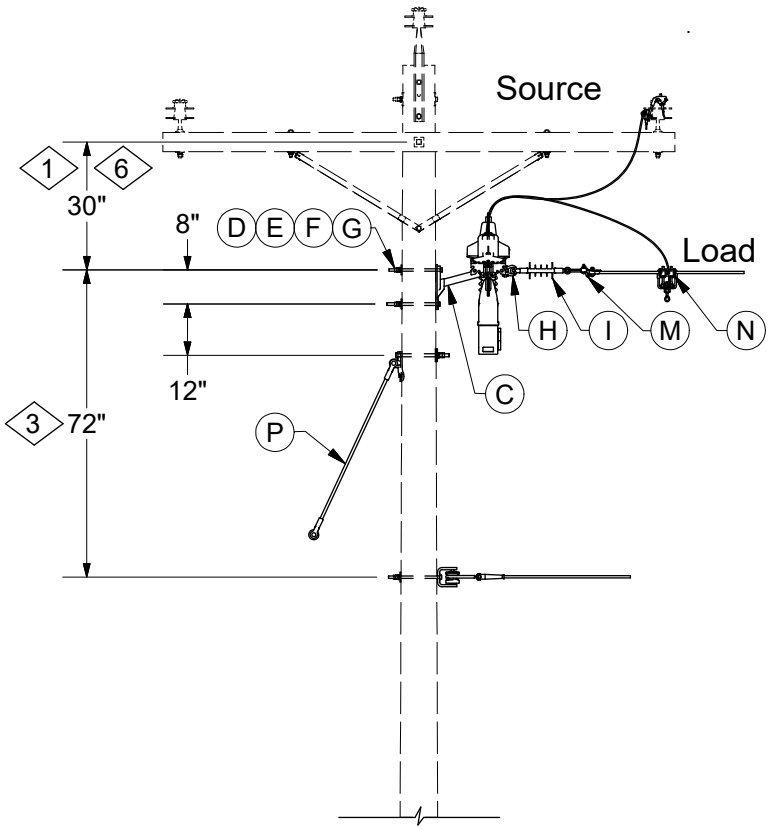
5. This dimension may be reduced to 40" on existing poles to avoid replacing otherwise serviceable poles.

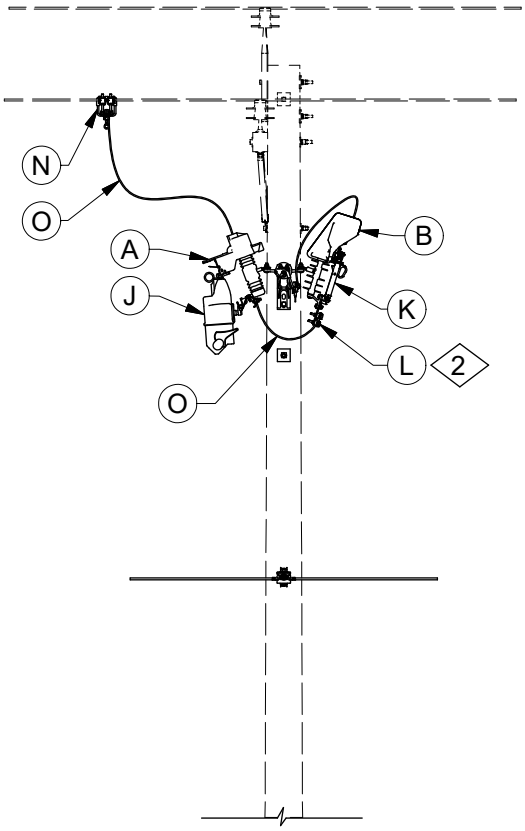
6. Arresters are not required for normally closed switch installations. Where switches are normally open, install arresters on adjacent pole if the circuit on that side of the switch does not extend in both directions. When installing arresters on adjacent pole for lower circuit is not practical, arresters may be installed on a crossarm 30" below the buckarm for that side of the switch if there is 6'-0" of clearance between buckarm and neutral. See DCS **12 00 01 01** for arresters selection.

7. FCI's may be installed on line conductor from 1/0 and larger when switches are installed.



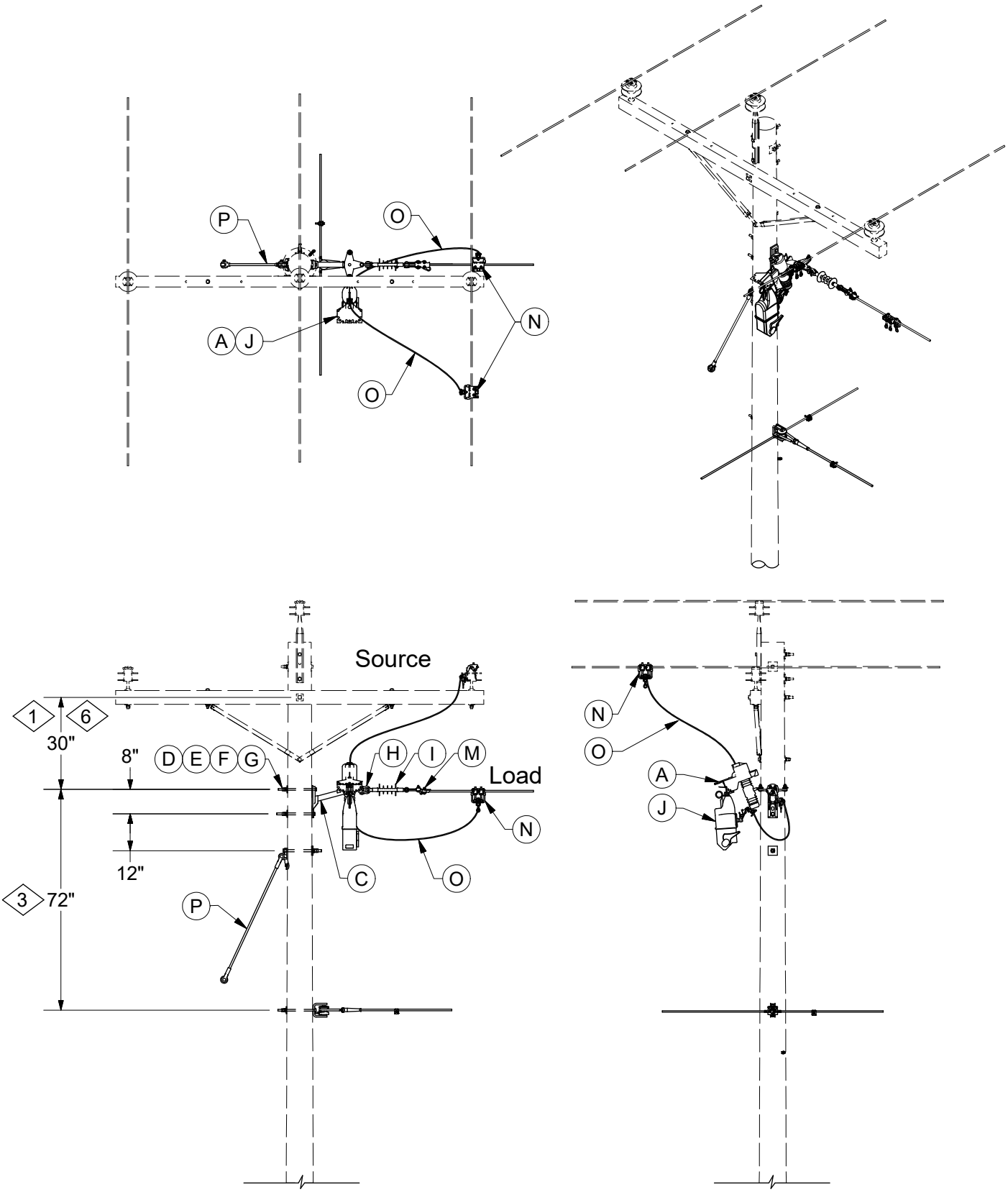






10 12 25 01
Tripsaver with 600 Amp Switch

REV	DATE	ENG	DESCRIPTION
005	07/01/20	DT	Conversion to new standard book format
004	04/01/19	DT	Added Connector 17 51 114 and replaced switch avian protection



10 12 25 02
Tripsaver Without 600 Amp Switch 8

REV	DATE	ENG	DESCRIPTION
005	07/01/20	DT	Conversion to new standard book format
004	04/01/19	DT	Added Connector 17 51 114 and replaced switch avian protection

Tripsaver Stock Numbers	
STK #	**DESCRIPTION**
69 10 279	10T trip - 10T drop open, 40A continuous
69 10 280	20T trip - 20T drop open, 40A continuous
69 10 281	25T trip - 25T drop open, 40A continuous
69 10 282	30T trip - 30T drop open, 40A continuous
69 10 283	40T trip - 40T drop open, 40A continuous (IL only)
69 10 258	40T trip - 40T drop open, 100A continuous (MO only)
69 10 278	50T trip - 50T drop open, 100A continuous
69 10 253	65T trip - 65T drop open, 100A continuous
69 10 254	80T trip - 80T drop open, 100A continuous
69 10 255	100T trip - 100T drop open, 100A continuous
69 10 269	100T trip - 100T drop open, 200A continuous
69 10 270	140T trip - 140T drop open, 200A continuous
69 10 264	User Programmed, 40A continuous
69 10 260	User Programmed, 100A continuous
69 10 267	User Programmed, 200A continuous

CONSTRUCTION NOTE(s):

1. For armless construction, apply dimension shown to upper bolt of lowest insulator. For single phase pole, use 36" from the top of the pole.

2. When Conductor is smaller than 1/0, replace two bolt connectors on 600A switch with Stock #17 51 114.

	ITEM	STK / DCS #	DESCRIPTION 10 12 25 **	01	02
	A	23 17 411	Wildlife Guard - Cover Cutout	1	1
	B	23 17 512	Wildlife Guard - Vertical Switch 600 Amp	1	-
5	C	23 56 063	Bracket - Equipment Mount 3 Position	1	1
	D	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	2	2
	E	23 66 027	Washer, Flat, Square 5/8"	2	2
	F	23 66 134	Lock Washer - 5/8" Double Coil	2	2
	G	23 65 043	Lock Nut - 5/8" Square	2	2
	H	23 68 181	Shackle - Deadend	1	1
	I	25 06 052	Insulator, Deadend, 12kV	1	1
	J	-	Tripsaver II - See Stock Number Table Above	1	1
	K	54 07 296	Switch - Disconnect 15kV 600 Amp	1	-
@	L	17 51 114	Connector - One Bolt #8 to 2/0	2	-
@	M	**07 00 11 00 @**	Clamp, Deadend	1	1
@	N	**07 00 21 00 @**	Hotline Clamp and Stirrup	2	2
@	O	**07 00 80 00 @**	Wire - Poly Covered (ft.)	10	10
@	P	**11 00 ** ** @**	Guy Unit	1	1

REV	DATE	ENG	DESCRIPTION
005	07/01/20	DT	Conversion to new standard book format
004	04/01/19	DT	Added Connector 17 51 114 and replaced switch avian protection

DESIGN NOTE(s):

3. This dimension may be reduced to 40" for existing poles to prevent replacement of otherwise serviceable poles.

4. Stock #69 10 260, stock #69 10 264 and stock #69 10 267 must be programmed before installation. The programming kit is stock #69 10 259 if needed.

5. Maximum line tension of 5,000 pounds for item C.

6. This dimension may be reduced to 24" for existing pole to prevent replacement of otherwise serviceable poles.

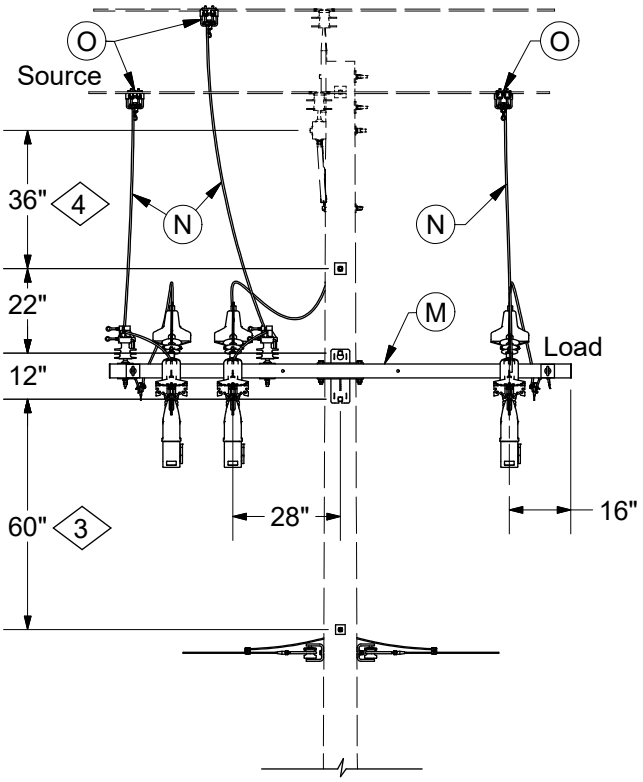
7. If fused switches are currently installed on a three point bracket with this configuration, tripsavers may be installed using existing dimensions.

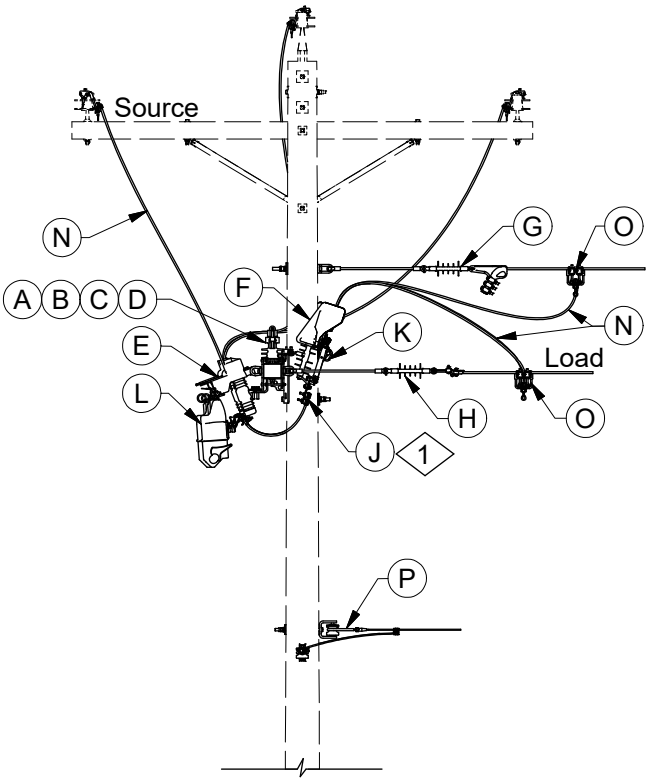
8. DCS 10 12 25 02 (omitting 600 amp switch) MUST be installed in locations that are bucket truck accessible and only available in Illinois.

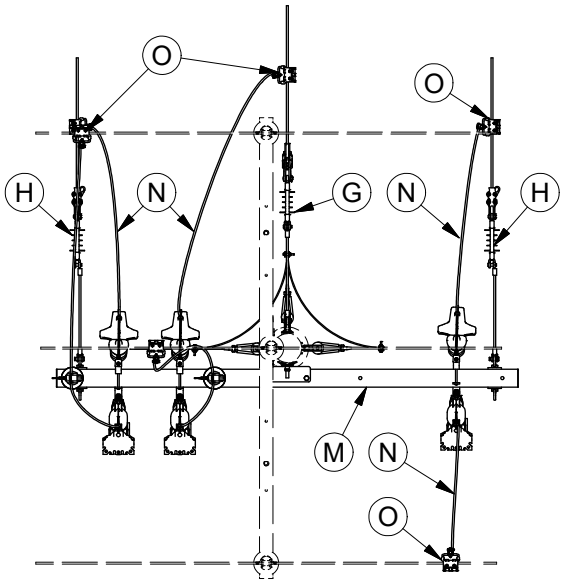
OPERATIONS NOTE(s):

9. If equipped with 600 amp switch, when closing Tripsaver, do not pick up load.
   - Open solid blade switch.
   - Close Tripsaver.
   - Close solid blade switch.

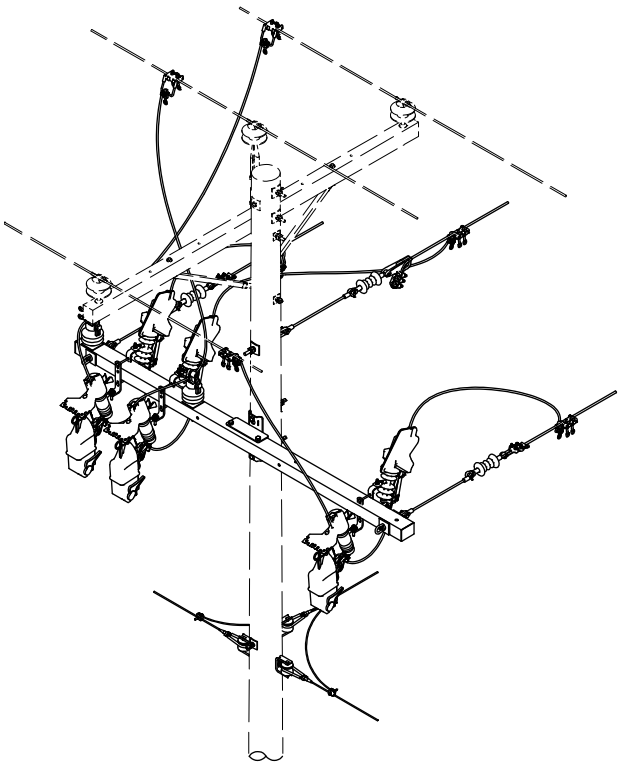
10. When 600 amp switch is omitted, do not close Tripsaver using extendo stick.







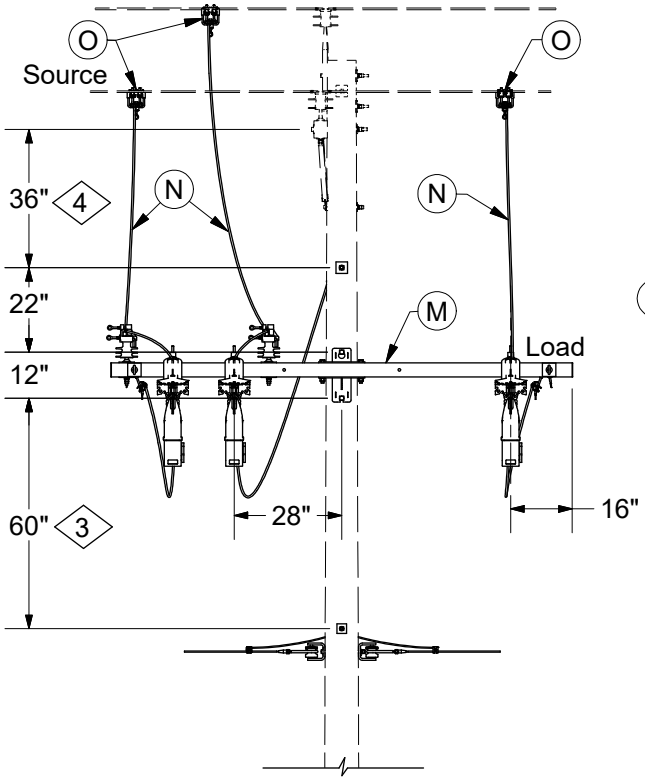
Top View

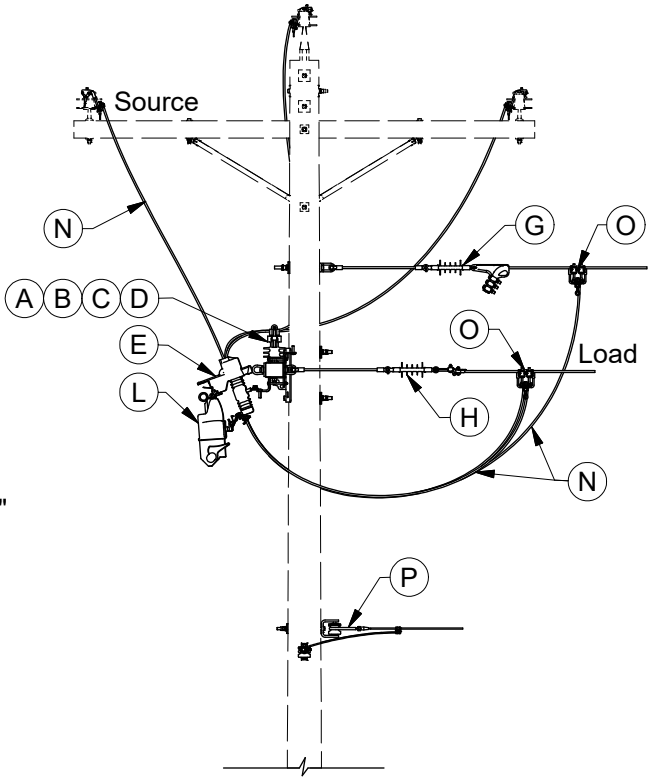


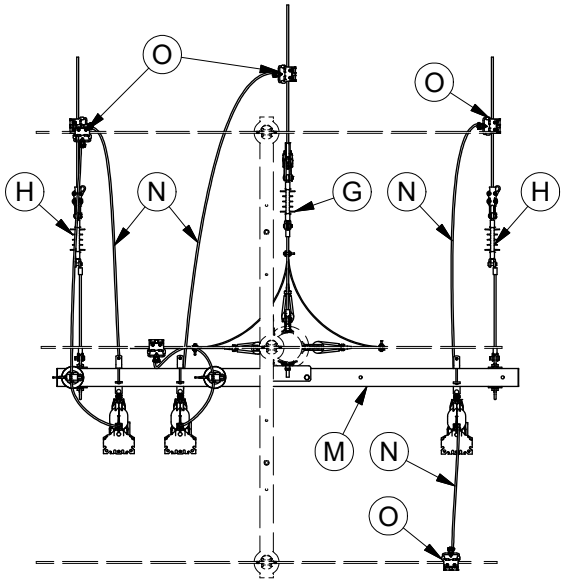
Isometric View

DCS#	DESCRIPTION
10 12 26 01	2-Phase Tripsavers with 600A Switches
10 12 26 02	3-Phase Tripsavers with 600A Switches

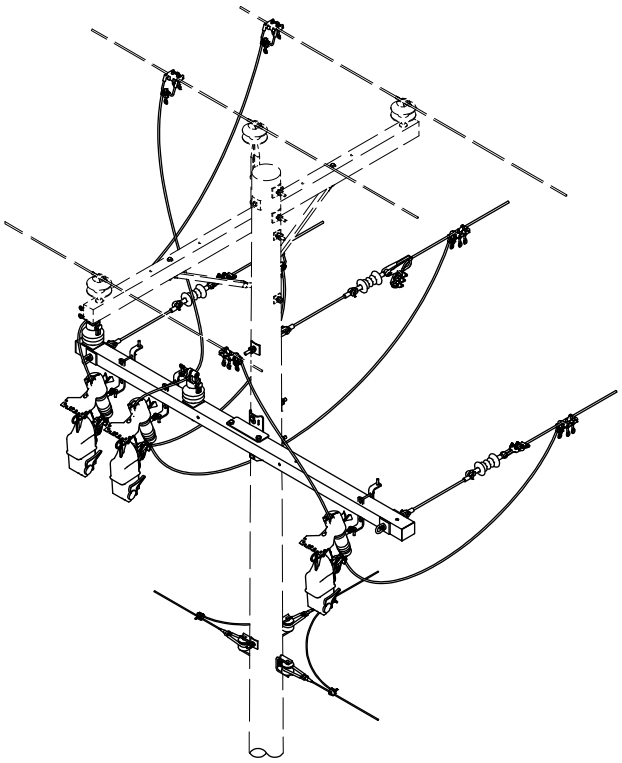
REV	DATE	ENG	DESCRIPTION
4	01/01/24	JMW	Updated to new book format
3	04/01/19	DT	Updates to switch connectors and avian protection







Top View



Isometric View

DCS#	DESCRIPTION	
10 12 26 03	2-Phase Tripsavers without 600A Switches	6
10 12 26 04	3-Phase Tripsavers without 600A Switches	

REV	DATE	ENG	DESCRIPTION
4	01/01/24	JMW	Updated to new book format
3	04/01/19	DT	Updates to switch connectors and avian protection

Tripsaver Stock Numbers	
STK #	**DESCRIPTION**
69 10 279	10T trip - 10T drop open, 40A continuous
69 10 280	20T trip - 20T drop open, 40A continuous
69 10 281	25T trip - 25T drop open, 40A continuous
69 10 282	30T trip - 30T drop open, 40A continuous
69 10 283	40T trip - 40T drop open, 40A continuous (IL only)
69 10 258	40T trip - 40T drop open, 100A continuous (MO only)
69 10 278	50T trip - 50T drop open, 100A continuous
69 10 253	65T trip - 65T drop open, 100A continuous
69 10 254	80T trip - 80T drop open, 100A continuous
69 10 255	100T trip - 100T drop open, 100A continuous
69 10 269	100T trip - 100T drop open, 200A continuous
69 10 270	140T trip - 140T drop open, 200A continuous
69 10 264	User Programmed, 40A continuous
69 10 260	User Programmed, 100A continuous
69 10 267	User Programmed, 200A continuous

CONSTRUCTION NOTE(s):

1. Replace two bolt connectors on 600A switch with Stock #17 51 114, when conductor (item N) is smaller than 1/0.

	ITEM	STK / DCS #	DESCRIPTION **10 12 26 ****	01	02	03	04
	A	25 05 143	Insulator, Vice Top, 12kV	1	2	1	2
	B	23 62 028	Pin, Insulator, Long Shank	1	2	1	2
	C	23 66 132	Washer, Flat, Sq., 4" x 4", w/ 13/16" Hole	2	4	2	4
	D	23 65 043	Lock Nut - 5/8" Square	1	2	1	2
	E	23 17 411	Wildlife Guard - Cover Cutout	2	3	3	2
	F	23 17 512	Wildlife Guard - Vertical Switch 600 Amp	2	3	3	2
	G	**06 12 30 01 @**	Deadend on Pole w/FG Extension	-	1	-	1
	H	**06 12 35 01 @**	Deadend on FG Single Arm	2	2	2	2
	I	17 58 054	Bracket - Arrester/Cutout Mounting	-	-	2	3
		23 56 088	Bracket - Crossarm Double Sided NEMA	2	3	-	-
	J	17 51 114	Connector - One Bolt #8 to 2/0	4	4	6	4
	K	54 07 296	Switch - Disconnect 15kV 600 Amp	2	3	-	-
@	L	-	Tripsaver II - See stock number table above	2	3	2	3
@	M	**04 00 42 02**	Crossarm - Deadend FG 8'	1	1	1	1
		04 00 42 03	Crossarm - Deadend FG 10'	1	1	1	1
1,@	N	**07 00 80 00 @**	Wire -Poly Covered S.D. (ft.)	20	30	20	30
@	O	**07 00 21 00 @**	Hotline Clamp and Stirrup	4	6	4	6
@	P	**03 01 ** ** @**	Secondary Configuration	1	1	1	1

REV	DATE	ENG	DESCRIPTION
4	01/01/24	JMW	Updated to new book format
3	04/01/19	DT	Updates to switch connectors and avian protection

DESIGN NOTE(s):

2. Stock #69 10 260, Stock #69 10 264, and Stock #69 10 269 must be programmed by the end user.

3. This dimension may be reduced to 40" for existing poles to prevent replacement of otherwise serviceable poles.

4. This dimension may be reduced to 24" for existing poles to prevent replacement of otherwise serviceable poles.

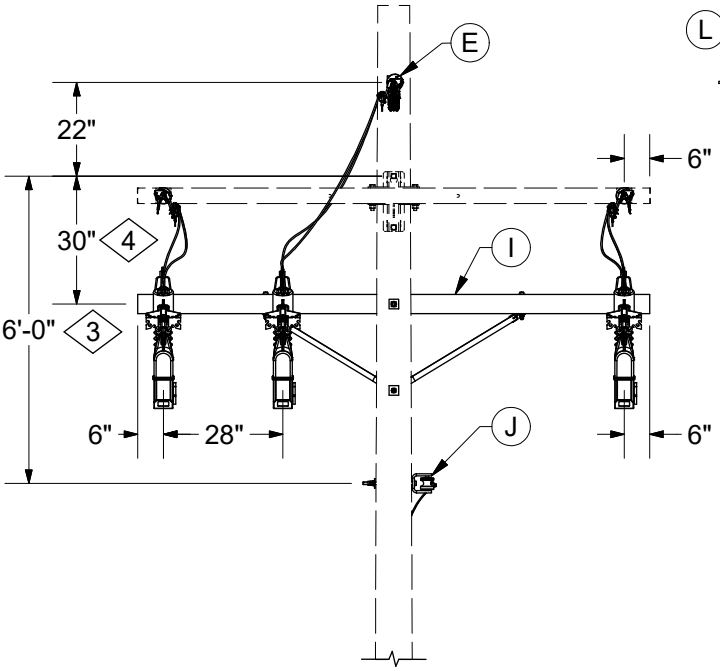
5. If fused cutout are currently installed on a crossarm with this configuration, Tripsavers may be installed using existing crossarm dimensions.

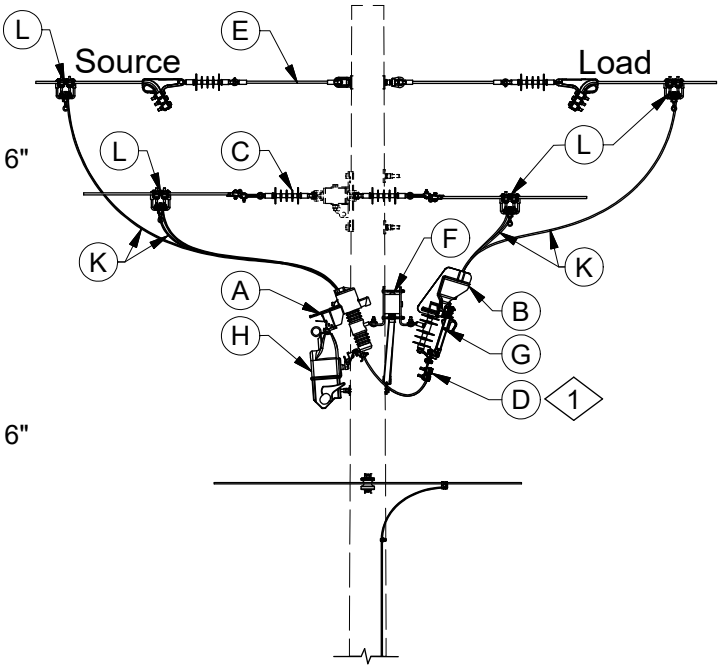
6. DCS **10 12 26 03** and **10 12 26 04** (omitting 600 amp switch) MUST be installed in locations that are bucket truck accessible and only available in Illinois.

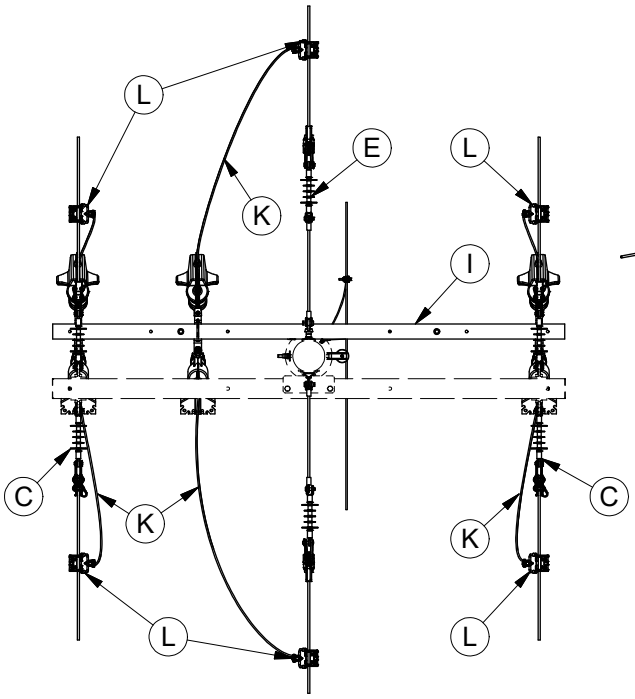
OPERATIONS NOTE(s):

7. If equipped with 600A switch, when closing Tripsaver, do not pick up load.
   - Open solid blade switch.
   - Close Tripsaver.
   - Close solid blade switch.

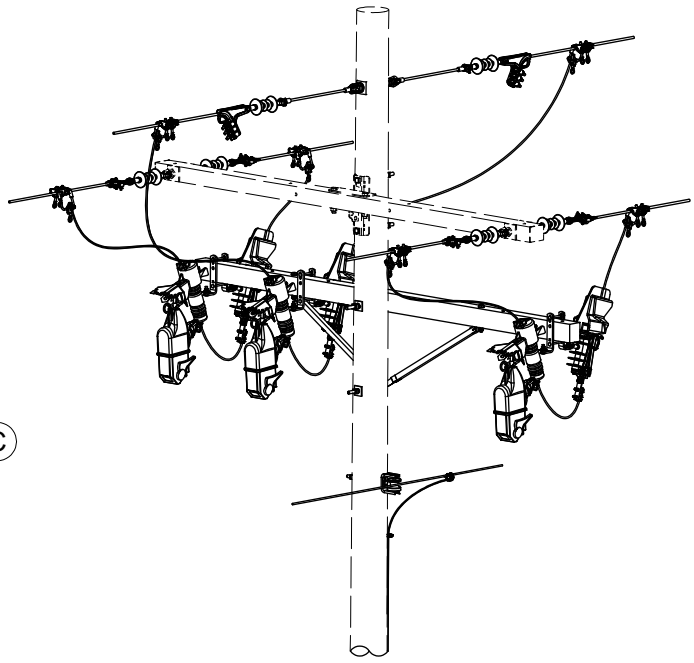
8. When 600A switch is omitted, do not close Tripsaver using Extendo Stick.





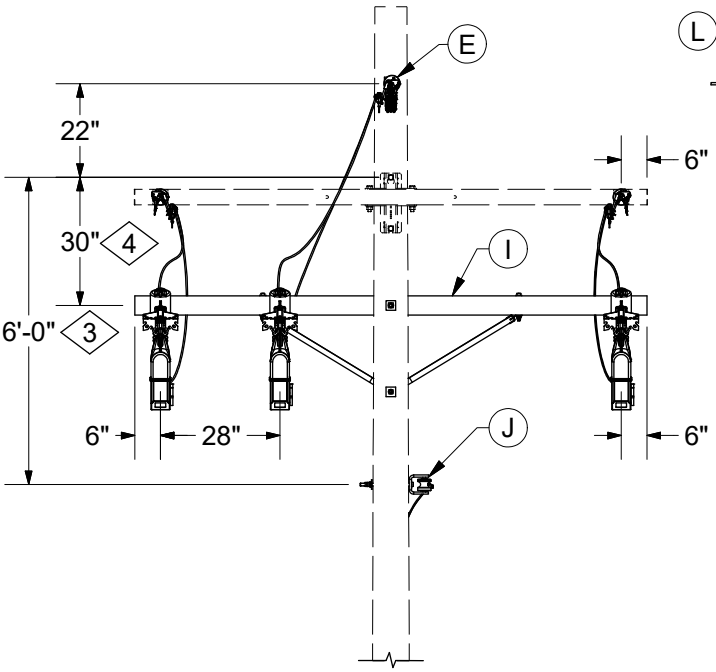


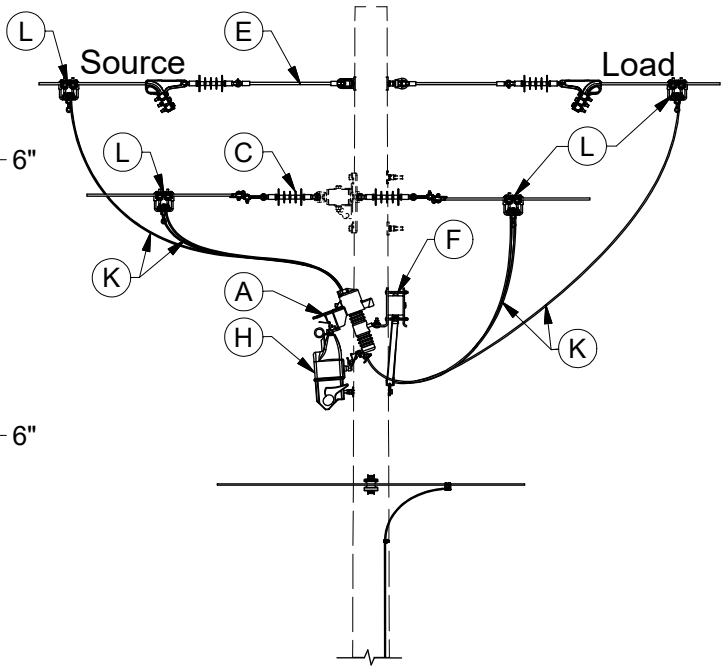
Top View

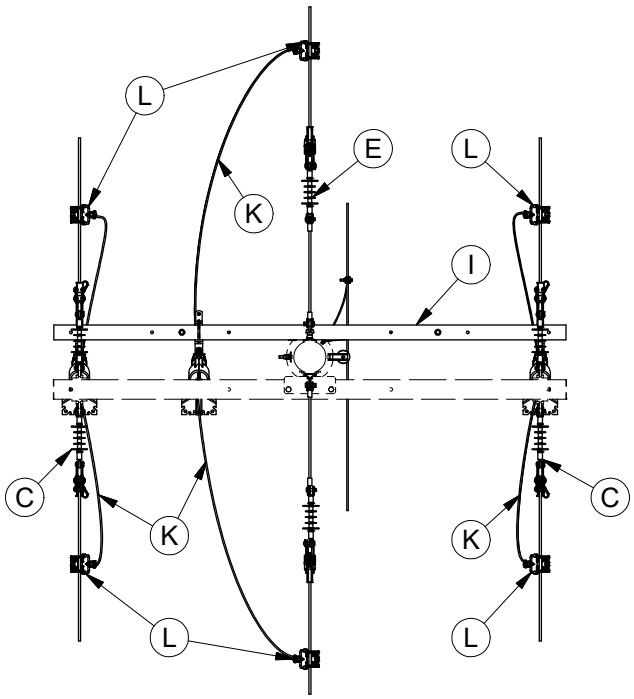


Isometric View

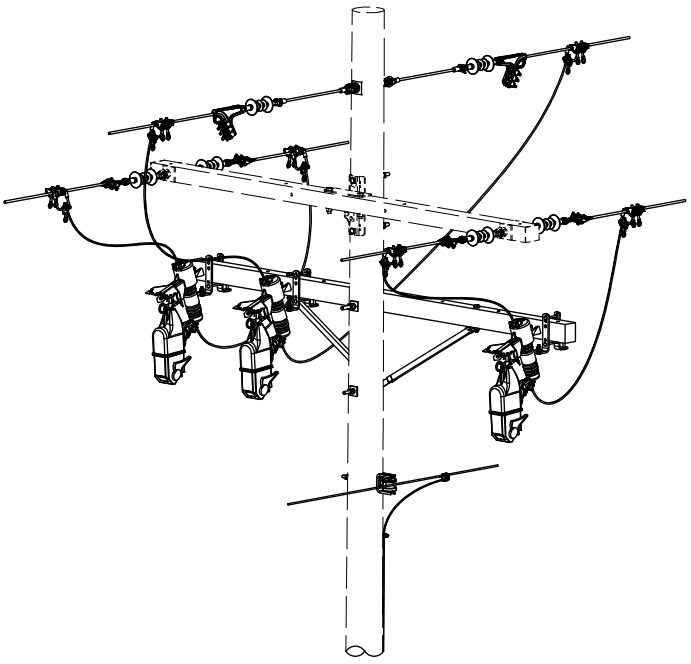
DCS #	DESCRIPTION
10 12 27 01	2-Phase Tripsavers with 600A Switches
10 12 27 02	3-Phase Tripsavers with 600A Switches







Top View



Isometric View

DCS #	DESCRIPTION	
10 12 27 03	2-Phase Tripsavers without 600A Switches	6
10 12 27 04	3-Phase Tripsavers without 600A Switches	

REV	DATE	ENG	DESCRIPTION
1	01/01/24	DT	Converted to new format
0	07/01/20	DT	New Issue

Tripsaver Stock Numbers	
STK #	**DESCRIPTION**
69 10 279	10T trip - 10T drop open, 40A continuous
69 10 280	20T trip - 20T drop open, 40A continuous
69 10 281	25T trip - 25T drop open, 40A continuous
69 10 282	30T trip - 30T drop open, 40A continuous
69 10 283	40T trip - 40T drop open, 40A continuous (IL only)
69 10 258	40T trip - 40T drop open, 100A continuous (MO only)
69 10 278	50T trip - 50T drop open, 100A continuous
69 10 253	65T trip - 65T drop open, 100A continuous
69 10 254	80T trip - 80T drop open, 100A continuous
69 10 255	100T trip - 100T drop open, 100A continuous
69 10 269	100T trip - 100T drop open, 200A continuous
69 10 270	140T trip - 140T drop open, 200A continuous
69 10 264	User Programmed, 40A continuous
69 10 260	User Programmed, 100A continuous
69 10 267	User Programmed, 200A continuous

CONSTRUCTION NOTE(s):

1. Replace two bolt connectors on 600A switch with stock #17 51 114, when conductor (Item K) is smaller than 1/0.

	ITEM	STK / DCS #	DESCRIPTION 10 12 27 **	01	02	03	04
	A	23 17 411	Wildlife Guard - Cover Cutout	2	3	2	3
	B	23 17 512	Wildlife Guard - Vertical Switch 600 Amp	2	3	-	-
	C	**06 12 35 02 @**	Double Deadend on FG Arm	2	2	2	2
	D	17 51 114	Connector - One Bolt #8 to 2/0	4	6	-	-
	E	**06 12 30 03 @**	Dbl Deadend on Pole w/FG Extension	4	6	4	6
	F	17 58 054	Bracket - Arrester/Cutout Mounting	2	3	-	-
		23 56 088	Bracket - Crossarm Double Sided NEMA	-	-	2	3
6	G	54 07 296	Switch - Disconnect 15kV 600 Amp	2	3	-	-
@	H	-	Tripsaver II - See stock number table above	2	3	2	3
@	I	**04 00 20 03**	10' Single Wood Crossarm	1	1	1	1
		04 00 41 16	10' F/G Tangent Crossarm	1	1	1	1
@	J	**03 01 ** ** @**	Secondary Configuration	1	1	1	1
@	K	**07 00 80 00**	Wire - Poly Covered S.D. (ft.)	20	30	20	30
@	L	**07 00 21 00**	Hotline Clamp and Stirrup	4	6	4	6

REV	DATE	ENG	DESCRIPTION
1	01/01/24	DT	Converted to new format
0	07/01/20	DT	New Issue

DESIGN NOTE(s):

2. Stock #69 10 260, stock #69 10 264, and stock #69 10 267 must be programmed by user.

3. This dimension may be reduced to 40" for existing poles to prevent replacement of otherwise serviceable poles.

4. This dimension may be reduced to 24" for existing poles to prevent replacement of otherwise serviceable poles.

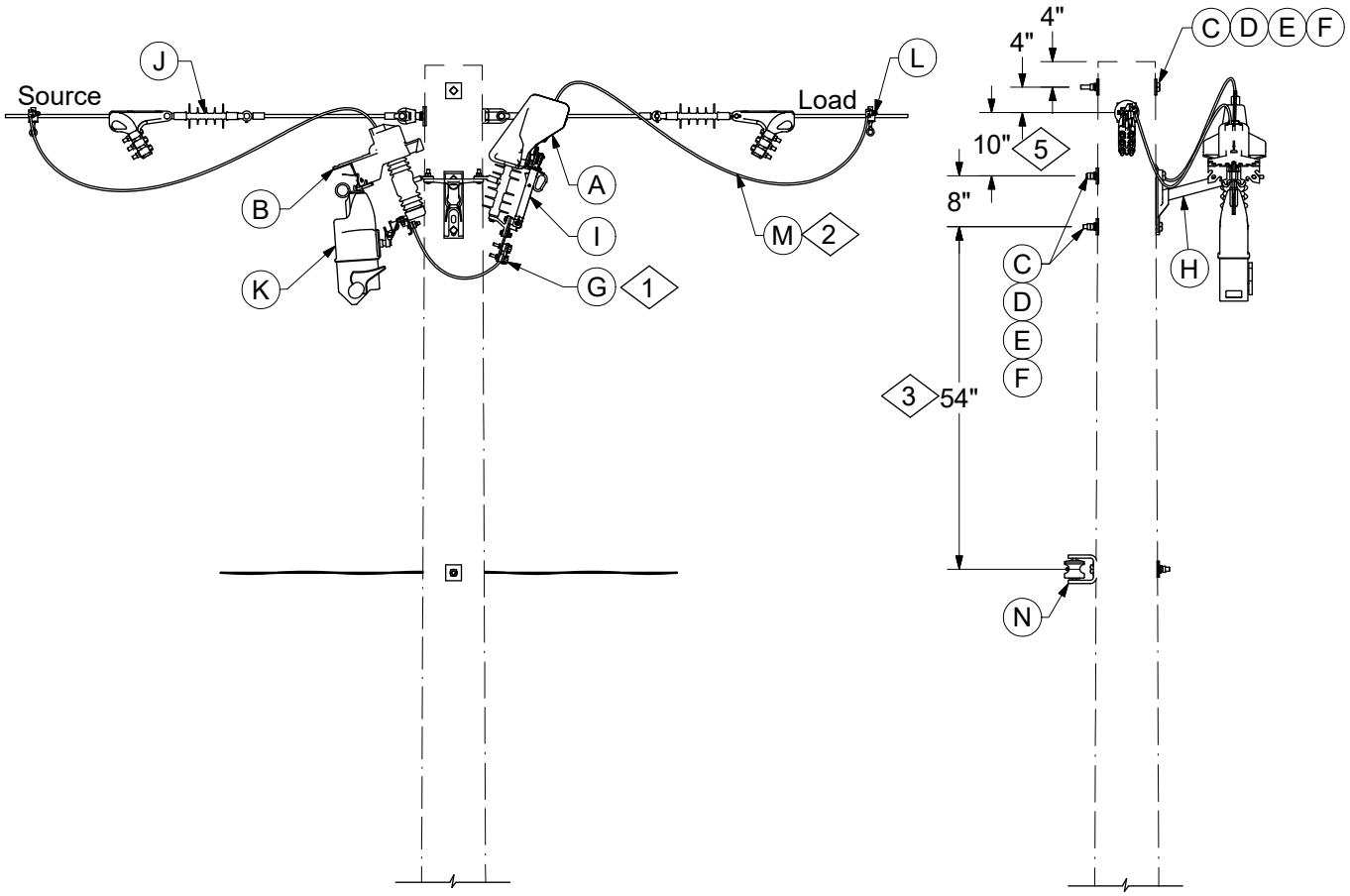
5. If fused cutouts are currently installed on a crossarm with this configuration, tripsavers may be installed using existing crossarm dimensions.

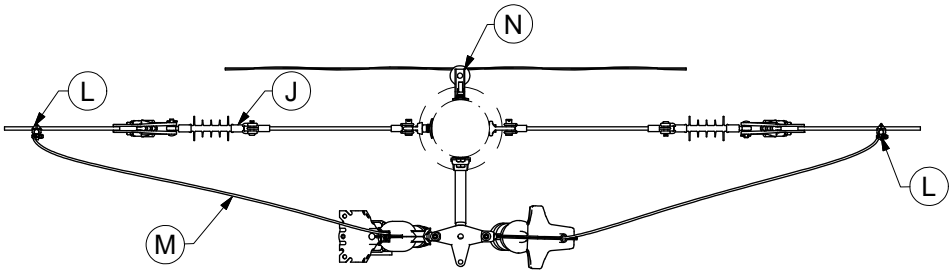
6. DCS 10 12 27 03 and 10 12 27 04 (omitting 600 amp switch) MUST be installed in locations that are bucket truck accessible and only available in Illinois.

OPERATIONS NOTE(s):

7. Tripsavershave a symmetrical fault current rating 6.3kA while Ameren's standard 100A fused switch has a symmetrical fault current rating of 10kA and the 200A switch is rated for 7.5kA.

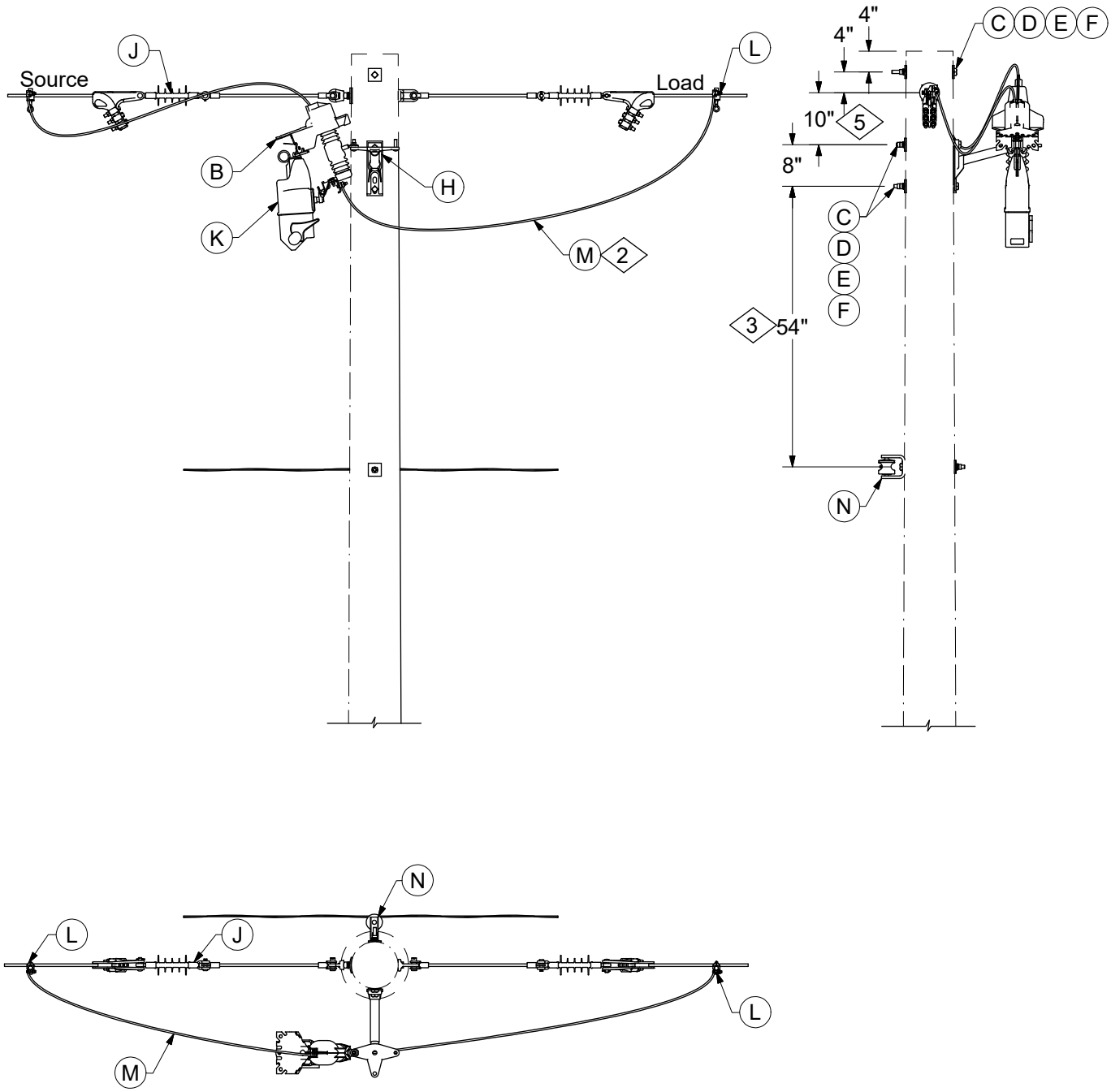
8. When 600A switch is omitted, do not close Tripsaver using extendo stick.





Top View

REV	DATE	ENG	DESCRIPTION
1	01/01/24	DT	Converted to new format
	xx/xx/xx	xxx	



Top View

10 12 28 02
Tripsaver without 600A Switch 7

Tripsaver Stock Numbers	
STK #	**DESCRIPTION**
69 10 279	10T trip - 10T drop open, 40A continuous
69 10 280	20T trip - 20T drop open, 40A continuous
69 10 281	25T trip - 25T drop open, 40A continuous
69 10 282	30T trip - 30T drop open, 40A continuous
69 10 283	40T trip - 40T drop open, 40A continuous (IL only)
69 10 258	40T trip - 40T drop open, 100A continuous (MO only)
69 10 278	50T trip - 50T drop open, 100A continuous
69 10 253	65T trip - 65T drop open, 100A continuous
69 10 254	80T trip - 80T drop open, 100A continuous
69 10 255	100T trip - 100T drop open, 100A continuous
69 10 269	100T trip - 100T drop open, 200A continuous
69 10 270	140T trip - 140T drop open, 200A continuous
69 10 264	User Programmed, 40A continuous
69 10 260	User Programmed, 100A continuous
69 10 267	User Programmed, 200A continuous

CONSTRUCTION NOTE(s):

1. Replace two bolt connectors on 600A switch with Stock #17 51 114. When conductor (item M) is smaller than 1/0.

2. Maximum wire size shall be 1/0 Cu for item M.

	ITEM	STK / DCS #	DESCRIPTION 10 12 28 **	01	02
	A	23 17 512	Wildlife Guard - Vertical Switch 600 Amp	1	-
	B	23 17 411	Wildlife Guard - Cover Cutout	1	1
	C	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	3	3
	D	23 66 207	Washer, Curved, Square, 5/8"	4	4
	E	23 66 134	Lock Washer - 5/8" Double Coil	3	3
	F	23 65 043	Lock Nut - 5/8" Square	3	3
	G	17 51 114	Connector - One Bolt #8 to 2/0	2	-
	H	23 56 063	Bracket - Equipment Mount 3 Position	1	1
	I	54 07 296	Switch - Disconnect 15kV 600 Amp	1	-
	J	**06 12 30 03 @**	Dbl Deadend on Pole w/ FG Extention	1	1
@	K	-	Tripsaver II - See stock numbers table above	1	1
@	L	**07 00 21 00**	Hotline Clamp and Stirrup	2	2
2,@	M	**07 00 80 00 @**	Wire - Poly Covered (ft)	10	10
@	N	**03 01 ** ** @**	Secondary Configuration	1	1

REV	DATE	ENG	DESCRIPTION
1	01/01/24	DT	Converted to new format
	xx/xx/xx	xxx	

DESIGN NOTE(s):

3. This dimension may be reduced to 28” for existing poles to prevent replacement of otherwise serviceable poles.

4. Stock # 69 10 260, stock #69 10 267 and stock #69 10 264 must be programmed. The programming kit is stock # 69 10 259.

5. This dimension may be reduced to 4” for existing poles to prevent replacement of otherwise serviceable poles.

6. If fused cutouts are currently installed on a three point bracket with this configuration the Tripsaver may be installed using existing dimensions.

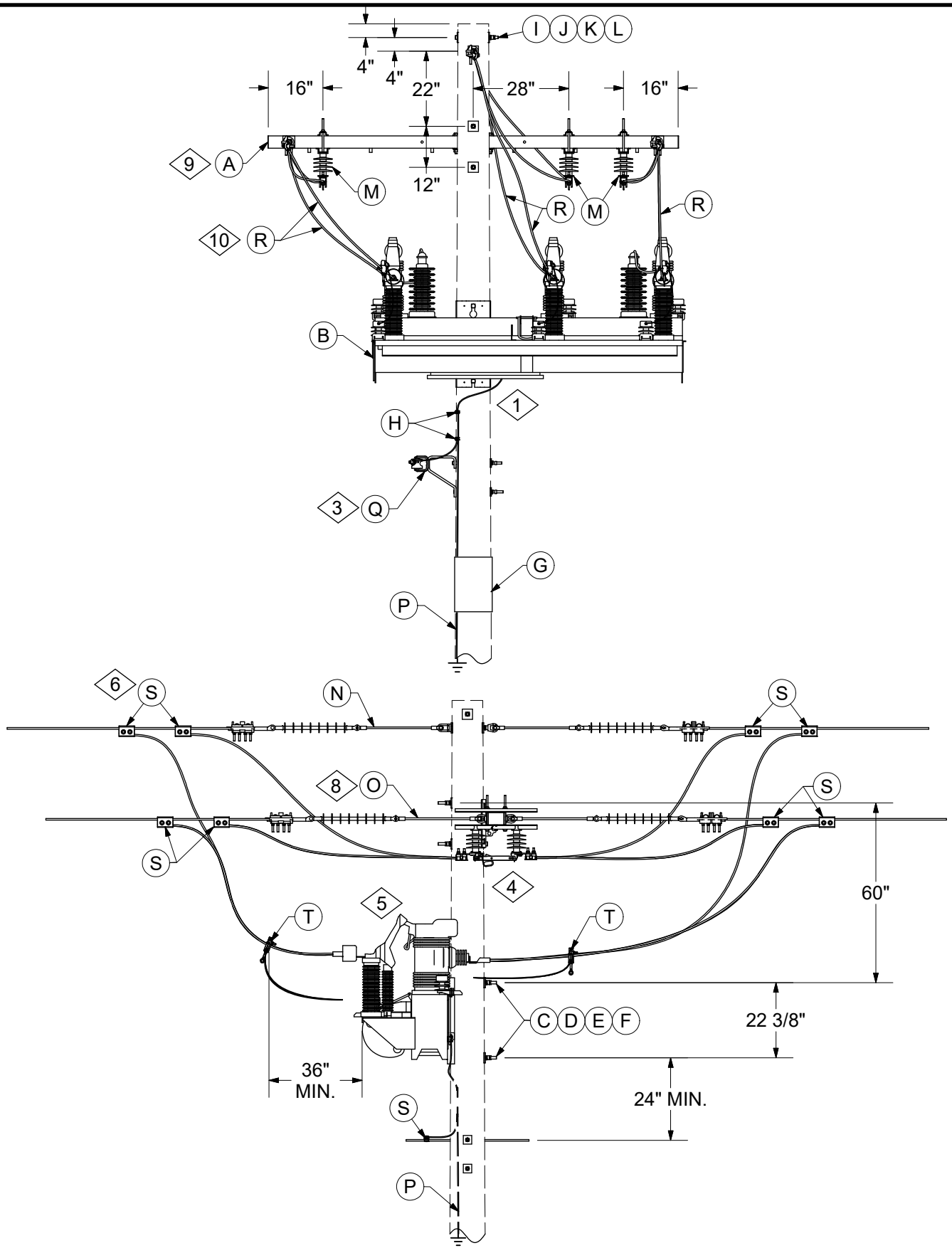
7. DCS **10 12 28 02** (omitting 600 amp switch) MUST be installed in locations that are bucket truck accessible and only available in Illinois.

OPERATIONS NOTE(s):

8. Tripsavers have a symmetrical fault current rating 6.3kA while Ameren's standard 100A fused cutout has a symmetrical fault current rating of 10kA and the 200A cutout is rated for 7.5kA.

9. If equipped with 600 amp switch, when closing Tripsaver, do not pick up load.
   - Open solid blade switch.
   - Close Tripsaver.
   - Close solid blade switch.

10. When 600A switch is omitted, do not close Tripsaver using extendo stick.


I J K L
4"
4"
22"
28"
16"
16"
12"
9 A
M
R M R
10 R
B
1
H
3 Q
G
P
6 S
N
S
8 O
S
S
4
5
T
T
60"
C D E F
22 3/8"
36" MIN.
24" MIN.
S
P

CONSTRUCTION NOTE(s):

1. Intellirupter recloser frame must be connected to ground with #2 Cu. Pole ground to neutral connection must be #2 Cu.

2. Tool for removal / install of radio module and control module is Stock #46 01 645.

3. Install neutral/secondary using extension brackets on the side of the pole with only one phase to allow access to the compartments on the bottom of the Intellirupter. The neutral/secondary may be dead-ended to the pole as long as they are mounted 36 inches below the bottom mounting bolt of the Intellirupter.

4. Bypass switch shall be installed to open towards climbing side of pole. Only install the two inside bolts on the switch and slide them as close to the crossarm as possible, when installing switches on single crossarm.

5. Integral disconnect switches on recloser shall be in the open position while connecting primary leads to the recloser.

6. The recloser leads shall be connected to the line connector with a piggy-back clamp (Stock #85 38 392) during the installation. The lightning arresters shall be connected to the recloser leads with hot line clamps and the hot line clamps must be installed 36” away from the aluminum base of the Intellirupter. Then, the recloser leads shall be permanently connected with parallel groove clamps and the piggy-back clamps shall be removed.

7. Intellirupter Recloser weighs 1010 lbs.

8. Install 26” fiberglass extension to provide clearance between insulator and switch.

9. When differential tension is present, fiberglass crossarm shall be installed on the side of the pole with lower tension. Intellirupter shall be installed on opposite side of the pole as fiberglass crossarm.

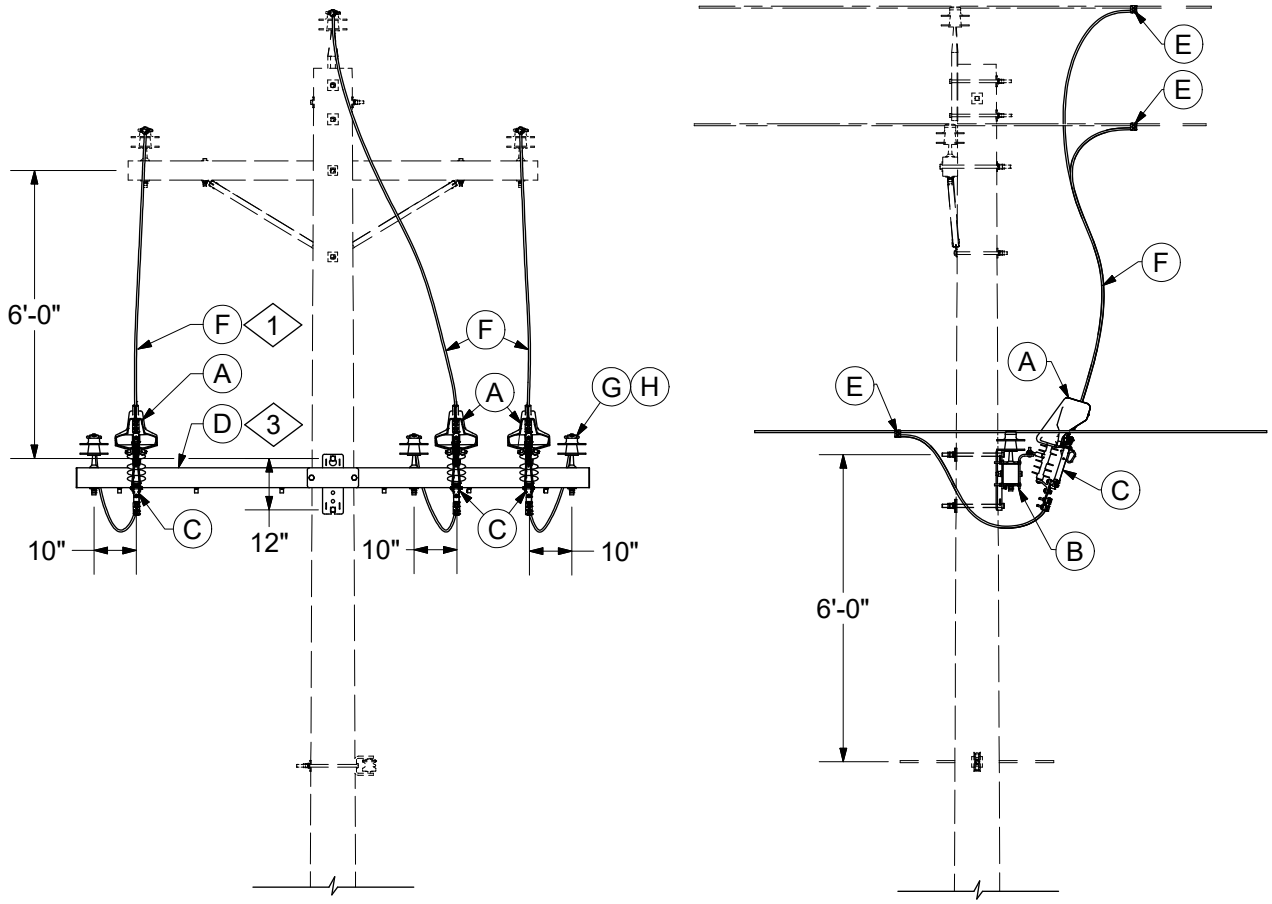
10. Wire sizes smaller than 1/0 shall not be used.

	ITEM	STK / DCS #	DESCRIPTION 10 12 33 **	01
9	A	**04 00 42 03**	Crossarm - Deadend, F/G 10'	1
	B	69 10 250	Recloser, S&C Intellirupter, 15kV, 600A w/Comm Module	1
	C	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	4
	D	23 66 031	Washer, Curved, Square, 3/4"	8
	E	23 66 135	Lock Washer - 3/4" Double Coil	6
	F	23 65 042	Lock Nut - 3/4" Square	5
	G	23 17 473	Animal Guard, Pole Wrap	1
	H	17 54 373	Connector - Split Bolt, #14 AWG Str. to #2 AWG Str.	3
	I	23 52 097	Bolt, Mach., 3/4" x 12" w/ square nut	2
	J	23 66 207	Washer, Curved, Square, 5/8"	2
	K	23 66 134	Lock Washer - 5/8" Double Coil	2
	L	23 65 043	Lock Nut - 5/8" Square	2
	M	54 07 204	Switch, Disc. 600A., 15 kV	3
	N	**06 12 30 03 @**	Dbl Deadend on Pole F/G Extension	1
@	O	**06 12 35 04 @**	Dbl Deadend on FG Arm w/ F/G Extension	1
@	P	**12 00 10 03**	Grounding Unit (with #2 S.D. Cu) - Ground Rod	1
		12 00 10 04	Grounding Unit (with #2 S.D. Cu) - Ground Coil	1
3,@	Q	**03 01 ** ** @**	Neutral Configuration	1
10,@	R	**07 00 80 00**	Wire, Poly, S.D., (ft.)	100'
@	S	**07 00 25 00**	Clamp, Parallel Groove	13
@	T	**07 00 21 00**	Clamp, Hot line	6
12,@	U	69 10 252	4 kV Power Supply	1
13,@	V	16 16 060	Speednet Radio	1

DESIGN NOTE(s):

11. 8'-0" crossarms can be used if existing on pole in Missouri.
13. Speednet radio may be required for communications.

REV	DATE	ENG	DESCRIPTION
13	01/01/24	DT	Converted to new format
12	10/01/19	DT	



CONSTRUCTION NOTE(s):

1. Wire sizes for leads shall be a minimum of 1/0.

	ITEM	STK / DCS #	DESCRIPTION 10 12 50 **	01
	A	23 17 512	Wildlife Guard - Vertical Switch 600 Amp	3
	B	17 58 054	Bracket, Arrester/Cutout Mounting	3
	C	54 07 296	Switch - Disconnect 15kV 600 Amp	3
3,@	D	**04 00 20 03**	Crossarm, 10', Single Wood Arm	1
		04 00 41 16	Crossarm, Tangent, F/G, 10'	1
@	E	**07 00 25 00**	Clamp, Parallel Groove	6
1,@	F	**07 00 80 00**	Wire, Poly, S.D. (ft.)	40'
@	G	**06 12 01 01**	Single Pin & Insulator - Wood Crossarm	3
		06 12 01 12	Single Pin & Insulator - FG Crossarm	3
@	H	**07 00 41 00**	Top Tie, Single Pin	3

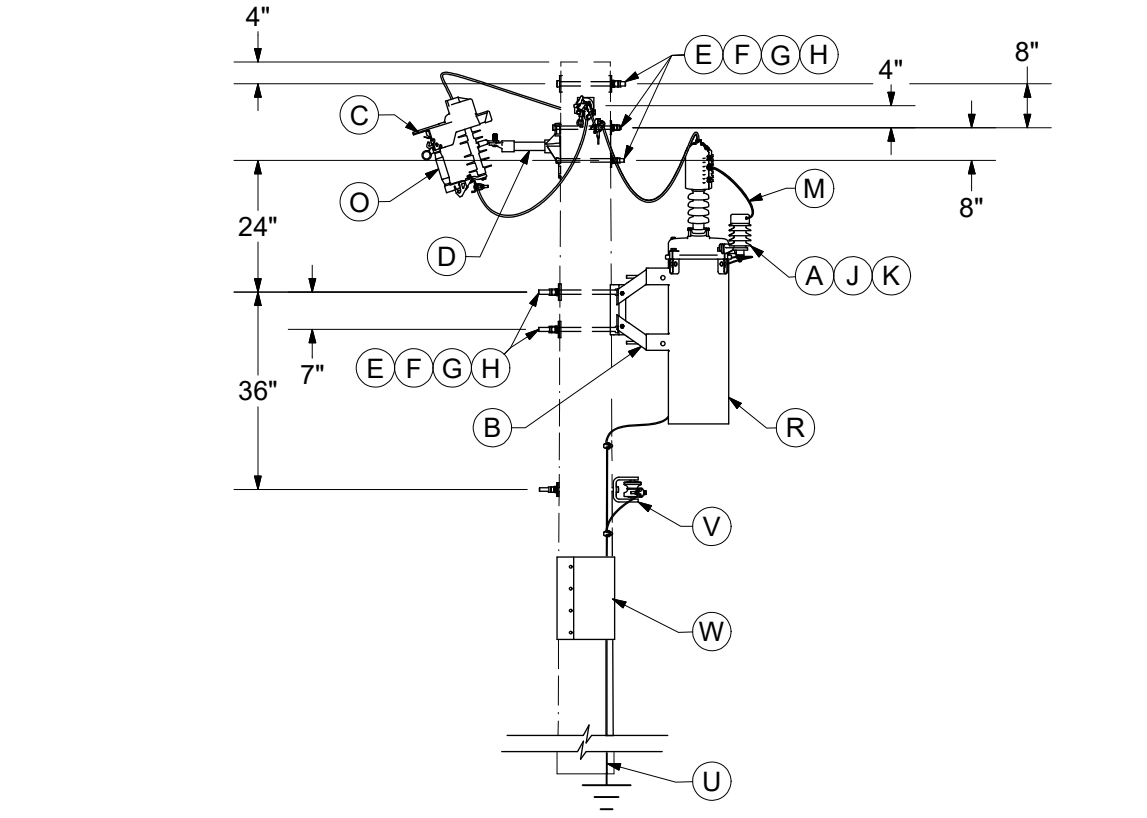
DESIGN NOTE(s):

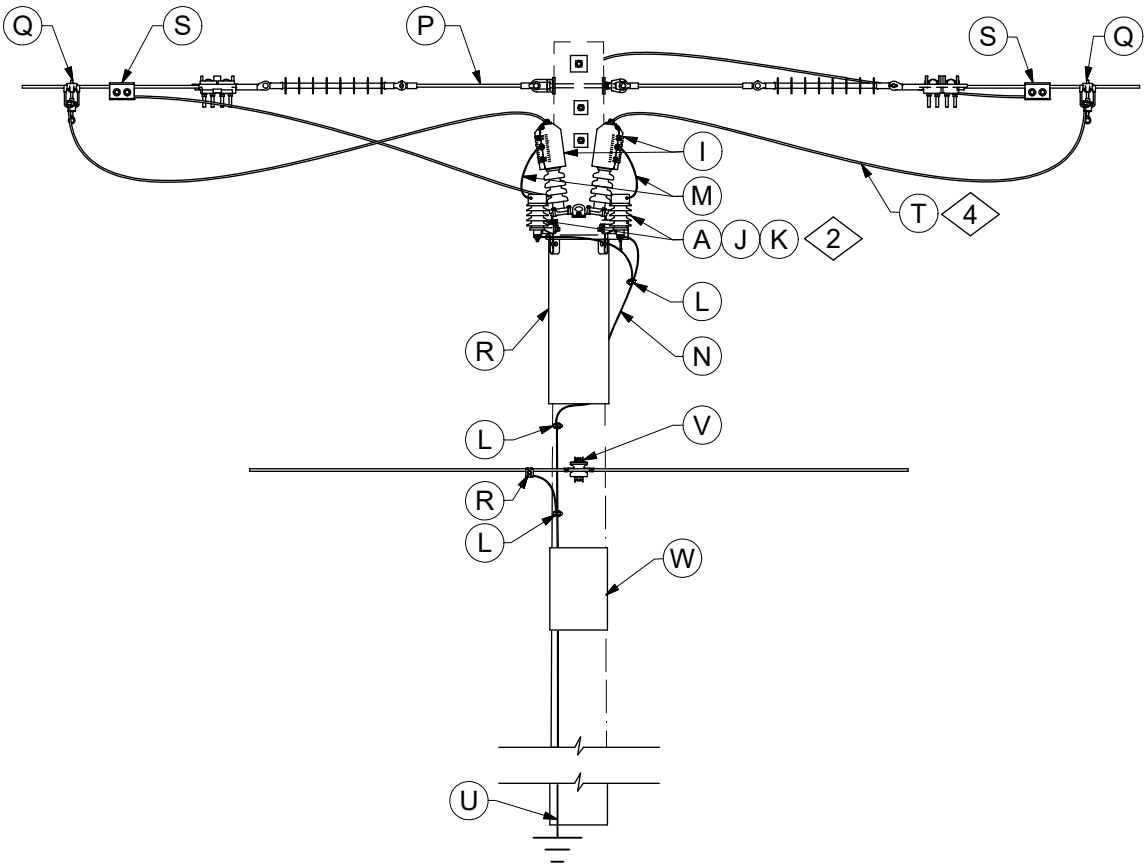
2. Arresters are not required for normally closed switch installations. If both upper and lower circuits continue in both directions, arresters are not required when switches are normally open. If a circuit does not continue in both directions, an arrester is required on an adjacent pole for that circuit. Refer to DCS **12 00 01 01** for arrester selection.

3. 8'-0" crossarms may be used when required.

4. For existing poles with crossarms in this configuration, switches may be installed using existing clearances between crossarms to avoid replacing otherwise serviceable poles.

REV	DATE	ENG	DESCRIPTION
7	01/01/24	DT	Conveted to new format
6	06/30/16	WYW	


4"
E F G H
4"
8"
C
O
M
8"
24"
D
A J K
7"
E F G H
36"
B
R
V
W
U


Q
S
P
S
Q
I
M
T
4
A J K
2
L
R
N
L
V
R
L
W
U

CONSTRUCTION NOTE(s):

1. Recloser shall be turned in tank to position shown.

2. Lightning arrester shall be mounted on tank cover lug for both source and load sides of the recloser. Factory bolts can be replaced with 1/2" x 4" machine bolts and flat washers.

3. Each recloser weighs 205 pounds.

4. Maximum lead size shall be 1/0 Cu.

Recloser Stock Numbers			
STK #	**DESCRIPTION**	**STK #**	**DESCRIPTION**
69 10 210	25A V4L	69 10 214	100A V4L
69 10 211	35A V4L	69 10 142	140A V4L
69 10 212	50A V4L	69 10 215	200A V4L
69 10 213	70A V4L	69 10 143	280A V4L

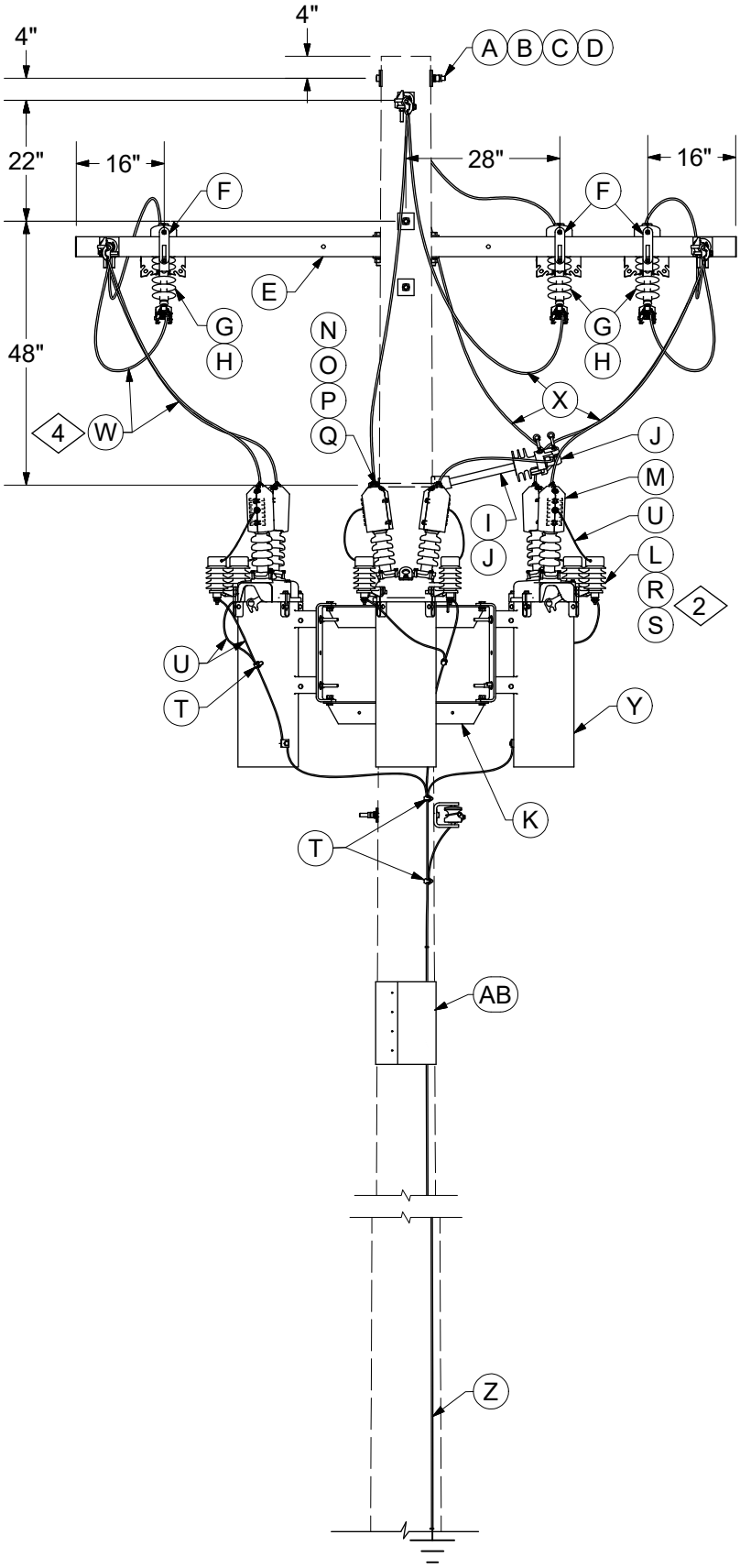
	ITEM	STK / DCS #	DESCRIPTION 10 12 60 **	01
	A	10 01 144	Arrestor, Lightning 10kV/8.4kV MCOV	2
	B	23 17 291	Mounting, Recloser	1
	C	23 17 411	Wildlife Guard - Cover Cutout	1
	D	23 06 127	Bracket - Standoff, 12" FG	1
	E	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	5
	F	23 66 207	Washer, Curved, Square, 5/8"	6
	G	23 66 134	Lock Washer - 5/8" Double Coil	5
	H	23 65 043	Lock Nut - 5/8" Square	5
	I	69 58 181	Guard, Clam−shell, Wildlife	2
	J	23 52 034	Bolt, Mach., 1/2" x 4" w/ square nut	2
	K	23 66 017	Washer - Round 1/2"	2
	L	17 54 182	Connector, Split Bolt, 3-#2 Str. CU	3
	M	18 51 021	Wire, Poly #6 Cu (ft.)	7
	N	18 51 025	Wire, Poly #4 Cu (ft.)	3
	O	54 07 210	300A Solid Blade Switch	1
	P	**06 12 30 03 @**	Double Deadend on Pole w/ FG Extension	1
@	Q	**07 00 21 00**	Clamp, Stirrup, with Hot Line Clamp	2
@	R	69 10 ***	Recloser, See recloser stock numbers table	1
@	S	**07 00 25 00**	Clamp - Parallel Groove	3
4,@	T	**07 00 80 00**	Wire, Poly Covered, S.D. (ft.)	15
@	U	**12 00 10 01**	Grounding Unit, Ground Coil	1
		12 00 10 02	Grounding Unit, Ground Rod	1
@	V	**03 01 ** ** @**	Neutral Configuration	1
6,@	W	23 17 473	Wood Pole Wrap	#

DESIGN NOTE(s):

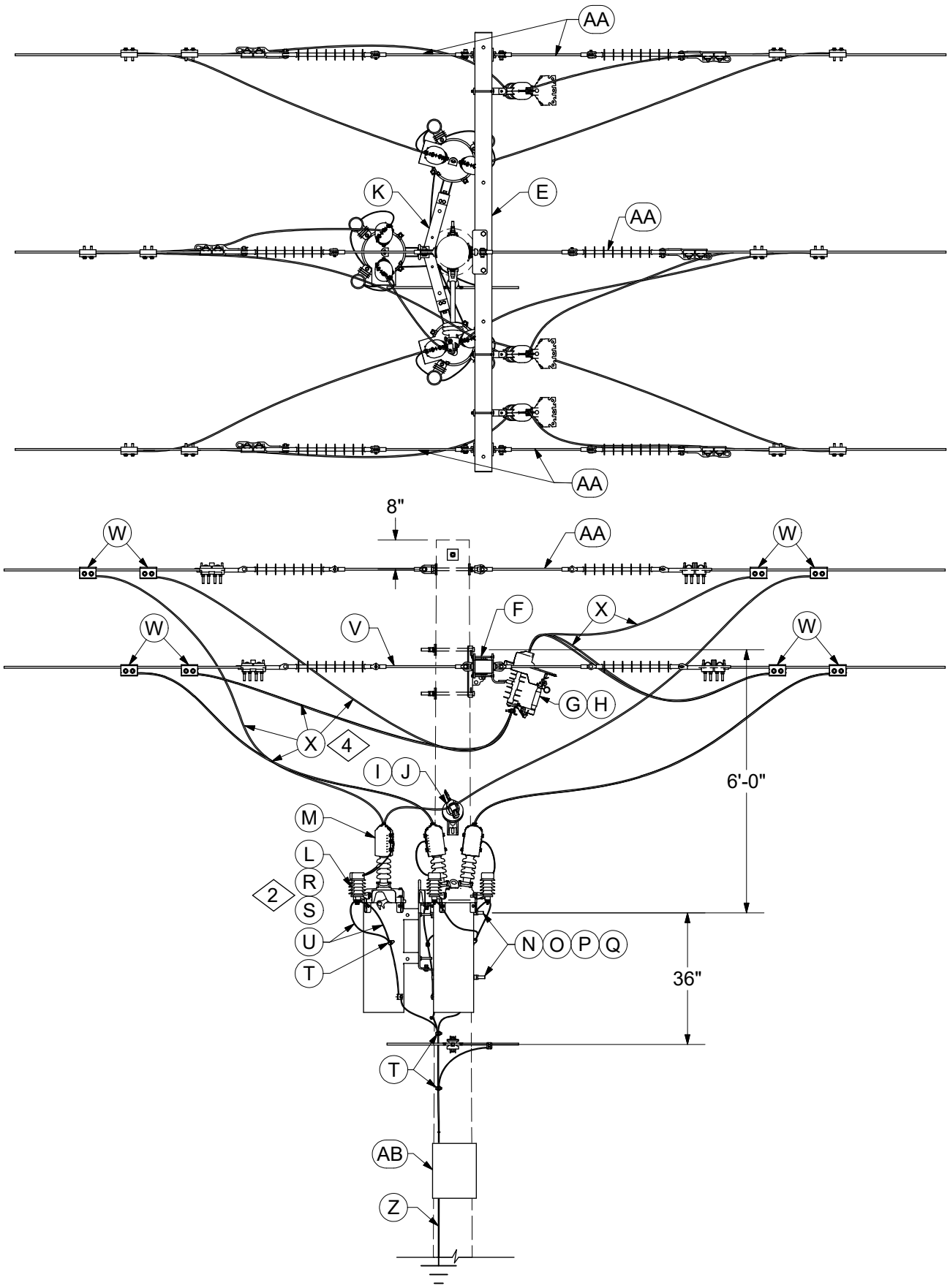
5. Fuse tube may be substituted for solid blade for sensitive circuits or if extended outage is anticipated.

6. Pole wrap is received in 100' rolls. Cut to size and wrap around pole approximately 12" below neutral or secondary.

REV	DATE	ENG	DESCRIPTION
9	01/01/24	DT	Converted to new format
8	11/30/16	WYW	



REV	DATE	ENG	DESCRIPTION
14	01/01/24	DT	Converted to new format
13	06/28/17	WYW	



REV	DATE	ENG	DESCRIPTION
14	01/01/24	DT	Converted to new format
13	06/28/17	WYW	

CONSTRUCTION NOTE(s):

1. Recloser shall be turned in tank position shown.
2. Lightning arrester shall be mounted on tank cover lug for both source and load sides of the recloser. Factory bolts can be replaced with 1/2" x 4" machine bolts and flat washers.
3. Each recloser weighs 205 pounds.
4. Largest conductor size shall be 1/0 for item W.
5. Fiberglass crossarm shall be installed on side of pole with lower tension when differential tension is present.

Recloser Stock Numbers			
STK #	**DESCRIPTION**	**STK #**	**DESCRIPTION**
69 10 210	25 A V4L	69 10 214	100 A V4L
69 10 211	35 A V4L	69 10 142	140 A V4L
69 10 212	50 A V4L	69 10 215	200 A V4L
69 10 213	70 A V4L	69 10 143	280 A V4L

	ITEM	STK / DCS #	DESCRIPTION 10 12 62 **	01
	A	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	2
	B	23 66 207	Washer, Curved, Square, 5/8"	3
	C	23 66 134	Lock Washer - 5/8" Double Coil	2
	D	23 65 043	Lock Nut - 5/8" Square	2
	E	**04 00 42 03**	Crossarm - Deadend, F/G 10'	1
	F	17 58 054	Bracket, Arrester/Cutout Mounting	3
	G	54 07 210	300A Solid Blade Switch	3
	H	23 17 411	Wildlife Guard - Cover Cutout	3
	I	23 12 123	Bracket, FG, Standoff, LD, 18"	1
	J	25 05 143	Insulator, Vice Top, 12kV	1
	K	23 17 209	Mounting Unit 3 Pos. Light (Up to Three 50 KVA Trans)	1
	L	10 01 144	Arrester, Lightning 10kV	6
	M	69 58 181	Guard, Clam−shell, Wildlife	6
	N	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	2
	O	23 66 031	Washer, Curved, Square, 3/4"	2
	P	23 66 135	Lock Washer - 3/4" Double Coil	2
	Q	23 65 042	Lock Nut - 3/4" Square	2
	R	23 52 034	Bolt, Mach., 1/2" x 4" w/ Square nut	6
	S	23 66 017	Washer - Round 1/2"	6
	T	17 54 182	Connector, Split Bolt	5
	U	18 51 021	Wire, Poly, #6 Cu (ft.)	20
	V	**06 12 35 02 @**	Double Deadend on Arm	2
4,@	W	**07 00 25 00**	Clamp - Parallel Groove	13
@	X	**07 00 80 00**	Wire, Poly Covered, S.D. (ft.)	60
@	Y	69 10 ***	Hydraulic Recloser, See recloser stock numbers table	3
@	Z	**12 00 10 03**	Grounding Unit, Ground Rod	1
		12 00 10 04	Grounding Unit, Ground Coil	1
@	AA	**06 12 30 03 @**	Double Deadend on Pole w/FG Extension	1
		06 12 30 13 @	Double Deadend on Pole w/o FG Extention	1
8,@	AB	23 17 473	Wood Pole Wrap	#

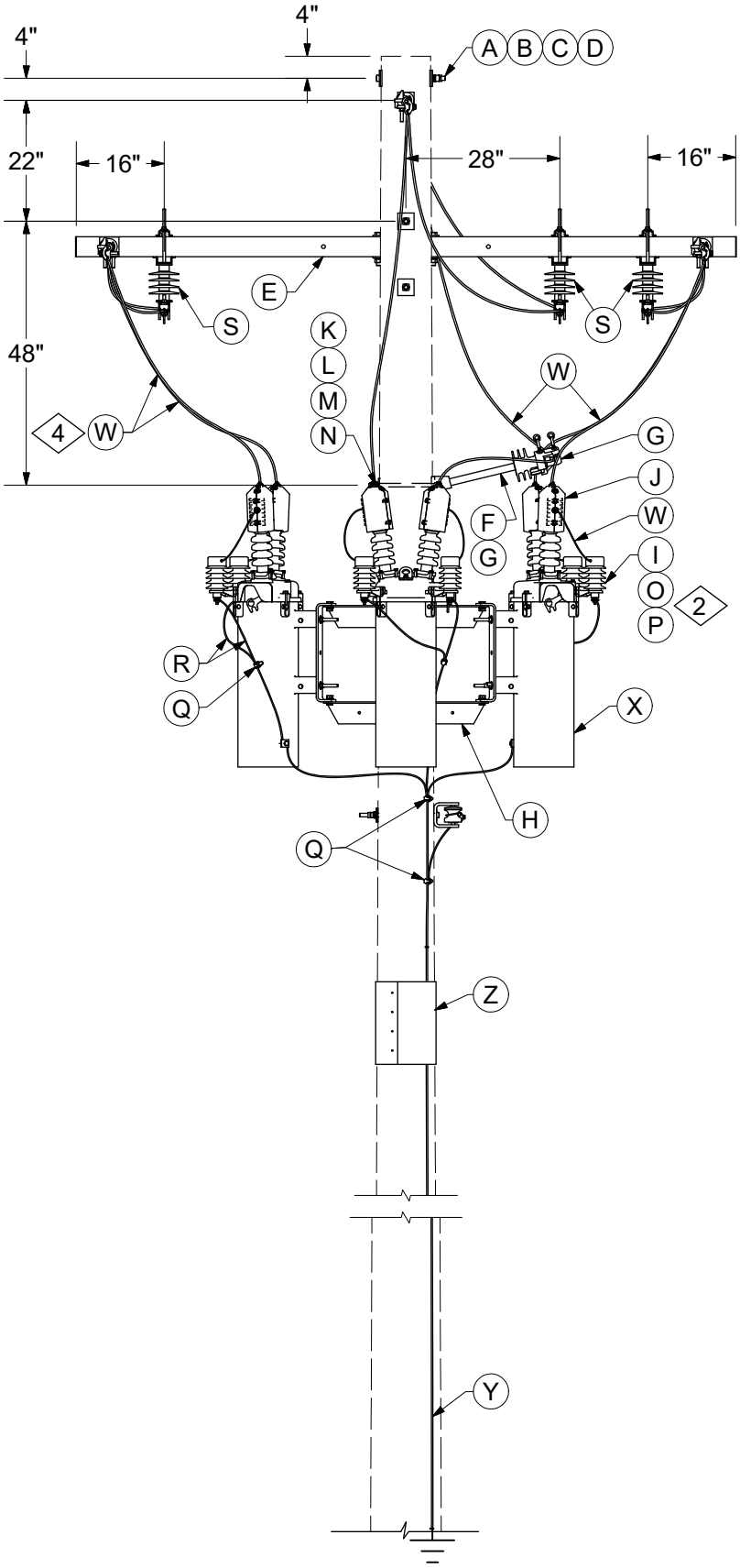
REV	DATE	ENG	DESCRIPTION
14	01/01/24	DT	Converted to new format
13	06/28/17	WYW	

DESIGN NOTE(s):

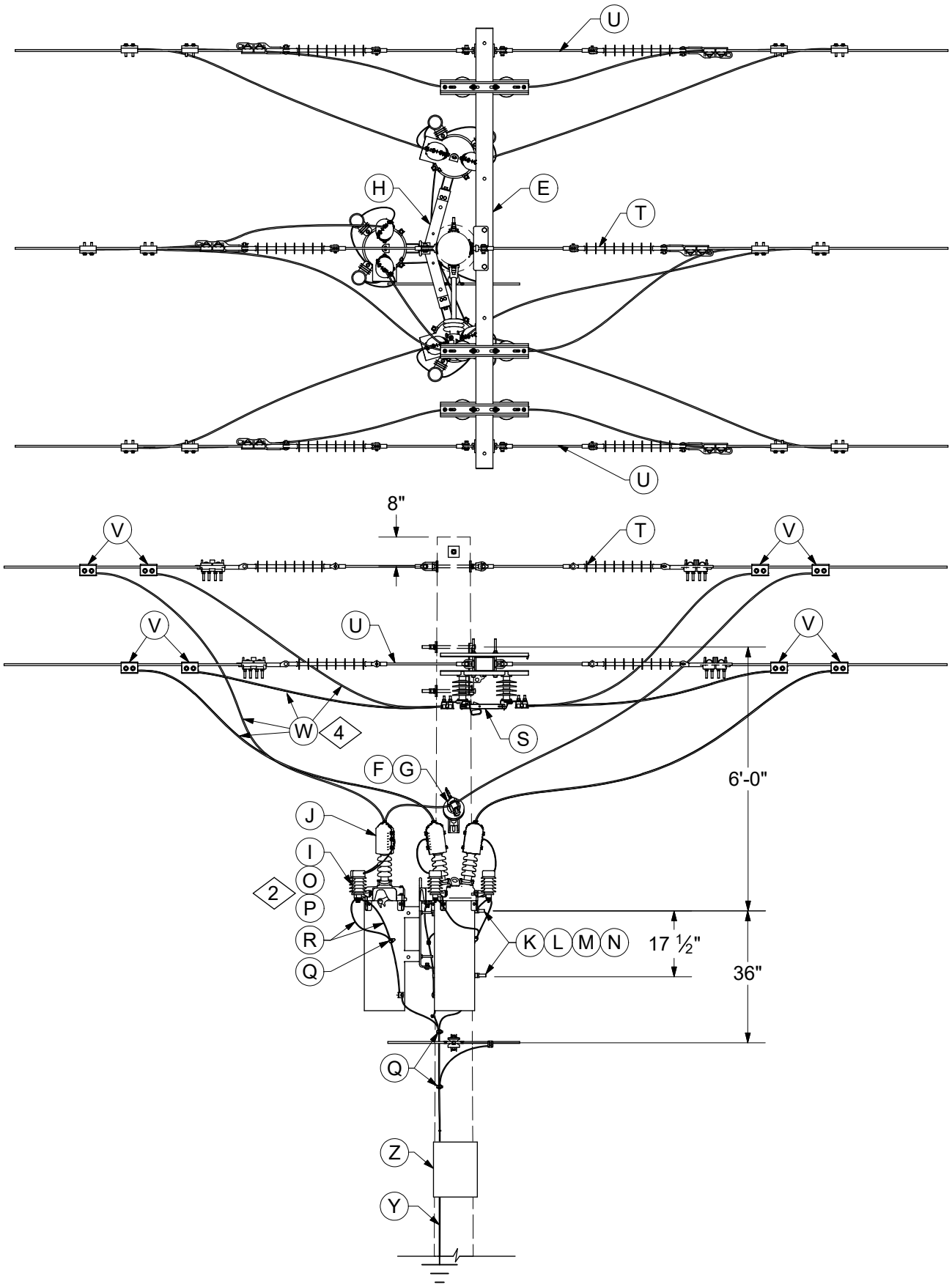
6. Fuse cartridge may be substituted for solid blade if sensitive circuit or extended outage anticipated.

7. Underbuild construction requires deadend on pole w/ FG extension.

8. Pole wrap is received in 100'-0" rolls. Cut roll to size and wrap around pole approximately 12" below neutral or secondary.



REV	DATE	ENG	DESCRIPTION
14	01/01/24	DT	Converted to new format
13	06/28/17	WYW	



REV	DATE	ENG	DESCRIPTION
14	01/01/24	DT	Converted to new format
13	06/28/17	WYW	

CONSTRUCTION NOTE(s):

1. Recloser shall be turned in tank position shown.

2. Lightning arrester shall be mounted on tank cover lug for both source and load sides of the recloser. Factory bolts can be replaced with 1/2" x 4" machine bolts and flat washers.

3. Each recloser weighs 205 pounds.

4. Only wire sizes between 1/0 and 350 kcmil shall be used.

5. Fiberglass crossarm shall be installed on side of pole with lower tension when differential tension is present.

Recloser Stock Numbers			
STK #	**DESCRIPTION**	**STK #**	**DESCRIPTION**
69 10 210	25 A V4L	69 10 214	100 A V4L
69 10 211	35 A V4L	69 10 142	140 A V4L
69 10 212	50 A V4L	69 10 215	200 A V4L
69 10 213	70 A V4L	69 10 143	280 A V4L

	ITEM	STK / DCS #	DESCRIPTION 10 12 62 **	03
	A	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	2
	B	23 66 207	Washer, Curved, Square, 5/8"	3
	C	23 66 134	Lock Washer - 5/8" Double Coil	2
	D	23 65 043	Lock Nut - 5/8" Square	2
	E	**04 00 42 03**	Crossarm - Deadend, F/G 10'	1
	F	23 12 123	Bracket, FG, Standoff, LD, 18"	1
	G	25 05 143	Insulator, Vice Top, 12kV	1
	H	23 17 209	Mounting Unit 3 Pos. Light (Up to Three 50 KVA Trans)	1
	I	10 01 144	Arrester, Lightning 10kV	6
	J	69 58 181	Guard, Clam−shell, Wildlife	6
	K	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	2
	L	23 66 031	Washer, Curved, Square, 3/4"	2
	M	23 66 135	Lock Washer - 3/4" Double Coil	2
	N	23 65 042	Lock Nut - 3/4" Square	2
	O	23 52 034	Bolt, Mach., 1/2" x 4" w/ Square nut	6
	P	23 66 017	Washer - Round 1/2"	6
	Q	17 54 182	Connector, Split Bolt	7
	R	18 51 021	Wire, Poly, #6 Cu (ft.)	20
	S	54 07 204	Switch, Disc. 600A., 15 kV	3
	T	**06 12 30 03 @**	Double Deadend on Pole w/FG Extension	1
	U	**06 12 35 02 @**	Double Deadend on Arm	2
@	V	**07 00 25 00**	Clamp - Parallel Groove	13
4,@	W	**07 00 80 00**	Wire, Poly Covered, S.D. (ft.)	60
@	X	69 10 ***	Hydraulic Recloser, See recloser stock numbers table	3
@	Y	**12 00 10 03**	Grounding Unit, Ground Rod	1
		12 00 10 04	Grounding Unit, Ground Coil	1
6,@	Z	23 17 473	Wood Pole Wrap	#

DESIGN NOTE(s):

6. Pole wrap is received in 100'-0" rolls. Cutt roll to size and wrap around pole approximately 12" below neutral or secondary

REV	DATE	ENG	DESCRIPTION
14	01/01/24	DT	Converted to new format
13	06/28/17	WYW	

1. For normally closed switch mounted on a steel pole with or without motor operator:

A pole ground wire is not required but there must be provisions (Rivnuts) for grounding a shield wire, primary system neutral, a motor operator cabinet, and the base of the pole. The manually operated switch handle must be grounded directly to the driven ground rod or the field formed electrode riser with a #2 Cu ground wire. The motor operator cabinet, if present, can be bonded to a steel pole or connected to the ground electrode.

A ground mat is required for a steel pole. Refer to DCS **12 69 11 02**.

Operating rod TR-210 porcelain insulator, Stock #25 09 045, and 8'-0" fiberglass section that come with the switch may be omitted on a steel pole.

2. For normally closed manually operated switch mounted on a wood pole.

Pole ground wire shall be omitted/removed from pole.

The 8'-0" fiberglass pipe section shall be installed with a minimum of 24" above distribution primary and a minimum of 12" below the lowest primary. One 34.5kV, TR-210 porcelain operating rod insulator shall be installed at minimum of 8' above the ground between the lowest electric/communications and manually operated handle.

Attach the switch operating handle to a driven ground rod or a field formed ground electrode with #2 cu ground wire.

A ground mat is not required as long as pole ground is not connected to static or neutral. Refer to DCS **12 69 11 04**.

3. For normally closed motor operated switch mounted on a wood pole:

A #2 cu pole ground wire is required to extend up the pole for grounding of motor operator cabinet, switch operating handle, primary system neutral (if present), and static wire.

The 8'-0" fiberglass pipe section shall be installed with a minimum of 24" above distribution primary and a minimum of 12" below the lowest primary. One 34.5kV, TR-210 porcelain operating rod insulator shall be installed at minimum of 8'-0" above the ground between the lowest electric/communications and manually operated handle.

A ground mat is required. Refer to DCS **12 69 11 01**.

4. For normally closed manually operated switch mounted on a composite pole:

Composite pole internal pole ground should not be connected to static or neutral.

The 8'-0" fiberglass pipe section shall be installed with a minimum of 24" above distribution primary and a minimum of 12" below the lowest primary. One 34.5kV, TR-210 porcelain operating rod insulator shall be installed at minimum of 8'-0" above ground between the lowest electric/communications and manually operated handle.

Attach the switch operating handle to a driven ground rod or a field formed ground electrode with #2 cu ground wire.

A ground mat is not required as long as pole ground is not connected to static or neutral. Refer to DCS **12 69 11 04**.

5. For normally closed motor operated switch mounted on a composite pole:

A ground mat is required. See DCS **12 69 11 03**.

Static wire, primary system neutral (if present), switch operating handle, and motor operator (if present) must be bonded to the #2 cu pole ground wire which comes with a pole.

The 8'-0" fiberglass pipe section shall be installed with a minimum of 24" above distribution primary and a minimum of 12" below the lowest primary. One 34.5kV, TR-210 porcelain operating rod insulator shall be installed at minimum of 8'-0" above the ground between the lowest electric/communications and manually operated handle.

6. For normally open switches:

In addition to the grounding requirement stated above, arresters on both sides of the switch are required. Install a set of arresters on adjacent poles on each side of the switch, see DCS section 12. When installing arresters on adjacent poles is not practical, arresters may be installed suspended from deadend insulator on switch pole.

Refer to DCS **10 34 05 ****, DCS **10 34 07 ****, DCS **10 69 05 ****, DCS **10 69 07 ****, DCS **10 69 09 ****, DCS **10 69 20 ****, and DCS **10 69 30 **** for arresters installation on switch pole.

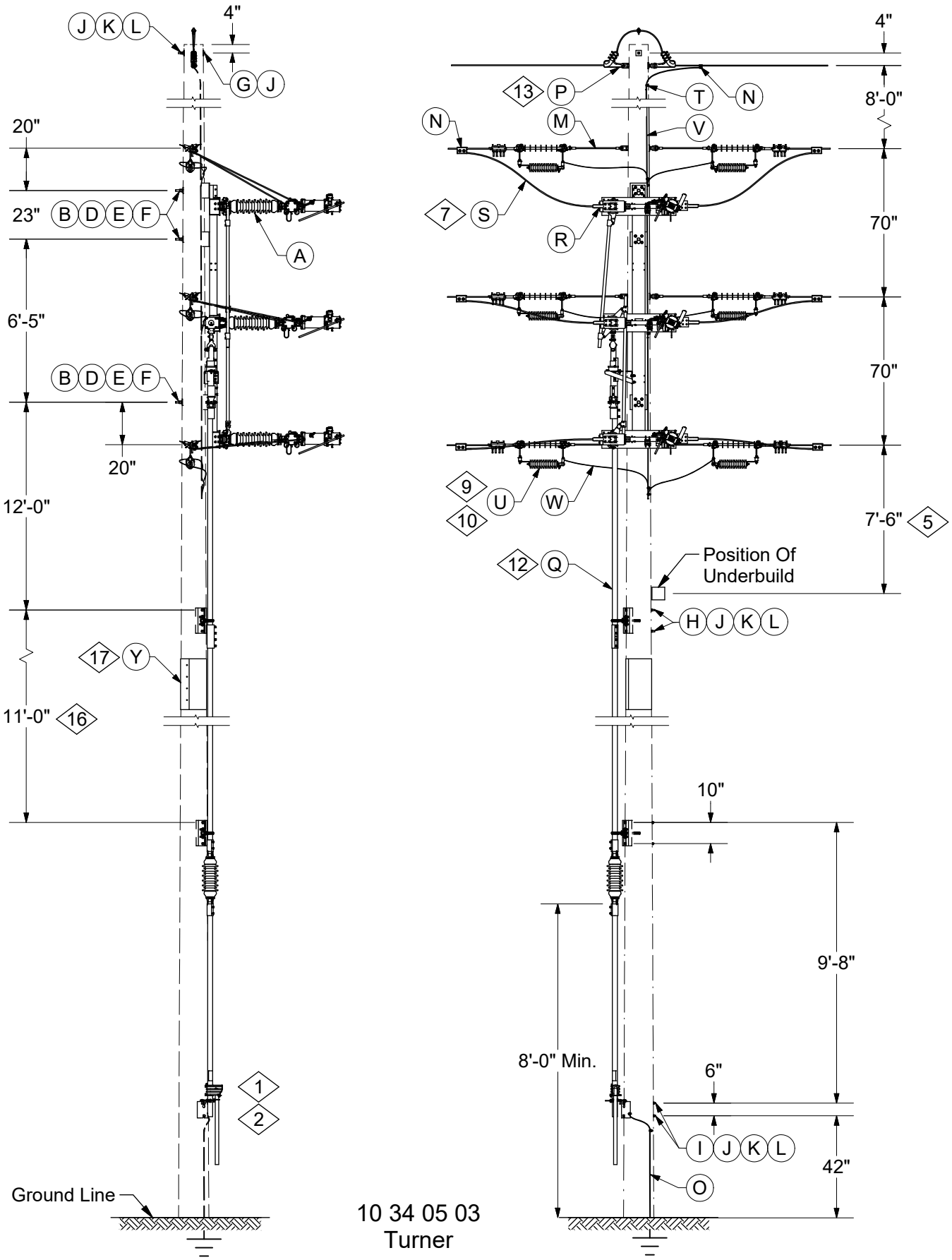
When arresters are installed on switch poles that do not require grounding mat:

If distribution neutral is present, arrester ground should be connected to distribution neutral and pole grounds installed on adjacent poles. If neutral is not present but static is present, arrester grounds should be connected to static and pole grounds installed on adjacent poles. If neither distribution or static is present, either a ground mat may be installed and arresters connected to pole ground or a neutral may be installed to adjacent poles with pole grounds and arrester grounds connected to neutral.

FUSES AND SWITCHES

Single Circuit Group Operated Switch
Vertical Construction - 1200 Amp

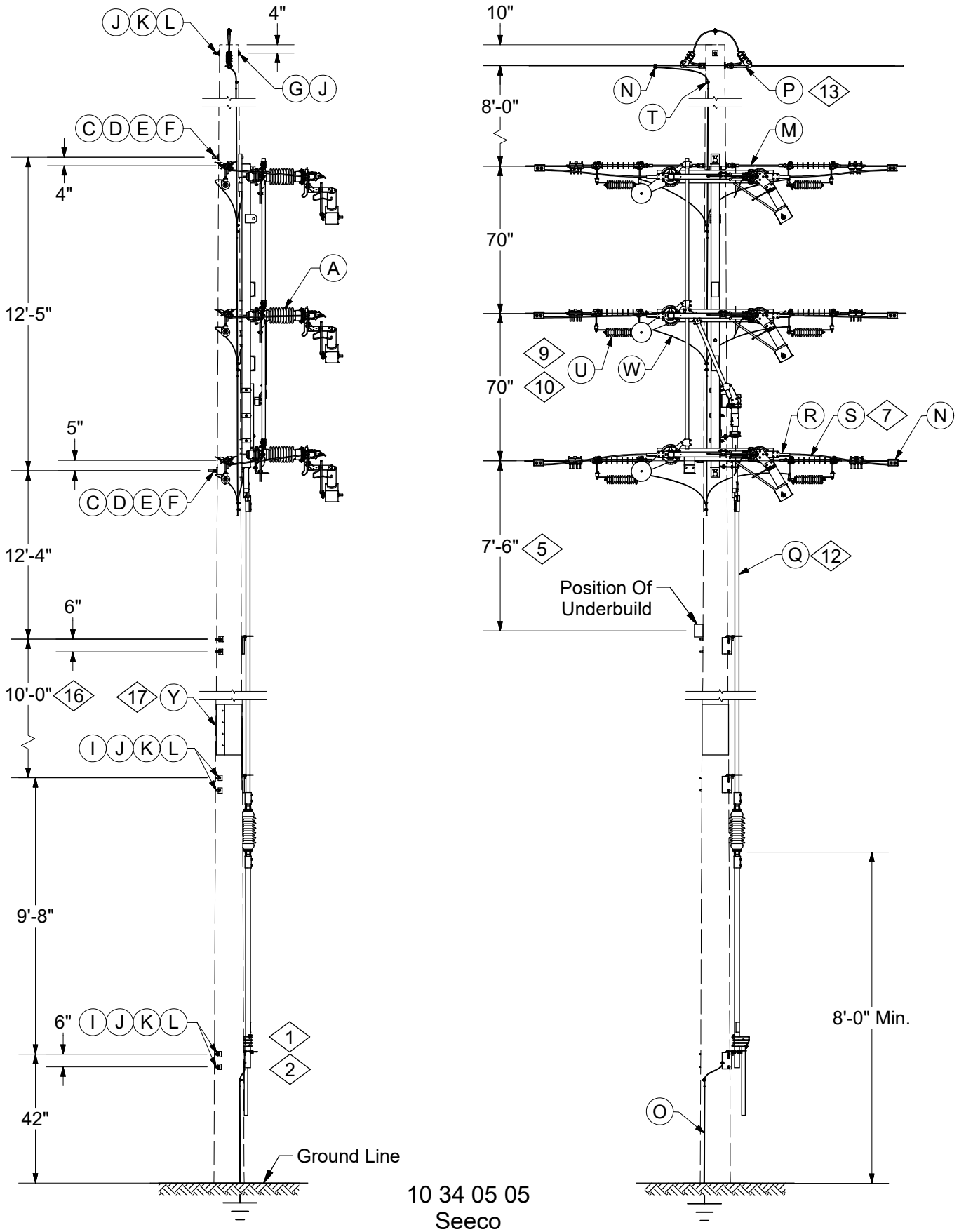
10 34 05 **
35kV
1 of 4



10 34 05 03
Turner

DISTRIBUTION
CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
18	01/01/24	DT	Converted to new format
17	09/29/17	WYW	



10 34 05 05
Seeco

REV	DATE	ENG	DESCRIPTION
18	01/01/24	DT	Converted to new format
17	09/29/17	WYW	

CONSTRUCTION NOTE(s):

1. Switch handle must be grounded. For pole ground, operating pipe insulator, fiberglass section and ground mat requirements, refer to DCS **10 34 01 01**, Section C.

2. Install operating handle in best position possible for unobstructed safe operation of the switch.

3. Install padlock on handle to prevent switch operation by the public.

4. The Turner switch weighs 980 lbs with interrupters. Seeco switch weighs 1,400 lbs with interrupters.

5. 7'-6" clearance between 34kV and underbuild applies to lowest 34kV deadend or lowest bolt of switch (whichever is lower) and highest distribution crossarm bolt or deadend (whichever is higher).

6. Remove switch lifting bracket after installation.

7. For switch leads, use line conductor for sizes larger than 556. For smaller line conductors, use poly covered copper, see DCS **07 00 80 00**.

8. Field cut pipe lengths as needed.

9. The line arrester shown in the drawing is suspended from the compressed on end fittings of the polymer deadend insulator and supported by aluminum hot line clamps, and will not work with porcelain deadend bells. The disconnector coupling assembly detaches the line end of the arrester should the arrester fail and will cause the arrester to pivot and drop down into a vertical position which makes the failed arrester much more visible. The disconnect coupling assembly with a 3/8” threaded stud that can be inserted into the tap lead eyebolt of the hotline clamp on the line end and an eyebolt with 3/8” stud that can be inserted into the tap lead eyebolt of the hotline clamp on the ground end. One of the tinned copper leads (on the pole end of the assembly) is to shunt the clevis-eye connection to eliminate radio noise. The longer tinned copper lead is for connection to a pole ground wire. Use a 3/8” carriage head bolt through the hot line clamp eyebolt to keep the assembly from falling if the hot line clamp tap lead eyebolt should loosen.

	ITEM	STK / DCS #	DESCRIPTION 10 34 05 **	03	05
	A	54 08 433	Turner TS2, Three Phase with LBRK – Vertical Mount	1	-
		54 08 442	SEECO 34kV, 1200A w/LBRK Vertical	-	1
	B	23 52 103	Bolt, Mach., 3/4" x 18" w/ square nut	3	-
	C	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	-	2
	D	23 66 031	Washer, Curved, Square, 3/4"	3	2
	E	23 66 135	Lock Washer - 3/4" Double Coil	3	2
	F	23 65 042	Lock Nut - 3/4" Square	3	2
	G	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	1	1
	H	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	4	4
	I	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	4	4
	J	23 66 207	Washer, Curved, Square, 5/8"	10	10
	K	23 66 134	Lock Washer - 5/8" Double Coil	9	9
	L	23 65 043	Lock Nut - 5/8" Square	9	9
	M	**06 34 60 15 @**	Pole, Deadend, 34kV w/ FG Extension	6	6
@	N	**07 00 25 00**	Clamp - Parallel Groove	6	6
1,@	O	**12 69 11 ****	Grounding Unit - Switching Pole	1	1
13,@	P	**06 00 11 ** @**	Static Wire Attachment	#	#
		18 05 10 01 @	OPGW Static	#	#
12,@	Q	32 01 821	2" x 10' Steel Pipe w/Coupling	#	#
@	R	**07 00 30 00**	Lug, Compression	6	6
7,@	S	**07 00 80 00**	Wire, Switch Lead	45	45
10,@	T	17 54 373	Connector - Split Bolt, #14 AWG Str. to #2 AWG Str.	8	8
10,@	U	10 01 248	Arrester, Line protection, 36kV Rated	6	6
10,@	V	18 51 019	Wire, #2 Cu SD Poly Covered (ft.)	20	20
10,@	W	18 51 021	Wire, #6 Cu SD Poly Covered (ft.)	20	20
10,@	X	23 64 001	Staple 3/8" x 2"	20	20
17,@	Y	23 17 473	Wood Pole Wrap	#	#
15,@	Z	60 55 041	FCI, Non Communicating, 8 hr or 3A Reset, 100A min Trip	#	#

DESIGN NOTE(s):

10. Arresters are not required for normally closed switch installation. Where switches are normally open, install a set of arresters on adjacent poles on both sides of the switch. When installing arresters on adjacent poles is not practical, both sets of arresters may be installed as described in note 9. Items T, U, V, W, and X are only required when arresters are installed.

11. If motor operator is required, refer to DCS **10 69 10 ****.

12. Item Q required if additional vertical pipe is required. Turner switch comes with four 10'-6" sections of pipe. Seeco switch comes with one 21'-0" and one 12'-6" section of pipe. Add extra pipe if upper mounting bolt is higher than 63'-0" for Turner switch and 59'-0" for Seeco switch.

13. Item P required if static wire is present.

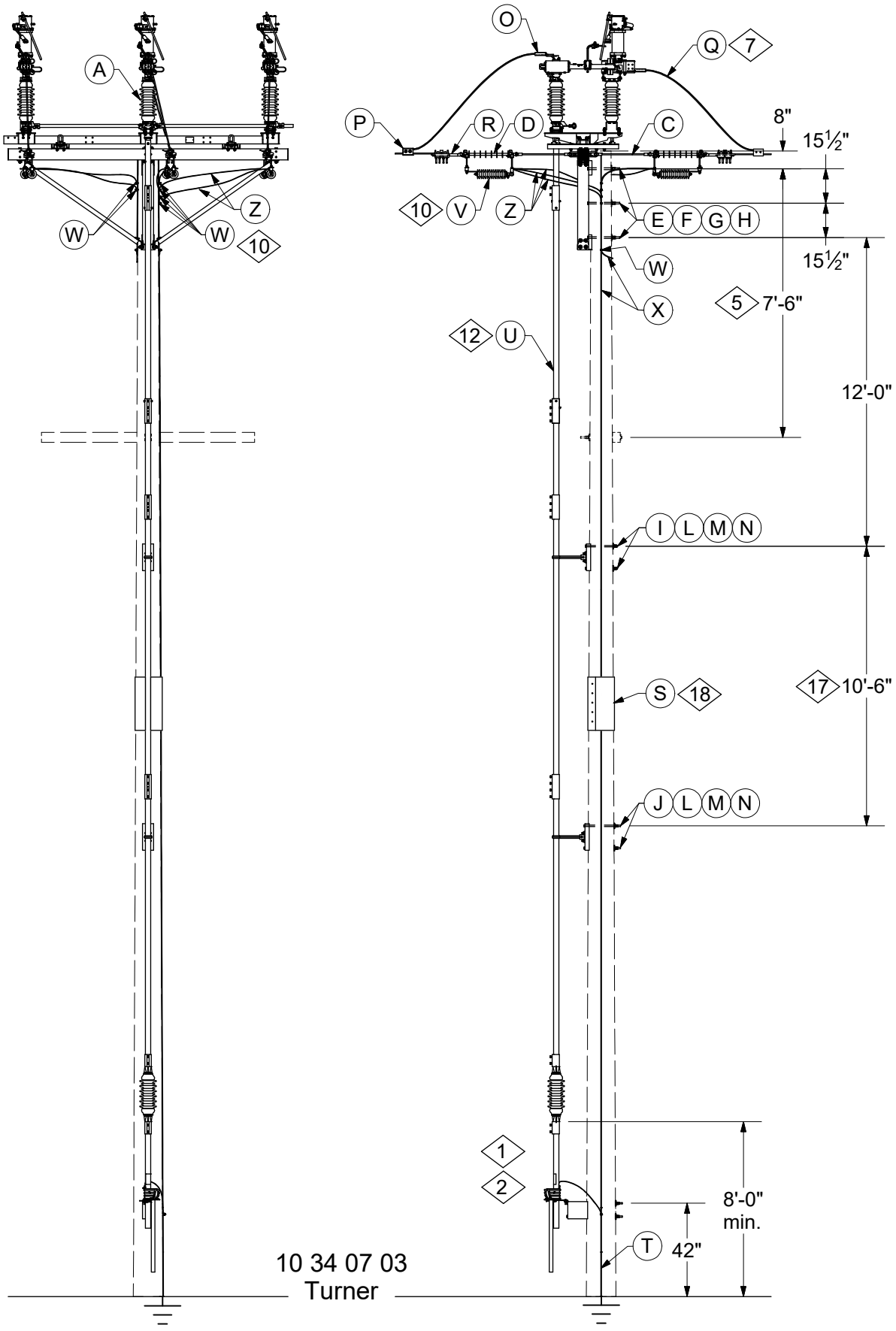
14. Switch should be installed on a pole that does not require guying.

15. FCI's may be installed on line conductor from 1/0 to 954 when switches are installed.

16. Pipe guide spacing may be adjusted from 8'-0" to 15'-0" to account for pole height.

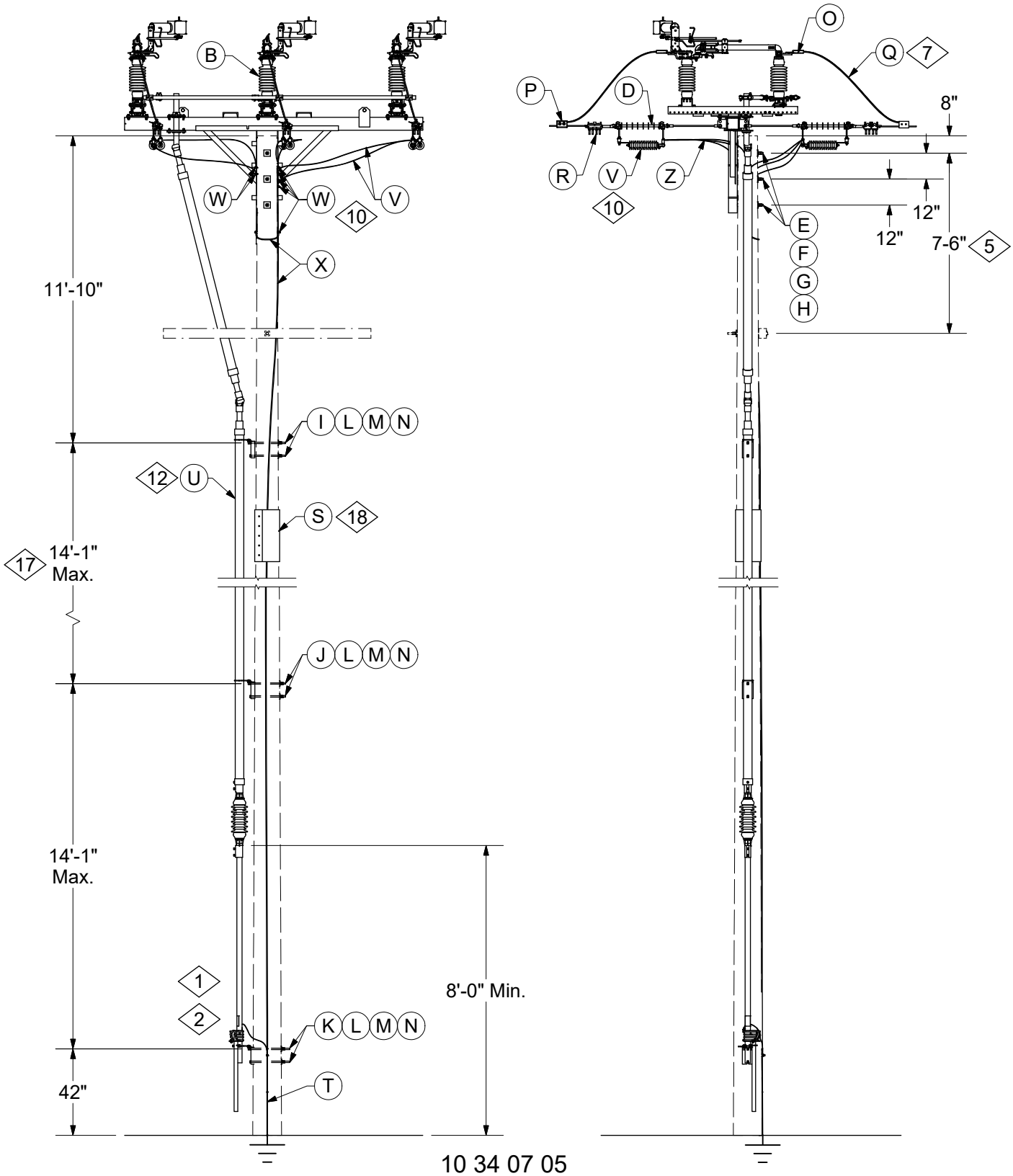
17. Pole wrap is received in 100'-0" rolls.

REV	DATE	ENG	DESCRIPTION
18	01/01/24	DT	Converted to new format
17	09/29/17	WYW	



10 34 07 03
Turner

REV	DATE	ENG	DESCRIPTION
12	01/01/24	DT	Converted to new format
11	06/30/16	WYW	



10 34 07 05
Seeco

REV	DATE	ENG	DESCRIPTION
12	01/01/24	DT	Converted to new format
11	06/30/16	WYW	

CONSTRUCTION NOTE(s):

1. Switch handle must be grounded. For pole ground, operating pipe insulator, fiberglass section and ground mat requirements, refer to DCS **10 34 01 01**, Section C.

2. Install operating handle in best position possible for unobstructed safe operation of the switch.

3. Install padlock on handle to prevent switch operation by the public.

4. The Turner switch weighs 980 lbs with interrupters. Seeco switch weighs 1,300 lbs with interrupters.

5. 7'-6" clearance between 34kV and underbuild applies to the top bolt for the switch pole mount bracket and the highest distribution crossarm bolt or deadend (whichever is higher).

6. Remove switch lifting bracket after installation.

7. For switch leads, use line conductor for sizes larger than 556. For smaller line conductors, use poly covered copper, see DCS **07 00 80 00**.

8. Field cut pipe lengths as needed.

9. The line arrester shown in the drawing is suspended from the compressed on end fittings of the polymer deadend insulator and supported by aluminum hot line clamps, and will not work with porcelain deadend bells. The disconnector coupling assembly detaches the line end of the arrester should the arrester fail and will cause the arrester to pivot and drop down into a vertical position which makes the failed arrester much more visible. The disconnect coupling assembly with a 3/8" threaded stud that can be inserted into the tap lead eyebolt of the hotline clamp on the line end and an eyebolt with 3/8" stud that can be inserted into the tap lead eyebolt of the hotline clamp on the ground end. One of the tinned copper leads (on the pole end of the assembly) is to shunt the clevis-eye connection to eliminate radio noise. The longer tinned copper lead is for connection to a pole ground wire. Use a 3/8" carriage head bolt through the hot line clamp eyebolt to keep the assembly from falling if the hot line clamp tap lead eyebolt should loosen.

	ITEM	STK / DCS #	DESCRIPTION 10 34 07 **	03	05
	A	54 08 437	Turner TS2 Switch, 34kV, 1200A w/LBRK-Flat Top Mount	1	-
	B	54 08 447	Seeco, Three Phase with LBRK – Flat Top Mount	-	1
	C	25 56 076	Insulator, Guy Strain, 26"	6	6
	D	25 06 053	Insulator, Suspension, 34kV	6	6
	E	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	3	3
	F	23 66 031	Washer, Curved, Square, 3/4"	4	4
	G	23 66 135	Lock Washer - 3/4" Double Coil	4	4
	H	23 65 042	Lock Nut - 3/4" Square	4	4
	I	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	2	2
	J	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	4	4
	K	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	2	2
	L	23 66 207	Washer, Curved, Square, 5/8"	8	8
	M	23 66 134	Lock Washer - 5/8" Double Coil	8	8
	N	23 65 043	Lock Nut - 5/8" Square	8	8
@	O	**07 00 30 00**	Lug, Compression	6	6
@	P	**07 00 25 00**	Clamp - Parallel Groove	6	6
7,@	Q	**07 00 80 00**	Wire, Switch Lead	45	45
@	R	**07 00 11 00**	Clamp, Deadend	6	6
18,@	S	23 17 473	Wood Pole Wrap	#	#
@	T	**12 69 11 ** @**	Grounding Unit - Switch Pole	1	1
12,@	U	32 01 821	Pipe, Steel Galv. 2" x 10' w Coupling, Turner	#	#
10,@	V	10 01 248	Arrester, Lightning, 36kV, Metal Oxide	6	6
10,@	W	17 54 373	Split Bolt, Bronze, #2 Str - #14 Str	8	8
10,@	X	18 51 019	Wire, #2 Cu Covered S.D. (ft.)	20	20
10,@	Y	23 64 001	Staple, Cu Coated Steel	20	20
10,@	Z	18 51 021	Wire, #6 Cu SD Poly Covered (ft.)	20	20
16,@	AA	60 55 041	FCI, Non Communicating, 8 hr or 3A Reset, 100A min. Trip	#	#

DESIGN NOTE(s):

10 Arresters are not required for normally closed switch installation. Where switches are normally open, install a set of arresters on adjacent poles on both sides of the switch. When installing arresters on adjacent poles is not practical, both sets of arresters may be installed as described in note 9. Items V, W, X, Y, and Z are only required when arresters are installed.

11. If motor operator is required, refer to DCS **10 69 10 ****.

12 Item U required if additional vertical pipe is required. Turner switch comes with four 10'-6" sections of pipe. Seeco switch comes with two 21'-0" sections of pipe. Add extra pipe if upper mounting bolt is higher than 59-'0" for either switch.

13. Maximum differential tension for Seeco switch shall not exceed 333 pounds per phase under NESC Heavy conditions. Maximum line tension shall not exceed 10,000 pounds under NESC Heavy conditions.

14. Maximum differential tension for Turner switch shall not exceed 1,000 pounds per phase under NESC Heavy conditions. Maximum line tension shall not exceed 10,000 pounds under NESC Heavy conditions.

15. Switch should be installed on a pole that does not require guying.

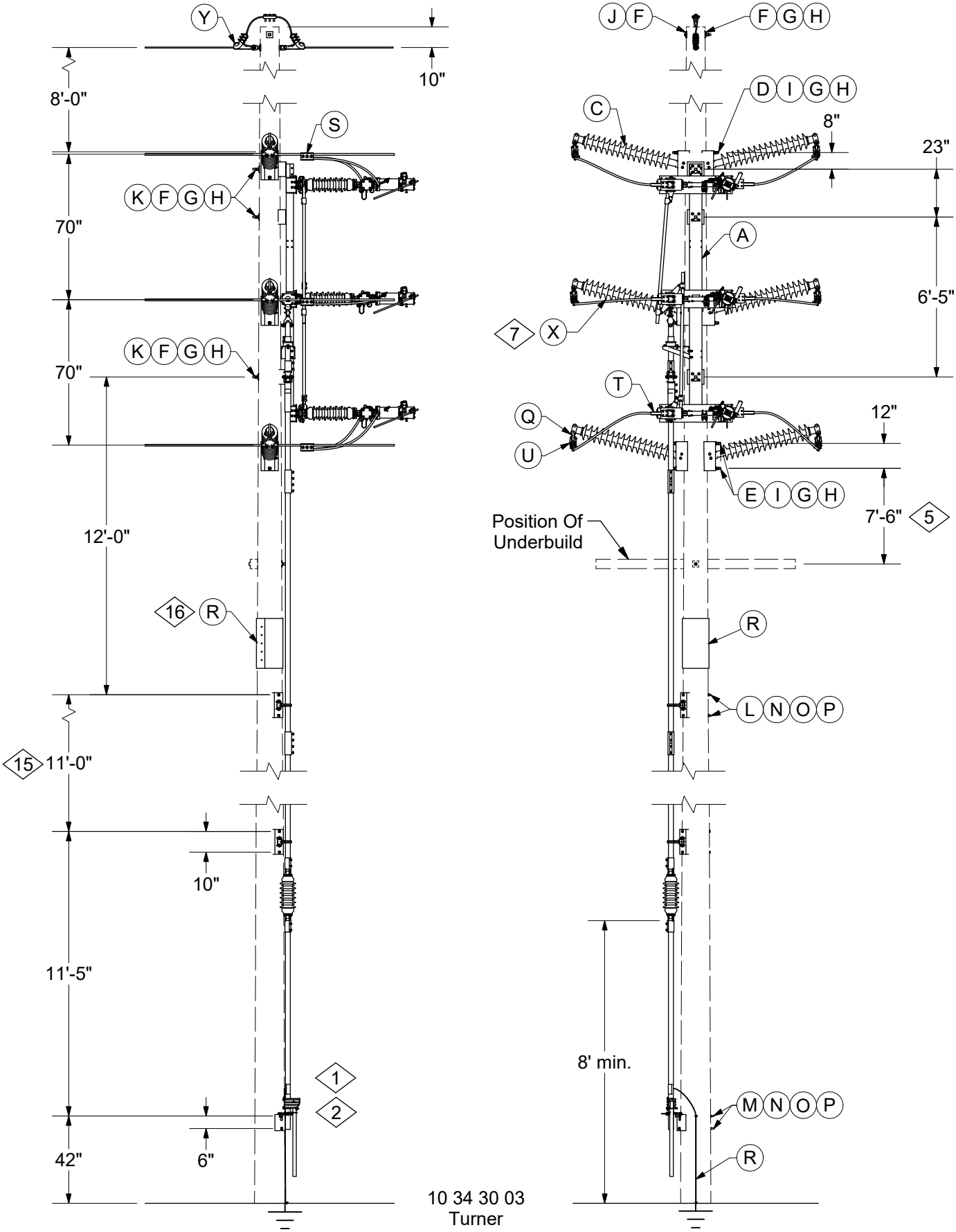
REV	DATE	ENG	DESCRIPTION
12	01/01/24	DT	Converted to new format
11	06/30/16	WYW	

DESIGN NOTE(s):

16. FCI's may be installed on line conductor from 1/0 to 954 when switches are installed.

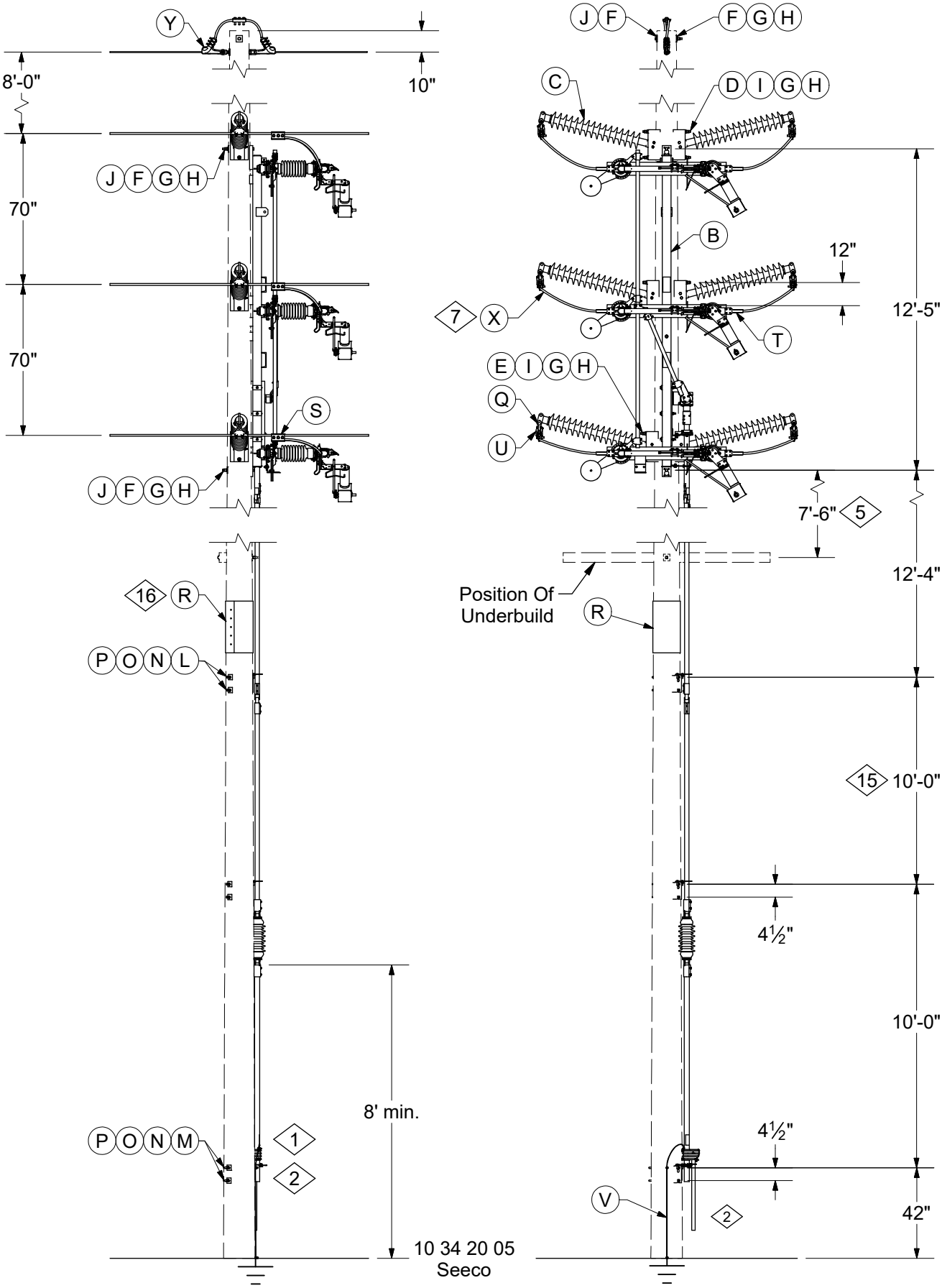
17. Pipe guide spacing may be adjusted from 8'-0" to 15'-0" to account for pole height.

18. Pole wrap is received in 100'-0" rolls. Cut roll to size and wrap around pole approximately 12" below neutral or secondary.



10 34 30 03
Turner

REV	DATE	ENG	DESCRIPTION
13	01/01/24	DT	Converted to new format
12	11/04/16	WYW	



REV	DATE	ENG	DESCRIPTION
13	01/01/24	DT	Converted to new format
12	11/04/16	WYW	

CONSTRUCTION NOTE(s):

1. Switch handle must be grounded. For pole ground, operating pipe insulator, fiberglass section and ground mat requirements, refer to DCS **10 34 01 01**, Section C.

2. Install operating handle in best position possible for unobstructed safe operation of the switch.

3. Install padlock on handle to prevent switch operation by the public.

4. The Turner switch weighs 980 lbs including interrupters. Seeco switch weighs 1,400 lbs.

5. 7'-6" clearance between 34kV and underbuild applies to lowest 34kV deadend, insulator bolt or lowest bolt of switch (whichever is lower) and highest distribution crossarm bolt or deadend (whichever is higher).

6. Remove switch lifting bracket after installation.

7. For switch leads, use line conductor for sizes larger than 556. For smaller line conductors, use poly covered copper, see DCS **07 00 80 00**.

8. Field cut pipe lengths as needed.

	ITEM	STK / DCS #	DESCRIPTION 10 34 20 **	03	05
	A	54 08 433	Turner TS2, Three Phase with LBRK – Vertical Mount	1	-
	B	54 08 442	SEECO 34kV, 1200A w/LBRK Vertical	-	1
	C	25 05 132	Insulator, Line Post, Horizontal, 138kV	6	6
	D	23 53 061	Bolt, DA, 3/4" Dia x 22" w/ 4 square nuts	4	4
	E	23 53 062	Bolt, DA, 3/4" Dia x 24" w/ 4 square nuts	2	2
	F	23 66 031	Washer, Curved, Square, 3/4"	5	4
	G	23 66 135	Lock Washer - 3/4" Double Coil	16	15
	H	23 65 042	Lock Nut - 3/4" Square	16	15
	I	23 66 030	Washer, Square, 3/4" Bolt	12	12
	J	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	1	3
	K	23 52 103	Bolt, Mach., 3/4" x 18" w/ square nut	3	-
	L	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	4	4
	M	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	4	4
	N	23 66 207	Washer, Curved, Square, 5/8"	8	8
	O	23 66 134	Lock Washer - 5/8" Double Coil	8	8
	P	23 65 043	Lock Nut - 5/8" Square	8	8
	Q	23 58 063	Wye Clevis − (Rotated) Eye Fitting	6	6
16,@	R	23 17 473	Wood Pole Wrap	#	#
@	S	**07 00 25 00**	Clamp - Parallel Groove	6	6
@	T	**07 00 30 00**	Lug, Compression	6	6
@	U	**07 00 20 00**	Clamp, Suspension	6	6
@	V	**12 69 11 ** @**	Grounding Unit - Switch Pole	1	1
10,@	W	32 01 821	2" x 10' Galv. Steel Pipe with Coupling	#	#
7,@	X	**07 00 80 00**	Wire, Switch Lead	60	60
11,@	Y	**06 00 11 ** @**	Static Wire Attchment	#	#
		18 05 10 01 @	OPGW Static	#	#
14,@	Z	60 55 041	FCI, Non Communicating, 8 hr or 3A reset, 100A min Trip	#	#

REV	DATE	ENG	DESCRIPTION
13	01/01/24	DT	Converted to new format
12	11/04/16	WYW	

DESIGN NOTE(s):

9. If motor operator is required, refer to DCS **10 69 10 ****.

10. Item W required if additional vertical pipe is required. Turner switch comes with four 10'-6" sections of pipe. Seeco switch comes with one 21'-0" and one 12'-6" section of pipe. Add extra pipe if upper mounting bolt is higher than 63'-0" for Turner switch and 59'-0" for Seeco switch.

11. Item Y required if static wire is present.

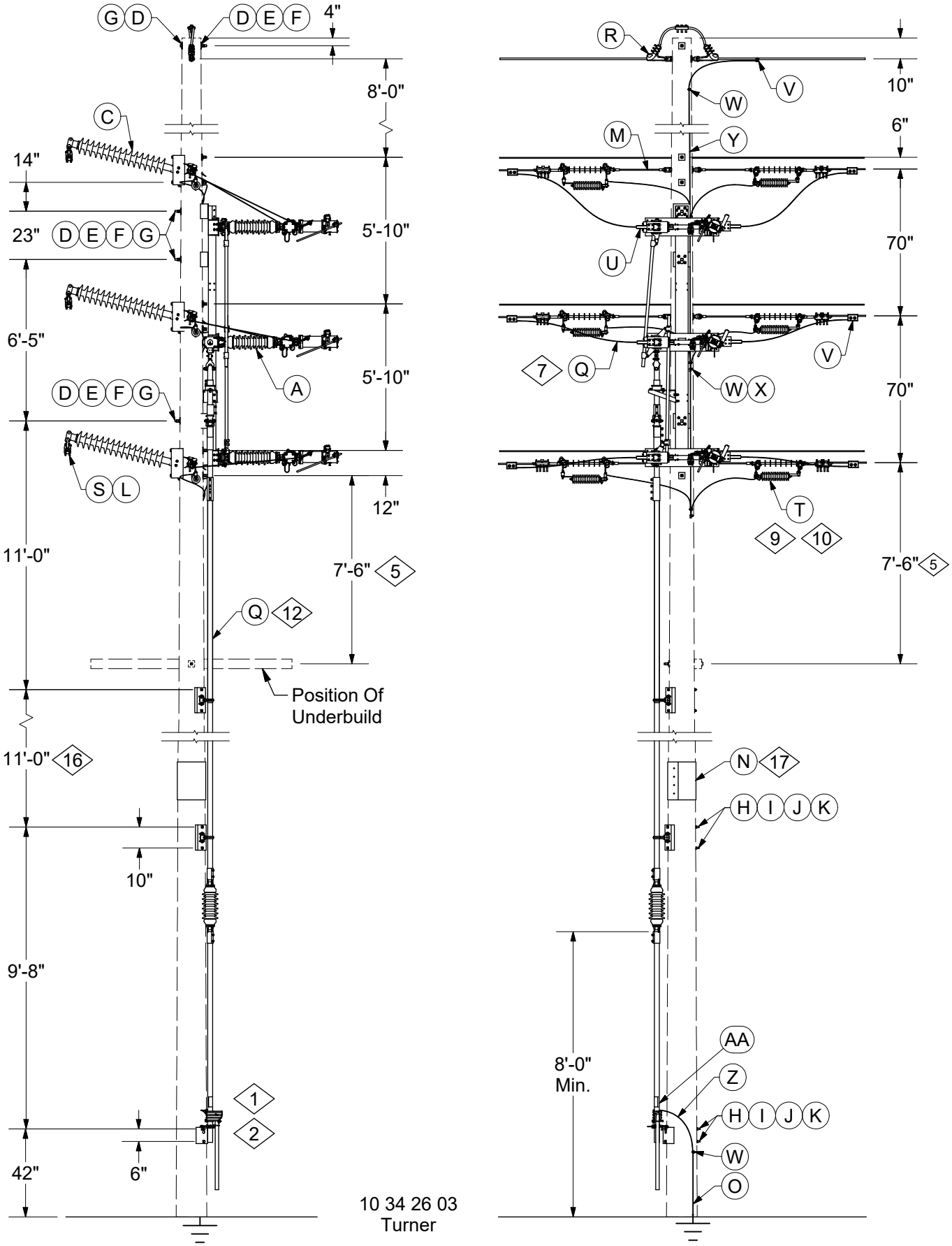
12. Switch should be installed on a pole that does not require guying.

13. Arresters are not required for normally closed switch installation. If switch is normally open, arresters are only needed on a circuit that does not continue in both directions. Install arresters when required on pole that circuits ends on, see DCS **12 00 01 01**.

14. FCI's may be installed on line conductor Larger than 1/0 when switches are installed.

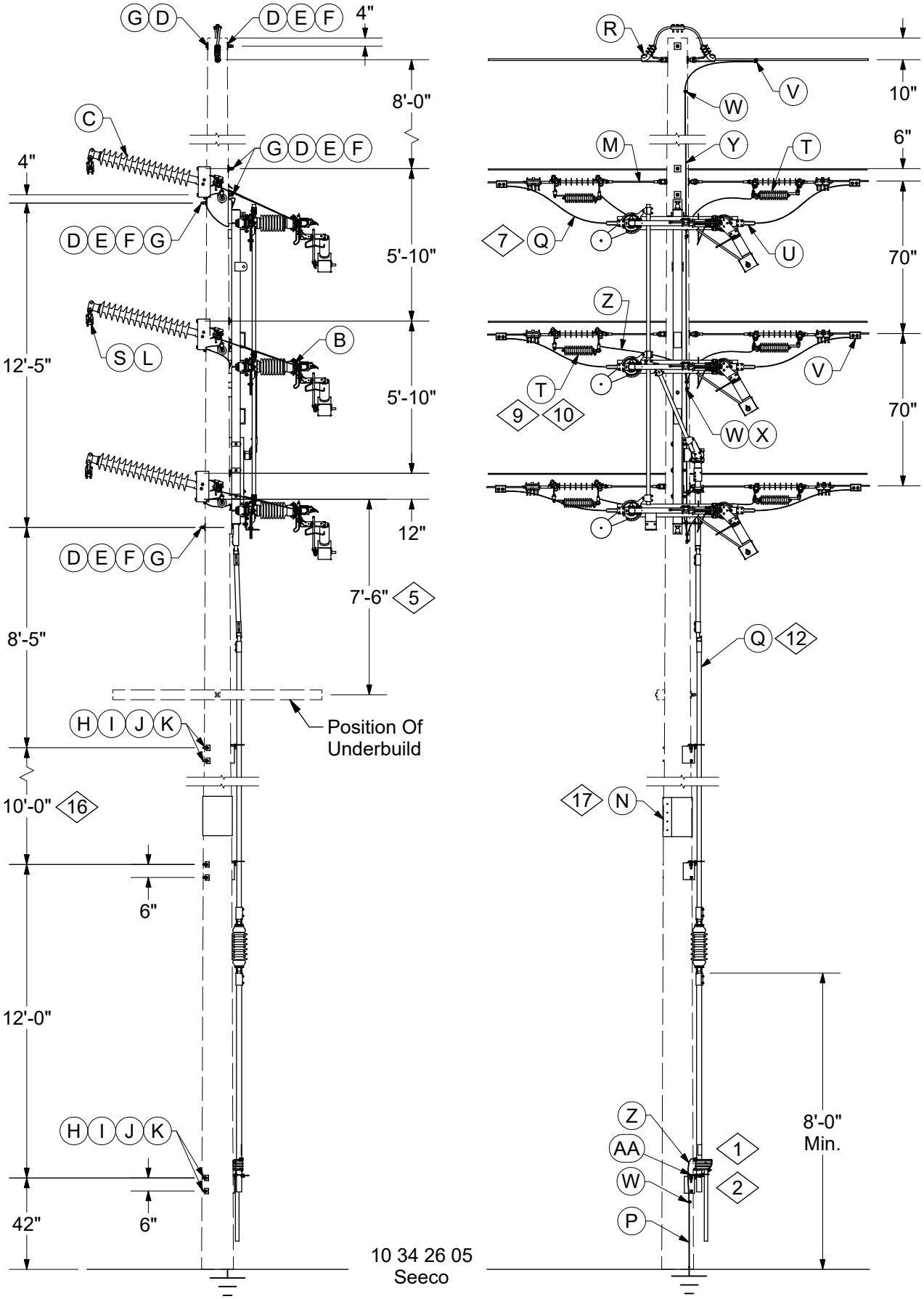
15. Pipe guide spacing may be adjusted from 8'-0" to 15'-0" to account for pole height.

16. Pole wrap is received in 100'-0" rolls. Cut roll to size and wrap around pole approximately 12" below neutral or secondary.



10 34 26 03
Turner

REV	DATE	ENG	DESCRIPTION
12	01/01/24	DT	Converted to new format
11	11/04/16	WYW	



10 34 26 05
Seeco

REV	DATE	ENG	DESCRIPTION
12	01/01/24	DT	Converted to new format
11	11/04/16	WYW	

CONSTRUCTION NOTE(s):

1. Switch handle must be grounded. For pole ground, operating pipe insulator, fiberglass section and ground mat requirements, refer to DCS **10 34 01 01**, Section C.

2. Install operating handle in best position possible for unobstructed safe operation of the switch.

3. Install padlock on handle to prevent switch operation by the public.

4. The Turner switch weighs 980 lbs including interrupters. Seeco switch weighs 1,400 lbs.

5. 7'-6" clearance between 34kV and underbuild applies to lowest 34kV deadend, insulator bolt or lowest bolt of switch (whichever is lower) and highest distribution crossarm bolt or deadend (whichever is higher).

6. Remove switch lifting bracket after installation.

7. For switch leads, use line conductor for sizes larger than 556. For smaller line conductors, use poly covered copper, see DCS **07 00 80 00**.

8. Field cut pipe lengths as needed.

9. The line arrester shown in the drawing is suspended from the compressed-on end fittings of the polymer deadend insulator and supported by aluminum hot line clamps, and will not work with porcelain deadend bells. The disconnector coupling assembly detaches the line end of the arrester should the arrester fail and will cause the arrester to pivot and drop down into a vertical position which makes the failed arrester much more visible. The disconnect coupling assembly with a 3/8" threaded stud that can be inserted into the tap lead eyebolt of the hot line clamp on the line end and an eyebolt with 3/8" stud that can be inserted into the tap lead eyebolt of the hot line clamp on the ground end. One of the tinned copper leads (on the pole end of the assembly) is to shunt the clevis-eye connection to eliminate radio noise. The longer tinned copper lead is for connection to a pole ground wire. Use a 3/8" carriage head bolt through the hot line clamp eyebolt to keep the assembly from falling if the hot line clamp tap lead eyebolt should loosen.

	ITEM	STK / DCS #	DESCRIPTION 10 34 26 **	03	05
	A	54 08 433	Turner TS2, Three Phase with LBRK – Vertical Mount	1	-
	B	54 08 442	SEECO 34kV, 1200A w/LBRK Vertical	-	1
	C	25 05 132	Insulator, Line Post, Horizontal, 138kV	3	3
	D	23 66 031	Washer, Curved, Square, 3/4"	11	10
	E	23 66 135	Lock Washer - 3/4" Double Coil	10	9
	F	23 65 042	Lock Nut - 3/4" Square	10	9
	G	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	1	3
		23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	6	6
		23 52 103	Bolt, Mach., 3/4" x 18" w/ square nut	3	-
	H	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	4	4
		23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	4	4
	I	23 66 207	Washer, Curved, Square, 5/8"	6	8
	J	23 66 134	Lock Washer - 5/8" Double Coil	6	8
	K	23 65 043	Lock Nut - 5/8" Square	6	8
	L	23 58 063	Wye Clevis − (Rotated) Eye Fitting	3	3
	M	**06 34 60 15 @**	Deadend, Pole, 34.5 kV	6	6
17,@	N	23 17 473	Wood Pole Wrap	#	#
@	O	**12 69 11 ** @**	Grounding Unit - Switch Pole	1	1
7,@	P	**07 00 80 00**	Wire, Switch Leads	45	45
12,@	Q	32 01 821	2" x 10' Steel Pipe w/coupling	#	#
13,@	R	**06 00 11 ** @**	Static Wire Attachment	#	#
		18 05 10 01 @	OPGW Static	#	#
@	S	**07 00 20 00**	Clamp, Suspension	3	3
10,@	T	10 01 248	Arrester, Line protection, 36kV Rated	6	6
@	U	**07 00 30 00**	Lug, Connecting	6	6
@	V	**07 00 25 00**	Clamp - Parallel Groove	6	6
10,@	W	17 54 373	Connector - Split Bolt, #14 AWG Str. to #2 AWG Str.	8	8
10,@	X	23 64 001	Staple 3/8" x 2"	20	20
10,@	Y	18 51 019	Wire, #2 Cu S.D. Poly Covered (ft.)	20	20
10,@	Z	18 51 021	Wire, #6 Cu S.D. Poly Covered (ft.)	20	20
15,@	AA	60 55 041	FCI, Non Communicating, 8 hr or 3A Reset, 100A min Trip	#	#

DESIGN NOTE(s):

10. Arresters are not required for normally closed switch installation. Where switches are normally open, install a set of arresters on adjacent poles on both sides of the switch. When installing arresters on adjacent poles is not practical, both sets of arresters may be installed as described in note 9. Refer to DCS **12 00 01 01** for arrester/s selection. Items T,W,X,Y, and Z are only required when arrester/s are installed.

11. If motor operator is required, refer to DCS **10 69 10 ****.

12. Item Q required if additional vertical pipe is required. Turner switch comes with four 10'-6" sections of pipe. Seeco switch comes with one 21'-0" and one 12'-6" section of pipe. Add extra pipe if upper mounting bolt is higher than 63'-0" for Turner switch and 59'-0" for Seeco switch.

13. Item R required if static wire is present.

14. Switch should be installed on a pole that does not require guying.

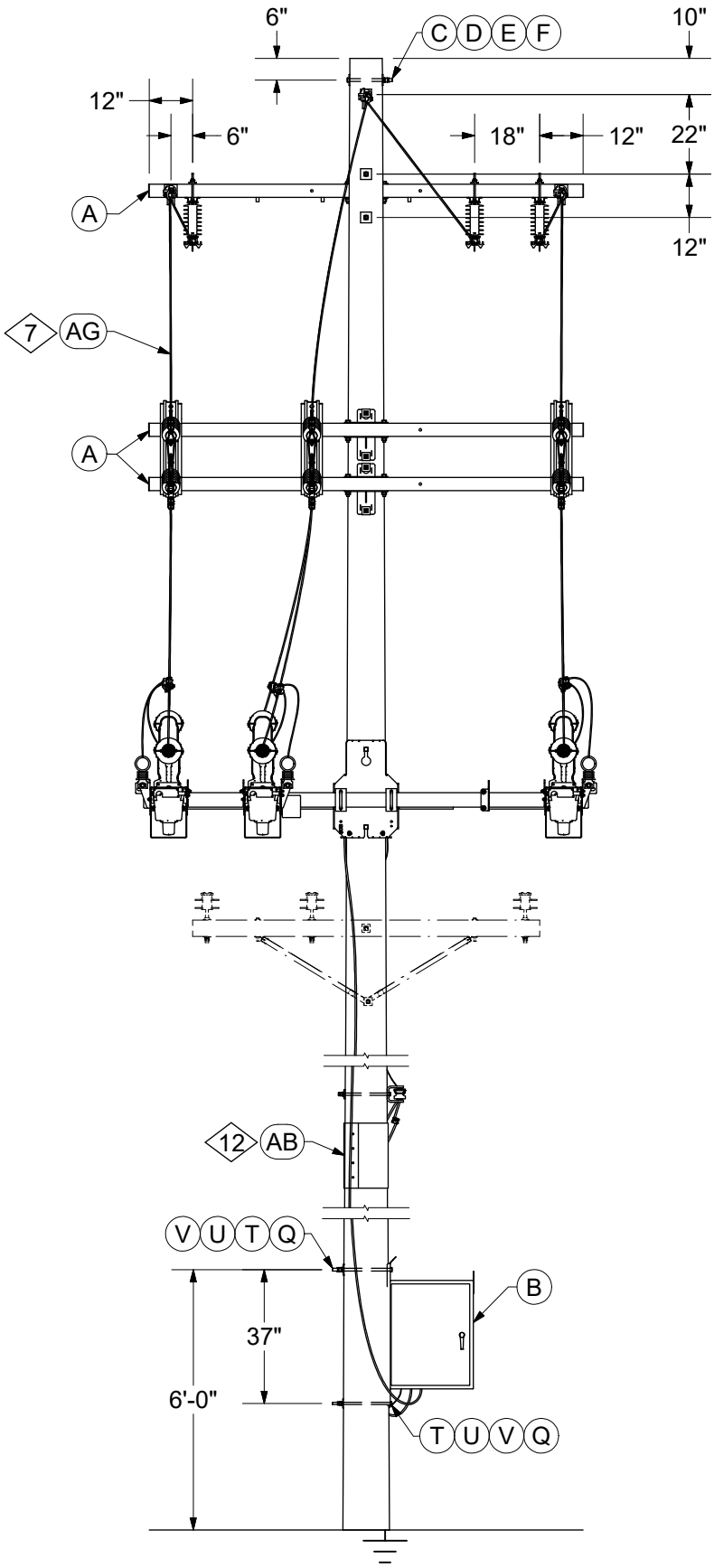
REV	DATE	ENG	DESCRIPTION
12	01/01/24	DT	Converted to new format
11	11/04/16	WYW	

DESIGN NOTE(s):

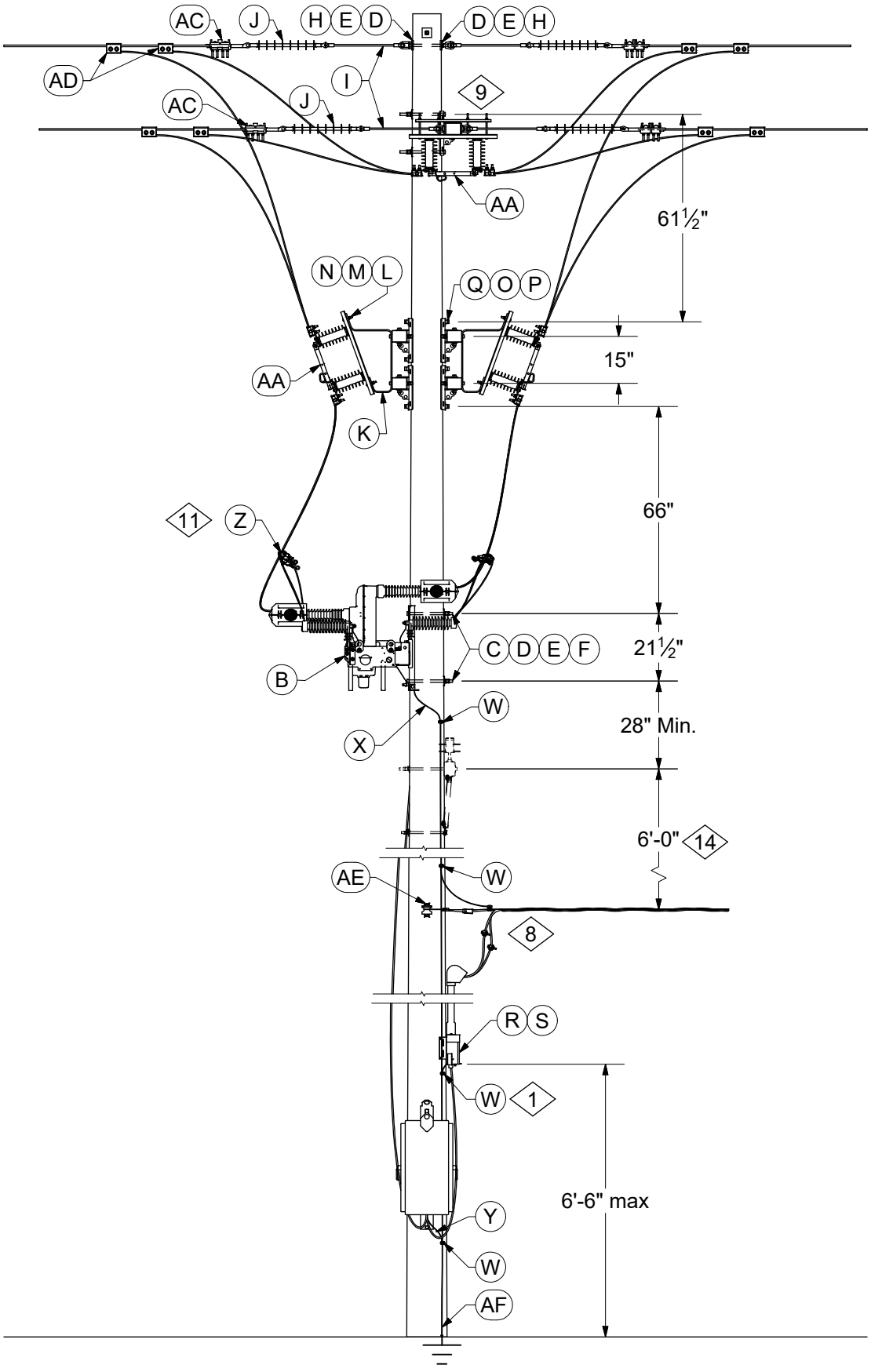
15. FCI's may be installed on line conductor 1/0 and larger when switches are installed.

16. Pipe guide spacing may be adjusted from 8'-0" to 15'-0" to account for pole height.

17. Pole wrap is received in 100'-0" rolls.Cut roll to size and wrap around pole approximately 12" below neutral or secondary.



REV	DATE	ENG	DESCRIPTION
17	01/01/24	DT	Converted to new format
16	09/29/17	WYW	



REV	DATE	ENG	DESCRIPTION
17	01/01/24	DT	Converted to new format
16	09/29/17	WYW	

CONSTRUCTION NOTE(s):

1. Secondary breaker box and recloser control cabinet shall be connected to pole ground with #6, S.D. Cu. Recloser shall be bonded to pole ground with #2 Cu.

2. Position lugs so the cable enters the animal guard through the side entry point, in order to direct cables to the switches.

3. If static present, maintain 8' separation from the static wire to the upper bolt phase crossarm.

4. The middle arresters should always be mounted on the pole side, the outside phase arresters should be mounted to the outside of the Viper arm. The arrangement will maximize the phase-phase spacing of energized parts.

5. The 36 kV lightning arresters come pre-installed on the Viper recloser from the factory with 36" of #4 cu poly covered wire that must be connected to the recloser leads with hot line clamps at least 36" away from the base of recloser or any exposed component. The replacement 36 kV arrester is Stock #10 01 252.

6. If system neutral is present, bond #2 Cu ground to the system neutral. If system neutral is not present and a static/shield wire is present, then bond the #2 Cu ground to the static/shield wire. If system neutral and static wire are both present, only bond the #2 Cu ground to the system neutral.

7. Minimum conductor size shall be 1/0 Cu.

8. If communications is present, 40" clearance to communication applies to the lowest secondary or drip loop at weatherhead, whichever is lowest.

9. If differential tension is present, fiberglass deadend crossarm shall be installed on the side of the pole with lower tension. The Viper shall be installed on the opposite side of the pole as the crossarm. Bypass switches shall open away from recloser.

10. If secondary neutral is not common to primary neutral and/or static, drive an additional ground rod for the secondary neutral not less than 20'-0" from the pole ground rod and connect the ground lead through an isolation arrester (Stock #10 01 019) to the pole ground. The secondary grounding conductor shall be installed for 600V (use riser wire Stock #18 53 011). Both ground leads must be covered with plastic moulding for a distance of 8' from the ground. The resistance of both grounds should not exceed 25 ohms.

11. If recloser leads are 1/0, use (6) hotline clamps, Stock #23 78 183.

12. Wood pole wrap comes on 100'-0" rolls. Install rough side of wrap against pole.

	ITEM	STK / DCS #	DESCRIPTION 10 34 50 **	03
	A	**04 00 42 03**	Crossarm - Deadend, F/G 10'	5
	B	69 10 248	Recloser, 35kV, 800 Amp (G&W) Z Style	1
	C	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	2
		23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	2
	D	23 66 031	Washer, Curved, Square, 3/4"	6
	E	23 66 135	Lock Washer - 3/4" Double Coil	4
	F	23 65 042	Lock Nut - 3/4" Square	3
	G	23 59 095	Eyelet, 3/4"	1
	H	23 65 018	Eyenut, 3/4"	1
	I	25 56 076	Insulator, Guy Strain, 26"	6
	J	25 06 053	Insulator, Suspension, 34kV	6
	K	23 06 131	Bracket, Angle Mount	6
	L	23 52 003	Carriage Bolt, 3/8" x 5" w/ square nut	12
	M	23 66 016	Flat Washer, 3/8", Galvanized	12
	N	23 66 003	Washer - Lock, Galv. Steel, 3/8"	12
	O	23 52 256	Bolt, Mach., 5/8" x 7" w/ square nut	12
	P	23 66 132	Washer, Flat, Sq., 4" x 4", w/ 13/16" Hole	12
	Q	23 65 043	Lock Nut - 5/8" Square	14
	R	54 17 486	Circuit Breaker, Receptical Box, w/Riser 120V, 15A	1
	S	23 60 002	Lag Screw - 1/4" x 4"	4
	T	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	2
	U	23 66 207	Washer, Curved, Square, 5/8"	2
	V	23 66 134	Lock Washer - 5/8" Double Coil	2
	W	17 54 373	Connector - Split Bolt, #14 AWG Str. to #2 AWG Str.	4
	X	18 51 019	Wire, #2 Cu Poly (ft.)	10
	Y	18 51 021	Wire, #6 Cu Poly (ft.)	6
	Z	17 02 175	Clamp, Hotline, 500 kCMIL to #4 Cu	6
11	AA	54 07 302	Disc., Switch, 900 A, 34 kV,	9
@	AB	23 17 473	Wood Pole Wrap	1
@	AC	**07 00 20 00**	Clamp, Deadend	6
@	AD	**07 00 25 00**	Clamp - Parallel Groove	15
@	AE	**03 01 ** ** @**	Secondary Configuration	1
@	AF	**12 00 10 03 @**	Ground Unit, #2 Cu Poly, Ground Rod	1
		12 00 10 04 @	Ground Unit, #2 Cu Ploy, Ground Coil	1
@	AG	**07 00 80 00**	Wire, Cu, Poly (ft.)	110

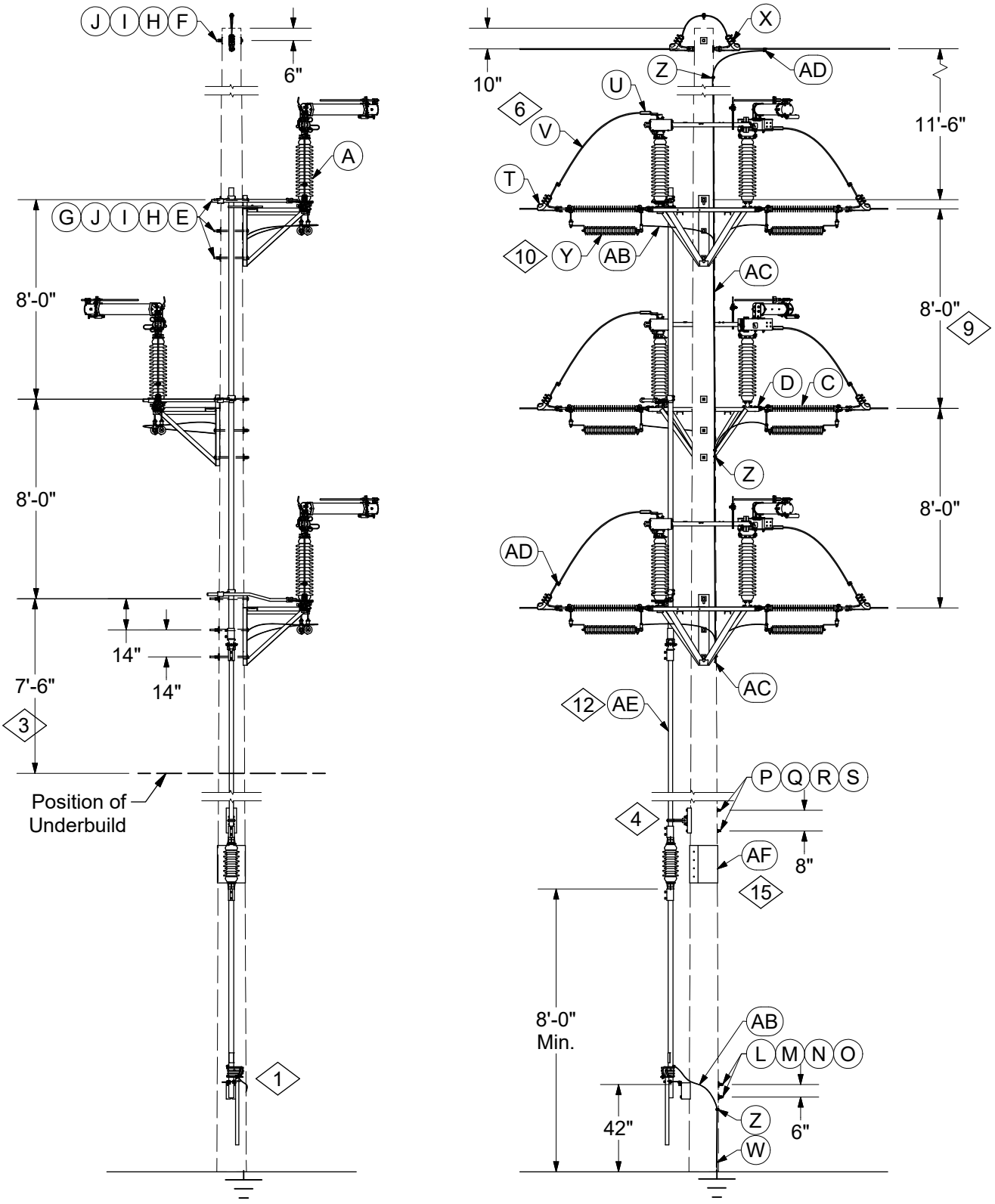
DESIGN NOTE(s):

13. The Viper comes with a 50'-0" control cable. If the lower Viper mounting bolt is higher than 47'-0", a 75'-0" control cable, Stock #69 10 263, is required. If a shorter cable is needed, a 35'-0" cable is available under Stock #69 10 234. Replacement 50'-0" cable is Stock #69 10 233.

<14> See DCS **03 00 01 00** for spacing information. May be reduced to 40" if pole space is limited.

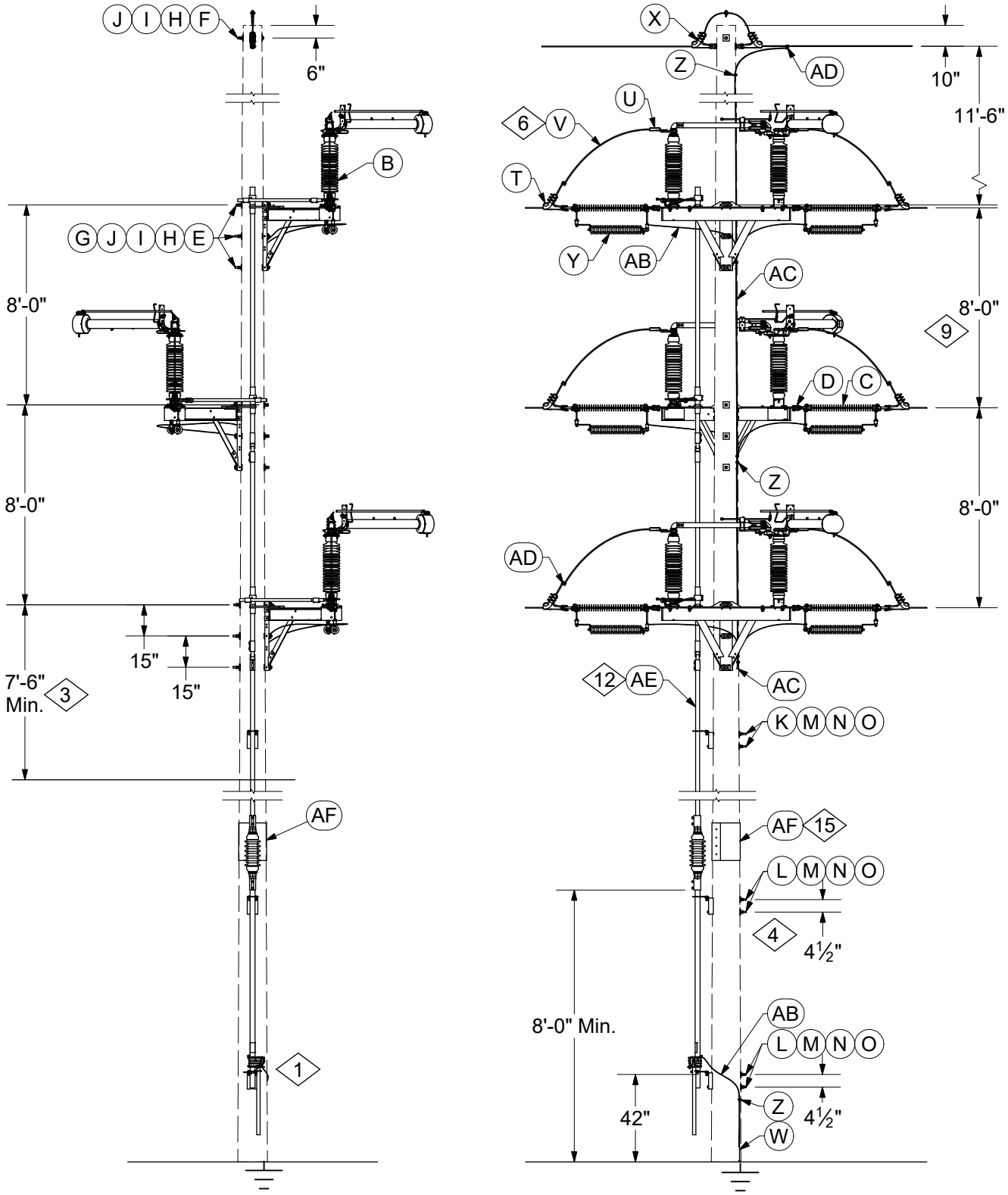
15. 120V AC is required to power recloser control cabinet. If secondary is not present, a 1 kVa or larger transformer may be installed on nearby pole.

REV	DATE	ENG	DESCRIPTION
17	01/01/24	DT	Converted to new format
16	09/29/17	WYW	



DCS #	DESCRIPTION
10 69 05 01	Turner Switch 69kV 1200A w/Load Interrupters
10 69 05 02	Turner Switch 69kV 1200A w/o Load Interrupters

REV	DATE	ENG	DESCRIPTION
6	01/01/24	DT	Converted to new format
5	07/27/17	WYW	



DCS #	DESCRIPTION
10 69 05 03	SEECO Switch 69kV 1200A w/Load Interrupters
10 69 05 04	SEECO Switch 69kV 1200A w/o Load Interrupters

REV	DATE	ENG	DESCRIPTION
6	01/01/24	DT	Converted to new format
5	07/27/17	WYW	

CONSTRUCTION NOTE(s):

1. Switch handle must be grounded. For pole ground, operating pipe insulator, fiberglass section and ground mat requirements, refer to DCS **10 34 01 01**, Section C.

2. Install padlock on handle to prevent switch operation by the public.

3. 7'-6" clearance between 69kV and underbuild applies to upper mounting bolt on lowest switch frame and highest distribution crossarm bolt or deadend (whichever is higher).

4. Evenly space pipe guides 10'-0" to 15'-0" apart.

5. Each Seeco phase assembly weighs 600 pounds without interrupter and 700 pounds with interrupter. Each Turner phase assembly weighs 350 pounds without interrupter and 400 pounds with interrupter.

6. For switch leads, use line conductor for sizes larger than 556. For smaller line conductors, use poly covered copper, see DCS **07 00 80 00**.

7. Field cut pipe lengths as needed.

8. The line arrester shown in the drawing is suspended from the compressed on end fittings of the polymer deadend insulator and supported by aluminum hot line clamps, and will not work with porcelain deadend bells. The disconnector coupling assembly detaches the line end of the arrester should the arrester fail and will cause the arrester to pivot and drop down into a vertical position which makes the failed arrester much more visible. The disconnect coupling assembly with a 3/8" threaded stud that can be inserted into the tap lead eyebolt of the hotline clamp on the line end and an eyebolt with 3/8" stud that can be inserted into the tap lead eyebolt of the hotline clamp on the ground end. One of the tinned copper leads (on the pole end of the assembly) is to shunt the clevis-eye connection to eliminate radio noise. The longer tinned copper lead is for connection to a pole ground wire.

9. For 8'-0" spacing, the interrupter (if equipped) must be horizontally mounted to the insulator, as shown in the standards; otherwise the spacing shall be 10'-0" for vertically mounted interrupters, as shown in Figure 1. All new load break switches come with horizontally mounted interrupters. The vertically mounted interrupter can be replaced with horizontally mounted interrupters.

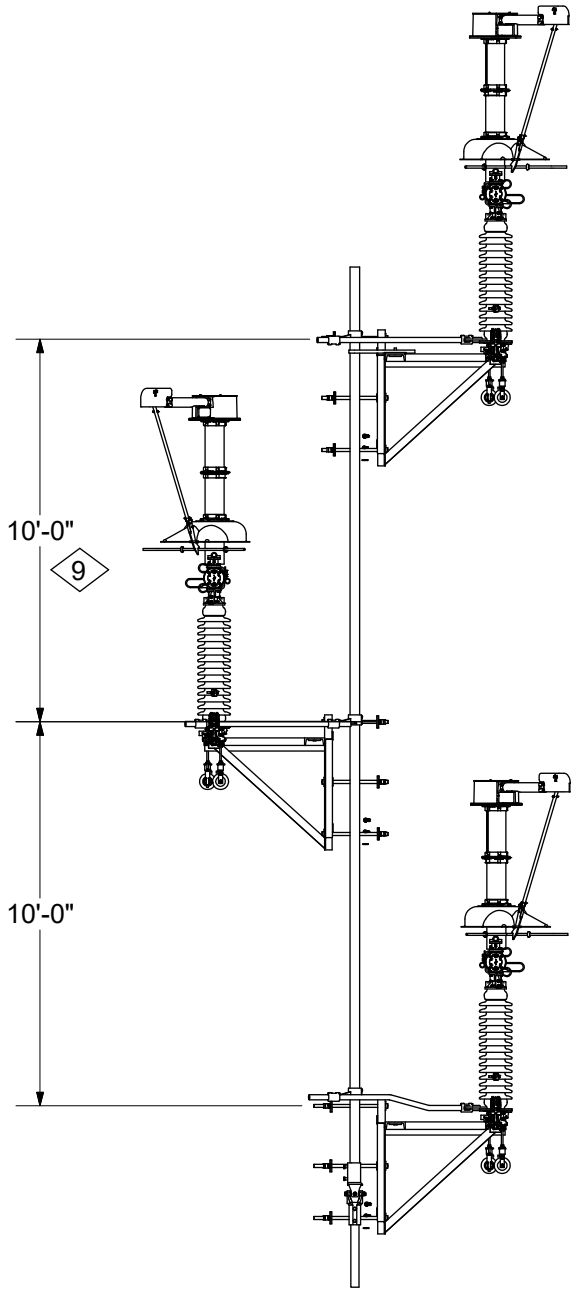


Figure 1

REV	DATE	ENG	DESCRIPTION
6	01/01/24	DT	Converted to new format
5	07/27/17	WYW	

	ITEM	STK / DCS #	DESCRIPTION 10 69 05 **	01	02	03	04
	A	54 09 393	Turner CS2 Switch, 69kV, 1200A, w/o Interrupters	-	1	-	-
		54 09 395	Turner CS2 Switch, 69kV, 1200A, w/Interrupters	1	-	-	-
	B	54 09 035	SEECO Switch, 69kV, 1200A, w/ Interrupters	-	-	1	-
		54 09 369	SEECO Switch, 69kV, 1200A, w/o Interrupters	-	-	-	1
	C	25 06 113	Insulator, Suspension, 69kV	6	6	6	6
	D	23 68 440	Shackle, Anchor, 3/4" Pin, 1-1/16" opening, Galv.	6	6	6	6
	E	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	6	6	6	6
	F	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	1	1	1	1
	G	23 66 131	Washer, Square, 3/4"	9	9	9	9
	H	23 66 031	Washer, Curved, Square, 3/4"	11	11	11	11
	I	23 66 135	Lock Washer - 3/4" Double Coil	10	10	10	10
	J	23 65 042	Lock Nut - 3/4" Square	10	10	10	10
	K	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	-	-	8	8
	L	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	2	2	4	4
	M	23 66 207	Washer, Curved, Square, 5/8"	2	2	12	12
	N	23 66 134	Lock Washer - 5/8" Double Coil	2	2	12	12
	O	23 65 043	Lock Nut - 5/8" Square	2	2	12	12
	P	23 52 309	Bolt, Mach., 1/2" x 16" w/ square nut	6	6	-	-
	Q	23 66 017	Washer - Round 1/2"	6	6	-	-
	R	23 66 133	Lock Washer - Double Coil 1/2"	6	6	-	-
	S	23 65 056	Lock Nut - 1/2" Square	6	6	-	-
@	T	**07 00 20 00**	Clamp, Deadend	6	6	6	6
@	U	**07 00 30 00**	Lug, Compr. Terminal, AL.	6	6	6	6
6,@	V	**07 00 80 00**	Wire, Switch Leads	45	45	45	45
1,@	W	**12 69 11 ** @**	Grounding Unit	1	1	1	1
@	X	**06 00 11 ** @**	Static Wire Attachment	#	#	#	#
		18 05 10 01 @	OPGW Static	#	#	#	#
10,@	Y	10 01 236	Arrester, Line Protection, 60kV Duty Cycle, 48kV MCOV	6	6	6	6
10,@	Z	17 54 373	Connector - Split Bolt, #14 AWG Str. to #2 AWG Str.	8	8	8	8
10,@	AA	18 51 019	Wire, #2 Cu SD Poly Covered (ft.)	40	40	40	40
10,@	AB	18 51 021	Wire, #6 Cu SD Poly Covered (ft.)	42	42	42	42
10,@	AC	23 64 001	Staple 3/8" x 2"	20	20	20	20
@	AD	**07 00 25 00**	Clamp, Parallel Groove	6	6	6	6
12,@	AE	32 01 821	2" x 10' Steel Pipe w/Coupling	#	#	#	#
15,@	AF	23 17 473	Wood pole Wrap	#	#	#	#
14,@	AG	60 55 041	FCI, Non Communicating, 8 hr or 3A Reset, 100A min. Trip	#	#	#	#

REV	DATE	ENG	DESCRIPTION
6	01/01/24	DT	Converted to new format
5	07/27/17	WYW	

DESIGN NOTE(s):

10. Arresters are not required for normally closed switch installation. Where switches are normally open, install a set of arresters on adjacent poles on both sides of the switch. When installing arresters on adjacent poles is not practical, both sets of arresters may be installed as described in note 8. Refer to DCS **12 00 01 01** for arrester selection. Items AA, AB, AC, AD, and AE are only required when arresters are installed.

11. If motor operator is required, refer to DCS **10 69 10 ****.

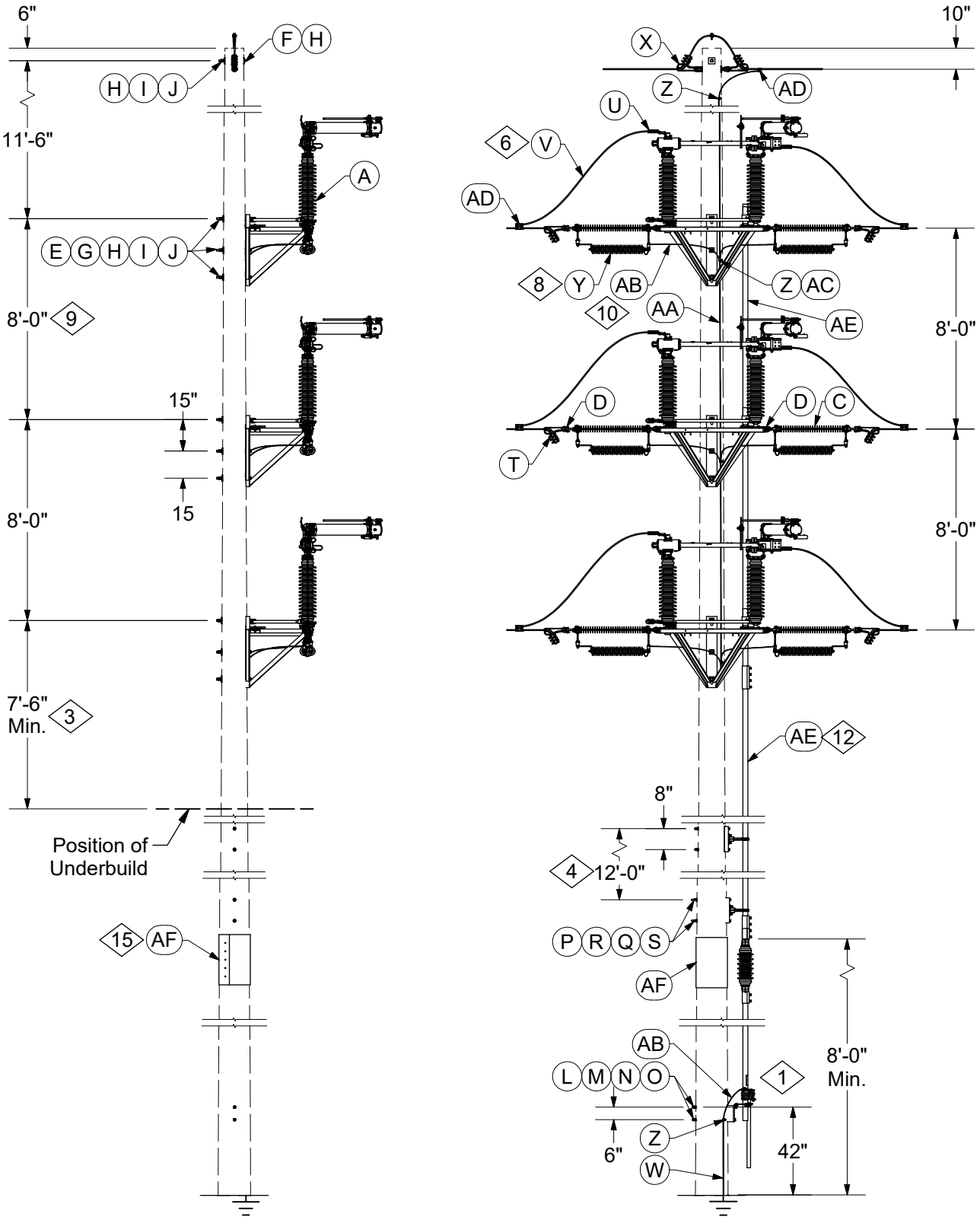
12. Stock #32 01 821 required if additional vertical pipe is required. Turner switch comes with three 21'-0" sections of pipe. Seeco switch comes with four 21'-0" sections of pipe. Add extra pipe if upper switch mounting bolt for top phase is higher than 76'-0" for Turner switch and 97'-0" for Seeco switch.

13. Switch should be installed on a pole that does not require guying.

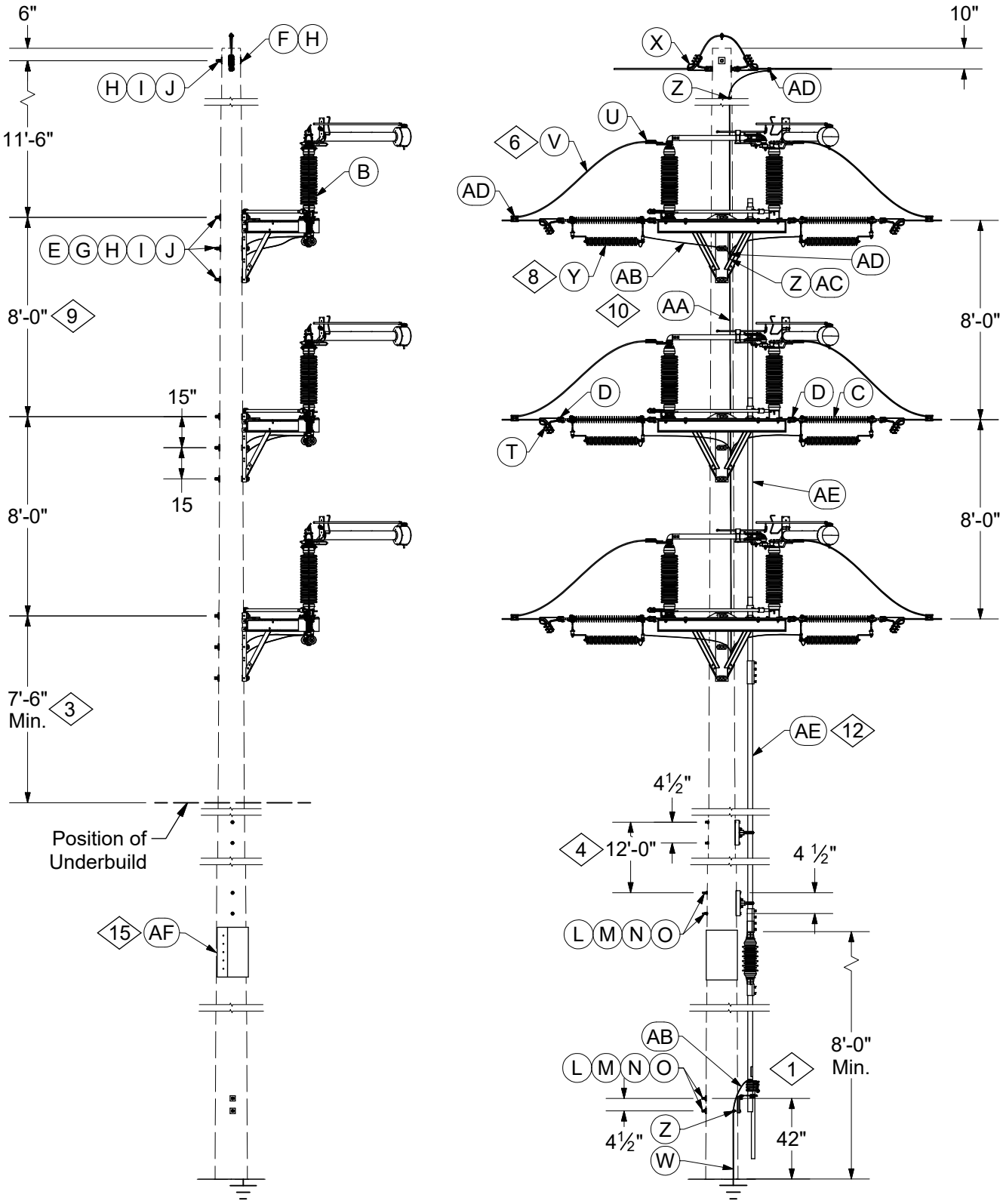
14. FCI's may be installed on line conductor larger than 1/0 when switches are installed.

15. Pole wrap is received in 100'-0" rolls. Cut roll to size and wrap around pole approximately 12" below neutral or secondary.

16. Switch frames are designed to have equal line tension on both sides of swtich with a maximum DE tension of 10,000 lbs. and a maximum line angle of 10°.



DCS#	DESCRIPTION
10 69 07 01	Turner Switch 69kV 1200A w/ Load Interrupters
10 69 07 02	Turner Switch 69kV 1200A w/o Load Interrupters



DCS#	DESCRIPTION
10 69 07 03	SEECO Switch 69kV 1200A w/ Load Interrupters
10 69 07 04	SEECO Switch 69kV 1200A w/o Load Interrupters

REV	DATE	ENG	DESCRIPTION
6	01/01/24	DT	Converted to new format
5	07/27/17	WYW	

CONSTRUCTION NOTE(s):

1. Switch handle must be grounded. For pole ground, operating pipe insulator, fiberglass section and ground mat requirements, refer to DCS **10 34 01 01**, Section C.

2. Install padlock on handle to prevent switch operation by the public.

3. 7'-6" clearance between 69kV and underbuild applies to upper mounting bolt on lowest switch frame and highest distribution crossarm bolt or deadend (whichever is higher).

4. Evenly space pipe guides 10'-0" to 15'-0" apart.

5. Each Seeco phase assembly weighs 600 pounds without interrupter and 700 pounds with interrupter. Each Turner phase assembly weighs 350 pounds without interrupter and 400 pounds with interrupter.

6. For switch leads, use line conductor for sizes larger than 556. For smaller line conductors, use poly covered copper, see DCS **07 00 80 00**.

7. Field cut pipe lengths as needed.

8. The line arrester shown in the drawing is suspended from the compressed on end fittings of the polymer deadend insulator and supported by aluminum hot line clamps, and will not work with porcelain deadend bells. The disconnector coupling assembly detaches the line end of the arrester should the arrester fail and will cause the arrester to pivot and drop down into a vertical position which makes the failed arrester much more visible. The disconnect coupling assembly with a 3/8" threaded stud that can be inserted into the tap lead eyebolt of the hotline clamp on the line end and an eyebolt with 3/8" stud that can be inserted into the tap lead eyebolt of the hotline clamp on the ground end. One of the tinned copper leads (on the pole end of the assembly) is to shunt the clevis-eye connection to eliminate radio noise. The longer tinned copper lead is for connection to a pole ground wire.

9. For 8'-0" spacing, the interrupter (if equipped) must be horizontally mounted to the insulator, as shown in the standards; otherwise the spacing shall be 10'-0" for vertically mounted interrupters, as shown in Figure 1. All new load break switches come with horizontally mounted interrupters. The vertically mounted interrupter can be replaced with horizontally mounted interrupters

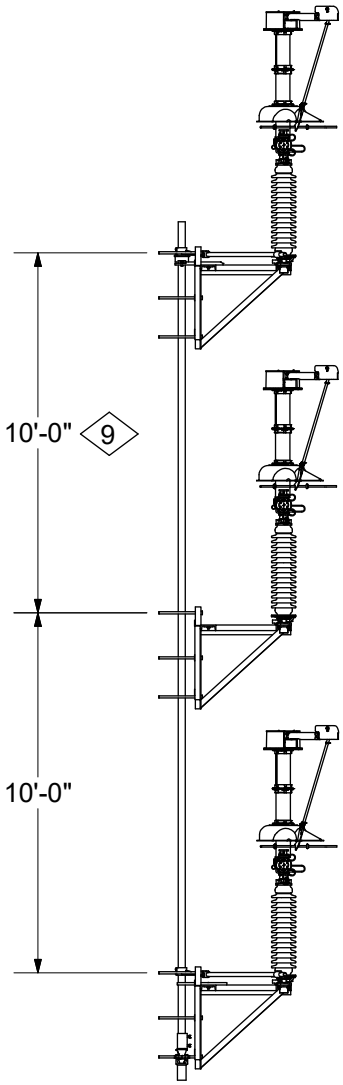


Figure 1

REV	DATE	ENG	DESCRIPTION
6	01/01/24	DT	Converted to new format
5	07/27/17	WYW	

	ITEM	STK / DCS #	DESCRIPTION 10 69 07 **	01	02	03	04
	A	54 09 392	Turner Switch, CS2 69kV, 1200A, w/o Interrupters	-	1	-	-
		54 09 394	Turner Switch, CS2 69kV, 1200A, w/Interrupters	1	-	-	-
	B	54 09 368	SEECO Switch, 69kV, 1200A, w/o Interrupters	-	-	-	1
		54 09 370	SEECO Switch, 69kV, 1200A, w/Interrupters	-	-	1	-
	C	25 06 113	Insulator, Suspension, 69kV	6	6	6	6
	D	23 68 440	Shackle, Anchor, 3/4” Pin, 1-1/16” opening, Galv.	6	6	6	6
	E	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	9	9	9	9
	F	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	1	1	1	1
	G	23 66 131	Washer, Square, 3/4"	9	9	9	9
	H	23 66 031	Washer, Curved, Square, 3/4"	11	11	11	11
	I	23 66 135	Lock Washer - 3/4" Double Coil	10	10	10	10
	J	23 65 042	Lock Nut - 3/4" Square	10	10	10	10
	K	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	-	-	6	6
	L	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	2	2	4	4
	M	23 66 207	Washer, Curved, Square, 5/8"	2	2	10	10
	N	23 66 134	Lock Washer - 5/8" Double Coil	2	2	10	10
	O	23 65 043	Lock Nut - 5/8" Square	2	2	10	10
	P	23 52 309	Bolt, Mach., 1/2" x 16" w/ square nut	6	6	-	-
	Q	23 66 133	Lock Washer - Double Coil 1/2"	6	6	-	-
	R	23 66 017	Washer - Round 1/2"	6	6	-	-
	S	23 65 056	Lock Nut - 1/2" Square	6	6	-	-
@	T	**07 00 20 00**	Clamp, Deadend	6	6	6	6
@	U	**07 00 30 00**	Lug, Compr. Terminal, AL	6	6	6	6
6,@	V	**07 00 80 00**	Wire, Switch Leads	45	45	45	45
1,@	W	**12 69 11 ** @**	Grounding Unit	1	1	1	1
@	X	**06 00 11 ** @**	Static Wire Attachment	#	#	#	#
	X	**18 05 10 01 @**	OPGW Static	#	#	#	#
10,@	Y	10 01 236	Arrester, Line Protection, 60kV Duty Cycle, 48kV MCOV	6	6	6	6
10,@	Z	17 54 373	Connector - Split Bolt, #14 AWG Str. to #2 AWG Str.	9	9	9	9
10,@	AA	18 51 019	Wire, #2 Cu SD Poly Covered (ft.)	40	40	40	40
10,@	AB	18 51 021	Wire, #6 Cu SD Poly Covered (ft.)	42	42	42	42
10,@	AC	23 64 001	Staple 3/8" x 2"	3	3	3	3
@	AD	**07 00 25 00**	Clamp, Parallel Groove, PG*	6	6	6	6
12,@	AE	32 01 821	2" x 10' Steel Pipe w/Coupling	#	#	#	#
15,@	AF	23 17 473	Wood Pole Wrap	#	#	#	#
14,@	AG	60 55 041	FCI, Non Communicating, 8 hr or 3A Reset, 100A min Trip	#	#	#	#

REV	DATE	ENG	DESCRIPTION
6	01/01/24	DT	Converted to new format
5	07/27/17	WYW	

DESIGN NOTE(s):

10. Arresters are not required for normally closed switch installation. Where switches are normally open, install a set of arresters on adjacent poles on both sides of the switch. When installing arresters on adjacent poles is not practical, both sets of arresters may be installed as described in note 8. Refer to DCS **12 00 01 01** for arrester selection. Items Y, Z, AA, AB, and AC are only required when arresters are installed.

11. If motor operator is required, refer to DCS **10 69 10 ****.

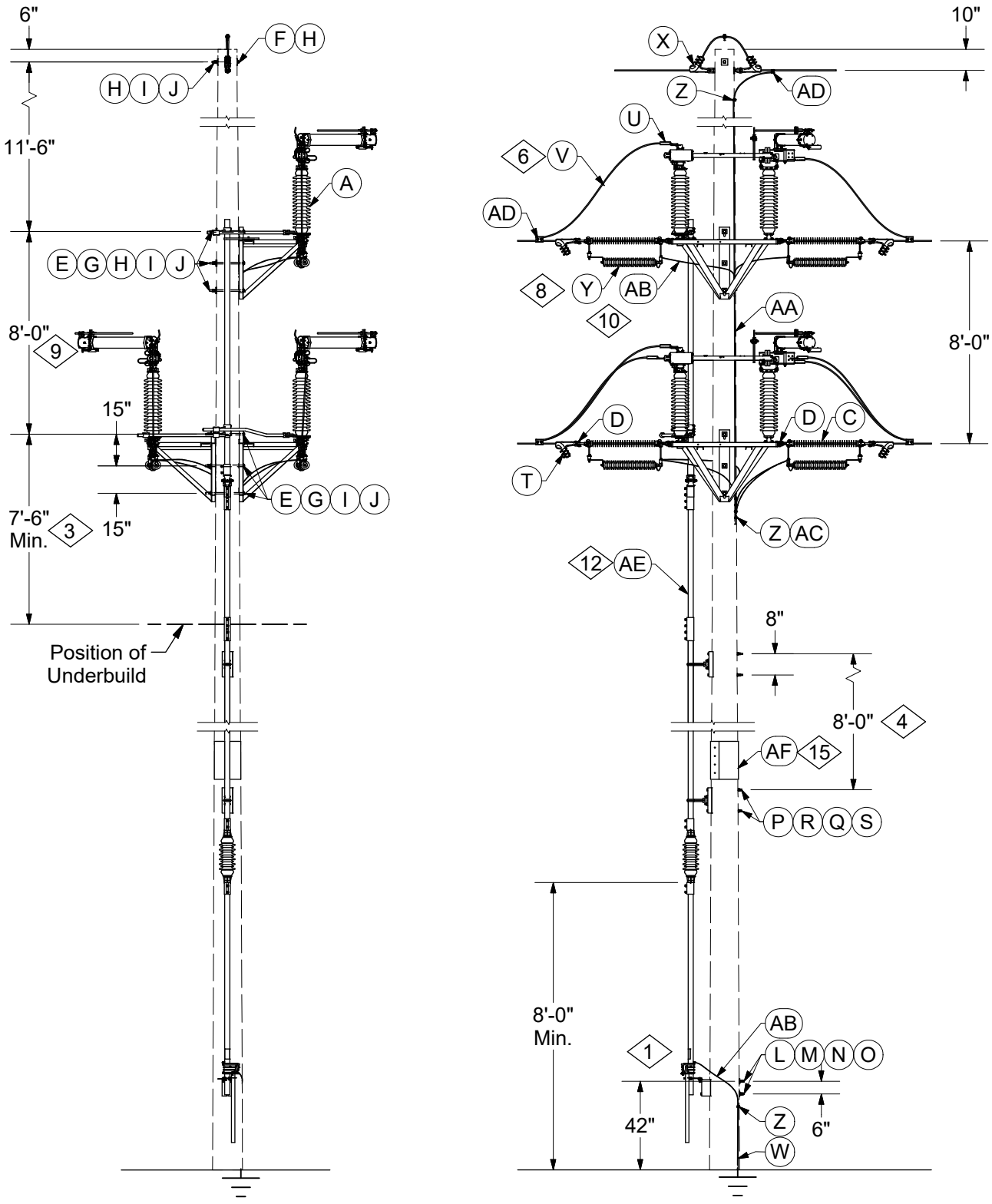
12. Stock #32 01 821 required if additional vertical pipe is required. Turner switch comes with three 21'-0" sections of pipe. Seeco switch comes with one 18'-0" pipe, one 12'-0" pipe, and three 21'-0" pipes. Add extra pipe if upper switch mounting bolt for top phase is higher than 74'-0" for Turner switch and 104'-0" for Seeco switch.

13. Switch should be installed on a pole that does not require guying.

14. FCI"s may be installed on line conductor larger than 1/0 when switches are installed.

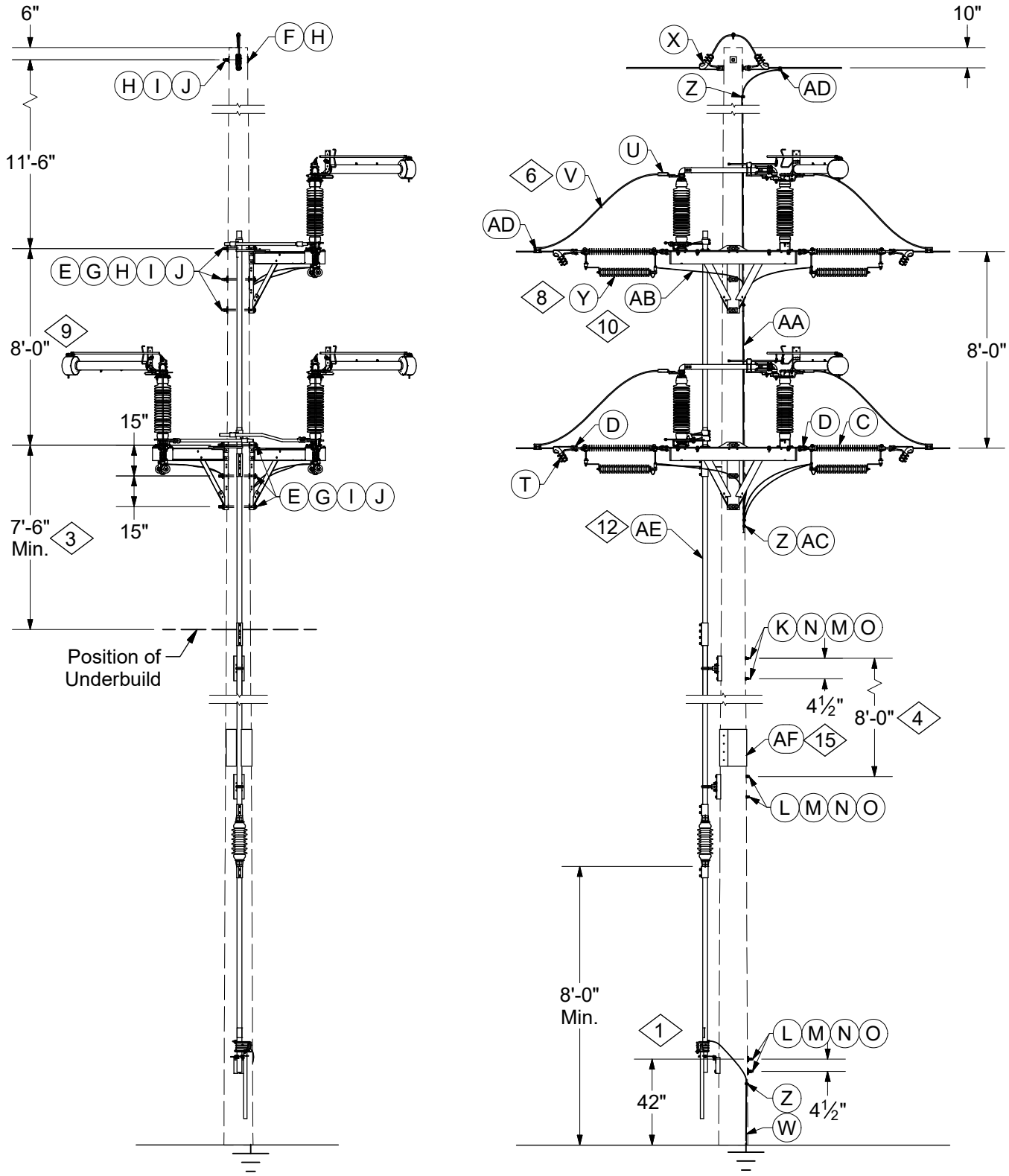
15. Pole wrap is recieved in 100-0" rolls. Cut roll to size and wrap around pole approximately 12" below neutral or secondary

16. Switch frames are designed to have equal line tension on both side of switch with a maximum deadend tension of 10,000 lbs and a maximum line angle of 10°.



DCS#	DESCRIPTION
10 69 09 01	Turner 69kV 1200A w/Load Interrupters
10 69 09 02	Turner 69kV 1200A w/o Load Interrupters

REV	DATE	ENG	DESCRIPTION
5	01/01/24	DT	Converted to new format
4	11/04/16	WYW	



DCS#	DESCRIPTION
10 69 09 03	SEECO 69kV 1200A w/Load Interrupters
10 69 09 04	SEECO 69kV 1200A w/o Load Interrupters

REV	DATE	ENG	DESCRIPTION
5	01/01/24	DT	Converted to new format
4	11/04/16	WYW	

CONSTRUCTION NOTE(s):

1. Switch handle must be grounded. For pole ground, operating pipe insulator, fiberglass section and ground mat requirements, refer to DCS **10 34 01 01**, Section C.

2. Install padlock on handle to prevent switch operation by the public.

3. 7'-6" clearance between 69kV and underbuild applies to upper mounting bolt on lowest switch frame and highest distribution crossarm bolt or deadend (whichever is higher).

4. Evenly space pipe guides 10'-0" to 15'-0" apart.

5. Each Seeco phase assembly weighs 600 pounds without interrupter and 700 pounds with interrupter. Each Turner phase assembly weighs 350 pounds without interrupter and 400 pounds with interrupter.

6. For switch leads, use line conductor for sizes larger than 556. For smaller line conductors, use poly covered copper, see DCS **07 00 80 00**.

7. Field cut pipe lengths as needed.

8. The line arrester shown in the drawing is suspended from the compressed on end fittings of the polymer deadend insulator and supported by aluminum hot line clamps, and will not work with porcelain deadend bells. The disconnector coupling assembly detaches the line end of the arrestor should the arrestor fail and will cause the arrester to pivot and drop down into a vertical position which makes the failed arrester much more visible. The disconnect coupling assembly with a 3/8" threaded stud that can be inserted into the tap lead eyebolt of the hotline clamp on the line end and an eyebolt with 3/8" stud that can be inserted into the tap lead eyebolt of the hotline clamp on the ground end. One of the tinned copper leads (on the pole end of the assembly) is to shunt the clevis-eye connection to eliminate radio noise. The longer tinned copper lead is for connection to a pole ground wire.

9. For 8'-0" spacing, the interrupter (if equipped) must be horizontally mounted to the insulator, as shown in the standards; otherwise the spacing shall be 10'-0" for vertically mounted interrupters, as shown in Figure 1. All new load break switches come with horizontally mounted interrupters. The vertically mounted interrupter can be replaced with horizontally mounted interrupters.

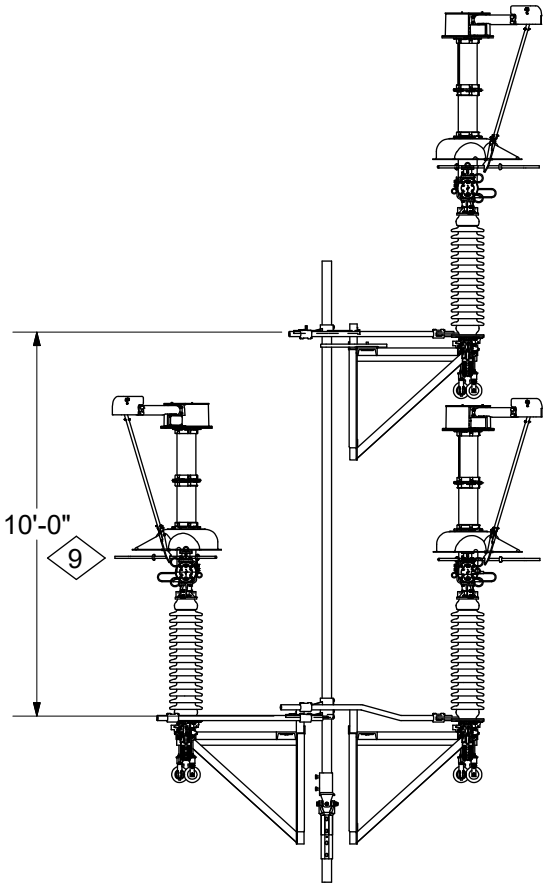


Figure 1

	ITEM	STK / DCS #	DESCRIPTION 10 69 09 **	01	02	03	04
	A	54 09 393	Turner CS2 Switch, 69kV, 1200A, w/o Interrupters	-	1	-	-
		54 09 395	Turner CS2 Switch, 69kV, 1200A, w/Interrupters	1	-	-	-
	B	54 09 035	SEECO Switch, 69kV, 1200A, w/ Interrupters	-	-	1	-
		54 09 369	SEECO Switch, 69kV, 1200A, w/o Interrupters	-	-	-	1
	C	25 06 113	Insulator, Suspension, 69kV	6	6	6	6
	D	23 68 440	Shackle, Anchor, 3/4” Pin, 1-1/16” opening, Galv.	6	6	6	6
	E	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	6	6	6	6
	F	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	1	1	1	1
	G	23 66 131	Washer, Square, 3/4"	9	9	9	9
	H	23 66 031	Washer, Curved, Square, 3/4"	5	5	5	5
	I	23 66 135	Lock Washer - 3/4" Double Coil	7	7	7	7
	J	23 65 042	Lock Nut - 3/4" Square	7	7	7	7
	K	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	-	-	8	8
	L	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	2	2	4	4
	M	23 66 207	Washer, Curved, Square, 5/8"	-	-	12	12
	N	23 66 134	Lock Washer - 5/8" Double Coil	-	-	12	12
	O	23 65 043	Lock Nut - 5/8" Square	-	-	12	12
	P	23 52 309	Bolt, Mach., 1/2" x 16" w/ square nut	6	6	-	-
	Q	23 66 133	Lock Washer - Double Coil 1/2"	6	6	-	-
	R	23 66 017	Washer - Round 1/2"	6	6	-	-
	S	23 65 056	Lock Nut - 1/2" Square	6	6	-	-
@	T	**07 00 20 00**	Clamp, Deadend	6	6	6	6
@	U	**07 00 30 00**	Lug, Compr. Terminal, AL	6	6	6	6
6,@	V	**07 00 80 00**	Wire, Switch Leads	45	45	45	45
1,@	W	**12 69 11 ** @**	Grounding Unit	1	1	1	1
@	X	**06 00 11 ** @**	Static Wire Attachment	#	#	#	#
	X	**18 05 10 01 @**	OPGW Static	#	#	#	#
10,@	Y	10 01 236	Arrester, Line Protection, 60kV Duty Cycle, 48kV MCOV	6	6	6	6
10,@	Z	17 54 373	Connector - Split Bolt, #14 AWG Str. to #2 AWG Str.	8	8	8	8
10,@	AA	18 51 019	Wire, #2 Cu SD Poly Covered (ft.)	40	40	40	40
10,@	AB	18 51 021	Wire, #6 Cu SD Poly Covered (ft.)	42	42	42	42
10,@	AC	23 64 001	Staple 3/8" x 2"	20	20	20	20
@	AD	**07 00 25 00**	Clamp, Parallel Groove	6	6	6	6
12,@	AE	32 01 821	2" x 10' Steel Pipe w/Coupling	#	#	#	#
15,@	AF	23 17 473	Wood Pole Wrap	#	#	#	#
14,@	AG	60 55 041	FCI, Non Communicating, 8 hr or 3A Reset, 100A min Trip	#	#	#	#

REV	DATE	ENG	DESCRIPTION
5	01/01/24	DT	Converted to new format
4	11/04/16	WYW	

DESIGN NOTE(s):

10. Arresters are not required for normally closed switch installation. Where switches are normally open, install a set of arresters on adjacent poles on both sides of the switch. When installing arresters on adjacent poles is not practical, both sets of arresters may be installed as described in note 8. Refer to DCS **12 00 01 01** for arrester selection. Items Y, Z, AA, AB, and AC are only required when arresters are installed.

11. If motor operator is required, refer to DCS **10 69 10 ****.

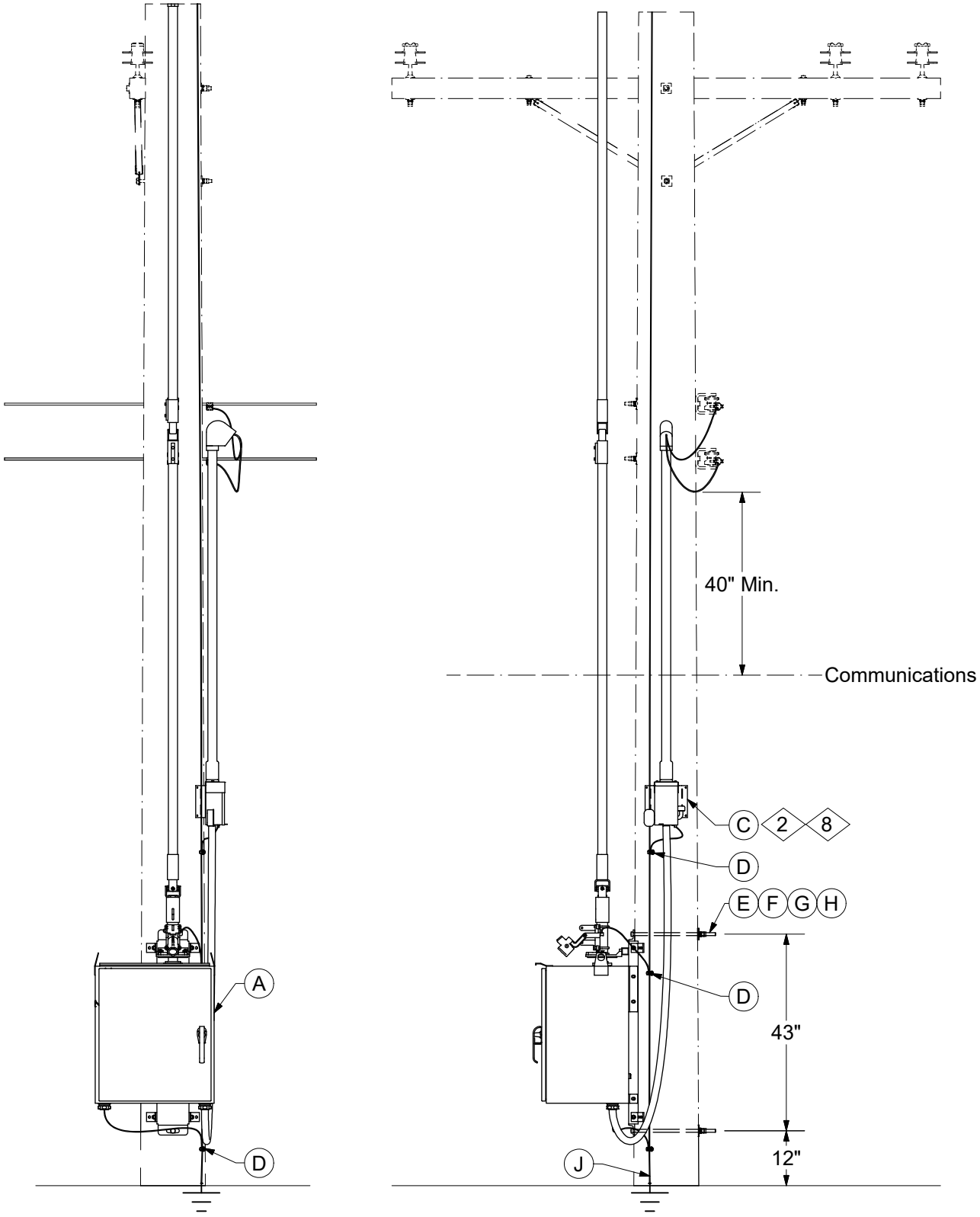
12. Stock #32 01 821 required if additional vertical pipe is required. Turner switch comes with three 21'-0" sections of pipe. Seeco switch comes with four 21'-0" sections of pipe. Add extra pipe if upper switch mounting bolt for top phase is higher than 76'-0" for Turner switch and 97'-0" for Seeco switch.

13. Switch should be installed on a pole that does not require guying.

14. FCI's may be installed on line conductor larger than 1/0 when switches are installed.

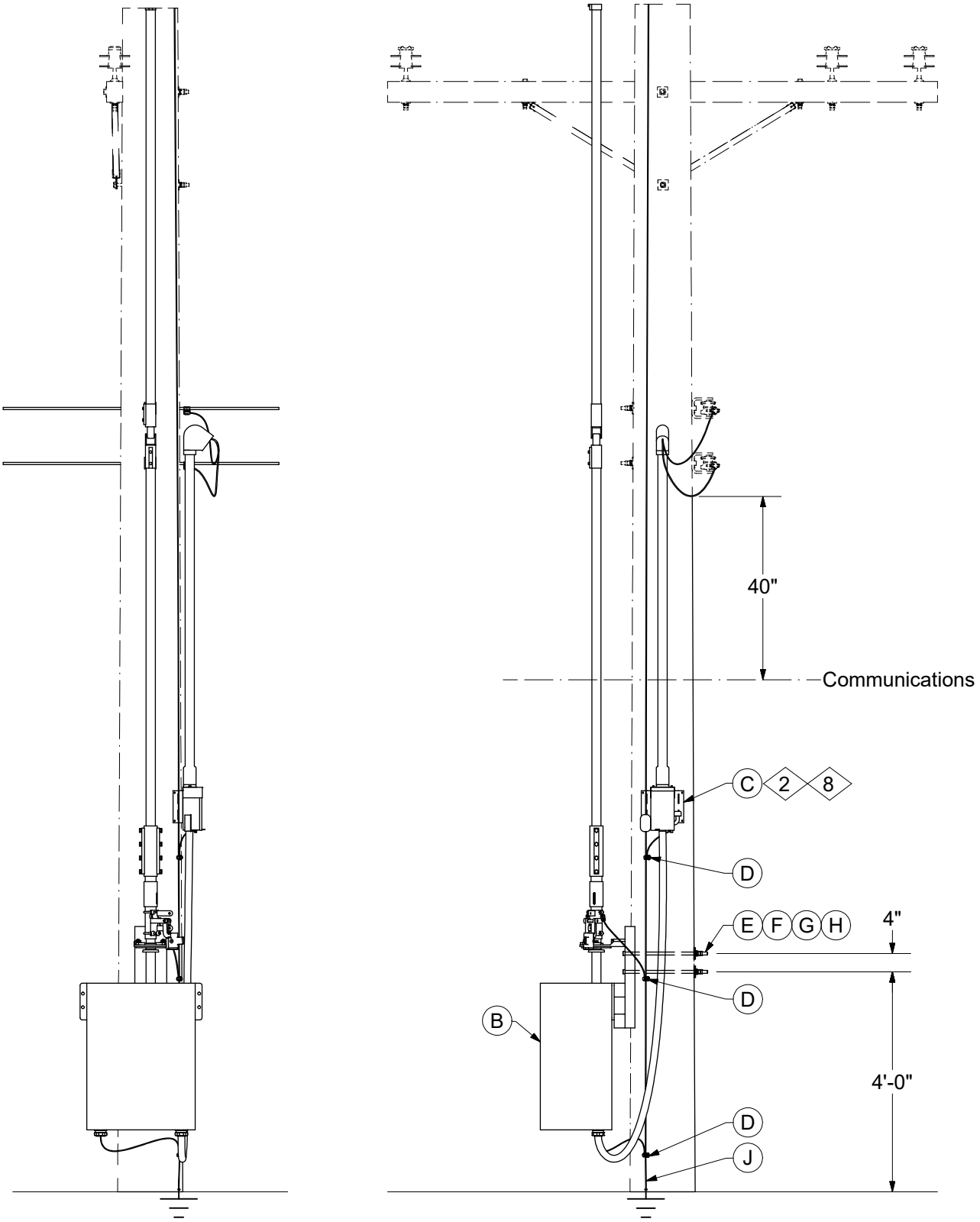
15. Pole wrap is received in 100'-0" rolls. Cut roll to size and wrap around pole approximately 12" below neutral or secondary

16. Switch frames are designed to have equal line tension on both sides of switch with a maximum DE tension of 10,000 lbs and a maximum line angle of 10°.



34 & 69kV - 1200A - Turner Motor Operator

REV	DATE	ENG	DESCRIPTION
8	01/01/24	DT	Converted to new format
7	10/01/19	DT	



34 & 69kV - 1200A - SEECO Motor Operator

REV	DATE	ENG	DESCRIPTION
8	01/01/24	DT	Converted to new format
7	10/01/19	DT	

CONSTRUCTION NOTE(s):

1. If a motor operator is to be installed on a new or existing switch, the switch should be completely and properly adjusted and operating satisfactorily prior to motor operator installation. If the motor operator is to be mounted on an existing switch, proper maintenance should be performed. (Contact Distribution Automation to schedule adjustment and commissioning of motor operator and RTU.)

2. Open circuit breaker to disconnect power to the motor operator before working inside cabinet to avoid hazard of electric shock.

3. Use the aluminum support channel for lifting the motor operator.

4. Align operator power shaft with vertical operating pipe, with a level. Mount the motor operator securely to the switch structure or pole with through bolts and lag screws.

5. If motor operator is mounted on wood pole:

   A. A #2 Cu pole ground wire is required for grounding of motor operator cabinet, static wire, circuit breaker box, and switch handle.
   B. Operating rod insulators between circuits are required, See DCS **10 34 01 01**.
   C. A ground mat is required, See DCS **12 69 11 01**.
   D. The motor operator cabinet and switch operating handle must be grounded to the driven ground rod or a field formed ground electrode with a #2 Cu wire, See DCS **12 69 11 ****.

6. If motor operator is mounted on steel pole:

   A. A pole ground wire is not required but there must be provisions (Rivnuts) for grounding a shield wire, a primary system neutral (if present), a motor operator cabinet, circuit breaker box, and the base of the pole.
   B. The motor operator cabinet must be grounded to the pole ground wire.
   C. TR-210 porcelain operating rod insulator, Stock #25 09 048 and 8 ft. fiberglass insulator, Stock #54 08 324 which comes with the switch may be omitted on a steel pole, and both items should be put back in the stock with the stock # assigned.
   D. The operating handle shall be grounded to a driven ground rod or a field formed ground electrode with a #2 Cu wire.
   E. A ground mat is required. See DCS **12 69 11 02**.

7. If motor operator is mounted on composite pole:

   A. The #2 Cu pole ground wire comes with the pole must be bonded to the grounding electrode at the base of the pole, motor operator, circuit breaker box and shield wire, and a primary system neutral (if present).
   B. Operating rod insulators between circuits are required, See DCS **10 34 01 01**.
   C. The operating handle shall be grounded to a driven ground rod or a field formed ground electrode with a #2 Cu wire.
   D. A ground mat is required. See DCS **12 69 11 03**.

8. Attach secondary breaker box to pole and route black, white, and green wires in 10'-0" of 1/2" liquid tight conduit to controller and route black and white wires in 20'-0" of 3/4" liquid tight conduit to the weatherhead.

9. If antenna installation is required in supply space, See DCS **25 90 00 00** for clearance requirement. If antenna installation is required in communications zone, See DCS **29 00 17 11** for clearance requirement.

DCS#	DESCRIPTION
10 69 10 01	34kV Turner D Switch
10 69 10 02	69kV Turner D Switch
10 69 10 03	34 & 69kV Seeco Switch
10 69 10 04	34 & 69kV Turner TSB or TS2

	ITEM	STK / DCS #	DESCRIPTION 10 69 10 **	01	02	03	04
	A	54 08 416	Motor Operator for Turner D 34kV Switch	1	-	-	-
		54 09 349	Motor Operator for Turner D 69kV Switch	-	1	-	-
		54 08 430	Motor Op. for Turner TSB or TS2 34kV and 69kV Switch	-	-	-	1
	B	54 09 731	Motor Operator for SEECO 34kV or 69kV Switch	-	-	1	-
	C	54 17 486	Circuit Breaker, Receptical Box, w/Riser 120V, 15A	1	1	1	1
	D	17 54 373	Connector - Split Bolt, #14 AWG Str. to #2 AWG Str.	3	3	3	3
	E	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	2	2	2	2
	F	23 66 207	Washer, Curved, Square, 5/8"	2	2	2	2
	G	23 66 134	Lock Washer - 5/8" Double Coil	2	2	2	2
	H	23 65 043	Lock Nut - 5/8" Square	2	2	2	2
@	I	54 02 031	NovaTech Orion LXm	#	#	#	#
		54 02 032	NovaTech Orion MX	#	#	#	#
@	J	**12 69 11 ** @**	Grounding Unit	1	1	1	1

REV	DATE	ENG	DESCRIPTION
8	01/01/24	DT	Converted to new format
7	10/01/19	DT	

NOTES

GUYING 11

APPLICATION AND COMPONENTS.....11 00 01 01
INSULATOR REQUIREMENTS AND PLACEMENT.....11 00 02 01
INSULATOR DIMENSIONAL REQUIREMENTS.....11 00 02 02
INSULATOR REQUIREMENTS, MINIMUM CLEARANCES GUY TO CONDUCTOR.....11 00 02 03
METHOD OF DETERMINING LINE ANGLES.....11 00 04 01
ASSEMBLY - INSULATOR, GUY.....11 00 40 **
STUB POLE GUY.....11 00 41 **
SUB TRANSMISSION ANCHOR GUY, FIBERGLASS INSULATOR.....11 00 42 **
ANCHOR GUY, FIBERGLASS INSULATOR AT THE POLE.....11 00 43 **
SIDEWALK GUY.....11 00 44 00
SPAN GUY - POLE TO POLE, FIBERGLASS INSULATOR AT THE POLE.....11 00 46 **
SPAN GUY - ARM TO POLE, FIBERGLASS INSULATOR AT THE ARM.....11 00 48 **
SECONDARY EXTENSION BRACKET TO POLE.....11 00 49 **
POLE ATTACHMENTS.....11 00 56 **
SCREW ANCHORS.....11 00 60 **
EXPANDING ANCHORS.....11 00 61 **
ROCK ANCHOR, EXPANDING TYPE.....11 00 62 00
ROCK ANCHOR, REBAR TYPE WITH RESIN BONDING.....11 00 62 01
HIGH TORQUE SCREW ANCHORS (ALTERNATE).....11 00 63 **

Guys are used to sustain unbalanced forces imposed on a structure at corners, angles, deadends, large differences in span lengths, and changes of grade of construction. Guys shall be considered as taking the entire load in the direction in which they act, with the pole or structure acting as a strut only, resisting the vertical component of all forces.

The strength requirements of guy and anchor systems are governed by the National Electrical Safety Code (NESC) which specifies criteria for calculating conductor tensions and imposes overload factors to be used under different circumstances.

Guying is preferable to oversized self sustained poles. Where adequate guying cannot be obtained due to right-of-way or other difficulties, self sustained poles, within their limitations, may be used. Loading and other details for self sustained poles are covered in DCS **02 00 04 02**.

1. GUY WIRE & FITTINGS

   Three sizes and grades of galvanized steel guy wire are stocked for normal use. The maximum tension and associated fittings for each guy wire is given in the table below . The maximum tensions shown are 90 percent of the rated breaking strength, in accordance with the NESC. In Illinios, 1/4" guy wire is not used.

Guy Wire Maximum Tension and Associated Fittings				
	Guy Wire		**Preformed Grip**	**Automatic Deadend**
STK #	Size & Grade	Max. Tension (lbs)	STK #	STK #
27 59 016	1/4" Galv. E.H.S.	5,985	23 68 241	23 68 300
27 59 020	3/8" Galv. E.H.S.	13,860	23 68 237	23 68 299
27 59 022	7/16" Galv. E.H.S.	18,720	23 68 238	23 68 301

   In general, all guy strands shall be secured to the pole fitting or to guy insulators with preformed guy grips. Automatic deadends may only be used with galvanized guy wire at the anchor or guy pole. Due to increased cost, there is no need for more than one automatic installed per guy lead.

2. ANCHORS & ANCHOR RODS

   Three types of anchors are available for use in the distribution system; power installed screw anchors, expanding anchors, and rock anchors.

   A. Power installed screw anchors are the preferred anchors for use in all soils other than solid rock. Access with a power digger equipped with a wrench assembly is required for installation. Two strengths of these anchors are stocked; a 6,000 ft-lb series for use in sandy to hard pan soils, and a 10,000 ft-lb series for use in rockier soils in which the 6,000 ft-lb anchors cannot be installed. Only square shaft anchors shall be used in Illinios for down guys on Sub-Transmission (34.5kV and 69kV).

   B. Expanding anchors can be installed in most any soil in which an 8" to 12" diameter hole, depending on anchor size, can be augered. Because of the time needed to install these anchors, usage is generally limited to locations not accessible to power equipment.

C. Rock anchors are an expanding type of anchor which must be installed in at least 12" of soild rock. A 2" or 2-1/4" diameter hole is needed for installation. Rod lengths from 30" to 96" are available to meet site requirements.

Standard sizes, holding strengths, and methods of installation for each type of anchor are shown in DCS **11 00 60 **** thru **11 00 63 ****.

3. USE OF GUY INSULATORS

Guy strain insulators are used to: (1) protect pedestrians and line workers if a guy accidentally contacts supply conductors, (2) minimize the possibility of plant damage which may result in unsafe conditions, and (3) increase the structure BIL and reduce lightning caused outages.

All guys attached to poles supporting energized conductors or equipment shall have a minimum of one guy strain insulator inserted in each guy.
EXCEPTION: Stub-pole to anchor guys generally do not require an insulator unless the exposure between the energized pole and the stub-pole cannot be isolated. One insulator typically cannot be located to satisfy all of the following requirements. Additional insulators shall be used as required.

Where multiple guys are required, **the insulators in each guy shall be located so that in case any guy sags down upon another, the insulators will not become ineffective (NESC Rule 215C2).**

DCS **11 00 02 01** demonstrates the general concepts of proper guy strain insulator placement described in this DCS.DCS **11 00 02 02** gives more detailed guidance for guy strain insulator placement for many of Ameren's typical structure configuations.

If necessary, a fiberglass (FG) guy strain insulator may be used to allow a guy to be located in closer proximity to a conductor than would otherwise be allowed. **In no instance, however, shall any conductive portion of the guy or the insulator be located in closer proximity to a conductor than is specified in DCS 11 00 02 03.** To achieve the requirements from the NESC as described in this DCS, it will often be necessary to link two or more FG guy strain insulators together.

A. Distribution

Only FG insulators shall be used. Insulators shall be installed to meet all of the following placement criteria that apply:

a. A FG guy strain insulator shall be used at the pole attachment of all anchor or span guys.
EXCEPTION: Stub-pole to anchor guys do not require insulators if the span guys are effectively isolated and there are no energized conductors or communication attachments on the stub-pole.
b. On non-joint use poles, at least 12" of a FG insulator must be located between primary voltage and secondary voltage (including neutral) supply circuits. This insulator must be located so that:
   i. It prevents the possibility of voltage transfer between the primary and secondary circuits during normal operation of the guy, and

REV	DATE	ENG	DESCRIPTION
10	04/01/23	DG	Converted to new format
9	04/01/19	DG	

ii. If the guy wire breaks below the insulator, the insulator will fall below all primary voltage supply conductors and above any secondary conductors (including the neutral) as it rests against the pole.

c. On non-joint use poles, at least 12" of a FG insulator must be located between the lowest supply conductor (primary, secondary, or neutral) and ground. The insulator must be located so that:
   i. It prevents the possibility of voltage transfer between the lowest supply conductor and ground during normal operation of the guy, and
   ii. If the guy wire breaks below the insulator, the insulator falls below the lowest supply conductor and the bottom of the insulator must fall a minimum of 8 ft. above the ground as it rests against the pole.

d. On joint use poles, in addition to a. thru c. above at least 12" of a FG insulator must be located between the lowest supply conductor (primary, secondary, or neutral) and the highest communication cable. This insulator must be located so that:
   i. Any guy passing within 12" of a supply conductor and also passing within 12" of a communication cable shall have an insulator located below the lowest supply conductor and above the highest communication cable (NESC Table 235-6, Note (1)).
   ii. It prevents the possibility of voltage transfer between the supply circuits and communication cable during normal operation of the guy, and
   iii. If the guy wire breaks below the insulator, it will fall below all supply conductors and above any communication cables as it rests against the pole.

e. On joint use poles at least 12" of a FG insulator must be located between the lowest communication cable and ground. The insulator must be located so that:
   i. It prevents the possibility of voltage transfer between the lowest communication cable and ground during normal operation of the guy, and
   ii. If the guy wire breaks below the insulator, the insulator falls below the lowest communication cable and the bottom of the insulator must fall a minimum of 8 ft. above the ground as it rests against the pole. EXCEPTION: This insulator is not required if the communication cables are self-supported fiber-optic (with no metallic messenger).

B. Sub Transmission

Guys associated with 34.5kV or 69kV circuits require use of FG guy strain insulators. In addition to the protective role, FG guy strain insulators serve to increase the BIL level of ungrounded structures associated with these circuits. FG guy strain insulators shall be installed to meet all of the following placement criteria that apply in addition to the criteria in section 3.A. of this DCS:

a. A FG guy strain insulator shall be used at the pole attachment of all anchor or span guys. EXCEPTION: Stub-pole to anchor guys do not require insulators if the span guys are effectively isolated and there are no energized conductors on the stub-pole.

b. If no underbuilt circuits are present, at least 24" of a FG insulator must be located between the lowest 34.5kV or 69kV conductor and ground. The insulator must be located so that:
   i. It prevents the possibility of voltage transfer between the lowest supply conductor and ground during normal operation of the guy, and
   ii. If the guy wire breaks below the insulator, the insulator falls below the lowest supply conductor and the bottom of the insulator must fall a minimum of 8 ft. above the ground as it rests against the pole.

REV	DATE	ENG	DESCRIPTION
10	04/01/23	DG	Converted to new format
9	04/01/19	DG	

c. If an underbuilt circuit is present, at least 24" of a FG insulator shall be located to effectively isolate the lowest 34.5kV or 69kV conductor and the highest distribution underbuilt conductor.

C. Span Guys

All of the requirements of sections 3.A. and 3.B. of this DCS also apply to span guys.

D. OPGW Transition Coils

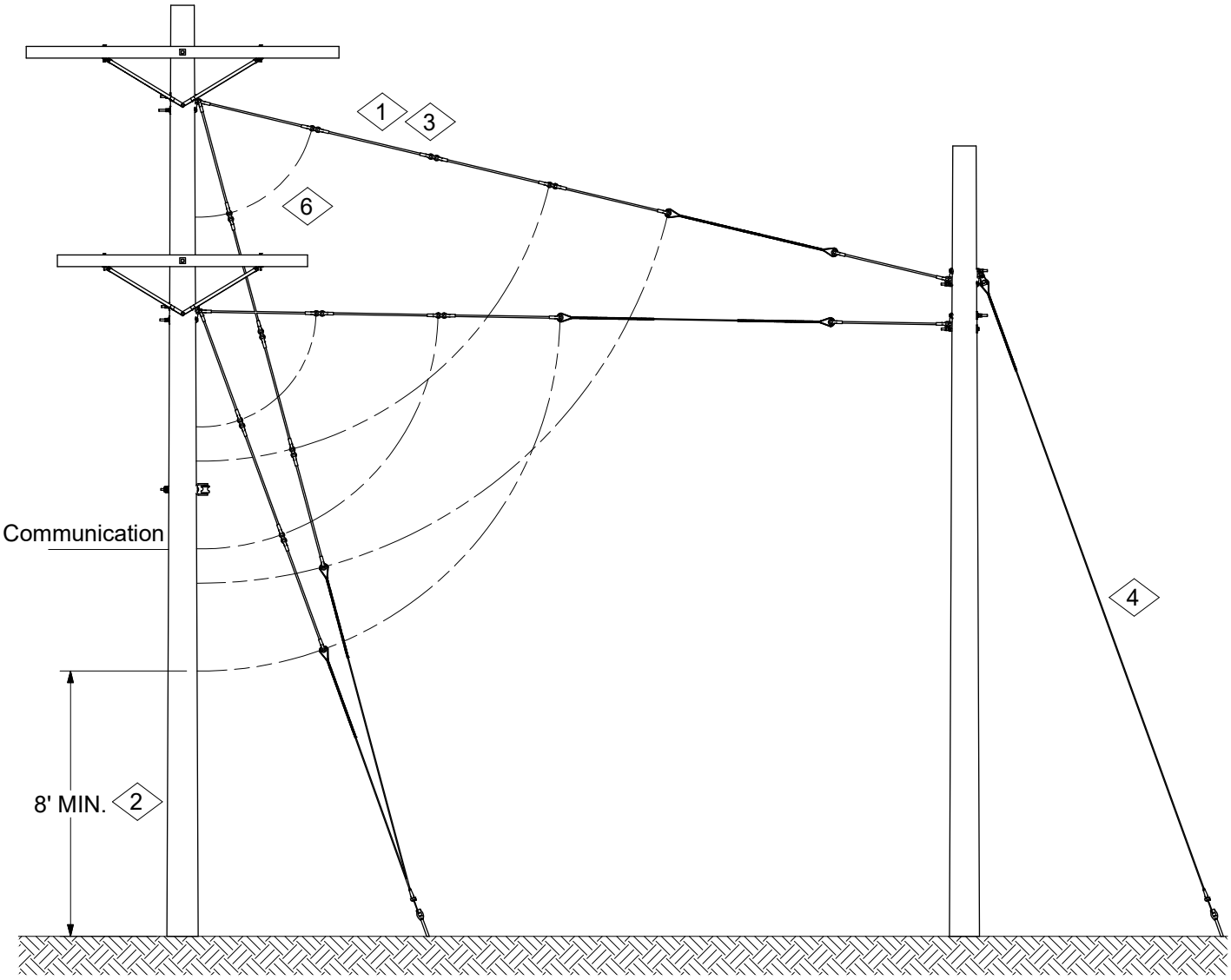
For down or span guys on structures with an OPGW Transition Coil installed on it, guy installation must be applied as follows:

a. A guy strain insulator (or at least 24" of a FG insulator) must be located between sub-transmission voltage and the top of the OPGW Transition Coil.
b. A guy strain insulator (or at least 12" of a FG insulator) must be located between primary voltage and the top of the OPGW Transition Coil.
c. A guy strain insulator (or at least 12" of FG insulator) must be located between the bottom of the OPGW Transition Coil and the next communication attachment below it.
d. If the OPGW coil is the lowest equipment on the structure, a guy strain insulator (or at least 12" of a FG insulator) must be located between the bottom of the OPGW Transition Coil and 8 ft. above the ground.
e. This insulator must be located so that:
   i. It prevents the possibility of voltage transfer between the supply circuits and the OPGW Transition Coil during normal operation of the guy, and
   ii. It prevents the possibility of voltage transfer between the supply circuits and the OPGW Transition Coil if the guy wire breaks below the insulator as it rests against the pole.
   iii. It prevents the possibility of voltage transfer between the OPGW Transition Coil and ground if the guy wire breaks below the insulator as it rests against the pole.

4. GUY MARKERS

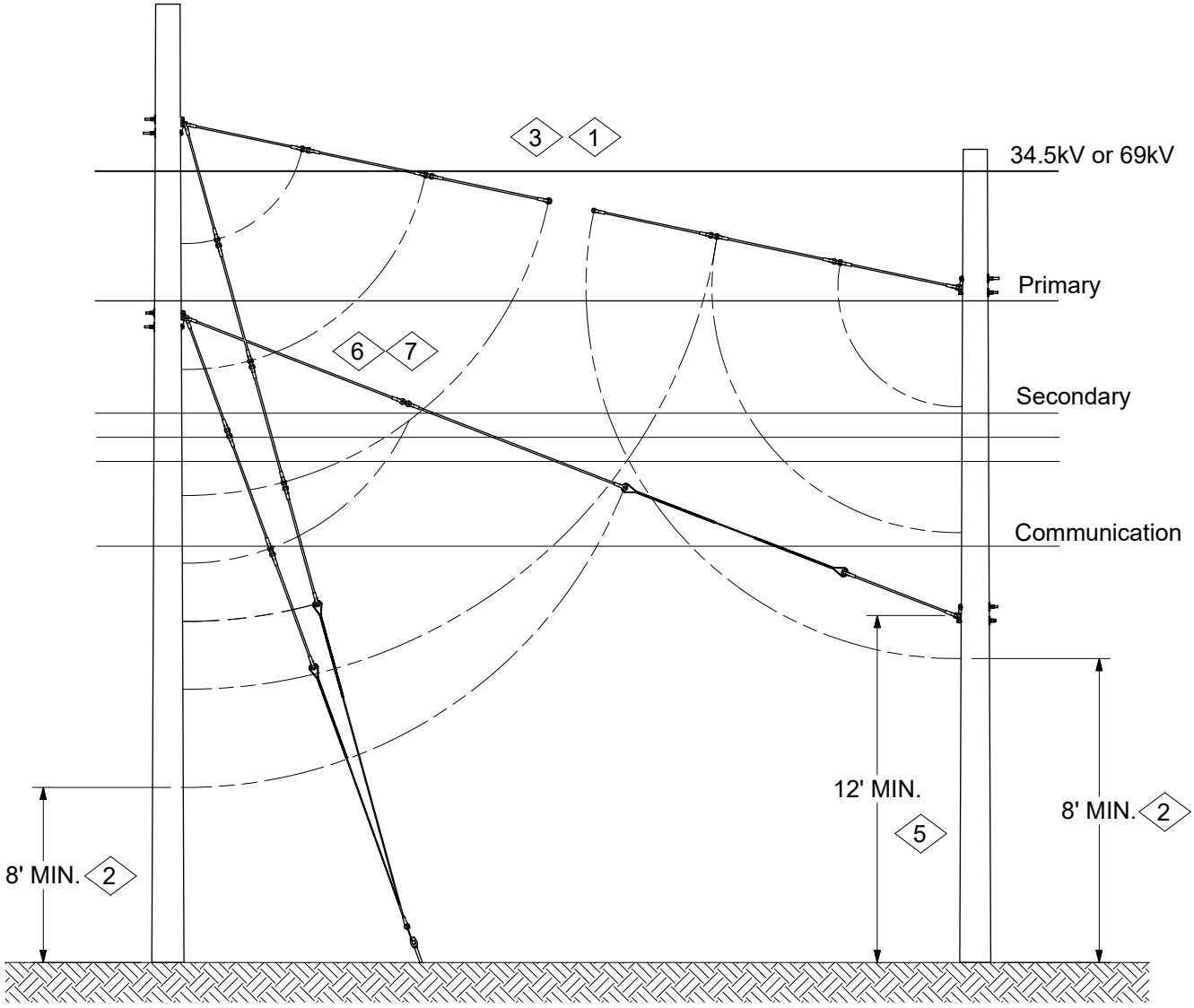
Guy Markers shall be installed on the ground end of all anchor guys. Where two or more guys are attached to the same anchor, only one marker is required and shall be installed on the highest guy wire.

Ameren has two colors of guy markers available for use. A yellow guy marker, Stock #23 78 091 is for use in most applications as it is typically the most visible. An orange guy marker, Stock #23 68 826 is for use on down guys adjacent to cultivated fields as the orange is more visible against the background of farm crops. The orange guy marker is also to be used on down guys installed within railroad right-of-way.



Perpendicular to Line

REV	DATE	ENG	DESCRIPTION
6	04/01/23	DG	Converted to new format
5	04/01/19	DG	



Parallel to Line

CONSTRUCTION NOTE(s):

1. Guys must be installed such that if they break and fall into the pole, insulation will be provided between subtransmission and primary distribution circuits, between primary and secondary distribution circuits, between secondary distribution and communication circuits, and below the communication circuits. (Note: Guy insulators must fall between all circuits.)

2. The bottom of the lowest insulator must fall a minimum of eight feet above ground level.

3. Fiberglass guy strain insulators shall be used.

4. Stub pole to anchor guys require no insulator if the span guys attached to the stub pole have been effectively isolated with insulators and there are no other energized conductors on the stub pole.

5. Guys shall be attached a minimum of twelve feet above ground on a pole, or higher as needed to satisfy midspan clearance requirements. (This assumes a 45" guy insulator to meet the 8' Min. Ground level rule.)

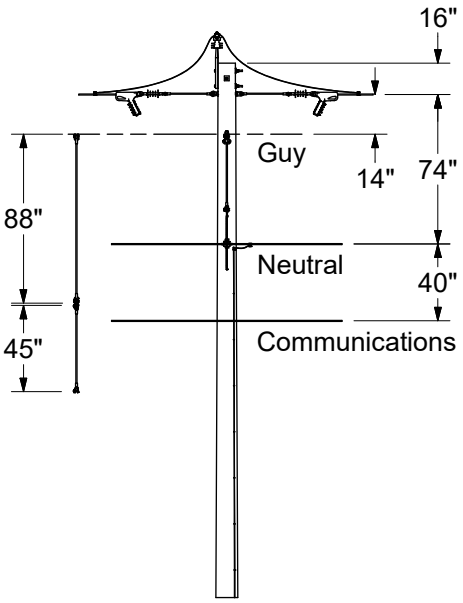
6. See DCS **11 00 02 03** for minimum clearances of guys to conductors.

7. If a span guy passes over or through supply conductors, two insulators shall be used, each satisfying the above requirements.

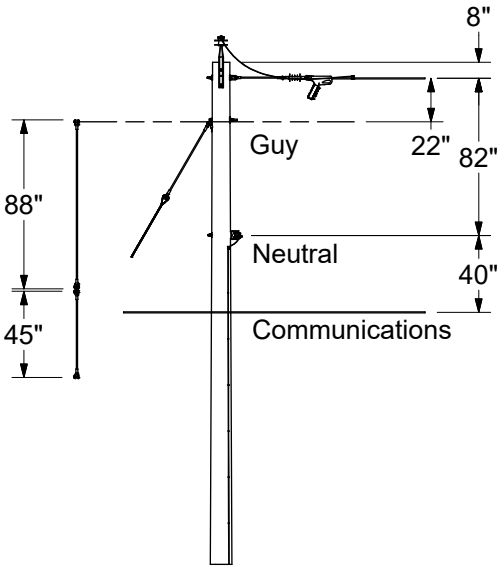
REV	DATE	ENG	DESCRIPTION
6	04/01/23	DG	Converted to new format
5	04/01/19	DG	

The purpose of this standard is to show combinations of FG guy strain insulators that will provide proper guy insulation on many of Ameren's standard structures. Although only the neutral and one communications attachment is shown, these FG guy strain insulator combinations are based on the structure having a single-phase secondary rack and two communication attachments. Note: The guy attachment dimensions in this DCS are presented in inches (instead of feet-inches) for easy comparison to the inches nomenclature used for the FG guy strain insulators.

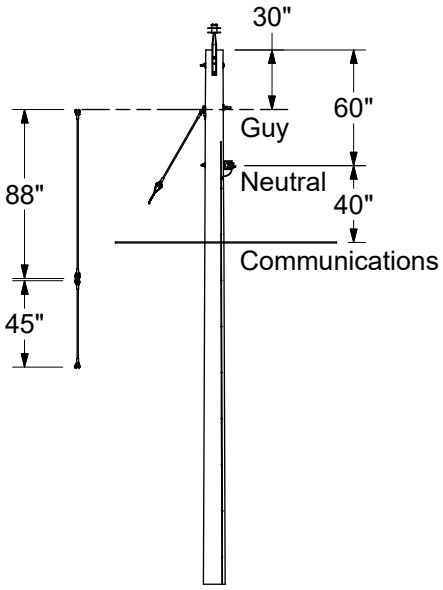
Single Phase



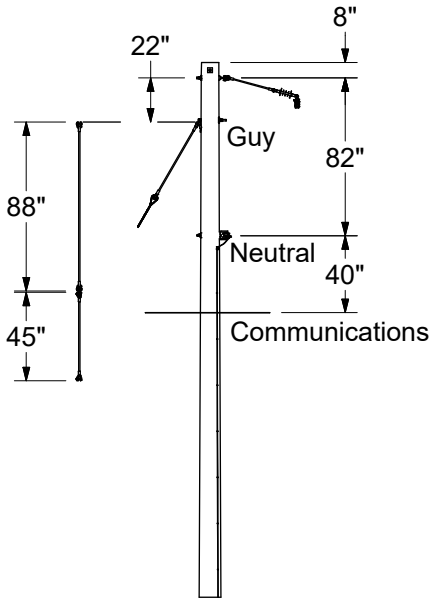
Loopover
03 12 01 07



Tap
03 12 01 08



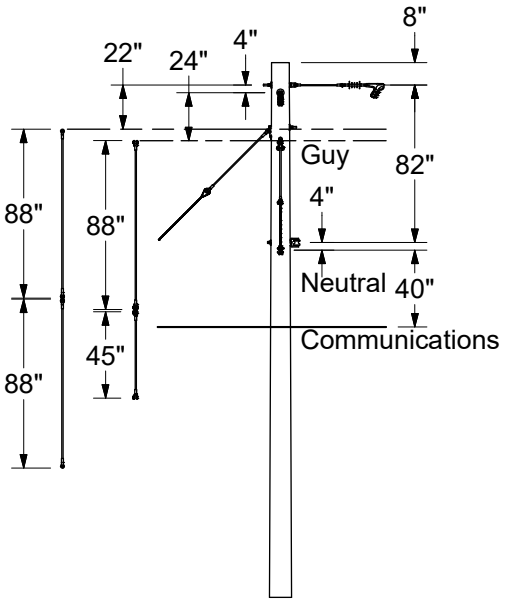
Pole Top Pin
03 12 01 02
03 12 01 22



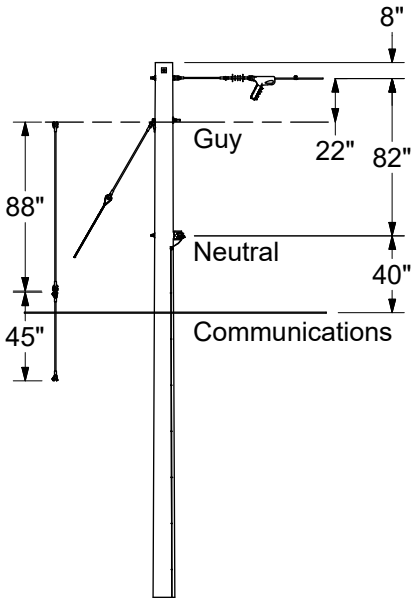
Floating Angle
03 12 01 04

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	07/01/20	DG	

Single Phase

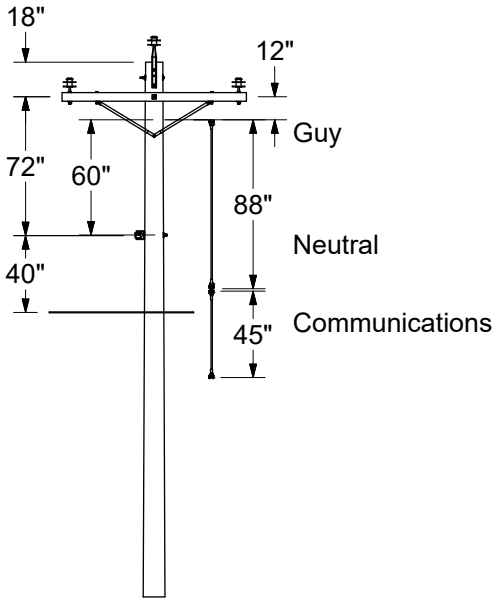


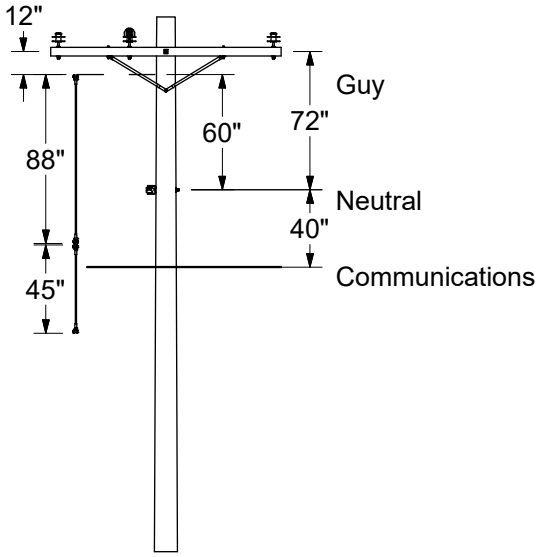
90° Angle
03 12 01 05



Deadend
03 12 01 06

One, Two, or Three-Phase
Angle on Crossarm



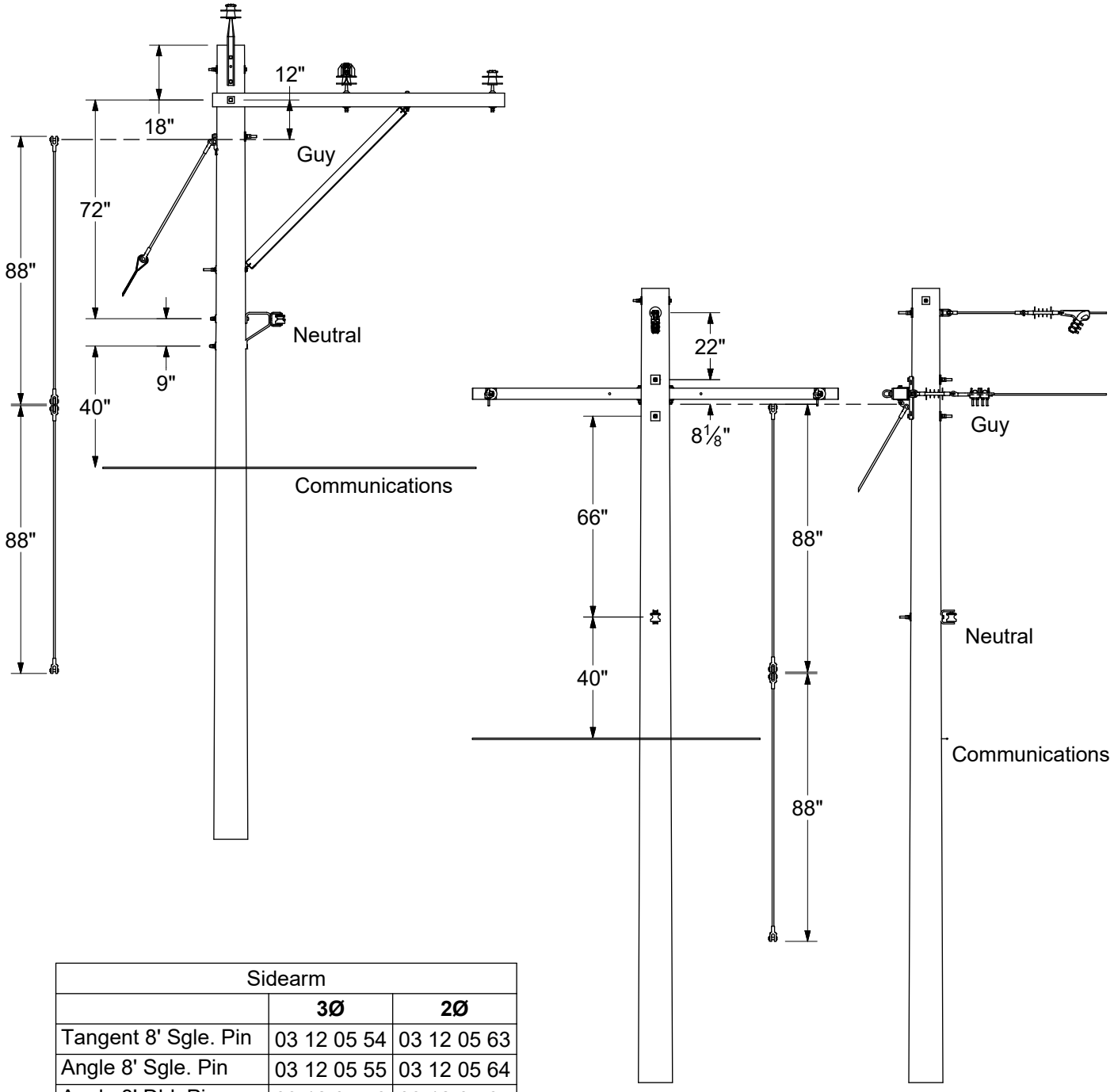


Angle		
	3Ø	**2Ø**
Angle 10' Sgle. Arm	03 12 05 05	03 12 05 11
Angle 8' Sgle. Arm	03 12 05 02	03 12 05 08

Underbuild			
	3Ø	**2Ø**	**1Ø**
Angle 8' Sgle. Pin	-	-	03 12 02 02
Angle 8' Dbl. Pin	-	-	03 12 02 03
Angle 10' Sgle. Pin	03 12 05 52	03 12 05 61	03 12 02 12
Angle 10' Dbl. Pin	-	-	03 12 02 13

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	07/01/20	DG	

One, Two, or Three-Phase
Angle on Crossarm

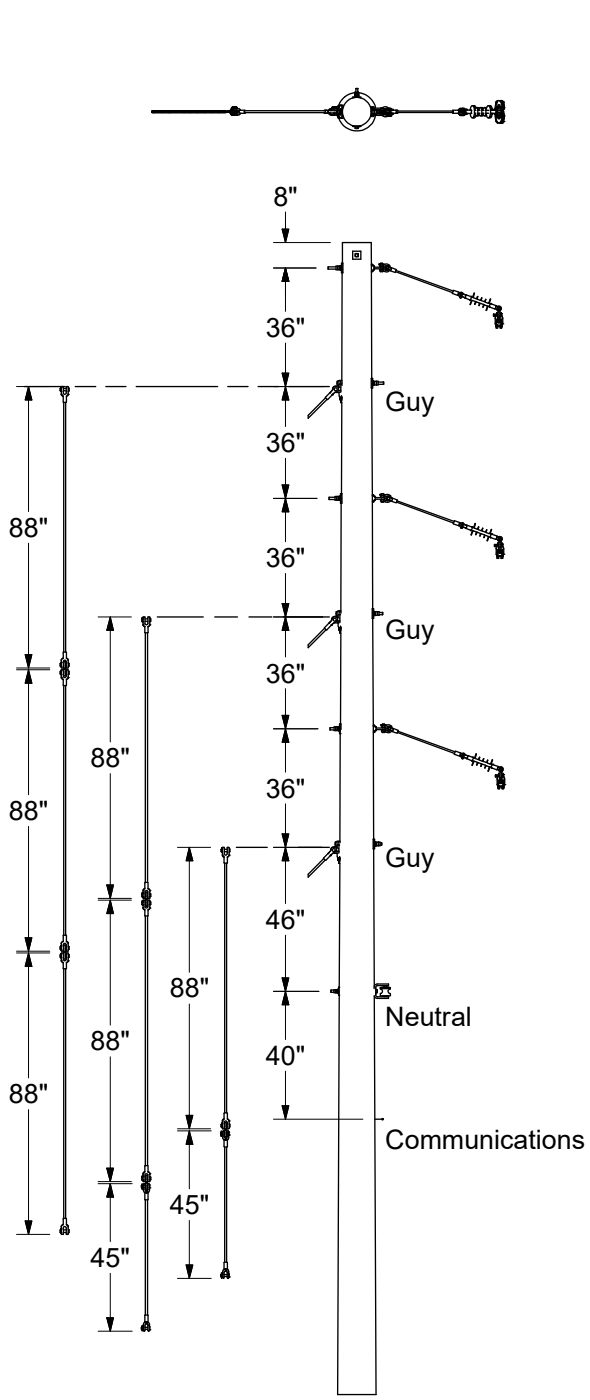


Sidearm		
	3Ø	**2Ø**
Tangent 8' Sgle. Pin	03 12 05 54	03 12 05 63
Angle 8' Sgle. Pin	03 12 05 55	03 12 05 64
Angle 8' Dbl. Pin	03 12 05 56	03 12 05 65

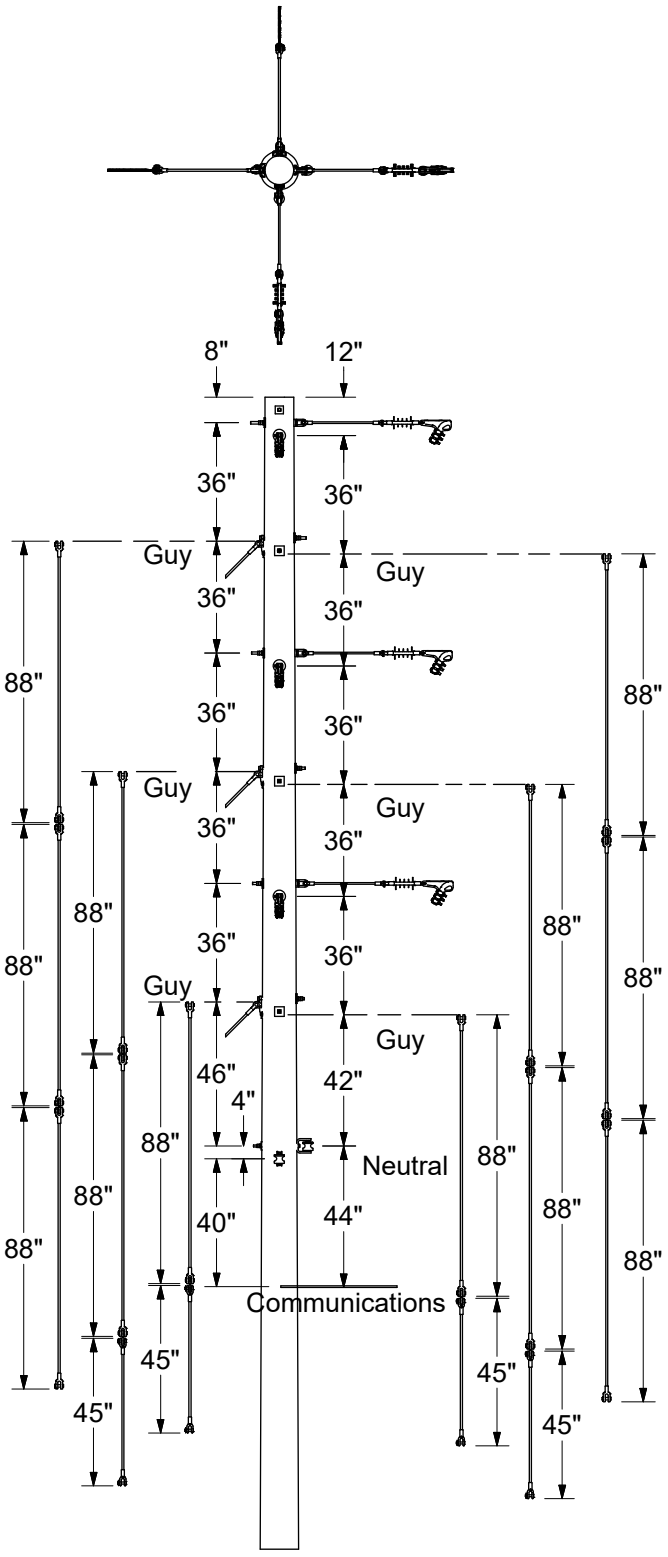
Deadend Arm - Pole Top or Underbuild			
	3Ø	**2Ø**	**1Ø**
DE Assy 8' Arm	03 12 11 51	03 12 11 31	03 12 02 06
DE Assy 10' Arm	03 12 11 52	03 12 11 54	03 12 02 16

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	07/01/20	DG	

Two or Three-Phase Floating and 90° Angle



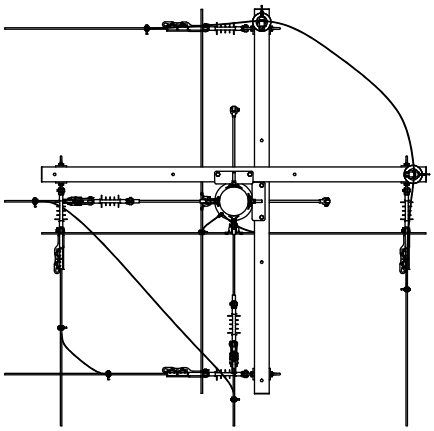
Vertical Floating Angle	
3Ø	03 12 07 02
2Ø	03 12 07 06

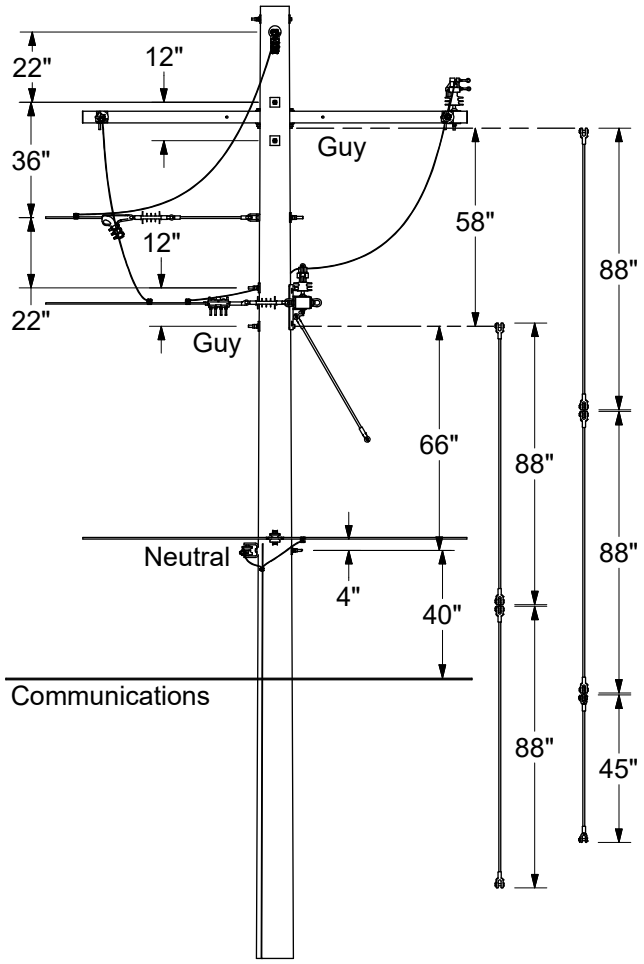


Vertical 90° Angle with FG Ext.	
3Ø	03 12 07 04
2Ø	03 12 07 08

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	07/01/20	DG	

Two or Three-Phase Buck Arm - 90° Angle

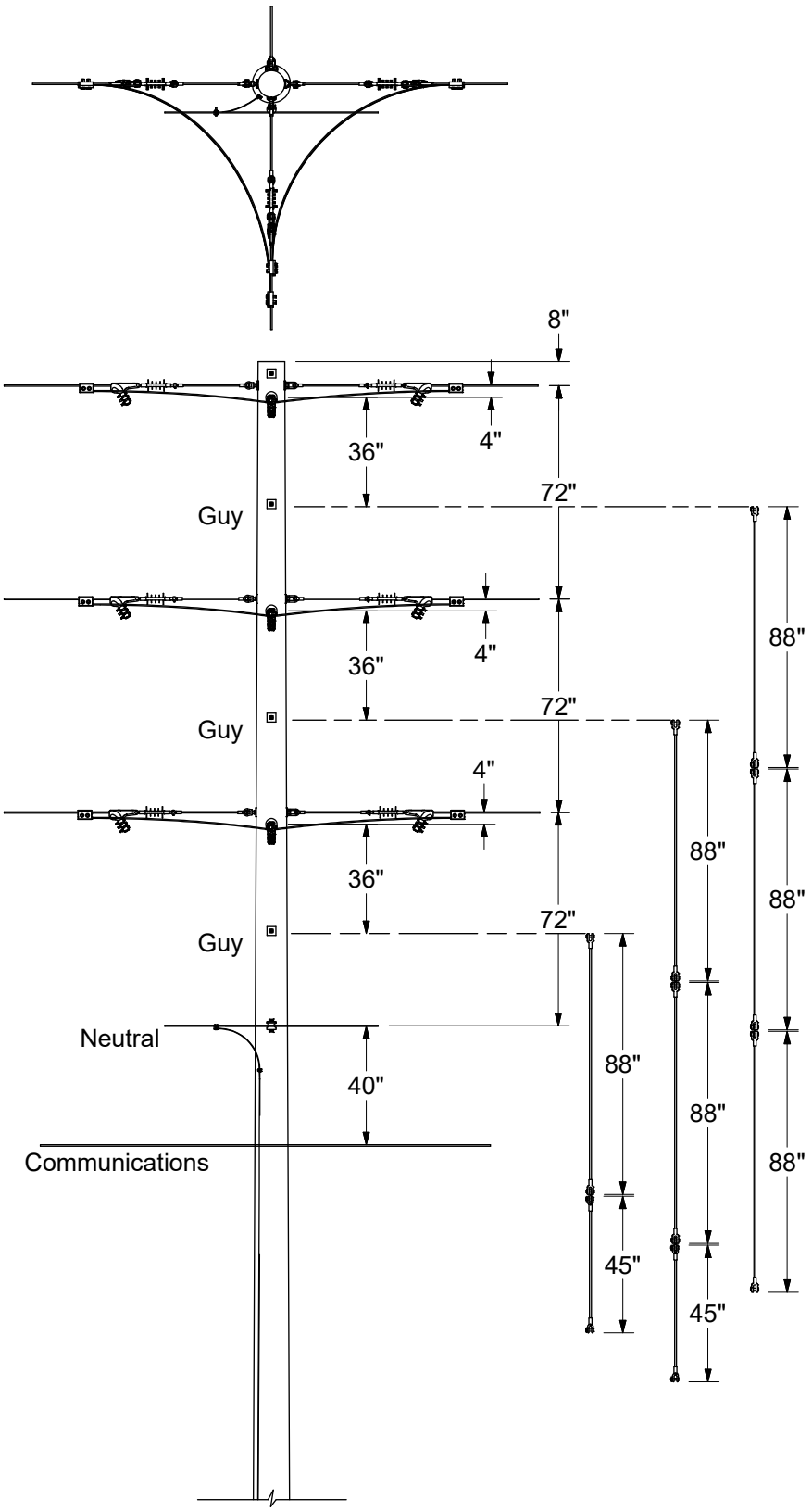




	3Ø	2Ø
	w/ Ext.	Not Shown
8' FG Arms	03 12 09 03	03 12 09 04
10' FG Arms	03 12 09 02	03 12 09 08

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	07/01/20	DG	

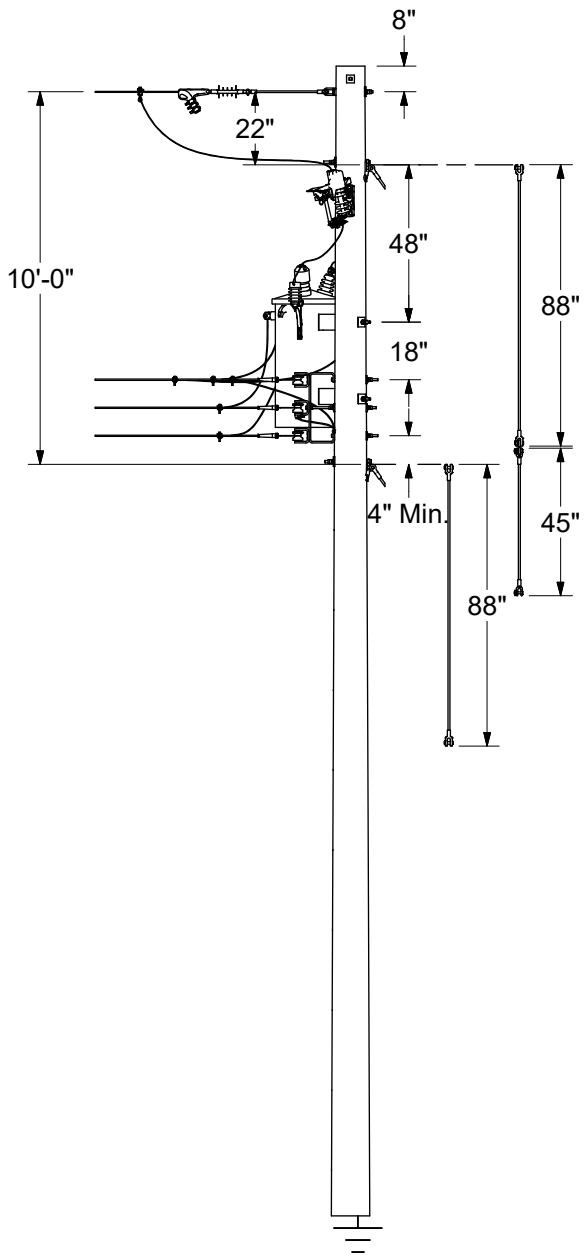
Two or Three-Phase - Vertical Tap



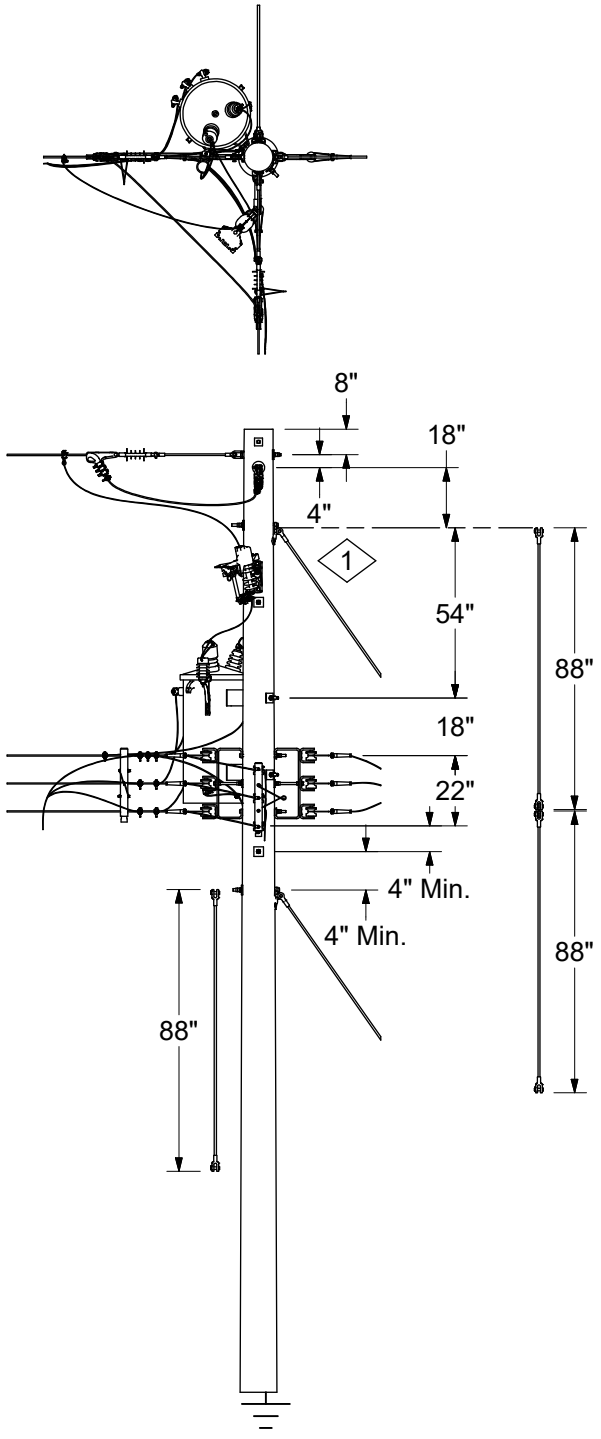
03 12 30 11

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	07/01/20	DG	

1 to 167kVA Deadend or "L" Corner



Deadend
13 12 07 **

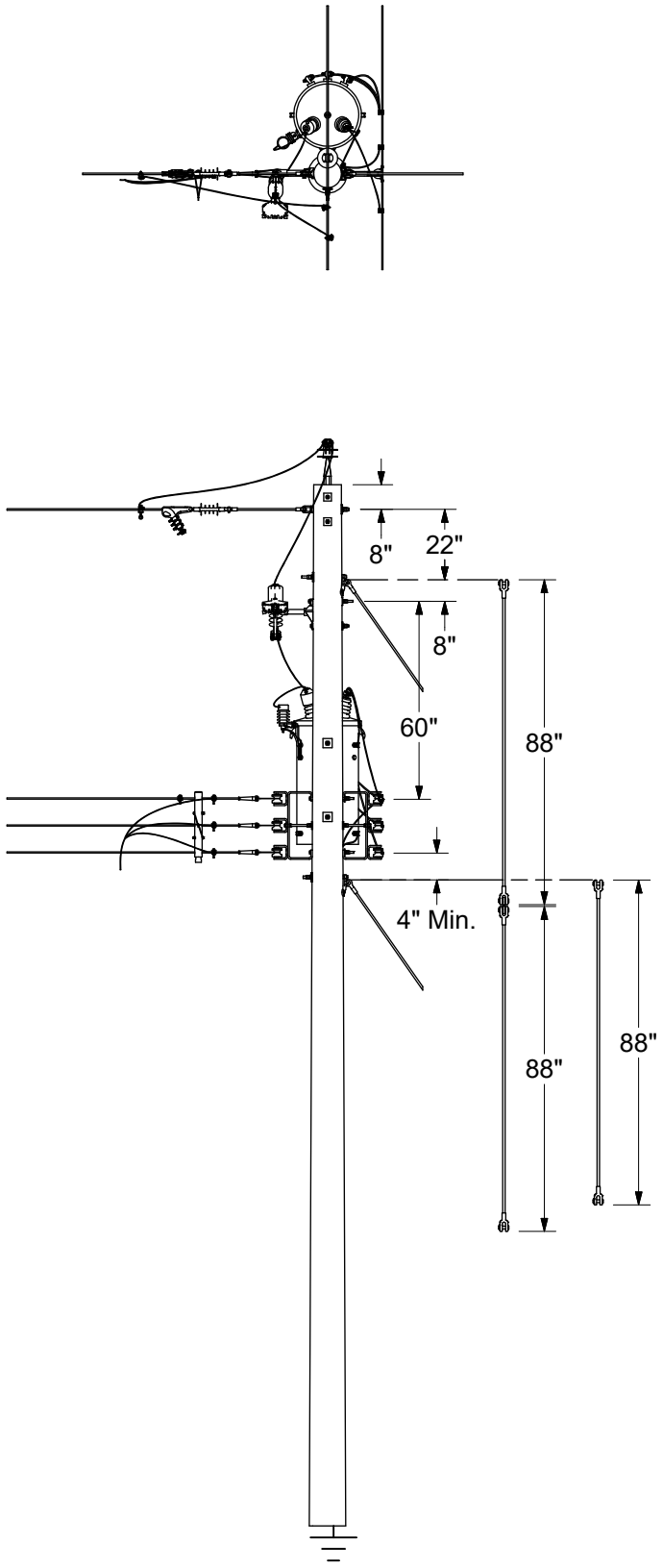


"L" Corner
13 12 10 **

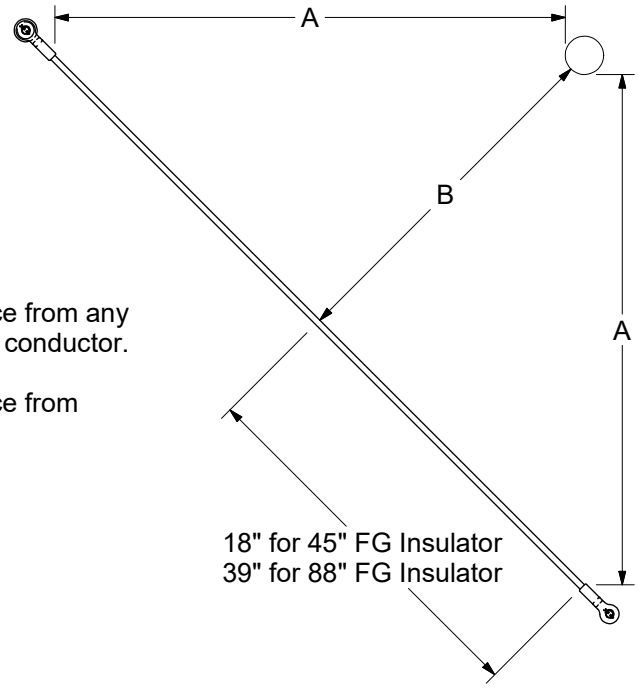
DESIGN NOTE(s):

1. On "L" corners, where a guy can only be installed below the transformer, a Class 4 or heavier pole shall be used. A Class 4 pole will provide adequate strength for deadening 1-1/0 bare AAAC at 1,360 lbs. Max. Tension (non-standard intermediate span urban construction). For conductor tension greater than this, contact Distribution Standards for determination of pole class.

Transformer, 1-Phase, T Corner



13 12 14 **



"A" is the minimum clearance from any conductive portion of guy to conductor.

"B" is the minimum clearance from fiberglass to conductor.

Minimum Clearances Guy to Conductor						
Reference: NESC, 2017 Edition, Rule 235E						
Phase To Phase Voltage	Span Guy Parallel To Conductor 1			All Other 1		
	A	B 2		A	B 2	
		45"FG	88"FG 7		45"FG	88"FG 7
Communications 3,8	6"	5"	5"	6"	5"	5"
0–4.16 kV 9	12" 3,6	9"	9"	6" 3	5"	5"
12.47–14.4 kV	15"	12"	12"	9" 3	7"	7"
34.5 kV	30" 4	24" 5	18"	30" 4	24" 5	13"
69 kV	38"	34" 5	29"	32"	27" 5	24"

DESIGN NOTE(s):

1. "Parallel" means in same general direction as line conductors. "All Other" includes down guys and span guys that cross over or under line conductors.

2. "B" is the minimum clearance required to the insulator or insulated section of guy wire between two insulators provided that the "A" minimum clearance to the uninsulated end fitting or guy wire is maintained.

3. On joint use poles, guys which pass within twelve inches of supply conductors and also pass within twelve inches of communication cables require a strain insulator to be located at a point below the lowest supply conductor and above the highest communication cable (NESC Table 235-6, Note 1: 2017 Edition).

4. 30" is based on Ameren's use of 200kV BIL.

5. This clearance required to maintain the air gap clearance to conductive parts. No reduction in clearance is allowed.

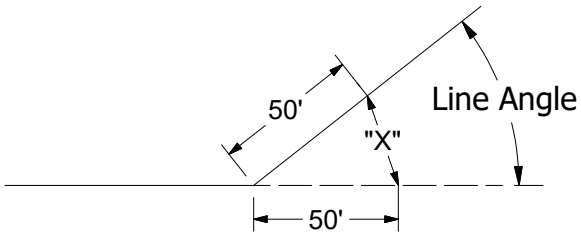
6. For neutral conductors, dimension "A" can be reduced to 6".

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	04/01/19	DG	

7. Longer FG insulators or daisy chained insulators will not allow further reduction of clearance to guy insulators.

8. Clearance of guy to communication cable may be reduced to 3" when abrasion protection is provided on the guy or communication cable.

9. Clearance of guy to 600V secondary conductor may be reduced to 3" when abrasion protection is provided on the guy or secondary conductor.

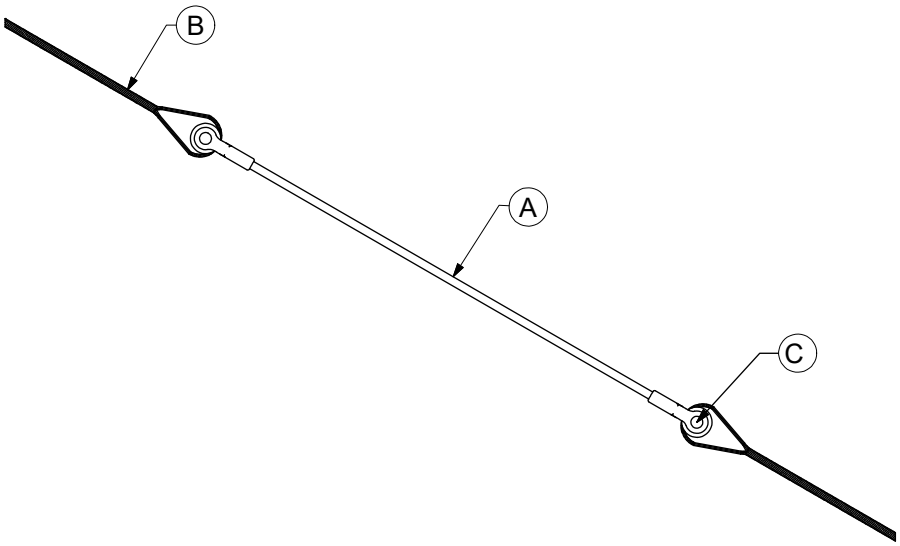


Line Angle Degrees	Distance "X"	Line Angle Degrees	Distance "X"	Line Angle Degrees	Distance "X"
1	0'-10"	21	18'-3"	41	35'-2"
2	1'-9"	22	19'-2"	42	36'-0"
3	2'-8"	23	20'-0"	43	36'-10"
4	3'-6"	24	20'-8"	44	37'-5"
5	4'-4"	25	21'-7"	45	38'-6"
6	5'-3"	26	22'-6"	46	39'-5"
7	6'-1"	27	23'-4"	47	40'-0"
8	7'-0"	28	24'-3"	48	40'-10"
9	7'-10"	29	25'-1"	49	41'-7"
10	8'-8"	30	26'-0"	50	42'-5"
11	9'-6"	31	26'-9"	51	43'-0"
12	10'-5"	32	27'-7"	52	43'-10"
13	11'-3"	33	28'-5"	53	44'-7"
14	12'-1"	34	29'-4"	54	45'-5"
15	13'-0"	35	30'-2"	55	46'-1"
16	13'-9"	36	30'-11"	56	46'-11"
17	14'-8"	37	31'-10"	57	47'-7"
18	15'-6"	38	32'-8"	58	48'-6"
19	16'-4"	39	33'-5"	59	49'-3"
20	17'-4"	40	34'-2"	60	50'-0"

CONSTRUCTION NOTE(s):

1. A close approximation of the line angle may be obtained by measuring 50 feet out along either the line or line extended. From this point measure the distance "X". This distance in feet will approximate the line angle in degrees. For more accurate results use the sketch and the table above.

REV	DATE	ENG	DESCRIPTION
2	04/01/23	DG	Converted to new format
1	06/11/98	DG	



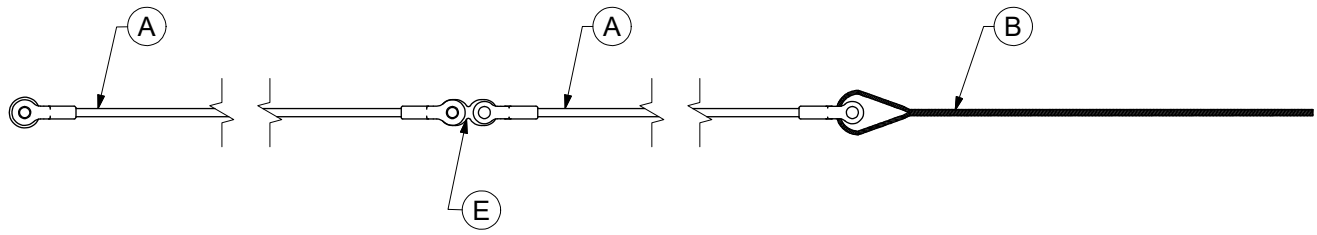
One Insulator		
DCS #	DESCRIPTION	Guy Wire
11 00 40 04	45" Fiberglass Insulator	1/4"
11 00 40 05	45" Fiberglass Insulator	3/8"
11 00 40 06	45" Fiberglass Insulator	7/16"
11 00 40 07	88" Fiberglass Insulator	1/4"
11 00 40 08	88" Fiberglass Insulator	3/8"
11 00 40 09	88" Fiberglass Insulator	7/16"

CONSTRUCTION NOTE(s):

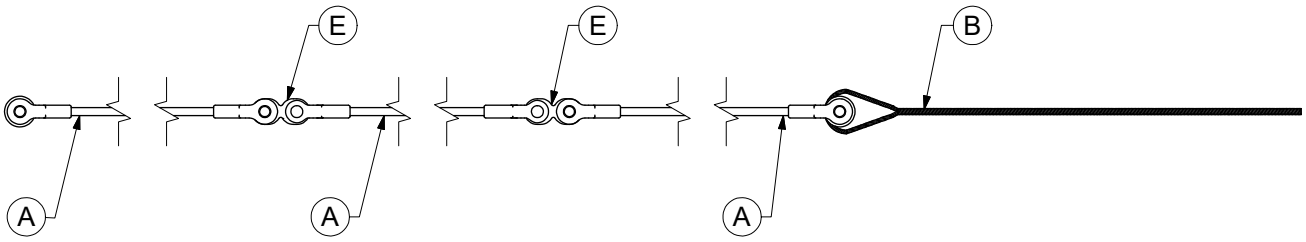
1. If installing insulator in existing guy, Operation Code 918 must be added.

	ITEM	STK / DCS #	DESCRIPTION 11 00 40 **	04	05	06	07	08	09
	A	25 56 070	Insulator - Fiberglass, 45"	1	1	1	-	-	-
		25 56 058	Insulator - Fiberglass, 88”	-	-	-	1	1	1
	B	23 68 241	Grip - Guy Wire 1/4"	2	-	-	2	-	-
		23 68 237	Grip - Guy Wire 3/8"	-	2	-	-	2	-
		23 68 238	Grip - Guy Wire 7/16"	-	-	2	-	-	2
	C	23 68 327	Roller - Guy	-	-	-	1	1	1
1@		918	Op Code, Install Guy	2	2	2	2	2	2

REV	DATE	ENG	DESCRIPTION
4	04/01/23	DG	Converted to new format
3	03/21/16	DDG	



Two Insulator

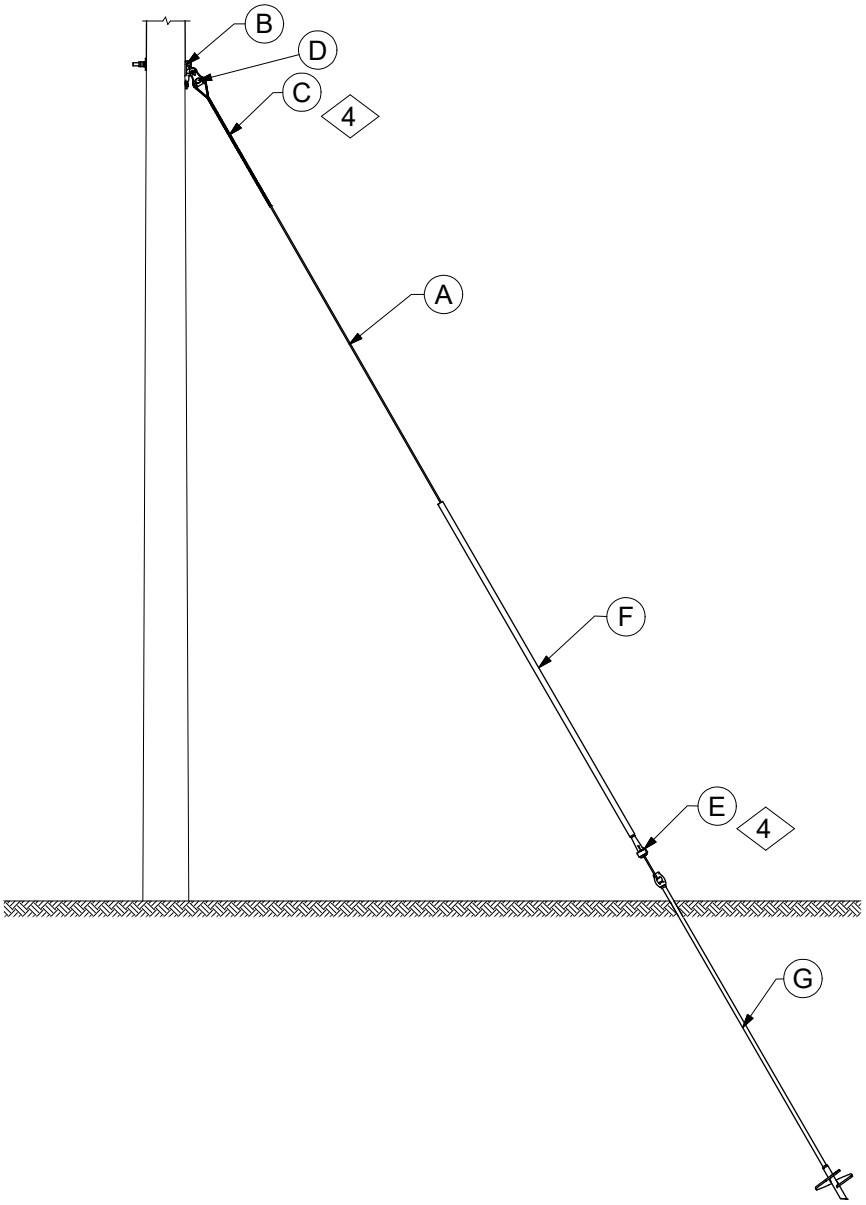


Three Insulator

Two or Three Insulator		
DCS #	DESCRIPTION	Guy Wire
11 00 40 10	One 45" and One 88" FG Insulator	3/8"
11 00 40 11	One 45" and One 88" FG Insulator	7/16"
11 00 40 12	Two 88" FG Insulators	3/8"
11 00 40 13	Two 88" FG Insulators	7/16"
11 00 40 14	One 45" and Two 88" FG Insulator	3/8"
11 00 40 15	One 45" and Two 88" FG Insulator	7/16"

	ITEM	STK / DCS #	DESCRIPTION 11 00 40 **	10	11	12	13	14	15
	A	25 56 058	Insulator - Fiberglass, 88”	1	1	2	2	2	2
		25 56 070	Insulator - Fiberglass, 45"	1	1	-	-	1	1
	B	23 68 238	Grip - Guy Wire 7/16"	-	1	-	1	-	1
		23 68 237	Grip - Guy Wire 3/8"	1	-	1	-	1	-
	E	23 59 064	Link - Figure 8	1	1	1	1	2	2
1@		918	Op Code, Install Guy	2	2	2	2	3	3

REV	DATE	ENG	DESCRIPTION
4	04/01/23	DG	Converted to new format
3	03/21/16	DDG	



CONSTRUCTION NOTE(s):

1. This DCS may only be used on guy stub poles where the span guy is insulated and there is no other energized conductor or communication attachments on the pole. Use DCS **11 00 43 ****** if insulated down guy is needed.

2. DCS **11 00 41 01** for 1/4" guy is not to be used in Illinois.

3. Separate multiple guy attachments at pole by minimum of 12".

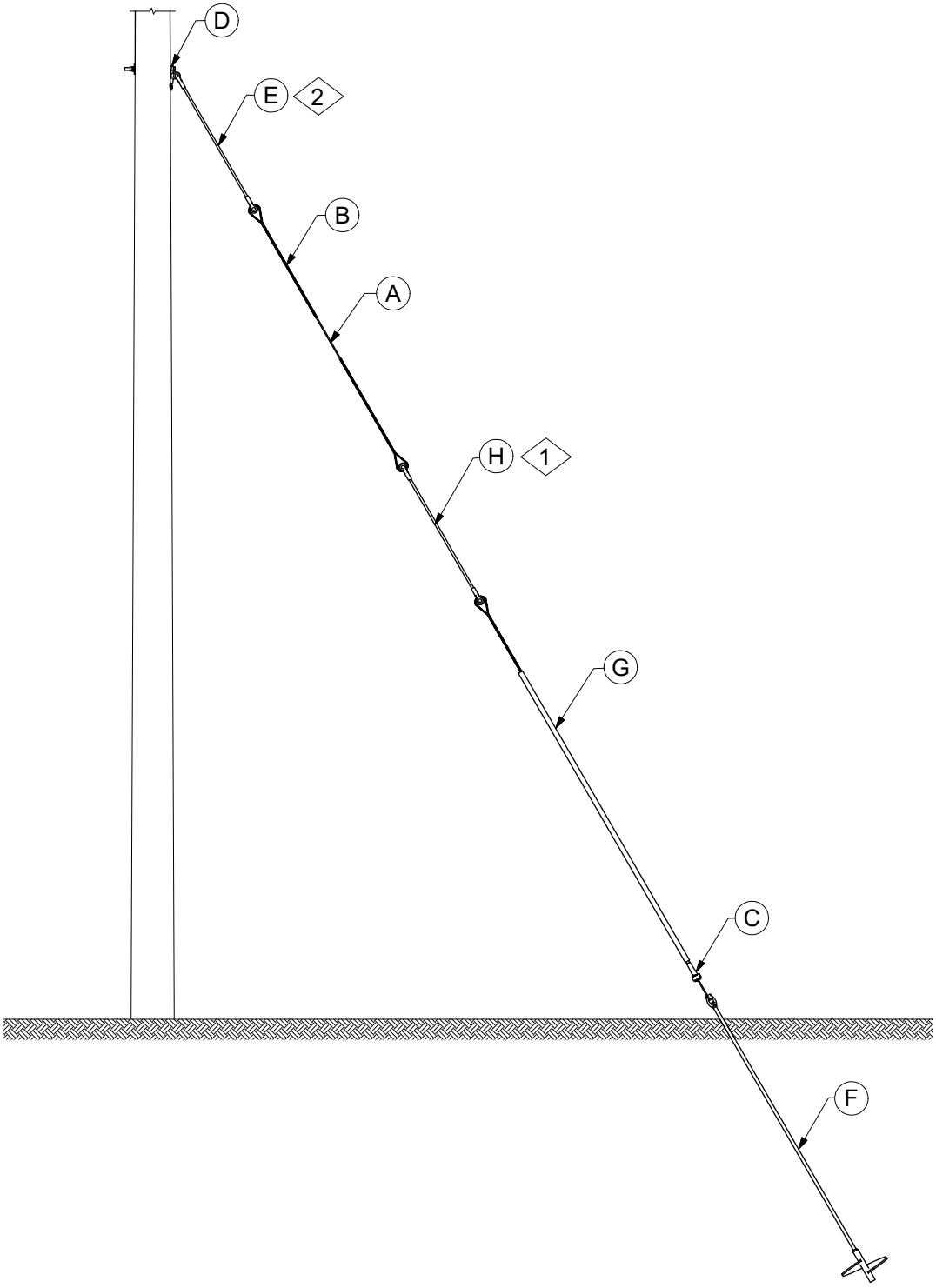
4. Locations of items C and E may be reversed for 3/8" and 7/16" down guys.

REV	DATE	ENG	DESCRIPTION
11	04/01/23	DG	Converted to new format
10	11/13/15	DG	

	DCS #	Guy Wire
2	11 00 41 01	1/4"
	11 00 41 02	3/8"
	11 00 41 04	7/16"

	ITEM	STK / DCS #	DESCRIPTION 11 00 41 **	01	02	04
	A	27 59 016	Guy Wire - 1/4"	40	-	-
		27 59 020	Guy Wire - 3/8"	-	40	-
		27 59 022	Guy Wire - 7/16"	-	-	40
	B	**11 00 56 01**	Guy Hook - Light Duty	1	-	-
		11 00 56 02	Guy Hook - Heavy Duty	-	1	1
	C	23 68 241	Grip - Guy Wire 1/4"	1	-	-
		23 68 237	Grip - Guy Wire 3/8"	-	1	-
		23 68 238	Grip - Guy Wire 7/16"	-	-	1
	D	23 58 054	Clevis - Thimble, Galvanized Steel	-	1	1
	E	23 68 300	Deadend - Automatic 1/4"	1	-	-
		23 68 299	Deadend - Automatic 3/8"	-	1	-
		23 68 301	Deadend - Auto 7/16"	-	-	1
@	F	23 78 091	Marker - Guy Wire Yellow	1	1	1
		23 68 826	Marker - Guy Wire Orange	1	1	1
@	G	**11 00 60 ****	Anchor - Screw	1	1	1
		11 00 63 **	Anchor - Screw, Hi-Torque	1	1	1
		918	Op Code, Install Guy	2	2	2

REV	DATE	ENG	DESCRIPTION
11	04/01/23	DG	Converted to new format
10	11/13/15	DG	



CONSTRUCTION NOTE(s):

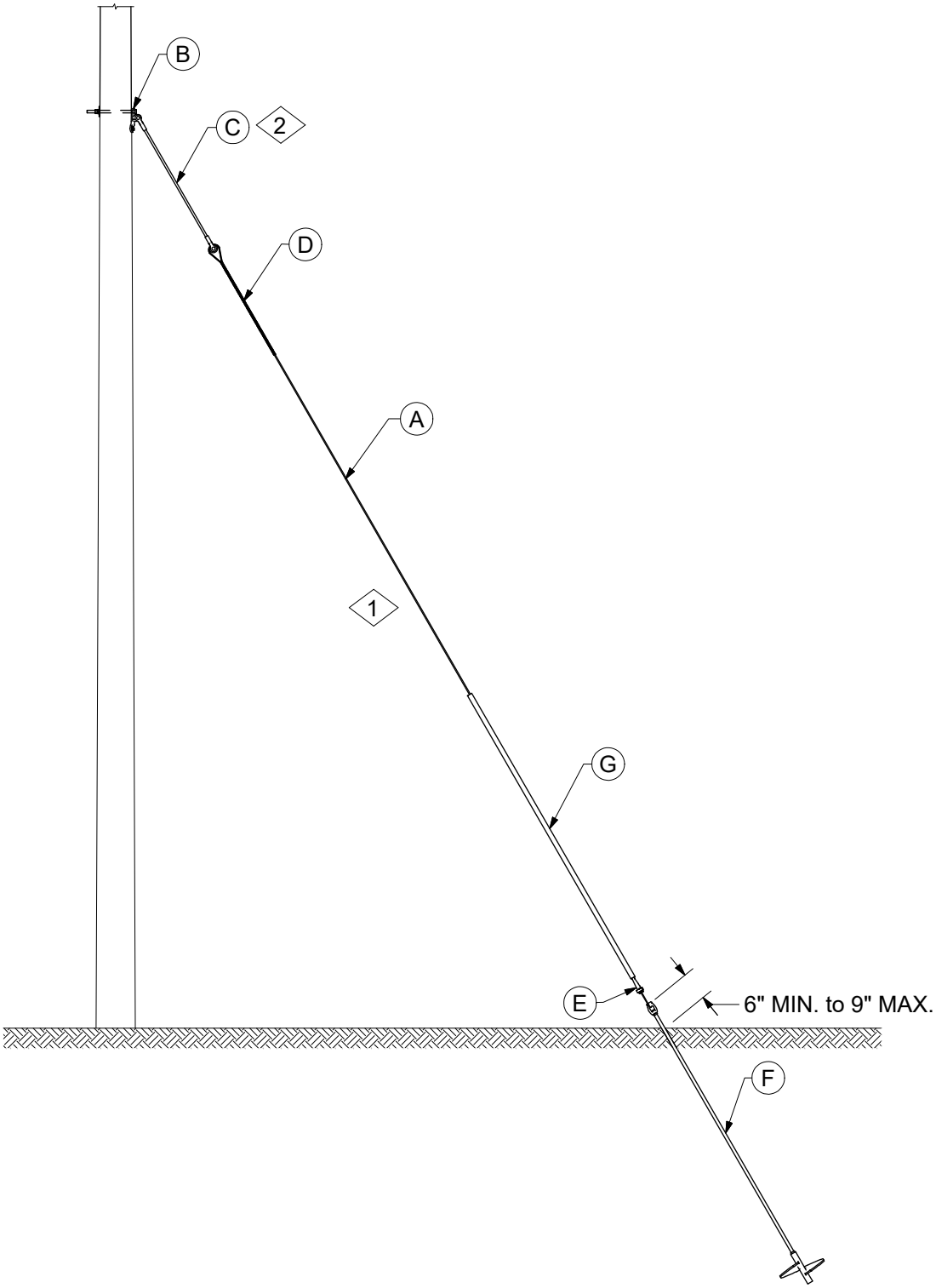
1. Omit insulator if not required. Insert additional insulators if needed. See DCS **11 00 02 01** and **11 00 02 02** for typical insulator location and requirements.
2. 88" FG insulator (Stock #25 56 058) may be used in place of the 45" FG insulator where required.
3. For anchors with three guys attached, use DCS **11 00 42 05** or **11 00 42 06**.

REV	DATE	ENG	DESCRIPTION
10	04/01/23	DG	Converted to new format
9	02/08/16	DG	

DCS #	Description	Guy Wire
11 00 42 02	Single Guy Wire	3/8"
11 00 42 04	Single Guy WIre	7/16"
11 00 42 05	Three Guy Wires	3/8"
11 00 42 06	Three Guy Wires	7/16"

	ITEM	STK / DCS #	DESCRIPTION 11 00 42 **	02	04	05	06
	A	27 59 020	Wire - Guy - 3/8"	60	-	180	-
		27 59 022	Wire - Guy - 7/16"	-	60	-	180
	B	23 68 237	Grip - Guy Wire 3/8"	1	-	3	-
		23 68 238	Grip - Guy Wire 7/16"	-	1	-	3
	C	23 68 299	Deadend - Automatic 3/8"	1	-	2	-
		23 68 744	Deadend - Automatic 3/8" Long Bail	-	-	1	-
		23 68 301	Deadend - Automatic 7/16"	-	1	-	2
		23 78 454	Deadend - Automatic 7/16" Long Bail	-	-	-	1
@	D	**11 00 56 03**	Guy Hook - Heavy Duty	1	1	3	3
		11 00 56 04	Guy Hook - Heavy Duty	1	1	3	3
2@	E	25 56 070	Insulator - Fiberglass, 45"	1	1	3	3
		25 56 058	Insulator - Fiberglass, 88"	1	1	3	3
@	F	**11 00 60 ** **	Anchor - Screw	1	1	1	1
		**11 00 63 ** **	Anchor - Screw, Hi-Torque	1	1	1	1
@	G	23 78 091	Marker - Guy Wire Yellow	1	1	1	1
		23 68 826	Marker - Guy Wire Orange	1	1	1	1
1@	H	**11 00 40 ** **	Assembly - Insulator, Guy	#	#	#	#
		918	Op Code, Install Guy	2	2	6	6

REV	DATE	ENG	DESCRIPTION
10	04/01/23	DG	Converted to new format
9	02/08/16	DG	



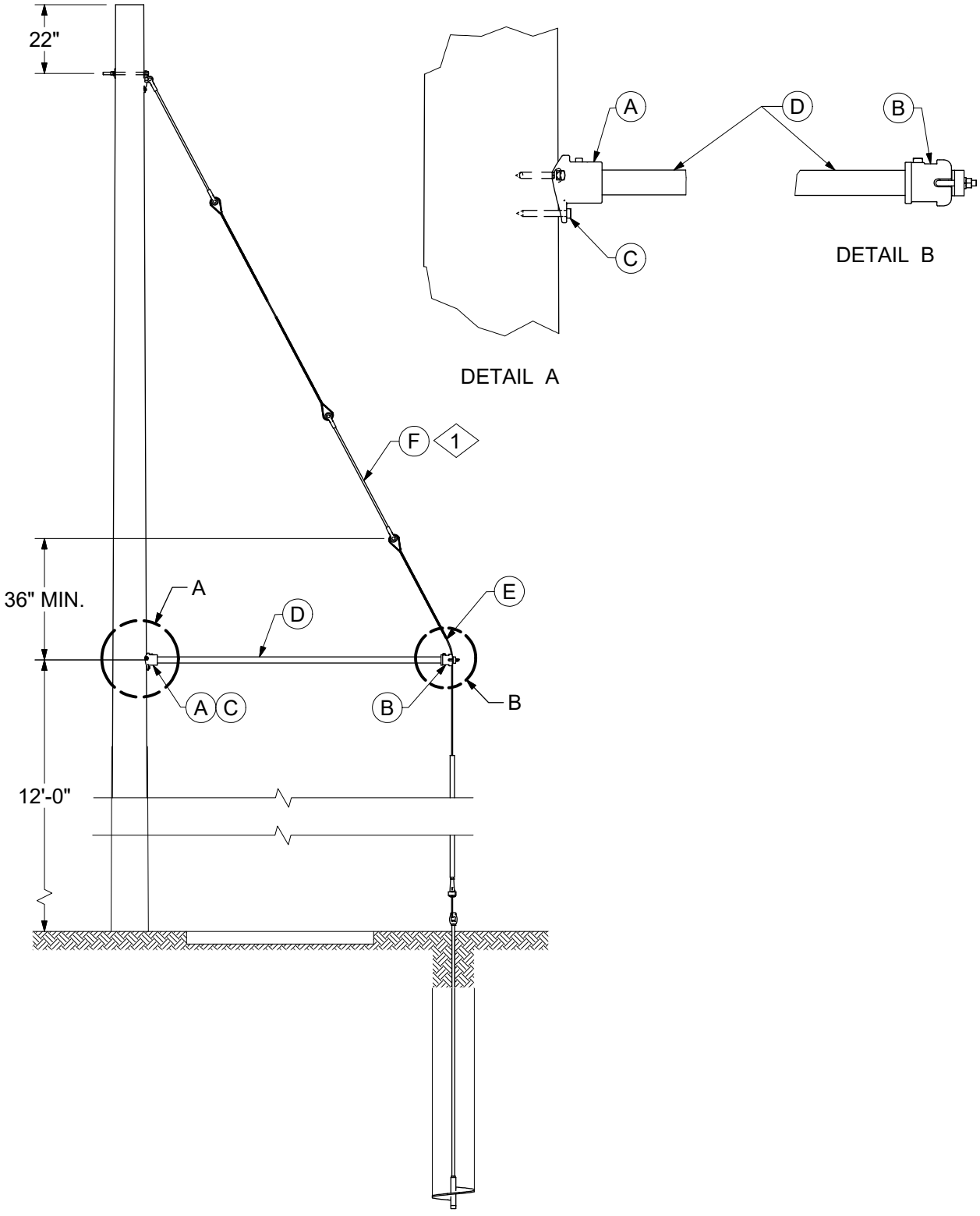
CONSTRUCTION NOTE(s):

1. Insert additional insulators if needed. See DCS **11 00 02 01** and **11 00 02 02** for typical insulator location and requirements.

2. Use 88" guy strain if additional electrical clearance is required where 45" does not meet the NESC code.

	ITEM	STK / DCS #	DESCRIPTION 11 00 43 **	01	03	05	07	09	11
	A	27 59 016	Wire - Guy, 1/4"	40	40	-	-	-	-
		27 59 020	Wire - Guy, 3/8"	-	-	40	40	-	-
		27 59 022	Wire - Guy, 7/16"	-	-	-	-	40	40
	B	**11 00 56 03**	Guy Hook - Heavy Duty	1	1	1	1	1	1
2	C	25 56 070	Insulator - Fiberglass, 45"	1	-	1	-	1	-
		25 56 058	Insulator - Fiberglass, 88"	-	1	-	1	-	1
	D	23 68 241	Grip - Guy Wire 1/4"	1	1	-	-	-	-
		23 68 237	Grip - Guy Wire 3/8"	-	-	1	1	-	-
		23 68 238	Grip - Guy Wire 7/16"	-	-	-	-	1	1
	E	23 68 300	Deadend - Automatic 1/4"	1	1	-	-	-	-
		23 68 299	Deadend - Automatic 3/8"	-	-	1	1	-	-
		23 68 301	Deadend - Automatic 7/16"	-	-	-	-	1	1
@	F	**11 00 60 ****	Anchor - Screw	1	1	1	1	1	1
		11 00 63 **	Anchor - Screw, Hi-Torque	1	1	1	1	1	1
@	G	23 78 091	Marker - Guy Wire Yellow	1	1	1	1	1	1
		23 68 826	Marker - Guy Wire Orange	1	1	1	1	1	1
1 @	H	**11 00 40 ****	Assembly - Insulator, Guy	#	#	#	#	#	#
		918	Op Code, Install Guy	2	2	2	2	2	2

REV	DATE	ENG	DESCRIPTION
11	04/01/23	DG	Converted to new format
10	11/18/15	KSP	



CONSTRUCTION NOTE(s):

1. Add additional guy insulators if required per DCS **11 00 01 01**.

REV	DATE	ENG	DESCRIPTION
6	04/01/23	DG	Converted to new format
5	06/11/15	DG	

	ITEM	STK / DCS #	DESCRIPTION 11 00 44 **	00
	A	23 67 263	Plate - Sidewalk Guy	1
	B	23 68 422	Fitting - Guy End	1
	C	23 60 007	Lag Screw - 1/2" x 4"	3
4	D	40 83 022	Pipe - 2" Galv. (ft.)	10
@	E	**11 00 43 ** @**	Guy - Anchor, Insulator	1
@	F	**11 00 40 ** @**	Assembly - Insulator, Guy	1
		918	Op Code, Install Guy	2

DESIGN NOTE(s):

2. A conductor tension unit is a resultant force (in 1,000 lb. units) for a given conductor and line angle.

3. These are the maximum resultant tensions that these poles can support under these given installation parameters. For other pole heights, classes, guy and strut attachment heights, refer to Engineering Design Manual LS-30 and associated Guying Tool.

4. Maximum conductor tension limits are based on an 8ft guy strut. Using the full 10ft length of pipe for the guy strut will allow slightly higher conductor tensions.

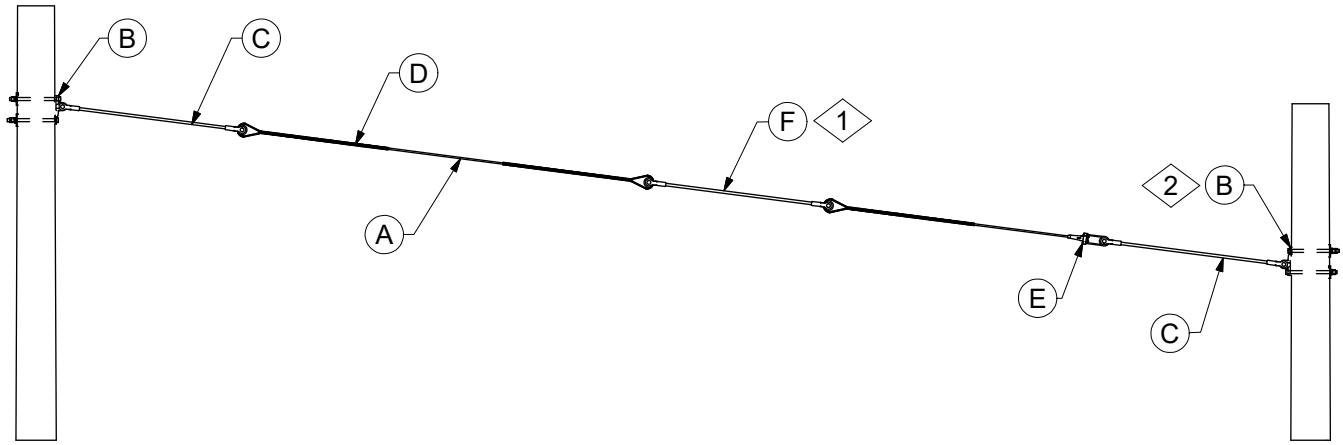
Table 1 - Max. Conductor Tension Units 2 3

Pole Height	Pole Class	Grade C			Grade B		
		1/4" Guy	3/8" Guy	7/16" Guy	1/4" Guy	3/8" Guy	7/16" Guy
30	4	1.53	2.28	2.28	1.02	1.16	1.16
	5	1.53	1.78	1.78	0.91	0.91	0.91
35	1	1.40	3.25	4.39	0.93	2.17	2.78
	3	1.40	3.25	3.54	0.93	1.80	1.80
	4	1.40	2.77	2.77	0.93	1.41	1.41
	5	1.40	2.13	2.13	0.93	1.08	1.08
40	3	1.26	2.92	3.95	0.84	1.94	2.14
	4	1.26	2.92	3.32	0.84	1.70	1.70
45	4	1.13	2.39	2.39	0.75	1.59	1.59

REV	DATE	ENG	DESCRIPTION
6	04/01/23	DG	Converted to new format
5	06/11/15	DG	

Table 2 - Max. Conductor Tension Units Limiting Component							
Pole Height	Pole Class	Grade C			Grade B		
		1/4" Guy	3/8" Guy	7/16" Guy	1/4" Guy	3/8" Guy	7/16" Guy
30	4	Guy Wire	Pole @ Strut	Pole @ Strut	Guy Wire	Pole @ Strut	Pole @ Strut
	5	Guy Wire	Pole @ Strut	Pole @ Strut	Pole @ Strut	Pole @ Strut	Pole @ Strut
35	1	Guy Wire	Guy Wire	Guy Wire	Guy Wire	Guy Wire	Pole @ Strut
	3	Guy Wire	Guy Wire	Pole @ Strut	Guy Wire	Pole @ Strut	Pole @ Strut
	4	Guy Wire	Pole @ Strut	Pole @ Strut	Guy Wire	Pole @ Strut	Pole @ Strut
	5	Guy Wire	Pole @ Strut	Pole @ Strut	Guy Wire	Pole @ Strut	Pole @ Strut
40	3	Guy Wire	Guy Wire	Guy Wire	Guy Wire	Guy Wire	Pole @ Strut
	4	Guy Wire	Guy Wire	Column Loading	Guy Wire	Pole @ Strut	Pole @ Strut
45	4	Guy Wire	Column Loading	Column Loading	Guy Wire	Column Loading	Column Loading

REV	DATE	ENG	DESCRIPTION
6	04/01/23	DG	Converted to new format
5	06/11/15	DG	



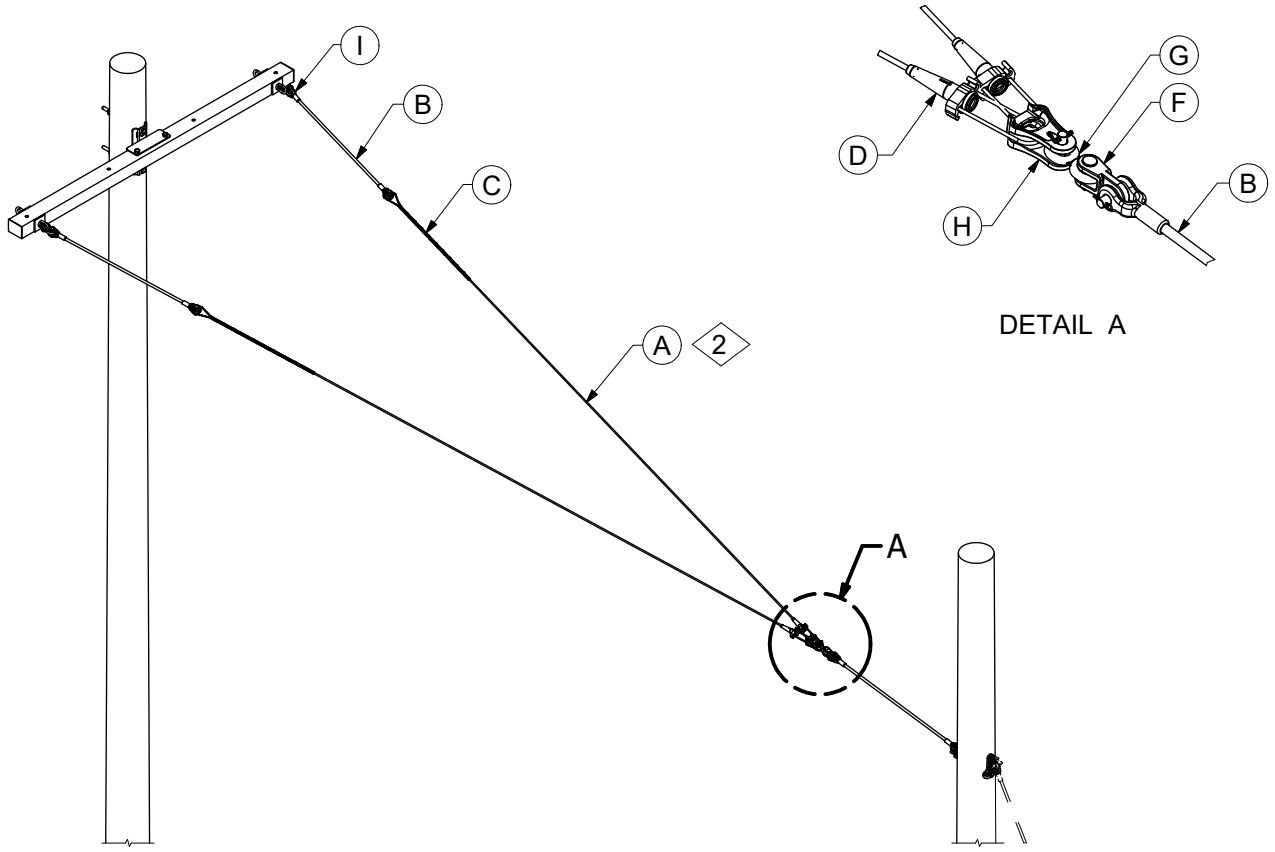
CONSTRUCTION NOTE(s):

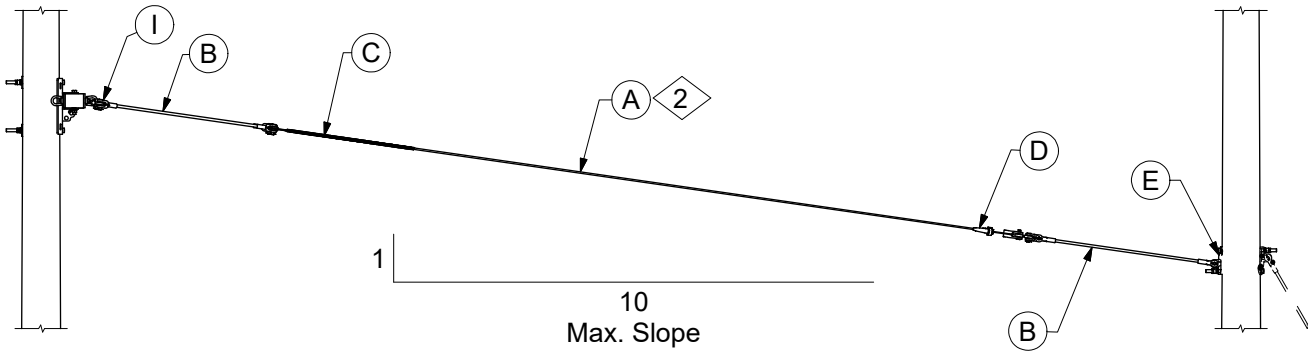
1. Add insulators as required. See DCS **11 00 01 01** for insulator location and requirements.

2. Install guy hook upside down when there is uplift on the guy to pole attachment.

	ITEM	STK / DCS #	DESCRIPTION 11 00 46 **	01	03	05	07	15	16
	A	27 59 016	Wire - Guy, 1/4"	150	150	-	-	-	-
		27 59 020	Wire - Guy, 3/8"	-	-	150	150	-	-
		27 59 022	Wire - Guy, 7/16"	-	-	-	-	150	150
	B	**11 00 56 04**	Guy Hook - Heavy Duty	2	2	2	2	2	2
	C	25 56 070	Insulator - Fiberglass, 45"	2	-	2	-	2	-
		25 56 058	Insulator - Fiberglass, 88"	-	2	-	2	-	2
	D	23 68 241	Grip - Guy Wire 1/4"	1	1	-	-	-	-
		23 68 237	Grip - Guy Wire 3/8"	-	-	1	1	-	-
		23 68 238	Grip - Guy Wire 7/16"	-	-	-	-	1	1
	E	23 68 300	Deadend - Automatic 1/4"	1	1	-	-	-	-
		23 68 299	Deadend - Automatic 3/8"	-	-	1	1	-	-
		23 68 301	Deadend - Automatic 7/16"	-	-	-	-	1	1
1@	F	**11 00 40 ****	Assembly - Insulator, Guy	#	#	#	#	#	#
		918	Op Code, Install Guy	2	2	2	2	2	2

REV	DATE	ENG	DESCRIPTION
12	04/01/23	DG	Converted to new format
11	11/30/15	KSP	





REV	DATE	ENG	DESCRIPTION
9	04/01/23	DG	Converted to new format
8	04/01/10	DG	

	ITEM	STK / DCS #	DESCRIPTION 11 00 48 **	01	02	03	04
3	A	27 59 016	Wire - Guy, 1/4"	300	300	-	-
		27 59 020	Wire - Guy, 3/8"	-	-	300	300
	B	25 56 070	Insulator - Fiberglass, 45"	3	-	3	-
		25 56 058	Insulator - Fiberglass, 88”	-	3	-	3
	C	23 68 241	Grip - Guy Wire 1/4"	2	2	-	-
		23 68 237	Grip - Guy Wire 3/8"	-	-	2	2
	D	23 68 300	Deadend - Automatic 1/4"	2	2	-	-
		23 68 299	Deadend - Automatic 3/8"	-	-	2	2
	E	**11 00 56 04**	Guy Hook - Heavy Duty	1	1	1	1
	F	23 59 057	Eye - Clevis, 90 Degree	1	1	1	1
	G	23 59 064	Link - Figure 8	1	1	1	1
	H	23 58 054	Clevis - Thimble, Galvanized Steel	1	1	1	1
	I	23 68 181	Shackle - Deadend	2	2	2	2
2@	J	**11 00 40 ****	Assembly - Insulator, Guy	#	#	#	#
		918	Op Code, Install Guy	2	2	2	2

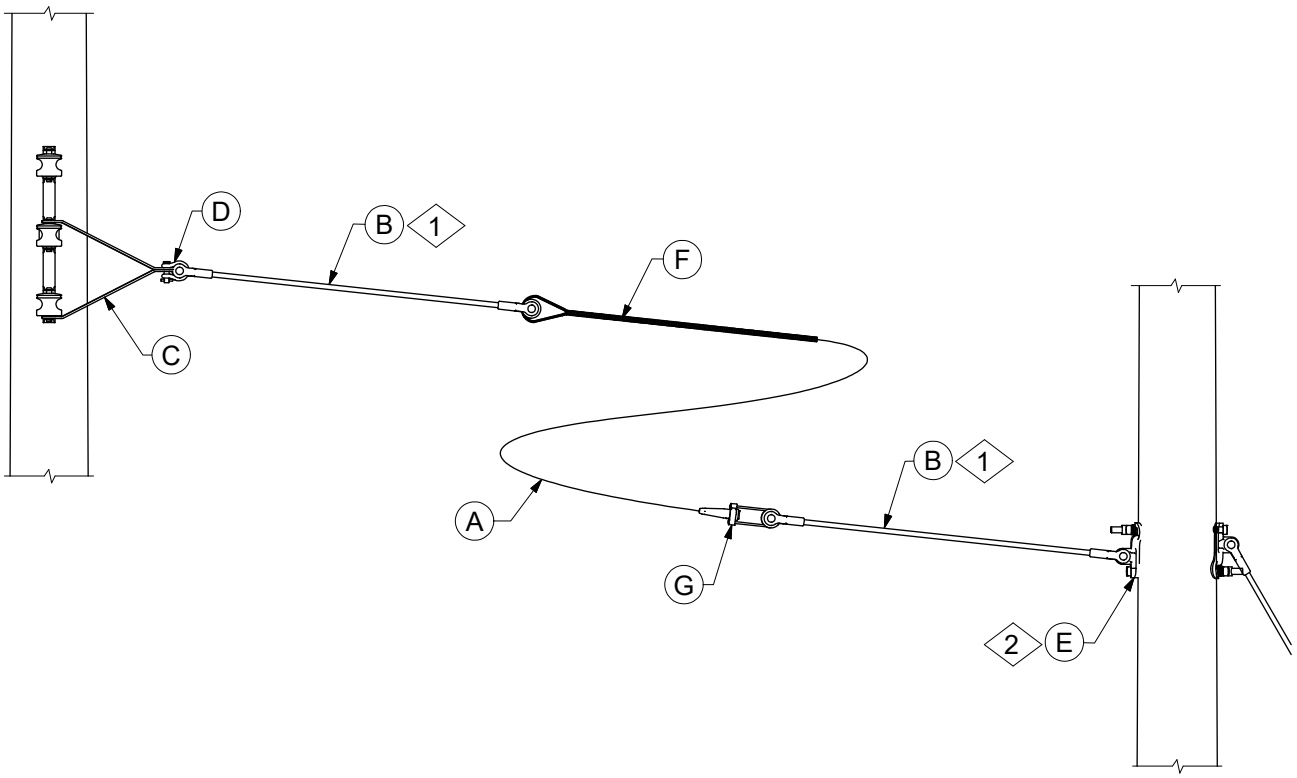
DESIGN NOTE(s):

1. This DCS is for use when loading on the deadend arm assembly is unbalanced.

2. Add insulators if required. See DCS **11 00 01 01** for insulator location and requirements.

3. DCS **11 00 48 (01 & 02)** for 1/4" guy are not to be used in Illinois.

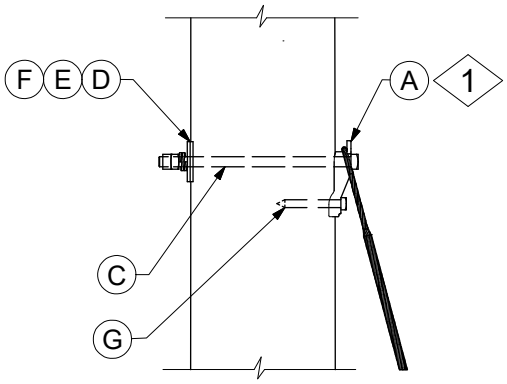
REV	DATE	ENG	DESCRIPTION
9	04/01/23	DG	Converted to new format
8	04/01/10	DG	



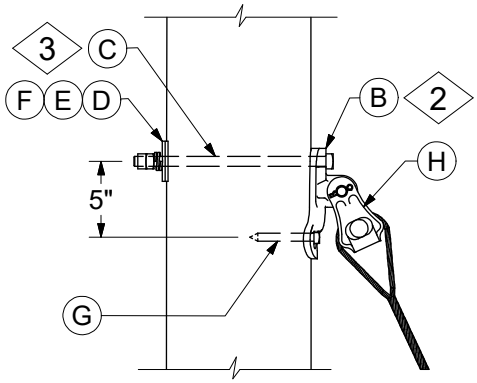
CONSTRUCTION NOTE(s):

1. If communications is below span guy, use 88" FG insulators. See DCS **11 00 01 01** for insulator location and requirements.
2. Install guy hook upside down when there is uplift on the guy to pole attachment.

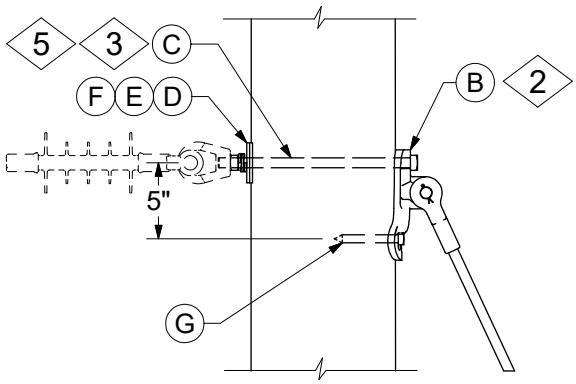
	ITEM	STK / DCS #	DESCRIPTION 11 00 49 **	01	02
1	A	27 59 016	Wire - Guy, 1/4"	150	150
	B	25 56 070	Insulator - Fiberglass, 45"	2	-
		25 56 058	Insulator - Fiberglass, 88"	-	2
	C	23 68 330	Link - Secondary Guy (Pair)	1	1
	D	23 68 181	Shackle - Deadend	1	1
	E	11 00 56 04	Guy Hook - Heavy Duty	1	1
	F	23 68 241	Grip - Guy Wire 1/4"	1	0
	G	23 68 300	Deadend - Automatic 1/4"	1	0
		918	Op Code, Install Guy	2	2



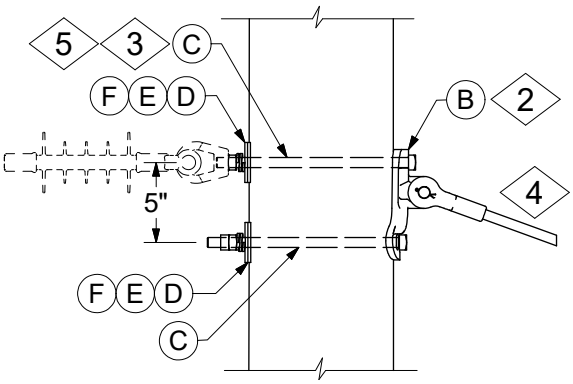
11 00 56 01
Guy Stub Pole 6



11 00 56 02
11 00 56 05
Guy Stub Pole 6



11 00 56 03
11 00 56 06
Down Guy



11 00 56 04
Span Guy or Composite Pole 7

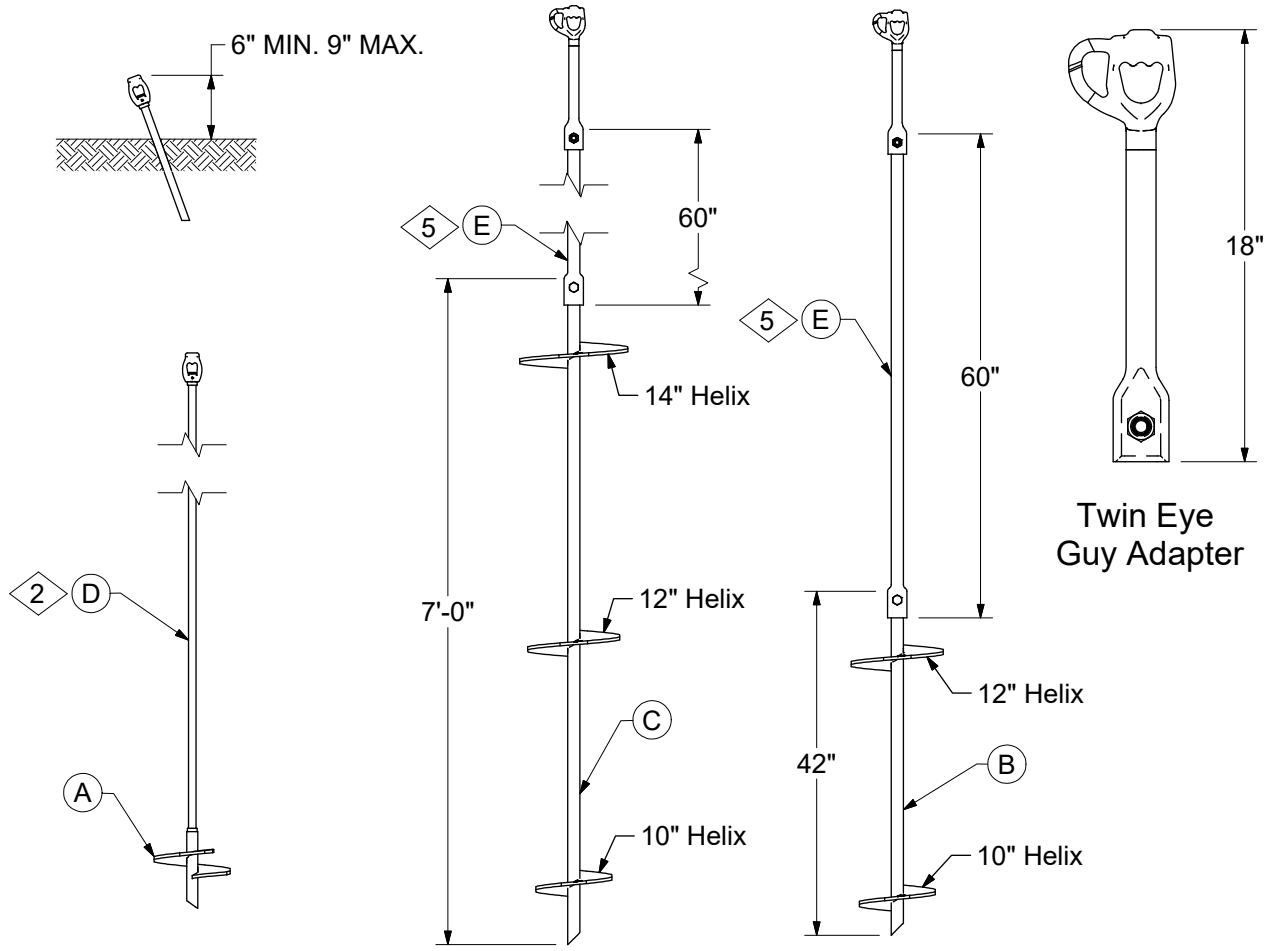
CONSTRUCTION NOTE(s):

1. Working Load of light duty hook (90% of ultimate) is 9,000 lb.
2. Working load of heavy duty hook (90% of ultimate) is 18,000 lb.
3. Use a 5/8" bolt only when guy is behind a 5/8" eyelet, secondary clevis, or light duty guy hook w/ 1/4" guy wire.
4. See DCS **11 00 46 **** for span guy.
5. The top bolt used for guy hook attachment may also be used to attach polymer DE or eyelet bolt.
6. These configurations may only be used for stub pole guys with no energized conductors.
7. For composite pole applications, only through-bolt mounting DCS **11 00 56 04** is acceptable. Lag screws are not to be used with composite poles.

REV	DATE	ENG	DESCRIPTION
6	04/01/23	DG	Converted to new format
5	02/03/16	KSP	

	ITEM	STK / DCS #	DESCRIPTION 11 00 56 **	01	02	03	04	05	06
1	A	23 68 056	Guy Hook - Light Duty	1	-	-	-	-	-
2	B	23 78 345	Guy Hook - Heavy Duty	-	1	1	1	1	1
3	C	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	1	-	-	-	1	1
		23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	-	1	1	2	-	-
	D	23 66 207	Washer, Curved, Square, 5/8"	1	-	-	-	1	1
		23 66 031	Washer, Curved, Square, 3/4"	-	1	1	2	-	-
	E	23 66 134	Lock Washer - 5/8" Double Coil	1	-	-	-	1	1
		23 66 135	Lock Washer - 3/4" Double Coil	-	1	1	2	-	-
	F	23 65 043	Lock Nut - 5/8" Square	1	-	-	-	1	1
		23 55 042	Lock Nut - 3/4" Square	-	1	1	2	-	-
7	G	23 60 007	Lag Screw - 1/2" x 4"	1	2	2	-	2	2
	H	23 58 054	Clevis, NM, Thimble, Galvanized Steel	-	1	-	-	1	-

REV	DATE	ENG	DESCRIPTION
6	04/01/23	DG	Converted to new format
5	02/03/16	KSP	



Twin Eye
Guy Adapter

11 00 60 (01 & 03)
Round Rod Single Helix

11 00 60 06

11 00 60 07
Square Shaft Multi Helix 8

DCS #	Helix Size	Torque Rating ft. - lbs.	Holding Power - Lbs.		
			Sand	Clay	Clay Pan
11 00 60 01	10"	6,000	12,000	15,000	16,500
11 00 60 03	14"	6,000	18,000	22,000	25,000
11 00 60 07	10" & 12"	5,500	25,000	30,000	40,000
11 00 60 06	10", 12", & 14"	5,500	35,000	40,000	60,000

CONSTRUCTION NOTE(s):

1. Expanding anchors DCS **11 00 61 ** may be used if power installation equipment is unavailable or if soil condition, particularly rocks, makes use of screw anchor or high torque screw anchor impractical.

2. Helix must be a minimum of 5' deep. 3'-6" sectional rods (Stock #23 63 097) may also be used in poor soil to obtain greater setting depth of the anchor.

3. High torque screw anchors DCS **11 00 63 ** should be used only where power installation equipment is available and soil conditions are such that regular screw anchors would twist off at the helix.

REV	DATE	ENG	DESCRIPTION
7	04/01/23	DG	Converted to new format
6	08/31/15	DG	

4. Guy eye nut/adapter is provided with the rod. If it is necessary to order separately, the stock numbers are;
   - Twin eye nut for 3/4" or 1" round rod - 23 59 075
   - Triple eye nut for 3/4" or 1" round rod - 23 59 132
   - Triple eye adapter for 1-1/2" square shaft - 23 13 112

5. The top helix must be a minimum of 6' deep. Therefore, extension rod (Stock #23 13 099) must be used in all cases. Continue to install until there is approximately one-quarter (1/4) turn per foot in the square shaft.

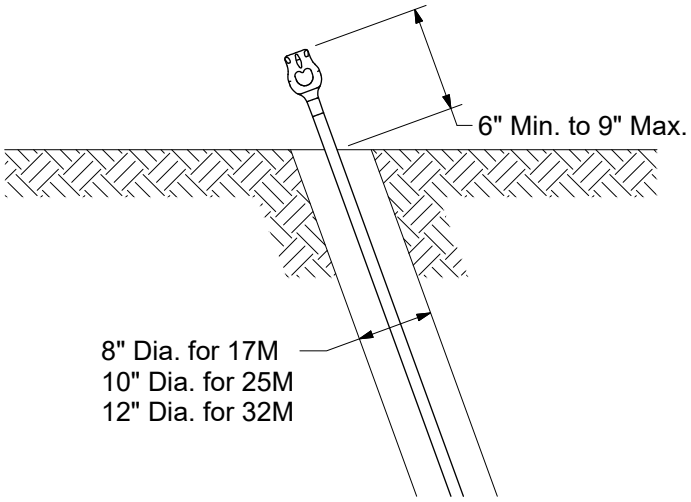
6. Drive wrench for square shaft anchors is Stock #86 14 736.

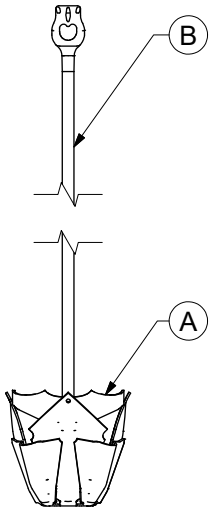
7. Multiple anchors must be spaced a minimum of 5' apart.

8. Square shaft anchors Stock #23 13 110 and Stock #23 13 138 must be used for 34.5kV and 69kV structures in Illinois.

	ITEM	STK / DCS #	DESCRIPTION 11 00 60 **	01	03	06	07
	A	23 13 131	Anchor - 10" Helix 1-3/8" Hub	1	-	-	-
		23 13 092	Anchor - 14" Helix 1-3/8" Hub	-	1	-	-
	B	23 13 110	Anchor - 10" & 12" Helix, w/Twin Eye Guy Adaptor	-	-	-	1
	C	23 13 138	Anchor - 10", 12", & 14" Helix, w/Twin Eye Guy Adapter	-	-	1	-
2	D	23 60 090	Anchor Rod - 7' with Twin Eye Nut	1	1	-	-
5	E	23 13 099	Rod - Anchor, 5' Extension 1-1/2" Square	-	-	1	1

REV	DATE	ENG	DESCRIPTION
7	04/01/23	DG	Converted to new format
6	08/31/15	DG	





DCS #	Helix Size	Holding Power - lbs.		
		Sand	Clay	Hard Pan
11 00 61 01	17M	11,500	17,500	23,000
11 00 61 02	25M	17,000	25,000	32,000
11 00 61 03	32M	32,000	32,000	36,000

CONSTRUCTION NOTE(s):

1. Screw anchors DCS **11 00 60 ** ** are preferred and should be used if power installation equipment is available and soil condition is satisfactory.

ITEM	STK / DCS #	DESCRIPTION 11 00 61 **	01	02	03
A	23 13 005	Anchor - Expansion, 17M	1	-	-
	23 13 007	Anchor - Expansion, 25M	-	1	-
	23 13 094	Anchor - Expansion, 32M	-	-	1
B	23 63 019	Rod - Anchor Guy, 3/4" x 8', Double Strand Eye	1	-	-
	23 63 022	Rod - Anchor Guy Rod 1" x 8', Double Strand Eye	-	1	1

INSTRUCTIONS - Installation of Expanding Anchors

1. Using an adjustable earth auger (Stock #85 01 026), drill a hole of such depth that the anchor rod will extend 6" to 9" above the ground line when the anchor is expanded; and at such an angle that the anchor rod will be as near as possible to the angle the guy wire will assume after the load is applied to it.

   For 17M anchors, the hole shall be 8" in diameter; for 22M anchors, the hole shall be 10" in diameter; and for 32M anchors, the hole shall be 12" in diameter.

2. Screw the anchor rod into the unexpanded anchor. Take any measurements of the anchor and rod which may be necessary in checking for complete expansion later.

REV	DATE	ENG	DESCRIPTION
3	04/01/23	JSS	Converted to new format
2	06/26/07	DG	

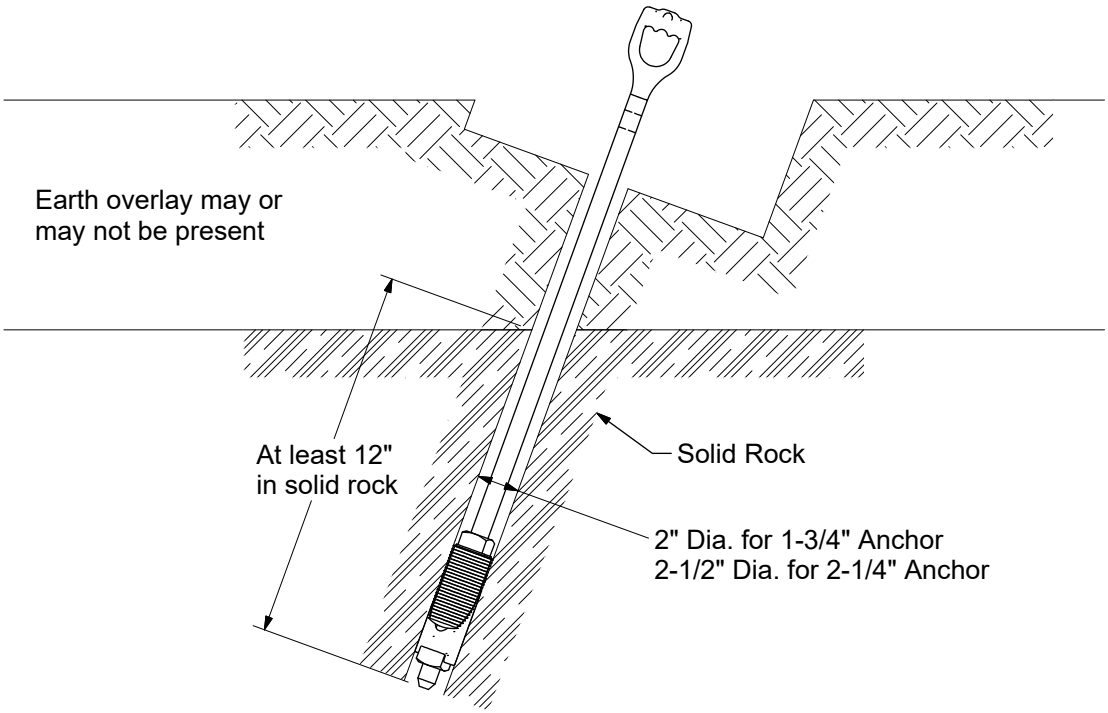
3. Clean all loose dirt from the bottom of the hole and insert the anchor. Press the anchor firmly against the bottom of the hole, with the anchor rod held as close as possible to the angle the guy wire will assume after the load has been applied.

4. Expand the anchor, using a tubular anchor spreader (Stock #85 32 093) for 17M anchors. For 25M and 32M anchors, use expanding and tamping bar (Stock #85 36 001). When the latter is used, it must be rotated around the anchor rod between blows in order that the expanding force will be distributed to all sides of the anchor. The first few blows must be heavy to insure the shearing of retaining bolts or wire, and proper positioning of the anchor blades in the side walls of the hole.

5. Make sure the anchor is completely expanded. When expansion is complete, the sound of the spreader striking the anchor will be a more "solid" sound than while the anchor is being expanded. Check visually using a light; and take measurements to compare with those made before the anchor was placed in the hole to determine whether the anchor is completely expanded.

6. The backfill is one of the most important factors in making a good anchor installation. Cover the anchor with a thin layer of loose dirt, and tamp as solidly as possible around the anchor blades. Complete the backfill to the ground line, tamping each shovel—full of earth thoroughly. All of the earth which was removed from the hole should be used in the backfill.

7. Where expanding anchors are installed in good soil under water or in good soil that is very wet, the first 30" of backfill shall consist of very thoroughly tamped chat, crushed stone (not larger than egg size), or clean gravel. The backfill shall then be completed as usual. The use of chat, crushed stone, or gravel will substantially improve the anchor's holding power under these adverse conditions allowing normal tensions to be applied.



STK #	Anchor Diameter	Rod Diameter	Rod Length	Breaking Load	Size Rock Drill
23 13 053	1-3/4"	3/4"	30"	23,000	2"
23 13 054	1-3/4"	3/4"	53"	23,000	2"
23 13 106	1-3/4"	3/4"	72"	23,000	2"
23 13 056	1-3/4"	3/4"	96"	23,000	2"
23 13 118	2-1/4"	1"	53"	36,000	2-1/2"
23 13 117	2-1/4"	1"	96"	36,000	2-1/2"

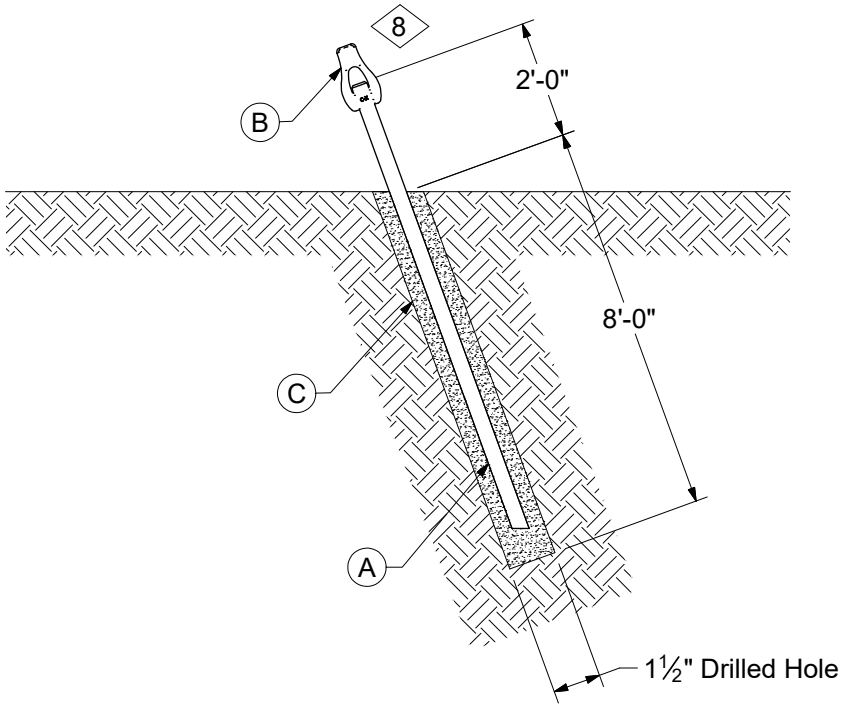
CONSTRUCTION NOTE(s):

1. Rock anchors shall be used only in solid rock. Drill a hole using a rock bit at least 12 inches deep in the rock. The hole shall be at such an angle that will allow the anchor rod to be as near as possible to the angle the guy wire will assume when it is loaded.
2. Place the anchor in the bottom of the hole. Expand the anchor by turning the rod with a wrench or bar in the eye of the rod.

DESIGN NOTE(s):

3. These are expanding type anchors and do not require grout or concrete for installation. When set in solid rock at least 12" deep, these anchors will develop the full strength of the anchor rod.
4. Ameren has two standard sizes of expanding type rock anchors available:
   1-3/4" Anchor with 3/4" Diameter Tripleye Rod
   2-1/4" Anchor with 1" Diameter Tripleye Rod

REV	DATE	ENG	DESCRIPTION
3	04/01/23	DG	Converted to new format
2	04/18/01	DDG	



CONSTRUCTION NOTE(s):

1. 1-1/2" diameter hole can be drilled with boring bar if in a dry environment; for wet environment use a hammer drill.

2. Dust and loose rock chips must be removed prior to inserting resin cartridges.

3. Resin cartridges should be warmed to 55 - 60°F prior to insertion. Curing time at these temperatures is 15 to 30 minutes. Curing time increases at lower temperatures.

4. Use hooked rod to check for seams in drilled hole and for depth of hole.

5. Hole should be drilled as nearly in line with the down guy as possible. Misalignment by more than 10 degrees can result in premature failure.

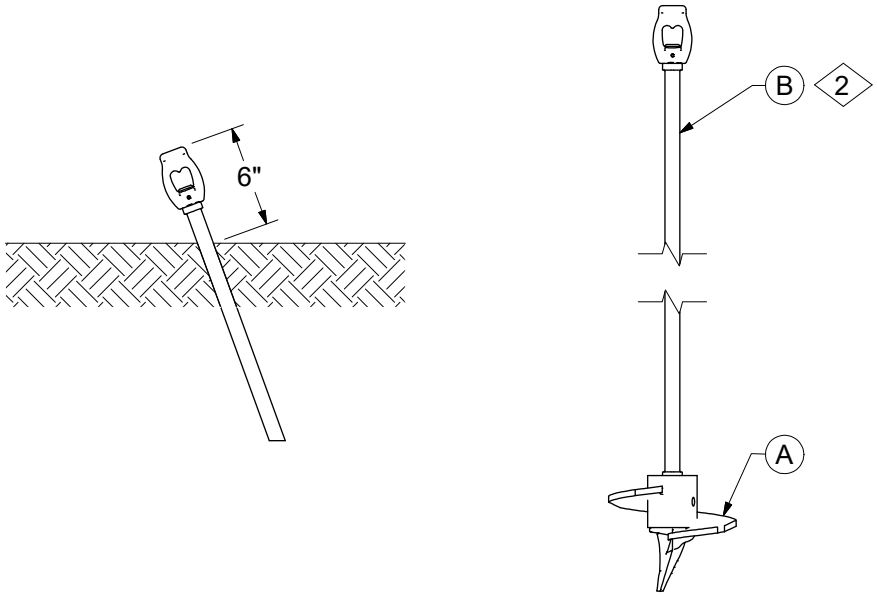
6. Following cartridge insertion, the 10 foot rebar (item A) should be inserted in the hole, puncturing the cartridges. A 3/4 inch adaptor should be attached to the threaded end of the rebar and the rebar rotated 60 seconds using a mechanical driver to disperse the hardener throughout the resin.

7. Center rebar in hole as nearly as possible and support while resin is curing.

8. If surface of rock is below surface of soil, item D can be used to extend the attachment point. Thimbleye nut should not extend more than 2 feet above ground line.

ITEM	STK / DCS #	DESCRIPTION 11 00 62 **	01
A	23 13 154	Anchor - #8 Rebar, 10', with Threaded End	1
B	23 65 061	Nut - Thimbleeye	1
C	14 12 377	Anchor - Fast Lock T-Resin (Celitite), WilliamsForm Cat. No. S6R-32-305-15-30	7
D	23 63 097	Extension - 1" Dia. x 3-1/2 ft. Threaded w/Coupler	1

REV	DATE	ENG	DESCRIPTION
1	04/01/23	DG	Converted to new format
0	10/16/07		



DCS #	Helix Size	Holding Power - Lbs.			
		Clay	Claypan	Hardpan	Laminated Rock
11 00 63 01	8"	◇3	12,500	20,000	24,000
11 00 63 03	10"	◇3	16,500	25,000	28,000

CONSTRUCTION NOTE(s):

1. Expanding anchors DCS **11 00 61 **** may be used if power installation equipment is unavailable or if soil condition, particularly rocks, makes use of high torque screw anchors impossible.

◇2. Helix must be a minimum of 5' deep. 3'-6" rods stock # 23 63 097 must be used with some installation equipment.

◇3. Screw anchors DCS **11 00 60 **** must be used in clay type soil. They should also be used where soil conditions permit because of the increased expense of these high torque screw anchors over regular screw anchors.

ITEM	STK / DCS #	DESCRIPTION 11 00 63 **	01	03
A	23 13 123	Anchor - 8" Helix	1	-
	23 13 124	Anchor - 10" Helix	-	1
B	23 63 090	Rod - Anchor, 7' with Twin Eye Nut	1	1

REV	DATE	ENG	DESCRIPTION
2	04/01/23	DG	Converted to new format
1	05/14/99	DDG	

NOTES

LIGHTNING PROTECTION & GROUNDING 12

APPLICATION INSTRUCTIONS.....12 00 01 01

POLE GROUND SYSTEM FOR STATIC AND SYSTEM NEUTRAL.....12 00 10 **

LIGHTNING ARRESTER INSTALLATION ON EXISTING STRUCTURES.....12 12 01 **

LIGHTNING ARRESTER INSTALLATION ON TRANSFORMER WITHOUT LUGS.....12 12 05 **

LIGHTNING ARRESTER INSTALLATION ON EXISTING STRUCTURES - BUILT TO PREVIOUS CONSTRUCTION STANDARDS .....12 34 01 **

LIGHTNING ARRESTER INSTALLATION - SINGLE AND DOUBLE CIRCUIT.....12 34 02 **

GROUND SYSTEM FOR GROUP OPERATED SWITCHES.....12 69 11 **

This section outlines standard ratings of lightning protective equipment, methods of installation, equipment to be grounded, and methods of grounding.

1. Lightning Protection

A. Overhead Static Wire

This is a grounded overhead wire installed above the circuit to be protected to shield it from lightning. It is located at an elevation such that a line passing through the static wire and the outermost conductor below it is at a 30° maximum angle with a vertical line. This continuous overhead static wire is grounded by means of a formed copper wire grounding electrode at each pole.

a. Installation of Static Wire

The preferred method of lightning protection of overhead sub-transmission circuits is through use of an overhead static wire. The static wire shall be grounded at every pole except manually operated group air break switch poles. The best protection is afforded by low pole ground resistance (less than 15 ohms).

B. Lightning Arresters

Metal Oxide Varistor (MOV) arresters are normally used for protection of overhead distribution circuits or equipment where conditions warrant (e.g. high ground resistance or retrofitting shielded circuits with a poor history of lightning performance). These arresters (mostly zinc oxide) are solid state and are direct connected from line to ground. MOV arresters are sensitive to temporary system overvoltage such as may occur due to ferroresonance or to single phase switching of ungrounded wye-delta transformer banks. In such instances contact Standards Engineering for recommendations. Higher voltage arresters may be required.

There are many silicon carbide internally and externally gaped arresters still on the system. These allow a higher discharge voltage than MOV arresters, reducing the surge protective margin. When these are found during work on a pole they should be replaced with a polymer housed metal oxide (MOV) arrester (especially at riser poles).

a. Installation of Lightning Arresters

When installed to protect equipment, arresters shall be installed as near as practical to the equipment to be protected. See Table 2 for equipment to be protected.

Arresters are also installed on sub-transmission for general line protection. In this application, arresters should be installed on the top phase of every pole where a 30° shield angle exists. Skipping spans severely reduces the ability of the arresters to protect against direct stroke flashovers. Where lines run through wooded areas or close (within 1-1/2 pole heights) to any type of structure at least as tall as the top phase, induce flashovers may be experienced. If outages are experienced in this circumstance, arresters should be installed on the remaining phases of the circuit(s) at roughly 300' intervals. Where a shield angle greater than 30° exists, arresters should be placed on all three phases of every pole in open territory. Where the line runs through areas shielded by trees or other structures, arresters should be installed on all three phases at roughly 300' intervals.

Distribuition underbuild, particularly when built with all three phases on one crossarm, will many times experience flashovers from the ground lead of either static construction or arresters on the sub-transmission circuit(s). If experience indicates this to be the case, arresters should be installed on the B phase (closest to the pole).

In all cases the primary connection lead as well as the ground lead should be as short as possible and free of any sharp bends. Under no circumstances should "pigtail" coils be made in the arrester connecting leads.

REV	DATE	ENG	DESCRIPTION
23	10/01/23	JMW	Converted to new format
22	06/25/18	JMW	

CONSTRUCTION NOTE(s):

1. Connect the arrester ground lead before connecting the arrester to the line.
2. Install wildlife guards on line terminals of all line arresters.
3. Do not reconnect arresters with a blown ground lead disconnector.
4. Arresters removed for any reason shall not be re-installed.

Table 1 - Standard Lightning Arrester Ratings

App	Note(s)	Type Circuit	Rating	*MCOV	Stock Number
OVERHEAD	5	2400 V Delta	3 kV	2.55 kV	10 01 133
	5	4160 Gnd Y/2400V	3 kV	2.55 kV	10 01 133
	5	4160 Gnd Y/2400 V Trf. Mnt	3 kV	2.55 kV	10 01 122
	5	4160 Gnd Y/2400 V Terminal Pole	3 kV	2.55 kV	10 01 133
	5	4160/2400 V with Isolated Neut	3 kV	2.55 kV	10 01 133
	5	4160 V without Neutral Extended	6 kV	5.10 kV	10 01 184
	5	4800 V Delta	6 kV	5.10 kV	10 01 184
	6	**12470 Gnd Y/7200 V**	**10 kV**	**8.4 kV**	**10 01 144**
		12470 Gnd Y/7200 V Trf Mnt	10 kV	8.4 kV	10 01 145
	6	**12470 Gnd Y/7200 V Terminal Pole**	**9 kV**	**7.65 kV**	**10 01 129**
	8	12470 Gnd Y/7200 V Terminal Pole	10 kV	8.4 kV	10 01 146
		12470 Delta or 14,400 Un-Grounded, Gapped	15 kV	12.7 kV	10 01 188
		13200 Gnd Y/7620 V	10 kV	8.4 kV	10 01 144
		13800 Gnd Y/7970 V	12 kV	10.2 kV	10 01 008
		13800 V Uni-Grounded	15 kV	12.7 kV	10 01 188
		13800 or 14400 Delta	18 kV	15.3 kV	10 01 143
		13800 Gnd Y/7970 V Terminal Pole	10 kV	8.4 kV	10 01 146
		24900 Gnd Y/14400 V (Solidly Grounded)	18 kV	15.3 kV	10 01 143
		34500 Gnd Y/19.9 kV (Solidly Grounded)(Transformer)	27 kV	22 kV	10 01 234
	6	**34500 Gnd Y/19920 V (Solidly Grounded)**	**36 kV**	**30 kV**	**10 01 252**
	6	**34500 Gnd Y/19920 V Terminal Pole**	**27 kV**	**22 kV**	**10 01 137**
	10	34500 Gnd Y/19920 V Terminal Pole, Gapped	27 kV	22 kV	10 01 199
	9	34500 Gnd Y/19920 V Suspended with Side Post Insulator	30 kV	24.4 kV	10 01 239
	10,18	34500 V Un-grounded Delta/Suspended with Side Post Insulator	36 kV	29 kV	10 01 249
		34500 Gnd Y/19920 Suspended with DE Insulator	30 kV	24.4 kV	10 01 237
	6,18	**34500 V Un-grounded Delta/Suspended with DE Insulator**	**36 kV**	**29 kV**	**10 01 248**
	15	34500 Gnd Y/19920 V (Solidly Grounded) - Intermediate Class	30 kV	24.4 kV	10 01 240
	12	34500 Gnd Y/19920 V (Solidly Grounded) - Intermediate Class	30 kV	24.4 kV	10 01 241
	12,18	34500 V Un-grounded Delta - Intermediate Class	36 kV	29 kV	10 01 243
	13,18	34500 V Un-grounded Delta - Intermediate Class	36 kV	29 kV	10 01 242
	15	69000 V Gnd Y - Intermediate Class	60 kV	48 kV	10 01 245
		69000 V Gnd Y Suspended with Side Post Insulator	60 kV	48 kV	10 01 158
		69000 V Gnd Y Susspended with DE Insulator	60 kV	48 kV	10 01 236
UNDERGROUND	6	**12470 V URD**	**10 kV**	**8.4 kV**	**10 01 138**
		12470 V URD (Parking Stand Arrester)	10 kV	8.4 kV	10 01 151
		25000 V URD	18 kV	15.3 kV	10 01 267
	6,16	**34000 V URD (Small Interface)**	**27 kV**	**22 kV**	**10 01 163**
	17	34000 V URD (Large Interface)	27 kV	22 kV	10 01 177
	16,18	34000 V URD (Small Interface)	36 kV	29 kV	10 01 255
	17,18	34000 V URD (Large Interface)	36 kV	29 kV	10 01 154
SEC		1 Phase 120 or 120/240 V	175 kV		10 01 032

* Maximum Continuous Operating Voltage (MCOV)

REV	DATE	ENG	DESCRIPTION
23	10/01/23	JMW	Converted to new format
22	06/25/18	JMW	

DESIGN NOTE(s):

5. Use 3kV arrester only on structures built to old 5kV specs, or for replacement on 5kV rated equipment and cable. Use 10kV and 9kV arresters when built to 15kV specs.

6. Bold indicates common arresters for 4kV, 12kV, and 34kV lines, terminal poles, and URD applications.

7. Crossarm or pole mounting bracket required.

8. Use when problems occur with 9kV arresters (Stock #10 01 129) or where voltage may be high, such as right outside substation. Also use on 13.2kV terminal poles.

9. The suspended arrester is special application only on 34kV.

10. Use on un-grounded delta system.

11. Base mount for use on primary metering structure

12. Crossarm mount for use on primary metering structure.

13. Base mount for use on un-grounded delta primary metering structure.

14. Crossarm mount for use on un-grounded delta primary metering structure.

15. Base mount for use on primary metering structure.

16. Small interface is to mount on radial feed.

17. Large interface is to mount on loop feed.

18. For un-grounded delta 34kV system.

Table 2 - Equipment To Be Protected by Lightning Arresters

Equipment	**Arrester Location**
Distribution Transformers	Primary Side
Voltage Regulators - Pole Installations	Primary & Secondary Sides
Constant Current Regulators - Pole Installations	Primary & Secondary Sides
Terminal Poles - Lead and Non-Lead Cables	On terminal pole and on same phase on strucures each side of riser poles
Line Switches - Normally Closed	Arresters not required
Line Switches - Normally Open	Install both sets of arresters on adjacent poles. If adjacent pole cannot accomodate arresters, install arresters on a separate bracket arm below the switches, and install additional set of arresters on adjacent pole of unprotected side.
Airbreak Switches - Normally Open - 35 & 69 kV	Install both sets of arresters on adjacent poles.
Capacitors	On capacitor rack
Meters only on approval of Engineering)	On service entrance equipment
Unshielded Distribution Lines	On crossarm, pole face or primary apparatus. Minimum of 4 arresters per phase per mile (counting apparatus arresters if separated by 600ft or more)
Deadend Poles (Unshielded Circuits)	Top Phase (Vert): All Phases (Flat)

REV	DATE	ENG	DESCRIPTION
23	10/01/23	JMW	Converted to new format
22	06/25/18	JMW	

2. Grounding Practices

A. Grounds in Soil

Ground rods will continue to be used for grounding pad mounted equipment and existing pole ground installations. For new pole ground installations, a formed #2 soft-drawn copper electrode shall be used. This electrode is to be placed at the bottom of the pole and covered with at least twelve inches of native soil. The vertical lead of the electrode should be trained to the side of the pole hole so that it will not be covered by the crushed rock backfill. If the desired resistance is not obtained, additional ground rods can be driven in parallel with the formed electrode, but a minimum separation distance of six feet shall be maintained.

B. The Common Neutral System

Either a 2400/4160 Y volt or a 7200/12470 volt common neutral distribution system is normally used at Ameren. These systems use a continuous metallic conductor which serves as both the primary and secondary neutral conductor. This neutral conductor must be attached to grounds at various points throughout its length to ensure adequate grounding of the circuit. These grounds (Table 3) will consist of customers' grounds, lightning arrester grounds, and static wire grounds and occasionally a ground installed solely to provide adequate grounding of the common neutral. Where a common neutral is present, all grounds installed for any purpose shall be bonded to it.

C. Number of Grounds - Common Neutral

At least four grounds are required, (counting equipment grounds but not counting customers' grounds), in each mile of common neutral circuit for both overhead and underground circuits (maximum 1320 feet spacing).

D. Size of Ground Wire

The size of the ground wire will be 7-#10 CW or #2 Cu. Equipment must it connected to the ground wire or the system neutral with wire shown in Table 3.

E. Multiple Ground Leads on Same Pole

Where both Ameren and communication systems are grounded on a joint use structure, NESC Rule 97G requires that either a single pole ground lead shall be used for both systems or the Ameren and communication worker safety zone (40" below lowest Ameren attachment if made by Communication Company or at the neutral if connection is made by Ameren). Where Ameren is maintaining isolation* between primary and secondary neutrals, the communication system ground shall be connected only to the primary neutral ground lead.

The same requirement for bonding of separate ground leads at the neutral level applies for all instances where multiple ground leads are installed. (i.e., static/shield wire and system neutral ground leads; Ameren and other electrical utility system neutral ground leads).

*See DCS **13 00 06 06**, **13 00 06 08**, and the delta primary connection diagrams in **13 00 07 02** thru **13 00 07 12** for situations requiring isolation of Ameren primary and secondary neutrals.

F. Multiple Ground Rods on Same Pole

Where separate ground rods are used for separate pole grounds, NESC Rule 99C requires a bond wire not smaller than #6 copper or equivalent to be placed between the two ground rods. This bond should be visible at the pole base. All separate ground rods shall be bonded together except where Ameren is maintaining isolation between primary and secondary neutrals.

*See DCS **13 00 06 06**, **13 00 06 08**, and the delta primary connection diagrams in **13 00 07 02** thru **13 00 07 12** for situations requiring isolation of Ameren primary and secondary neutrals.

REV	DATE	ENG	DESCRIPTION
23	10/01/23	JMW	Converted to new format
22	06/25/18	JMW	

G. Equipment to be Grounded

Table 3 - Equipment to be Connected to Ground (Pole Ground, System Neutral, or Ground Bus) and Size of Connecting Wire

Pole Mounted Equipment	**Wires**	**Pad Mounted Equipment**	**Wires**
Transformer - tank	#4 Cu. Poly Cov.	Transformer - tank	#2 Cu. Bare
Transformer - H2 Bushing	#4 Cu. Poly Cov.	Transformer - X0 Bushing	#2 Cu. Bare
Transformer - X2 Bushing	#4 Cu. Poly Cov.	Capacitor Bank - cabinet	#2 Cu. Bare
Voltage Regulator - tank and SL Bushing	#4 Cu. Poly Cov.	Switchgear - cabinet	#2 Cu. Bare
Voltage Regulator - control cabinet	#6 Cu. Poly Cov.	Primary Pedestal - cabinet	#2 Cu. Bare
Capacitor Bank - frame or rack	#4 Cu. Poly Cov.	Secondary Pedestal - cabinet	#2 Cu. Bare
Capacitor Bank - cell ground bus	#4 Cu. Poly Cov.	Cable Concentric Neutral (at elbow, terminator or splice)	#2 Cu. Bare
Capacitor Bank - control	#6 Cu. Poly Cov.	Elbow (static drain wire)	#14 Cu. Bare
Capacitor Bank - junction box	#6 Cu. Poly Cov.	Elbow Lightning Arrester (static drain wire)	#14 Cu. Bare
Capacitor Bank - disconnect box	#6 Cu. Poly Cov.	Insulating Cap (static drain wire)	#14 Cu. Bare
Recloser (oil filled) - tank	#4 Cu. Poly Cov.	Feed Through Bushing (static drain wire)	#14 Cu. Bare
Recloser (S&C Intellirupter) - frame	#2 Cu. Poly Cov.		
Recloser (G&W Viper) - frame	#2 Cu. Poly Cov.		
Recloser (G&W Viper) - disconnect box	#6 Cu. Poly Cov.		
Recloser (G&W Viper) - control	#6 Cu. Poly Cov.		
Cable Concentric Neutral (terminator)	#2 Cu. Poly Cov.		
Metal Guards (protecting cable risers)	#6 Cu. Poly Cov.		
Lightning Arrester - ground terminal	#6 Cu. Poly Cov.		

CONSTRUCTION NOTE(s):

19. Pole line hardware (including cluster bracket and streetlight brackets) must not be grounded except with engineering approval.

20. Where a lightning arrester is installed on a secondary or service the arrester ground lead shall be solidly connected to any one or combination of the following grounds:

    A. The neutral or grounded service wire.

    B. Customer's common grounding conductor.

    C. Customer's equipment grounding conductor.

    D. A separate grounding conductor such as a driven rod.

H. Ground Wire Attachment and Covering

The ground wire shall be run in a straight line or a smooth curve and shall clear hardware by at least 2 inches. The static ground wire from 34kV circuits shall be routed on the opposite side of the pole away from the closest phase of any underbuilt circuit. Avoid making sharp bends in ground wires. Take care when driving staples to avoid damaging the wire.

Where the ground wire passes over a messenger or guy wire, a loop shall be formed to clear the messenger or guy wire. If necessary, a bridge shall be made from a 6" length of plastic molding, placing the half round of the molding against the pole and taping the ground wire in place in the groove.

Where guarding is not required, grounds shall be protected by being substantially attached closely to the surface of the pole or other structure in areas of exposure to mechanical damage and, where practical, on the portion of the structure having least exposure.

A 4'0" section of molding may be placed over the ground wire in the working area on badly congested poles. The purpose of the molding is to keep linemen's climbers from damaging the ground wire when working on primary circuits.

Ground wire molding is required for installation with no common neutral and separate arrester/equipment tank and secondary neutral grounds. These separate grounds shall be made with 600 volt insulated conductor (Stock #18 53 011) and shall be covered with plastic molding for a distance of 8 feet from the ground. The arrester/tank ground and secondary ground can be connected using an isolation arrester (Stock #10 01 019). One ground rod at least 20 feet from the base of the pole and connected with #2 SD bare copper conductor.

I. Static Wire at Substation

1/0 AAAC or 110.8 ACSR static wire shall be electrically continuous and tied into the bulk substation ground grid. Where the connection into the substation cannot be made overhead, direct bury a 4/0 bare copper conductor from the last pole with static termination to the substation ground grid. The 4/0 size conductor allows some safety margin for corrosion. The downlead from the static wire to the 4/0 conductor shall be #2 copper.

J. Static Wire Personal Protective Grounds

a. Wire Common Neutral

1/0 AAAC or 110.8 (12/7) ACSR (or other shield wires having current capacity of 250 amps or greater) may be used for direct connection of protective grounds on 35 and 69kV circuits if there is a common neutral and #2 copper pole grounds (or other pole grounds with current capacity of at least 50 amps) connected to the shield wire for at least two poles in each direction. The common neutral must also be connected to the down leads at each pole.

b. Without Common Neutral

1/0 AAAC or 110.8 (12/7) ACSR (or other shield wires having current capacity of 250 amps or greater) may be used for direct connection of protective grounds on 35 and 69kV circuits with no common neutral present if #2 copper down leads are grounded at every 4th pole (no more than 1200 feet apart); a supplementary grounded rod must be driven at least 6 feet from the closest ground rod. This extra ground rod shall be connected with #2 copper to the #2 copper down lead.

c. Alumoweld Static Wire

Alumoweld static wires have been installed in the past. Do not connect protective grounds to Alumoweld. It may fuse if a fault occurs. To improve protective grounding on 35kV lines with Alumoweld static and poor ground resistance, #2 copper downleads may be installed at intervals of 4 spans (no more than 1200 feet). Protective grounds can then be connected to the #2 Cu. A supplemental ground is required from #2 copper downlead to a second driven ground.

REV	DATE	ENG	DESCRIPTION
23	10/01/23	JMW	Converted to new format
22	06/25/18	JMW	

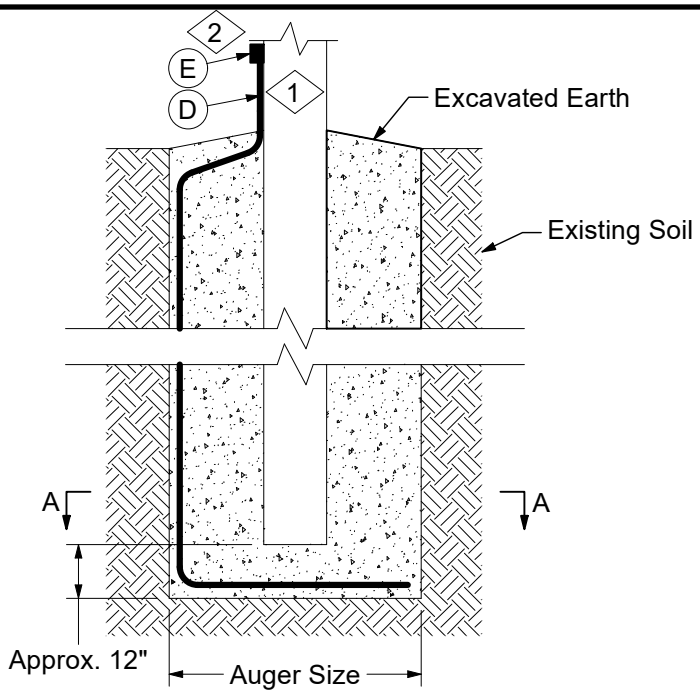
K. Static Wire/Common Neutral Wire

1/0 AAAC or 110.8 (12/7) ACSR (or other static wires having current capacity of 250 amps or greater) may be used as the common neutral for lower voltage underbuilt circuits where the run is 3000 feet or more. In such cases the static wire must be continuous and connected to the source transformer neutral with #2 SD poly covered wire.

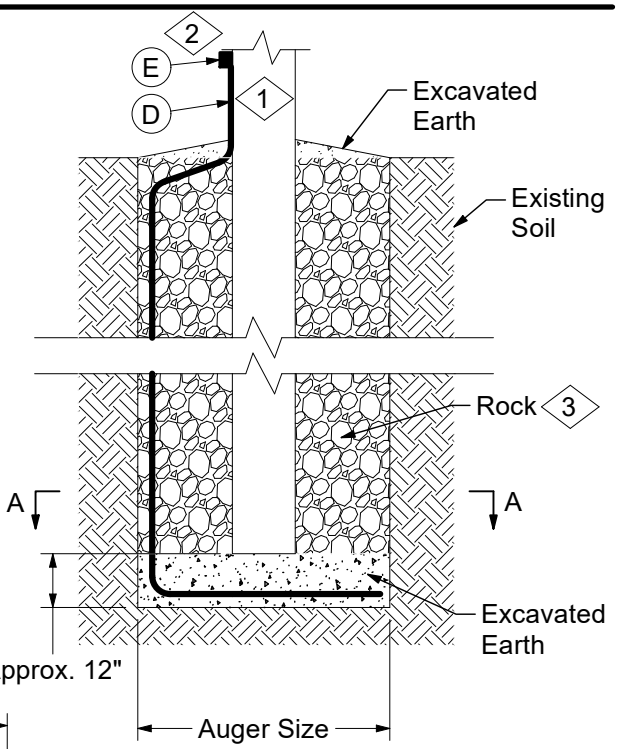
The static wire shall not be used in place of the secondary neutral. Where secondary is present the secondary neutral shall be paralleled with the static wire neutral and interconnected at every static wire ground downlead. However, where this would result in short discontinuous sections of neutral a continuous neutral shall be installed from the source transformer.

To equalize ground potential static wire ground leads, arrester ground leads, neutral ground leads and equipment case ground leads shall be bonded together with the only exceptions noted in the transformer section of the standards.

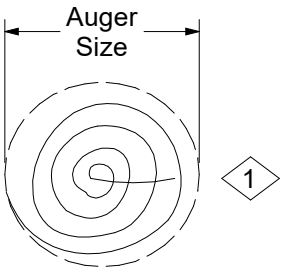
REV	DATE	ENG	DESCRIPTION
23	10/01/23	JMW	Converted to new format
22	06/25/18	JMW	



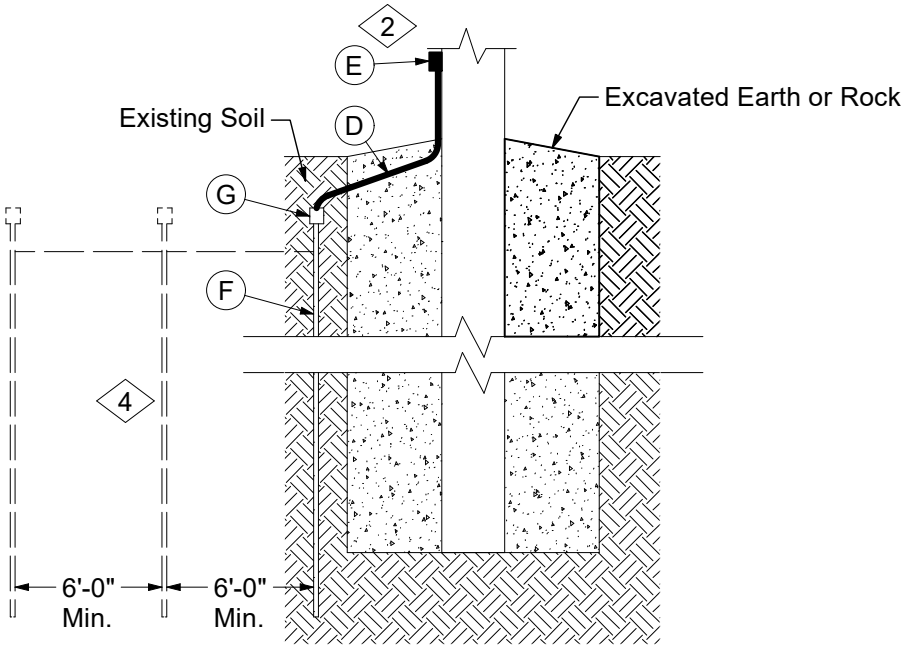
New Pole
Excavated Earth Backfill



New Pole
Rock Backfill

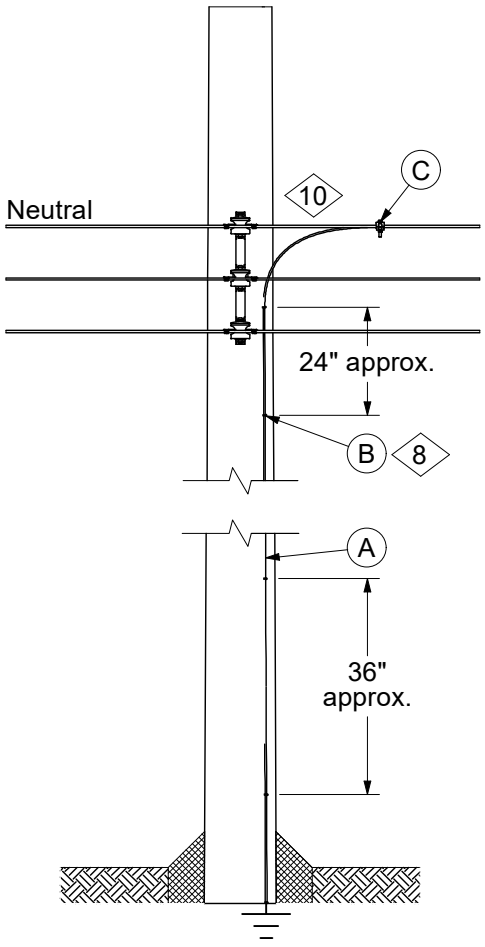


Section A-A

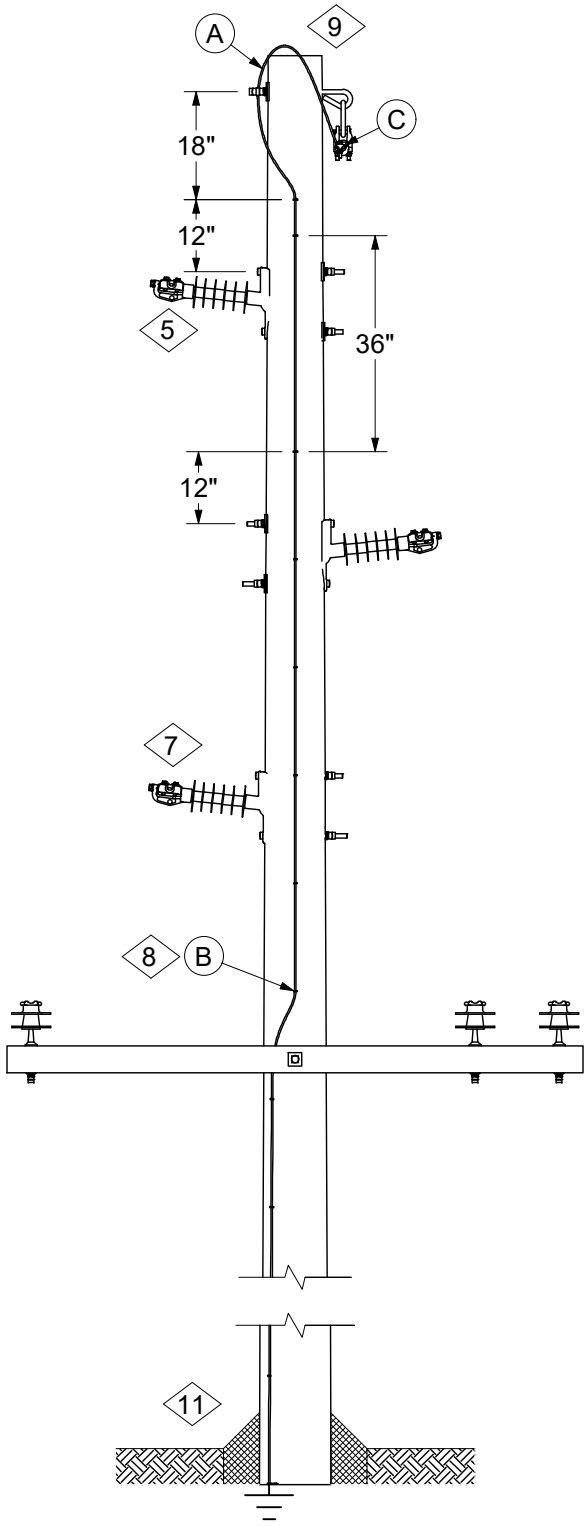


Existing Pole
Adding Ground(s)

REV	DATE	ENG	DESCRIPTION
22	10/01/23	JMW	Converted to new format
21	02/01/18	JMW	

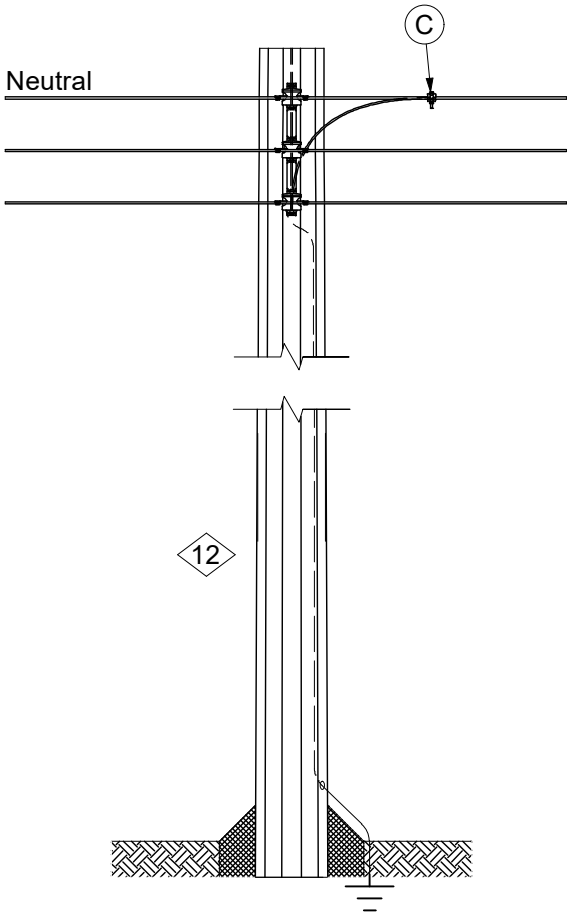


Wood Pole Ground - 15kV

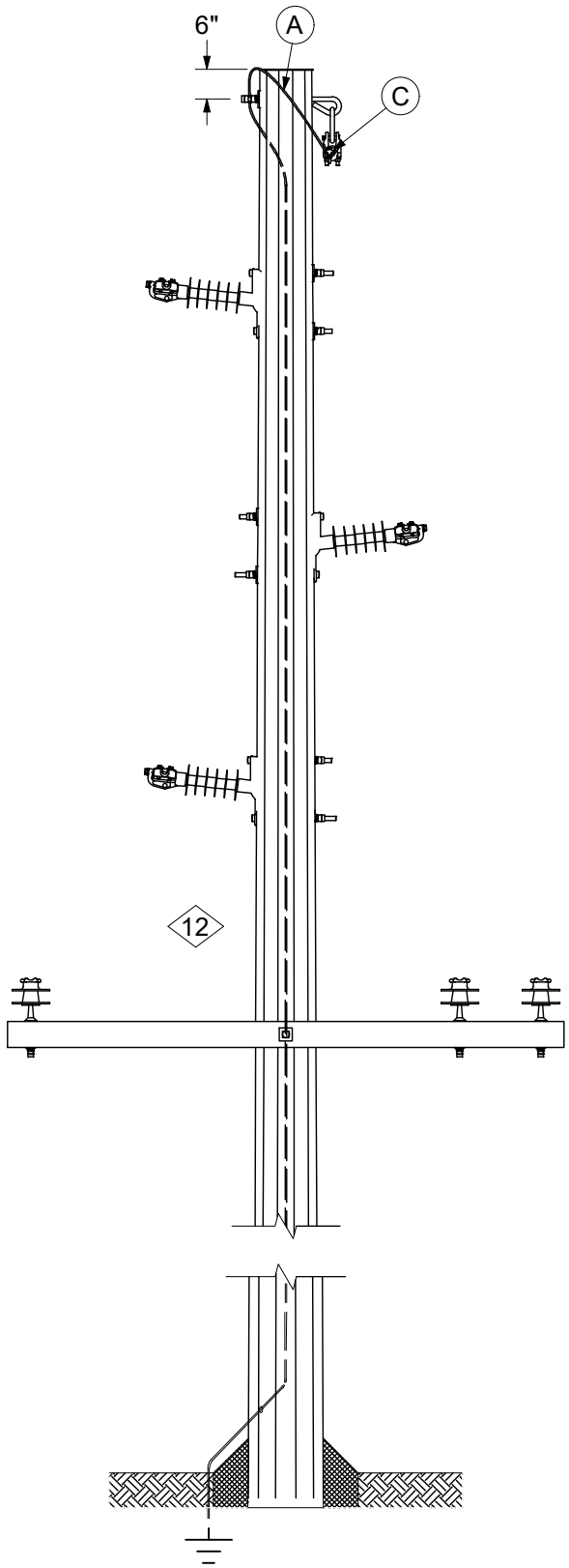


Wood Pole Ground - 34kV & 69kV

REV	DATE	ENG	DESCRIPTION
22	10/01/23	JMW	Converted to new format
21	02/01/18	JMW	



Composite Pole Ground - 15kV



Composite Pole Ground - 34kV & 69kV

REV	DATE	ENG	DESCRIPTION
22	10/01/23	JMW	Converted to new format
21	02/01/18	JMW	

CONSTRUCTION NOTE(s):

1. Train below grade ground wire approximately 8" above ground line to line up with pole ground wire above grade. Avoid making sharp bends. Make the ground coil to the same diameter as the pole hole using at least 12' of bare #2 copper wire.

2. Connectors shall be positioned above grade with a staple above and below the connector.

3. Pole foam may be used in extenuating circumstances. With rock or foam backfill, make sure ground coil wire is pushed against dirt and not encapsulated in rock or foam.

4. Ground resistance will normally be less than 25 ohms with one coil or one rod. In rocky or sandy soil where experience indicates ground resistance may exceed 25 ohms, install additional coil or rods spaced not less than 6' apart. Doubling the number of rods or coils or doubling the length of the rod reduces ground resistance by 40%.

   If additional grounding is needed:

   A. terminal poles - a #2 bare Cu. counterpoise wire 100'-150' long may be placed in the cable trench and connected to the ground lead.

   B. in rocky soil where driving a rod is difficult - a counterpoise, as stated in A., may be placed in a trench at least 18" deep.

5. The ground wire shall be run in as straight a line down the pole without making sharp bends in such a manner as to clear hardware by at least 2 inches. Avoid damaging ground wire when installing staples.

6. According to an NESC subcommittee's interpretation, metal brackets and straps used to support non-conductive conduits do not need to be grounded. However, conductive material conduits that enclose electrical supply lines or are exposed to contact with open supply conductors must be effectively grounded.

7. Refer to DCS Section 03 for proper grounding position on different structure configuration.

8. Staples are to be spaced 3' on pole ground wire and 18" from top of the pole on 34kV and 69kV line.

9. See DCS **06 00 11 ** ** for static support assembly and DCS **12 34 01 ** ** and **12 34 02 ** ** for lightning arrester connection.

10. When the ground wire is run up the pole and past the neutral, a jumper must connect the pole ground to the system neutral. For #2 Cu. pole ground wire, use a #2 Cu. poly covered jumper. For 7-#10 CW pole ground wire, use a #4 Cu. poly covered jumper. Use a bronze connector to connect the Cu. jumper wire to the Cu. or CW pole ground wire.

11. If pole ground wire cannot be connected to system neutral or static wire, cover ground wire at base of pole with plastic molding Stock #41 56 041 using 10 staples Stock #23 64 028.

12. Factory installed #2 Cu. pole ground located inside pole.

13. Use appropriate connector for the ground wire size being replaced. Non-tension sleeve (Stock #17 60 730) can be used 7#10 CW connections, reducing non-tension sleeve (Stock #17 60 749) can be used for #2 solid Cu. to 7-#10 CW or #2 stranded Cu. connections, and split-bolt (Stock #17 54 373) can be used for most other connections.

14. If a distribution circuit is added to subtransmission pole with 7-#10 Copperweld or #6 Cu. pole ground wire and the static wire is used for the distribution system neutral, the pole ground wire must be changed to #2 Cu or larger.

Table 1 - Grounding System for Wood Poles			
APPLICATION		**WIRE**	**DCS #**
New Pole	System Neutral	7 #10 CW	12 00 10 01
		#2 Cu.	12 00 10 04
	Static Wire	7 #10 CW	12 00 10 05
		#2 Cu.	12 00 10 09
Existing Pole	System Neutral	7 #10 CW	12 00 10 02
		#2 Cu.	12 00 10 03
	Static Wire	7 #10 CW	12 00 10 06
		#2 Cu.	12 00 10 10

Table 2 - Grounding System for Composite Poles			
APPLICATION		**WIRE**	**DCS #**
New Pole	System Neutral	#2 Cu.	12 00 10 11
	Static Wire	#2 Cu.	12 00 10 12

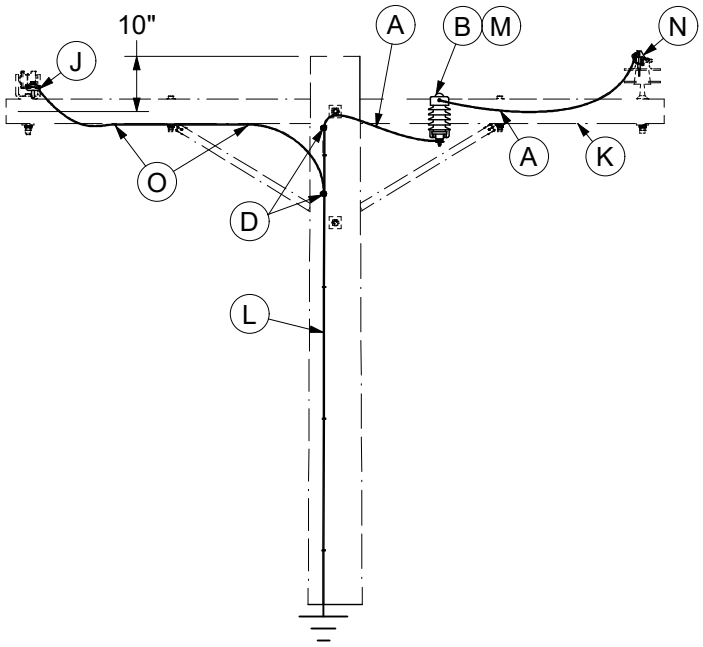
	ITEM	STK / DCS #	DESCRIPTION 12 00 10 **	01	02	03	04	05	06	10	09	11	12
8	A	27 09 215	Wire, 7#10, CW Poly Covered	40	40	-	-	70	70	-	-	-	-
		18 51 019	Wire, #2 Cu. Poly Covered, 7 Strand	-	-	40	40	-	-	70	70	5	10
	B	23 64 001	Staple, Ground Wire, Serrated, Cu Clad	15	15	15	15	25	25	25	25	-	-
	C	17 51 032	Clamp, Parallel Groove, #6 - 1/0	1	1	1	1	1	1	1	1	1	2
	D	18 52 025	Wire, #2 Cu. Bare, Solid	20	2	2	20	20	2	2	20	20	20
	E	17 60 749	Sleeve, Non-tension, Reducer, #2 Cu Solid to 7#10 CW or #2 Cu 7 Strand	1	1	1	1	1	1	1	1	1	1
	F	23 13 069	Rod, Ground, 5/8" x 8' Cu Bonded	-	1	1	-	-	1	1	-	-	-
	G	17 52 032	Clamp, Ground Rod, 5/8" dia Rod	-	1	1	-	-	1	1	-	-	-
		301	Op Code Install Ground Coil	1	-	-	1	1	-	-	1	1	1
		401	Op Code Install Ground Rod	-	1	1	-	-	1	1	-	-	-
		302	Op Code Install Ground Wire on Pole	1	1	1	1	1	1	1	1	-	-

DESIGN NOTE(s):

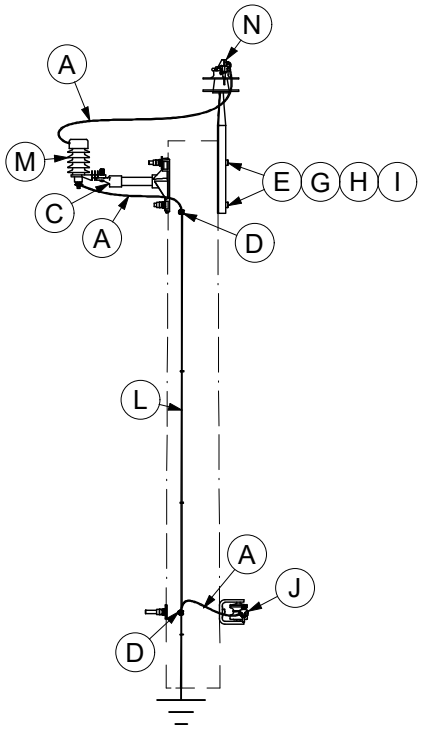
15. 7-#10 CW shall be the pole ground conductor on poles with transformers, capacitors, regulators and lightning arresters - unless other equipment on the pole requires #2 Cu. 7 strand. #2 Cu. 7 strand may also be substituted in areas where copper theft is unexpected.

16. #2 Cu. 7 strand shall be the pole ground conductor on terminal poles, poles with reclosers, and poles with static wire. The pole ground conductor for the static may be 7#10 CW in areas with high copper theft, but not if the static is the system neutral.

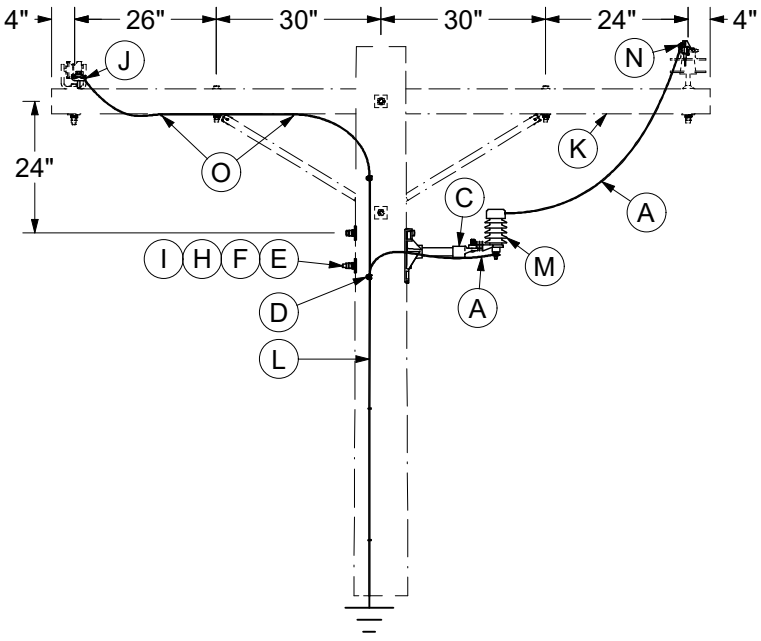
REV	DATE	ENG	DESCRIPTION
22	10/01/23	JMW	Converted to new format
21	02/01/18	JMW	



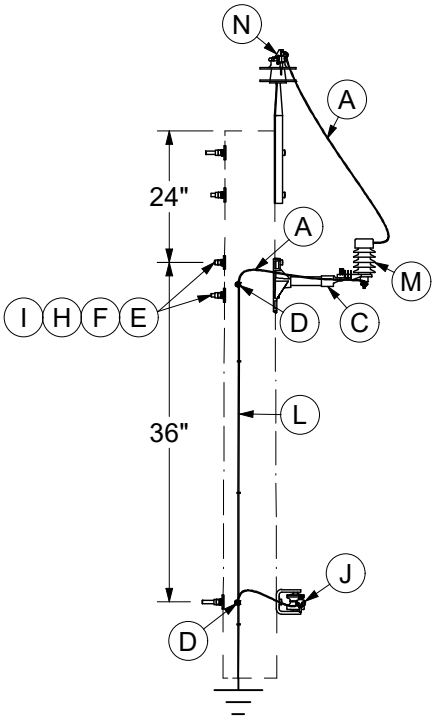
12 12 01 01



12 12 01 03

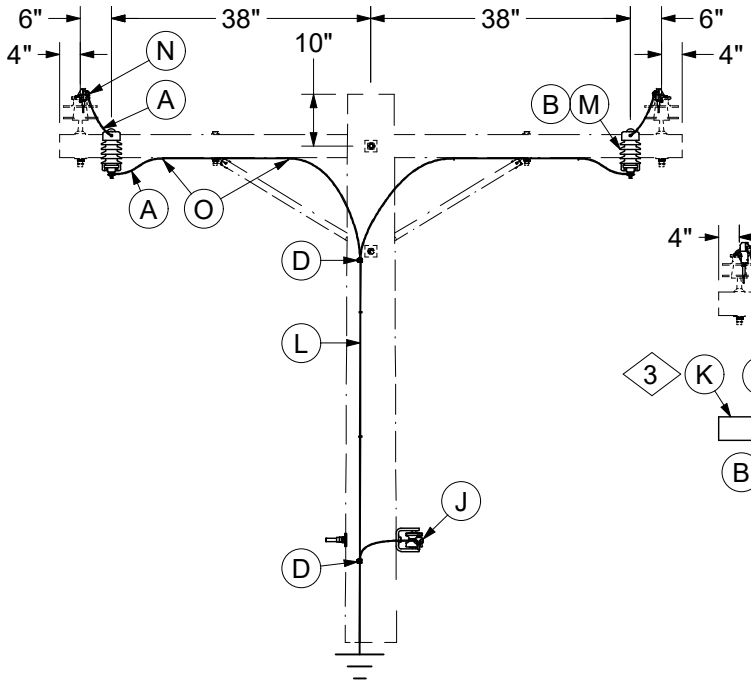


12 12 01 02

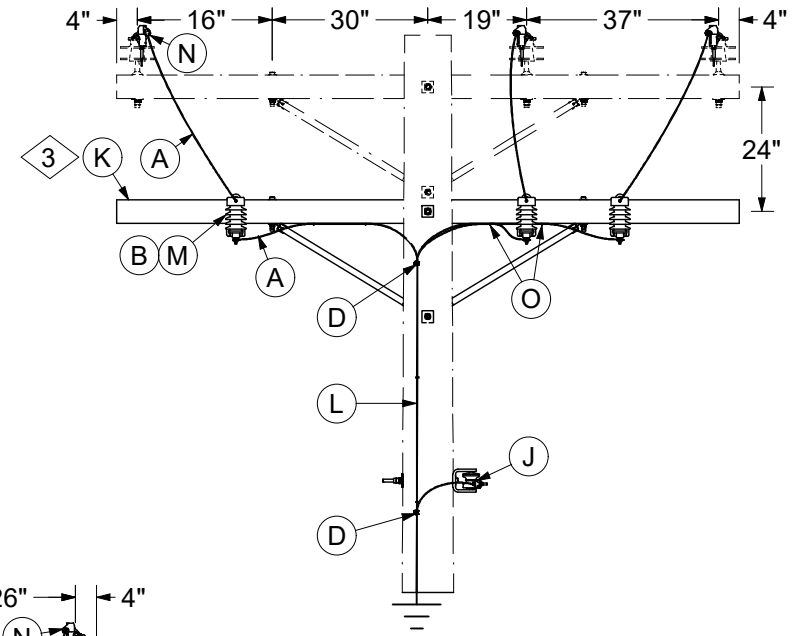


12 12 01 04

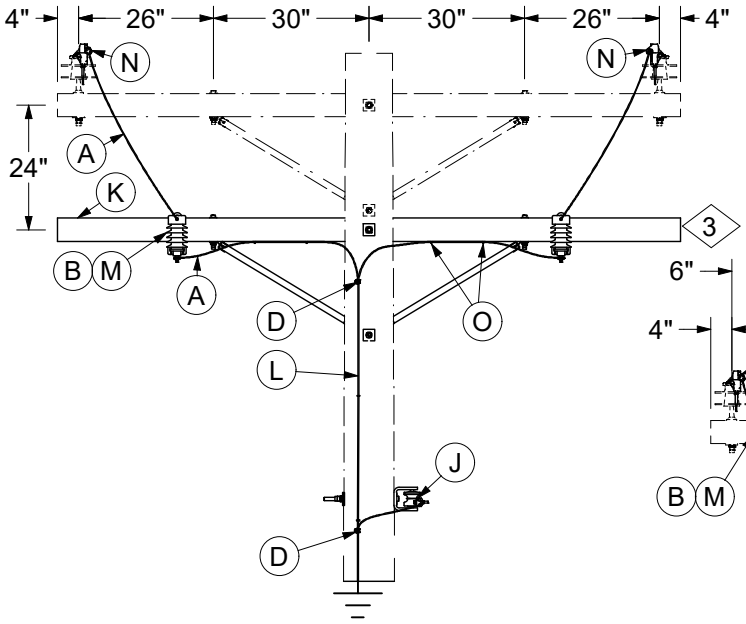
REV	DATE	ENG	DESCRIPTION
12	10/01/23	JMW	Converted to new format
11	06/15/15	WYW	



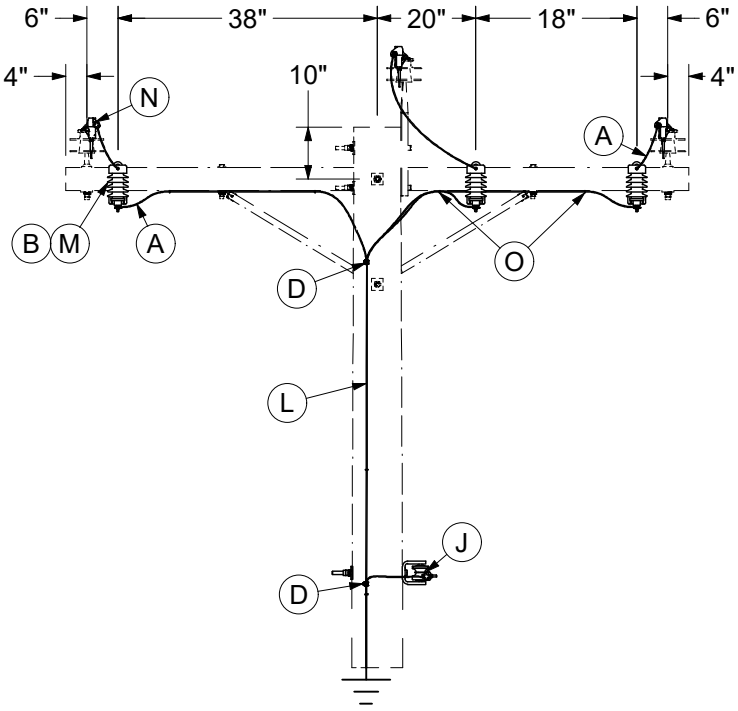
12 12 01 05



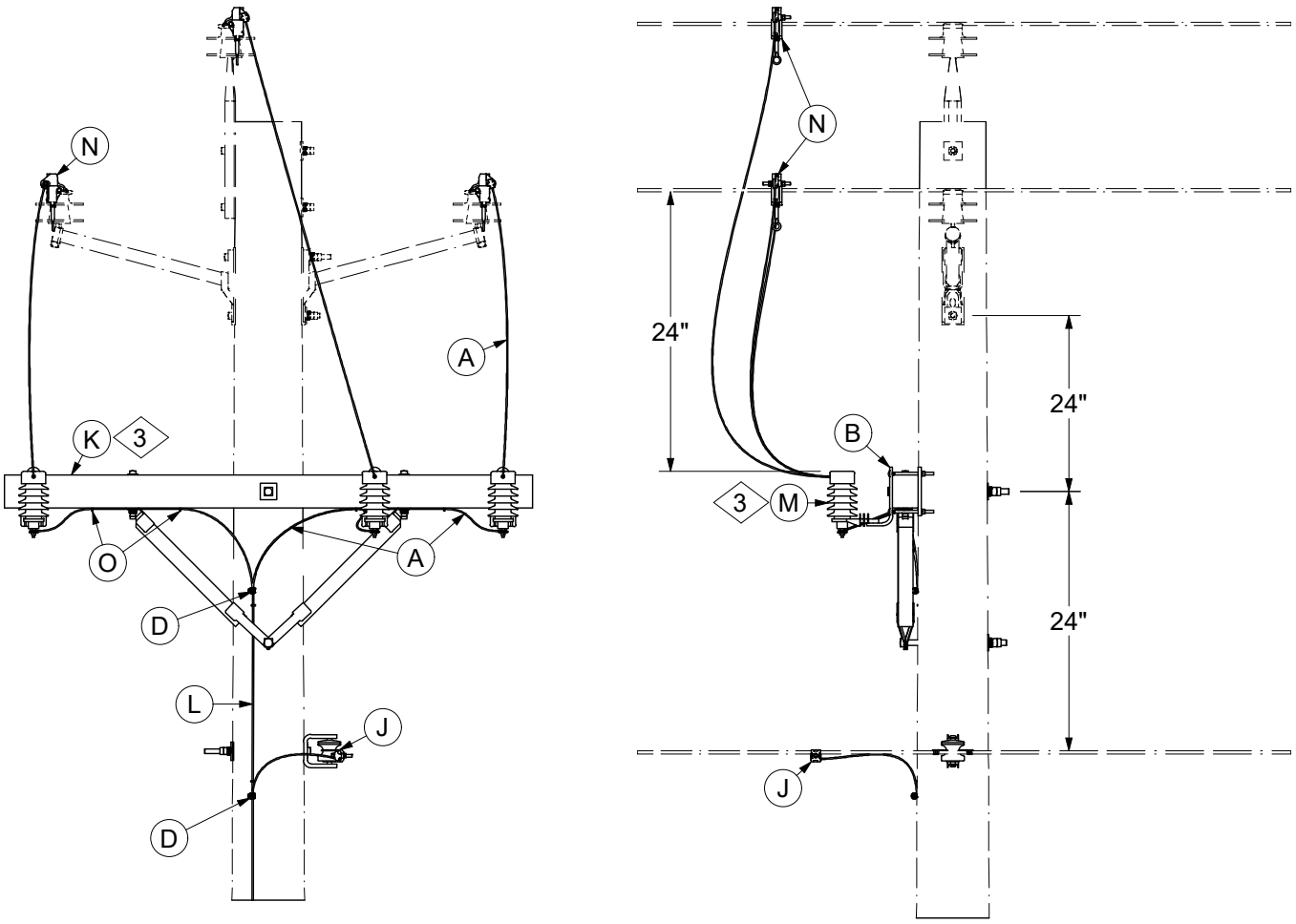
12 12 01 07



12 12 01 06



12 12 01 08



12 12 01 09 - 10 ft Crossarm
12 12 01 10 - 6 ft Crossarm

REV	DATE	ENG	DESCRIPTION
12	10/01/23	JMW	Converted to new format
11	06/15/15	WYW	

CONSTRUCTION NOTE(s):

1. Route the ground wires in a straight line or a smooth curve. Avoid making sharp bends in ground wires.
2. Take care when driving the staples onto the ground wires to avoid damaging the wire.
3. If fiberglass crossarm is used, secure ground wire to bottom of arm with clips, Stock #23 67 746. 12 clips per bag.

	ITEM	STK / DCS #	DESCRIPTION 12 12 01 **	01	02	03	04	05
				1 Ph	1 Ph	1 Ph	1 Ph	2 Ph
	A	18 51 021	Wire, Copper, #6 SD Poly Covered (ft)	10	10	6	6	12
	B	17 58 054	Bracket, Arrester/Cutout Mounting	1	-	-	-	2
	C	23 06 127	Bracket - Standoff, 12" FG	-	1	1	1	-
	D	17 54 373	Connector - Split Bolt	2	2	2	2	2
	E	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	-	2	2	2	-
		23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	-	2	2	2	-
	F	23 66 207	Washer, Curved, Square, 5/8"	-	2	-	2	-
	G	23 66 027	Washer, Flat, Square 5/8"	-	-	2	-	-
	H	23 66 134	Lock Washer - 5/8" Double Coil	-	2	2	2	-
	I	23 65 043	Lock Nut - 5/8" Square	-	2	2	2	-
	J	07 00 25 00	Clamp, Parallel Groove PG**	1	1	1	1	1
@	K	04 00 20 01	6' Crossarm	-	-	-	-	-
		04 00 20 03	10' Crossarm	-	-	-	-	-
@	L	12 00 10 **	Grounding Unit	1	1	1	1	1
	M	10 01 144	Arrester, 10kV, 8.4kV MCOV	1	1	1	1	2
5,@		10 01 008	Arrester, 12kV, 10.2kV MCOV	1	1	1	1	2
		10 01 188	Arrester, 15kV, 12.7kV MCOV	1	1	1	1	2
@	N	07 00 21 00	Clamp, Hotline HLC*W	1	1	1	1	2
@	O	23 64 001	Staple 3/8" x 2"	4	2	-	-	4

REV	DATE	ENG	DESCRIPTION
12	10/01/23	JMW	Converted to new format
11	06/15/15	WYW	

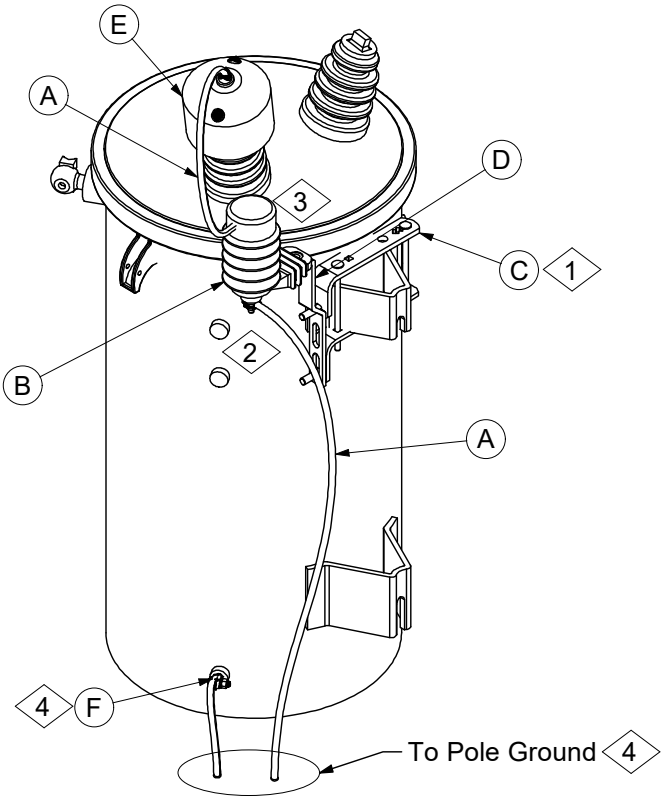
	ITEM	STK / DCS #	DESCRIPTION 12 12 01 **	06	07	08	09	10
				2 Ph	3 Ph	3 Ph	3 Ph	3 Ph
	A	18 51 021	Wire, Copper, #6 SD Poly Covered (ft)	16	24	20	23	23
	B	17 58 054	Bracket, Arrester/Cutout Mounting	2	3	3	3	3
	C	23 06 127	Bracket - Standoff, 12" FG	-	-	-	-	-
	D	17 54 373	Connector - Split Bolt	2	2	2	2	2
	E	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	-	-	-	-	-
		23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	-	-	-	-	-
	F	23 66 207	Washer, Curved, Square, 5/8"	-	-	-	-	-
	G	23 66 027	Washer, Flat, Square 5/8"	-	-	-	-	-
	H	23 66 134	Lock Washer - 5/8" Double Coil	-	-	-	-	-
	I	23 65 043	Lock Nut - 5/8" Square	-	-	-	-	-
	J	07 00 25 00	Clamp, Parallel Groove - PG**	1	1	1	1	1
@	K	04 00 20 01	6' Crossarm - 3-1/2" x 4-1/2"	1	1	-	-	1
		04 00 20 03	10' Crossarm - 3-1/2" x 4-1/2"	1	1	-	1	-
@	L	12 00 10 **	Grounding Unit	1	1	1	1	1
	M	10 01 144	Arrester, 10kV, 8.4kV MCOV	2	3	3	3	3
5,@		10 01 008	Arrester, 12kV, 10.2V MCOV	2	3	3	3	3
		10 01 188	Arrester, 15kV, 12.7kV MCOV	2	3	3	3	3
@	N	07 00 21 00	Clamp, Hot line - HLC*W	2	3	3	3	3
@	O	23 64 001	Staple 3/8" x 2"	4	6	6	6	6

DESIGN NOTE(s):

4. In IL - the arresters must be installed on 10' crossarm below the line arm. In MO - the arresters should be installed on a crossarm below the line arm, but if space is not available, the arresters may be placed on the line arm. Note that an additional crew person will be required to replace the arresters on the line arm.

5. Arresters selection, Refer to DCS **12 00 01 01** - Table 1.

REV	DATE	ENG	DESCRIPTION
12	10/01/23	JMW	Converted to new format
11	06/15/15	WYW	



12 12 05 01 - 7.2 kV thru 7.97 kV
12 12 05 02 - 2.4kV

CONSTRUCTION NOTE(s):

1. For transformer with cover mounted primary bushings, install the cutout/arrester crossarm mounting bracket oriented as shown on the top hanger of the transformer.

2. Stock #23 06 122 comes with a copper strap that is to be removed and returned to the storeroom for recycling.

3. Make sure the wire opening in the arrester cap is oriented away from the mounting bracket.

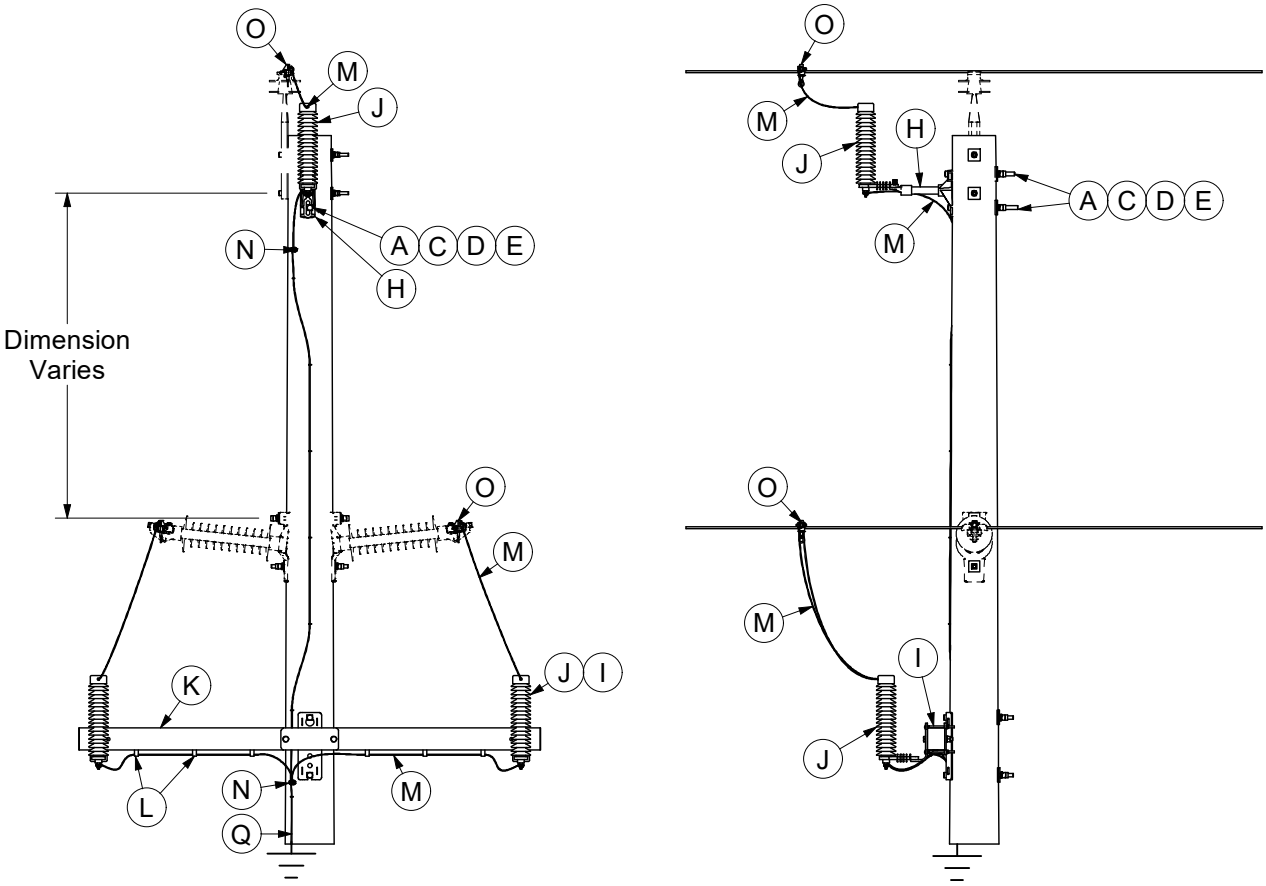
4. Bond the arrester ground directly to the pole ground and use the ground lug to separately bond the tank to the pole ground.

	ITEM	STK / DCS #	DESCRIPTION 12 12 05 **	01	02
2	A	18 51 021	Wire, Ground, #6, S.D. Poly Covered (ft.)	7	7
	B	10 01 133	Arrester, 3kV, 2.55kV MCOV	-	1
		10 01 144	Arrester, 10kV, 8.4kV MCOV	1	-
	C	23 56 088	Backet - Crossarm Double Sided NEMA	1	1
	D	23 06 122	Arrester L Bracket - Packaged with Arrester Kit	1	1
	E	69 58 296	Wildlife Guard - Transformer Bushing Cover	1	1
	F	69 58 121	Ground, Transformer Tank, #8 Sol. to #2 Str. Cu.	1	1

DESIGN NOTE(s):

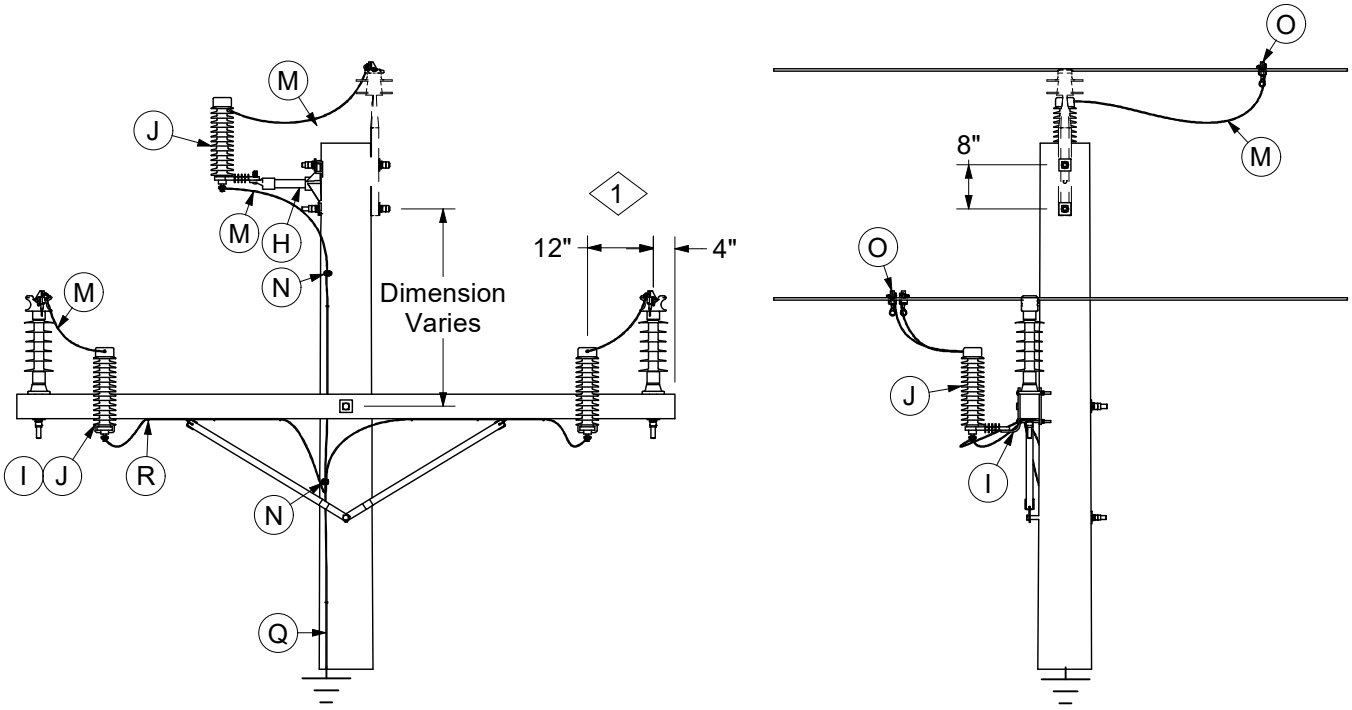
5. This DCS is for mounting arresters adjacent to the H1 bushing on a transformer that does NOT have existing lugs for tank mounting of the arrester. Use when arrester is being moved from Engergized Zone to transformer level on existing/older transformer installations.

REV	DATE	ENG	DESCRIPTION
1	10/01/23	JMW	Converted to new format
0	05/21/18	DG	



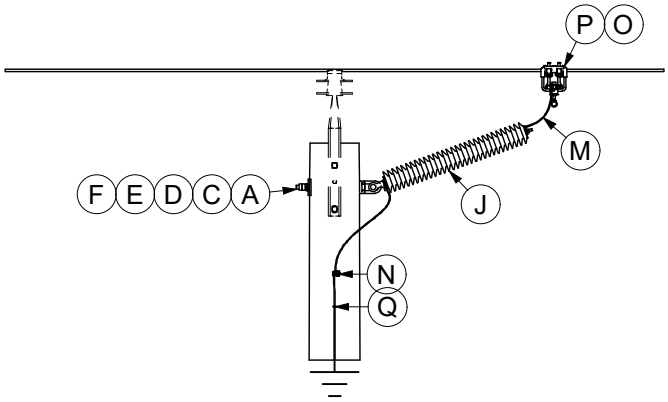
12 34 01 01 - 34kV Top Phase
12 34 01 02 - 34kV Three Phase

REV	DATE	ENG	DESCRIPTION
15	10/01/23	JMW	Converted to new format
14	12/16/16	WYW	

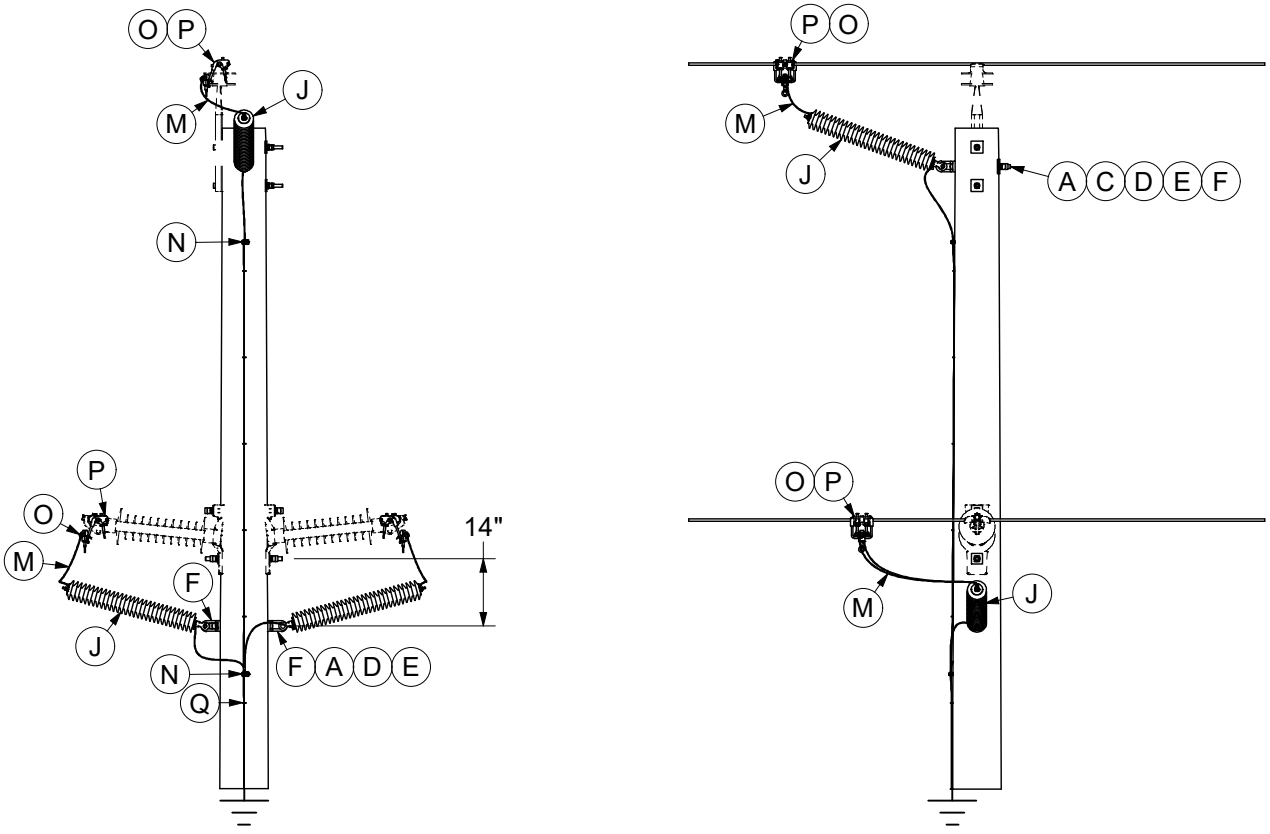


12 34 01 03 - 34kV Three Phase

REV	DATE	ENG	DESCRIPTION
15	10/01/23	JMW	Converted to new format
14	12/16/16	WYW	



12 34 01 04 - 69kV Top Phase



12 34 01 05 - 69kV Three Phase

REV	DATE	ENG	DESCRIPTION
15	10/01/23	JMW	Converted to new format
14	12/16/16	WYW	

CONSTRUCTION NOTE(s):

1. Use double staples to hold ground wire in the event the ground lead isolator blows off. Distance from the double staples to the ground lead isolator should be 6" minimum.

2. Route the ground wires in a straight line or a smooth curve. Avoid making sharp bends in ground wires.

3. Take care when driving the staples onto the ground wires to avoid damaging the wire.

	ITEM	STK / DCS #	DESCRIPTION 12 34 01 **	01	02	03	04	05
	A	23 52 097	Bolt, Mach., 3/4" x 12" w/ square nut	2	2	-	1	2
	B	23 53 058	Bolt, DA, 3/4" Dia x 16" w/ 4 square nuts	-	-	2	-	-
	C	23 66 031	Washer, Curved, Square, 3/4"	2	2	-	1	1
		23 66 131	Washer, Square, 3/4"	-	-	4	-	-
	D	23 66 135	Lock Washer - 3/4" Double Coil	2	2	4	1	2
	E	23 65 042	Lock Nut - 3/4" Square	2	2	4	1	2
	F	23 59 095	Eyelet, 3/4" Bolt	-	-	-	1	3
	G	23 65 018	Eyenut, 3/4" Bolt	-	-	-	-	-
	H	23 06 127	Bracket - Standoff, 12" FG	1	1	1	-	-
	I	17 58 054	Bracket, Arrester/Cutout Mounting	-	2	2	-	-
	J	10 01 252	Arrester, 36kV, 29kV MCOV	1	3	-	-	-
		10 01 158	Arrester, 60kV, 48kV MCOV W/Clevis, Susp	-	-	-	1	3
	K	04 00 42 01	Crossarm - Tangent, F/G 8'	-	1	-	-	-
	L	23 68 746	Grounding Clip	-	1	-	-	-
	M	18 51 021	Wire - Copper, Poly Covered, #6 S.D.	8	20	20	8	20
@	N	17 54 373	Connector - Split Bolt, #14 AWG Str. to #2 AWG Str.	1	2	2	1	2
@	O	07 00 21 00	Clamp - Hotline HLC*W	1	3	3	1	3
@	P	07 00 21 00	Clamp - Stirrup STC*W	-	-	-	1	3
@	Q	12 00 10 **	Grounding Unit	1	1	1	1	1
1,@	R	23 64 001	Staple 3/8" x 2"	-	-	6	-	-

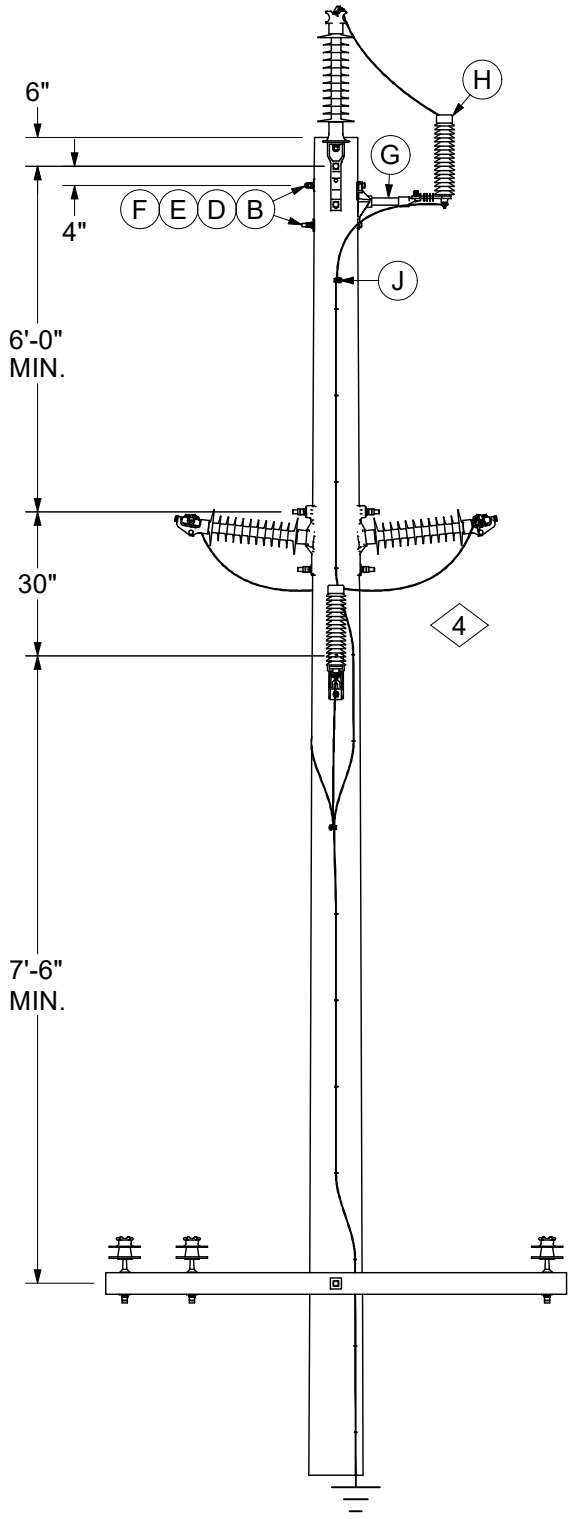
DESIGN NOTE(s):

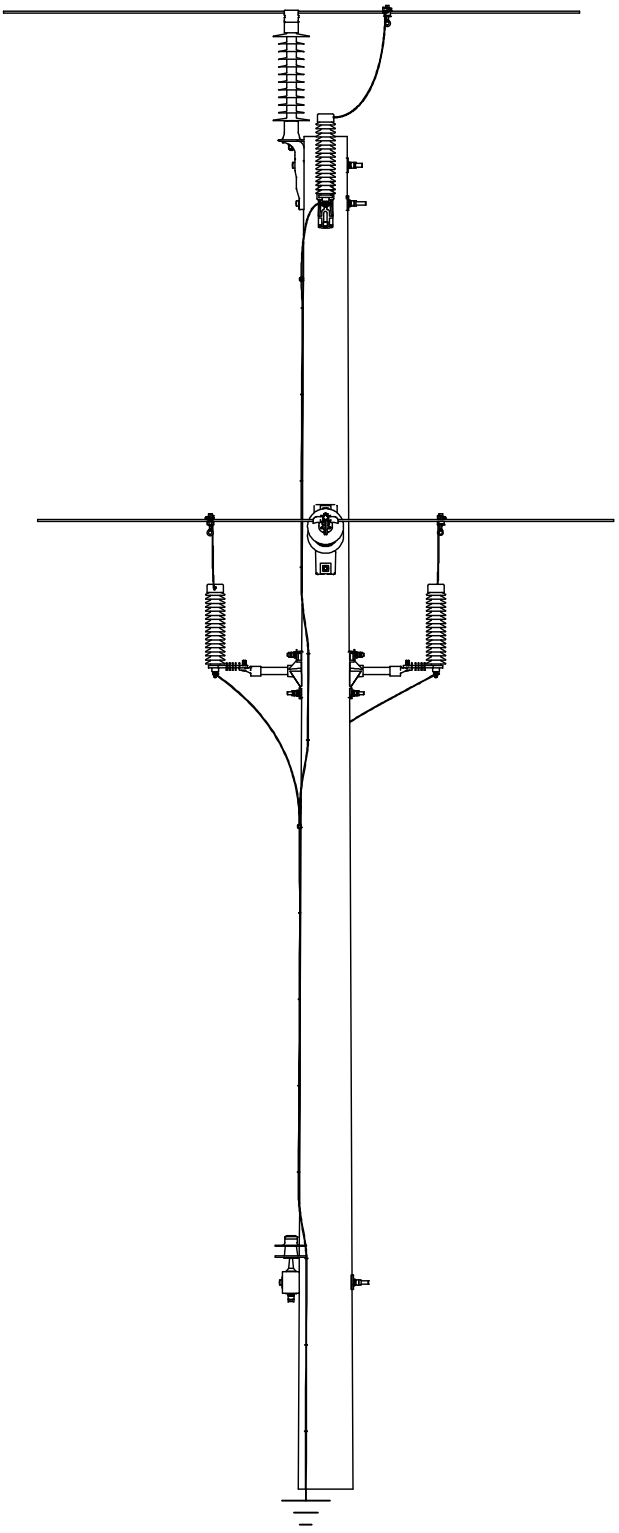
4. Not for use in new construction. This standard is only for lightning protection of existing subtransmission configurations.

5. Arresters should be installed on the top phase of every pole. If the line runs through wooded areas where trees are as tall as the top phase, induced flashover may be experienced and additional arresters are needed. In these cases, install arresters on the lower phases at roughly 300' intervals.

6. If the shield formed by the pole top insulator and the outside crossarm insulator is less than 30 deg., install arresters on the top phase only. If the angle exceeds 30 deg., install arresters on all three phases.

REV	DATE	ENG	DESCRIPTION
15	10/01/23	JMW	Converted to new format
14	12/16/16	WYW	

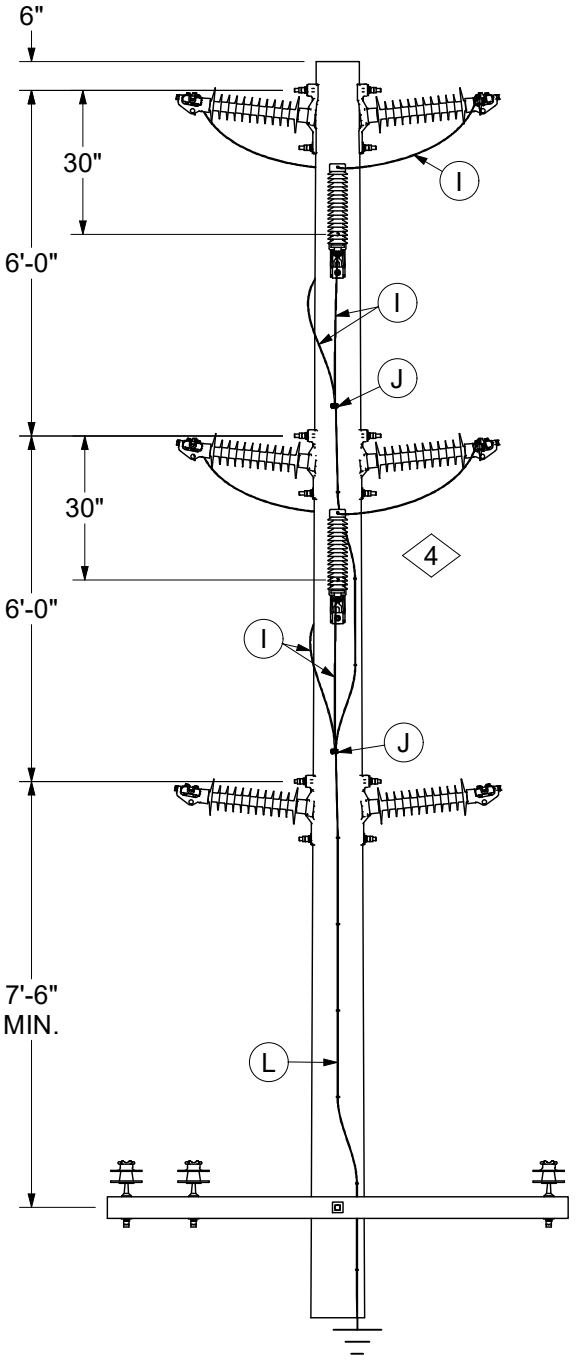


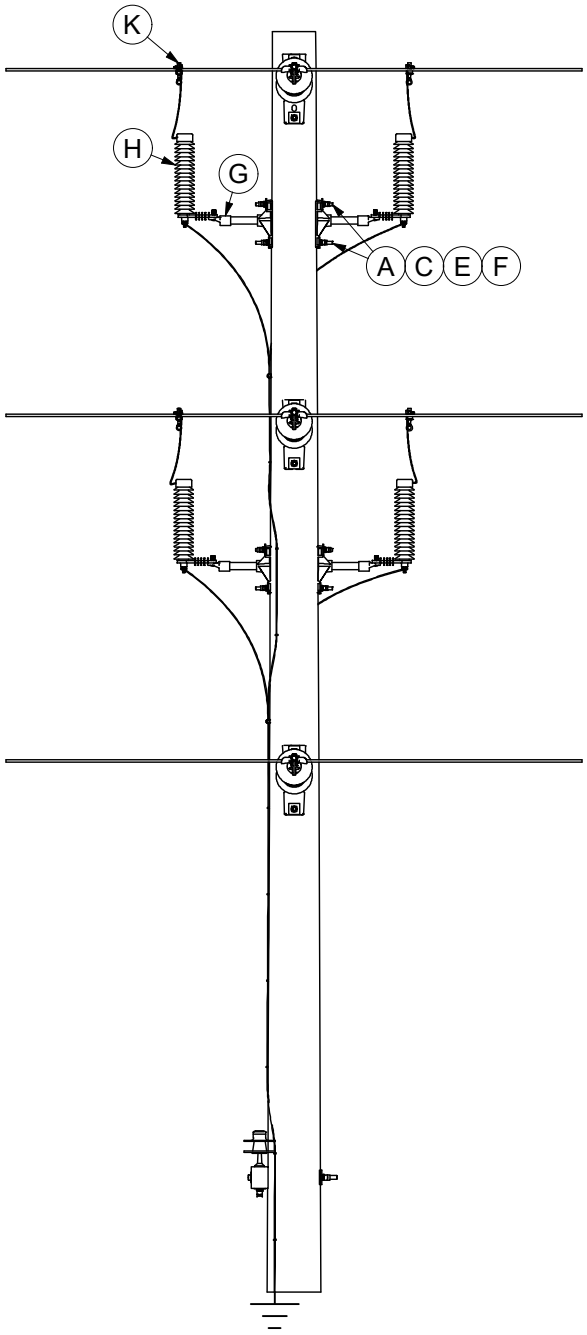


12 34 02 01 - Single Circuit - Arrester Top Phase
12 34 02 02 - Single Circuit - Arrester Three Phase

4

REV	DATE	ENG	DESCRIPTION
8	10/01/23	JMW	Converted to new format
7	09/08/14	WYW	





12 34 02 03 - Double Circuit - Arrester Top Phase
12 34 02 04 - Double Circuit - Arrester Top Two Phases ◇4

REV	DATE	ENG	DESCRIPTION
8	10/01/23	JMW	Converted to new format
7	09/08/14	WYW	

CONSTRUCTION NOTE(s):

1. Route the ground wires in a straight line or a smooth curve. Avoid making sharp bends in ground wires.

2. Use double staples to hold ground wire in case the ground lead isolator blows off. Distance from the double staples to the ground lead isolator should be 6" maximum.

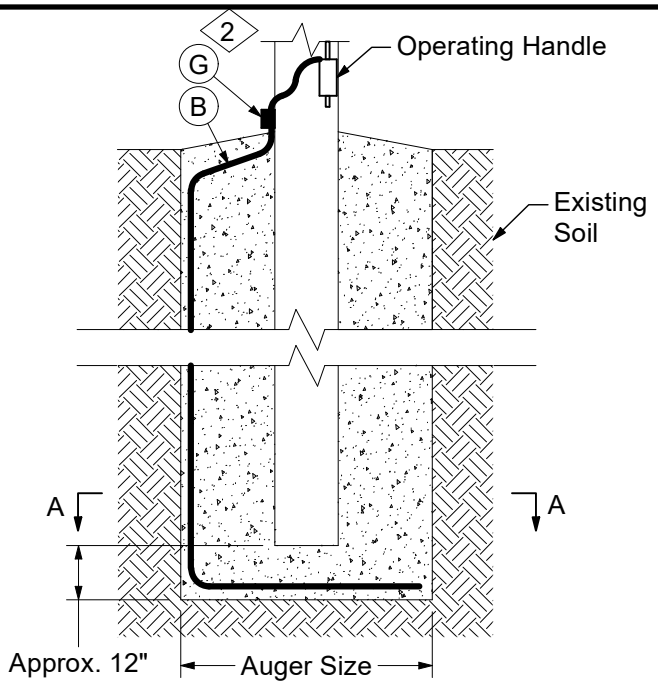
3. Use care when driving staples onto covered pole ground wire to avoid damaging the wire.

	ITEM	STK / DCS #	DESCRIPTION 12 34 02 **	01	02	03	04
	A	23 53 002	Bolt, DA, 5/8" Dia x 16" w/ 4 square nuts	-	2	4	4
	B	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	2	2	0	0
	C	23 66 027	Washer, Flat, Square 5/8"	-	4	8	8
	D	23 66 207	Washer, Curved, Square, 5/8"	2	2	-	-
	E	23 66 134	Lock Washer - 5/8" Double Coil	2	6	4	8
	F	23 65 043	Lock Nut - 5/8" Square	2	6	4	8
	G	23 06 127	Bracket - Standoff, 12" FG	1	3	2	4
	H	10 01 252	Arrester, 36kV, 29kV MCOV	1	3	2	4
	I	18 51 021	Wire, Copper, Poly Covered, #6 S.D.	10	15	20	25
@	J	17 54 373	Connector - Split Bolt, #14 AWG Str. to #2 AWG Str.	1	2	1	2
@	K	07 00 21 00	Hotline Clamp	1	3	2	4
@	L	12 00 10 **	Grounding Unit	1	1	1	1

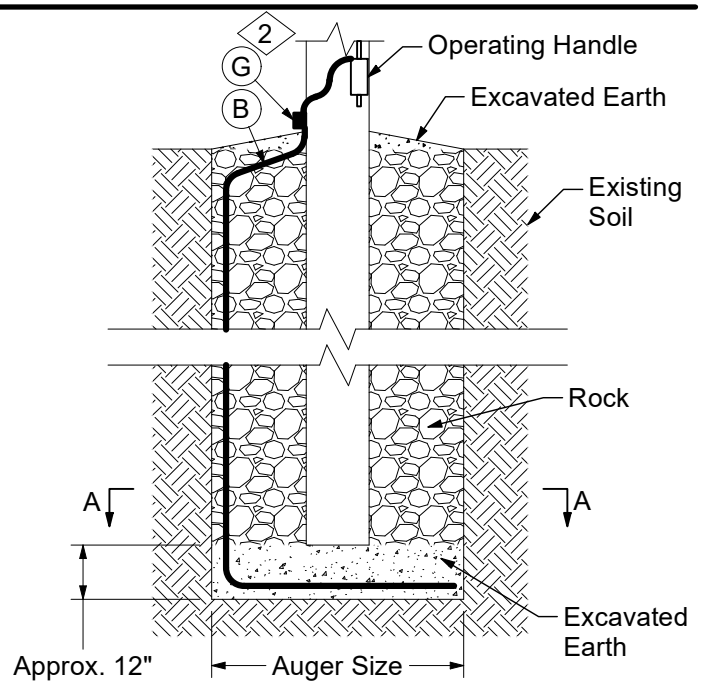
DESIGN NOTE(s):

◇4. Arresters should be installed on the top phase(s) of every pole. This provides approximately the same level of protection as a static wire system. If the line runs through wooded areas where nearby trees are as tall as the top phase, induced flashovers may be experienced and additional arresters are needed. In these cases, install additional arresters on the lower phases at roughly 300' intervals. On poles with a single circuit, install extra arresters on both lower phases. On poles with a double circuit, install extra arresters on both middle phases.

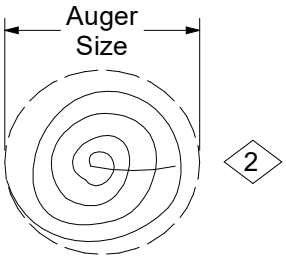
REV	DATE	ENG	DESCRIPTION
8	10/01/23	JMW	Converted to new format
7	09/08/14	WYW	



Ground Coil with Excavated Earth Backfill

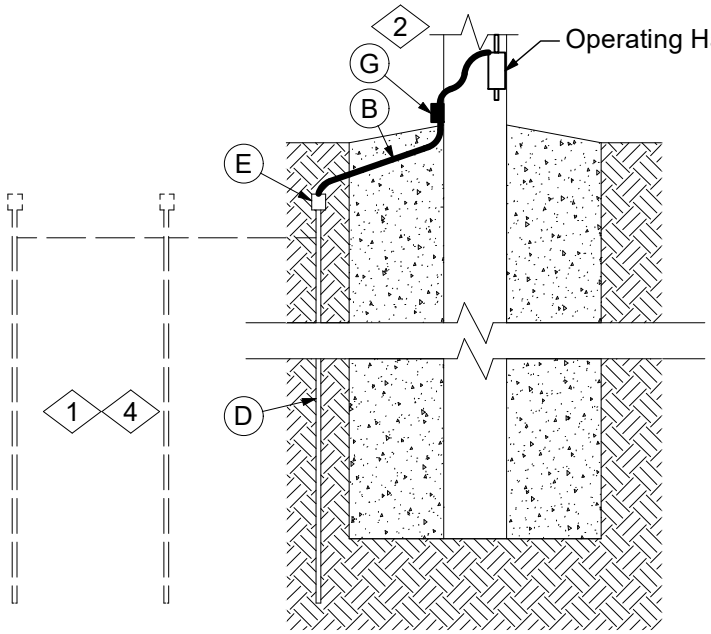


Ground Coil with Rock Backfill



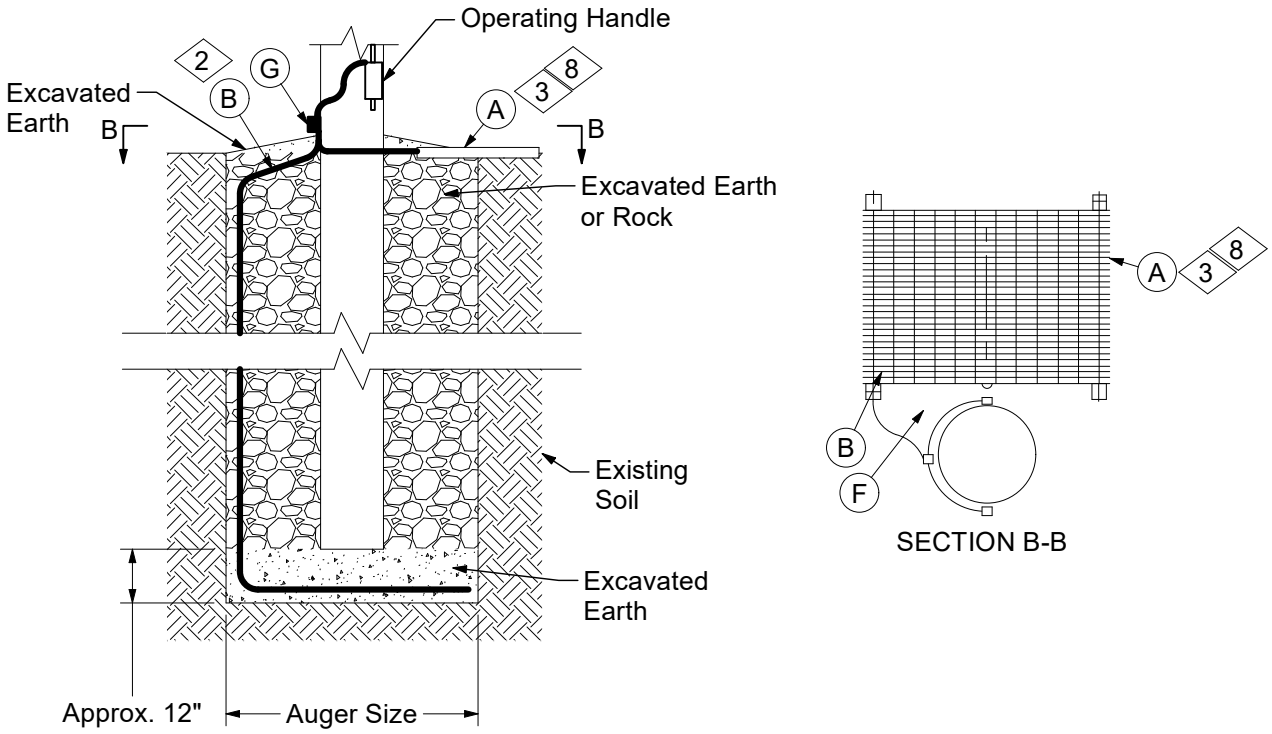
Section A-A

12 69 11 01 Ground Coil for New Pole Installation

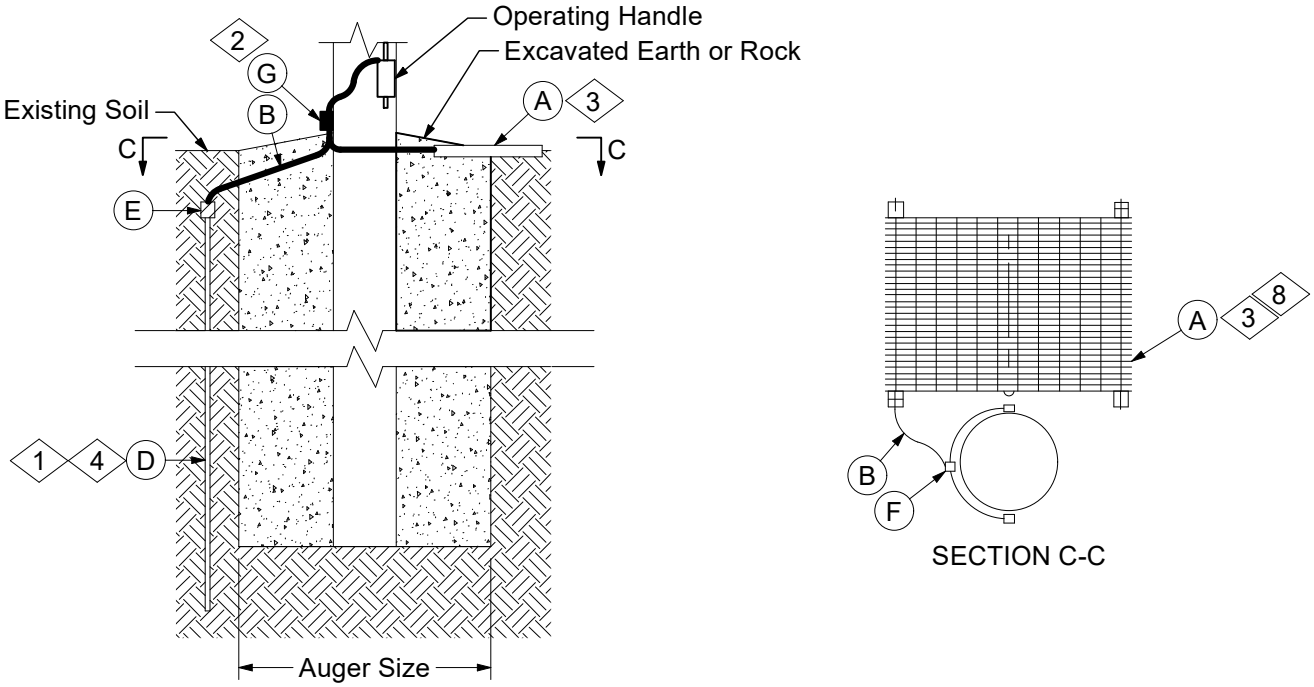


12 69 11 02 Ground Rod(s) with Existing Pole

REV	DATE	ENG	DESCRIPTION
9	10/01/23	JMW	Converted to new format
8	11/04/16	WYW	



12 69 11 03 - Ground Mat with Ground Coil



12 69 11 04 - Ground Mat with Ground Rod

REV	DATE	ENG	DESCRIPTION
9	10/01/23	JMW	Converted to new format
8	11/04/16	WYW	

CONSTRUCTION NOTE(s):

1. Ground resistance will normally be less than 25 ohms with one rod. In rocky or sandy soil where experience indicates ground resistance may exceed 25 ohms, install additional rods spaced 6' apart. Doubling the number or length of the rod reduces the ground resistance by 40%.

   A. If additional grounding is needed and this is a terminal pole, a #2 bare copper counterpoise wire 100'-150' long may be placed in the conduit trench and connected to the ground lead.

   B. In rocky soil where driving a rod is difficult - a counterpoise, as stated in A., may be placed in a trench at least 18" deep.

2. Train below grade ground wire approximately 8" above ground line to line up with ground lead from switch handle. Staple wire to pole above and below connector. Make the ground coil to the same diameter as the pole hole and use at least 12' of bare #2 copper wire.

3. Ground mat to be installed under operating handle. Always place some crushed rock on top of ground mat to add better ground support for operating the switch.

4. Ground rods to be installed along conductor center-line if more than one rod is required.

5. Switches come with connectors to join braided cable to ground wire. If extra are needed, use Stock #17 52 140 for SEECO switch and Stock #17 54 373 for Turner switch.

6. The ground wire is normally connected to only the switch handle. However, on some 34kV terminal poles, the ground wire must extend up the pole and connect to the cable concentric or arrester. See 34kV terminal pole and switch DCS's for guidance.

	ITEM	STK / DCS #	DESCRIPTION 12 69 11 **	01	02	03	04
8	A	23 17 405	Ground Platform 4' x 3', Galv. Steel	-	-	1	1
2	B	18 52 025	Wire - #2 Cu. Bare, Solid	20	4	25	8
	C	23 64 001	Staple, Ground Wire, Serrated, Cu. Clad	5	5	5	5
1	D	23 13 069	Rod, Ground, 5/8" x 8' Cu. Bonded	-	1	-	1
1	E	17 52 032	Clamp, Ground Rod, 5/8" dia Rod	-	1	-	1
	F	17 54 373	Connector - Wire, #2 Cu. Split Bolt	-	-	1	1
5,@	G	17 52 140	Clamp, Grounding, Cable to Flat, 4-300 kcmil, Cu.	-	-	-	-
6,8,@	H	18 51 019	Wire, #2 Cu. Poly Covered, 7 Strand	50	50	50	50
		303	Op Code, Install Ground Rod	-	1	-	1
		306	Op Code, Pole Ground	0.5	-	0.5	-
		307	Op Code, Grounding Connection	0.5	0.5	0.5	0.5

DESIGN NOTE(s):

7. All group operated switch handles will be connected to a ground rod/coil.

8. Ground mat is required if the switch is motor operated or if the switch is mounted on a steel pole. Ground mat is also required on 34kV switch poles where the cable concentrics or arresters must connect to the ground rod/coil because the static or neutral is not present. Use #2 Cu. poly wire for this ground wire. See 34kV terminal pole and switch DCS's for guidance.

REV	DATE	ENG	DESCRIPTION
9	10/01/23	JMW	Converted to new format
8	11/04/16	WYW	

NOTES

TRANSFORMERS 13

TYPES AND OPERATION....13 00 01 01

STOCK NUMBERS....13 00 01 02

INSTALLATION & REMOVAL....13 00 02 01

PRIMARY AND SECONDARY LEADS....13 00 03 01

DIMENSIONS AND WEIGHTS....13 00 04 01

CONNECTION DIAGRAM, 1-PHASE, WYE PRIMARY, 3-WIRE SECONDARY, 5,15kV....13 00 06 02

CONNECTION DIAGRAM, 1-PHASE, WYE PRIMARY, 2-WIRE SECONDARY, 5,15kV....13 00 06 03

CONNECTION DIAGRAM, 1-PHASE, DELTA PRIMARY, 3-WIRE SECONDARY, 5,15kV....13 00 06 06

ELIMINATION OF STRAY VOLTAGES....13 00 06 08

CONNECTION DIAGRAM, 3-PHASE, 240Δ OR 480Δ VOLT SECONDARY,
FLOATING Y OR DELTA PRIMARY, 5,15kV....13 00 07 02

CONNECTION DIAGRAM, 3-PHASE, 208Y/120 OR 480Y/277 VOLT SECONDARY,
DELTA PRIMARY, 5,15kV....13 00 07 03

CONNECTION DIAGRAM, 3-PHASE BANKED, 240Δ OR 480Δ VOLT
CORNER GRD SECONDARY, FLOATING Y PRIMARY, 5,15kV....13 00 07 04

CONNECTION DIAGRAM, 3-PHASE BANKED, 240Δ OR 480Δ VOLT
CORNER GRD SECONDARY, DELTA PRIMARY, 5,15kV....13 00 07 05

CONNECTION DIAGRAM, 3-PHASE BANKED, 120/208Y OR 277/480Y VOLT
SECONDARY, DELTA PRIMARY, 5,15kV....13 00 07 08

CONNECTION DIAGRAM, 3-PHASE BANKED, 120/208Y OR 277/480Y VOLT
SECONDARY, WYE PRIMARY, 5,15kV....13 00 07 09

CONNECTION DIAGRAM, 3-PHASE BANKED, 120/240 VOLT 4-WIRE SECONDARY,
UNGROUNDED WYE PRIMARY, 5,15kV....13 00 07 10

CONNECTION DIAGRAM, 3-PHASE BANKED, 12-/240 VOLT 4-WIRE SECONDARY,
DELTA PRIMARY, 5,15kV....13 00 07 11

CONNECTION DIAGRAM, 3-PHASE BANKED, 12-/240 VOLT 4-WIRE SECONDARY,
OPEN DELTA PRIMARY, 5,15kV....13 00 07 12

CONNECTION DIAGRAM, 3-PHASE BANKED, 120/240 VOLT 4-WIRE SECONDARY,
OPEN WYE PRIMARY, 5,15kV....13 00 07 13

SECONDARY AND SERVICES TRAINING AND SUPPORTS FOR 1- OR 3-PHASE, 600V....13 01 01 **

PARALLEL MULTIPLEX SERVICE DROP, 600V....13 01 04 **

SECONDARY AND SERVICES, SECONDARY SERVICE BUS, FOR
TRIPLEX CABLE, 1-PHASE, 600V....13 01 07 00

3-PHASE - 3 OR 4 WIRE, 750kVA, 5kV.....13 04 58 02

1-PHASE - GROUNDED WYE PRIMARY SYSTEM, 1-167kVA, 5,15kV.....13 12 00 **

1-PHASE - DELTA PRIMARY SYSTEM, 1-167kVA, 5,15kV.....13 12 05 **

1-PHASE, DEADEND, GROUNDED WYE PRIMARY SYSTEM, 1-167kVA, 5,15kV.....13 12 07 **

1-PHASE, "L" CORNER - GROUNDED WYE PRIMARY SYSTEM, 1-167kVA, 5,15kV.....13 12 10 **

1-PHASE, "T" CORNER - GROUNDED WYE PRIMARY SYSTEM, 1-167kVA, 5,15kV.....13 12 14 **

1-PHASE, SIDE ARM - GROUNDED WYE PRIMARY SYSTEM, 1-100kVA, 5,15kV.....13 12 21 **

1-PHASE, ARMLESS UNDERBUILD - GROUNDED WYE
PRIMARY SYSTEM, 1-167kVA, 5,15kV.....13 12 34 **

1-PHASE STEP-UP OR DOWN, 50-333kVA, 5,15kV.....13 12 48 **

3-PHASE - 3 OR 4 WIRE, 30-500kVA, 15kV.....13 12 54 **

3-PHASE - 3 OR 4 WIRE, 750kVA.....13 12 58 02

1-PHASE AND 3-PHASE CLUSTER MOUNTED
4,500# MAX. ONE UNIT, 6,600# MAX. TOTAL WEIGHT, 15kV.....13 12 75 02

THREE 1-PHASE CLUSTER MOUNTED, UNGROUNDED WYE
PRIMARY TO DELTA SECONDARY, 5,15kV.....13 12 80 **

THREE 1-PHASE CLUSTER MOUNTED, GROUNDED WYE
PRIMARY TO GROUNDED WYE SECONDARY, 5,15kV.....13 12 81 **

THREE 1-PHASE CLUSTER MOUNTED, DELTA PRIMARY
TO GROUNDED WYE OR DELTA SECONDARY, 5,15kV.....13 12 82 **

GRD WYE PRIMARY SYSTEMS - 120/240 VOLTS - SINGLE PHASE, 35kV.....13 34 01 **

DELTA PRIMARY SYSTEMS - 120 OR 120/240 VOLT - 1-PHASE, 35kV.....13 34 02 **

Three general types of distribution transformers are used on the Ameren System. These differ from each other principally in the type and hookup of lightning arresters and switches used to protect the transformers. For purposes of uniformity the three transformer types will be referred to as:

Conventional Transformers (C)
Protected Transformers (P)
Completely Self Protected Transformers (CSP)

1. Conventional Transformers (C)

   These transformers require separately mounted lightning arresters and fused switches for their protection. Some Conventional transformers are still purchased new. A considerable number installed in past years are still in service. As non-standard Conventional transformers are removed from service they will be converted to Protected transformers by mounting lightning arresters on the transformers before they are placed in our transformer stock.

2. Protected Transformers (P)

   Transformers of this type have lightning arresters mounted on the transformer. Since the discharge path of the lightning arrester is by way of the transformer tank, good tank grounds are imperative.

   Protected transformers are standard for most new purchases of single-phase and three-phase transformers.

   Protected transformers shall have separately mounted fused switches installed. Transformers whose primary winding are connected phase-to-ground are provided with only one lightning arrester. This arrester is normally connected to the H_1 bushing, but may be shifted to the side of the tank giving the best clearances. The arrester shall be connected to the phase lead which is connected to the fused switch. Transformers whose primary winding are connected phase-to-phase will have two arresters mounted on the transformer.

3. Completely Self Protected Transformers (CSP)

   Completely Self Protected transformers have built into the unit internal primary fuse links (designed to open only on internal transformer faults) and a secondary breaker for protection against external overloads. These devices are all under oil. In addition, externally mounted lightning arresters are provided. The discharge path of the lightning arresters is by way of the transformer tank, therefore, good tank grounds are imperative.

   Single-phase Completely Self Protected transformers are no longer purchased new. Three-phase units in sizes 30 kVA to 150 kVA inclusive for 4.16kV and in sizes 30 kVA and 45 kVA for 12.47 kV units are still purchased new.

   Completely Self Protected transformers shall have separately mounted fused switches installed unless pole space does not allow and the number of customers affected by transformer failure is deemed acceptable. Only in such cases may the transformer be directly connected to the line wires.

4. Connecting Primary Leads

   Care should be exercised in connecting primary leads to transformers.

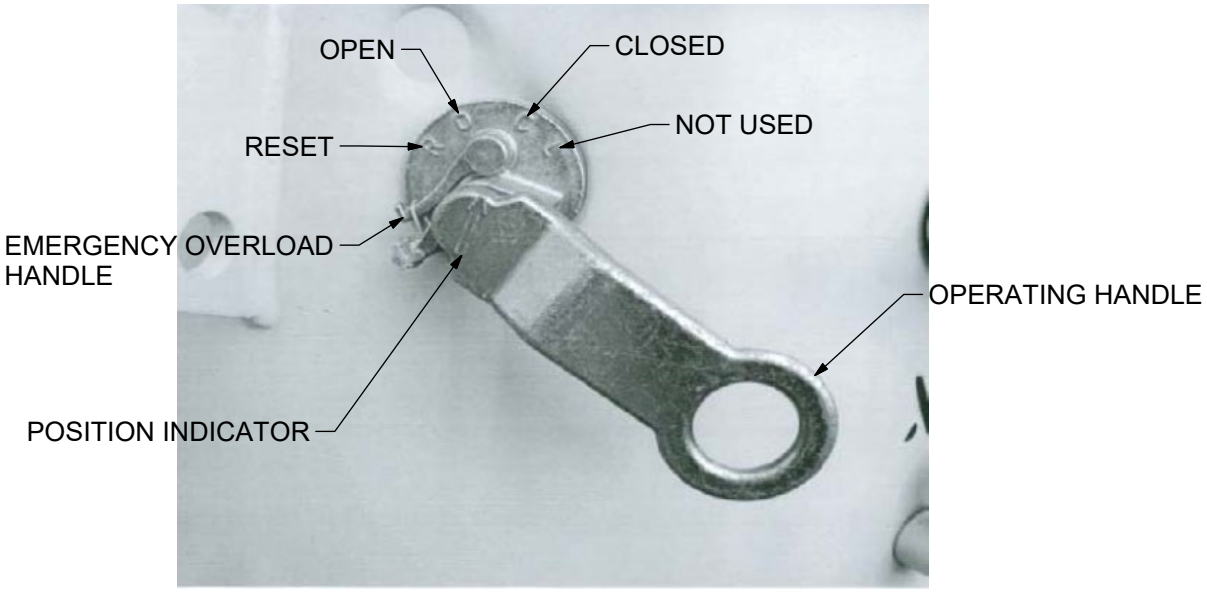
   On single-phase transformers connected phase-to-neutral the neutral connection shall be made before the primary lead is connected.

   On single-phase transformers connected phase-to-phase both primary terminals will be hot after the first primary lead is connected.

   On three-phase transformers all primary terminals will be hot after the first primary lead is connected.

REV	DATE	ENG	DESCRIPTION
16	04/01/23	DG	Converted to new format
15	08/18/11	DG	

5. Breaker Operation on CSP Transformers



Breaker Switch

To Reset the breaker after it has opened due to overload move the handle to the ”Reset” position and then move it to the ”Close” position.

To Open the breaker raise handle until pointer coincides with the word ”Open".

To Close breaker (when it has not opened due to overload) lower handle until pointer coincides with the word ”Close”. On some units, this will be sufficient to close the breaker. On other units, it is necessary to move the handle to the Reset ”R” position before it can be closed. This is true even though the transformer has not tripped on overload.

The breaker will trip free of the handle permitting the closing on a short circuit with safety.

CSP transformers may also be equipped with an emergency overload control. Adjustment of this device will increase the capacity of the transformer for emergency loading. The emergency control is operated by a handle located so as to be partially concealed by the larger breaker operating handle.

In case the breaker has tripped because of excessive overload, an attempt should first be made to reset the breaker in the usual manner without moving the emergency control handle. Usually this will be possible, and no other action will be necessary. If the tripping is the result of overload, then the transformer should be replaced with a larger unit. However, if this replacement cannot be made immediately and if the breaker cannot be reclosed, then it may be possible to reclose the breaker by use of the emergency overload device. First rotate the emergency handle clockwise, then the breaker handle can be moved to the reset position and the breaker reclosed in the usual manner.

The transformer should be allowed to carry this loading only until the transformer can be replaced, preferably not more than a day.

Some CSP transformers have two secondary breakers connected in parallel. Both breakers must be closed to secure full capacity on these transformers.

REV	DATE	ENG	DESCRIPTION
16	04/01/23	DG	Converted to new format
15	08/18/11	DG	

6. 480 Volt Three Wire Service From 480Y/277 Volt Four Wire Transformers

CAUTION: Do not make these conversions on three-phase transformers that have the primary and secondary neutrals internally connected together.

A. Three-wire 480 volt service is non-standard for new installations.

B. Corner-Grounded Three-Wire Service

a. Remove the secondary neutral ground strap(s) from all transformers.

b. Tape the secondary neutral terminal(s) to prevent accidental contact and any misunderstanding as to which terminals are being used and the type of service being provided.

c. Run a #2 copper lead from the ”A” phase secondary terminal to the tank ground connector. Ground the transformer tank(s) to a driven ground rod and to the common system neutral (if present).

CAUTION: After the “A” phase secondary terminal is energized, the taped neutral terminal(s) are energized.

d. Before connecting the customer's cable, determine which cable the customer has grounded (if any) and connect that cable to the now grounded ”A” phase secondary terminal.

C. Un-Grounded Three-Wire Service

a. Remove the secondary neutral ground strap(s) from all transformers.

b. Ground the transformer tank(s) to a driven ground rod and to the common system neutral (if present).

7. Un-Grounded Y Primary to △ Secondary

A. This connection is non-standard for new installations.

B. For un-grounded Y primary to △ secondary connected transformers, when primary voltage is lost to one of the bank phases or one of the cutouts is opened, a high temporary over-voltage can be impressed across the tank mounted arresters. Therefore, for 2.4 and 4.16 kV transformers 6 kV rated arrester Stock #10 01 184 is used. For 7.2 through 14.4 kV transformers 15 kV rated arrester Stock #10 01 188 is used.

8. Open Y or Open △ Primary to Open △ Secondary

A. Open Y primary to open △ secondary connections should only be used where the three phase load is small and three primary phases are not available. 120/240 V, 3-phase, 4-wire open △ service is provided with this connection. This connection can also be used for temporary situations where one transformer in a closed Y to closed △ bank of three transformers has failed. The capacity of this connection is 86.6% of the two remaining transformers or 57.7% of the initial three transformers (based on three equal size transformers).

B. Open △ primary to open △ secondary connections should only be used for temporary situations where one transformer in a closed △ to closed △ bank of three transformers has failed. The capacity of this connection is 86.6% of the two remaining transformers or 57.7% of the initial three transformers (based on three equal size transformers).

Table 1 - Transformer Voltage Code Explanation			
Codes	Primary & Secondary	Codes	Primary & Secondary
AA	2400/4160Y X 7200/12470Y X 7620/13200Y −120/240	HF	13200 − 480Y/277
AD	2400/4160Y X 7200/12470Y X 7620/13200Y −240/480	HN	7200 CONSTANT CURRENT
AN	2400 CURRENT TRANSFORMER	HP	7200 CONSTANT CURRENT
AP	2400 CURRENT TRANSFORMER	HQ	13200Y − 240 W/120 MIDTAP
AU	2400/4160Y X 7200/12470Y X 7620/13200Y − 277	HR	BLANK
BA	2400/4160Y − 120/240	IA	12000 − 120/240
BD	2400/4160Y − 240/480	IJ	12470 − 2400/4160Y
BJ	2400/4160Y − 2400	IU	12000 − 277
BM	2400/4160Y − 7200/12470Y	JA	7200/12470Y − 120/240
BR	2400/4160Y − 240/120	JD	7200/12470Y − 240/480
BT	2400/4160Y − 480	JJ	7200/12470Y − 2400/4160Y
BU	2400/4160Y − 277	JR	7200/12470Y − 240/120
BW	2400/4160Y − 240	JT	7200/12470Y − 480
CA	4160/7200Y − 120/240	JU	7200/12470Y − 277
CD	4160/7200Y − 240/480	JW	7200/12470Y − 240
CM	4160/7200Y − 7200/12470Y	KC	12470Y − 208Y/120
CU	4160/7200Y − 277	KE	12470Y − 240 X 480
DE	4160Y − 240 X 480	KF	12470Y − 480Y/277
DF	4160Y − 480Y/277	KG	12470Y − 240
DG	4160Y − 240	KH	12470Y − 480
DH	4160Y − 480	KQ	12470Y − 240 W/120 MIDTAP
DQ	4160Y − 240 W/120 MIDTAP	KU	12470Y − 277
EC	4160 − 208Y/120	LC	12470 − 208Y/120
EF	4160 − 480Y/277	LF	12470 − 480Y/277
EH	4160 − 480	LG	12470 − 240
EQ	4160 − 240 W/120 MIDTAP	LJ	12470 − 2400/4160Y
FA	4160GRDY/2400 − 120/240	LQ	12470 − 240 W/120 MIDTAP
FC	4160GRDY/2400 − 208Y/120	LX	12470 − 4160Y/2400
FF	4160GRDY/2400 − 480Y/277	MA	12470GRDY/7200 − 120/240
FR	4160GRDY/2400 − 240/120	MC	12470GRDY/7200 − 208Y/120
GA	24940GRDY/14400 − 120/240	MF	12470GRDY/7200 − 480Y/277
GP	24940GRDY/14400 − 14400Y/8300	MK	12470GRDY/7200 − 120
GX	69000 - 480	MQ	12470GRDY/7200 − 240 W/MIDTAP
HA	BLANK	MR	12470GRDY/7200 − 240/120
HB	13200 − 216Y/125		

Table 1 - Transformer Voltage Code Explanation (Cont.)			
Codes	Primary & Secondary	Codes	Primary & Secondary
MU	12470GRDY/7200 − 277	RU	14400/24940Y − 277
MX	12470GRDY/7200 − 4160Y/2400	RX	13200GRDY/7620 X 12470GRDY/7200 − 120/240
MZ	12470GRDY/7200 − 480/240	SA	13200GRDY/7620 − 120/240
NC	13200 − 208Y/120	SC	13200GRDY/7620 − 208Y/120
NF	13200 − 480Y/277	SD	13200GRDY/7620 − 240/480
NU	13200 − 277	SF	13200GRDY/7620 − 480Y/277
NX	13200 - 4160Y/2400	SK	13200GRDY/7620 − 120
OA	19920/34500Y − 120/240	SR	13200GRDY/7620 − 240/120
OD	19920/34500Y − 240/480	SU	2400/4160Y X 7620/13200Y − 277
OM	19920/34500Y − 7200/12470Y	SW	2400/4160Y X 7620/13200Y − 120/240
OU	19920/34500Y − 277	SX	13200GRDY/7620 − 4160Y/2400
PB	13800 − 216Y/125	SZ	13200GRDY/7620 − 480/240
PC	13800 − 208Y/120	TA	13800GRDY/7970 − 120/240
PF	13800 − 480Y/277	TC	BLANK
PM	13800 − 7200/12470Y	TF	4160GRDY/2400 X 12470GRDY/7200 X 13200GRDY/7620 − 480Y/277
PU	13800 − 277	TR	13800GRDY/7970 − 240/120
QA	34500 − 120/240	TX	4160GRDY/2400 X 13200GRDY/7620 − 120/240
QB	34500 − 2400/4160Y X 7200/12470Y	UA	7970/13800Y − 120/240
QC	34500 − 208Y/120	UB	14400 − 216Y/125
QD	34500 − 240/480	UC	14400 − 120/240
QF	34500 − 480Y/277	UD	7970/13800Y − 240/480
QJ	34500 − 2400/4160Y (1ph) or 34500 − 4160Y/2400 (3ph)	UE	14400 − 240/480
QK	34500 − 120	UF	14400 − 480Y/277
QM	34500 − 7200/12470Y (1ph) or 34500 − 12470Y/7200 (3ph)	UJ	14400 − 2400/4160Y
QT	34500 − 480	UR	4160GRDY/2400 X 13200GRDY/7620 − 240/120
QU	34500 − 277	UU	14400 − 277
RA	14400/24940Y − 120/240	VA	34500GRDY/19920 − 120/240 (1 BUSHING − 150KV BIL)
RD	14400/24940Y − 240/480	VC	34500GRDY/19920 − 208Y/120
RJ	14400/24940Y − 2400/4160Y	VD	34500GRDY/19920 − 240/480
RM	14400/24940Y − 7200/12470Y	VF	34500GRDY/19920 − 480Y/277
RO	14400/24940Y − 7620/13200Y	VM	34500GRDY/19920 − 7200/12470Y
RR	14400/24940Y x 24940GrdY/14400 - 240/120	VR	34500GRDY/19920 − 240/120

Table 1 - Transformer Voltage Code Explanation (Cont.)			
Codes	Primary & Secondary	Codes	Primary & Secondary
VU	34500GRDY/19920 − 277	YA	7620/13200Y − 120/240
WA	4160GRDY/2400 X 12470GRDY/7200 − 120/240	YD	7620/13200Y − 240/480
WC	4160GRDY/2400 X 12470GRDY/7200 − 208Y/120	YJ	7620/13200Y − 2400/4160Y
WF	4160GRDY/2400 X 12470GRDY/7200 − 480Y/277	YO	13800Y − 7620/13200Y
WR	4160GRDY/2400 X 12470GRDY/7200 − 240/120	YQ	13800Y − 240
WX	4160GRDY/2400 X 12470GRDY/7200 X 13200GRDY/7620 − 120/240	YU	7620/13200Y − 277
XA	2400/4160Y X 7200/12470Y − 120/240	ZA	13200GRDY/7620 X 12470GRDY/7200 − 120/240
XC	4160 X 12470 − 208Y/120	ZC	4160GRDY/2400 X 13200GRDY/7620 − 208Y/120
XD	2400/4160Y X 7200/12470Y − 240/480	ZD	2400/4160Y X 7620/13200Y − 240/480
XF	4160 X 12470 − 480Y/277	ZF	4160GRDY/2400 X 13200GRDY/7620 − 480Y/277
XG	4160 X 12470 − 240	ZQ	4160Y X 13200Y − 240 W/120 MIDTAP
XH	4160 X 12470 − 480	ZR	4160GRDY/2400 X 12470GRDY/7200 X 13200GRDY/7620 − 240/120
XQ	4160 X 12470 − 240 W/120 MIDTAP	ZZ	4160GRDY/2400 X 12470GRDY/7200 X 13200GRDY/7620 − 480/240
XU	2400/4160Y X 7200/12470Y − 277		

REV	DATE	ENG	DESCRIPTION
16	04/01/23	DG	Converted to new format
15	08/18/11	DG	

Table 2 - Transformer Type/Style Code Explanation	
Codes	Types/Styles
A	CILCO padmount, 3Ø, radial feed, dead−front, w/bayonets
B	CILCO padmount, 3Ø, loop feed, dead−front, w/4−way switch or IP w/600A Bushing
C	Crossarm mount or IP 2400V 1Ø w/LA
D	Direct polemount, CSP, w/LA
E	Direct polemount, CSP, w/2 LA's
F	Direct polemount, conventional, w/LA
G	Direct polemount, conventional, no LA
H	Platform type, conventional, no LA
I	Direct polemount, w/breaker, w/LA
J	CIPS direct polemount, conventional, no LA
K	UE dry type or CILCO minipad, 1Ø, w/bayonet
L	Padmount, 3Ø, loop feed, dead−front
M	Padmount, 3Ø, radial feed, dead−front
N	CIPS platform type, 1Ø, conventional
O	CILCO padmount, 3Ø, selective primary, w/external fuses
P	Platform type, conventional, w/LA
Q	Vault type, 1Ø
R	CIPS padmount, 3Ø, radial feed, live−front
S	Subway type
T	CIPS direct polemount, 3Ø
U	CIPS platform type, 3Ø
V	Vault type, 3Ø
W	Padmount, 1Ø, no bayonet
X	Padmount, 1Ø, 32" high
Y	Padmount, 1Ø, low profile, w/bayonet
Z	Padmount, live−front

CONSTRUCTION NOTE(s):

1. The Style Codes are used by all companies unless marked for a specific legacy company (UE, CIPS, CILCO, IP).

Transformer Stock Number Format = AANNNNA
A = Alpha
N = Numeral
AA = Primary and Secondary Voltages
NNNN = Transformer Size w/ Leading Zeros
(Ex. 25 kVA = 0025, 150 kV = 0150)
A = Style Code Letter
Example: JA0025F
JA = 7200/12470Y-120/240 Transformer Voltage
0025 = 25 kVA Transformer
F = Pole Type, Conventional, w/ Lightning Arrester

REV	DATE	ENG	DESCRIPTION
16	04/01/23	DG	Converted to new format
15	08/18/11	DG	

Table 1 - Single-Phase Transformers - Pole and Platform Mount

Stock Number by kVA

Voltage Primary-Secondary	Primary Bushings	Voltage Code	1	10	15	25	50	75	100	167	250	333	500
2400/4160Y-120/240	2	BA		0010C	0015F	0025C 0025F	0050C 0050F	0075C 0075F	0100C 0100F	0167C 0167F	0250C		
2400/4160Y-240/480	2	BD				0025F	0050C 0050F		0100C 0100F	0167F	0250C 0250P		0500P
2400/4160Y-277	2	BU							0100C	0167C		0333C	0500P
2400/4160Y-7200/12470Y	2	BM					0050G		0100G	0167G	0250G 0250P	0333G	
2400/4160Y x 7200/12470Y-120/240	2	XA		0010F	0015F	0025F	0050F	0075F	0100F	0167F	0250F	0333F	0500F
2400/4160Y x 7200/12470Y-240/480	2	XD		0010F		0025F	0050F		0100F	0167F	0250F	0333F	0500P
2400/4160Y x 7200/12470Y x 7620/13200Y-120/240	2	AA		0010F		0025F	0050F	0075F	0100F	0167F	0250F		
2400/4160Y x 7200/12470Y x 7620/13200Y-240/480	2	AD				0025F	0050F	0075F	0100F	0167F	0250F		
2400/4160Y x 7200/12470Y x 7620/13200Y-277	2	AU				0025F	0050F	0075F	0100F	0167F	0250F	0333F	0500P
4160/7200Y-120/240	2	CA				0025G	0050G	0075G	0100G	0167G			
4160/7200Y-277	2	CU								0167G			
7200/12470Y-120/240	2	JA		0010F	0015F	0025F 0037F	0050F	0075F	0100F	0167F	0250F	0333F	0500P
7200/12470Y-240/480	2	JD				0025F	0050F	0075F	0100F	0167F	0250F	0333F	0500P
7200/12470Y-277	2	JU					0050F		0100F	0167F	0250F	0333F	0500P
7620/13200Y-120/240	2	YA		0010F		0025F	0050F			0167F			
7620/13200Y-240/480	2	YD									0250F		
7620/13200Y-277	2	YU									0250F		
7620/13200Y-2400/4160Y	2	YJ							0100F	0167F	0250F		
7970/13800Y-120/240	2	UA			0015F	0025F	0050F	0075F	0100F	0167F			
7970/13800Y-240/480	2	UD				0025F	0050F		0100F	0167F			
12470 GrdY/7200-120	1	MK	0001F										
13200 GrdY/7620-120	1	SK	0001F										
14400/24940Y-120/240	2	RA			0015G	0025G	0050G	0075G	0100G	0167G	0250G	0333G	0500G
14400/24940Y-240/480	2	RD				0025G	0050G	0075G	0100G	0167G		0333G	0500G
14400/24940Y-2400/4160Y	2	RJ				0025G	0050G	0075G	0100G	0167G		0333G	
14400/24940Y-7200/12470Y	2	RM					0050G	0075G	0100G	0167G		0333G	0500G
14400/24940Y-7620/13200Y	2	RO										0333G	0500G
14400/24940Y-277	2	RU				0025G	0050G		0100G	0167G	0250G	0333G	0500H
19920/34500Y-120/240	2	OA				0025G							
19920/34500Y-240/480	2	OD				0025G	0050G		0100G	0167G			
34500 GrdY/19920-120/240	1	VA		0010F	0015F	0025F	0050F	0075F	0100F	0167F			
34500-120	2	QK		0010G									
34500-120/240	2	QA				0025F	0050F		0100F	0167F	0250F		
34500-277	2	QU					0050F		0100F	0167F	0250F	0333F	0500P

REV	DATE	ENG	DESCRIPTION
1	04/01/23	DG	Converted to new format
0	09/21/12	DG	

DESIGN NOTE(s):

1. Transformers with voltage codes starting with B have side-wall mounted 4 kV primary bushings except for those with type code C and those 250 kVA and larger.

2. Type code C, F, and P transformers have tank mounted arresters. Type code G and H transformers do not have arresters.

3. Type code H and P transformers are platform mount transformers

4. Taps - Transformers are provided without taps except as follows:

   A. Transformers rated 2400, 4160, and 7200 volt primary 250 kVA and larger have two 2-1/2% taps above and two 2-1/2% taps below rated voltage. This applies to all units except dual and triple voltage transformers that have no taps.

   B. Transformers rated 19920 volt primary and higher have two 2-1/2% taps above and below rated voltage.

   C. BM (2400/4160Y) transformers have taps at 2520 / 2460 / 2400 / 2340 / 2280.

   D. RA, RD, RJ, RM, RO, & RU (14400/24940Y) transformers have taps at 14400 / 13800 /13200 /12870 /12540.

   E. UA & UD (7970/13800Y) transformers have taps at 7970 / 7795 / 7620 / 7410 / 7200.

   F. YA, YD, YU, & YJ (7620/13200Y) transformers have taps at 7811 / 7620 / 7430 / 7239 / 7049.

Table 2 - Three-Phase Transformers - Pole Mount

Stock Number by kVA								
Voltage Primary-Secondary	Primary Bushings	Voltage Code	30	45	75	150	300	500
4160Δ-208Y/120	3	EC		0045D	0075D	0150D	0300F	0500F
4160Y-240	3	DG				0150D	0300F	0500F
4160Δ-480Y/277	3	EF		0045F	0075F	0150F	0300F	0500F
12470Δ-208Y/120	3	LC	0030I	0045I	0075F	0150F	0300F	0500F
12470Y-240	3	KG	0030I	0045I	0075F	0150F	0300F	0500F
12470Δ-480Y/277	3	LF	0030F	0045F	0075F	0150F	0300F	0500F
13200Δ-208Y/120	3	NC					0300F	0500F
13200Δ-480Y/277	3	NF			0075F	0150F	0300F	0500F

DESIGN NOTE(s):

5. Transformers with 4160 primary voltage have side-wall mounted 4 kV primary bushings.

6. All three-phase transformers have tank mounted arresters.

7. Type code D and I are CSP transformers.

8. Taps -

   A. Transformers with 4160 and 12470 volt primary windings do not have taps.

   B. NC & NF (13200) transformers have taps at 14400 / 13800 / 13200 / 12870 / 12540.

Table 3 - Three-Phase Transformers - Platform Mount									
Stock Number by kVA									
Voltage Primary-Secondary	Primary Bushings	Voltage Code	300	500	750	1000	1500	2000	2500
4160Δ-208Y/120	3	EC	0300P	0500P	0750P	1000P			
4160Y-240	3	DG			0750P	1000P			
4160Δ-480Y/277	3	EF		0500P	0750P	1000P	1500P	2000P	2500P
12470Δ-208Y/120	3	LC	0300P	0500P	0750P	1000P			
12470Y-240	3	KG	0300P	0500P	0750P	1000P			
12470Δ-480Y/277	3	LF	0300P	0500P	0750P	1000P	1500P	2000P	2500P
13200Δ-208Y/120	3	NC	0300P	0500P	0750P	1000P			
13200Δ-480Y/277	3	NF	0300P	0500P	0750P	1000P	1500P	2000P	2500P
34500Δ-480Y/277	3	QF		0500P	0750P	1000P	1500P	2000P	2500P

DESIGN NOTE(s):

9. All new platform mounted transformers have cover mounted primary bushings.

10. All new platform mounted transformers have tank mounted arresters.

11. Taps -

    A. Transformers with 4160 and 12470 volt primary windings 500 kVA and below do not have taps. Transformers 750 kVA and larger have two 2-1/2% taps above and below the rated primary voltage.

    B. NC & NF (13200) transformers have taps at 14400 / 13800 / 13200 / 12870 / 12540.

    C. QF (34500) transformers have taps at 36225 / 35363 / 34500 / 33638 / 32775.

REV	DATE	ENG	DESCRIPTION
1	04/01/23	DG	Converted to new format
0	09/21/12	DG	

Table 4 - Single-Phase Transformers - Pad Mount							
Stock Number by kVA							
Voltage Primary-Secondary	Voltage Code	25	50	75	100	167	250
4160 GrdY/2400-240/120	FR	0025X 0025Y	0050X 0050Y	0075X	0100X 0100Y	0167X	
4160 GrdY/2400 x 12470 GrdY/7200-240/120	WR	0025W 0025X 0025Y	0050W 0050X 0050Y	0075X	0100W 0100X 0100Y	0167W 0167X	
4160 GrdY/2400 x 12470 GrdY/7200 x 13200 GrdY/7620-240/120	ZR	0025X 0025Y	0050X 0050Y	0075X	0100X	0167X 0167Y	0250X
4160 GrdY/2400 x 12470 GrdY/7200 x 13200 GrdY/7620-480/240	ZZ	0025X		0075X 0075Y			
12470 GrdY/7200-240/120	MR	0025X	0050X 0050Y	0075X 0075Y	0100W 0100X	0167W 0167X 0167Y	
12470 GrdY/7200-480/240	MZ	0025X		0075X			
13200 GrdY/7620-240/120	SR	0025X	0050X	0075X	0100X		
13200 GrdY/7620-480/240	SZ			0075X 0075Y			
13800 GrdY/7970-240/120	TR	0025X	0050X	0075X	0100X	0167X	
14400/24940Y x 24940 GrdY/14400-240/120	RR		0050X				
34500 GrdY/19920-240/120	VR	0025X	0050X		0100X 0100Y	0167X	

DESIGN NOTE(s):

12. All single-phase padmount transformers have a non-field replaceable weak-link fuse or isolation link to clear the transformer from the circuit in the event of a winding failure.

13. Type code X are high-profile transformers. Starting in 4th quarter of 2015, these transformers are equipped with a Bay-O-Net fuse in series with an isolation link. Prior to this time, these transformers were equipped with a secondary breaker in series with a weak link fuse. Exception: ZRxxxxX transformers have always been equipped with a Bay-O-Net fuse in series with an isolation link.

14. Type code Y are low-profile transformers used primarily in Illinois. They are equipped with a Bay-O-Net fuse in series with an isolation link. Exception: VRxxxxY transformers are equipped with a Bay-O-Net fuse in series with a current-limiting fuse. Type Y transformers are no longer purchased but may be used for like-kind replacement until stock is depleted.

15. Type code W are high-profile transformers used in Illinois. They are equipped with only a non-field replaceable weak-link fuse.

16. Taps - All transformers are furnished without taps except as follows:
TR (13800 Grd Y/ 7970) transformers have taps at 7970 / 7795 / 7620 / 7410 / 7200.
VR (34500 Grd Y/ 19920) transformers have taps at 20916 / 20418 / 19920 / 19422 / 18924.

17. RR transformers have four primary bushings and a switch to allow operation on either 14400 Delta or 24490 GrdY circuits.

Table 5 - Three-Phase Transformers - Pad Mount											
Stock Number by kVA											
Voltage Primary-Secondary	Voltage Code	75	150	300	500	750	1000	1500	2000	2500	3000
4160Δ-208Y/120	EC	0075M	0150L 0150M	0300L 0300M		0750M	1000M				
4160Δ-480Y/277	EF		0150M	0300L	0500M		1000M	1500M 1500Z		2500M 2500Z	
4160 GrdY/2400 x 12470 GrdY/7200-208Y/120	WC	0075L 0075M	0150L 0150M	0300L 0300M	0500M	0750M	1000M				
4160 GrdY/2400 x 12470 GrdY/7200-480Y/277	WF		0150L 0150M	0300L 0300M	0500M	0750M	1000M	1500M	2000M		
4160 GrdY/2400 x 13200 GrdY/7620-208Y/120	ZC	0075A 0075L	0150A 0150L	0300A 0300L	0500A 0500L						
4160 GrdY/2400 x 13200 GrdY/7620-480Y/277	ZF	0075A 0075L	0150A 0150L	0300A 0300L	0500A 0500L						
4160Y x 13200Y-240Δ/120 Midtap	ZQ	0075A 0075L	0150A 0150L	0300A 0300L	0500A 0500L	0750A		1500M			
12470Δ-208Y/120	LC	0075L 0075M	0150L 0150M	0300L 0300M	0500L 0500M	0750L 0750M	1000L 1000M				
12470Δ-480Y/277	LF		0150L 0150M	0300L 0300M	0500L 0500M	0750L 0750M	1000L 1000M	1500M	2000M	2500M	
12470 GrdY/7200-208Y/120	MC	0075L 0075M	0150L 0150M	0300L 0300M	0500L 0500M	0750L 0750M	1000L 1000M				
12470 GrdY/7200-480Y/277	MF		0150L 0150M	0300L 0300M	0500L 0500M	0750L 0750M	1000L 1000M	1500L 1500M	2000M	2500L 2500M	
12470 GrdY/7200 4160 GrdY/2400	MX								2000M		3000M
12470Y-240Δ/120 Midtap	KQ		0150L	0300L	0500L	0750L	1000L				
13200Δ-208Y/120	NC		0150M	0300M	0500M	0750M	1000M				
13200Δ-480Y/277	NF		0150M	0300M	0500M	0750M	1000M	1500M	2000M	2500M	
13200Δ-4160 GrdY/2400	NX				0500M						3000M
13200 GrdY/7620-208Y/120	SC	0075A 0075L	0150A 0150L	0300A 0300L	0500A 0500L	0750A					
13200 GrdY/7620-480Y/277	SF	0075A 0075L	0150A 0150L	0300A 0300L	0500A 0500L	0750A 0750L	1000A 1000L	1500M	2000M	2500M	
13200Y-240Δ/120 Midtap	HQ	0075A 0075L	0150A 0150L	0300A 0300L	0500A 0500L						
13200 GrdY/7620-4160 GrdY/2400	SX			0300A 0300L	0500A 0500L	0750A 0750L	1000A 1000L	1500M	2000M	2500M	
34500Δ-208Y/120	QC				0500L	0750L					
34500Δ-480Y/277	QF				0500L	0750L	1000L	1500L 1500M	2000M	2500L 2500M	3000M
34500Δ-4160 GrdY/2400	QJ									2500M	
34500Δ-12470 GrdY/7200	QM									2500M	
34500 GrdY/19920-208Y/120	VC			0300L	0500L	0750L					
34500 GrdY/19920-480Y/277	VF				0500L	0750L	1000L	1500L		2500L	

REV	DATE	ENG	DESCRIPTION
1	04/01/23	DG	Converted to new format
0	09/21/12	DG	

DESIGN NOTE(s):

18. Type code A transformers are radial feed. They are equipped with Bay-O-Net fuses.

19. Type code M transformers are radial feed. They do not have fuses.

20. Type code L transformers are loop feed. They are equipped with Bay-O-Net fuses. Exception: See Note 24.

21. Type code Z transformers are live-front radial feed. They do not have fuses. **THESE TRANSFORMERS ARE NOT TO BE INSTALLED NEW. THEY ARE ONLY ALLOWED IF AVAILABLE FOR LIKE-KIND REPLACEMENT.**

22. Voltage code EF and WF transformers 1500 kVA and larger are equipped with 15 kV, 600 Amp non-loadbreak bushings.

23. QFxxxxM, QJxxxxM, and QMxxxxM transformers are quipped with 35 kV, 600 Amp non-loadbreak bushings.

24. All VCxxxxL, VFxxxxL, QCxxxxL, and QFxxxxL transformers are equipped with 35 kV, 200 Amp loadbreak bushings (large interface). These transformers are also equipped with clip style current limiting fuses instead of Bay-O-Net fuses.

25. VCxxxL and VFxxxxL **ARE NOT TO BE INSTALLED NEW. THEY ARE ONLY AVAILABLE FOR LIKE-KIND REPLACEMENT.**

26. MX, NX, and SX transformers 1500 kVA and larger are equipped with 15 kV, 600 Amp, non-loadbreak secondary bushings.

27. Taps -

    A. Transformers with 4160 and 12470 volt primary windings 500 kVA and below do not have taps. Transformers 750 kVA and larger have two 2-1/2% taps above and below the rated primary voltage.

    B. MX (12470 GrdY/7200) transformers have taps at 12782 / 12470 / 12158 / 11847 / 11535.

    C. NC, NF, and NX (13200Δ) transformers have taps at 14400 / 13800 / 13200 / 12870 / 12540.

    D. SC, SF, and SX (13200 GrdY/7620), and HQ (13200Y) transformers have taps at 13530 / 13200 / 12870 / 12540 / 12210.

    E. WC and WF (4160GrdY/2400 x 12470GrdY/7200) transformers manufactured prior to 2022 do not have taps. Starting in 2022, WC1000M, WF1000M, WF1500M, and WF2000M transformers are manufactured with taps on the 4160 winding at 4368 / 4264 / 4160 / 4056 / 3952.

    F. ZC and ZF (4160GrdY/2400 x 13200GrdY/7620) and ZQ (4160Y x 13200Y) transformers have taps on the 13200 winding at 13530 / 13200 / 12870 / 12540 / 12210.

    G. QC, QJ, QF, and QM (34500Δ), and VC and VF (34500 GrdY/19920) transformers have taps at 36225 / 35363 / 34500 / 33638 / 32775.

28. Secondary Supports -

    A. Transformers with 240Δ/120 Midtap and 208Y/120 volt secondary 500 kVA and larger are equipped with secondary bushing spade terminal supports.

    B. Transformers with 480Y/277 volt secondary 750 kVA and larger are equipped with secondary bushing spade terminal supports.

Table 6 - Three-Phase Transformers - Network						
Stock Number by kVA						
Voltage Primary-Secondary	Voltage Code	500	750	1000	1500	2000
13200Δ-216Y/125	HB	0500S	0750S	1000S		
13200Δ-480Y/277	NF	0500S	0750S	1000S		
13800Δ-216Y/125	PB	0500S	0750S			
13800Δ-480Y/277	PF			1000S	1500S	2000S
14400Δ-216Y/125	UB	0500S		1000S		
14400Δ-480Y/277	UF			1000S	1500S	2000S

DESIGN NOTE(s):

29. Voltage code HB and NF transformers are used in Bloomington and Decatur, IL.

30. Voltage code PB and PF transformers are used in St. Louis, MO.

31. Voltage code UB and UF transformers are used in Peoria, IL.

32. Taps -
    A. HB and NF (13200Δ) transformers have taps at 13200 / 12870 / 12540 / 12210 / 11880.
    B. PB and PF (13800Δ) transformers have taps at 14490 / 14145 / 13800 / 13455 / 13110.
    C. UB and UF (14400Δ) transformers have taps at 14400 / 14040 / 13680 / 13320 / 12960.

Table 7 - Three-Phase Transformers - Commercial Subsurface						
Stock Number by kVA						
Voltage Primary-Secondary	Voltage Code	150	225	300	500	750
12470Y/7200-208Y/120	MC	0150V	0225V	0300V	0500V	0750V
12470Y/7200-480Y/277	MF				0500V	0750V
4160Y/2400 x 12470Y/7200-208Y/120	WC	0150V		0300V	0500V	0750V
4160Y/2400 x 12470Y/7200-480Y/277	WF				0500V	0750V

DESIGN NOTE(s):

33. Commercial Subsurface Transformer are only used in Champaign, Galesburg, and Ottawa, IL.

34. Taps - Commercial Subsurface Transformers do not have taps.

REV	DATE	ENG	DESCRIPTION
1	04/01/23	DG	Converted to new format
0	09/21/12	DG	

1. Transformer Installations

Details of transformer installations will vary based on the number of phases, voltage, whether delta or wye connected, kVA rating, whether common or isolated neutral, and grounding requirements. Some special considerations are detailed below and should be used in conjunction with the other transformer construction standards.

2. Transformer Removals

Transformers removed from service shall be either retained at the district for future use or locally retired.

A. Guidelines for Retaining a Transformer for Reuse

a. The transformer was known to be working when removed and is less than 20 years old.
b. The transformer is a current design.
c. The transformer is in good condition.
   i. There are no broken bushings.
   ii. It is not leaking oil.
   iii. The paint is okay, very little rust present.
   iv. Tanks are not badly dented and hanger brackets are not broken.
   v. If a padmount, it has a penta head bolt and the integrity of the cabinet security has not been compromised.

B. Operations to be Performed Prior to Reuse

a. Replace porcelain arrester with polymer arrester on overhead transformers.
b. On CSP transformers, remove all leads and check the low voltage breaker(s) operation and continuity.
c. On overhead transformers with cover mounted bushings, install wildlife guard(s). Refer to DCS **05 12 10 01**.
d. On CSP transformers, reset the emergency overload lever to the normal position and install a meter seal.

3. Grounding of Transformer Tanks

On all transformer installations, tanks shall be connected to the pole ground by connecting a #6 or #4 CU grounding wire from the pole ground to the tank grounding lug provided for this purpose.

All single-phase transformers with two primary bushings, which are intended for phase to neutral connection, shall be connected to the primary neutral (See DCS **13 00 06 02**). Also, all single-phase transformers having 120/240 volt secondaries with solderless connector type secondary bushings shall have a grounding strap between the secondary neutral bushing and the transformer tank. However, where grounding rules require the interconnection of the secondary and arrester ground leads through a spark gap the grounding strap shall be removed (See DCS **13 00 06 06**).

All transformer tanks shall be regarded as being "hot" when not positively known to be effectively grounded.

4. Single-Phase Delta Primary Systems

When a transformer is used on a delta primary system, lightning arresters must be attached to each primary bushing (See DCS **13 00 06 06**).

5. Three-Phase Service

Three-phase service where the secondary voltage is 480Y/277 or 480 volts may be provided using three-phase transformers or by banking three single-phase transformers.

Three single-phase conventional transformers shall be banked for 120/208Y or 240 volt service.

CSP transformers should not be banked.

CAUTION:
If single-phase transformers having 120/240 volt secondaries are banked for three-phase corner grounded delta, ungrounded delta, or grounded wye service, the grounding strap between the secondary neutral bushing and the tank must be removed from all transformers. If not, circulating currents may, under some conditions, be set up through one half the secondary coil of adjacent transformers, transformer tanks, and ground.
See DCS **13 00 07 04**, **13 00 07 05**, **13 00 07 08**, and **13 00 07 09**.

If single-phase transformers having 120/240 volt secondaries are banked for three-phase mid-tap grounded delta service, the grounding strap between the secondary neutral bushing and the tank must be left in-place on the middle/lighter transformer (transformer serving the single-phase 120/240 volt load).
See DCS **13 00 07 10**, **13 00 07 11**, **13 00 07 12**, and **13 00 07 13**.

6. "Open" Transformer Banks

The open wye-open delta and open delta-open delta type transformer banks are used to supply power to small three-phase customers in addition to taking care of their lighting requirements. These customers require a four-wire service and only two transformers. When connecting two transformers together to form a transformer bank, the bank will be referred to as an "open bank".

The open wye-open delta bank may be used where three-phase service is required but only two primary phases are present. The "open bank" may also be used in emergencies where one transformer in a bank of three fails and service must be restored immediately.

When an "open bank" is used, the capacity is only 57% of the three-phase rating of a closed bank of three transformers. If an "open bank" is used in an emergency situation, measures must be taken to reduce load. Additionally, the failed transformer should be replaced as soon as possible.

7. Paralleling Transformers

No attempt should be made to parallel a three-phase transformer with a bank of three single-phase transformers. Differences in phase shifts (angular displacements) will not permit paralleling.

8. 480 Volt Three-Wire Service From 480Y/277 Volt Four-Wire Transformer
See DCS **13 00 01 01** (Section 7), **51 12 00 **** (Note 11), and **51 12 02 **** (Note 12).

9. Elimination Of Stray Voltages

Relatively low levels of neutral-to-earth (stray) voltage may produce adverse effects in especially sensitive installations, such as dairy farms. If the neutral-to-earth voltage on the customer's premise cannot be reduced by conventional methods such as tightening connectors, replacing connectors, or adding ground rods, a neutral isolation device may be utilized. See DCS **13 00 06 08**.

1. Secondary Leads

The following copper lead sizes shall be used for connections from overhead transformer secondary terminals to a secondary, a secondary bus, or an individual secondary service. Aluminum leads shall not be used. Exception: If a transformer installation serves only one customer, aluminum service conductor can be extended to the transformer secondary terminals provided pin terminal connectors with copper studs are used.

Where a three-phase installation consists of a bank of three single-phase transformers the lead sizes between the transformers secondary terminals shall be determined by the size of the individual transformers, their single-phase voltage, and the change-out overload rating. The lead size from the transformers to the secondary/service bus shall be determined by the size of the bank, the three-phase voltage, and the change-out overload rating.

For 208Y/120 Volt and 480Y/277 Volt banks, the size of both the transformer-to-transformer and transformer-to-secondary/service bus leads are the same. For 240 Volt and 480 Volt delta banks, the size of the transformer-to-transformer leads can be smaller than the transformer-to-secondary/service bus leads. The three-phase tables in this standard reflect the preceding sizing criteria. For paralleled transformers, the transformer-to-transformer lead size is based on the kVA of the largest single transformer. The transformer-to-secondary lead size is based on the total kVA of the paralleled transformers. Tables of lead sizes for paralleling transformers are not provided since it is a non-standard application to be used only in emergency situations.

Where customer's circuit is over 50 Amps and involves more than one metallic duct, connections should not be made unless each of the phase wires and neutral are in each duct. This is an NEC requirement to avoid heating the metallic ducts by induced currents.

167 kVA and larger transformers with 120/240 and 240/480 Volt secondary have four (4) secondary bushings so that the secondary windings can be externally connected in series or parallel depending on the application. If the windings are to be connected in series, the external connection wire size must match the phase wire size (if single-phase) or transformer-to-transformer wire size (if banked three-phase delta). If the windings are to be connected in parallel, the external connection wire size can be one-half (1/2) the phase wire size (if single-phase or banked three-phase wye).

Table 1.1 Single−Phase 120/240 Volt 3−Wire and 240 Volt 2−Wire			
	Cross−Linked Polyethylene Covered Copper Wire		
	Size (AWG or KCMIL)		
Transformer kVA	Phase	Neutral	Stock Number
15 & Smaller	#6	#6	18 51 021
25	#2	#2	18 51 019
37−1/2	1/0	1/0	18 51 024
50	4/0	4/0	18 51 023
75	350	350	18 51 052
100	500	500	18 51 022
167	2−350	2−350	18 51 052
200	2−500	2−500	18 51 022
250	2−500	−	18 51 022
333	2−750	−	18 51 020

Table 1.2 Single−Phase 120 Volt 2−Wire and 120/240 Volt With Paralleled Windings		
Transformer kVA	Cross−Linked Polyethylene Covered Copper Wire	
Single−Phase ◇1◇	Size (AWG or KCMIL)	Stock Number
15 & Smaller	#2	18 51 019
25	1/0	18 51 024
37−1/2	4/0	18 51 023
50	350	18 51 052
75	500	18 51 022
100	2−350	18 51 052
167	2−750	18 51 020

DESIGN NOTE(s):

◇1.◇ See Table 1.5 for three-phase, 208Y/120 Volt secondary lead sizes.

REV	DATE	ENG	DESCRIPTION
11	04/01/23	DG	Converted to new format
10	09/09/15	DG	

Table 1.3 Single−Phase 480 Volt 2−Wire		
Transformer kVA	Cross−Linked Polyethylene Covered Copper Wire	
	Size (AWG or KCMIL)	Stock Number
37−1/2 & Smaller	#6	18 51 021
50	#2	18 51 019
75	1/0	18 51 024
100	1/0	18 51 024
167	350	18 51 052
200	500	18 51 022
250	500	18 51 022
333	750	18 51 020

Table 1.4 Three−Phase 240 Volt			
Transformer or Bank kVA	Cross−Linked Polyethylene Covered Copper Wire		
	Size (AWG or KCMIL)		Stock Number
	Transformer to Transformer ◇2◇	Transformer to Secondary/Service	
30 & Smaller	#6	#6	18 51 021
45	#2	#2	18 51 019
75	1/0	1/0	18 51 024
112−1/2	4/0	4/0	18 51 023
150	4/0	4/0	18 51 023
225	500	500	18 51 022
300	1−350	2−350	18 51 052
500	1−500	2−500	18 51 022
750	2−750	2−750	18 51 020
1000	2−750	3−750	18 51 020

DESIGN NOTE(s):

◇2.◇ Applicable only to a bank of single-phase transformers

Table 1.5 Three−Phase 208Y/120 Volt 4−Wire			
	Cross−Linked Polyethylene Covered Copper Wire		
	Size (AWG or KCMIL)		
Transformer or Bank kVA	Phase ◇3◇	Neutral ◇4◇	Stock Number
30 & Smaller	#6	#6	18 51 021
45	#2	#2	18 51 019
75	1/0	1/0	18 51 024
150	350	350	18 51 052
225	500	500	18 51 022
300	2−350	2−350	18 51 052
500	2−750	2−750	18 51 020
750	3−750	3−750	18 51 020
1000	3−750	3−750	18 51 020

DESIGN NOTE(s):

◇3.◇ Wire size is the same for the Transformer-to-Transformer (banked single-phase transformers) and Transformer-to-Secondary/Service leads.

◇4.◇ Full-size neutrals are required to accommodate the harmonic currents associated with increased usage of electronic office equipment.

Table 1.6 Three−Phase 480 Volt			
	Cross−Linked Polyethylene Covered Copper Wire		
	Size (AWG or KCMIL)		
Transformer or Bank kVA	Transformer to Transformer ◇5◇	Transformer to Secondary/Service	Stock Number
75 & Smaller	#2	#2	18 51 019
112−1/2	#2	#2	18 51 019
150	1/0	1/0	18 51 024
225	4/0	4/0	18 51 023
300	4/0	4/0	18 51 023
500	500	500	18 51 022
750	750	750	18 51 020
1000	1−500	2−500	18 51 022
1500	2−750	2−750	18 51 020
2000	2−750	3−750	18 51 020
2500	2−750	3−750	18 51 020

DESIGN NOTE(s):

◇5.◇ Applicable only to a bank of single−phase transformers.

Table 1.7 Three−Phase 480Y/277 Volt 4−Wire			
	Cross−Linked Polyethylene Covered Copper Wire		
	Size (AWG or KCMIL)		
Transformer or Bank kVA	Phase ◇6◇	Neutral ◇7◇	Stock Number
75 & Smaller	#2	#2	18 51 019
112−1/2	#2	#2	18 51 019
150	1/0	1/0	18 51 024
225	4/0	4/0	18 51 023
300	4/0	4/0	18 51 023
500	500	500	18 51 022
750	750	750	18 51 020
1000	2−500	2−500	18 51 022
1500	2−750	2−750	18 51 020
2000	3−750	3−750	18 51 020
2500	3−750	3−750	18 51 020

DESIGN NOTE(s):

◇6◇ Wire size is the same for the Transformer-to-Transformer (banked single-phase transformers) and Transformer-to-Secondary/Service leads.

◇7◇ Full-size neutrals are required to accommodate the harmonic currents associated with increased usage of electronic office equipment.

REV	DATE	ENG	DESCRIPTION
11	04/01/23	DG	Converted to new format
10	09/09/15	DG	

Table 1.8 Three−Phase 240 Delta/120 Volt Grounded Center Tap ◇8◇			
Transformer Bank kVA	Cross−Linked Polyethylene Covered Copper Wire		
	Size (AWG or KCMIL)		
	Transformer to Transformer	Transformer to Secondary/Service ◇9◇	Stock Number
3−10	#6	#6	18 51 021
3−15	#2	#2	18 51 019
3−25	1/0	1/0	18 51 024
3−50	4/0	4/0	18 51 023
3−100	1−350	2−350	18 51 052
2−10 & 1−25	#2	#2	18 51 019
2−25 & 1−50	1/0	1/0	18 51 024
2−50 & 1−100	350	350	18 51 052
2−100 & 1−167	1−350	2−350	18 51 052
2−167 & 1−250	1−500	2−500	18 51 022
3−167	1−500	2−500	18 51 022
3−250	2−750	2−750	18 51 020
3−333	2−750	3−750	18 51 020

DESIGN NOTE(s):

◇8◇ Bank of three single-phase transformers. This table is provided for maintenance of existing installations.

◇9◇ Center tap neutral is the same size as the Transformer-to-Secondary/Service phase conductors.

REV	DATE	ENG	DESCRIPTION
11	04/01/23	DG	Converted to new format
10	09/09/15	DG	

Table 1.9 Three−Phase 120/240 Volt Open Wye−Open Delta, Grounded Center Tap ◇10◇			
	Cross−Linked Polyethylene Covered Copper Wire		
	Size (AWG or KCMIL)		
Transformer Bank kVA	Transformer to Transformer ◇11◇	Transformer to Secondary/Service ◇12◇	Stock Number
2−10	#6	#6	18 51 021
1−25 & 1−10	#2	#2	18 51 019
1−50 & 1−10	1/0	1/0	18 51 024
2−25	#2	#2	18 51 019
1−50 & 1−25	1/0	1/0	18 51 024
1−100 & 1−25	350	350	18 51 052
2−50	1/0	1/0	18 51 024
1−100 & 1−50	350	350	18 51 052
1−167 & 1−50	350	2−350	18 51 052

DESIGN NOTE(s):

◇10◇ This transformer connection has one 208 V phase-to-neutral “wild” phase, and two 120 V phase-to-neutral “lighter” phases. All phase-to-phase voltages are 240 V.

◇11◇ Transformer-to-transformer and “wild” phase transformer-to-secondary/service leads are the same size.

◇12◇ Transformer-to-Secondary/Service “lighter” phase and center tap neutral leads are the same size.

2. Primary Phase Leads

Table 2.1 Single−Phase and Three−Phase 2400−4160 Volt Transformers With Cover Mounted Bushings			
Maximum KVA		Cross−Linked Polyethylene Covered Copper Wire Size	Stock Number
Single−Phase 2400V	Three−Phase 4160V		
333	1000	#4 CU, Solid ◇13◇	18 51 025
500	1500	#2 CU, 7 Strand	18 51 019
1000	2500	4/0 CU, 19 Strand	18 51 023

DESIGN NOTE(s):

◇13◇ Where long primary leads are required, a #2 or larger conductor shall be used for mechanical strength.

REV	DATE	ENG	DESCRIPTION
11	04/01/23	DG	Converted to new format
10	09/09/15	DG	

Table 2.2 Single-Phase and Three-Phase 2400-4160 Volt Transformers With Side-Wall Mounted Bushings			
Maximum KVA		EPR Covered Copper Wire Size	Stock Number
Single−Phase 2400V	Three−Phase 4160V		
167	500	#6 CU, 7 Strand − 5KV ◇13◇	18 53 011
250	750	#2 CU, 7 Strand − 5KV	18 53 018
333	1000	1/0 CU, 19 Strand − 5KV	18 53 022

Table 2.3 Single−Phase and Three−Phase 5000−15000 Volt Transformers With Cover Mounted Bushings			
Maximum KVA		Cross−Linked Polyethylene Covered Copper Wire Size	Stock Number
Single−Phase	Three−Phase		
500	2500	#4 CU, Solid ◇13◇	18 51 025

3. Primary Neutral Leads

A. Two Bushing Transformers

All single-phase, two bushing transformers, connected phase-to-neutral shall have the neutral bushing grounded twice. One of the grounding connections is from the neutral bushing to the grounded transformer tank. The second grounding connection is from the neutral bushing to the common neutral and is to be clearly separated from all other common neutral connections.

For all kVA sizes of 7.2 thru 19.9 kV transformers and 2.4 kV transformers thru 333 kVA, the grounding connections are made using a single piece of #4 soft−drawn solid covered copper wire (Stock #18 51 025) by extending the lead from the grounding boss on the transformer tank through the primary neutral bushing to the common neutral. Use a gradual sweep when taking the lead through the primary neutral bushing to the common neutral. See DCS **13 00 06 02**. For 500 kVA 2.4 kV transformers, use #2 CU (Stock #18 51 019) from the primary neutral bushing to the common neutral.

B. Single Bushing Transformers

All single-phase, single bushing transformers, connected phase-to-neutral shall have two separate grounding connections to the tank. One connection shall be made from the tank to the earth ground. The second connection shall be made from the tank to the common neutral and is to be clearly separated from all other common neutral connections. In all instances, this connection shall be made with #4 soft-drawn solid covered copper wire (Stock #18 51 025).

Table 1 - Single-Phase - Pole or Platform Mounted (1) 5kV and Below (Typical Values) Single-Voltage					
kVA Size	Height (Inches)		Width (Inches) (2)	Weight (Pounds)	Oil (Gal)
	Side Bushings	Cover Bushings (3)			
10	30	34	23	235	10
15	30	34	27	310	13
25	30	40	30	475	18
50	36	42	32	800	28
75	40	50	32	900	38
100	46	50	36	1100	50
167	50	54	38	1805	79
250	50	58	41	2360	95
333	58	66	41	2860	104
500	–	66	41	3215	104

Table 2 - Three-Phase - Pole Mounted (1) 5kV and Below (Typical Values)				
kVA Size	Height (Inches)	Width (Inches) (2)	Weight (Pounds)	Oil (Gal)
30	61	40	1450	71
45	61	40	1480	71
75	61	40	1830	81
150	61	40	1900	85
225	70	56	2500	90
300	70	56	3200	115
500	74	56	3800	150

DESIGN NOTE(s):

1. This table does not include step-up/step-down transformers.

2. Width includes cooling fins and tank mounted arresters in their extended positions.

3. Distance from upper support lug to HV terminal for cover mounted bushings is 15" ± 3".

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	10/25/16	DG	

Table 3 - Single-Phase - Pole or Platform Mounted ◇4◇ 7.2 Thru 14.4 kV (Typical Values) Single-Voltage				
kVA Size	Height (Inches) ◇6◇	Width (Inches) ◇5◇	Weight (Pounds)	Oil (Gal)
1	26	15	110	4
10	36	25	285	14
15	39	26	365	16
25	40	28	510	18
50	48	31	800	33
75	52	31	900	38
100	60	32	1120	66
167	60	39	1805	83
250	60	41	2360	95
333	75	52	2720	85
500	75	52	3060	98

Table 4 - Three-Phase - Pole Mounted ◇4◇ 12.47 Thru 13.8 kV (Typical Values)				
kVA Size	Height (Inches) ◇7◇	Width (Inches) ◇5◇	Weight (Pounds)	Oil (Gal)
30	65	40	1435	72
45	65	40	1500	72
75	65	40	1815	83
150	70	40	2275	91
225	70	56	2600	120
300	72	56	3125	125
500	85	56	4777	150

DESIGN NOTE(s):

◇4◇ This table does not include step-up/step-down transformers.

◇5◇ Width includes cooling fins and tank mounted arresters in their extended positions.

◇6◇ Thru 13.8 kV, distance from upper support lug to HV terminal is 15" ± 3". For 14.4 kV, distance from upper support lug to HV terminal is 16.5" ± 3" thru 167 kVA, and 19.5" ± 3" for 250 thru 500 kVA.

◇7◇ Distance from upper support lug to HV terminal is 15" ± 3".

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	10/25/16	DG	

Table 5 - Single-Phase - Pole or Platform Mounted ◇8◇ 19.9 and 34.5kV (Typical Values) Single-Voltage								
kVA Size	Height (Inches) ◇10◇		Width (Inches) ◇9◇		Weight (Pounds)		Oil (Gal)	
	19.9kV	34.5kV	19.9kV	34.5kV	19.9kV	34.5kV	19.9kV	34.5kV
10	44	48	29	32	380	685	17	32
15	44	–	32	–	435	–	18	–
25	44	49	32	32	500	685	18	36
50	50	58	34	42	815	1090	32	62
75	52	–	34	–	1255	–	42	–
100	55	62	34	42	1430	1890	56	85
167	55	70	36	47	1710	2200	58	94
250	–	66	–	48	–	2610	–	95
333	–	74	–	48	–	2770	–	105
500	–	82	–	48	–	5650	–	125

Table 6 - Single-Phase - Pole Mounted ◇8◇ Double and Triple Voltage (Typical Values)				
kVA Size	Height (Inches) ◇11◇	Width (Inches) ◇9◇	Weight (Pounds)	Oil (Gal)
10	36	27	485	20
15	37	27	390	18
25	42	27	500	23
50	46	31	955	42
75	54	32	1425	42
100	54	34	1430	64
167	58	39	1970	86
250	62	39	2415	93
333	66	41	2960	105
500	66	41	3505	105

DESIGN NOTE(s):

◇8◇ This table does not include step-up/step-down transformers.

◇9◇ Width includes cooling fins and tank mounted arresters in their extended positions.

◇10◇ Distance from upper support lug to HV terminal is 16.5" ± 3" thru 167 kVA and 19.5" ± 3" for 250 thru 500 kVA.

◇11◇ Distance from upper support lug to HV terminal is 15" ± 3".

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	10/25/16	DG	

Table 7 - Three-Phase - Platform Mounted 12 5 Thru 13.2kV (Typical Values)					
kVA Size	Height (Inches)	Width (Inches) 13	Depth (Inches) 13	Weight (Pounds)	Oil (Gals)
225	67	61	30	4040	241
300	67	61	32	4385	241
500	67	61	41	5500	241
750	75	75	49	8200	413
1000	75	77	49	9900	437
1500	78	81	49	10300	441
2000	89	81	49	13800	565
2500	89	93	51	17400	602

Table 8 - Three-Phase - Pad Mounted 12 5 Thru 13.2kV (Typical Values)					
kVA Size	Height (Inches)	Width (Inches) 14	Depth (Inches) 14	Weight (Pounds)	Oil (Gals)
75	62	74	50	3200	175
150	62	74	53	4000	175
300	68	74	60	8045	260
500	69	74	72	8270	316
750	74	76	68	8700	394
1000	74	76	72	12400	418
1500	77	80	81	13218	593
2000	80	92	86	17000	590
2500	80	97	92	17300	562

DESIGN NOTE(s):

12. This table does not include step-up/step-down transformers.

13. Width and depth dimensions include cooling fins and tank mounted arresters in their extended positions.

14. Width and depth dimensions include cooling fins. Refer to DCS **34 21 05 **** for pad requirements for these transformers.

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	10/25/16	DG	

Table 9 - Single-Phase - Pad Mounted 2.4 Thru 7.97kV (Typical Values)						
kVA Size	15 Type	Height (Inches)	Width (Inches) 16	Depth (Inches) 16	Weight (Pounds) 17	Oil (Gals)
25	I	32	36	35	1070	56
50	I	32	40	38	1330	75
75	I	32	40	42	2035	87
100	I	36	40	44	2035	104
167	I	42	40	45	2855	116
250	I	42	40	51	2855	120
25	II	24	34	34	680	36
50	II	24	34	36	840	40
75	II	24	34	38	1005	69
100	II	32	36	38	1300	69
167	II	32	36	44	1840	91

Table 10 - Single-Phase - Pad Mounted 19.9kV (Typical Values)						
kVA Size	15 Type	Height (Inches)	Width (Inches) 18	Depth (Inches) 18	Weight (Pounds)	Oil (Gals)
25	I	36	38	38	1295	81
50	I	36	38	39	1415	82
100	I	36	38	43	1815	97
167	I	42	38	45	2500	120

DESIGN NOTE(s):

15 Type I are also referred to as high-profile transformers. Type II are also referred to as low-profile transformers.

16 Width and depth dimensions include cooling fins where applicable. Refer to DCS **34 21 05 **** for pad requirements for these transformers.

17 Weights for Type I padmount transformers are based on WR (dual voltage transformers) or ZR (triple voltage transformers). Single voltage transformers will typically weigh less.

18 Width and depth dimensions include cooling fins where applicable. Use pad stock #12 06 163 for these transformers per DCS **34 21 04 ****.

Table 11 - Three-Phase - Platform Mounted 19 35kV (Typical Values)					
kVA Size	Height (Inches)	Width (Inches) 20	Depth (Inches) 20	Weight (Pounds)	Oil (Gals)
500	84	77	48	6635	385
750	88	81	52	8900	451
1000	88	81	54	9200	456
1500	88	84	77	10785	456
2000	96	100	62	14500	585
2500	105	110	70	16500	605

Table 12 - Three-Phase - Pad Mounted 19 35kV (Typical Values)					
kVA Size	Height (Inches)	Width (Inches) 21	Depth (Inches) 21	Oil (Gals)	Weight (Pounds)
300 22	67	84	62	590	9300
500 22	77	87	66	685	11700
750 22	77	87	68	710	13400
1000 22	77	87	73	745	14900
1500 23	77	89	86	960	17600
2000 24	77	92	86	755	13065
2500 23	77	96	96	970	21100
3000 24	77	100	96	835	17900

DESIGN NOTE(s):

19 This table does not include step-up/step-down transformers.

20 Width and depth dimensions include cooling fins and tank mounted arresters in their extended positions.

21 Width and depth dimensions include cooling fins, but do not include the fuse cabinet provided on loop-feed transformers. With the fuse cabinet, the width of a loop-feed transformer can be up to 117”. Refer to DCS **34 11 00 00** for pad requirements for these transformers.

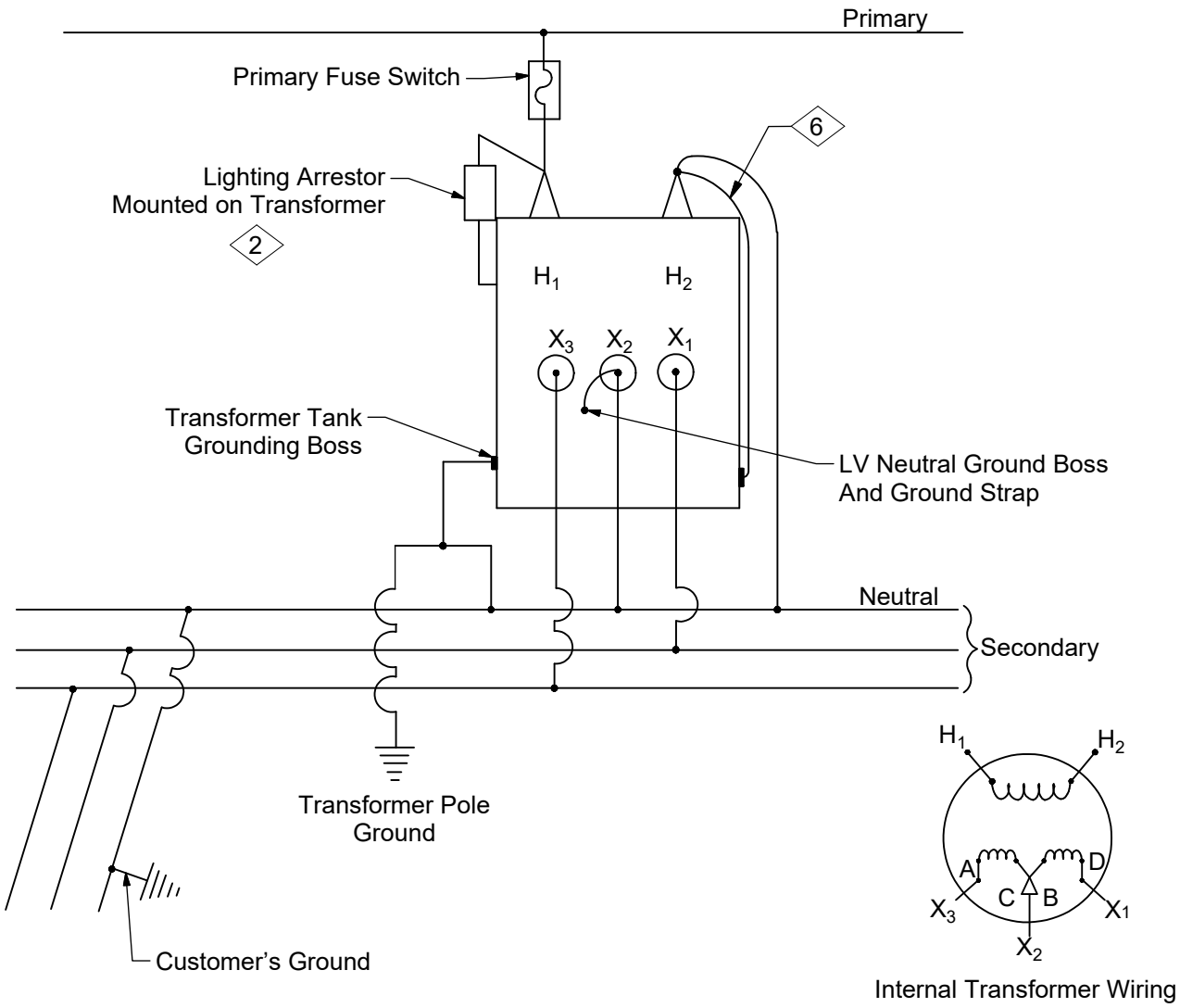
22 300 kVA thru 1000 kVA are only purchased as loop-feed.

23 1500 kVA and 2500 kVA are purchased in both radial-feed and loop-feed styles. These dimensions and weights are based on the loop-feed style.

24 2000 kVA and 3000 kVA transformers are only purchased as radial-feed.

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	10/25/16	DG	

120 / 240 or 240 / 480 Volt 3-Wire Service



CONSTRUCTION NOTE(s):

1. Some 2400/4160 Y transformers have sidewall mounted HV bushings.

2. Primary phase connection may be on either the H_1 or H_2 bushing, with the lightning arrester connected to the same bushing. The ground lead is then connected to the other "H" bushing.

3. See DCS **13 00 01 01** for information about conventional and completely self protected transformers (CSP). See DCS **13 00 03 01** for primary and secondary leads.

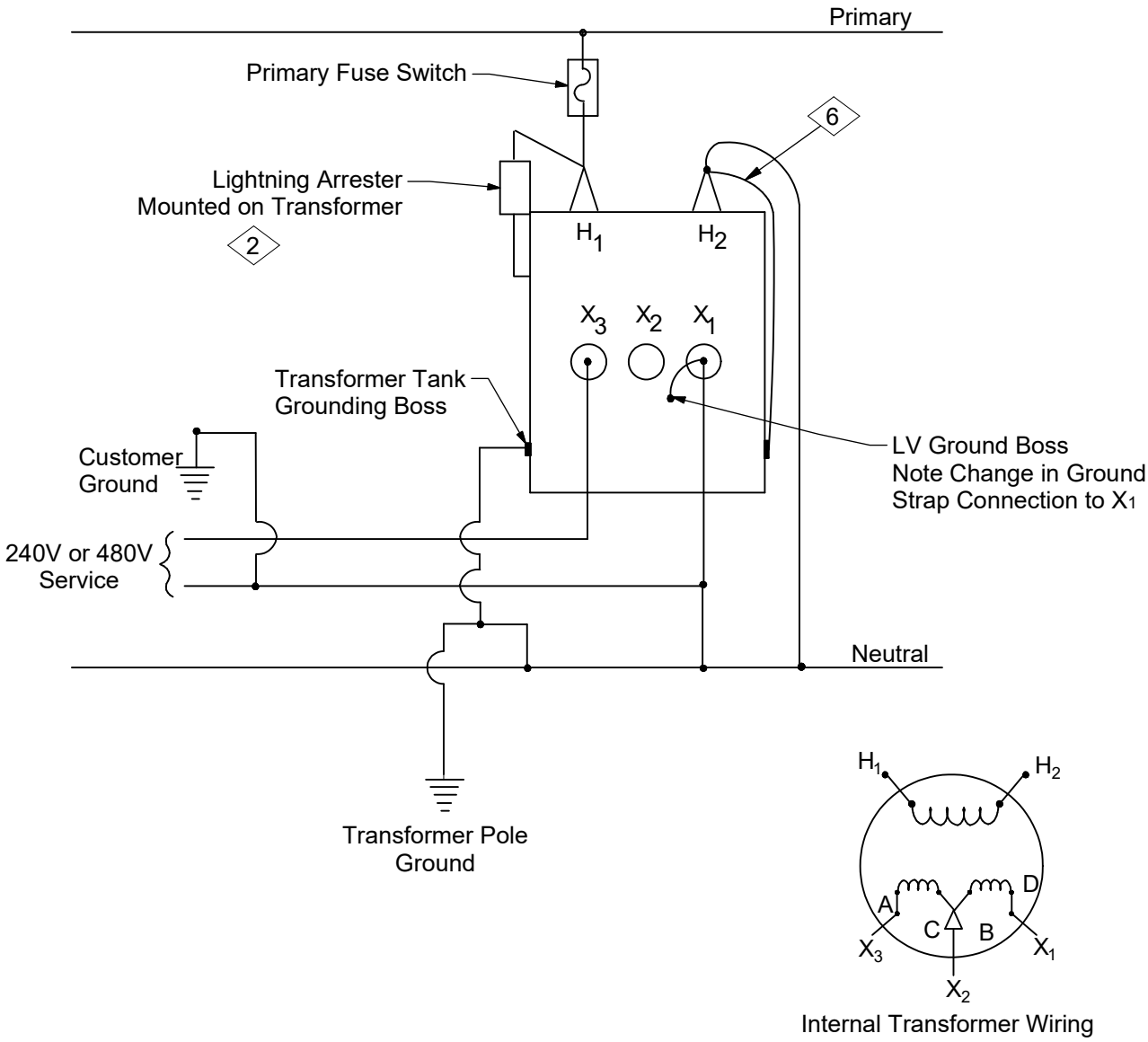
4. Transformers with a single HV bushing have one end of the winding grounded to the tank.

5. Transformer shown is additive polarity. Transformers 200 kVA and smaller with HV winding rated 8660 volts or less are additive polarity. All others are subtractive polarity. For subtractive polarity transformers, positions of the X_1 and X_3 bushings are reversed.

6. Extend lead from the ground boss through the primary neutral bushing to the common neutral. This lead should be clearly separated from all other common neutral connections (such as furthest connection from the pole or opposite side of pole from all other connections). Do not bend the primary neutral lead too severely. Use a gradual sweep when taking the lead to the common neutral.

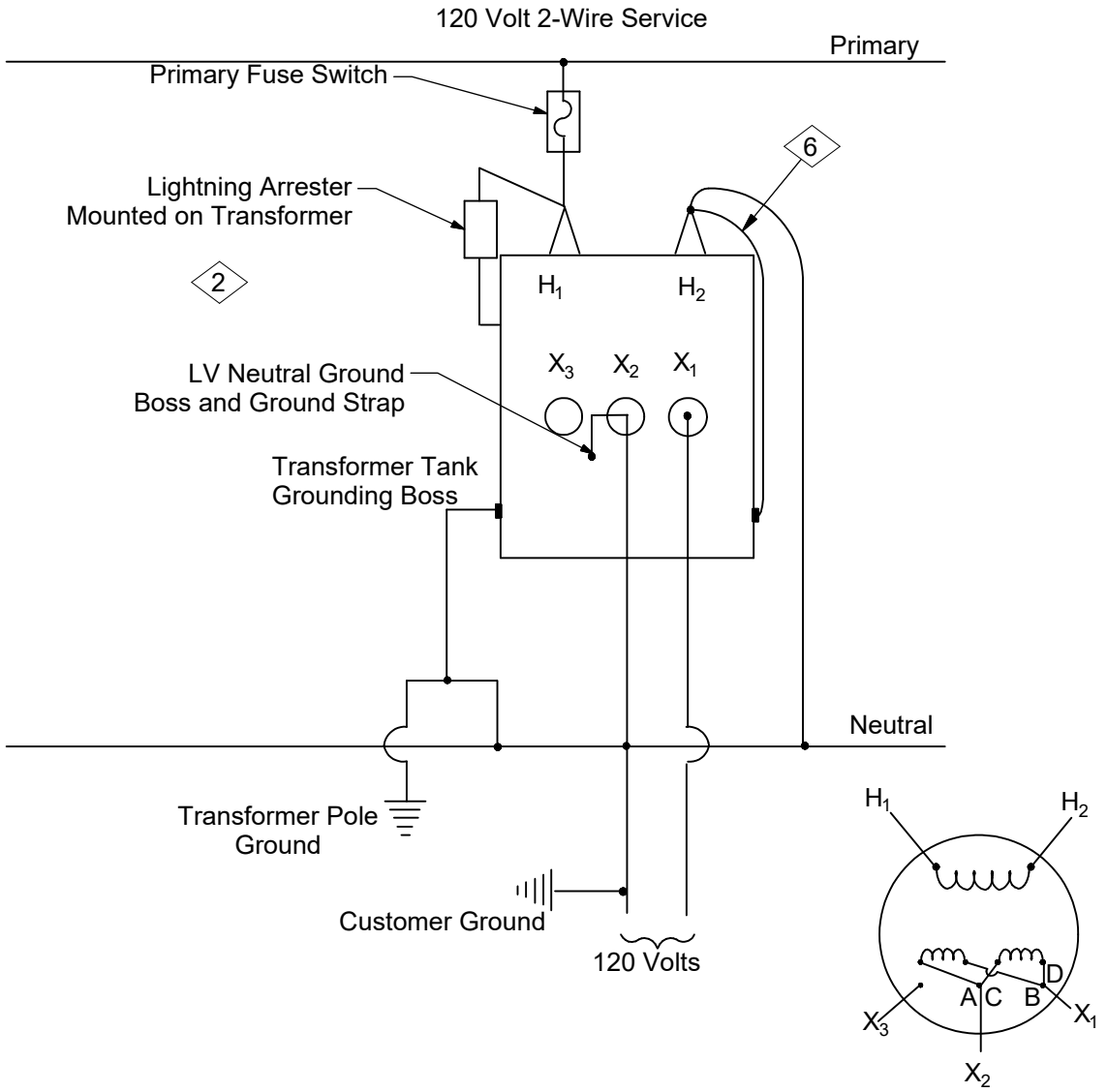
REV	DATE	ENG	DESCRIPTION
7	04/01/23	DG	Converted to new format
6	10/04/11	DG	

240 or 480 Volt 2-Wire Service



Internal Transformer Wiring

REV	DATE	ENG	DESCRIPTION
7	04/01/23	DG	Converted to new format
6	10/04/11	DG	



Internal Transformer Wiring
Requires Field Connection as Shown.
Winding X_3 X_2 is Reconnected as X_2 X_1

CONSTRUCTION NOTE(s):

1. 2400/4160 Y transformers may have sidewall mounted HV bushings.

2. Primary phase connection may be on either the H_1 or H_2 bushing, with the lightning arrester connected to the same bushing. The ground lead is then connected to the other "H" bushing.

3. See DCS **13 00 01 01** for information about conventional and completely self protected transformers (CSP). See DCS **13 00 03 01** for primary and secondary leads.

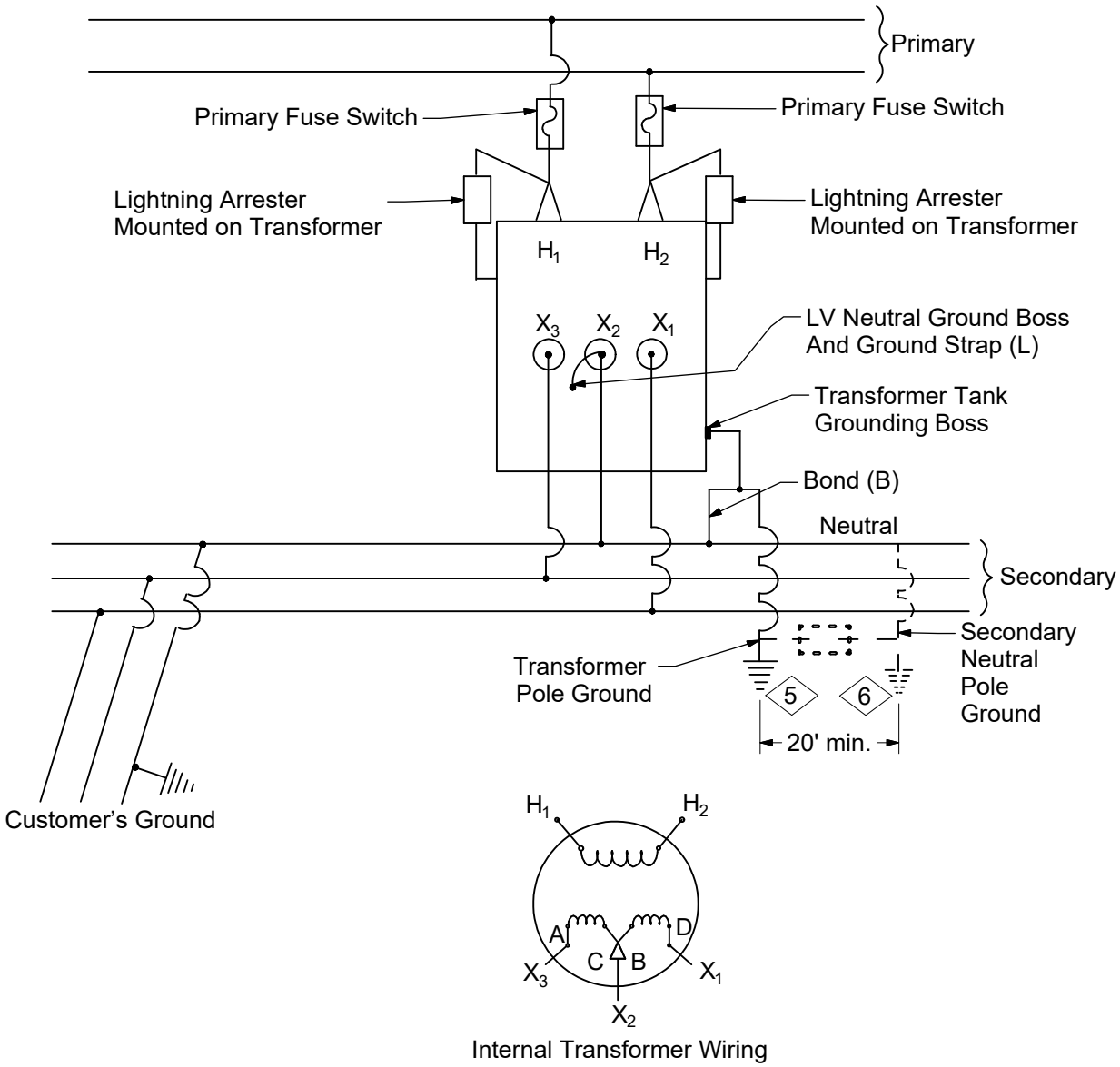
4. Transformers with a single HV bushing have one end of the winding grounded to the tank.

5. Transformer shown is additive polarity. Transformers 200 kVA and smaller with HV winding rated 8660 volts or less are additive polarity. All others are subtractive polarity. For subtractive polarity transformers, positions of X_1 and X_3 bushings are reversed.

6. Extend lead from the ground boss through the primary neutral bushing to the common neutral. This lead should be clearly separated from all other common neutral connections (such as furthest connection from the pole or opposite side of pole from all other connections). Do not bend the primary neutral lead too severely. Use a gradual sweep when taking the lead to the common neutral.

REV	DATE	ENG	DESCRIPTION
7	04/01/23	DG	Converted to new format
6	10/04/11	DG	

120 / 240 or 240 / 480 Volt 3-Wire Service



Internal Transformer Wiring

CONSTRUCTION NOTE(s):

1. 2400/4160Y or 4160 two wire transformers may have sidewall mounted HV bushings.
2. Lightning arresters must be connected to the H_1 and H_2 bushings.
3. See DCS **13 00 01 01** for information about conventional and completely self protected transformers (CSP). See DCS **13 00 03 01** for primary and secondary leads.
4. Transformer shown is additive polarity. Transformers 200 kVA and smaller with HV winding rated 8660 volts or less are additive polarity. All others are subtractive polarity. For subtractive polarity transformers, positions of X_1 and X_3 bushings are reversed.

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	10/04/11	DG	

5. Per NESC 097D1, the lightning arrester ground (Transformer Pole Ground) and secondary neutral can only be tied solidly together as shown if one or the other or both of the following requirements are met:

   A. The secondary neutral shall have at least one connection to a continuous metallic underground water pipe system.

   B. The secondary neutral shall be connected to a primary neutral or shield wire having not less than four ground connections in each mile of continuous line in addition to a ground connection at each individual service.

6. If the above requirements cannot be met, proceed as follows:

   A. Remove ground strap (L) and omit bond (B).

   B. Drive an additional ground rod for the secondary neutral not less than 20 ft. from the arrester ground rod and connect the ground lead through an isolation arrester (Stock #10 01 019) to the lightning arrester/transformer tank ground lead (shown dotted in figure).

   C. The secondary grounding conductor shall be insulated for 600V (use riser wire Stock #18 53 011).

   D. The secondary grounding conductor shall be buried 18" deep from the pole to the ground rod.

   E. Both ground leads must be covered with plastic moulding for a distance of 8 ft.from the ground.

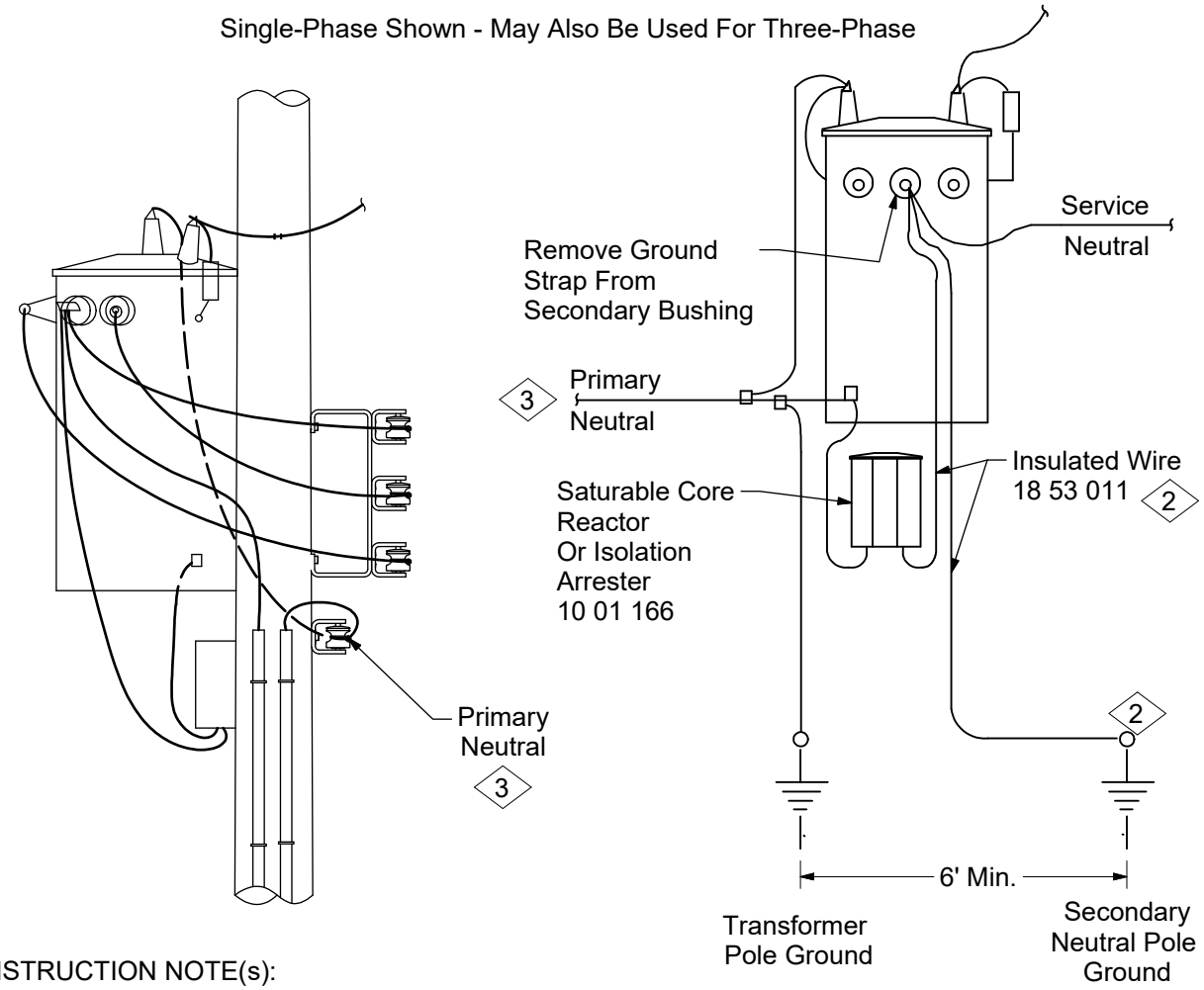
   F. The resistance of both grounds should not exceed 25 ohms.

7. If Communications needs to ground their messenger on this structure, they must bond ONLY to the Secondary Neutral Pole Ground.

DESIGN NOTE(s):

8. Information - Arrester (Stock #10 01 019) meets the NESC 097D1 requirement having a minimum 60 Hz flashover rating as the lessor of 2 times the primary circuit voltage or 10 kV.

Single-Phase Shown - May Also Be Used For Three-Phase



CONSTRUCTION NOTE(s):

1. Relatively low levels of neutral-to-earth (stray) voltage may produce adverse effects in especially sensitive installations, such as dairy farms. Usually stray voltages result from factors such as earth currents, ground electrode resistance, earth resistivity, or impedance of current carrying neutral conductors. If neutral-to-earth voltage on the customer's premise (as measured by Ameren personnel with customer's main disconnect in the open position, or with only 240 V loads connected) cannot be reduced to 1.0 volt AC or less across a 470 OHM 5% resistor by conventional methods such as tightening connectors, replacing connectors, or adding ground rods, a neutral isolation device may be utilized. **All options to eliminate stray voltages should be explored prior to installing either a saturable core reactor or an isolation arrester.**

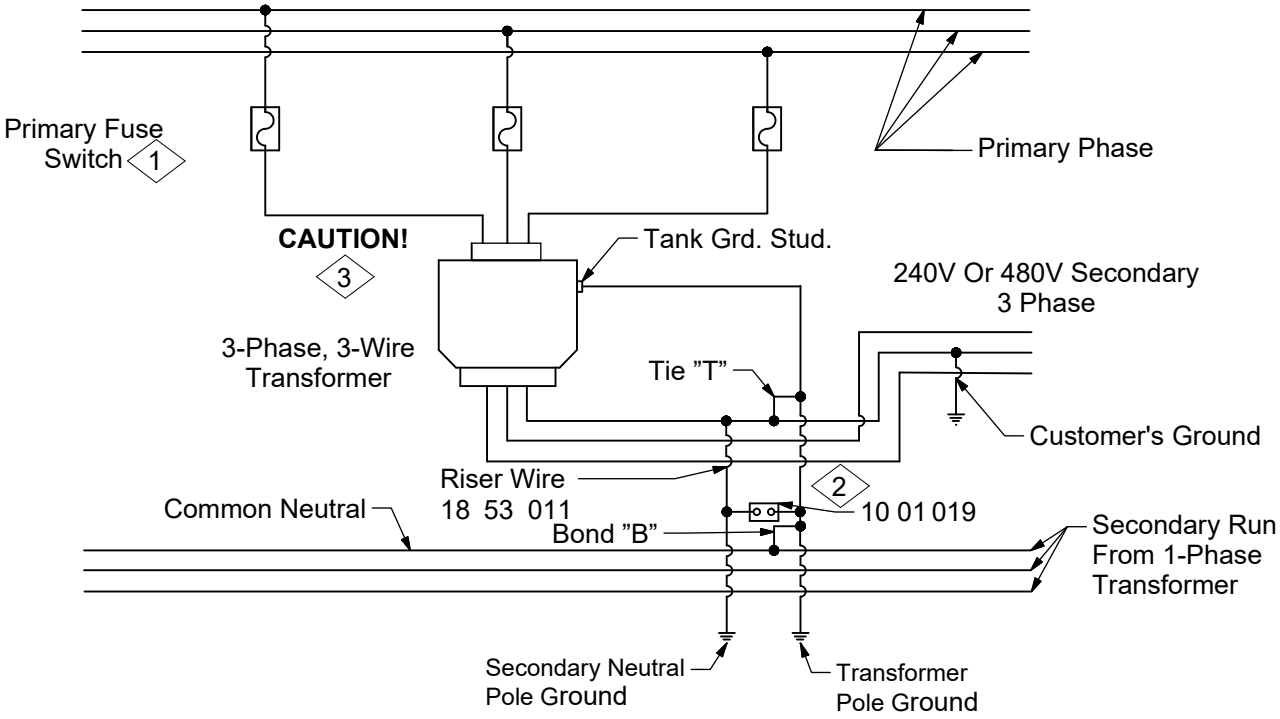
2. Rule 97D2 of the National Electrical Safety Code allows the primary and secondary neutrals of a multi-grounded system to be separated but interconnected through a spark gap or similar isolation device. The gap or device shall have a 60 Hz. breakdown voltage not exceeding 3 kV. Additionally, at least one other grounding connection on the secondary neutral shall be provided. This secondary ground rod shall be installed at least six feet from the primary ground rod. The secondary grounding conductor shall be insulated for 600 V, must be covered with plastic molding for a distance of 8 feet from the ground, and be buried a minimum of 18 inches deep to the ground rod. Resistance of the secondary ground should not exceed 25 ohms.

3. The system neutral must be connected to the grounded primary neutral bushing and the Transformer Pole Ground that connects the lightning arrester and transformer tank ground.

4. The reactor or isolation arrester ground must be completely isolated from other grounds.

5. Communications if present, must bond their messenger ONLY to the primary ground (Transformer Pole Ground) per NESC 97G.

REV	DATE	ENG	DESCRIPTION
2	04/01/23	DG	Converted to new format
1	06/24/11	DG	



CONSTRUCTION NOTE(s):

1. If installing CSP transformer, install fused switches as shown unless pole space does not allow and number of customers affected by transformer failure is deemed acceptable.

2. If a common neutral is not present omit bond "B" and tie "T" and install a second ground rod a minimum distance of 20 feet from the ground at the pole. Connect the lightning arrester/Transformer Pole Ground and Secondary Neutral Pole Ground together through an isolation arrester (Stock #10 01 019). The ground lead to the secondary ground rod shall be insulated for 600 V (use Stock #18 53 011). Both ground leads must be covered with plastic molding for a distance of 8 feet from the ground. The resistance of both grounds should not exceed 25 ohms.

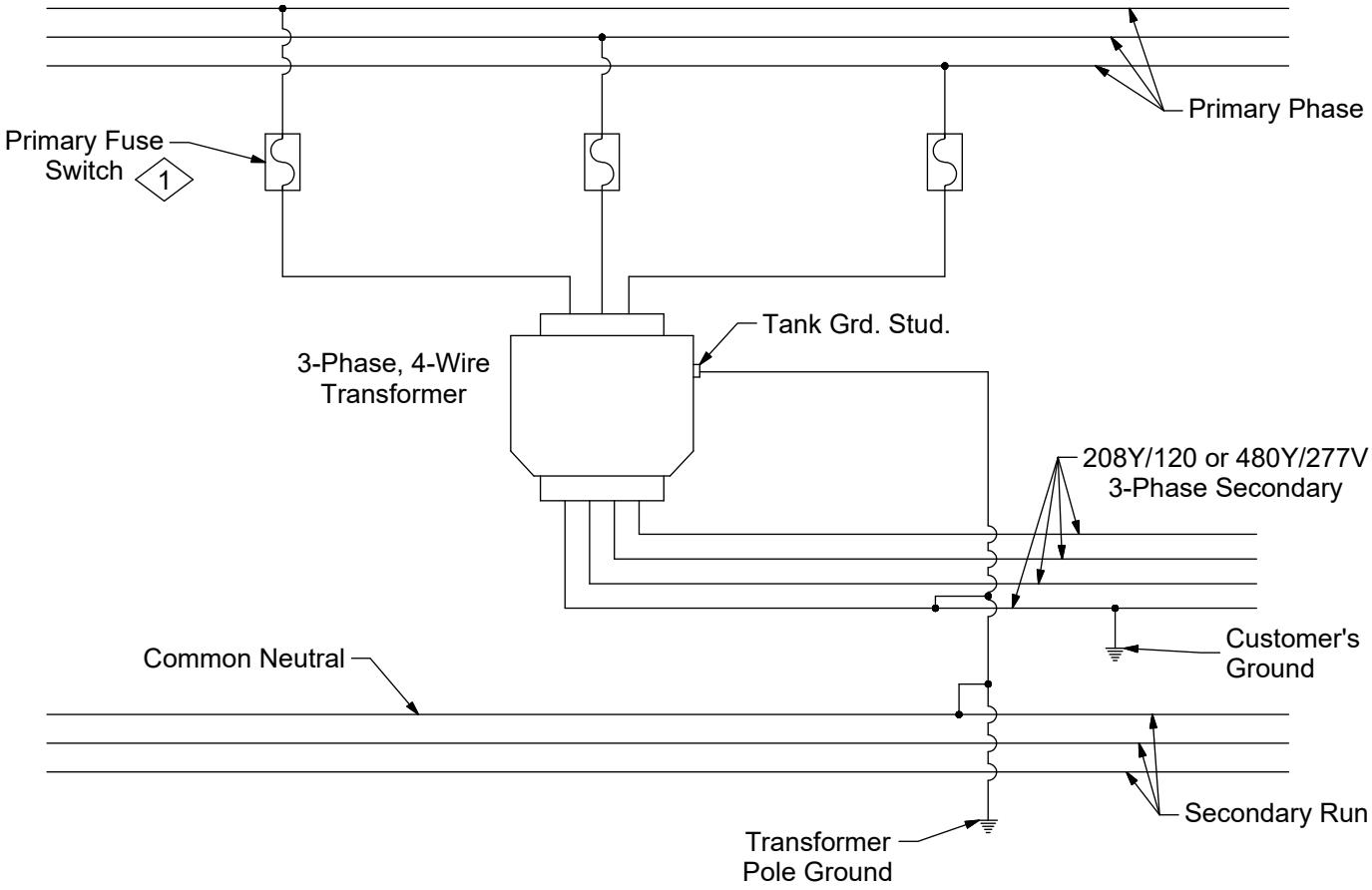
   Note: If Communications needs to ground their messenger on this structure, they must bond ONLY to the Secondary Neutral Pole Ground.

3. For 4.16 kV Y transformers use 6 kV arrester Stock #10 01 184. For 12.47 kV Y transformers use 15 kV arrester Stock #10 01 188.

DESIGN NOTE(s):

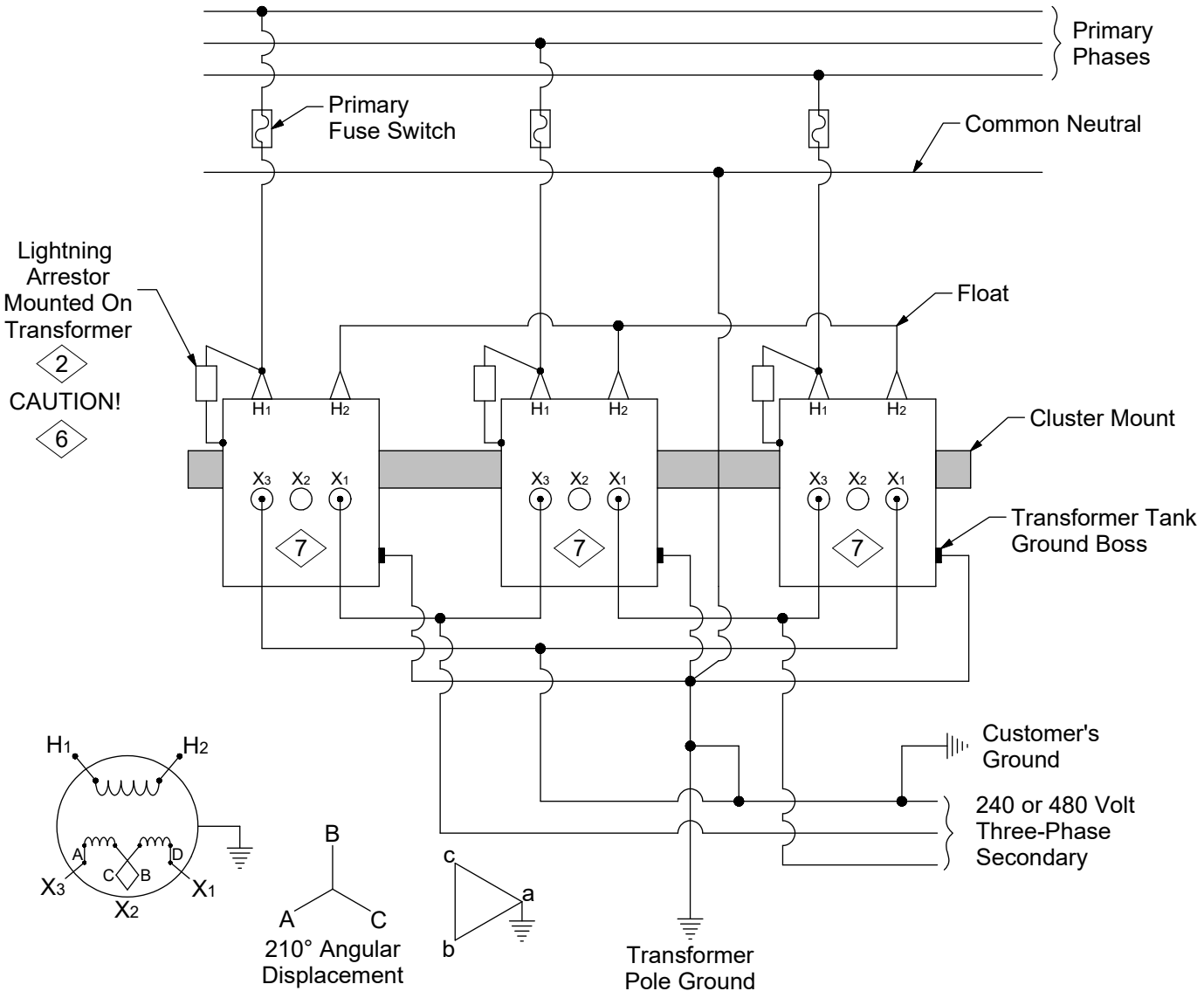
4. Information - Arrester (Stock #10 01 019) meets the NESC 097D1 requirement having a minimum 60 Hz flashover rating as the lessor of 2 times the primary circuit voltage or 10 kV.

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	07/08/11	DG	



CONSTRUCTION NOTE(s):

1. If installing CSP transformer, install fused switches as shown unless pole space does not allow and number of customers affected by transformer failure is deemed acceptable.



CONSTRUCTION NOTE(s):

1. 2400/4160 Y transformers may have sidewall mounted HV bushings.

2. Primary phase connections may be on either H_1 or H_2 bushings, with the lightning arresters connected to the same bushings. The floating (ungrounded) neutral is then connected to the other "H" bushings.

3. Transformers 100 kVA and below have three secondary bushings. Transformers 167 kVA and above have four secondary bushings.

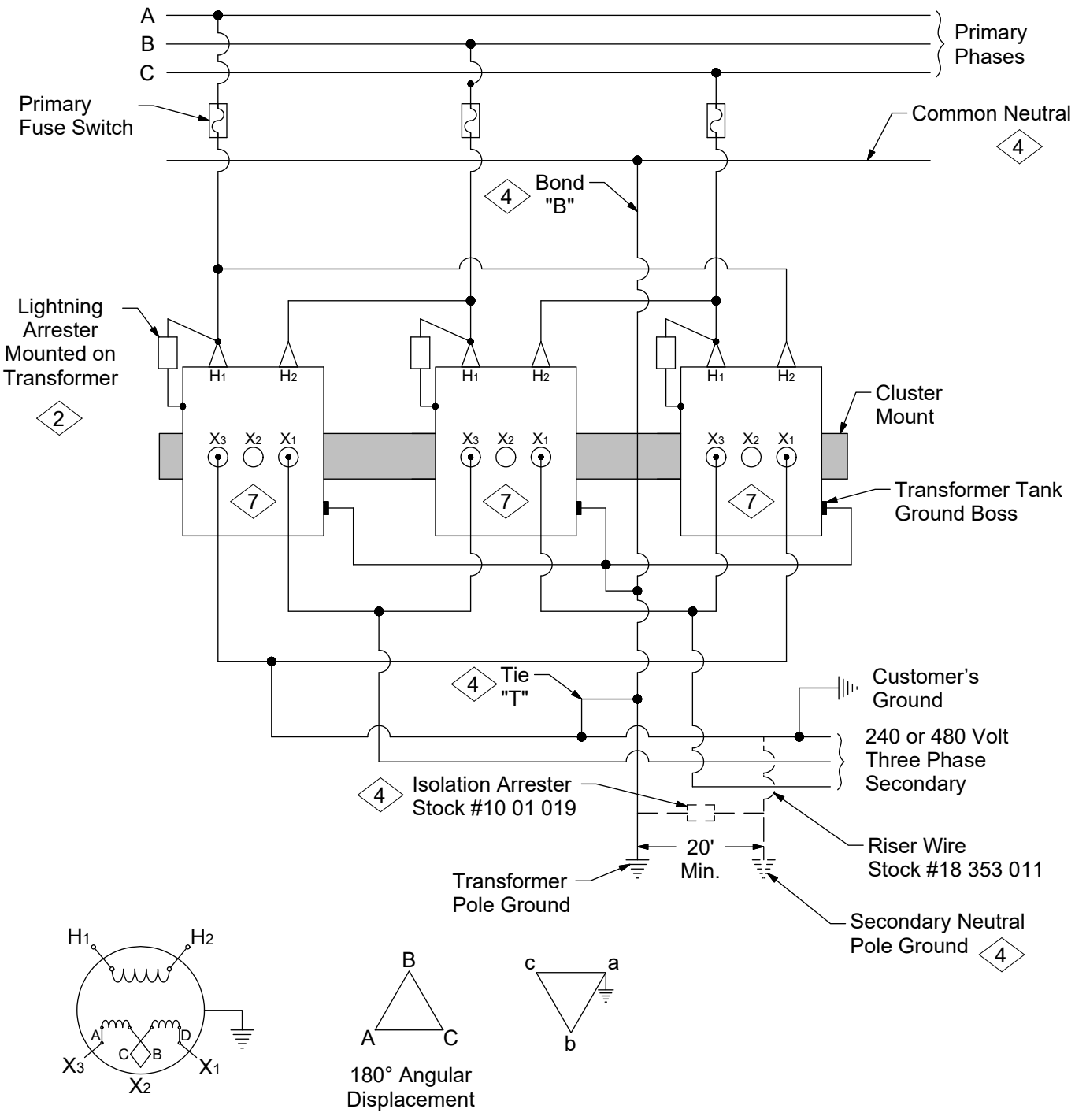
4. Transformer impedances do not need to match.

5. Transformers 200 kVA and below are additive polarity. Transformers 250 kVA and above are subtractive polarity.

6. For 7.2, 7.62, 7.97 kV, and multi-voltage (i.e., XA, XD, AA, AD) transformers use 15 kV arrester stock #10 01 188. For 2.4 kV transformers use 6 kV arrester stock #10 01 184.

7. Remove ground straps from all three transformers.

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	07/11/11	DG	



REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	06/24/11	DG	

CONSTRUCTION NOTE(s):

1. 2400 / 4160 transformers may have sidewall mounted HV bushings.

2. Lightning arrester may be on either H_1 or H_2 bushing.

3. Transformers 100 kVA and below have three secondary bushings. Transformers 167 kVA and above have four secondary bushings.

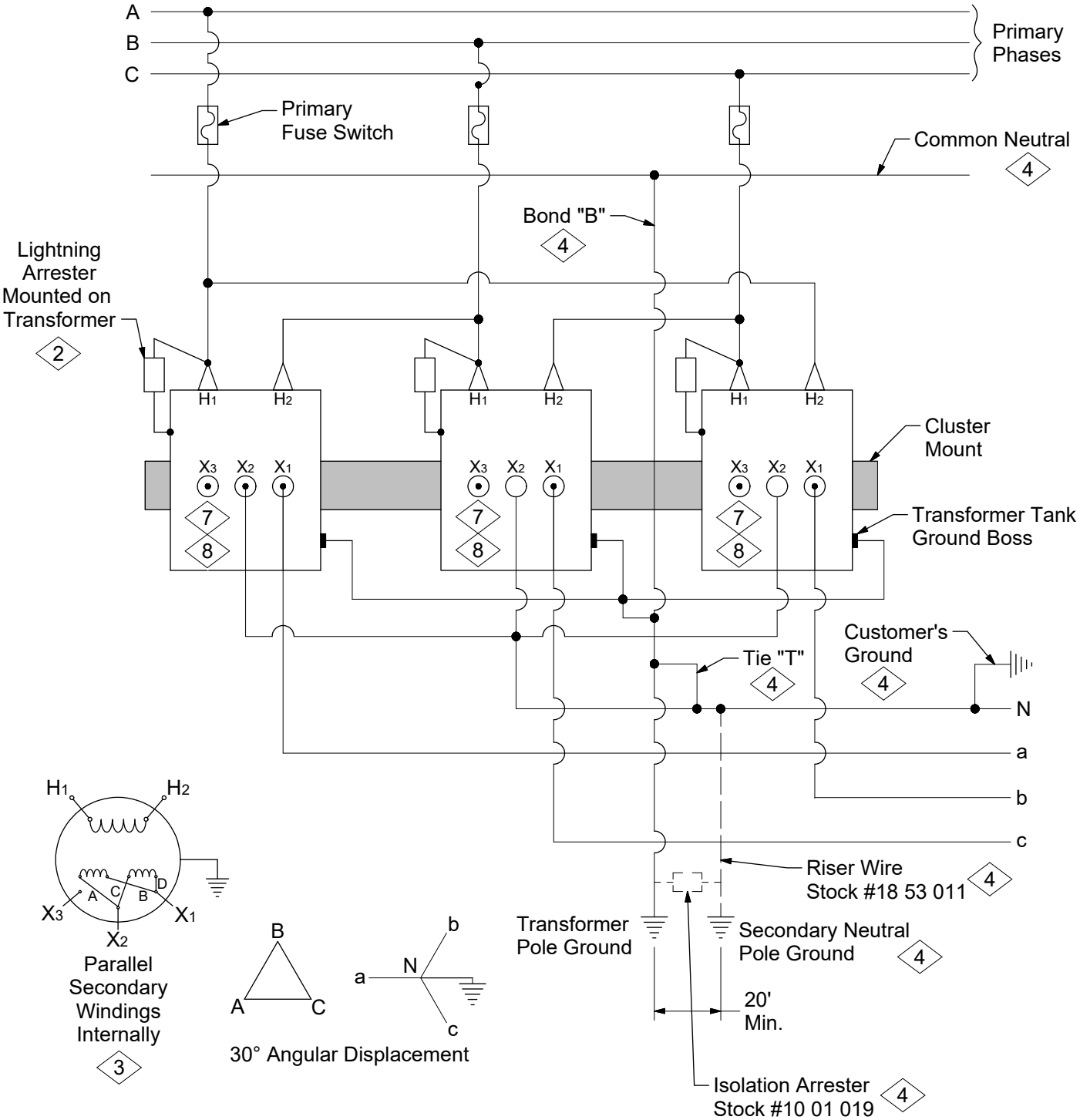
4. If a common neutral is not present omit Bond “B” and Tie “T” and install a second ground rod a minimum distance of 20 feet from the Transformer Pole Ground. Connect the lightning arrester/Transformer Pole Ground and Secondary Neutral Pole Ground together through an Isolation Arrester (Stock #10 01 019). The ground lead to the secondary ground rod shall be insulated for 600 V (use Stock #18 53 011). Both ground leads must be covered with plastic molding for a distance of 8 feet from the ground. The resistance of both grounds should not exceed 25 ohms. These requirements are to meet NESC 097.D.1.

5. Transformers 200 kVA and below are additive polarity. Transformers 250 kVA and above are subtractive polarity.

6. Transformer impedances must be closely matched (±10%).

7. Remove ground straps from all three transformers.

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	06/24/11	DG	



REV	DATE	ENG	DESCRIPTION
4	04/01/23	DG	Converted to new format
3	05/19/11	DG	

CONSTRUCTION NOTE(s):

1. 2400/4160 transformers may have sidewall mounted HV bushings.

2. Lightning arrester may be on either H_1 or H_2 bushing.

3. Transformers 100 kVA and below have three secondary bushings. Transformers 167 kVA and above have four secondary bushings. For 120/208 V service, units with three secondary bushings must be reconnected internally to parallel the secondary windings. Units with four secondary bushings must have the secondaries paralleled externally. For 277/480 V service, 277 V transformers are used and they have only two secondary bushings.

4. If a common neutral is not present omit Bond "B" and Tie "T" and install a second ground rod a minimum distance of 20 feet from the Transformer Pole Ground. Connect the lightning arrester/Transformer Pole Ground and Secondary Neutral Pole Ground together through an Isolation Arrester (Stock #10 01 019). The ground lead to the secondary ground rod shall be insulated for 600 V (use Stock #18 53 011). Both ground leads must be covered with plastic molding for a distance of 8 feet from the ground. The resistance of both grounds should not exceed 25 ohms. These requirements are to meet NESC 097.D.1.

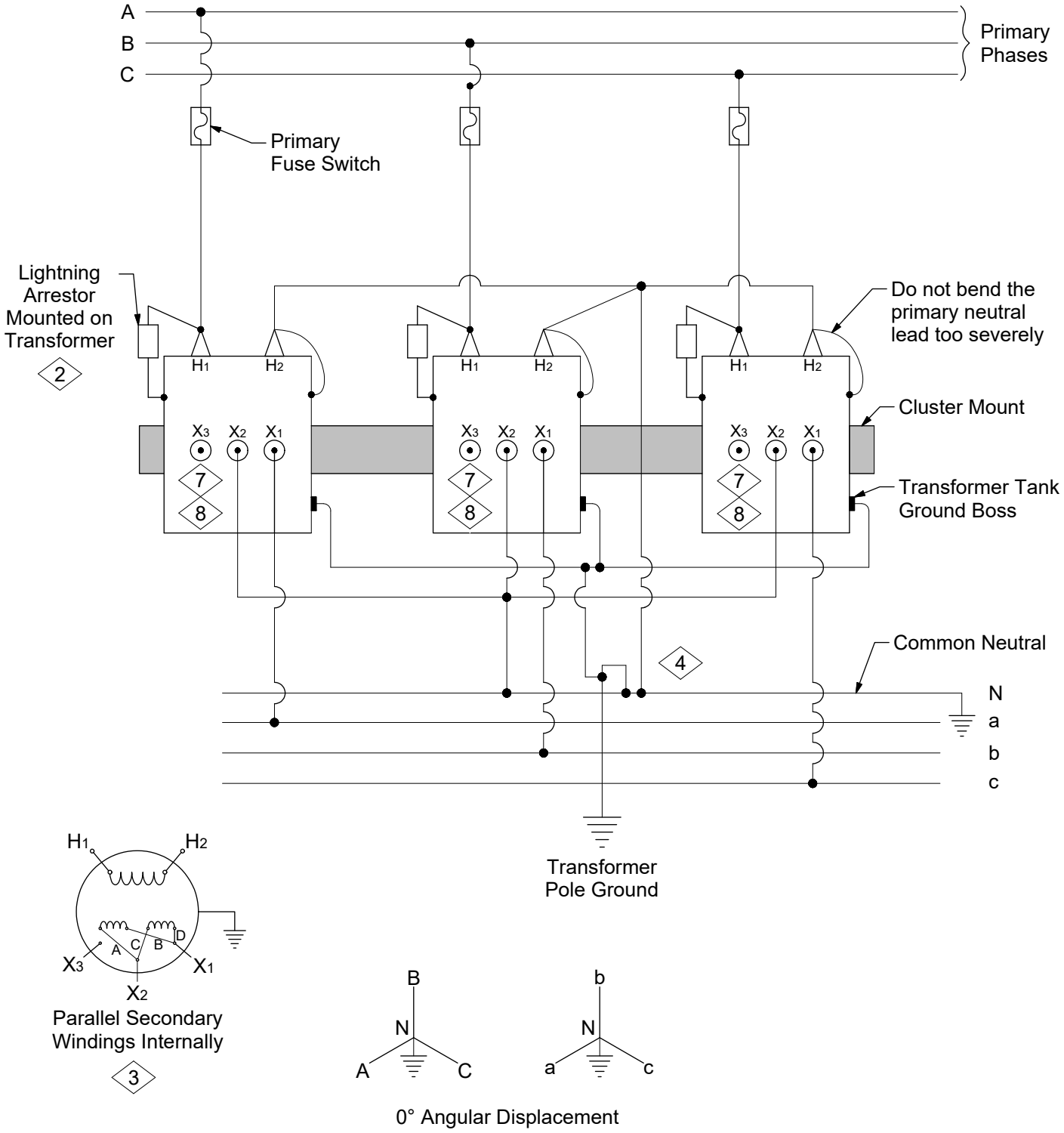
5. Transformers 200 kVA and below are additive polarity. Transformers 250 kVA and above are subtractive polarity.

6. Transformer impedances do not need to match.

7. Use tag, Stock #16 01 301 to identify transformers that have been wired internally for 120/208Y service. The tag should be attached to the secondary bushing that is no longer connected internally.

8. Remove ground straps from all three transformers.

REV	DATE	ENG	DESCRIPTION
4	04/01/23	DG	Converted to new format
3	05/19/11	DG	



REV	DATE	ENG	DESCRIPTION
4	04/01/23	DG	Converted to new format
3	05/11/15	DG	

CONSTRUCTION NOTE(s):

1. 2400/4160 transformers may have sidewall mounted HV bushings.

2. Primary phase connections may be on either H_1 or H_2 bushings, with the lightning arresters connected to the same bushings. The grounded neutral is then connected to the other ”H” bushings.

3. Transformers 100 kVA and below have three secondary bushings. Transformers 167 kVA and above have four secondary bushings. For 120/208 V service, units with three secondary bushings must be reconnected internally to parallel the secondary windings. Units with four secondary bushings must have the secondaries paralleled externally. For 277/480 V service, 277V transformers are used and they have only two secondary bushings.

4. The transformer primary neutral bus must be solidly connected to the system neutral.

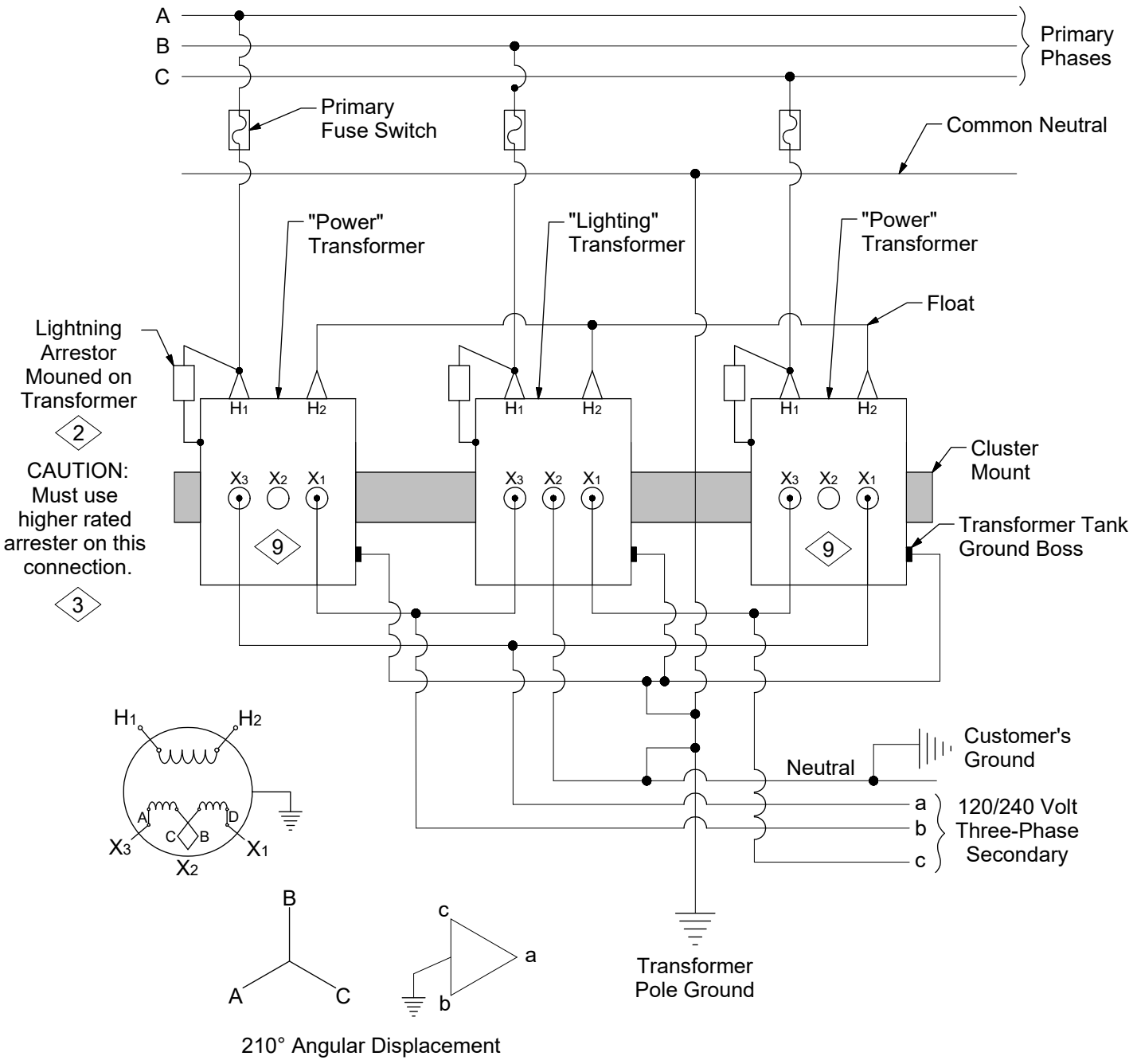
5. Transformers 200 kVA and below are additive polarity. Transformers 250 kVA and above are subtractive polarity.

6. Transformer impedances do not need to match.

7. Use tag, Stock #16 01 301 to identify transformers that have been wired internally for 120/208Y service. The tag should be attached to the secondary bushing that is no longer connected internally.

8. Remove ground straps from all three transformers.

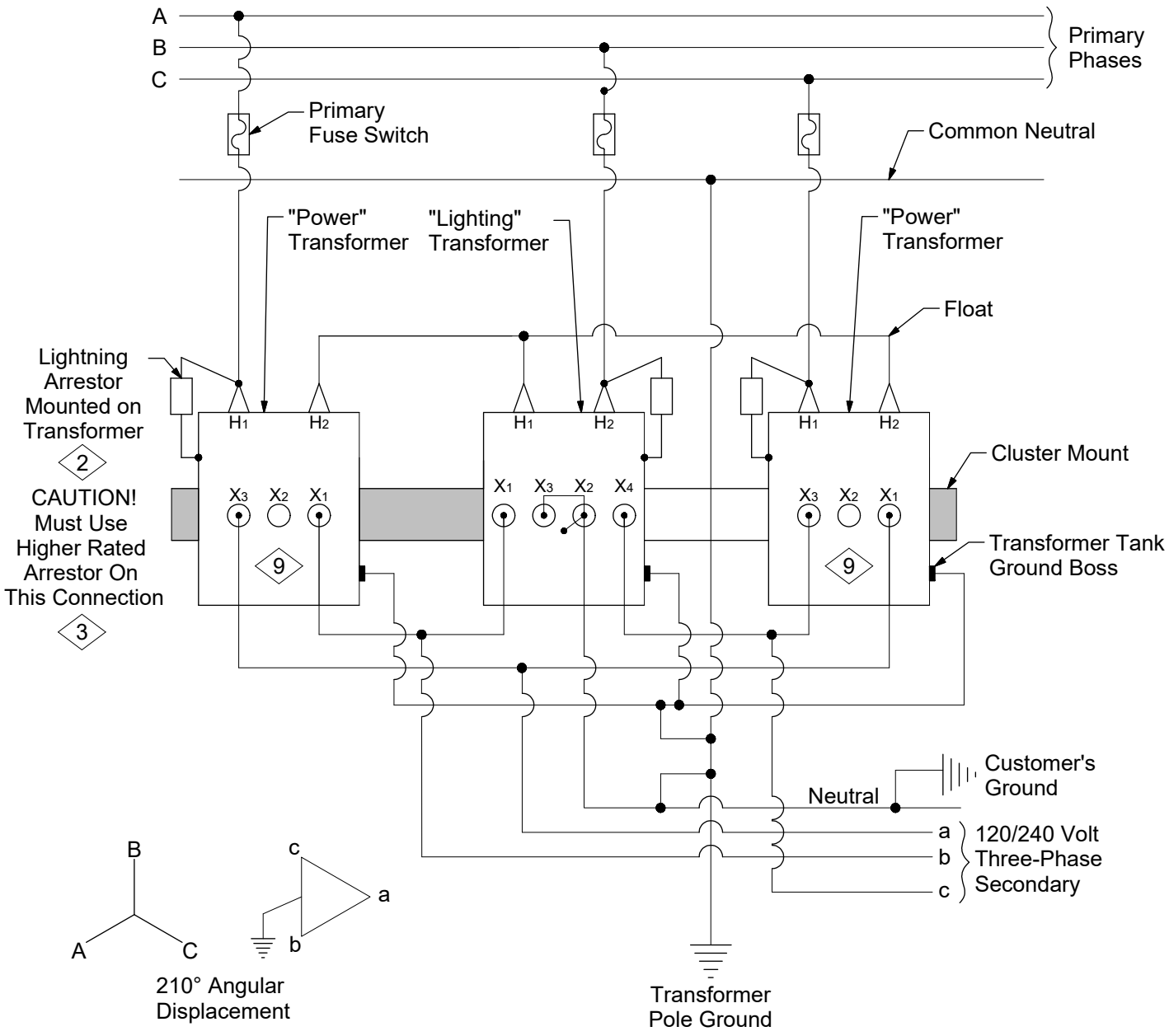
REV	DATE	ENG	DESCRIPTION
4	04/01/23	DG	Converted to new format
3	05/11/15	DG	

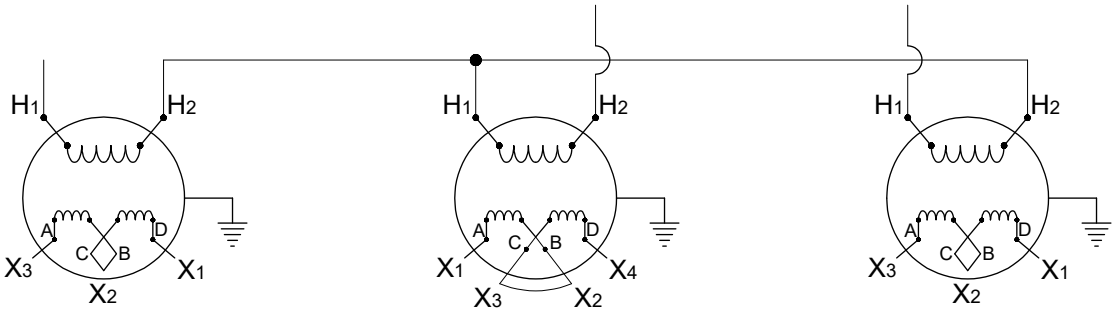


210° Angular Displacement

Three Additive Polarity Transformers

REV	DATE	ENG	DESCRIPTION
2	04/01/23	DG	Converted to new format
1	07/11/11	DG	





Two Additive and One Subtractive Polarity Transformers

REV	DATE	ENG	DESCRIPTION
2	04/01/23	DG	Converted to new format
1	07/11/11	DG	

CONSTRUCTION NOTE(s):

1. 2400/4160 transformers may have sidewall mounted HV bushings.

2. Primary phase connections may be on either H_1 or H_2 bushings with the lightning arresters connected to the same bushings. The floating neutral is then connected to the other "H" bushings.

3. For 7.2, 7.62, 7.97 kV, and multi-voltage (i.e., XA, AA) transformers use 15 kV arrester Stock #10 01 188. For 2.4 kV transformers use 6 kV arrester Stock #10 01 184.

4. Transformers 100 kVA and below have three secondary bushings. Transformers 167 kVA and above have four secondary bushings.

5. Transformers 200 kVA and below are additive polarity. Transformers 250 kVA and above are subtractive polarity.

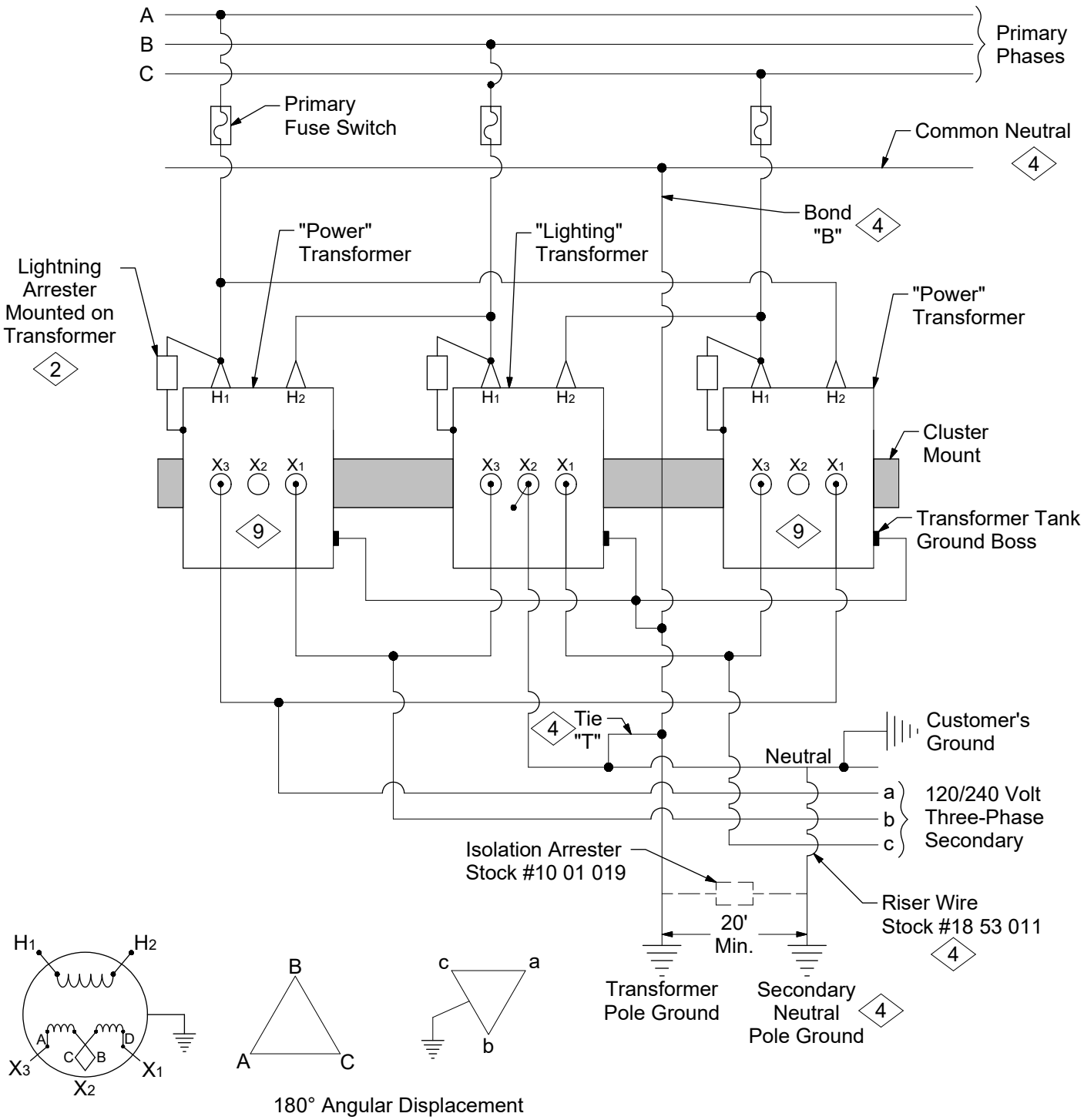
6. Transformer impedances do not need to match.

7. Rule of thumb: The "Lighting" transformer carries 2/3 of the single-phase load and 1/3 of the three-phase load. The "Power" transformers each carry 1/3 of the three-phase load and 1/3 of the single-phase load.

8. Phase rotation can be changed by reversing the secondary leads on the "Lighting" transformer (preferably on the secondary).

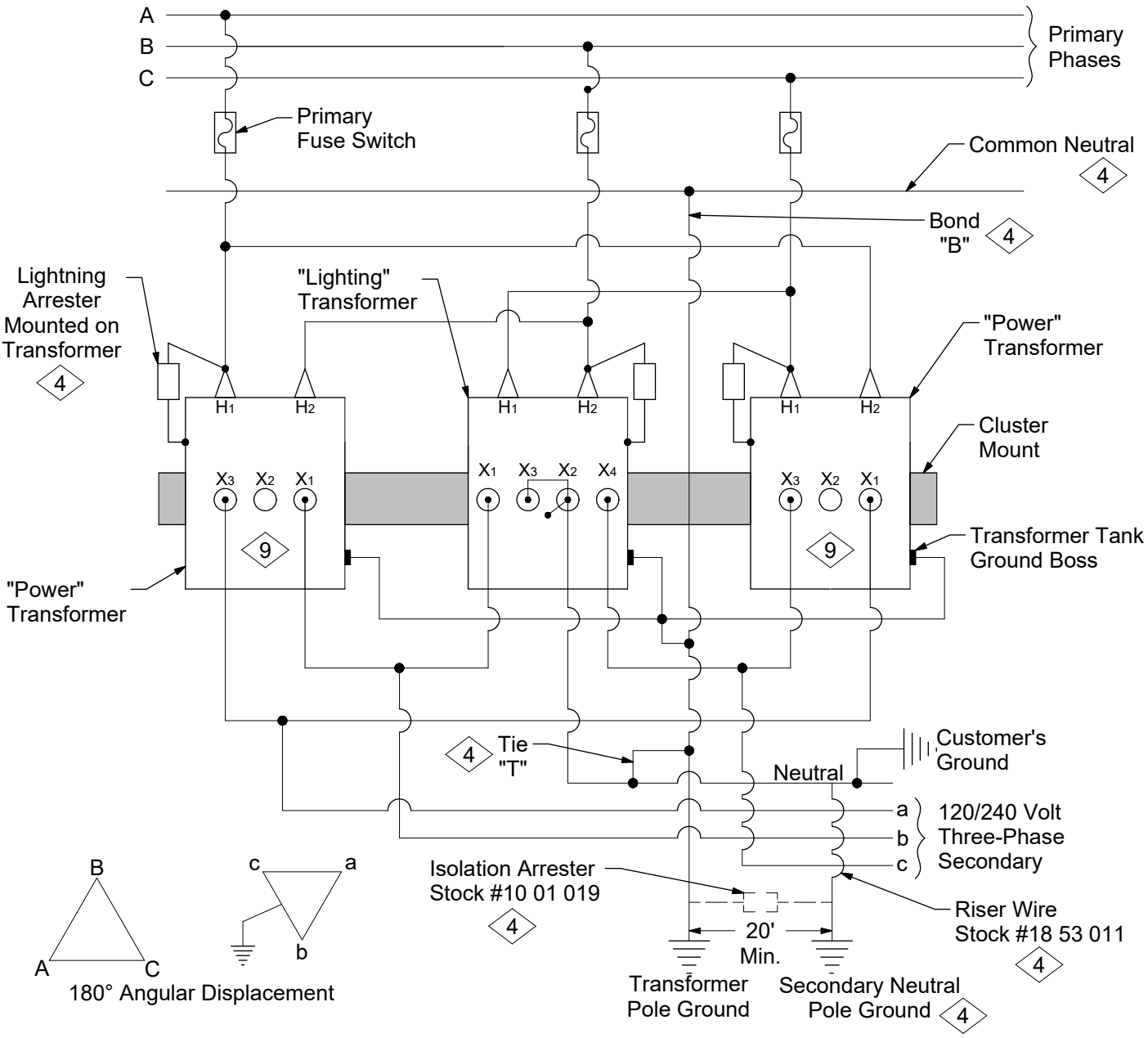
9. Remove ground straps from the outer two "Power" transformers.

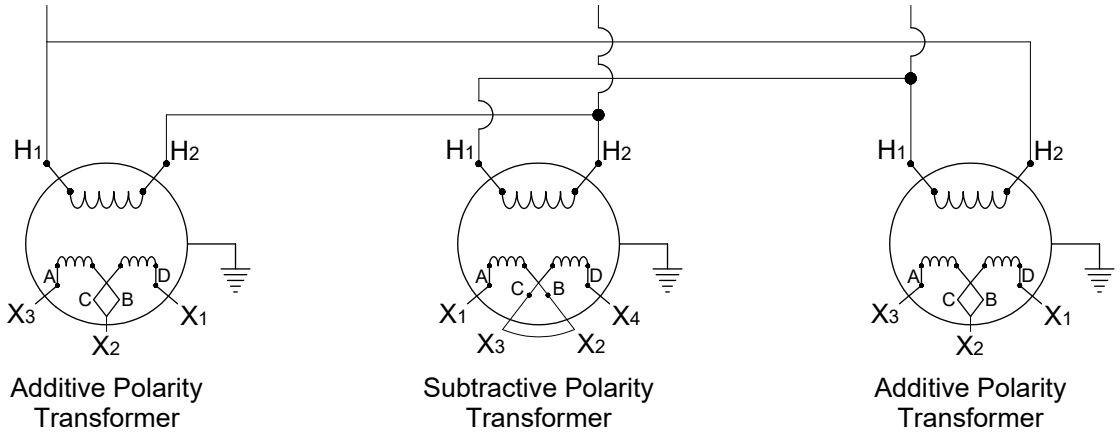
REV	DATE	ENG	DESCRIPTION
2	04/01/23	DG	Converted to new format
1	07/11/11	DG	



Three Additive Polarity Transformers

REV	DATE	ENG	DESCRIPTION
3	04/01/23	DG	Converted to new format
2	12/05/11	DG	





Two Additive and One Subtractive Polarity Transformers

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
3	04/01/23	DG	Converted to new format
2	12/05/11	DG	

CONSTRUCTION NOTE(s):

1. 2400/4160 transformers may have sidewall mounted HV bushings.

2. Lighting arrester may be on either H1 or H2 bushings.

3. Transformers 100 kVA and below have three secondary bushings. Transformers 167 kVA and above have four secondary bushings.

4. If a common neutral is not present omit X2 ground strap on center "Lighting" transformer, Bond "B", and Tie "T", and install a second ground rod a minimum distance of 20 feet from the Transformer Pole Ground. Connect the lighting arrester/Transformer Pole Ground and Secondary Neutral Pole Ground through an Isolation Arrester (Stock # 10 01 019). The ground lead to the secondary ground rod shall be insulated for 600 V (use Stock #18 53 011). Both ground leads must be covered with plastic molding for a distance of 8 feet from the ground. The resistance of both grounds should not exceed 25 ohms. These requirements are to meet NESC 097.D.1.

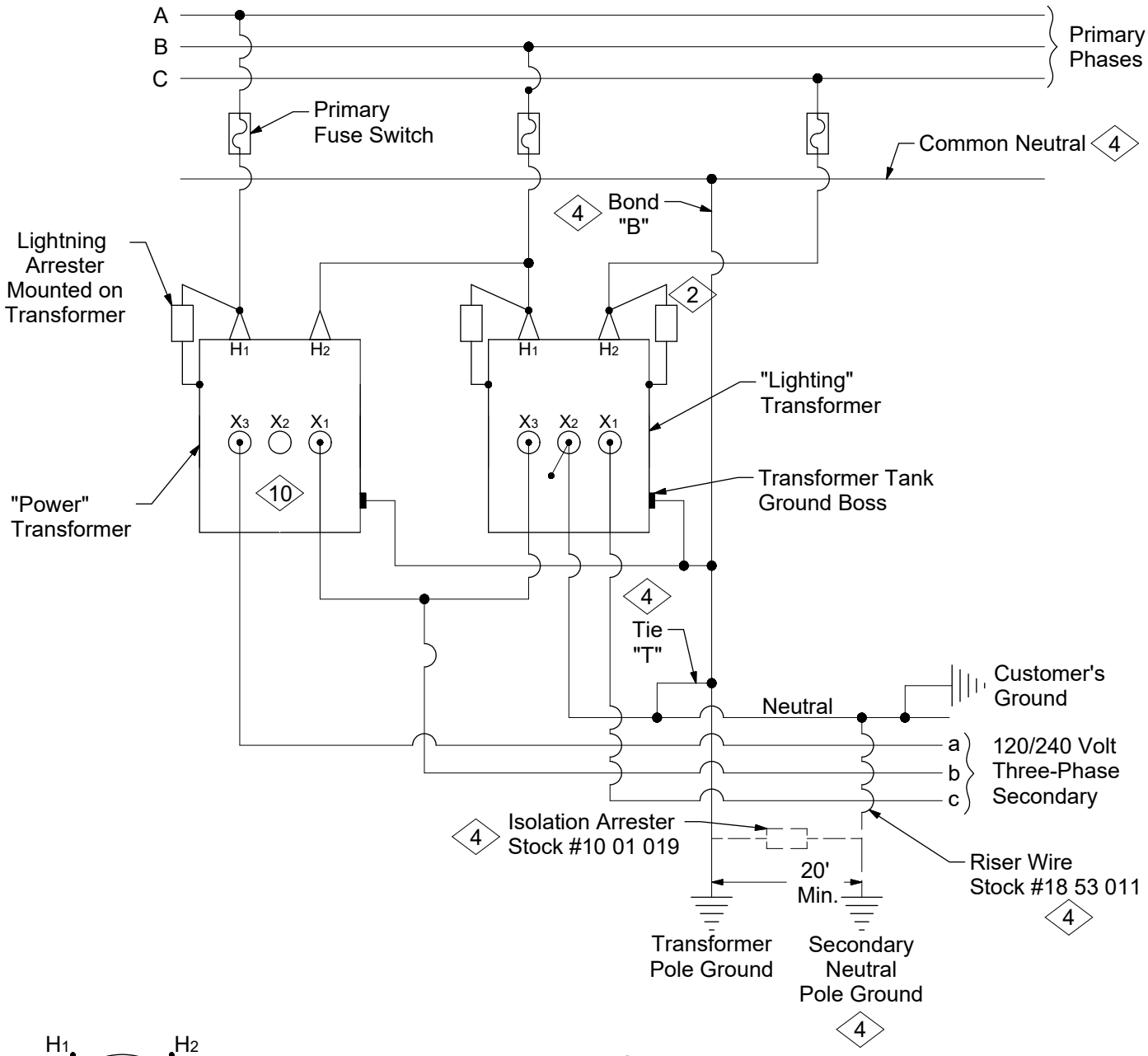
5. Transformers 200 kVA and below are additive polarity. Transformers 250 kVA and above are subtractive polarity.

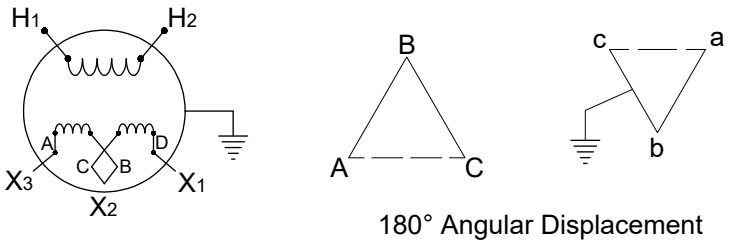
6. Transfomer impedances must be closely matched (±10%).

7. Rule of thumb: The "Lighting" transformer carries 2/3 of the single-phase load and 1/3 of the three-phase load. The "Power" transformers each carry 1/3 of the three-phase load and 1/3 of the single-phase load.

8. Phase rotation can be changed by reversing the secondary leads on the mid-tapped "Lighting" transformer (preferably on the secondary).

9. Remove ground straps from the outer two "Power" transformers.





180° Angular Displacement

REV	DATE	ENG	DESCRIPTION
3	04/01/23	DG	Converted to new format
2	04/01/19	DG	

CONSTRUCTION NOTE(s):

1. 2400 / 4160 Transformers may have sidewall mounted HV bushings.

2. Add arrester to H_2 of this transformer if transformer does not already have arresters on both bushings.

3. Transformers 100 kVA and below have three secondary bushings. Transformers 167 kVA and above have four secondary bushings.

4. If a common neutral is not present omit X_2 ground strap on both transformers, Bond "B", and Tie "T" and install a second ground rod a minimum distance of 20 feet from the Transformer Pole Ground. Connect the lightning arrester/Transformer Pole Ground and Secondary Neutral Pole Ground together through an Isolation Arrester (Stock #10 01 019). The ground lead to the secondary ground rod shall be insulated for 600 V (use Stock #18 53 011). Both ground leads must be covered with plastic molding for a distance of 8 feet from the ground. The resistance of both grounds should not exceed 25 ohms. These requirements are to meet NESC 097.D.1.

5. Transformers 200 kVA and below are additive polarity. Transformers 250 kVA and above are subtractive polarity.

6. Transformer impedances do not need to match.

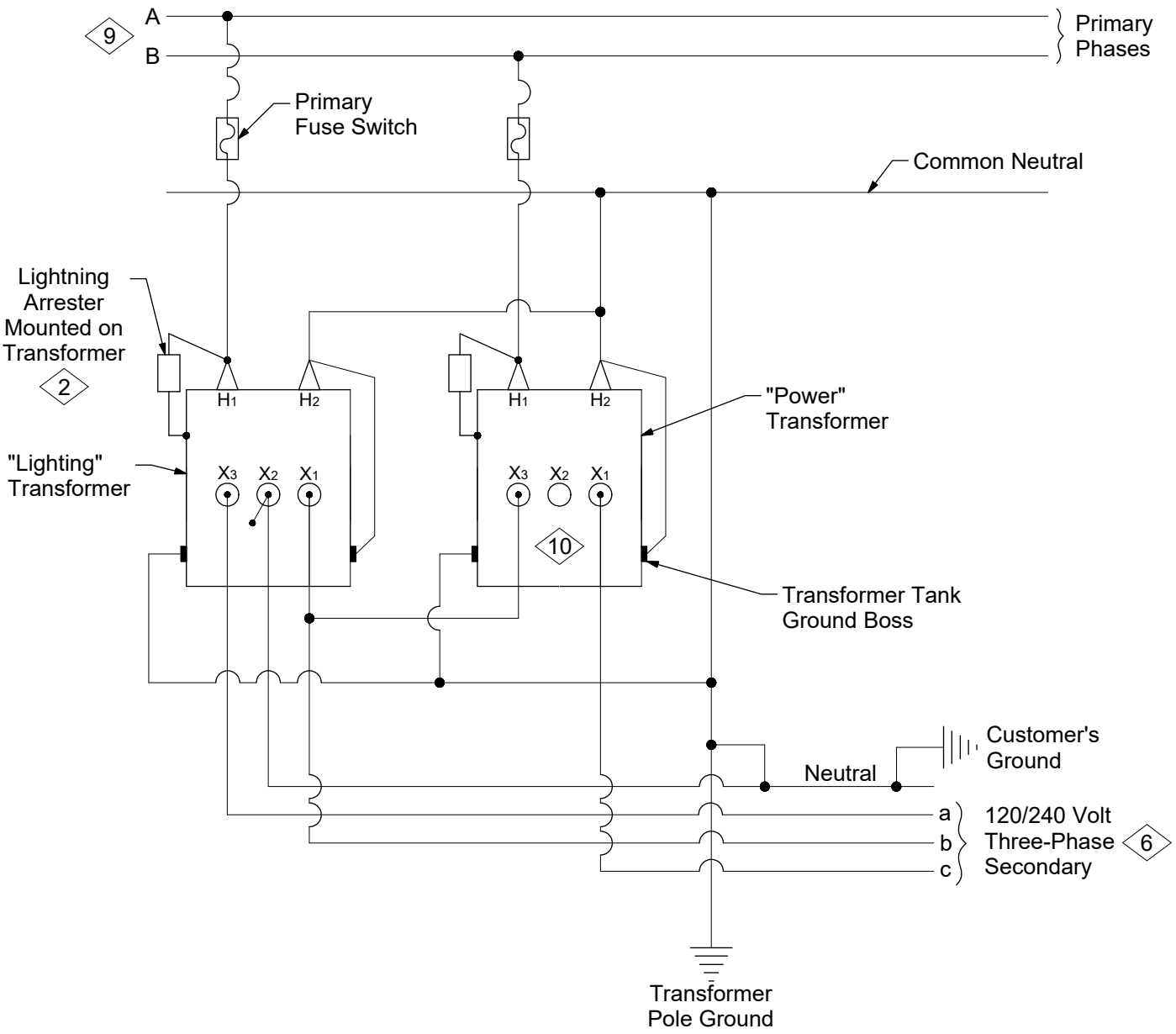
7. 3-Wire 240 V corner grounded delta secondary can be provided by removing the lead and ground strap from X2 on the "Lighting" transformer and bonding the "a" phase at the pole and customer service grounds.

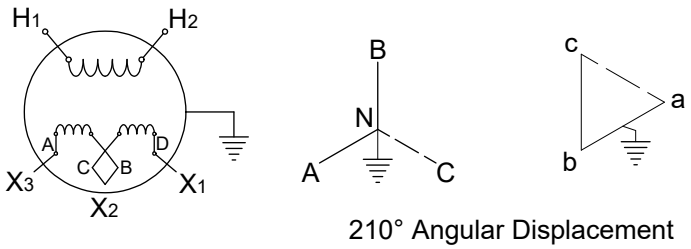
8. The "Lighting" transformer supplies all of the single-phase load and 1/2 of the three-phase load. The total three-phase load should not exceed 1.73 times the kVA of the smallest transformer.

9. Phase rotation can be changed by reversing any pair of primary line leads or by reversing the two secondary leads on the "Lighting" transformer (preferably on the secondary).

10. Remove ground strap from the "Power" transformer.

REV	DATE	ENG	DESCRIPTION
3	04/01/23	DG	Converted to new format
2	04/01/19	DG	





210° Angular Displacement

REV	DATE	ENG	DESCRIPTION
3	04/01/23	DG	Converted to new format
2	11/01/12	DG	

CONSTRUCTION NOTE(s):

1. 2400/4160 transformers may have sidewall mounted HV bushings.

2. Primary phase connections may be on either H_1 or H_2 bushings, with the lightning arresters connected to the same bushings. The neutral is then connected to the other "H" bushings.

3. Transformers 100 kVA and below have three secondary bushings. Transformers 167 kVA and above have four secondary bushings.

4. Transformer impedances do not need to match.

5. Transformers 200 kVA and below are additive polarity. Transformers 250 kVA and above are subtractive polarity.

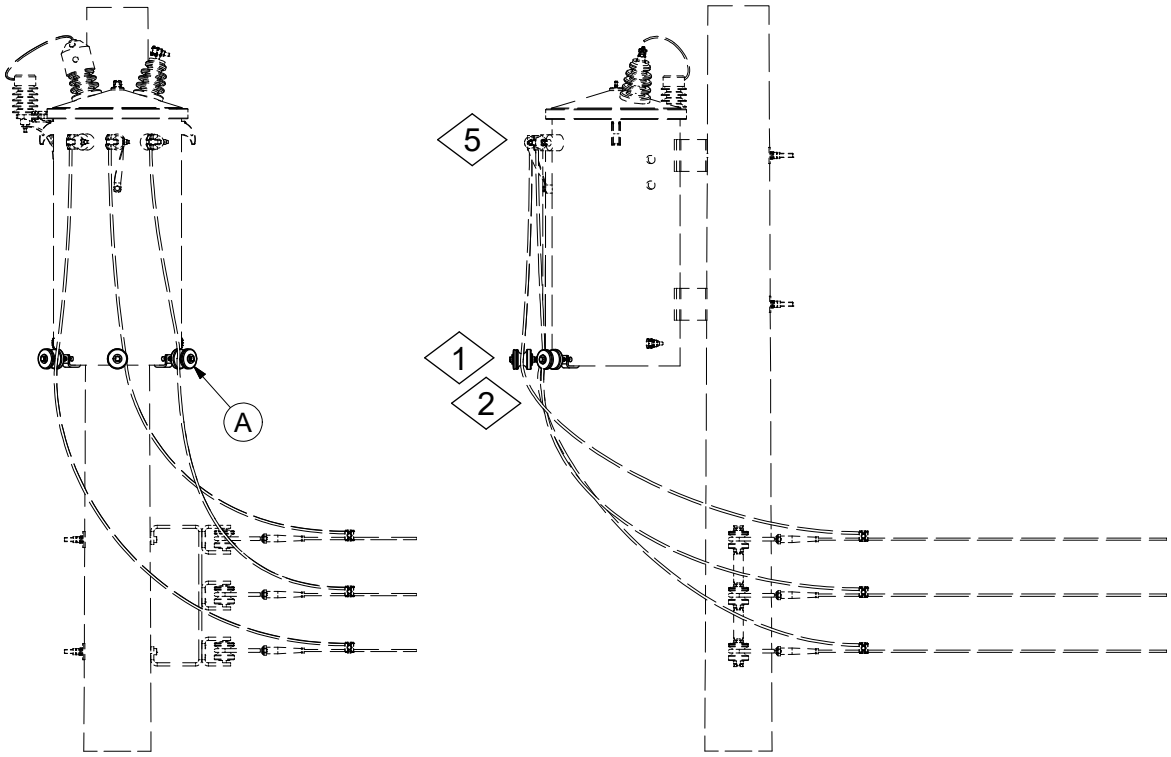
6. A 3-wire 240 V corner grounded delta secondary can be provided by removing the lead and ground strap from X_2 on the "Lighting" transformer and bonding the "a" phase at the pole and customer service grounds.

7. The "Lighting" transformer supplies all of the singlee-phase load and 1/2 of the three-phase load. The total three-phase load should not exceed 1.73 times the kVA of the smallest transformer.

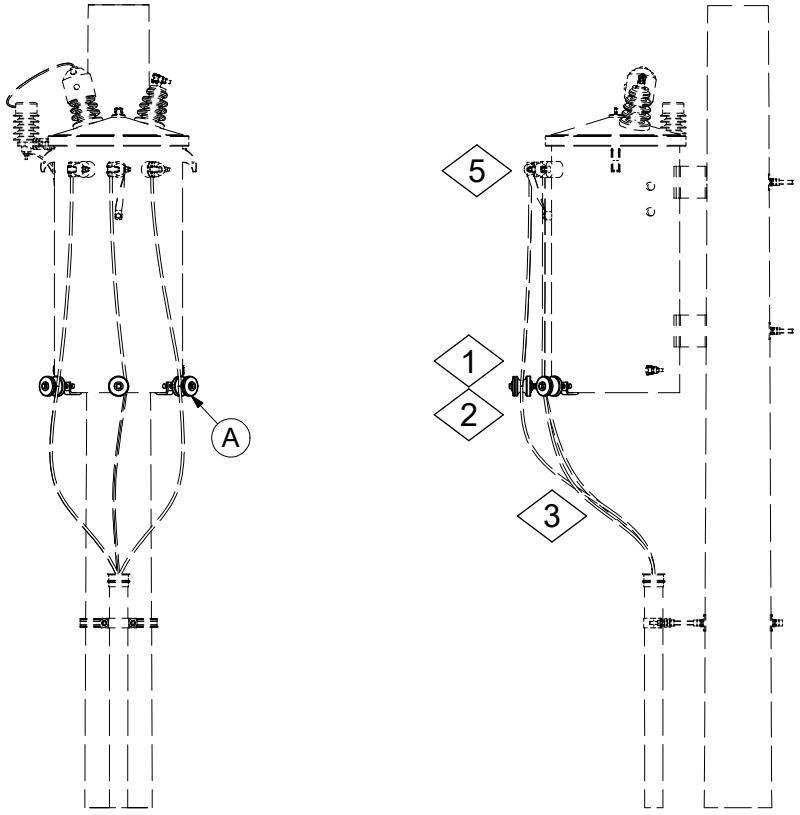
8. Phase rotation can be changed by reversing any pair of primary line leads or by reversing the two secondary leads on the "Lighting" transformer (preferably on the secondary).

9. Primary connection shown is for AmerenIL (ABC rotation). Primary connection for Ameren MO (CBA rotation) should be reversed. Connecting the leading primary phase to the "Lighting" transformer gives better utilization of transformer capacity, less voltage dip, less voltage unbalance.

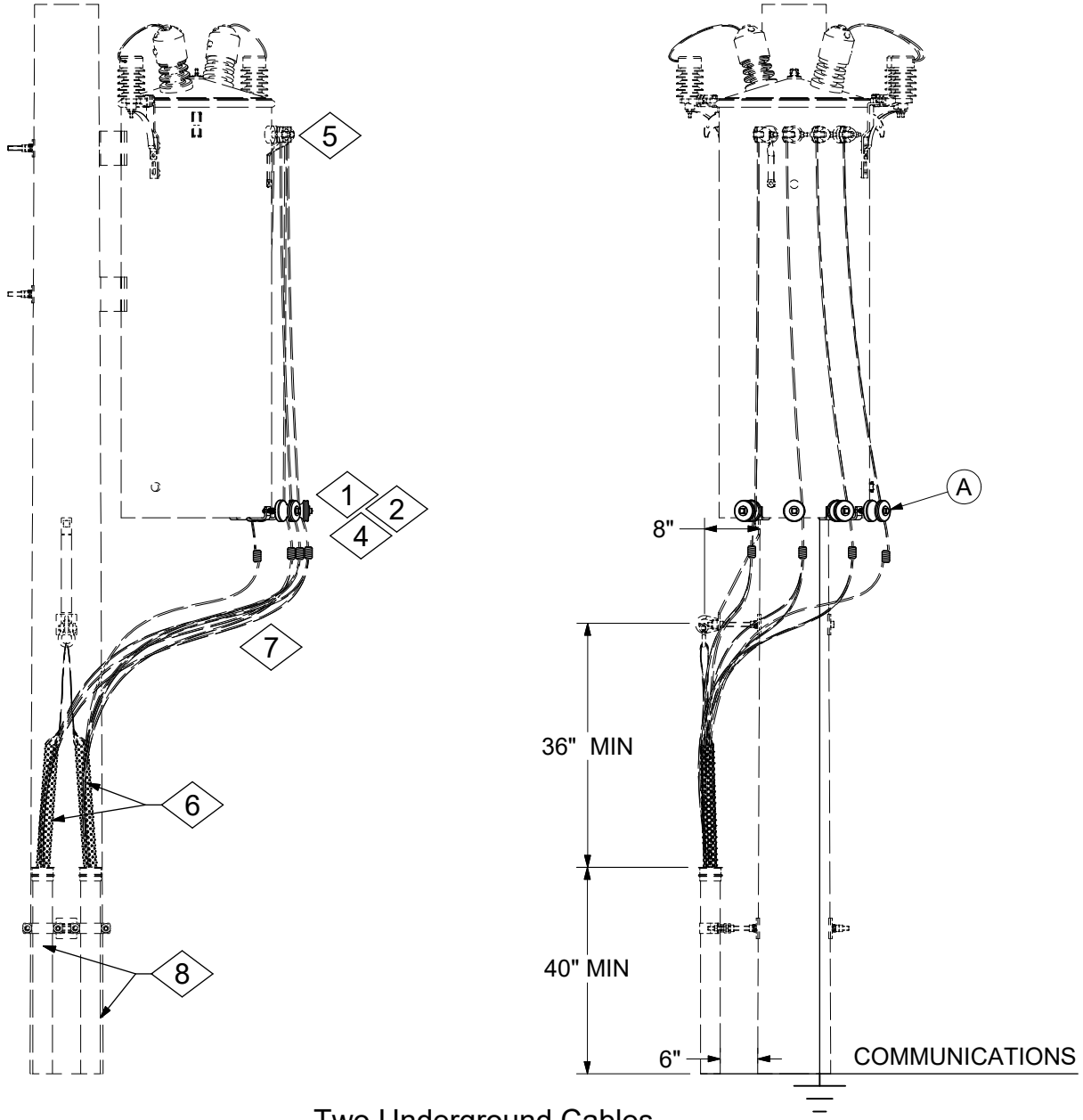
10. Remove ground strap from the "Power" transformer.



Overhead Service



Underground Service



Two Underground Cables

CONSTRUCTION NOTE(s):

1. This standard shows the training of secondary leads, using a bracket, Stock #69 08 249, which attaches to the bottom of the transformer. The bracket may be used with either 1Ø or 3Ø secondary and with all primary distribution voltages.

2. For additional clearance from the transformer use 1/2” x 8” machine bolts, Stock #23 52 041. Use 5/8” nuts, Stock #23 65 011 as spacers.

3. If an underground service must be located on a transformer pole with overhead secondary, attach the underground service to the secondary, per DCS **14 02 01 ****** NOT TO THE TRANSFORMER.

4. Cover with sealing compound (Stock #31 53 055) and tape so that water cannot enter strands.

REV	DATE	ENG	DESCRIPTION
3	04/01/23	DG	Converted to new format
2	05/17/11	DG	

5. Do not put aluminum conductors in transformer bushing connectors. Use copper secondary leads as per DCS **13 00 03 01**, or copper pin terminal connectors. For multiple conductors, use pin terminal lug connectors with copper studs as per DCS **13 01 04 ****. For transformers with secondary spade connections (1Ø>100 kVA and 3Ø>300 kVA) cable-to-flat lug connectors can be used (Stock #17 55 289 or 17 55 344).

6. See DCS **14 02 02** for cable grips, conduits, and stand off bracket. Apply 2 layers of tape under grips.

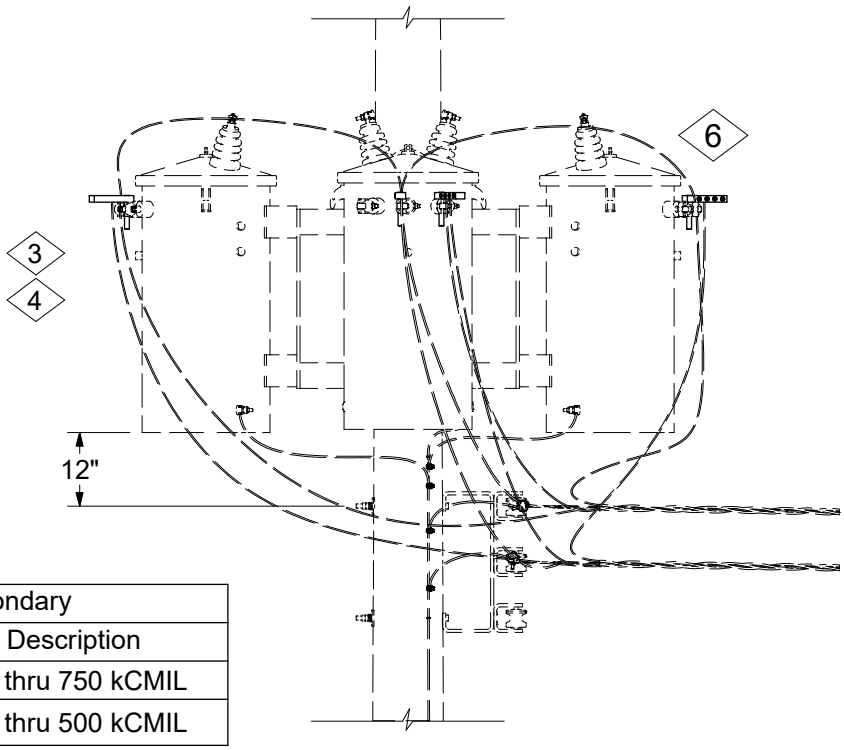
7. Pair cables, tape together and form drip loop.

8. Install all 3 phases and neutral in each conduit.

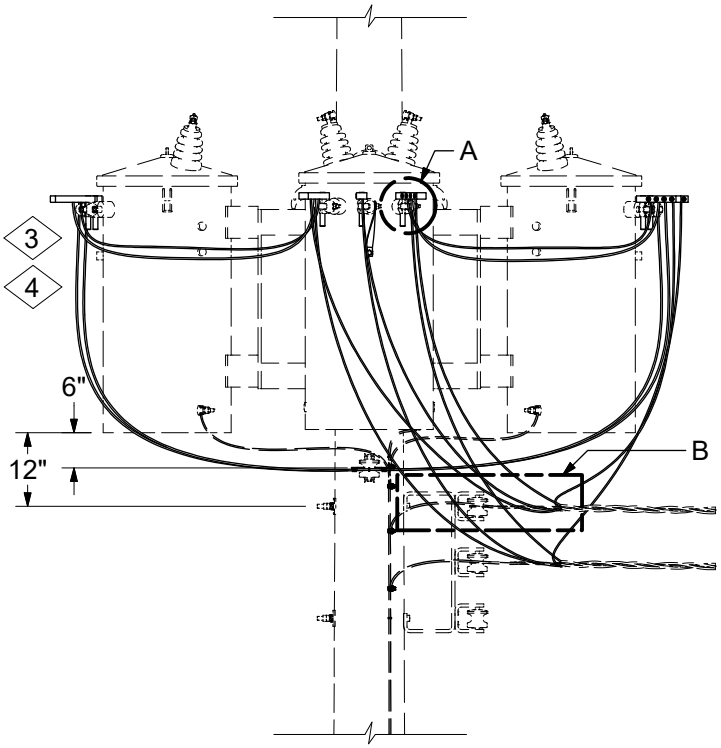
DCS #	Description
13 01 01 01	Single-Phase Transformer
13 01 01 03	Three-Phase Transformer

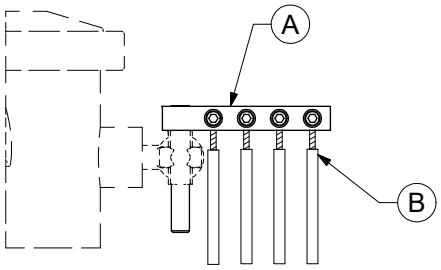
ITEM	STK / DCS #	DESCRIPTION 13 01 01 **	01	03
A	69 08 249	Bracket - Transformer Secondary Lead	3	4

REV	DATE	ENG	DESCRIPTION
3	04/01/23	DG	Converted to new format
2	05/17/11	DG	

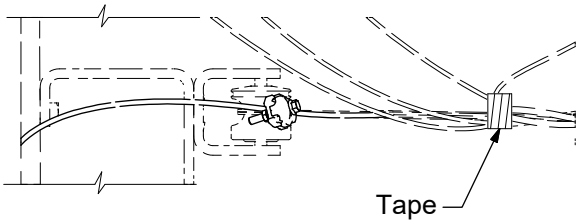


Wye Secondary	
DCS #	Description
13 01 04 03	1/0 thru 750 kCMIL
13 01 04 04	4/0 thru 500 kCMIL





Detail A



Detail B

Delta Secondary	
DCS #	Description
13 01 04 01	1/0 thru 750 kCMIL
13 01 04 02	4/0 thru 500 kCMIL

7

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	06/24/11	DG	

	ITEM	STK / DCS #	DESCRIPTION 13 01 04 **	01	02	03	04
2	A	17 54 245	Lug, 1/0 750 kcmil, 4 Position	7	-	6	-
		17 54 214	Connector - 4 Hole #2 - 500 Kcmil	-	7	-	6
	B	30 52 360	Compound, Sealing	1	1	1	1
		399	Op Code, Multiple Service Lug	7	7	6	6

CONSTRUCTION NOTE(s):

1. Clean cable surfaces and apply a liberal coating of corrosion inhibitor compound (Stock #31 59 058).

2. Use Stock #30 52 360 to weather seal lugs.

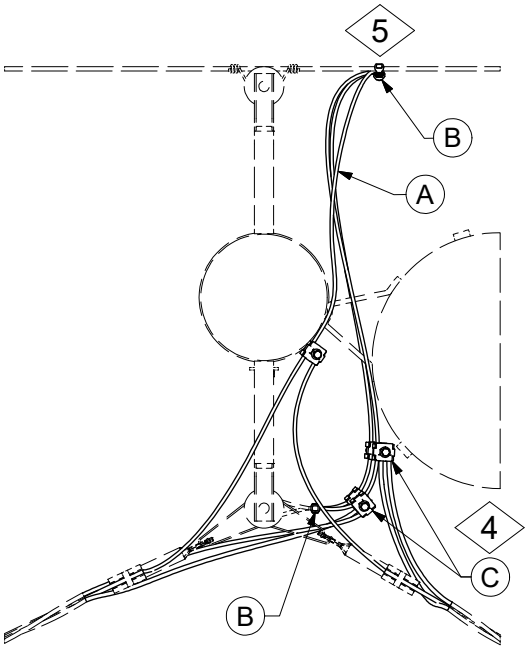
3. For buss sizing between the transformer secondary bushings see DCS **13 00 03 01**.

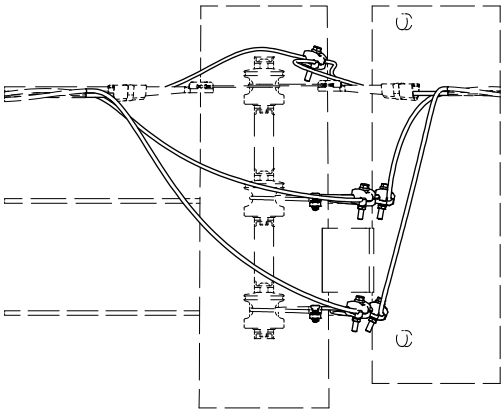
4. For wye connected secondary see connection diagram on DCS **13 00 07 08** or **13 00 07 09**. For delta connected secondary see connection diagram on DCS **13 00 07 04**, **13 00 07 05**, **13 00 07 10** or **13 00 07 11**.

5. The messengers of the quadruplex cables shall be grounded at the pole by connecting to the secondary neutral, if available, or to a ground rod. Exception: For non-standard ungrounded three-wire services the messengers are not grounded.

6. For wye connected secondary, neutral will need to be connected to the X_2 bushing of either the left or right transformer.

7. For ungrounded or corner grounded delta, use DCS **13 01 04 03** or **13 01 04 04**.





CONSTRUCTION NOTE(s):

1. Service buses shall be installed only where it is evident that two or more services will be required from each side of pole.

2. Normally a service bus should not be added to an existing installation when an additional service is installed.

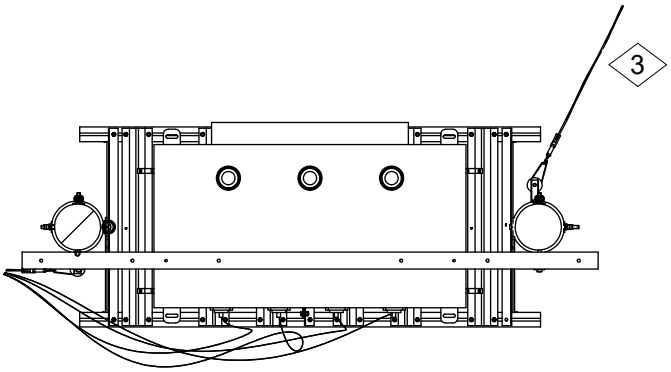
3. In many cases it may be desirable to install the service bus for the neutral only and connect the covered wires of the triplex cable directly to the secondary.

4. Tape connectors in accordance with DCS **07 00 25 00** and **07 00 27 00**.

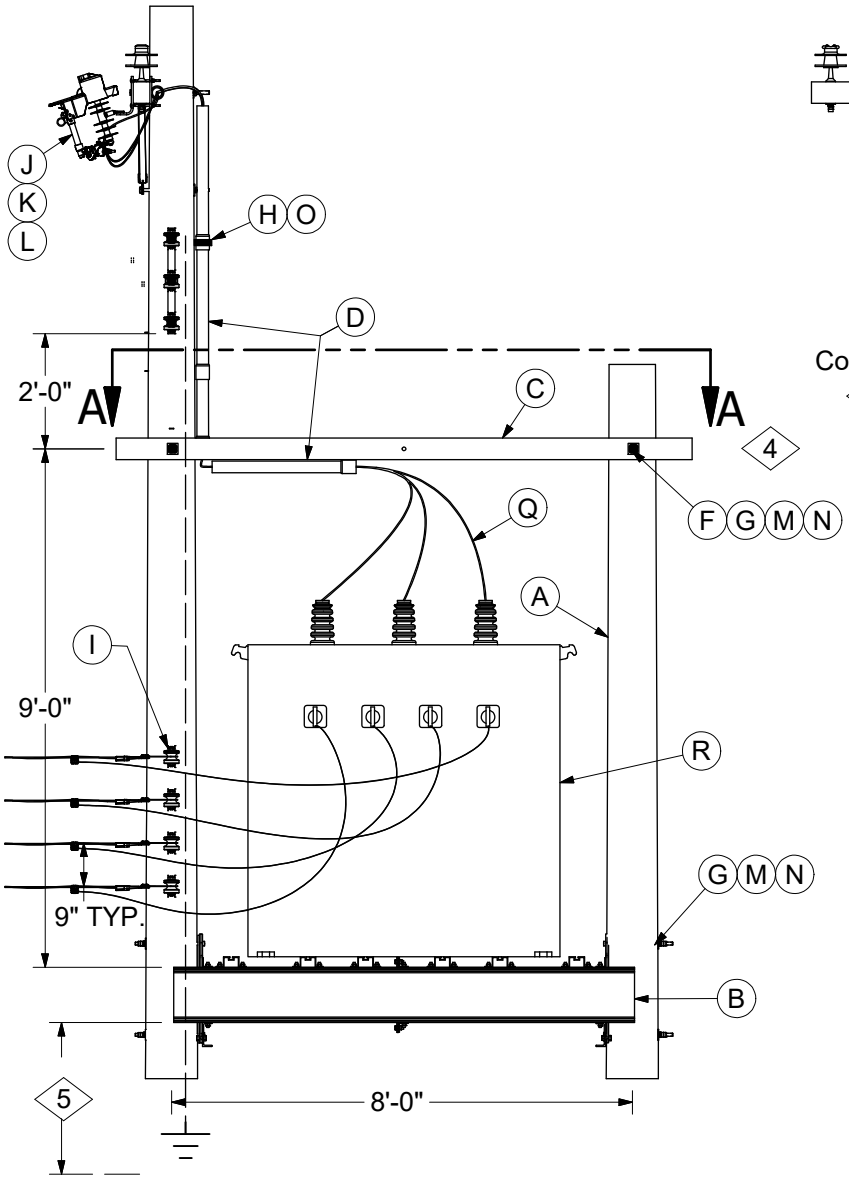
5. If aluminum secondary, use PG clamp, Item C.

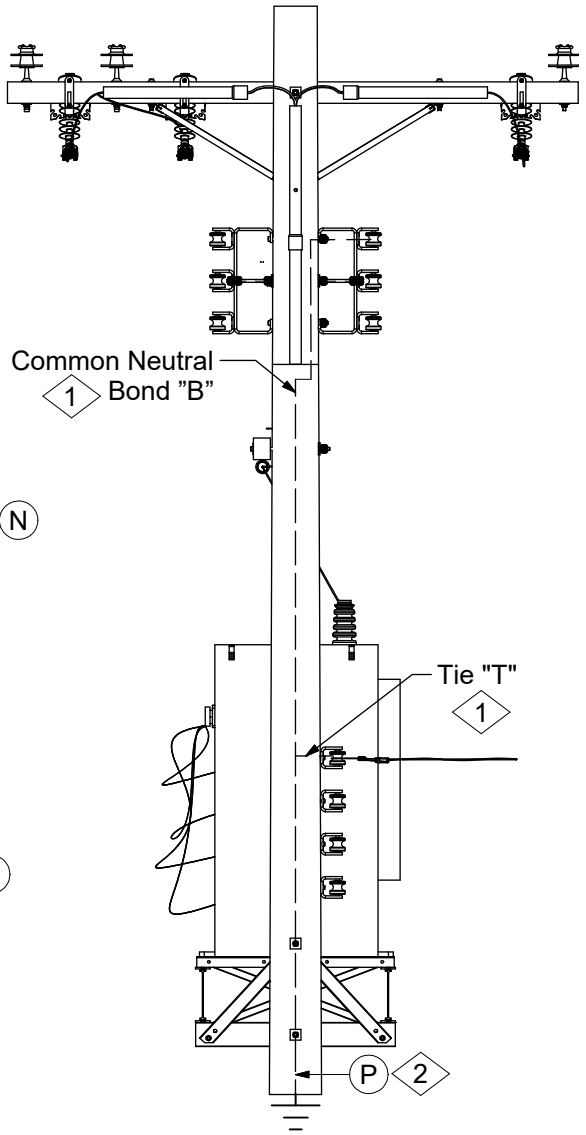
ITEM	STK / DCS #	DESCRIPTION 13 01 07 **	00
A	18 01 020	Wire - #2 Copper - W.P.	10
B	17 54 005	Connector - Split Bolt, #2 Copper	6
C	17 51 032	Clamp, Parallel Groove	6

REV	DATE	ENG	DESCRIPTION
3	04/01/23	DG	Converted to new format
2	06/08/11	DG	



Section A-A





REV	DATE	ENG	DESCRIPTION
6	04/01/23	DG	Converted to new format
5	11/30/11	DG	

CONSTRUCTION NOTE(s):

1. Common neutral is not present, refer to DCS **13 00 07 02** for installation of grounds.

2. Use DCS **12 00 10 01** for ground coil application on new pole installation. Use DCS **12 00 10 02** for ground rod application on existing pole installation.

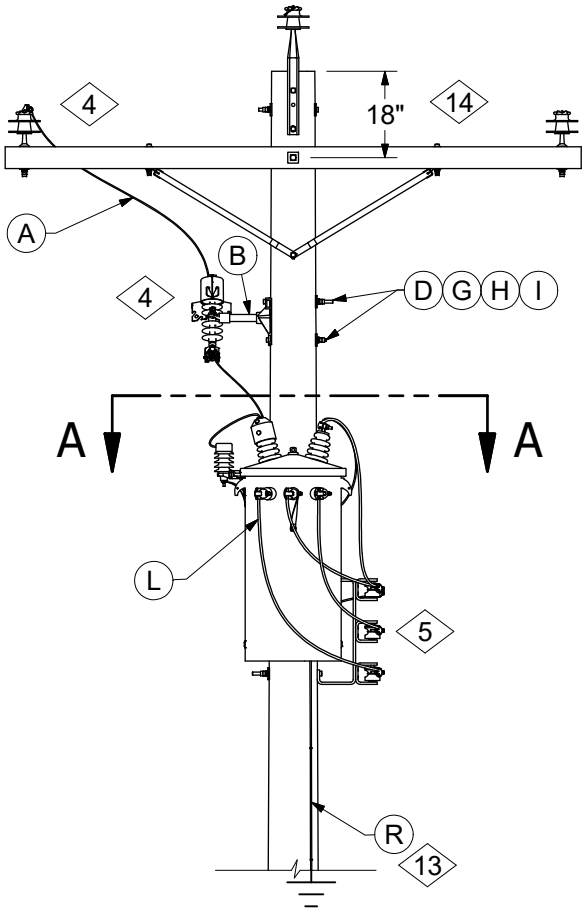
3. Optional Service takeoff. See DCS **09 01 12 00**.

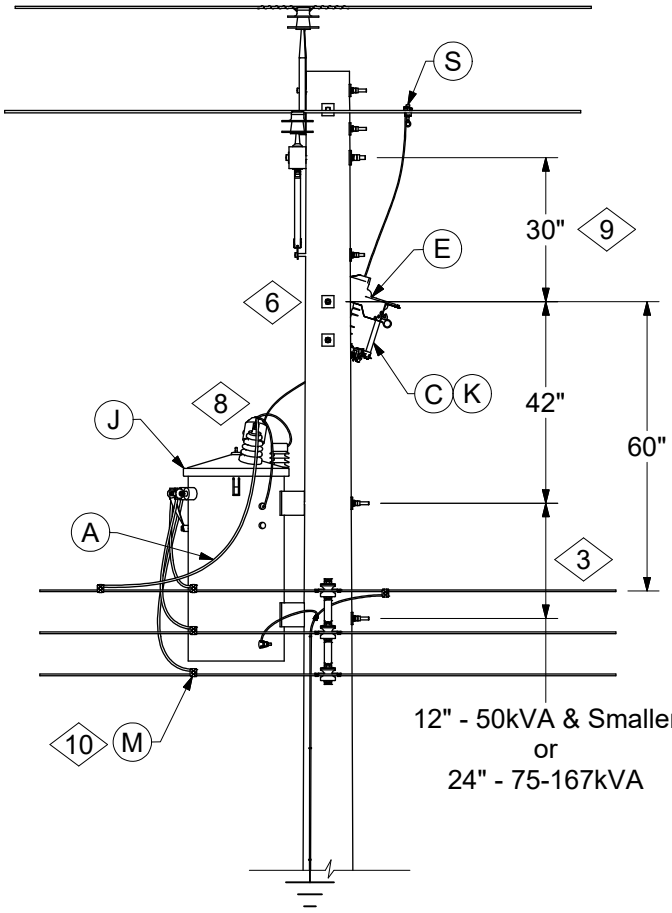
	ITEM	STK / DCS #	DESCRIPTION 13 04 58 **	01
	A	41 02 351	SYP CL 1 35' Pole	1
	B	23 17 174	Platform, Trans, 8'-0”	1
	C	41 01 008	10' Crossarm - 3-1/2" x 4-1/2"	1
	D	12 01 280	Conduit - 2" Schedule 40 (ft.)	15
	E	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	4
	F	23 52 065	Bolt, Mach., 5/8” x 12”	2
	G	23 66 027	Washer, Square, 5/8”	20
	H	27 60 035	Strip, Hanger (Ft.)	6
	I	**06 01 01 01**	Secondary Clevis	4
	J	54 07 209	Switch, Fused, 200A, 15kV	3
	K	23 17 411	Wildlife Guard - Cover Cutout	3
	L	17 58 054	Bracket, Arrester/Cutout Mounting	3
	M	23 66 134	Lock Washer - 5/8" Double Coil	6
	N	23 65 043	Lock Nut - 5/8" Square	6
	O	23 60 023	Screw - Lag, 1/4" x 2"	20
2,@	P	**12 00 10 ** **	Grounding Unit	1
@	Q	**13 00 03 01**	Wire, Ins., 5 kV (Ft.)	60
@	R	**13 00 01 02**	Transformer	1

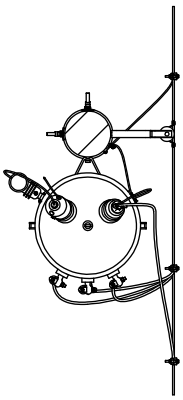
DESIGN NOTE(s):

4. Transformer platform may be either parallel or at right angle to the line to facilitate most convenient service take-off.

5. See DCS **29 00 17 03** for minimum clearance from ground to the transformer platform.

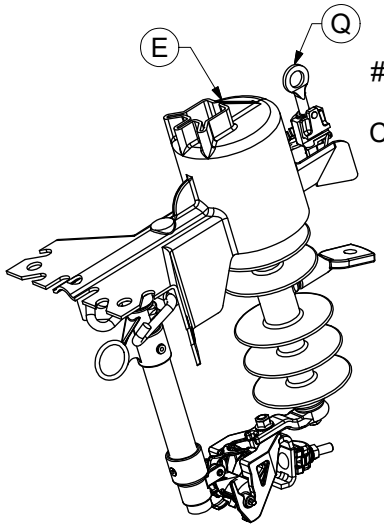




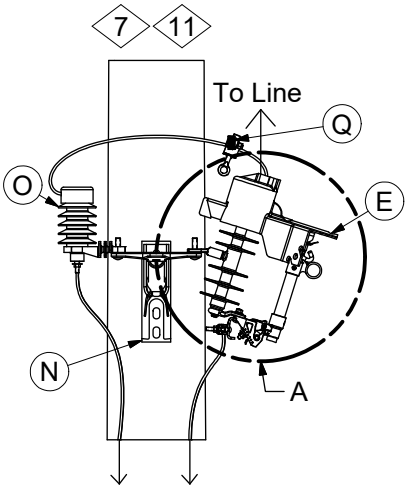


Section A-A

1 2



Detail A
Missouri Only



Arrester Mounting Detail For
Transformer Without Tank
Mounted Arrester
Missouri Only

REV	DATE	ENG	DESCRIPTION
13	04/01/23	DG	Converted to new format
12	11/17/15	DG	

CONSTRUCTION NOTE(s):

1. Arrester may be shifted to most convenient side of tank on two bushing transformers.

2. Transformer position may be rotated to obtain proper clearance from the secondary. Fused switch may also be rotated with respect to the transformer position.

3. Measure distance between mounting slots and drill so that transformer rests evenly on both bolts.

4. Switch may be mounted on either side of pole. To avoid replacing an existing pole when adding a transformer, the switch may be mounted on the crossarm. If the switch is mounted on the crossarm, it should be positioned 12" from the pin insulator or from the pole. The transformer may be raised 12" to 24" when the switch is located on the crossarm. Omit items B and D.

5. See DCS **13 01 01 ****** for secondary support and DCS **03 01 20 ****** for secondary configurations.

6. If installing a CSP transformer, a fused switch shall be installed as shown. Exception: If existing pole space does not allow for installation of a fused switch and the number of customers affected by transformer failure is deemed acceptable, then items B, C, D, E, and K may be omitted and connect the transformer primary lead to overhead conductor.

7. In Missouri, if installing a transformer that does not have a tank mounted lightning arrester, install arrester on transformer mounting bracket per DCS 12 12 05 ** or use items N, O, P, and Q and install the appropriate lightning arrester on the bracket beside the switch. Keep arrester leads as short as possible. See note 10 for avian protection requirements. In Illinois, only the DCS **12 12 05 ****** option is allowed.

8. 2400/4160Y transformer may have side wall or cover mounted HV bushings. If side wall mounted bushings:
   a. Build according to this DCS except use 2.5kV primary lead wire (Stock #18 53 011), or
   b. If pole is congested, 2.5kV primary lead wire (Stock #18 53 011) in conduit similar to Limited Use DCS **13 04 14 01** may be used.

9. This dimension is to top bolt position if FG crossarm is used.

10. If pole is NOT truck accessible, make secondary connections on the climbing side of the pole.

11. For locations in Missouri where additional avian protection is needed, omit the piece of #2 copper wire and hotline clamp, R. Connect #6 copper poly covered arrester wire, Q ,directly to the fused switch connector.

REV	DATE	ENG	DESCRIPTION
13	04/01/23	DG	Converted to new format
12	11/17/15	DG	

DCS #	Description
13 12 00 01	50 kVA or Smaller Transformer
13 12 00 02	75 - 167 kVA Transformer

	ITEM	STK / DCS #	DESCRIPTION 13 12 00 **	01	02
8T	A	18 51 025	Wire, Trans. Riser, #4, S.D. Poly Covered (FT.)	22	22
	B	23 06 127	Bracket - Standoff, 12" FG	1	1
6	C	54 07 208	Switch, Fused, Open Type	1	1
	D	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	2	2
	E	23 17 411	Wildlife Guard - Cover Cutout	1	1
T	F	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	2	-
		23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	-	2
T	G	23 66 207	Washer, Curved, Square, 5/8"	4	2
		23 66 031	Washer, Curved, Square, 3/4"	-	2
	H	23 66 134	Lock Washer - 5/8" Double Coil	4	2
		23 66 135	Lock Washer - 3/4" Double Coil	-	2
	I	23 65 043	Lock Nut - 5/8" Square	4	2
		23 65 042	Lock Nut - 3/4" Square	-	2
@	J	**13 00 01 02**	Transformer	1	1
@	K	**10 00 01 01**	Link, Fuse	1	1
T@	L	**13 00 03 01**	Secondary Leads (FT.)	12	12
T@	M	**07 00 25 00**	Parallel Groove Clamp, PG*	3	3
7@	N	23 56 063	Bracket, 3 Position, Equipment Mount	1	1
7@	O	**12 00 01 01**	Arrester, Lightning	1	1
7@	P	18 51 021	Wire, #6 Cu, S.D. Poly Covered (FT.)	2	2
7,11@	Q	23 78 394	Clamp, Hotline, #6 to 2/0	1	1
13@	R	**12 00 10 ** **	Grounding Unit	1	1
@	S	**07 00 21 00**	Hot Line Clamp, HLC*W	1	1

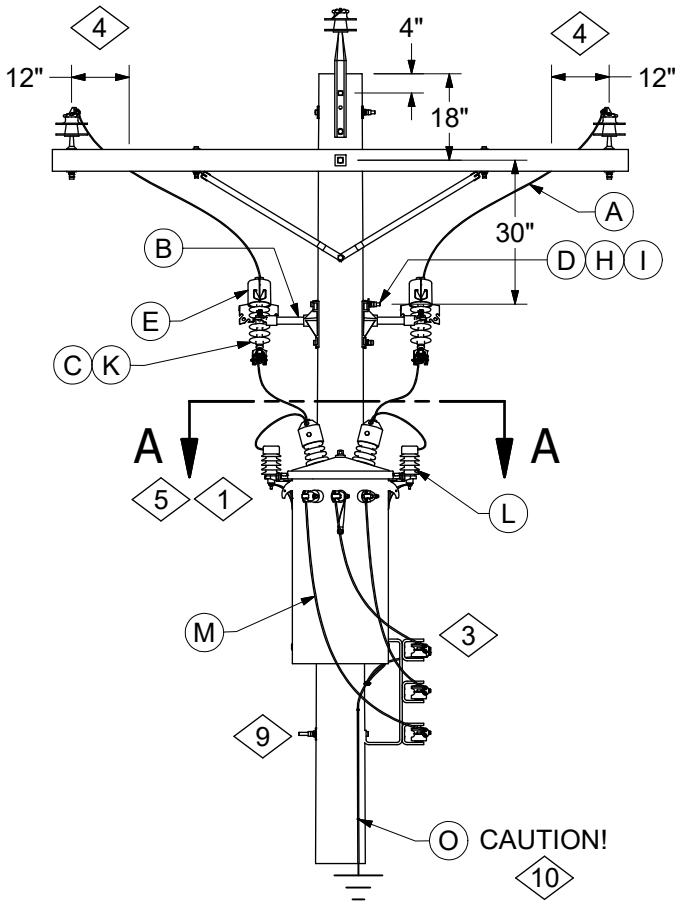
DESIGN NOTE(s):

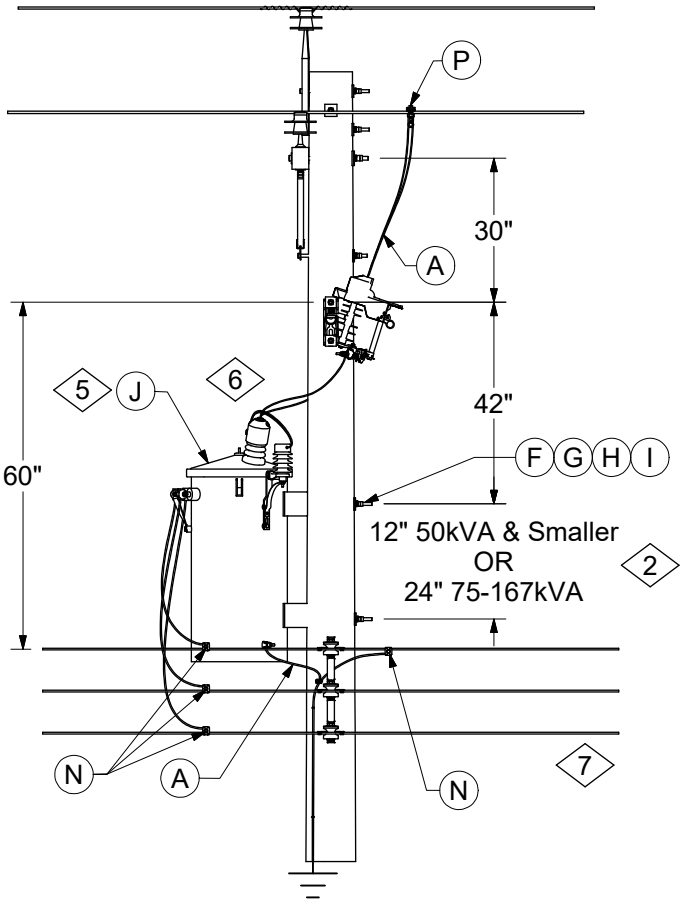
12. Deadend construction - Deadend primary one span past transformer pole if there is another pole in the lead. If not, see DCS **13 12 07 ****.

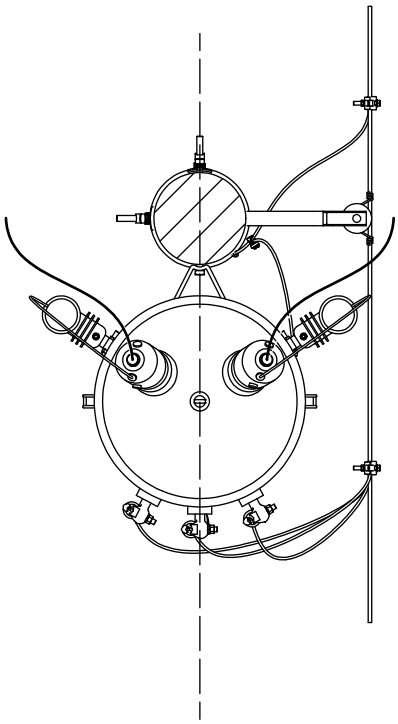
13. Use DCS **12 00 10 01** for ground coil application on new pole installation. Use DCS **12 00 10 02** for ground rod application on existing pole installation.

14. On single phase pole lines where future addition of crossarm for adding additional phases is not reasonably expected, this dimension can be reduced to 6" (i.e., total of 36" from the pole top to the top bolt of the cutout bracket).

REV	DATE	ENG	DESCRIPTION
13	04/01/23	DG	Converted to new format
12	11/17/15	DG	







Section A-A

REV	DATE	ENG	DESCRIPTION
0	04/01/23	DG	New

CONSTRUCTION NOTE(s):

1. Arresters must be connected to each HV bushing. Transformers coded BA, BD, JA, JD, XA, and XD have one arrester included, all others have no arrester.
2. Measure distance between mounting slots and drill so that transformer rests evenly on both bolts.
3. See DCS **13 01 01 ****** for secondary support and DCS **03 01 20 ****** for secondary configurations.
4. To avoid replacing an existing pole when adding a transformer, switches may be mounted on the crossarm. If the switches are mounted on the crossarm, they should be positioned 12" from the pin insulators. The transformer may be raised 12" to 24" when the switches are located on the crossarm. Omit items B, D, H, and I.
5. Only install transformers that have provision for tank mounting the arresters.
6. 2400/4160 Y transformers may have sidewall or cover mounted HV bushings.
7. If pole is NOT truck accessible, make secondary connections on climbing side of the pole.

DCS #	Description
13 12 05 01	50 kVA or Smaller Transformer
13 12 05 02	75 - 167 kVA Transformer

	ITEM	STK / DCS #	DESCRIPTION 13 12 05 **	01	02
	A	18 51 025	Wire, Trans. Riser, #4, S.D. Poly Covered (FT.)	24	24
4	B	23 06 127	Bracket - Standoff, 12" FG	2	2
	C	54 07 208	Switch, Fused, Open Type	2	2
4	D	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	2	2
	E	23 17 411	Wildlife Guard - Cover Cutout	2	2
T	F	23 52 066	Bolt, Mach., 5/8" x 14" (50 kVA & Smaller)	2	-
		23 52 219	Bolt, Mach., 3/4" x 14" (75-167 kVA)	-	2
T	G	23 66 027	Washer, Flat, Square 5/8" (50 kVA & Smaller)	2	-
		23 66 031	Washer, Curved, Square, 3/4" (75-167 kVA)	-	2
	H	23 66 134	Lock Washer - 5/8" Double Coil	4	2
		23 66 135	Lock Washer - 3/4" Double Coil	-	2
	I	23 65 043	Lock Nut - 5/8" Square	4	2
		23 65 042	Lock Nut - 3/4" Square	-	2
@	J	**13 00 01 02**	Transformer	1	1
@	K	**10 00 01 01**	Link, Fuse	2	2
1,@	L	**12 00 01 01**	Arrester, Lightning	#	#
T@	M	**13 00 03 01**	Secondary Leads (Ft.)	12	12
T@	N	**07 00 25 00**	PG* Connector	3	3
9,10@	O	**12 00 10 ******	Grounding Unit	1	1
@	P	**07 00 21 00**	HLC*W Hot Line Clamp	2	2

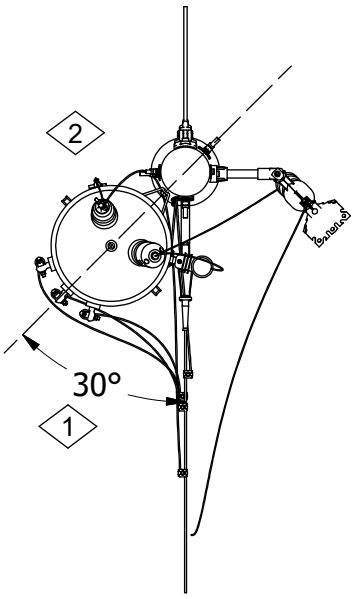
REV	DATE	ENG	DESCRIPTION
0	04/01/23	DG	New

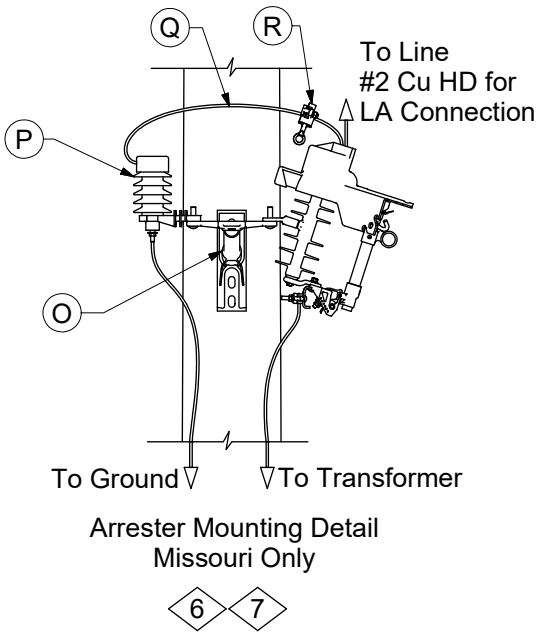
DESIGN NOTE(s):

8. Deadend construction Deadend primary one span past transformer pole if there is another pole in the lead. If not, see DCS **13 12 10 01**.

9. Use DCS **12 00 10 01** for ground coil application on new pole installation. Use DCS **12 00 10 02** for ground rod application on existing pole installation.

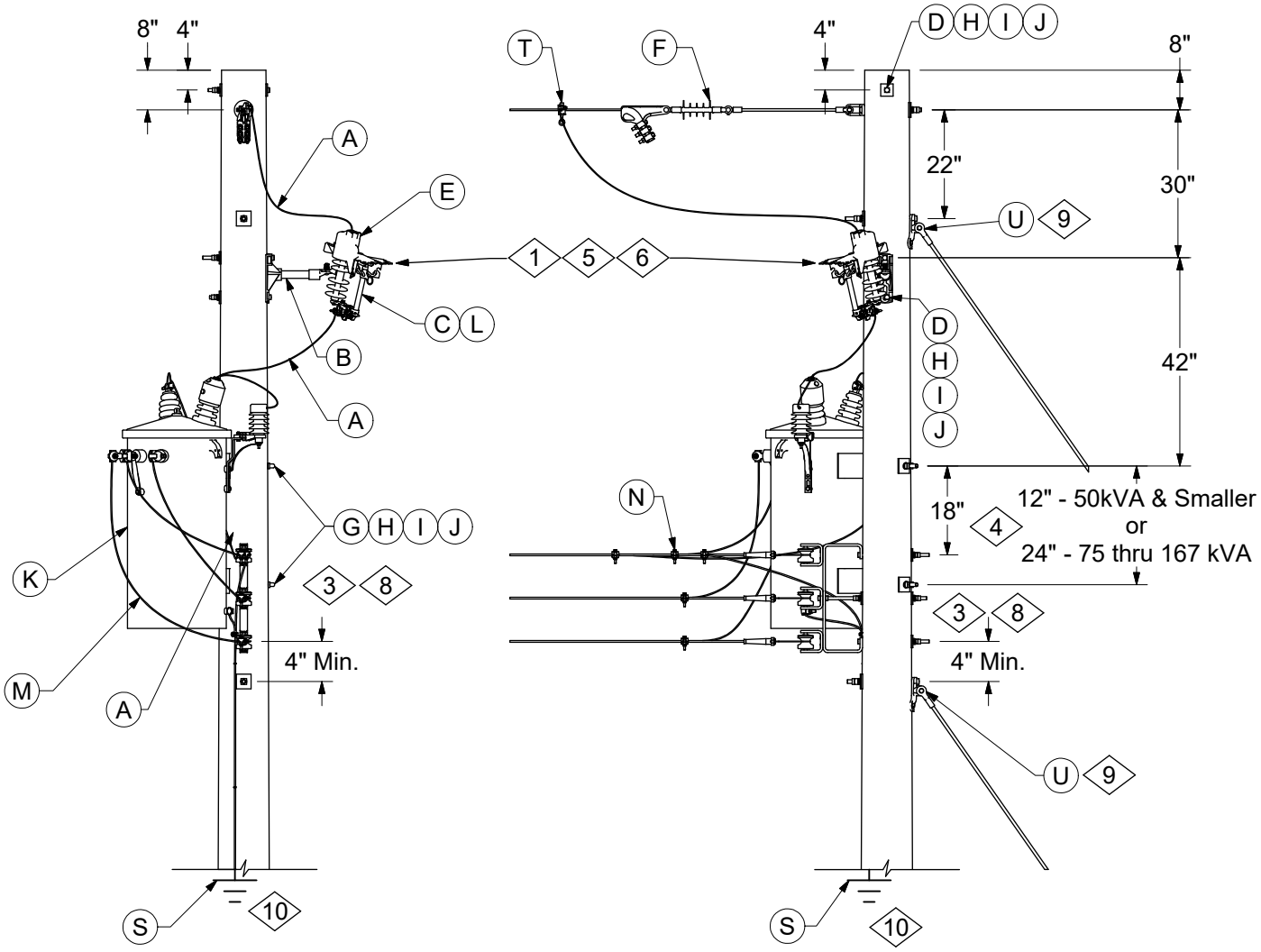
10. Arrester ground and secondary ground may be required to be separate. See DCS **13 00 06 06** for details on this requirement.





Arrester Mounting Detail
Missouri Only

6 7



DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
0	04/01/23	DG	New Standard

CONSTRUCTION NOTE(s):

1. Angle is shown as 30°; but may be varied depending on the size and shape of the transformer, to obtain proper clearance from the secondary. Fused switch can also be rotated with respect to the transformer position.

2. Arrester may be shifted to the most convenient side of tank on two bushing transformers.

3. Where primary deadends, and secondary runs through, construct as on DCS **13 12 00 ****.

4. Measure distance between mounting slots and drill so that transformer rests evenly on both bolts.

5. If installing a CSP transformer, a fused switch shall be installed as shown. Exception: If existing pole space does not allow for installation of a fused switch and the number of customers affected by transformer failure is deemed acceptable, then items B, C, L, D(2), and E may be omitted and connect the transformer primary lead to the overhead conductor.

6. In Missouri, if installing a transformer that does not have a tank mounted lightning arrester, install arrester on transformer mounting bracket per DCS **12 12 05 **** or use items O, P, Q, and R and install the appropriate lightning arrester on the bracket beside the switch. Keep arrester leads as short as possible. See note 7 for avian protection requirements. In Illinois, only the DCS **12 12 05 ** ** option is allowed.

7. For locations in Missouri where additional avian protection is needed, omit the #2 bare CU stud and hot line clamp, R, and connect the #6 CU poly covered arrester lead wire directly to the fused switch connector.

8. See DCS **13 01 01 ** ** for secondary support and DCS **03 01 20 ** ** for secondary configurations.

9. See DCS **11 00 02 02** for typical guy insulator placement.

REV	DATE	ENG	DESCRIPTION
0	04/01/23	DG	New Standard

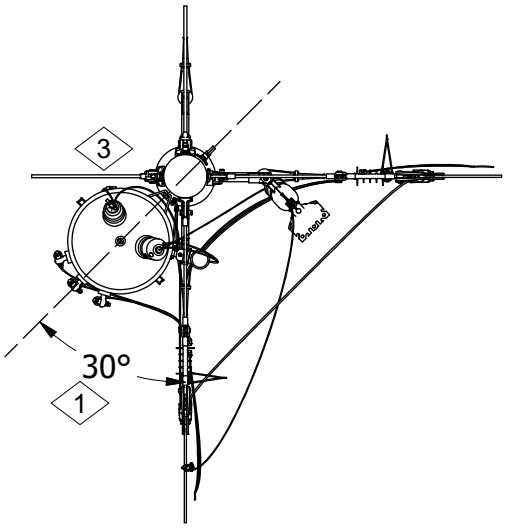
DCS #	Description
13 12 07 01	Deadend - 50 kVA or Smaller Transformer
13 12 07 02	Deadend - 75 - 167 kVA Transformer

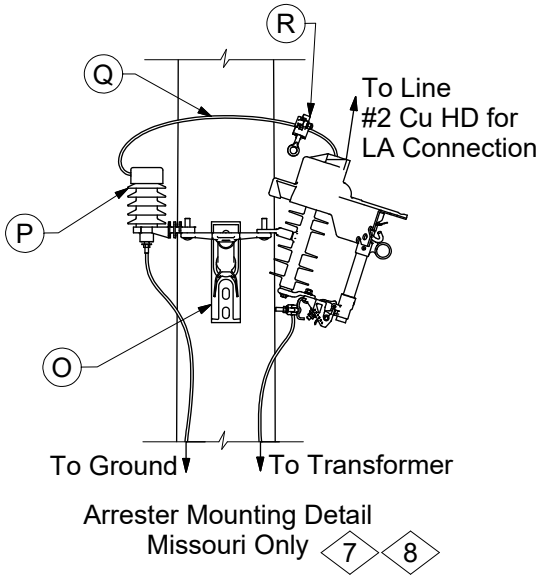
	ITEM	STK / DCS #	DESCRIPTION 13 12 07 **	01	02
	A	18 51 025	Wire, Trans. Riser, #4, S.D. Poly Covered (FT.)	12	12
	B	23 06 127	Bracket - Standoff, 12" FG	1	1
	C	54 07 208	Switch, Fused, Open Type	1	1
	D	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	3	3
	E	23 17 411	Wildlife Guard - Cover Cutout	1	1
	F	**06 12 30 01 @**	Deadend w/ Extension	1	1
T	G	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut (50 kVA & Smaller)	2	-
		23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut (75 kVA - 167 kVA)	-	2
T	H	23 66 207	Washer, Curved, Square, 5/8" (50 kVA & Smaller)	5	3
		23 66 031	Washer, Curved, Square, 3/4" (75 kVA - 167 kVA)	-	2
	I	23 66 134	Lock Washer - 5/8" Double Coil	5	3
		23 66 135	Lock Washer - 3/4" Double Coil	-	2
	J	23 65 043	Lock Nut - 5/8" Square	5	3
		23 65 042	Lock Nut - 3/4" Square	-	2
@	K	**13 00 01 02**	Transformer	1	1
@	L	**10 00 01 01**	Link, Fuse	1	1
T@	M	**13 00 03 01**	Secondary Leads (FT.)	12	12
T@	N	**07 00 25 00**	Clamp, Parallel Groove, PG*	3	3
6@	O	23 56 063	Bracket, 3 Position, Equipment Mount	1	1
6@	P	**12 00 01 01**	Arrester, Lightning	1	1
6@	Q	18 51 021	Wire, #6 Cu, S.D. Poly Covered (FT.)	2	2
6,7@	R	23 78 394	Clamp, Hotline, #6 to 2/0	1	1
10@	S	**12 00 10 ** **	Grounding Unit	1	1
@	T	**07 00 21 00**	Clamp, Hotline, HLC*W	1	1
9@	U	**11 00 4* ** **	Guying Unit	1	1

DESIGN NOTE(s):

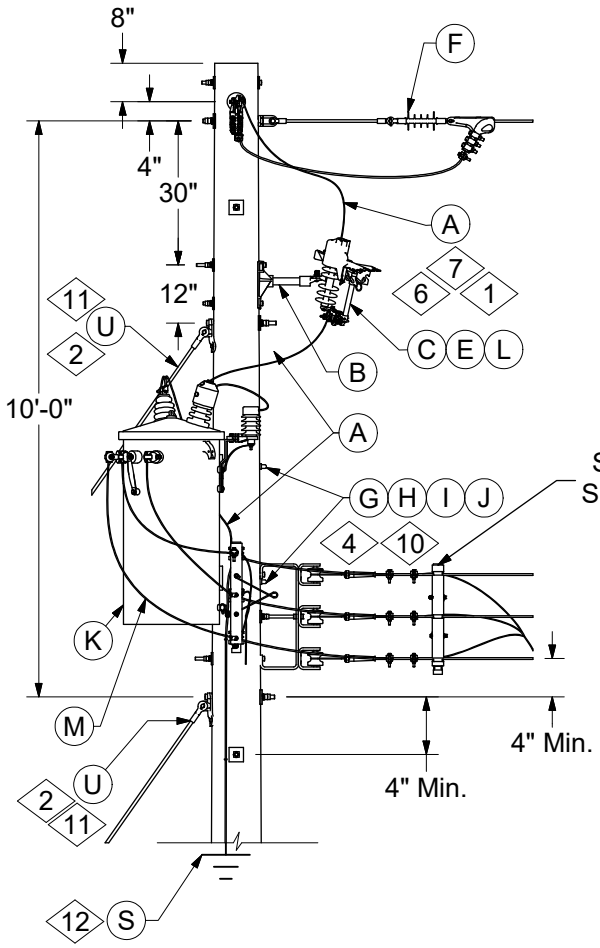
10 Use DCS **12 00 10 01** for ground coil application on new pole installation. Use DCS **12 00 10 02** for ground rod application on existing pole installation.

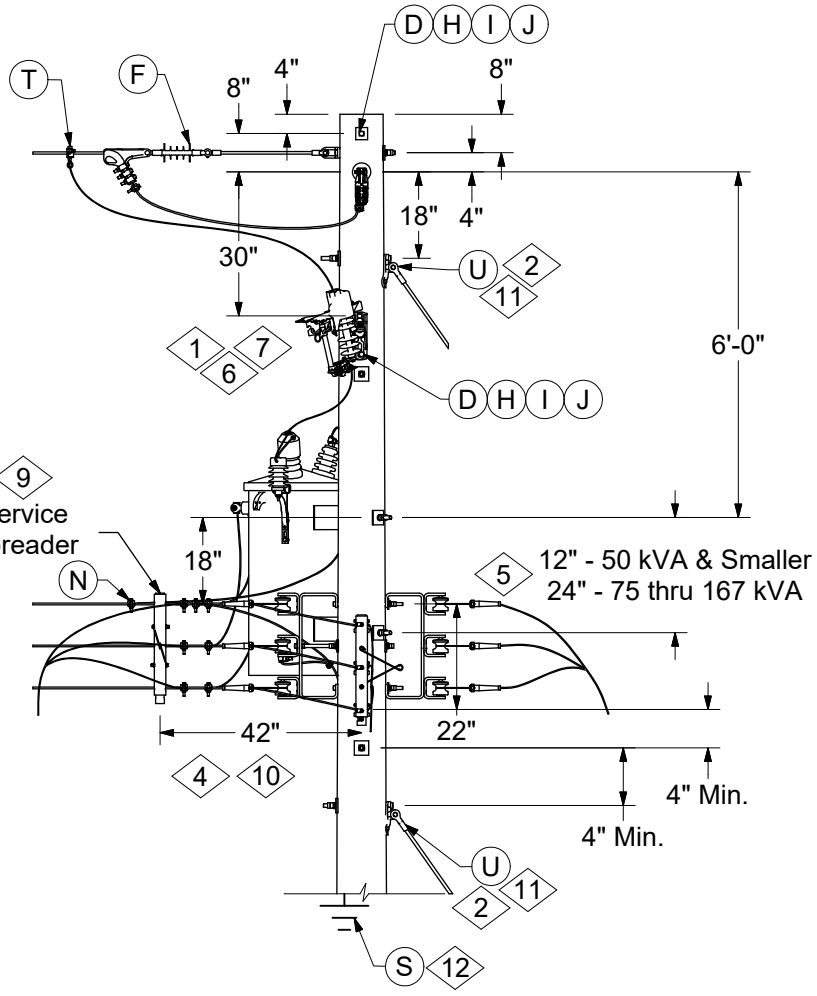
REV	DATE	ENG	DESCRIPTION
0	04/01/23	DG	New Standard





Arrester Mounting Detail
Missouri Only 7 8





DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
15	04/01/23	DG	Converted to new format
14	05/24/18	DG	

CONSTRUCTION NOTE(s):

1. Angle is shown as 30°; but may be varied depending on the size and shape of the transformer, to obtain proper clearance from the secondary. Fused switch can also be rotated with respect to the transformer position.

2. Where guy must be installed below transformer, a Class 4 or heavier pole shall be used. A Class 4 pole will provide adequate strength for deadening 1 - 1/0 bare AAAC at 1,400 lbs. max. tension. For conductor tension greater than this, contact Distribution Standards for determination of pole class.

3. Arrester may be shifted to the most convenient side of tank on two bushing transformers.

4. Where primary deadends, and secondary runs through, construct as on DCS **13 12 00 ****.

5. Measure distance between mounting slots and drill so that transformer rests evenly on both bolts.

6. If installing a CSP transformer, a fused switch shall be installed as shown. Exception: If existing pole space does not allow for installation of a fused switch and the number of customers affected by transformer failure is deemed acceptable, then items B, C, L, D(2), and E may be omitted and connect the transformer primary lead to the overhead conductor.

7. In Missouri, if installing a transformer that does not have a tank mounted lightning arrester, install arrester on transformer mounting bracker per DCS **12 12 05 ** or use items O, P, Q, and R and install the appropriate lightning arrester on the bracket beside the switch. Keep arrester leads as short as possible. See note 8 for avian protection requirements. In Illinois, only the DCS **12 12 05 ** option is allowed.

8. For locations in Missouri where additional avian protection is needed, omit the #2 bare CU stud and hot line clamp, R, and connect the #6 CU poly covered arrester lead wire directly to the fused switch connector.

9. Service Spreaders, Stock #23 17 227 (triplex) or Stock #23 17 219 (open-wire), can be used to increase climbing and working space around transformer.

10. See DCS **13 01 01 ** for secondary support and DCS **03 01 20 ** for secondary configurations.

11. See DCS **11 00 02 02** for typical guy insulator placement.

REV	DATE	ENG	DESCRIPTION
15	04/01/23	DG	Converted to new format
14	05/24/18	DG	

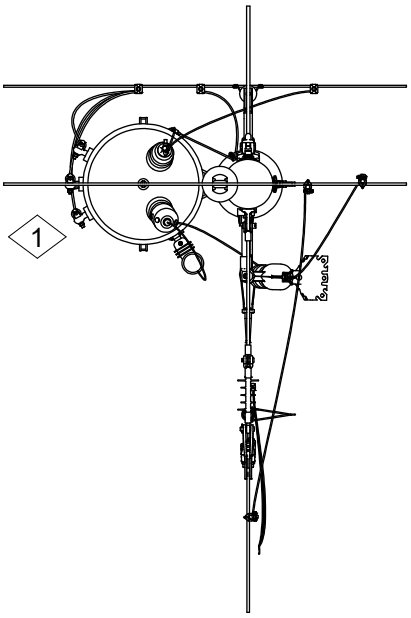
DCS #	Description
13 12 10 02	"L" Corner - 50 kVA & Smaller Transformer
13 12 10 03	"L" Corner - 75 thru 167 kVA Transformer

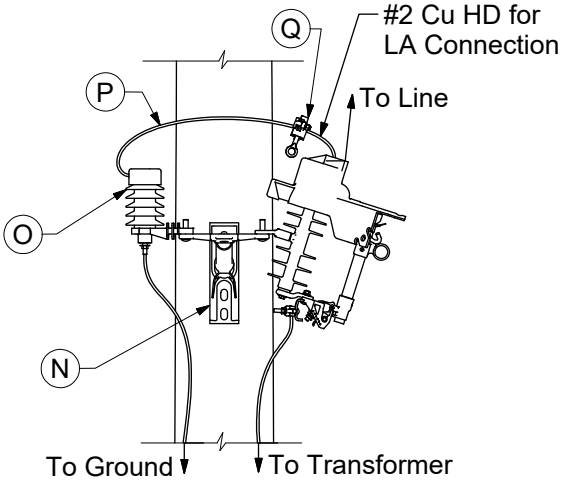
	ITEM	STK / DCS #	DESCRIPTION 13 12 10 **	02	03
	A	18 51 025	Wire, Trans. Riser, #4, S.D. Poly Covered (FT.)	12	12
	B	23 06 127	Bracket - Standoff, 12" FG	1	1
	C	54 07 208	Switch, Fused, Open Type	1	1
	D	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	3	3
	E	23 17 411	Wildlife Guard - Cover Cutout	1	1
	F	**06 12 30 01 @**	Deadend w/ Ext.	2	2
T	G	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	2	-
		23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	-	2
T	H	23 66 207	Washer, Curved, Square, 5/8"	5	3
		23 66 031	Washer, Curved, Square, 3/4"	-	2
	I	23 66 134	Lock Washer - 5/8" Double Coil	5	3
		23 66 135	Lock Washer - 3/4" Double Coil	-	2
	J	23 65 043	Lock Nut - 5/8" Square	5	3
		23 65 042	Lock Nut - 3/4" Square	-	2
@	K	**13 00 01 02**	Transformer	1	1
@	L	**10 00 01 01**	Link, Fuse	1	1
T@	M	**13 00 03 01**	Secondary Leads (FT.)	12	12
T@	N	**07 00 25 00**	Parallel Groove Clamp, PG*	3	3
7@	O	23 56 063	Bracket, 3 Position, Equipment Mount	1	1
7@	P	**12 00 01 01**	Arrester, Lightning	1	1
7@	Q	18 51 021	Wire, #6 Cu, S.D. Poly Covered (FT.)	2	2
7,8@	R	23 78 394	Clamp, Hotline, #6 to 2/0	1	1
12@	S	**12 00 10 ** **	Grounding Unit	1	1
@	T	**07 00 21 00**	Hot Line Clamp, HLC*W	1	1
11@	U	**11 00 4* ** **	Guying Unit	2	2

DESIGN NOTE(s):

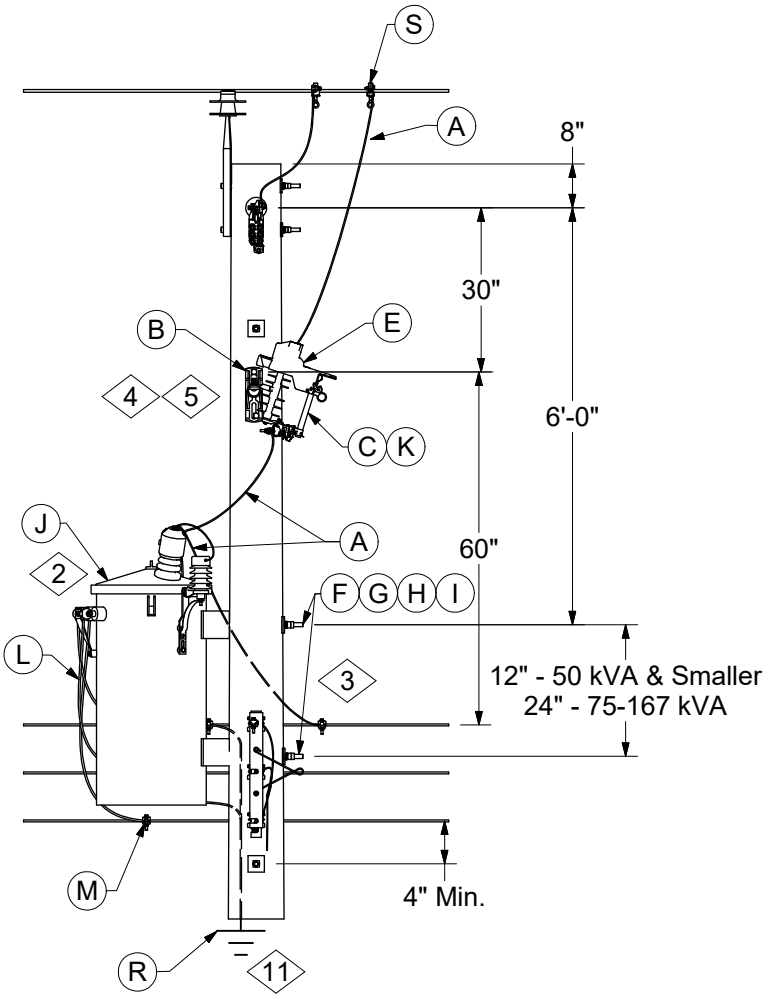
12. Use DCS **12 00 10 01** for ground coil application on new pole installation. Use DCS **12 00 10 02** for ground rod application on existing pole installation.

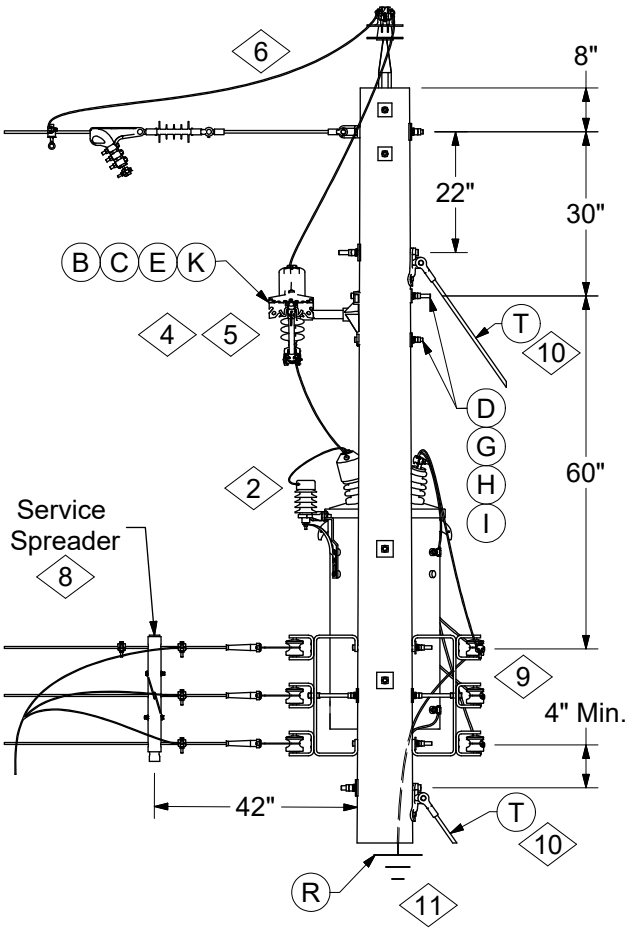
REV	DATE	ENG	DESCRIPTION
15	04/01/23	DG	Converted to new format
14	05/24/18	DG	





Arrester Mounting Detail
Missouri Only 5 7





CONSTRUCTION NOTE(s):

1. Transformer position may be rotated depending on the size and shape of the transformer to obtain proper clearance from the secondary. Fused switch can also be rotated with respect to the transformer position.

2. Arrester may be shifted to the most convenient side of tank on two bushing transformers.

3. Measure distance between mounting slots and drill so that transformer rests evenly on both bolts.

4. If a CSP transformer is used, a fused switch shall be provided as shown. Exception: If existing pole space does not allow for installation of a fused switch and the number of customers affected by transformer failure is deemed acceptable, then items B, C, E, K, and D may be omitted and connect the transformer primary lead to the overhead conductor.

5. In Missouri, if installing a transformer that does not have a tank mounted lightning arrester, install arrester on transformer mounting bracket per DCS **12 12 05 **** or use items N, O, P, and Q and install the appropriate lightning arrester on the bracket beside the switch. Keep arrester leads as short as possible. See note 7 for avian protection requirements. In Illinois, only the DCS **12 12 05 ** ** option is allowed.

6. If there is space available on the pole, a fused switch for the primary tap can be installed on “T” corners. Refer to DCS **10 12 19 ****.

7. For locations in Missouri where additional avian protection is needed, omit the #2 bare CU stud and hotline clamp Q and connect the #6 CU poly covered arrester lead wire P directly to the fused switch connector.

8. Service spreaders Stock #23 17 227 (triplex) or Stock #23 17 219 (open-wire) can be used to increase climbing and working space around transformer.

9. See DCS **13 01 01 ** ** for secondary support and DCS **03 01 20 ** ** for secondary configurations.

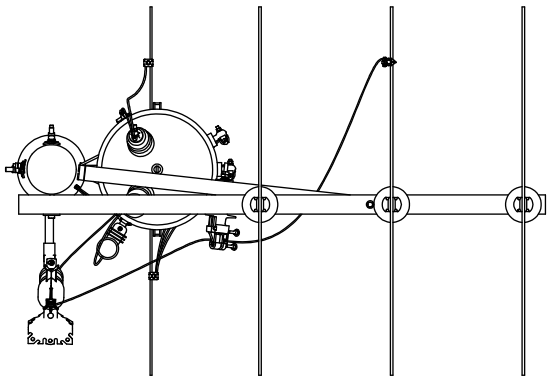
10. See DCS **11 00 02 02** for typical guy insulator placement.

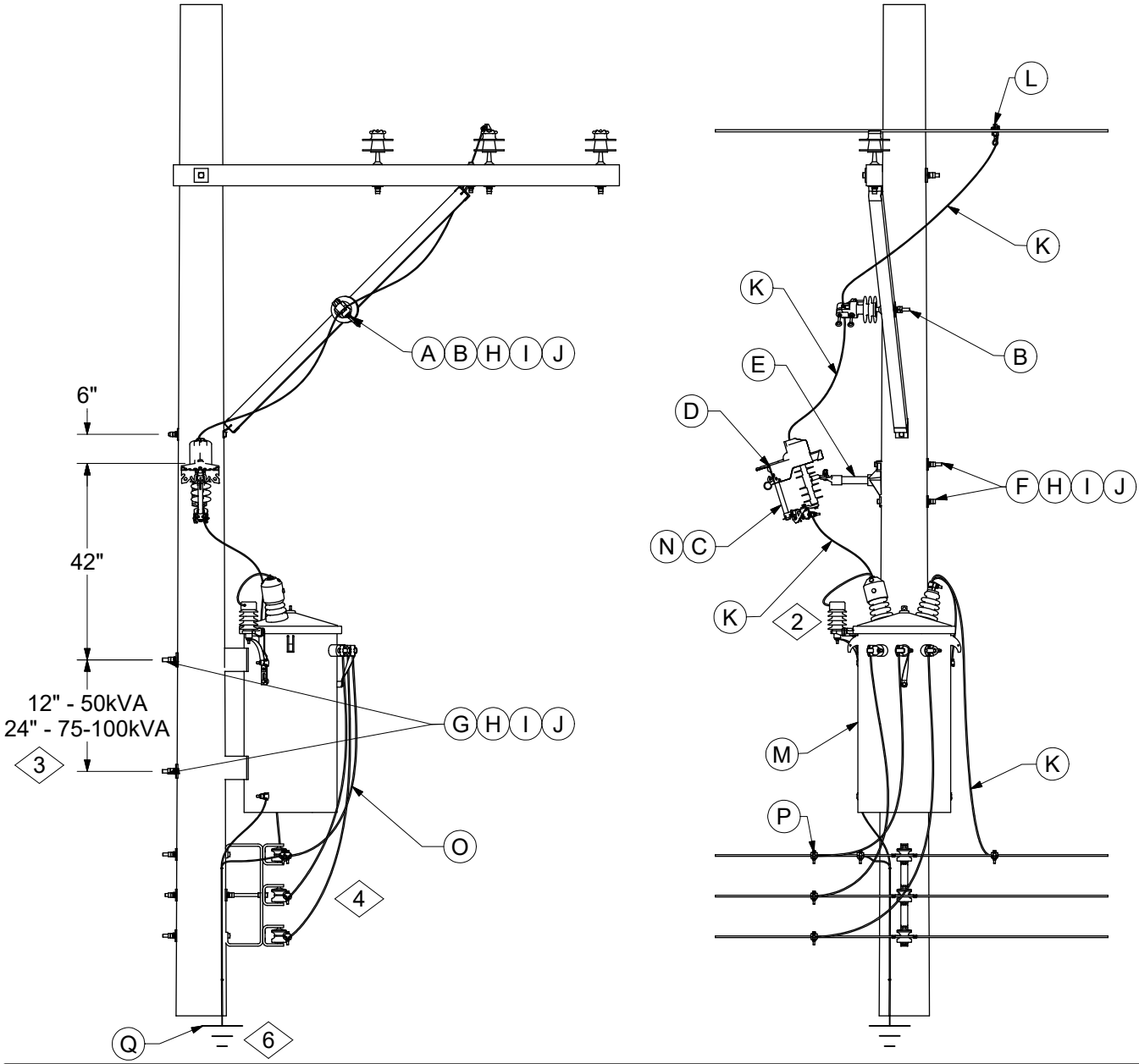
DCS #	Description
13 12 14 01	"T" Corner - 50 kVA or Smaller Transformer
13 12 14 02	"T" Corner - 75-167 kVA Transformer

	ITEM	STK / DCS #	DESCRIPTION 13 12 14 **	01	02
	A	18 51 025	Wire, Trans. Riser, #4, S.D. Poly Covered (Ft.)	12	12
	B	23 06 127	Bracket - Standoff, 12" FG	1	1
	C	54 07 208	Switch, Fused, Open Type	1	1
	D	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	2	2
	E	23 17 411	Wildlife Guard - Cover Cutout	1	1
T	F	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	2	-
		23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	-	2
T	G	23 66 207	Washer, Curved, Square, 5/8"	4	2
		23 66 031	Washer, Curved, Square, 3/4"	-	2
	H	23 66 134	Lock Washer - 5/8" Double Coil	4	2
		23 66 135	Lock Washer - 3/4" Double Coil	-	2
	I	23 65 043	Lock Nut - 5/8" Square	4	2
		23 65 042	Lock Nut - 3/4" Square	-	2
@	J	**13 00 01 02**	Transformer	1	1
@	K	**10 00 01 01**	Link, Fuse	1	1
T@	L	**13 00 03 01**	Secondary Leads (Ft.)	12	12
T@	M	**07 00 25 00**	Parallel Groove Clamp, PG*	3	3
5@	N	23 56 063	Bracket, 3 Position, Equipment Mount	1	1
5@	O	**12 00 01 01**	Arrester, Lightning	1	1
5@	P	18 51 021	Wire, #6 Cu, S.D. Poly Covered (Ft.)	2	2
5,7@	Q	23 78 394	Clamp, Hotline, #6 to 2/0	1	1
11@	R	**12 00 10 ** **	Grounding Unit	1	1
@	S	**07 00 21 00**	Hot Line Clamp, HLC*W	1	1
10@	T	**11 00 4* ** **	Guying Unit	1	1

DESIGN NOTE(s):

11 Use DCS **12 00 10 01** for ground coil application on new pole installation. Use DCS **12 00 10 02** for ground rod application on existing pole installation.





REV	DATE	ENG	DESCRIPTION
9	04/01/23	DG	Converted to new format
8	11/30/11	DG	

CONSTRUCTION NOTE(s):

1. For CSP transformers, a fused switch shall be installed as shown.

2. Arrester may be shifted to the most convenient side of tank on two bushing transformers.

3. Measure distance between mounting slots and drill so that transformer rests evenly on both bolts.

4. See DCS **13 01 01 ****** for secondary support and DCS **03 01 20 ****** for secondary configurations.

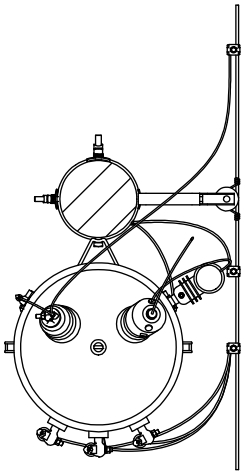
5. Transformer and fused switch positions may be rotated if additional working space is needed.

DCS #	Description
13 12 21 01	50 kVA or Smaller Transformer
13 12 21 02	75 - 100 kVA Transformer

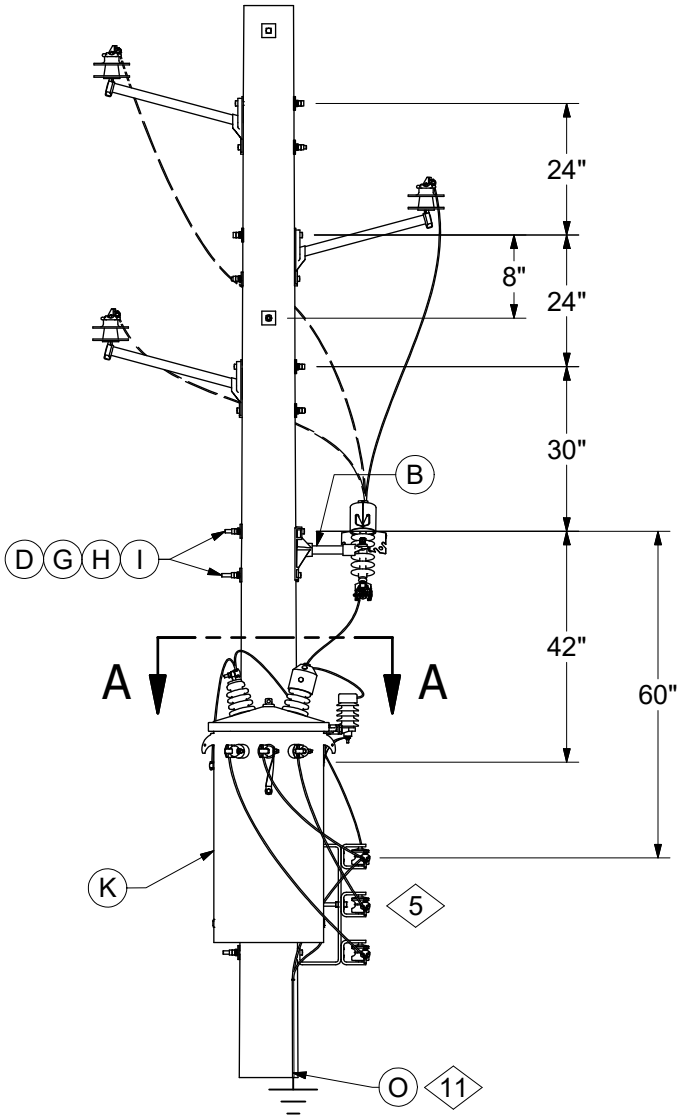
	ITEM	STK / DCS #	DESCRIPTION 13 12 21 **	01	02
	A	25 05 143	Insulator, Vice Top, 12kV	1	1
	B	23 62 028	Pin, Insulator, Long Shank	1	1
	C	54 07 208	Switch, Fused, Open Type	1	1
	D	23 17 411	Wildlife Guard - Cover Cutout	1	1
	E	23 06 127	Bracket - Standoff, 12" FG	1	1
	F	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	2	2
T	G	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	2	-
		23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	-	2
T	H	23 66 207	Washer, Curved, Square, 5/8"	5	3
		23 66 031	Washer, Curved, Square, 3/4"	-	2
	I	23 66 134	Lock Washer - 5/8" Double Coil	5	3
		23 66 135	Lock Washer - 3/4" Double Coil	-	2
	J	23 65 043	Lock Nut - 5/8" Square	5	3
		23 65 042	Lock Nut - 3/4" Square	-	2
	K	18 51 025	Wire, Trans. Riser, #4, S.D. Poly Covered (Ft.)	22	22
@	L	**07 00 21 00**	Clamp, Hotline, HLC*W	1	1
@	M	**13 00 01 02**	Transformer	1	1
@	N	**10 00 01 01**	Link, Fuse	1	1
T@	O	**13 00 03 01**	Secondary Leads (Ft.)	12	12
T@	P	**07 00 25 00**	Clamp, Parallel Groove, PG*	4	4
5@	Q	**12 00 10 ******	Grounding Unit	1	1

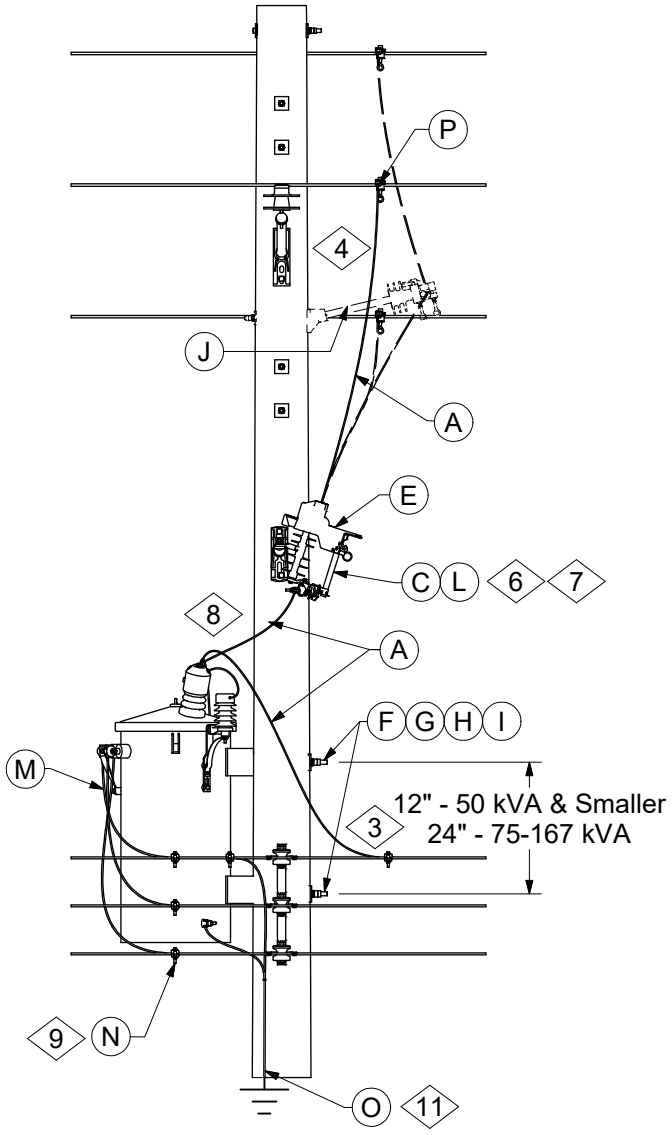
DESIGN NOTE(s):

6. Use DCS **12 00 10 01** for ground coil application on new pole installation. Use DCS **12 00 10 02** for ground rod application on existing pole installation.



SECTION A-A ◇1 ◇2





REV	DATE	ENG	DESCRIPTION
11	04/01/23	DG	Converted to new format
10	09/14/15	DG	

CONSTRUCTION NOTE(s):

1. Arrester may be shifted to most convenient side of tank on two bushing transformers.

2. Transformer position may be rotated to obtain proper clearance from the secondary. Fused switch may also be rotated with respect to the transformer position.

3. Measure distance between mounting slots and drill so that transformer rests evenly on both bolts.

4. When transformer must be connected to top phase, install 24” fiberglass standoff.

5. See DCS **13 01 01 ****** for secondary support and **DCS 03 01 20 ****** for secondary configurations.

6. Switch may be mounted on either side of the pole.

7. If installing a CSP Transformer, a fused switch shall be installed as shown. Exception: If existing pole space does not allow for installation of a fused switch and the number of customers affected by transformer failure is deemed acceptable, then items B, C, D, E, and L may be omitted and connect the transformer primary lead to the overhead conductor.

8. 2400/4160 Y transformer may have side wall or cover mounted HV bushings. If side wall mounted bushing:
   a. Build according to this DCS except use 2.5kV primary lead wire (Stock #18 53 011), or
   b. If pole is congested, 2.5kV primary lead wire (Stock #18 53 011) in in conduit similar to Limited Use DCS **13 04 14 01** may be used.

9. If pole is NOT truck accessible, make secondary connections on the climbing side of the pole.

DCS #	Description
13 12 34 03	50 kVA or Smaller Transformer
13 12 34 04	75 - 167 kVA Transformer

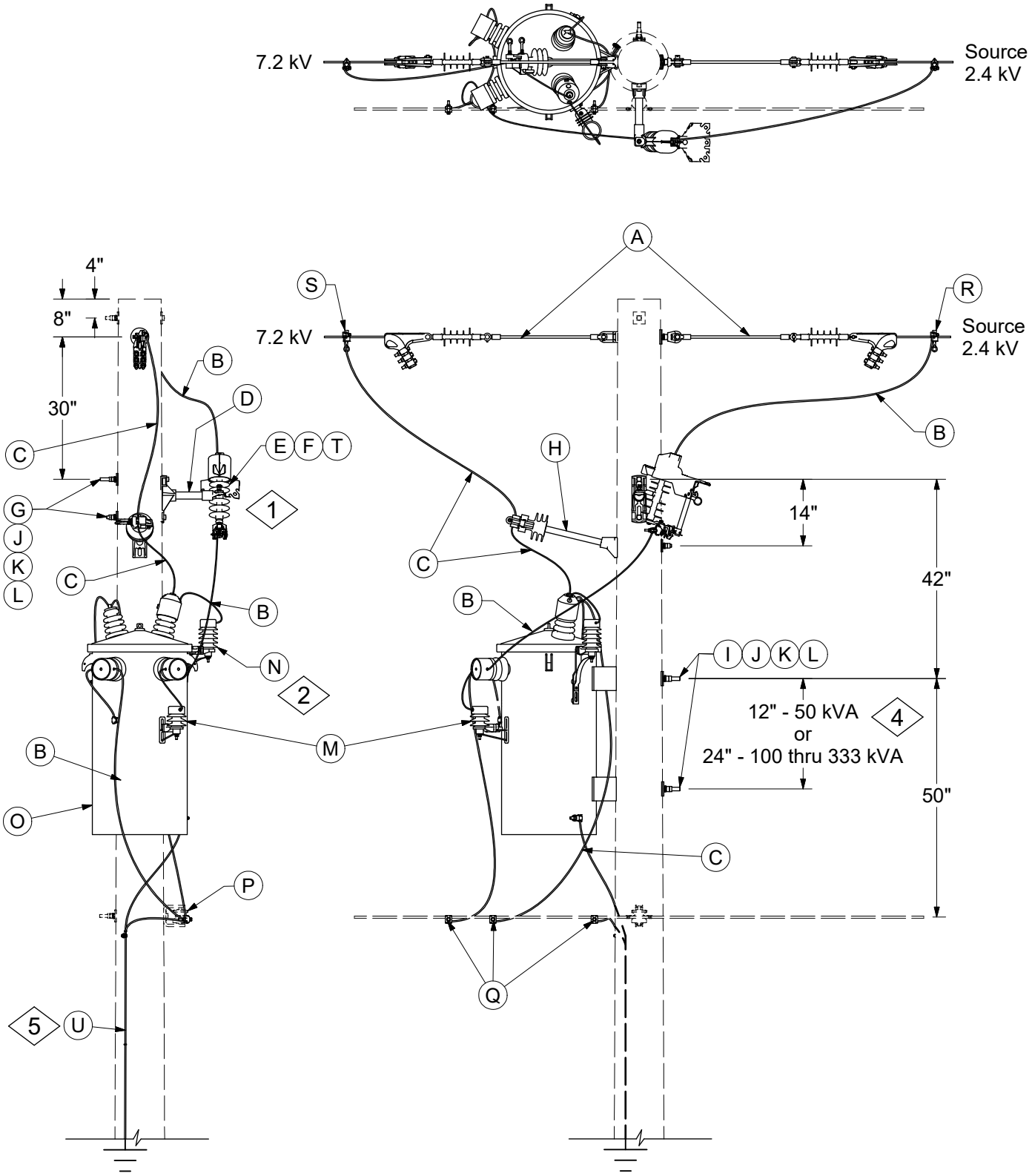
	ITEM	STK / DCS #	DESCRIPTION 13 12 34 **	03	04
	A	18 51 025	Wire, Trans. Riser, #4, S.D. Poly Covered (Ft.)	22	22
	B	23 06 127	Bracket - Standoff, 12" FG	1	1
	C	54 07 208	Switch, Fused, Open Type	1	1
	D	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	2	2
	E	23 17 411	Wildlife Guard - Cover Cutout	1	1
T	F	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	2	-
		23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	-	2
T	G	23 66 207	Washer, Curved, Square, 5/8"	4	2
		23 66 031	Washer, Curved, Square, 3/4"	-	2
	H	23 66 134	Lock Washer - 5/8" Double Coil	4	2
		23 66 135	Lock Washer - 3/4" Double Coil	-	2
	I	23 65 043	Lock Nut - 5/8" Square	4	2
		23 65 042	Lock Nut - 3/4" Square	-	2
4@	J	**06 12 20 04**	Insulator, Standoff, L.D.	1	1
@	K	**13 00 01 02**	Transformer	1	1
@	L	**10 00 01 01**	Link, Fuse	1	1
T@	M	**13 00 03 01**	Secondary Leads (Ft.)	12	12
T@	N	**07 00 25 00**	Clamp, Parallel Groove, PG*	3	3
11@	O	**12 00 10 ** **	Grounding Unit	1	1
@	P	**07 00 21 00**	Clamp, Hotline, HLC*W	1	1

DESIGN NOTE(s):

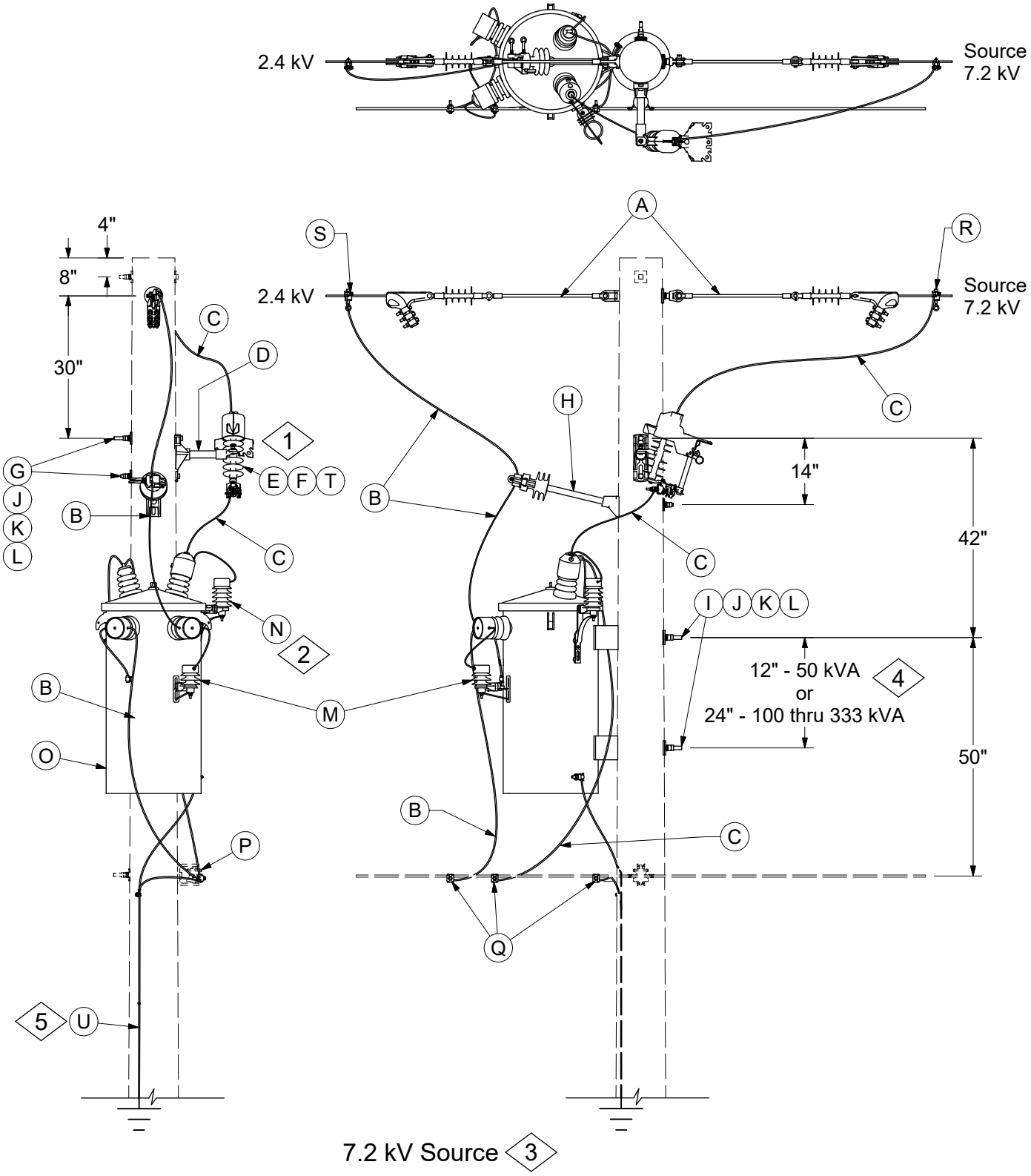
10. Deadend construction - Deadend primary one span past transformer pole if there is another pole in the lead. If not, see DCS **13 12 07 ****.

Use DCS **12 00 10 01** for ground coil application on new pole installation. Use DCS **12 00 10 02** for ground rod application on existing pole installation.

REV	DATE	ENG	DESCRIPTION
11	04/01/23	DG	Converted to new format
10	09/14/15	DG	



REV	DATE	ENG	DESCRIPTION
9	04/01/23	DG	Converted to new format
8	08/22/11	DG	



7.2 kV Source 3

REV	DATE	ENG	DESCRIPTION
9	04/01/23	DG	Converted to new format
8	08/22/11	DG	

CONSTRUCTION NOTE(s):

1. Install switch on source side only.

2. Install arresters on both source and load sides of transformer.

3. Connection shown is for subtractive polarity (250 and 333 kVA). On additive polarity transformers (50 thru 167 kVA), secondary bushings are reversed.

4. Measure distance between mounting slots and drill so that transformer rests evenly on both bolts.

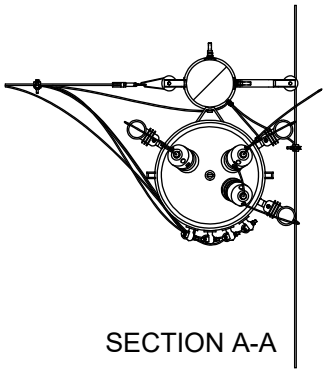
DCS #	Description
13 12 48 01	50 kVA, Step-Up or Step-Down
13 12 48 02	100-167 kVA, Step-Up or Step-Down
13 12 48 03	250 kVA, Step-Up or Step-Down
13 12 48 04	333 kVA, Step-Up or Step-Down

	ITEM	STK / DCS #	DESCRIPTION 13 12 48 **	01	02	03	04
	A	**06 12 30 03 @**	Double Deadend w/ FG Extensions	1	1	1	1
	B	18 53 011	Wire, #6 CU, 7 Strand, 5 kV (FT.)	15	15	-	-
		18 53 018	Wire, #2 CU, 7 Strand, 5 kV (FT.)	-	-	15	-
		18 53 022	Wire, 1/0 CU, 7 Strand, 5 kV (FT.)	-	-	-	15
	C	18 51 025	Wire, Cu., #4 S.D., Covered	20	20	20	20
	D	23 06 127	Bracket - Standoff, 12" FG	1	1	1	1
	E	54 07 208	Switch, Fused, Open Type	1	1	1	1
	F	23 17 411	Wildlife Guard - Cover Cutout	1	1	1	1
	G	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	2	2	2	2
	H	**06 12 20 04**	Wire Training Assembly	1	1	1	1
	I	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	2	-	-	-
		23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	-	2	2	2
	J	23 66 207	Washer, Curved, Square, 5/8"	4	2	2	2
		23 66 031	Washer, Curved, Square, 3/4"	-	2	2	2
	K	23 66 134	Lock Washer - 5/8" Double Coil	4	2	2	2
		23 66 135	Lock Washer - 3/4" Double Coil	-	2	2	2
	L	23 65 043	Lock Nut - 5/8" Square	4	2	2	2
		23 65 042	Lock Nut - 3/4" Square	-	2	2	2
	M	10 01 122	Arrester Kit, 3kV, w/ "T" Transformer Mtg. Brkt.	1	1	1	1
	N	10 01 145	Arrester Kit, 10kV, w/ "L" Transformer Mtg. Brkt.	1	1	1	1
@	O	**13 00 01 02**	Transformer - BMxxxxG	1	1	1	1
@	P	**06 01 01 ****	Single Clevis With or Without Extension Bracket	1	1	1	1
@	Q	**07 00 25 00**	Parallel Groove Clamp, PG*	3	3	3	3
@	R	**07 00 21 00**	Clamp, Hot Line, HLC*W	1	1	1	1
@	S	**07 00 21 00**	Hot Tap With/Stirrup, STC*W	1	1	1	1
@	T	**10 00 01 01**	Link, Fuse	1	1	1	1
5@	U	**12 00 10 ****	Grounding Unit	1	1	1	1

DESIGN NOTE(s):

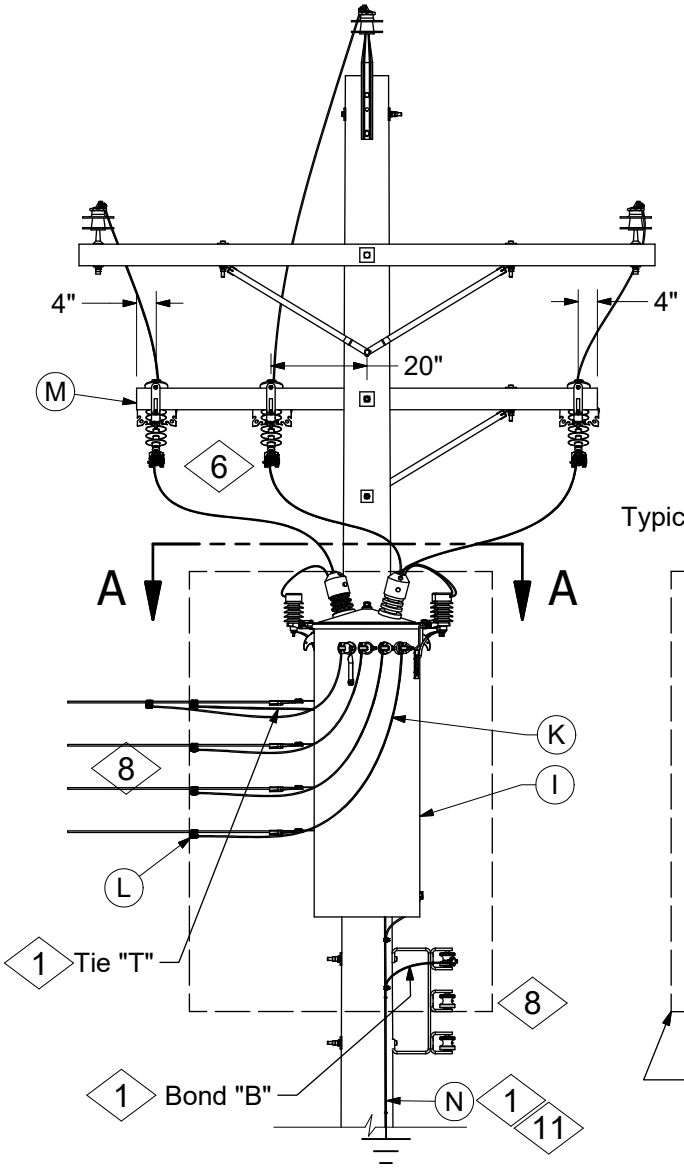
5. Use DCS **12 00 10 01** for ground coil application on new pole installation. Use DCS **12 00 10 02** for ground rod application on existing pole installation.

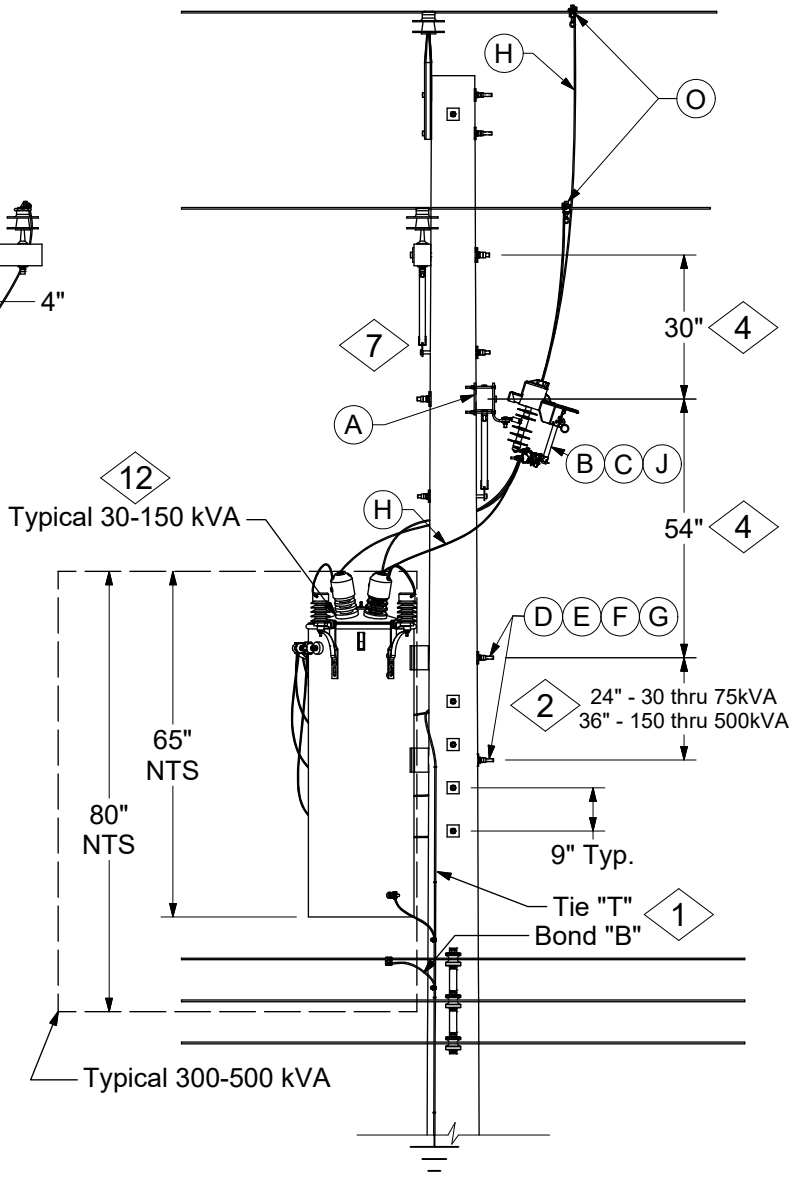
REV	DATE	ENG	DESCRIPTION
9	04/01/23	DG	Converted to new format
8	08/22/11	DG	



SECTION A-A

CAUTION:
All primary terminals are hot after the first phase wire is connected.





REV	DATE	ENG	DESCRIPTION
8	04/01/23	DG	Converted to new format
7	12/03/15	DG	

CONSTRUCTION NOTE(s):

1. If common neutral is not present refer to DCS **13 00 07 02** for installation of grounds.
2. Measure distance between mounting slots and drill so that transformer rests evenly on both bolts.
3. Units weighing in excess of 3400#'s (500 kVA) must be mounted using 1" bolts.
4. These dimensions may be reduced for existing installation to 24" and 48".
5. Instructions for converting a 480Y/277 volt four wire transformer to 480 volt three wire service are shown on DCS **13 00 01 01**.
6. If wood arm, use only one V brace. Keep the extra brace for future use.
7. For installation on a dead-end structure, use vice-top insulators on the fused switch drop arm for training the primary jumpers.
8. See DCS **13 01 01 **** for secondary support and DCS **03 01 20 **** for secondary configurations.

DCS #	Description
13 12 54 01	30 kVA Transformer
13 12 54 02	45-75 kVA Transformer
13 12 54 03	150-300 kVA Transformer
13 12 54 04	500 kVA Transformer

	ITEM	STK / DCS #	DESCRIPTION 13 12 54 **	01	02	03	04
	A	17 58 054	Bracket, Crossarm, Heavy Duty	3	3	3	3
	B	23 17 411	Wildlife Guard - Cover Cutout	3	3	3	3
	C	54 07 208	Switch, Fused, Open Type	3	3	3	3
	D	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut (30 kVA)	2	-	-	-
T		23 52 219	Bolt, Mach., 3/4" x 14" (45 thru 75 kVA)	-	2	-	-
		23 52 254	Bolt, Mach., 3/4" x 14" (150 thru 300 kVA)	-	-	2	-
		23 52 269	Bolt, Mach., 1" x 16" (500 kVA)	-	-	-	2
	E	23 66 027	Washer, Flat, Square 5/8" (30 kVA)	2	-	-	-
T		23 66 031	Washer, Curved, Square, 3/4" (45 thru 300 kVA)	-	2	2	-
		23 66 106	Washer, Curved, Square, 1" (500 kVA)	-	-	-	2
	F	23 66 134	Lock Washer - 5/8" Double Coil	2	-	-	-
		23 66 135	Lock Washer - 3/4" Double Coil	-	2	2	-
	G	23 65 043	Lock Nut - 5/8" Square	2	-	-	-
		23 65 042	Lock Nut - 3/4" Square	-	2	2	-
		23 65 055	Lock Nut - 1" Square	-	-	-	2
T	H	18 51 025	Primary Leads, S.D. (FT.)	35	35	35	35
@	I	**13 00 01 02**	Transformer	1	1	1	1
@	J	**10 00 01 01**	Fuse, Link	1	1	1	1
T@	K	**13 00 03 01**	Secondary Leads (FT.)	20	20	20	20
T@	L	**07 00 25 00**	Parallel Groove Clamp, PG*	4	4	4	4
	M	**04 00 20 02**	Crossarm, Wood, 8' w/ 60" V Brace	1	1	1	1
12@		**04 00 20 03**	Crossarm, Wood, 10' w/ 60" V Brace	1	1	1	1
		04 00 41 14	Crossarm, FG, 8'	1	1	1	1
		04 00 41 16	Crossarm, FG, 10'	1	1	1	1
11@	N	**12 00 10 ******	Grounding Unit	1	1	1	1
@	O	**07 00 21 00**	Hot Line Clamp, HLC*W	3	3	3	3
7@	P	**06 12 01 01**	Insulator, Vice-Top, 15 kV, with Pin, Insulator, Long Shank	3	3	3	3

DESIGN NOTE(s):

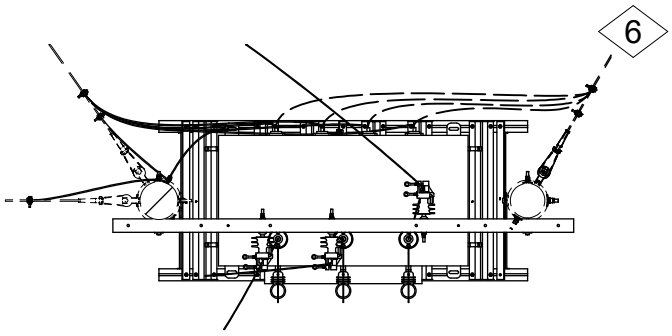
9. See DCS **02 00 02 00** for pole class.

10. See DCS **13 00 04 01** for dimensions and weights of transformers.

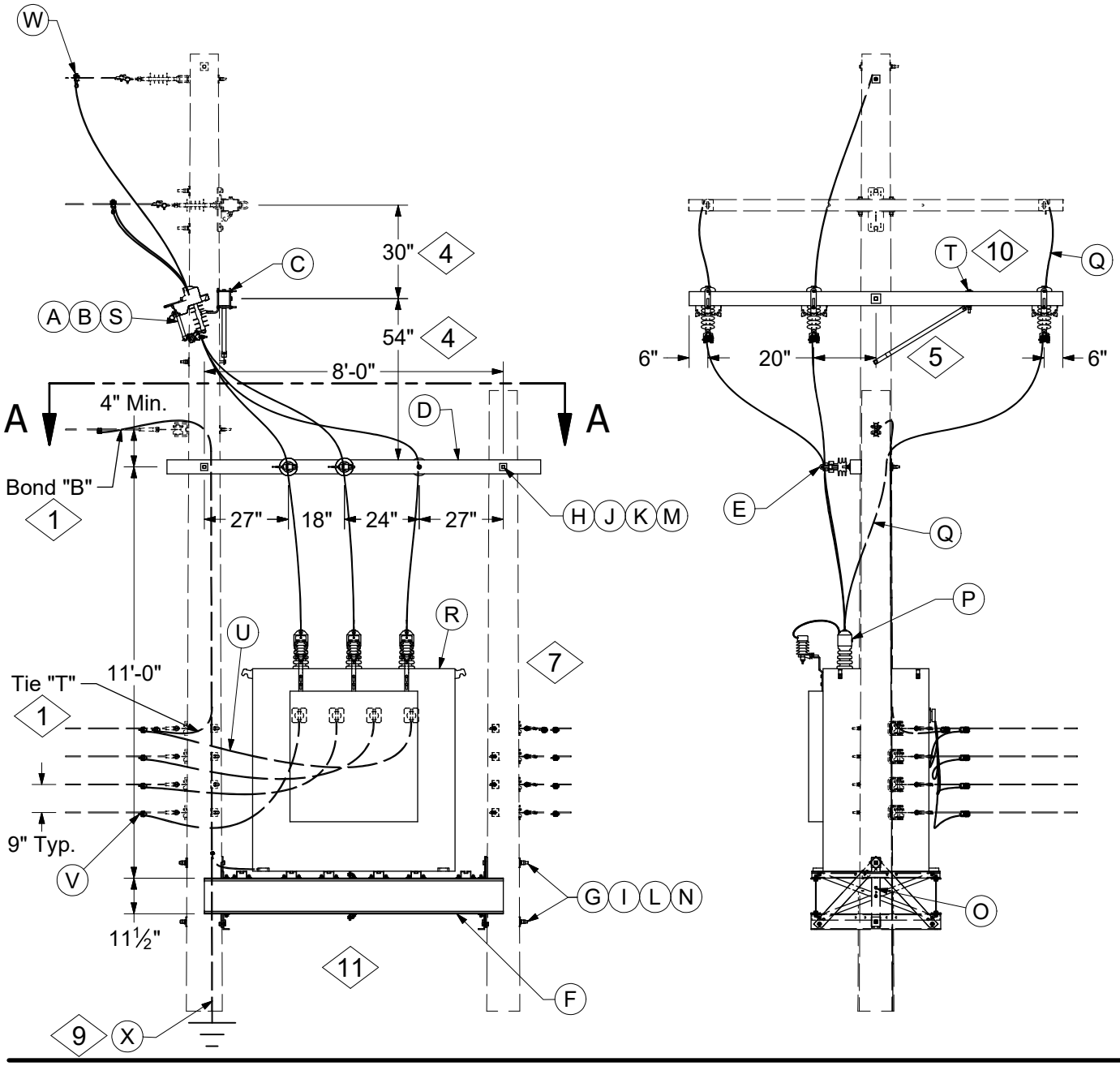
11. Use DCS **12 00 10 01** for ground coil application on new pole installation. Use DCS 12 00 10 02 for ground rod application on existing pole installation.

12. 8' arms may be used only in Missouri. Use 10' arms if underbuilt on subtransmission structure. Use FG arms if on composite pole or underbuilt on subtransmission structure.

REV	DATE	ENG	DESCRIPTION
8	04/01/23	DG	Converted to new format
7	12/03/15	DG	



SECTION A-A



REV	DATE	ENG	DESCRIPTION
9	04/01/23	DG	Converted to new format
8	10/08/15	DG	

CONSTRUCTION NOTE(s):

1. If common neutral is not present, refer to DCS **13 00 07 02** for installation of grounds.
2. See DCS **13 01 01 **** for underground service arrangement.
3. Instructions for converting a 480/277 volt four wire transformer to 480 volt three wire service are shown on DCS **13 00 01 01**.
4. These dimensions may be reduced for existing installation to 24" and 48".
5. If wood arm, use only one V brace. Keep extra brace for future use.
6. Optional service takeoff. See DCS **09 01 12 00**.

	ITEM	STK / DCS #	DESCRIPTION 13 12 58 **	02
	A	54 07 208	Switch, Fused, Open Type	3
	B	23 17 411	Wildlife Guard - Cover Cutout	3
	C	17 58 054	Bracket, Arrester/Cutout Mounting	3
	D	41 01 008	10' Crossarm - 3-1/2" x 4-1/2"	1
	E	**06 12 01 01**	Insulator, Vice Top, 15kV, with Pin, Insulator, Long Shank	3
	F	23 17 174	Platform, Trans, 8'−0"	1
	G	23 52 103	Bolt, Mach., 3/4" x 18" w/ Square Nut	4
	H	23 52 068	Bolt, Mach., 5/8" x 16" w/ Square Nut	2
	I	23 66 031	Washer, Curved, Square, 3/4"	4
	J	23 66 207	Washer, Curved, Square, 5/8"	2
	K	23 66 134	Lock Washer - 5/8" Double Coil	2
	L	23 66 135	Lock Washer - 3/4" Double Coil	4
	M	23 65 043	Lock Nut - 5/8" Square	2
	N	23 65 042	Lock Nut - 3/4" Square	4
	O	23 60 007	Screw, Lag, 1/2" x 4"	2
	P	69 58 181	Guard, Wildlife, Clam-Shell, Tall	3
T	Q	18 51 025	Wire, Trans. Riser, #4, S.D. Poly Covered (Ft.)	35
@	R	**13 00 01 02**	Transformer	1
@	S	**10 00 01 01**	Link, Fuse	3
	T	**04 00 20 02**	Crossarm, Wood, 8' w/ 60" V Brace	1
10@		**04 00 41 14**	Crossarm, FG, 8'	1
		04 00 41 16	Crossarm, FG, 10'	1
		04 00 20 03	Crossarm, Wood, 10' w/ 60" V Brace	1
T@	U	**13 00 03 01**	Secondary Leads (Ft.)	#
T@	V	**07 00 25 00**	Parallel Groove Clamp, PG*	#
@	W	**07 00 21 00**	Hot Line Clamp, HLC*W	3
9@	X	**12 00 10 ****	Grounding Unit	1

REV	DATE	ENG	DESCRIPTION
9	04/01/23	DG	Converted to new format
8	10/08/15	DG	

DESIGN NOTE(s):

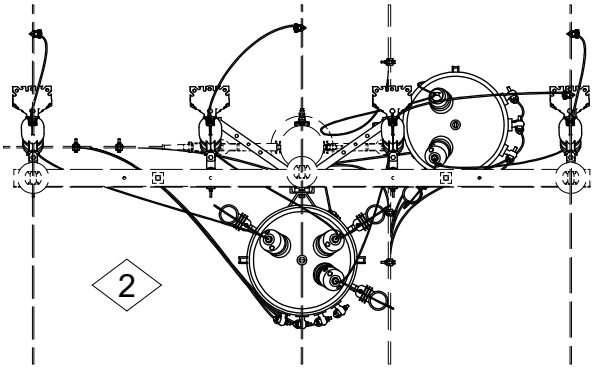
7. See DCS **02 00 02 00** for pole class.

8. See DCS **13 00 04 01** for dimensions and weights of transformers.

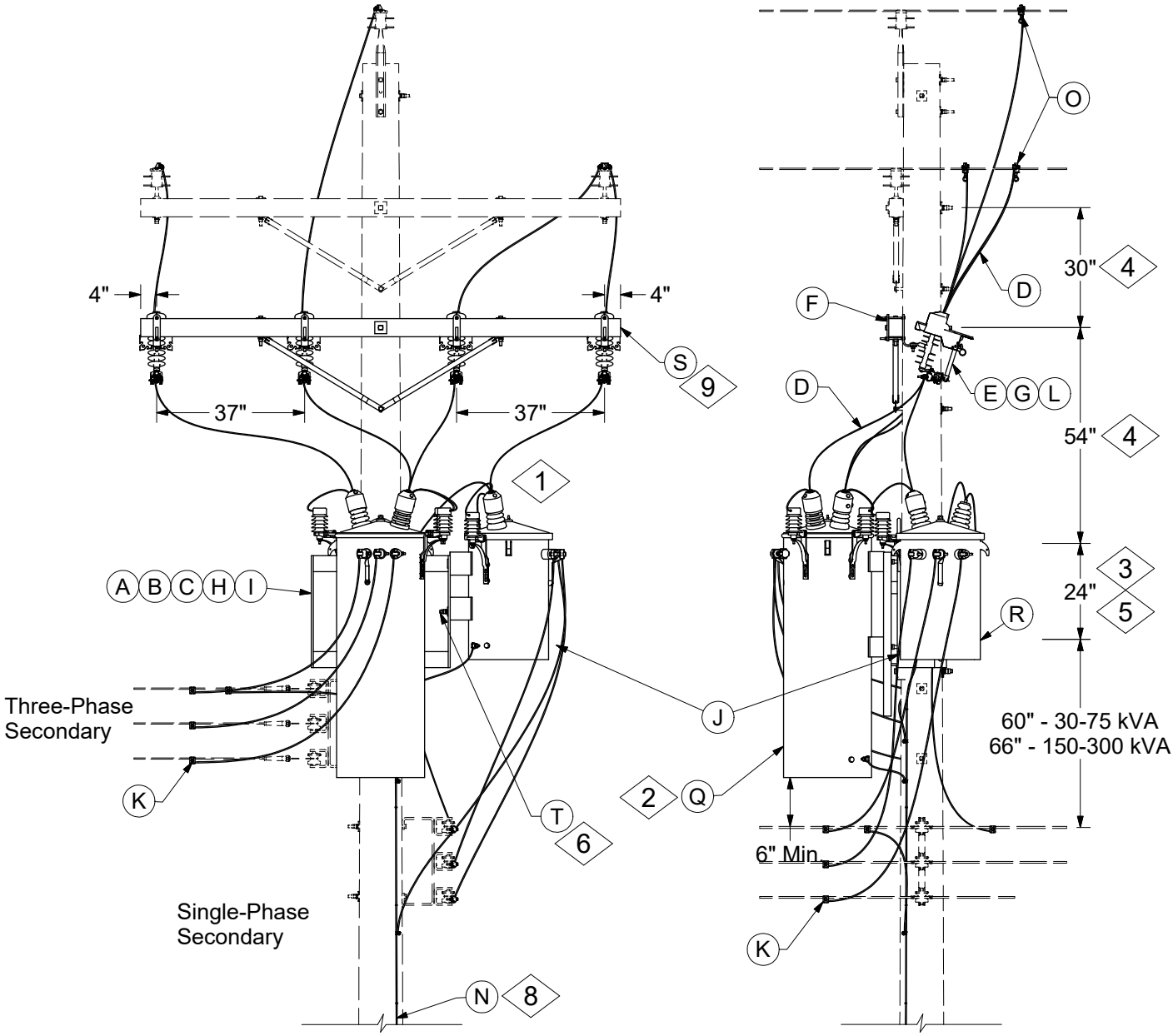
9. Use DCS **12 00 10 01** for ground coil application on new pole installation. Use DCS **12 00 10 02** for ground rod application on existing pole installation.

10. 8' arms may be used only in Missouri. Use 10' arms if underbuilt on subtransmission structure. Use FG arms if on composite pole or underbuilt on subtransmission structure.

11. Minimum ground clearance to bottom of platform:
    A: Places accessible to pedestrians only: 9 ft.
    B: Places accessible to vehicular traffic: 15 ft.



CAUTION:
All Primary Terminals of Three-Phase Transformer Are Hot After the First Phase Wire is Connected



REV	DATE	ENG	DESCRIPTION
10	04/01/23	DG	Converted to new format
9	11/18/15	DG	

CONSTRUCTION NOTE(s):

1. Single phase transformer shall be connected to outside phase only.

2. Install three-phase transformer in center position of the cluster mount bracket.

3. Measure distance between mounting slots on cluster mount bracket and drill pole so that weight rests evenly on both bolts.

4. These dimensions may be reduced for existing installation to 24" and 48".

5. Three-phase transformers through 75 kVA have 24" spacing between mounting lugs and can be installed directly to the cluster mount bracket. 150 kVA and larger have 36" spacing between mounting lugs and require adapter for installing on the cluster mount bracket.

6. Mounting unit comes equipped with 3/4" bolts for mounting transformers to the cluster mounting unit. Single-phase transformers 50 kVA and smaller require 5/8".

7. For installation on a deadend structure, use vice-top insulators on the fused switch drop arm for training the primary jumpers.

	ITEM	STK / DCS #	DESCRIPTION 13 12 75 **	02
	A	23 17 202	Mounting Unit, 3 Pos. Heavy (Three 75kVA to 167kVA Trans.)	1
	B	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	2
T	C	23 66 031	Washer, Curved, Square, 3/4"	2
T	D	18 51 025	Wire, Trans. Riser, #4, S.D. Poly Covered (FT.)	35
	E	54 07 208	Switch, Fused, Open Type	4
	F	17 58 054	Bracket, Arrester/Cutout Mounting	4
	G	23 17 411	Wildlife Guard - Cover Cutout	4
	H	23 66 135	Lock Washer - 3/4" Double Coil	2
	I	23 65 042	Lock Nut - 3/4" Square	2
T@	J	**13 00 03 01**	Secondary Leads (ft.)	30
T@	K	**07 00 25 00**	Parallel Groove Clamp, PG*	9
@	L	**10 00 01 01**	Link, Fuse	4
7@	M	**06 12 01 01**	Insulator, Vice Top, 15kV, with Pin, Insulator, Long Shank	4
8@	N	**12 00 10 ** @**	Grounding Unit	1
@	O	**07 00 21 00**	Hot Line Clamp, HLC*W	4
5@	P	69 58 127	Adapter, Mounting Plate 36” to 24” Lug Spacing	1
@	Q	**13 00 01 02**	Transformer, 3-Phase Polemount	1
@	R	**13 00 01 02**	Transformer, 1-Phase Polemount	1
9@	S	**04 00 20 03**	Crossarm, Wood, 10' w/ 60" V Brace	1
		04 00 41 16	Crossarm, FG, 10'	1
6@	T	23 52 049	Bolt, Mach., 5/8" x 2" w/ square nut (50kVA and smaller Trans.)	2

DESIGN NOTE(s):

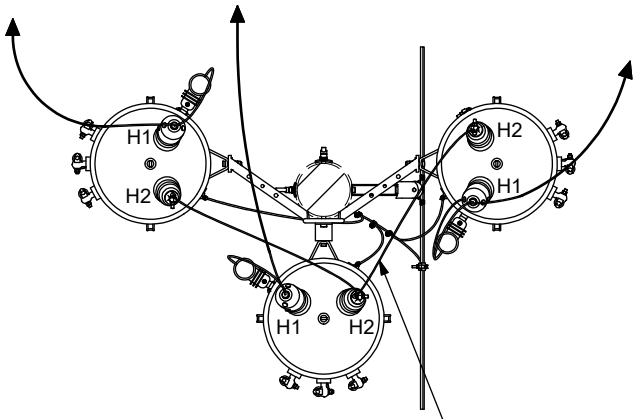
8. Use DCS **12 00 10 01** for ground coil application on new pole installation. Use DCS **12 00 10 02** for ground rod application on existing pole installation.

9. Use FG arms if on composite pole or underbuilt on subtransmission structure.

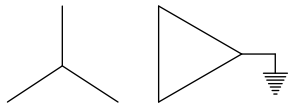
10. Maximum total weight limit is based on installation of transformers on a Class 1 pole.

11. This DCS is for providing single-phase 120/240 V and three-phase 240 V delta service.

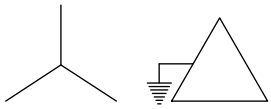
REV	DATE	ENG	DESCRIPTION
10	04/01/23	DG	Converted to new format
9	11/18/15	DG	



SECTION A-A

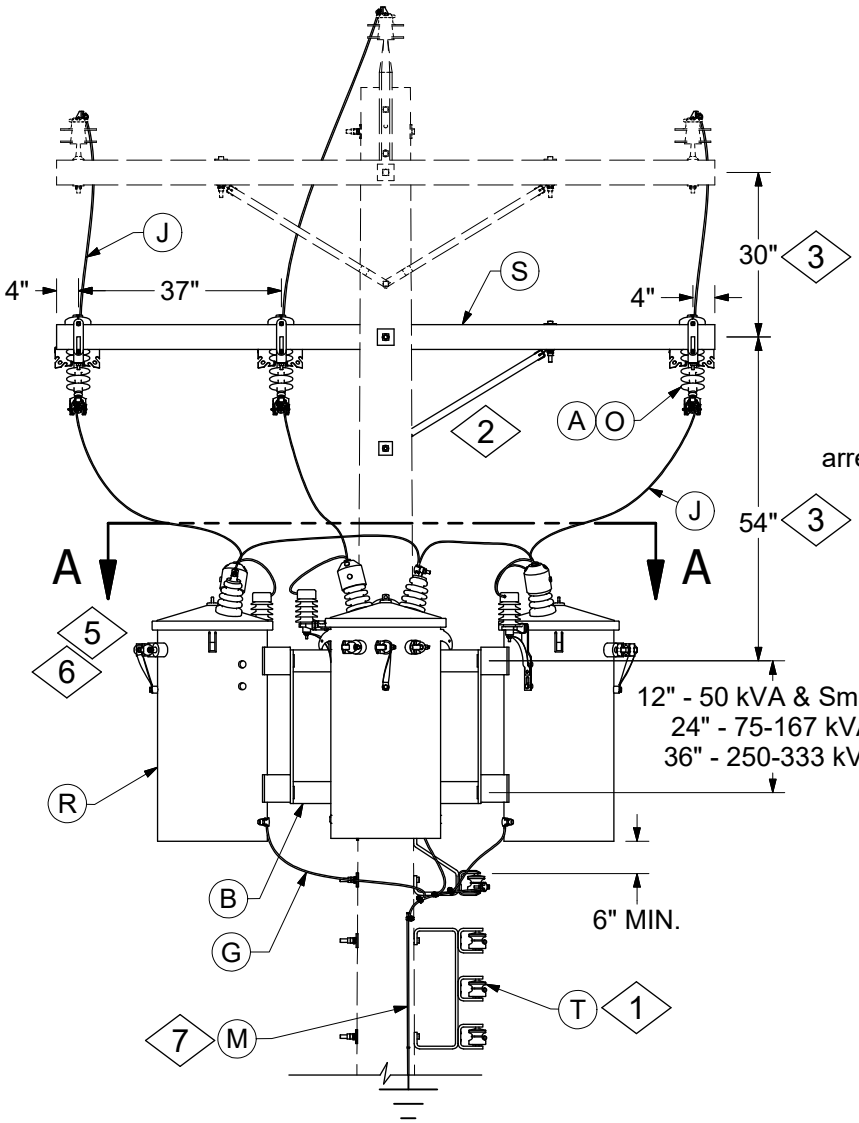


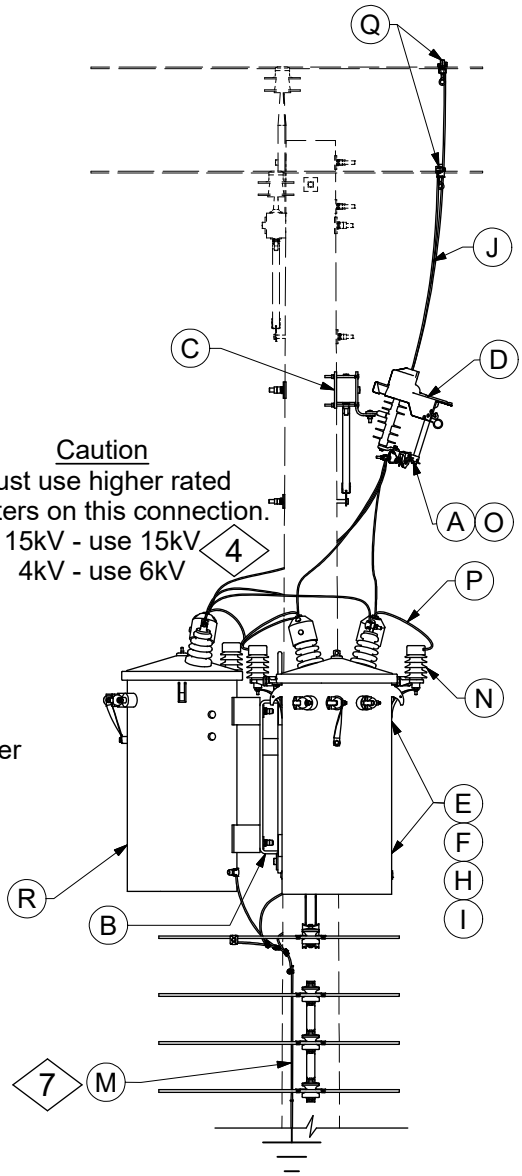
DCS **13 00 07 04**



DCS **13 00 07 10**

Ungrounded or Floating
High Voltage Neutral - Do Not
Connect to System Neutral
or Tank or Pole Ground





Caution
Must use higher rated
arresters on this connection.
15kV - use 15kV
4kV - use 6kV
4

REV	DATE	ENG	DESCRIPTION
10	04/01/23	DG	Converted to new format
9	06/10/15	DG	

CONSTRUCTION NOTE(s):

1. See DCS **13 01 01 **** for secondary support and DCS **03 01 20 **** for secondary configurations. DCS **03 01 20 03** modified should be used unless conditions do not allow.

2. Use only one V brace. Keep the extra brace for future use.

3. These dimensions may be reduced to 24" and 48" for installation on existing pole.

4. For 7.2, 7.62, 7.97 kV, and multi-voltage transformers use 15 kV arrester Stock #10 01 188. For 2.4 kV transformers use 6 kV arrester Stock #10 01 184.

5. 2400/4160 Y transformers may have sidewall or cover mounted HV bushings. If sidewall mounted bushings:
   a. Build according to the DCS except use 2.5kV primary lead wire Table 2.2 of DCS **13 00 03 01**, or
   b. If pole is congested, 2.5kV primary lead wire in conduit similar to Limited Use Standard DCS **13 04 50 01**.

6. See DCS **13 00 07 04** and **13 00 07 10** for neutral ground strap and secondary wiring connections

DCS #	Description
13 12 80 02	50 kVA & Smaller
13 12 80 03	75 - 167 kVA
13 12 80 04	250 - 333 kVA

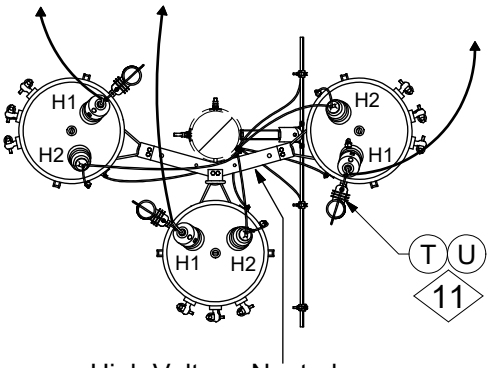
	ITEM	STK / DCS #	DESCRIPTION 13 12 80 **	02	03	04
8	A	54 07 208	Switch, Fused, Open Type	3	3	3
	B	23 17 209	Mounting Unit, 3 Pos. Heavy (Up to Three 50 kVA Trans.)	1	-	-
		23 17 202	Mounting Unit, 3 Pos. Heavy (Three 75 - 167 kVA Trans.)	-	1	-
		23 17 354	Mounting Unit, 3 Pos. Heavy (Three 250 - 333 kVA Trans.)	-	-	1
	C	17 58 054	Bracket, Arrester/Cutout Mounting	3	3	3
	D	23 17 411	Wildlife Guard - Cover Cutout	3	3	3
	E	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	2	2	-
5	F	23 66 031	Washer, Curved, Square, 3/4"	2	2	-
	G	18 51 025	Wire, #4 CU, S.D. Poly Covered (Ft.)	15	15	15
	H	23 66 135	Lock Washer - 3/4" Double Coil	2	2	-
	I	23 65 042	Lock Nut - 3/4" Square	2	2	-
T@	J	**13 00 03 01**	Primary Leads (Ft.)	40	40	40
T@	K	**13 00 03 01**	Secondary Leads (Ft.)	#	#	#
T@	L	**07 00 25 00**	Clamp, Parallel Groove, PG*	#	#	#
7@	M	**12 00 10 ** @**	Grounding Unit	1	1	1
4@	N	10 01 184	Arrester, 6kV	3	3	3
		10 01 188	Arrester, 15kV	3	3	3
@	O	**10 00 01 01**	Link, Fuse	3	3	3
@	P	18 51 021	Wire, #6 CU, S.D. Poly Covered (Ft.)	6	6	6
@	Q	**07 00 21 00**	Clamp, Hotline, HLC*W	3	3	3
@	R	**13 00 01 02**	Transformer	3	3	3
2@	S	**04 00 20 03**	Crossarm, Wood, 10' w/ 60" V Brace	1	1	1
		04 00 41 16	Crossarm, FG, 10'	1	1	1
1@	T	**03 01 20 03**	Single Plus Triple Extension Rack	1	1	1

DESIGN NOTE(s):

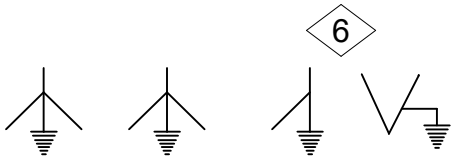
7. Use DCS **12 00 10 01** for ground coil application on new pole installation. Use DCS **12 00 10 02** for ground rod application on existing pole installation.

8. For transformer banks greater than 500 kVA on 4kV circuits, substitute 200A fused switches Stock #54 07 209.

REV	DATE	ENG	DESCRIPTION
10	04/01/23	DG	Converted to new format
9	06/10/15	DG	

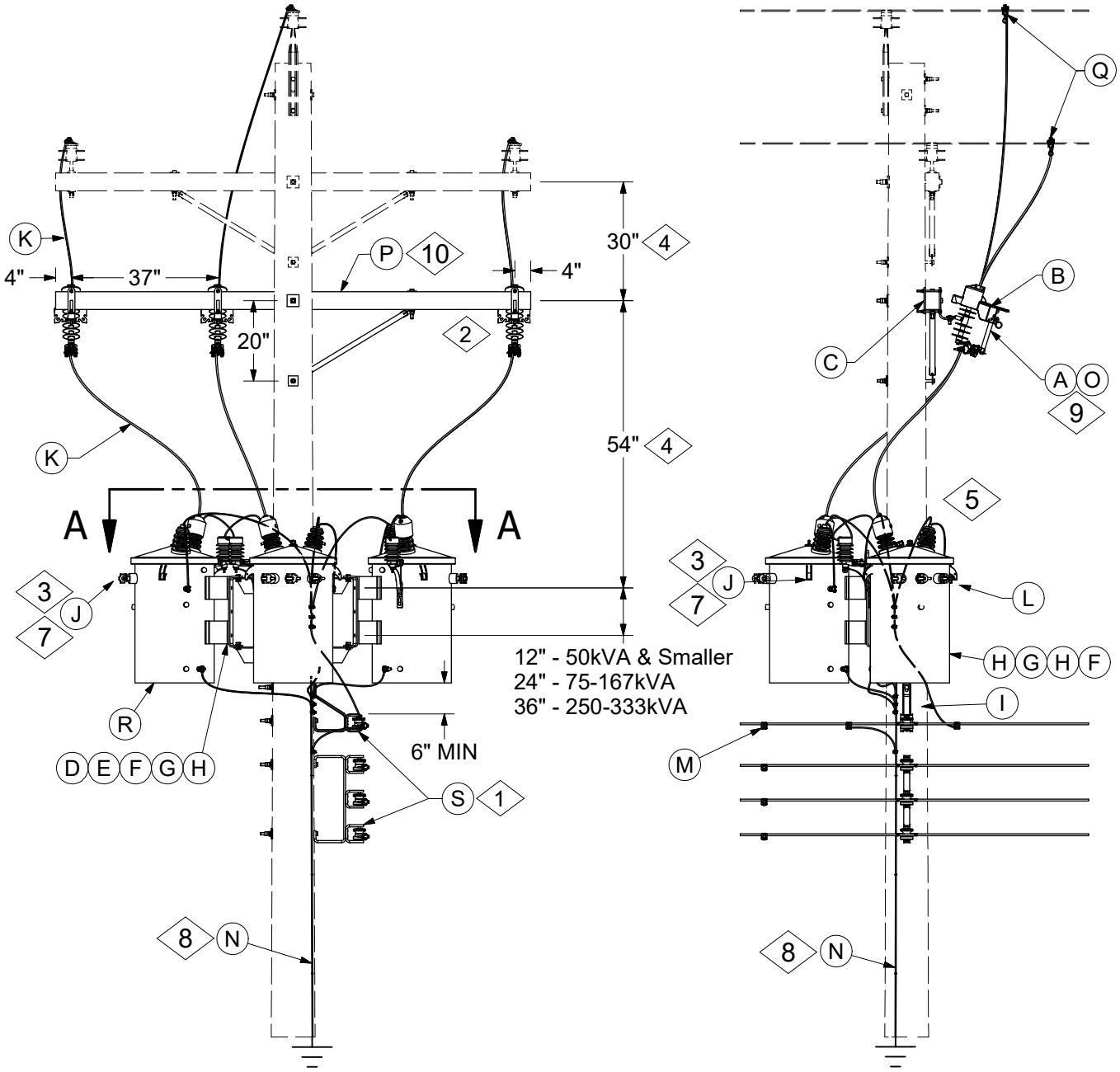


High Voltage Neutral
Connect to System Neutral
SECTION A-A



DCS **13 00 07 09**

DCS **13 00 07 13**



REV	DATE	ENG	DESCRIPTION
8	04/01/23	DG	Converted to new format
7	09/02/15	DG	

CONSTRUCTION NOTE(s):

1. See DCS **13 01 01 **** for secondary support and DCS **03 01 20 **** for secondary configurations. DCS **03 01 20 03** modified as per DCS **06 01 07 02** should be used unless conditions do not allow.

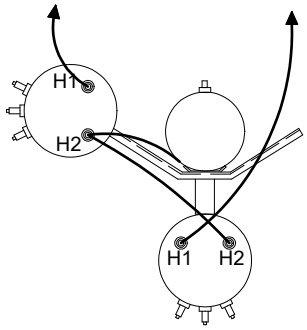
2. Use only one V Brace. Keep the extra brace for future use.

3. Use tag (Stock #16 01 301) to identify transformers that have been rewired internally for 120/208Y service. The tag should be attached to the secondary bushing that is no longer connected internally. See DCS **13 00 07 09**.

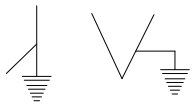
4. These dimensions may be reduced to 24" and 48" for installation on existing pole.

5. 2400/4160Y transformers may have side wall or cover mounted HV bushings. If side wall mounted bushings:
   a. Build according to this DCS except use 2.5 KV primary lead wire per Table 2.2 of DCS **13 00 03 01**, or
   b. If pole is congested, 2.5KV primary lead wire in conduit similar to Limited Use standard DCS **13 04 54 01**.

6. This DCS can also be used for open-wye primary to open-delta secondary installations.



Open-Wye Primary Connection



DCS **13 00 07 13**

7. See DCS **13 00 07 09** and **13 00 07 13** for neutral ground strap and secondary wiring connections.

DCS #	Transformer Size	Description
13 12 81 01	50 kVA & Smaller	Grd Open Y to Mid-Tap Grd Open Delta Secondary
13 12 81 02	50 kVA & Smaller	Grd Y Primary to Grd Y Secondary
13 12 81 03	75-167 kVA	Grd Y Primary to Grd Y Secondary
13 12 81 04	75-167 kVA	Grd Open Y to Mid-Tap Grd Open Delta Secondary
13 12 81 05	250-333 kVA	Grd Y Primary to Grd Y Secondary

	ITEM	STK / DCS #	DESCRIPTION 13 12 81 **	01	02	03	04	05
9	A	54 07 208	Switch, Fused	2	3	3	2	3
	B	23 17 411	Wildlife Guard - Cover Cutout	2	3	3	2	3
	C	17 58 054	Bracket, Arrester/Cutout Mounting	2	3	3	2	3
	D	23 17 209	Mounting Unit, 3 Pos. Light (Up to Three 50 KVA Trans.)	1	1	-	-	-
		23 17 202	Mounting Unit, 3 Pos. Heavy (Three 75kVA to 167kVA Trans.)	-	-	1	1	-
		23 17 354	Mounting Unit, 3 Pos. Xtra Hvy. (Three 250−333 kVA)	-	-	-	-	1
	E	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	2	2	2	2	-
	F	23 66 031	Washer, Curved, Square, 3/4"	2	2	2	2	-
	G	23 66 135	Lock Washer - 3/4" Double Coil	2	2	2	2	-
	H	23 65 042	Lock Nut - 3/4" Square	2	2	2	2	-
	I	18 51 025	Wire #4 CU, S.D. Poly Covered (Ft.)	10	15	15	10	15
3	J	16 01 301	Tag, Banked Transformer	-	3	3	-	3
5T@	K	**13 00 03 01**	Primary Leads (Ft.)	30	40	40	30	40
T@	L	**13 00 03 01**	Secondary Leads (Ft.)	24	36	36	24	36
T@	M	**07 00 25 00**	Parallel Groove Clamp, PG*	#	#	#	#	#
8@	N	**12 00 10 ** @**	Grounding Unit	1	1	1	1	1
@	O	**10 00 01 01**	Link, Fuse	2	3	3	2	3
2,10@	P	**04 00 20 03**	Crossarm, Wood, 10' w/ 60" V Brace	1	1	1	1	1
		04 00 41 16	Crossarm, FG, 10'	1	1	1	1	1
@	Q	**07 00 21 00**	Hot Line Clamp, HLC*W	2	3	3	2	3
@	R	**13 00 01 02**	Transformer	2	3	3	2	3
1@	S	**06 01 07 02 @**	Single Plus Triple Extension Rack	1	1	1	1	1
11@	T	10 01 143	Arrester, 18 kV	2	3	3	2	3
11@	U	23 06 122	Bracket, Arrester, Transformer Mounting, 10" to 12" Long	2	3	3	2	3

DESIGN NOTE(s):

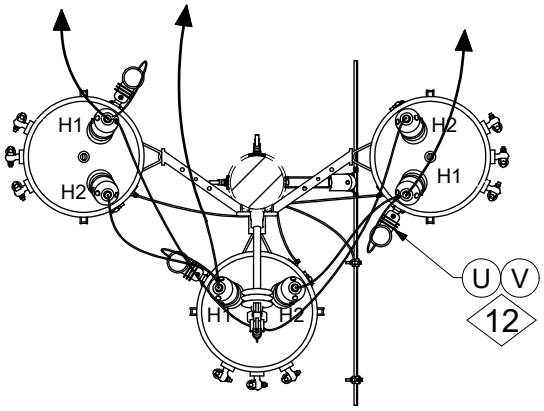
8. Use DCS **12 00 10 01** for ground coil application on new pole installation and DCS **12 00 10 02** for ground rod application on existing pole installation.

9. For transformer banks greater than 500 kVA on 4 kV circuits, substitute 200 A fused switches Stock #54 07 209.

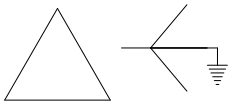
10. Use FG arms if on composite pole or underbuilt on subtransmission structure.

11. 14.4kV transformers must have arresters ordered separately and field installed. Use arrester Stock #10 01 143 with tank mounting bracket Stock #23 06 122.

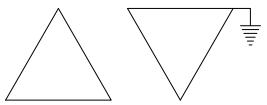
REV	DATE	ENG	DESCRIPTION
8	04/01/23	DG	Converted to new format
7	09/02/15	DG	



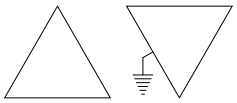
SECTION A-A



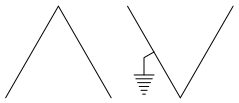
DCS **13 00 07 08**



DCS **13 00 07 05**

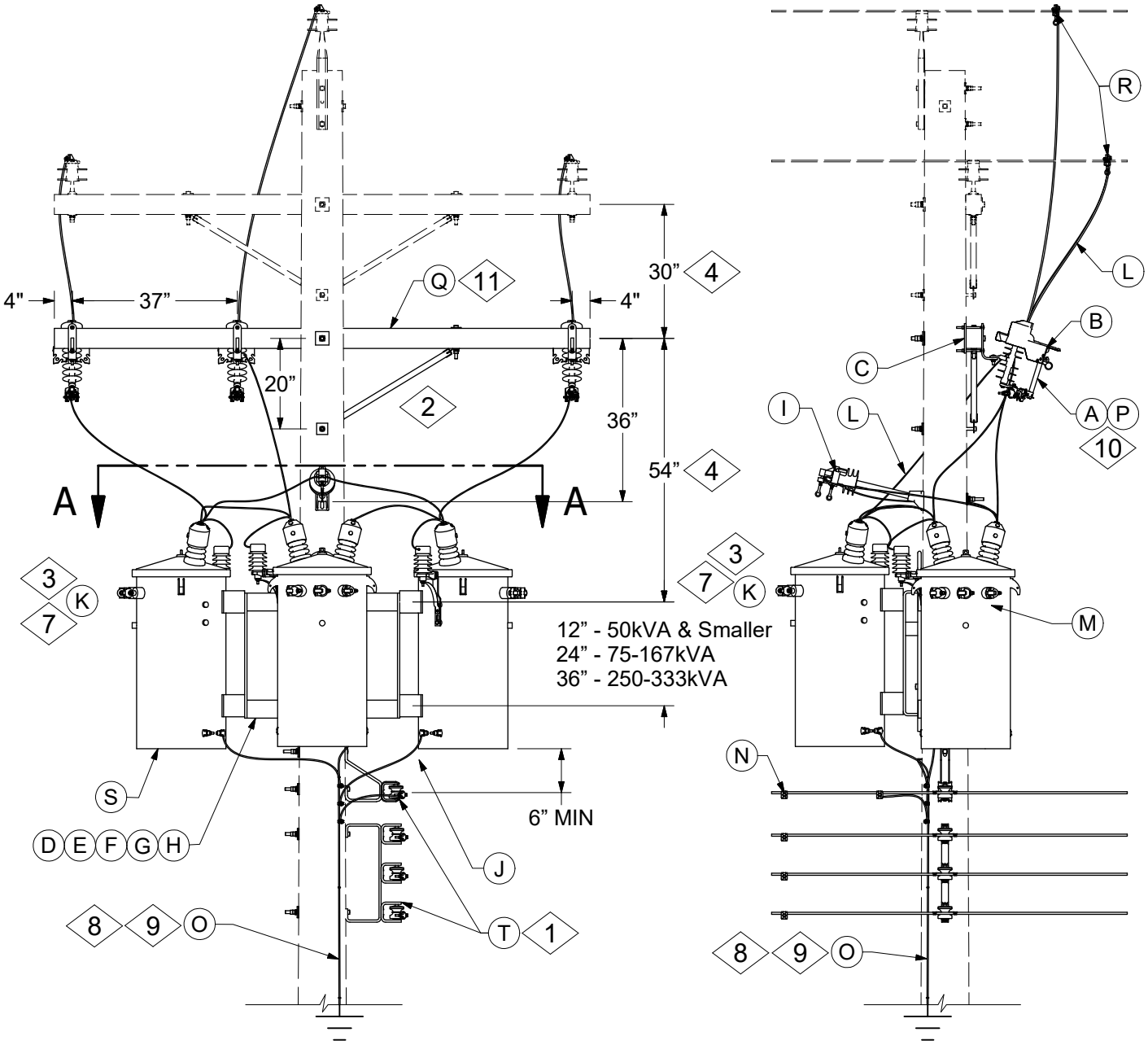


DCS **13 00 07 11**



DCS **13 00 07 12**

6



REV	DATE	ENG	DESCRIPTION
9	04/01/23	DG	Converted to new format
8	12/04/15	DG	

CONSTRUCTION NOTE(s):

1. See DCS **13 01 01 **** for secondary support and DCS **03 01 20 **** for secondary configurations. DCS **03 01 20 03** modified as per DCS **06 01 07 02** should be used unless conditions do not allow.

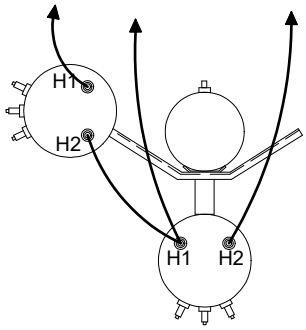
2. Use only one V brace. Keep the extra brace for future use.

3. Use tag, Stock #16 01 301, to identify transformers that have been rewired internally for 120/208Y service. The tag should be attached to the secondary bushing that is no longer connected internally. See DCS **13 00 07 08**.

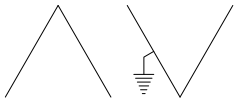
4. These dimensions may be reduced to 24” and 48” for installation on an existing pole.

5. 2400/4160Y transformers may have side wall or cover mounted HV bushings. If side wall mounted bushings:
   a. Build according to this DCS except use 2.5 kV primary lead wire per Table 2.2 of DCS **13 00 03 01**, or
   b. If pole is congested, 2.5 kV primary lead wire in conduit similar to Limited Use standard DCS **13 04 54 01**.

6. This DCS can also be used for open-delta primary to open-delta secondary installations.



Open-Delta Primary Connection



DCS **13 00 07 12**

7. See DCS **13 00 07 05**, **13 00 07 08**, **13 00 07 11**, and **13 00 07 12** for neutral ground strap and secondary wiring connections.

8. Arrester ground and secondary ground may be required to be separate. See DCS **13 00 06 06** for details on this requirement.

DCS #	Transformer Size	Description
13 12 82 01	50 kVA & Smaller	Open Delta to Mid-Tap Grd Open Delta Secondary
13 12 82 02	50 kVA & Smaller	Delta Primary to Grd Y or Delta Secondary
13 12 82 03	75-167 kVA	Delta Primary to Grd Y or Delta Secondary
13 12 82 04	75-167 kVA	Open Delta to Mid-Tap Grd Open Delta Secondary
13 12 82 05	250-333 kVA	Delta Primary to Grd Y or Delta Secondary

	ITEM	STK / DCS #	DESCRIPTION 13 12 82 **	01	02	03	04	05
10	A	54 07 208	Switch, Fused	3	3	3	3	3
	B	23 17 411	Wildlife Guard - Cover Cutout	3	3	3	3	3
	C	17 58 054	Bracket, Arrester/Cutout Mounting	3	3	3	3	3
	D	23 17 209	Mounting Unit, 3 Pos. Light (Up to Three 50 KVA Trans.)	1	1	-	-	-
		23 17 202	Mounting Unit, 3 Pos. Heavy (Three 75kVA to 167kVA Trans.)	-	-	1	1	-
		23 17 354	Mounting Unit, 3 Pos. Xtra Hvy. (Three 250−333 kVA)	-	-	-	-	1
	E	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	2	2	2	2	-
	F	23 66 031	Washer, Curved, Square, 3/4"	2	2	2	2	-
	G	23 66 135	Lock Washer - 3/4" Double Coil	2	2	2	2	-
	H	23 65 042	Lock Nut - 3/4" Square	2	2	2	2	-
	I	**06 12 20 04**	Insulator, Standoff 18” LD	1	1	1	1	1
	J	18 51 025	Wire #4 CU, S.D. Poly Covered (Ft.)	10	15	15	10	15
3@	K	16 01 301	Tag, Banked Transformer	-	3	3	-	3
5@	L	**13 00 03 01**	Primary Leads (Ft.)	30	40	40	30	40
T@	M	**13 00 03 01**	Secondary Leads (Ft.)	24	36	36	24	36
T@	N	**07 00 25 00**	Parallel Groove Clamp, PG*	#	#	#	#	#
9@	O	**12 00 10 ** @**	Grounding Unit	1	1	1	1	1
@	P	**10 00 01 01**	Link, Fuse	3	3	3	3	3
2,11@	Q	**04 00 20 03**	Crossarm, Wood, 10' w/ 60" V Brace	1	1	1	1	1
		04 00 41 16	Crossarm, FG, 10'	1	1	1	1	1
@	R	**07 00 21 00**	Hot Line Clamp, HLC*W	3	3	3	3	3
@	S	**06 12 20 04**	Transformer	2	3	3	2	3
1@	T	**06 01 07 02 @**	Single Plus Triple Extension Rack	1	1	1	1	1
12@	U	10 01 143	Arrester, 18 kV	3	3	3	3	3
12@	V	23 06 122	Bracket, Arrester, Transformer Mounting, 10" to 12" Long	3	3	3	3	3

DESIGN NOTE(s):

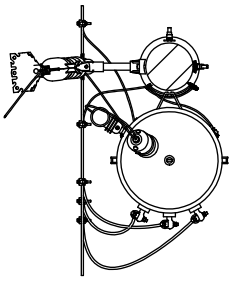
9. Use DCS **12 00 10 01** for ground coil application on new pole installation and DCS **12 00 10 02** for ground rod application on existing pole installation.

10. For transformer banks greater than 500 kVA on 4 kV circuits, substitute 200 A fused switches stock #54 07 209.

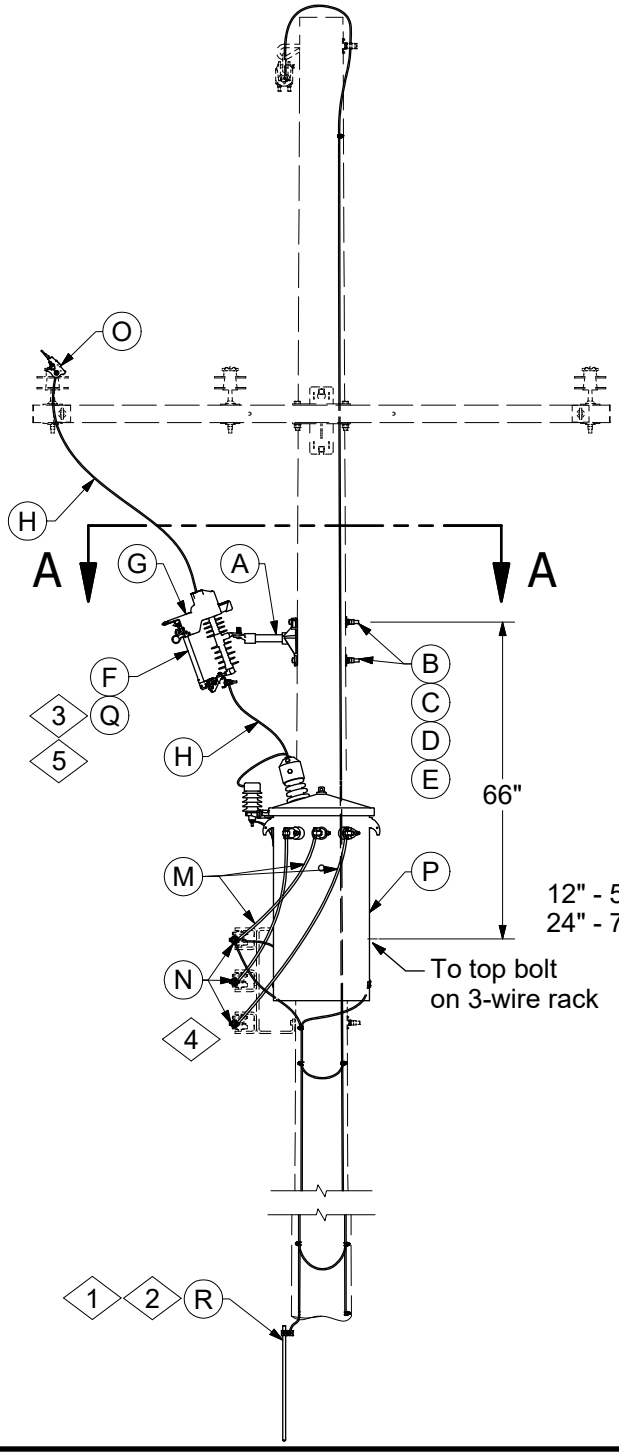
11. Use FG arms if on composite pole or underbuilt on subtransmission structure.

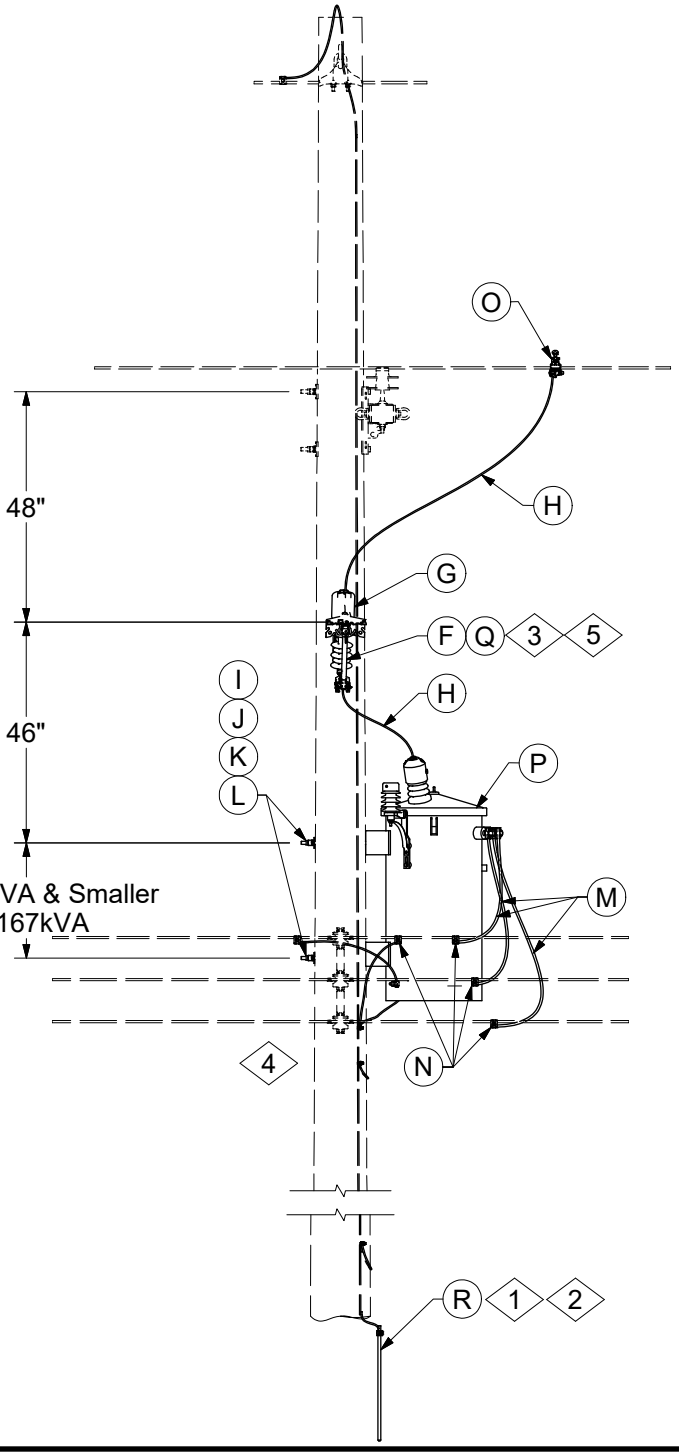
12. 14.4kV transformers must have arresters ordered separately and field installed. Use arrester Stock #10 01 143 with tank mounting bracket Stock #23 06 122.

REV	DATE	ENG	DESCRIPTION
9	04/01/23	DG	Converted to new format
8	12/04/15	DG	



SECTION A-A





REV	DATE	ENG	DESCRIPTION
10	04/01/23	DG	Converted to new format
9	8/22/11	DG	

CONSTRUCTION NOTE(s):

1. On existing structure, the static wire ground may not be adequate to use as a transformer ground. Therefore, a separate ground (DCS **12 00 10 02**) shall be installed for the transformer and it shall be bonded to the static ground.

2. On new structure, use grounding unit DCS **12 00 10 09** as both the static and transformer ground.

3. If fuse refill is required, contact Distribution Standards for proper size to use.

4. See DCS **13 01 01 ****** for secondary support and DCS **03 01 20 ****** for secondary configurations.

5

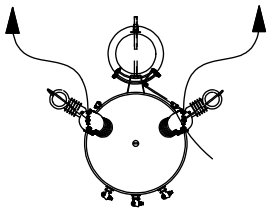
DCS #	Description
13 34 01 01	With 27kV 100 A Fused Switch
13 34 01 02	With 34kV SMD-20 Fused Switch

	ITEM	STK / DCS #	DESCRIPTION 12 34 01 **	01	02
	A	23 06 127	Bracket - Standoff, 12" FG	1	1
	B	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	2	2
	C	23 66 027	Washer, Flat, Square 5/8"	2	2
	D	23 66 134	Lock Washer - 5/8" Double Coil	2	2
	E	23 65 043	Lock Nut - 5/8" Square	2	2
5	F	54 07 234	Switch, Fused, 100A 27kV	1	-
		54 06 052	Switch, Fused, SMD−20, 34kV	-	1
5	G	23 17 411	Wildlife Guard - Cover, Cutout	1	-
		23 17 532	Wildlife Guard - Cover, SMD-20	-	1
T	H	18 51 025	Primary Leads (ft.)	15	15
T@	I	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut (50kVA & Smaller)	2	2
		23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut (75 thru 167kVA)	2	2
T@	J	23 66 027	Washer, Square 5/8" (50kVA & Smaller)	2	2
		23 66 031	Washer, Curved 3/4" (75 thru 167kVA)	2	2
@	K	23 66 134	Washer - Lock, 5/8" Double Coil (50kVA & Smaller)	2	2
		23 66 135	Washer - Lock, 3/4" Double Coil (75 thru 167kVA)	2	2
@	L	23 65 042	Lock Nut, 5/8" Square (50kVA & Smaller)	2	2
		23 65 043	Lock Nut, 3/4" Square (75 thru 167kVA)	2	2
T@	M	**13 00 03 01**	Secondary Leads (ft.)	12	12
T@	N	**07 00 25 00**	Parallel Groove Clamp, PG*W	#	#
@	O	**07 00 21 00**	Hot Line Clamp, HLC*W	1	1
@	P	**13 00 01 02**	Transformer, VAXXXXF, 34500 GRD Y /19920	1	1
3,5@	Q	**10 00 01 01**	Link, Fuse	1	-
		-	Refill, Fuse	-	1
1,2@	R	**12 00 10 ******	Grounding Unit	1	1

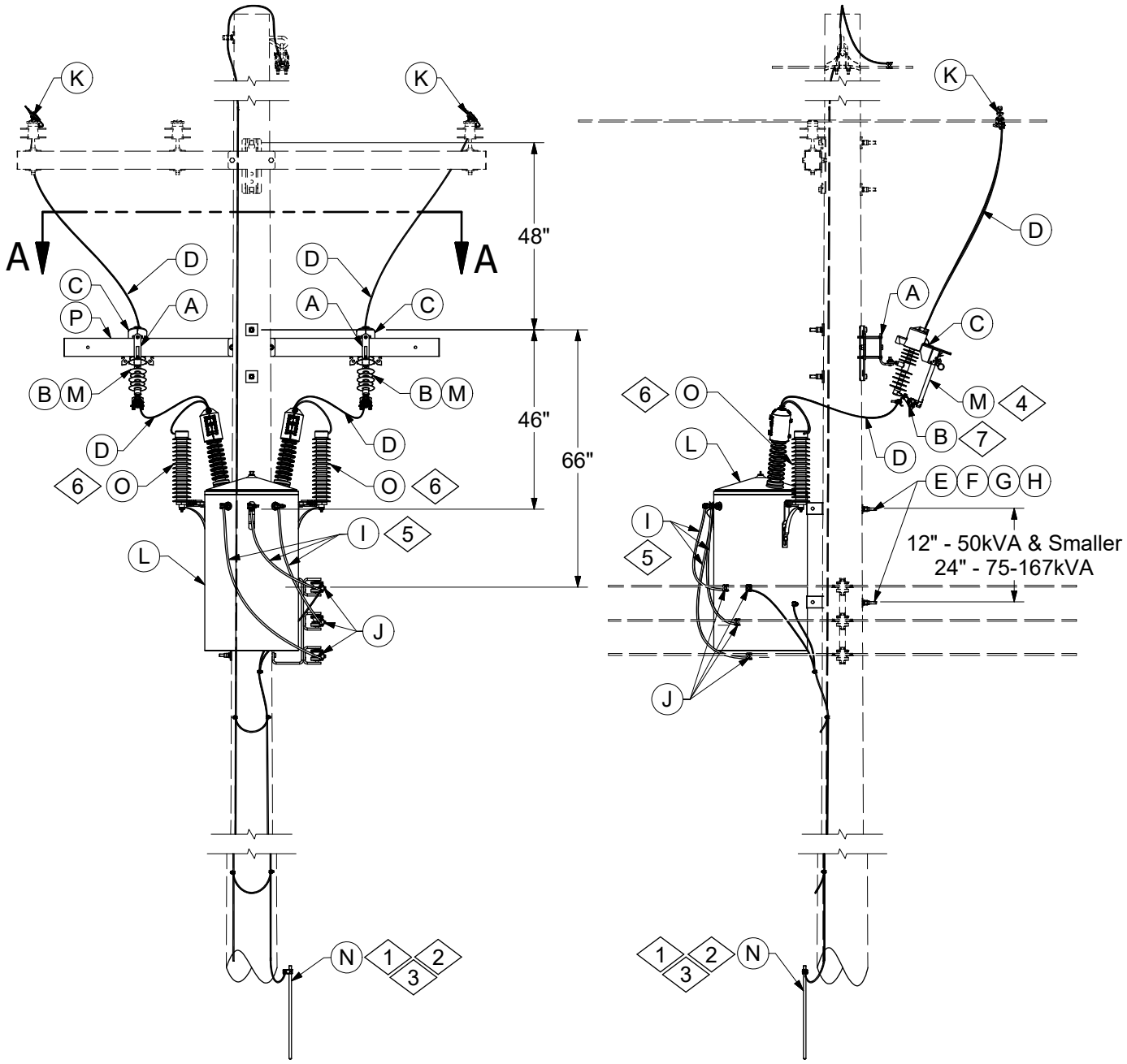
DESIGN NOTE(s):

5. If available fault current is less than 12 kA asymmetrical use DCS **13 34 01 01**. If available fault current is equal to or greater than 12 kA asymmetrical but less than 16 kA asymmetrical use DCS **13 34 01 02**. If asymmetrical fault current is greater than 16 kA, contact Distribution Standards.

REV	DATE	ENG	DESCRIPTION
10	04/01/23	DG	Converted to new format
9	8/22/11	DG	



SECTION A-A



REV	DATE	ENG	DESCRIPTION
4	04/01/23	DG	Converted to new format
3	08/22/11	DG	

CONSTRUCTION NOTE(s):

1. On an existing structure, the static wire ground may not be adequate to use as a transformer ground. Therefore, a separate ground (DCS **12 00 10 02**) shall be installed for the transformer and it shall be bonded to the static ground.

2. On new structures, use grounding unit DCS **12 00 10 09** as both the static and transformer ground.

3. If no static or common/primary neutral is present refer to DCS **13 00 06 06** for installation of grounds.

4. If fuse refill is required, for QK0010G transformer use 1A fuse refill (Stock #20 04 361). For QAXXXXF transformer, contact Distribution Standards for proper size to use.

5. See DCS **13 01 01 ****** for secondary support and DCS **03 01 20 ****** for secondary configurations.

6. QAXXXXF transformer are purchased with arresters pre−installed. Arresters must be field installed on QK0010G transformer.

DCS #	Description
13 34 02 01	With 27kV 100 A Fused Switch
13 34 02 02	With 34kV SMD-20 Fused Switch

	ITEM	STK / DCS #	DESCRIPTION 13 34 02 **	01	02
	A	17 58 054	Bracket, Arrester/Cutout Mounting	2	2
7	B	54 07 234	Switch Fused 100A 27kV	2	-
		54 06 052	Switch, Fused, SMD−20, 34kV	-	2
7	C	23 17 411	Wildlife Guard - Cover, Cutout	2	-
		23 17 532	Wildlife Guard - Cover, SMD-20	-	2
T	D	18 51 025	Primary Leads (ft.)	30	30
T@	E	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut (50kVA & Smaller)	2	2
		23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut (75kVA thru 167kVA)	2	2
T@	F	23 66 027	Washer, Flat, Square 5/8" (50kVA & Smaller)	2	2
		23 66 031	Washer, Curved, Square, 3/4" (75kVA thru 167kVA)	2	2
@	G	23 66 134	Lock Washer - 5/8" Double Coil (50kVA & Smaller)	2	2
		23 66 135	Lock Washer - 3/4" Double Coil (75kVA thru 167kVA)	2	2
@	H	23 65 043	Lock Nut - 5/8" Square (50kVA & Smaller)	2	2
		23 65 042	Lock Nut - 3/4" Square (75kVA thru 167kVA)	2	2
T@	I	**13 00 03 01**	Secondary Leads (ft.)	12	12
T@	J	**07 00 25 00**	Parallel Groove Clamp, PG*W	#	#
@	K	**07 00 21 00**	Hot Line Clamp, HLC*W	2	2
@	L	**13 00 01 02**	Transformer, QK0010G or QAXXXXF, 34500 Delta	1	1
4@	M	**10 00 01 01**	Link, Fuse	2	-
		-	Refill, Fuse	-	2
1,2,3@	N	**12 00 10 ******	Grounding Unit	1	1
6@	O	10 01 235	Arrester 36kV, w/ Transformer Mtg Brkt	2	2
@	P	**04 00 41 14**	Crossarm - Tangent, F/G 8'	1	1
		04 00 41 16	Crossarm - Tangent, F/G 10'	1	1

DESIGN NOTE(s):

7. If available fault current is less than 12 kA asymmetrical use switch and fuse link shown. If available fault current is equal to or greater than 12 kA asymmetrical but less than 16 kA asymmetrical use SMD-20 (Stock #54 06 052). If asymmetrical fault current is greater than 16 kA contact Distribution Standards.

REV	DATE	ENG	DESCRIPTION
4	04/01/23	DG	Converted to new format
3	08/22/11	DG	

CABLE TERMINALS 14

LOCATION & PLACEMENT OF RISERS - ON JOINT USE POLES.....14 00 01 02

STANDOFF BRACKET PLACEMENT AND GROUNDING.....14 00 01 03

RISER GUARD - CONCRETE.....14 00 20 **

SINGLE RISER - 600V.....14 02 01 **

DOUBLE RISER - 600V.....14 02 02 **

UNDERGROUND TO OH SERVICE - 600V.....14 02 03 **

SINGLE PHASE RISER - #2 OR 4/0 CABLE - 15kV.....14 12 01 **

SINGLE PHASE UG TO OH FEED - #2 OR 4/0 CABLE - 15kV.....14 12 02 **

THREE PHASE RISER - #2 OR 4/0 CABLE - 15kV.....14 12 05 **

THREE PHASE RISER, 350 - 750 kcmil CABLE W/ VERTICAL SWITCHES - 15kV.....14 12 14 **

THREE PHASE RISER, 350 - 750 kcmil CABLE W/ HORIZONTAL SWITCHES - 15kV.....14 12 16 **

THREE PHASE RISER WITH GROUP OPERATED SWITCH - #2 OR 4/0 CABLE - 15kV.....14 12 17 **

THREE PHASE RISER - WITH SM-5 FUSES - 15kV.....14 12 18 **

SWITCHED CABLE TERMINAL - 350 AND 750 kcmil, SINGLE AND PARALLEL CABLE - 35kV.....14 34 09 **

SINGLE CIRCUIT, 350 AND 750 kcmil CABLE, SINGLE AND PARALLEL RISER - 35kV.....14 34 11 **

SINGLE CIRCUIT VERTICAL DEADEND - 350 AND 750 kcmil CABLE, SINGLE AND PARALLEL RISER - 35kV.....14 34 14 **

SINGLE CIRCUIT DEADEND - 350 AND 750 kcmil CABLE, PARALLEL RISER - 35kV.....14 34 15 **

SINGLE CIRCUIT, 350 AND 750 kcmil CABLE, SINGLE AND PARALLEL RISER - 35kV.....14 34 16 **

SWITCHED CABLE TERMINAL DEADEND - 350 AND 750 kcmil CABLE, SINGLE RISER - 35kV.....14 34 17 **

SWITCHED CABLE TERMINAL DEADEND - 1/0 CABLE - 35kV.....14 34 18 **

TERMINAL POLE - 500 - 1000 kcmil CABLE - 69kV.....14 69 01 **

Below are the guidelines for communication companies using Ameren wood and composite poles.

1. Ameren and communication companies vertical runs shall not be placed on the same pole if it is practicable to place them on separate poles. If vertical runs must be placed on the same pole, the runs shall be placed in adjacent quadrants so that one-half of the pole is left open for climbing.

2. A riser should not be placed on a pole which by its addition exceeds the allotted quadrant or infringes on that portion of the pole considered as the climbing side.

3. When an existing riser contains cable from one phase, another cable may be added to that conduit no matter if the new cable is connected to the same or a different phase. Primary and secondary cables can also be in the same riser conduit. Sharing conduit with multiple cables is only to be done when space is very limited on a pole.

4. Schedule 80 PVC conduit shall be used for the first 10'-0" above grade.

5. Communication companies can be attached by pre-fabricated bolted option or by field assembly banded option on composite pole.

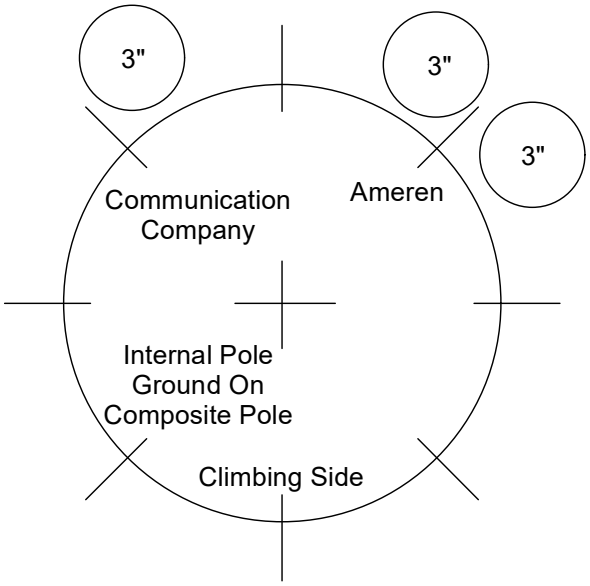


Table below shows how many risers will fit on the front side of 12" and 20" riser brackets when all of the risers are the same diameter. With mixed diameter risers, space utilized will need to be determined. The straps that hold the riser to the bracket are approximately 3" wider than the conduit diameter. If needed, risers may be attached to the back side of riser brackets.

Number of Risers for Given Diameter Conduit						
Dia. Of Conduit	**2"**	**2-1/2"**	**3"**	**4"**	**5"**	**6"**
12" Riser Bracket	2	2	1	1	1	1
20" Riser Bracket	4	3	3	3	2	2

REV	DATE	ENG	DESCRIPTION
5	01/01/24	JMW	Converted to new format
4	05/29/15	HLH	

1. Standoff Bracket Placement

   A. Ideally, the first (lowest) standoff bracket will be positioned a minimum of 8'-0" above ground to prevent anyone from walking into the bracket or using it to climb the pole. If the lowest bracket is less than 8'-0" above the ground or any other accessible surface, there must be a minimum of 8'-0" between the two lowest brackets.

   B. Standoff brackets should be placed approximately 8'-0" to 10'-0" apart and the top standoff bracket should be 6" to 12" below the top of the conduit.

2. Standoff Bracket Grounding

   A. Metal brackets and straps used to support non-conductive conduits do not need to be grounded. However, conductive material conduits that enclose electrical supply lines or are exposed to contact with open supply conductors must be effectively grounded.

   B. If the conduit being supported is conductive (steel or iron) and the standoff bracket is less than 8'-0" above ground the bracket must be bonded to the system neutral. The bond will be made with #6 solid copper conductor.

   C. The #6 solid copper conductor must be attached to the conduit support bracket and then trained along the DA bolt or bracket and attached to the pole ground wire. The pole ground wire must be connected to system neutral or static wire.

   D. The #6 solid copper conductor that is trained along the DA bolt or bracket may be secured to the DA bolt or bracket with plastic wire ties.

   E. Bonding method #1 - Slotted support brackets.

      This method is for bonding slotted conduit support bracket. Figure 1 shows the bonding on an H-slotted conduit support bracket. In addition to the general instructions shown above the following instructions will apply.

      a. Use a transformer ground connector (Stock #69 58 121) and M-F locknut (Stock #23 65 053).

      b. Place the M-F locknut on the transformer ground connector stud and then slide the nut into the small slot on the support bracket.

      c. Tighten the transformer ground connector into the locknut.

      d. Insert the #6 CU conductor into the transformer ground connector and securely tighten.

   F. Bonding method #2 - Conduit straps

      This method is for bonding to conduit straps. Examples of the support brackets that may require this type of bonding are shown in Figure 2.

      In addition to the general instructions shown in Section 1, the following instructions will apply.

      a. Remove a conduit strap bolt.

      b. Install two washers on the strap bolt and replace the bolt.

      c. Wrap the #6 CU around the strap bolt between the two washers and tighten the bolt securely.

REV	DATE	ENG	DESCRIPTION
4	01/01/24	JMW	Converted to new format
3	06/05/15	HLH	

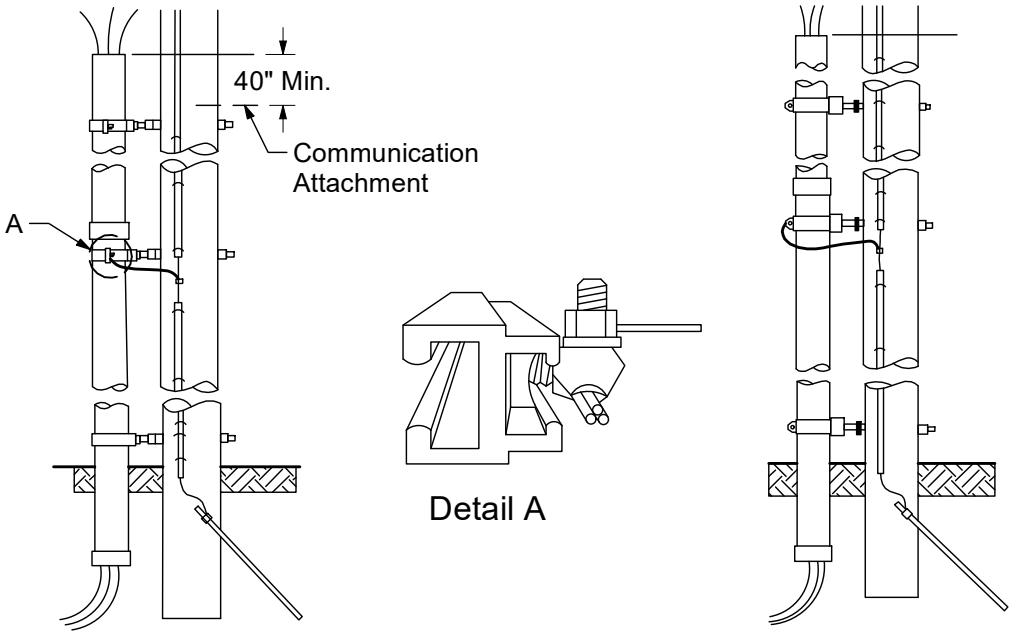


Figure 1

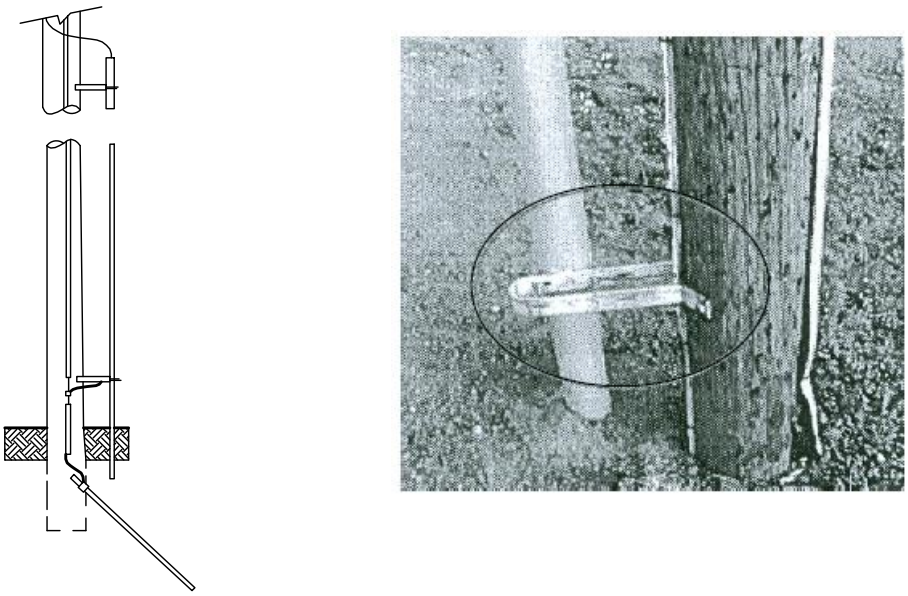
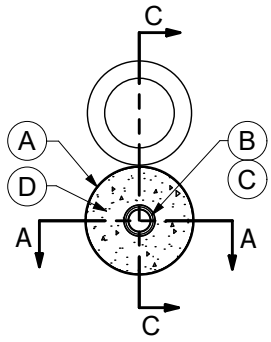
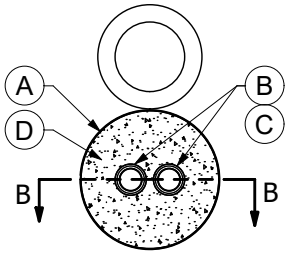


Figure 2

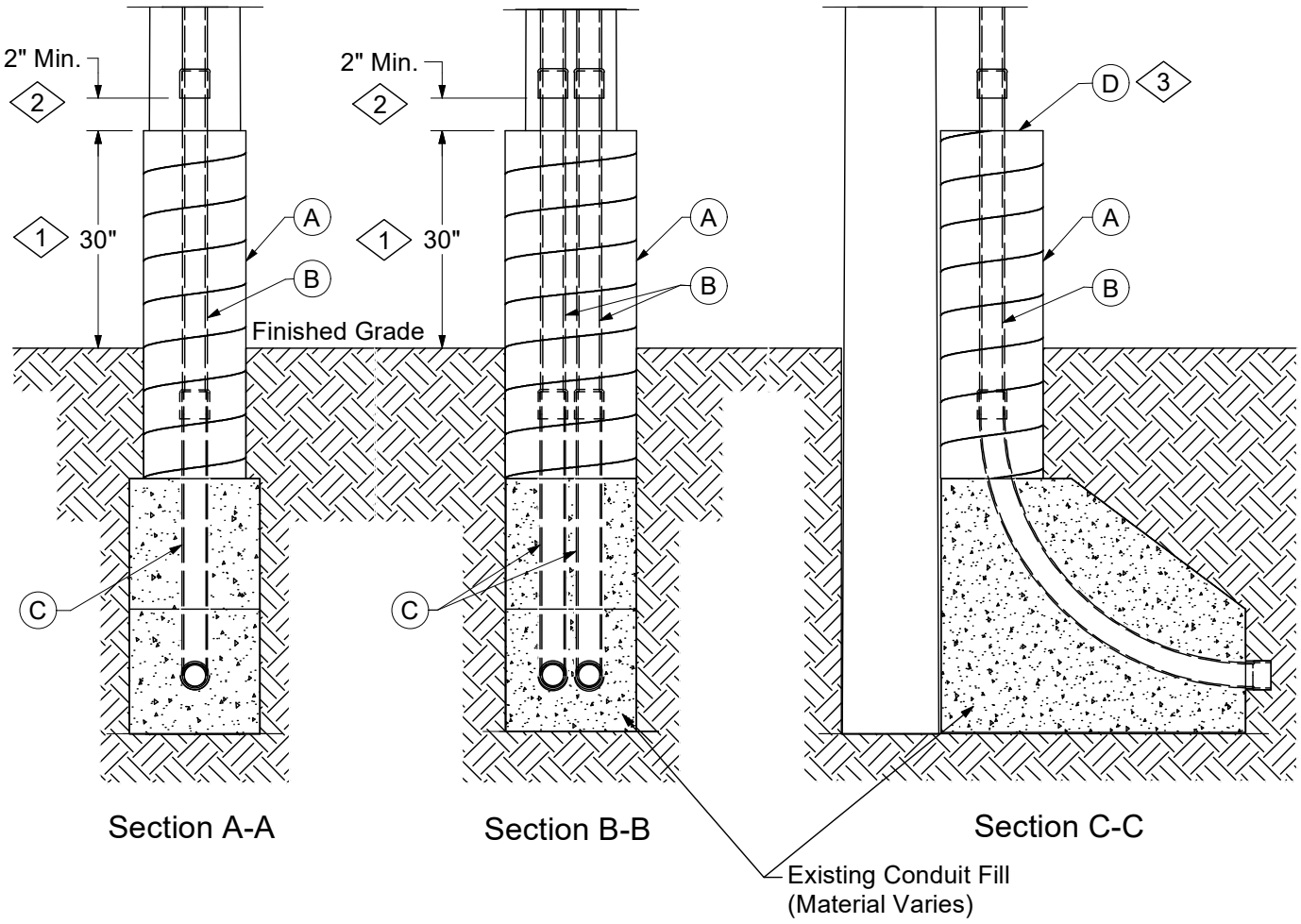
REV	DATE	ENG	DESCRIPTION
4	01/01/24	JMW	Converted to new format
3	06/05/15	HLH	



Single Conduit Riser



Double Conduit Riser



Section A-A

Section B-B

Section C-C

REV	DATE	ENG	DESCRIPTION
0	01/01/24	JMW	New Standard

CONSTRUCTION NOTE(s):

1. Concrete collar should rise 30"- 40" above grade to protect the conduit from vehicle damage.

2. The conduit bell end(s) shall be at the top. Cut the conduit to length such that the top will be 1-2" above the top edge of the sonotube, as concrete will be sloped away from conduit(s). Chamfer inside edge of cut end. Center single conduit in sonotube. On double conduit risers, center the conduits from back to front and space the conduits about 2" apart.

3. Fill sonotube slowly with concrete and be sure there are no air pockets by rodding the concrete as it is poured. Smooth finish top surface, sloping it away from conduit(s). Keep inside of conduit clean and clear from concrete.

Single Conduit Riser		
Conduit Dia.	Sonotube Dia.	DCS #
2"	10"	14 00 20 01
2-1/2"	14"	14 00 20 02
3"	14"	14 00 20 03
4"	14"	14 00 20 04
5"	18"	14 00 20 05

Double Conduit Riser		
Conduit Dia.	Sonotube Dia.	DCS #
2"	18"	14 00 20 06
2-1/2"	18"	14 00 20 07
3"	18"	14 00 20 08
4"	24"	14 00 20 09
5"	24"	14 00 20 10

	ITEM	STK / DCS #	DESCRIPTION 14 00 20 **	01	02	03	04	05	06	07	08	09	10
@	A	11 04 109	Tube, Concrete Form, Sonotube 10" Dia. x 12'-0" Lg.	1	-	-	-	-	-	-	-	-	-
		11 04 110	Tube, Concrete Form, Sonotube 14" Dia. x 12'-0" Lg.	-	1	1	1	-	-	-	-	-	-
		11 04 111	Tube, Concrete Form, Sonotube 18" Dia. x 12'-0" Lg.	-	-	-	-	1	1	1	1	-	-
		11 04 112	Tube, Concrete Form, Sonotube 24" Dia. x 12'-0" Lg.	-	-	-	-	-	-	-	-	1	1
	B	12 01 275	Conduit - 2" Schedule 80 (ft.)	#	-	-	-	-	#	-	-	-	-
		12 01 274	Conduit - 2-1/2" Schedule 80 (ft.)	-	#	-	-	-	-	#	-	-	-
		12 01 276	Conduit - 3" Schedule 80 (ft.)	-	-	#	-	-	-	-	#	-	-
		12 01 273	Conduit - 4" Schedule 80 (ft.)	-	-	-	#	-	-	-	-	#	-
		12 01 272	Conduit - 5" Schedule 80 (ft.)	-	-	-	-	#	-	-	-	-	#
@	C	12 51 180	Conduit - Bend 2", 36" Rad	1	-	-	-	-	2	-	-	-	-
		12 51 264	Conduit - Bend 2-1/2", 24" Rad	-	1	-	-	-	-	2	-	-	-
		12 51 173	Conduit - Bend 3", 36" Rad	-	-	1	-	-	-	-	2	-	-
		12 51 176	Conduit - Bend 4", 36" Rad	-	-	-	1	-	-	-	-	2	-
		12 51 206	Conduit - Bend 5", 36" Rad	-	-	-	-	1	-	-	-	-	2
	D	98 00 001	Concrete (C.Y.)	1	1	1	1	1	1	1	1	1	1

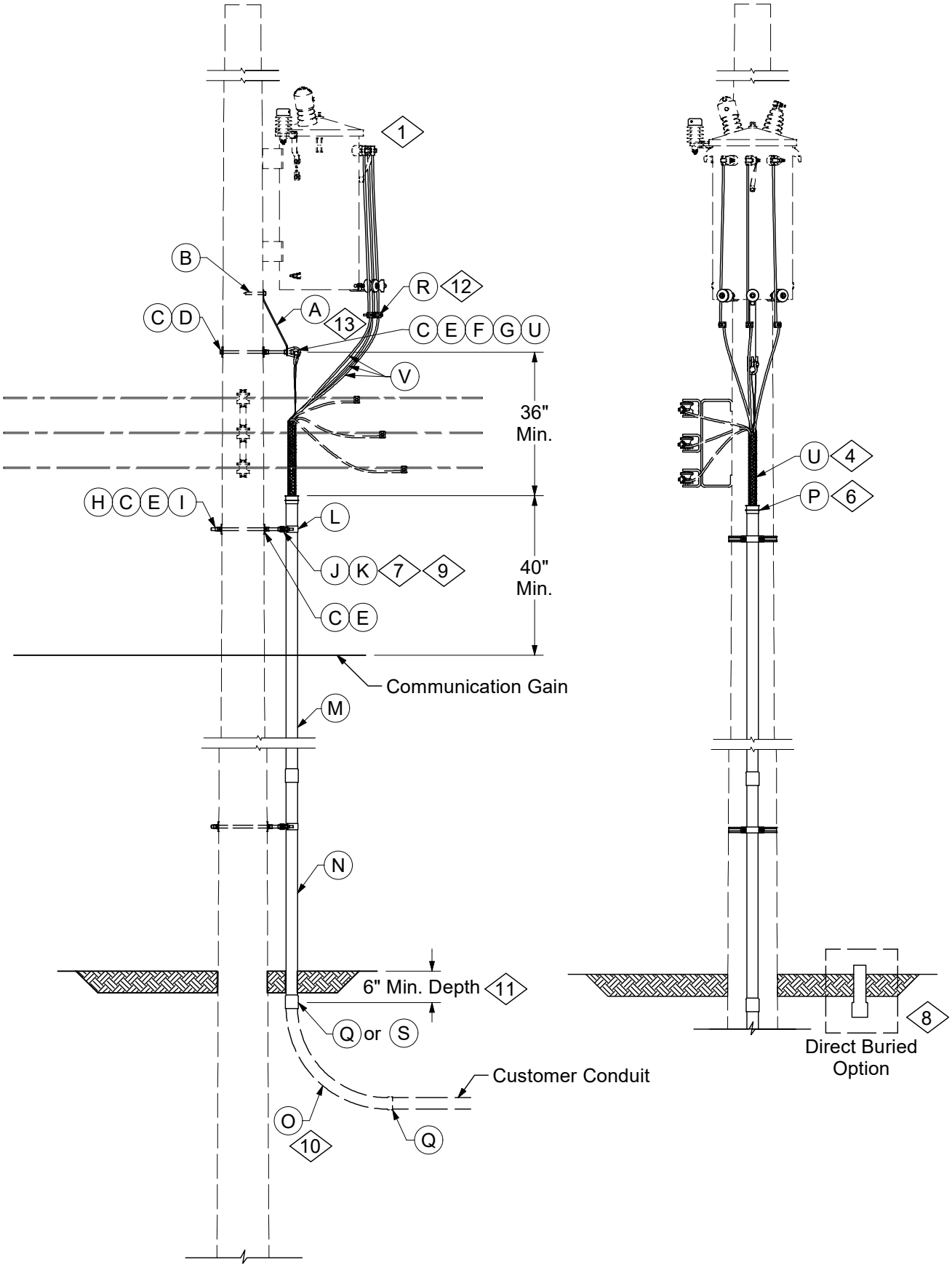
DESIGN NOTE(s):

4. Concrete encase the conduit riser when it is placed on the traffic side of a pole and a vehicle accident may take out an important circuit (feeder or major customer).

5. Concrete encase the conduit riser when the cable inside is 500 or 750 kcmil where pulling tensions may pull the bends up of from the ground.

6. Concrete encase the conduit riser when it is part of a concrete encased duct bank, such as a 34kV cable run from a substation.

REV	DATE	ENG	DESCRIPTION
0	01/01/24	JMW	New Standard



REV	DATE	ENG	DESCRIPTION
13	01/01/24	JMW	Converted to new format
12	10/22/15	HLH	

CONSTRUCTION NOTE(s):

1. Do not put aluminum conductors in transformer bushing connectors use copper secondary leads per DCS **13 00 03 01**.

2. Customer cable must be a type approved by the National Electrical Code and by Ameren. Cable must be suitable for exposure to sunlight and water. Cable should extend to the base of the pole or to a point designated by Ameren with sufficient additional cable provided for connection on pole as directed by an Ameren representative. The customer conduit shall extend to a nominal distance from the pole to accommodate the conduit bend. The location of the bend on the pole (quadrant) shall be specified by an Ameren representative.

3. It is recommended that the cable be installed in conduit under driveways and parking areas.

4. Apply two layers of tape to protect cable under the cable grips.

5. For alternate construction, call for split conduit - 3” (Stock #12 51 218), 4” (Stock #12 51 219), 5” (Stock #12 51 220).

6. Top of conduit may be sealed with polyurethane expanding foam, Stock #31 53 231.

7. Some standoff brackets require that one of the nuts on the double arming bolt be replaced with jam nut (Stock #23 65 053). The jam nut should then be inserted into the 5/8” slot on the standoff bracket. If the nut on the double arming bolt will fit into the 5/8” slot on the bracket - Do Not Use the jam nut.

8. In direct buried installations the conduit may have a coupling attached to the end or a duct shield inserted into the conduit to prevent cable damage.

9. See DCS **14 00 01 03** for standoff bracket placement and grounding requirements.

10. 36" radius bends may be used to reduce difficulty in installing cable.

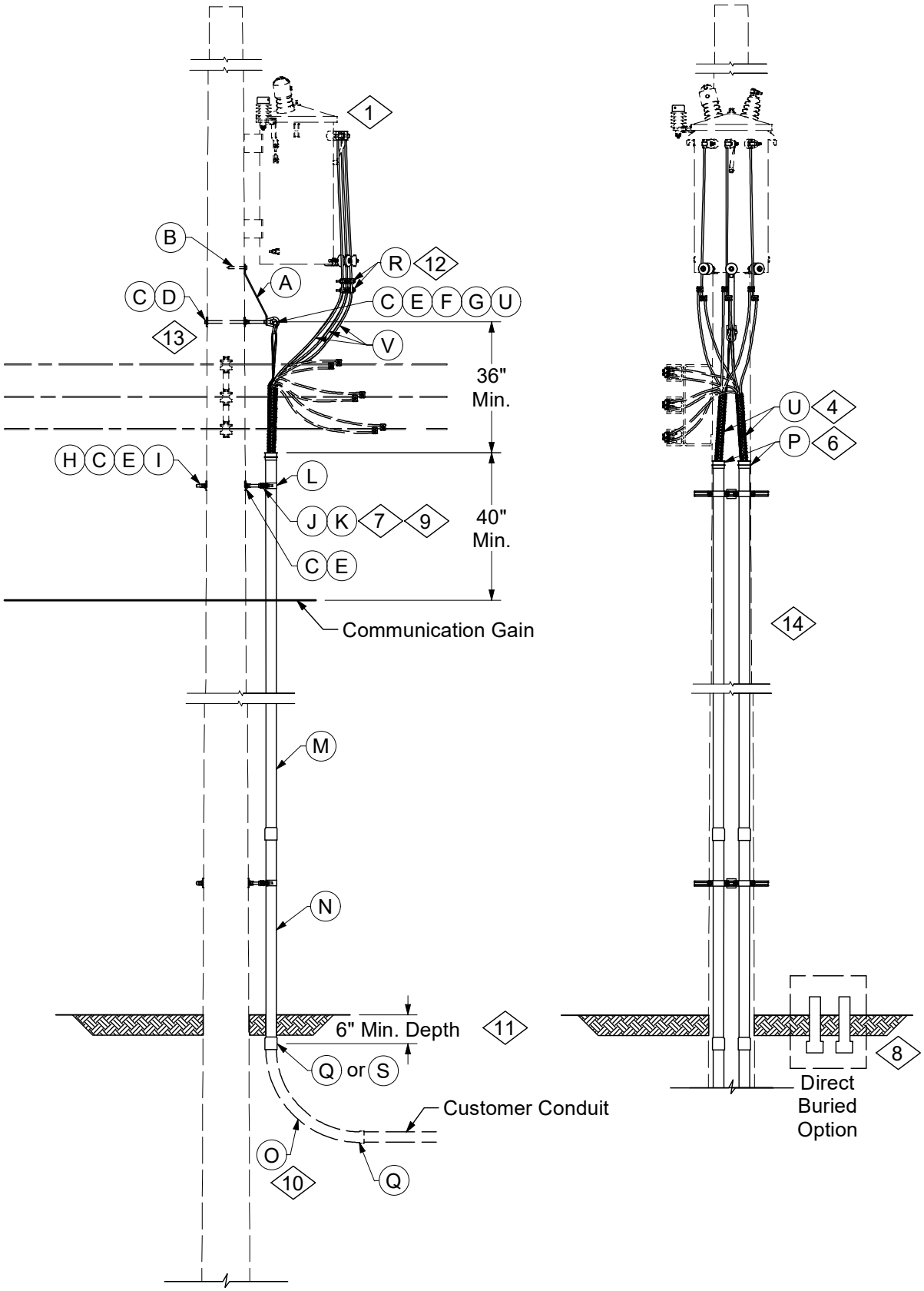
11. The conduit bend should be completely below grade. Field conditions may make this impractical, and in these cases, the top of the bend may be up top 6" above final grade.

12. Insulate connectors with electrical tape or appropriate PG cover.

13. Items A,B,C,D,F,G, and U may be omitted if the weight of cable is minimal, or can be supported by the secondary rack or lower spool insulators on the transformer.

	ITEM	STK / DCS #	DESCRIPTION 14 02 01 **	01	02	03	04
	A	23 68 330	Link, Guy	1	1	1	1
	B	23 60 011	Lag Screw - 5/8" x 5"	1	1	1	1
	C	23 66 207	Washer, Curved, Square, 5/8"	8	8	8	8
	D	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	1	1	1	1
	E	23 66 134	Lock Washer - 5/8" Double Coil	7	7	7	7
	F	23 65 012	Eyenut, 5/8"	1	1	1	1
	G	23 68 181	Shackle - Deadend	1	1	1	1
	H	23 53 003	Bolt, DA, 5/8" Dia x 18" w/ 4 square nuts	3	3	3	3
	I	23 65 043	Lock Nut - 5/8" Square	3	3	3	3
9	J	23 06 087	Bracket - Standoff, 12"	3	3	3	3
7	K	23 65 053	Nut - 5/8" Jam	3	3	3	3
	L	23 67 189	Strap - Conduit 2-1/2" w/2" Bolts	3	-	-	-
		23 67 182	Strap - Conduit 3" w/2" Bolts	-	3	-	-
		23 67 183	Strap - Conduit 4" w/2" Bolts	-	-	3	-
		23 67 184	Strap - Conduit 5" w/2" Bolts	-	-	-	3
	M	12 01 263	Conduit - 2-1/2" Schedule 40 (ft.)	20	-	-	-
		12 01 279	Conduit - 3" Schedule 40 (ft.)	-	20	-	-
		12 01 278	Conduit - 4" Schedule 40 (ft.)	-	-	20	-
		12 01 303	Conduit - 5" Schedule 40 (ft.)	-	-	-	20
	N	12 01 274	Conduit - 2-1/2" Schedule 80 (ft.)	10	-	-	-
		12 01 276	Conduit - 3" Schedule 80 (ft.)	-	10	-	-
		12 01 273	Conduit - 4" Schedule 80 (ft.)	-	-	10	-
		12 01 272	Conduit - 5" Schedule 80 (ft.)	-	-	-	10
	O	12 51 264	Conduit - Bend 2-1/2", 24" Rad	1	-	-	-
10		12 51 253	Conduit - Bend 3", 24" Rad	-	1	-	-
		12 51 249	Conduit - Bend 4", 24" Rad	-	-	1	-
		12 51 206	Conduit - Bend 5", 36" Rad	-	-	-	1
	P	12 51 398	Conduit - Coupling 2-1/2" Bell End	1	-	-	-
		12 51 008	Conduit - Coupling 3", Bell End	-	1	-	-
		12 51 254	Conduit - Coupling 4" Bell End	-	-	1	-
		12 51 233	Conduit - Coupling 5" Bell End	-	-	-	1
	Q	12 51 265	Coupling - 2-1/2" Schedule 40	1	-	-	-
		12 51 158	Coupling - 3" Schedule 40	-	1	-	-
		12 51 157	Coupling - 4" Schedule 40	-	-	1	-
		12 51 156	Coupling - 5" Schedule 40	-	-	-	1
12,@	R	**07 00 25 00**	Clamp, Parallel Groove, PG**	3	3	3	3
@	S	40 53 666	Reducer - Conduit 3" x 2-1/2"	1	1	-	-
@	T	12 06 053	Solvent - Cement, PVC	1	1	1	1
@	U	23 17 207	Grip - Cable 1-3/4", 2" Dia.	1	1	1	1
		23 17 220	Grip - Cable 3", 3-1/2" Dia.	1	1	1	1
@	V	**59 40 00 12**	Cable (ft.)	40	40	40	40
@		279	Op Code, Install Cable Up Pole	1	1	1	1

REV	DATE	ENG	DESCRIPTION
13	01/01/24	JMW	Converted to new format
12	10/22/15	HLH	



REV	DATE	ENG	DESCRIPTION
13	01/01/24	JMW	Converted to new format
12	03/11/16	HLH	

CONSTRUCTION NOTE(s):

1. Do not put aluminum conductors in transformer bushing connectors use copper secondary leads per DCS **13 00 03 01**.

2. Customer cable must be a type approved by the National Electrical Code and by Ameren. Cable must be suitable for exposure to sunlight and water. Cable should extend to the base of the pole or to a point designated by Ameren with sufficient additional cable provided for connection on pole as directed by an Ameren representative. The customer conduit shall extend to a nominal distance from the pole to accommodate the conduit bend. The location of the bend on the pole (quadrant) shall be specified by an Ameren representative.

3. It is recommended that the cable be installed in conduit under driveways and parking areas.

4. Apply two layers of tape to protect cable under the cable grips.

5. For alternate construction, call for split conduit - 3” (Stock #12 51 218), 4” (Stock #12 51 219), 5” (Stock #12 51 220).

6. Top of conduit may be sealed with polyurethane expanding foam, Stock #31 53 231.

7. Some standoff brackets require that one of the nuts on the double arming bolt be replaced with jam nut (Stock #23 65 053). The jam nut should then be inserted into the 5/8” slot on the standoff bracket. If the nut on the double arming bolt will fit into the 5/8” slot on the bracket - Do Not Use the jam nut.

8. In direct buried installations the conduit may have a coupling attached to the end or a duct shield inserted into the conduit to prevent cable damage.

9. See DCS **14 00 01 03** for standoff bracket placement and grounding requirements.

10. 36" radius bends may be used to reduce difficulty in installing cable.

11. The conduit bend should be completely below grade. Field conditions may make this impractical, and in these cases, the top of the bend may be up top 6" above final grade.

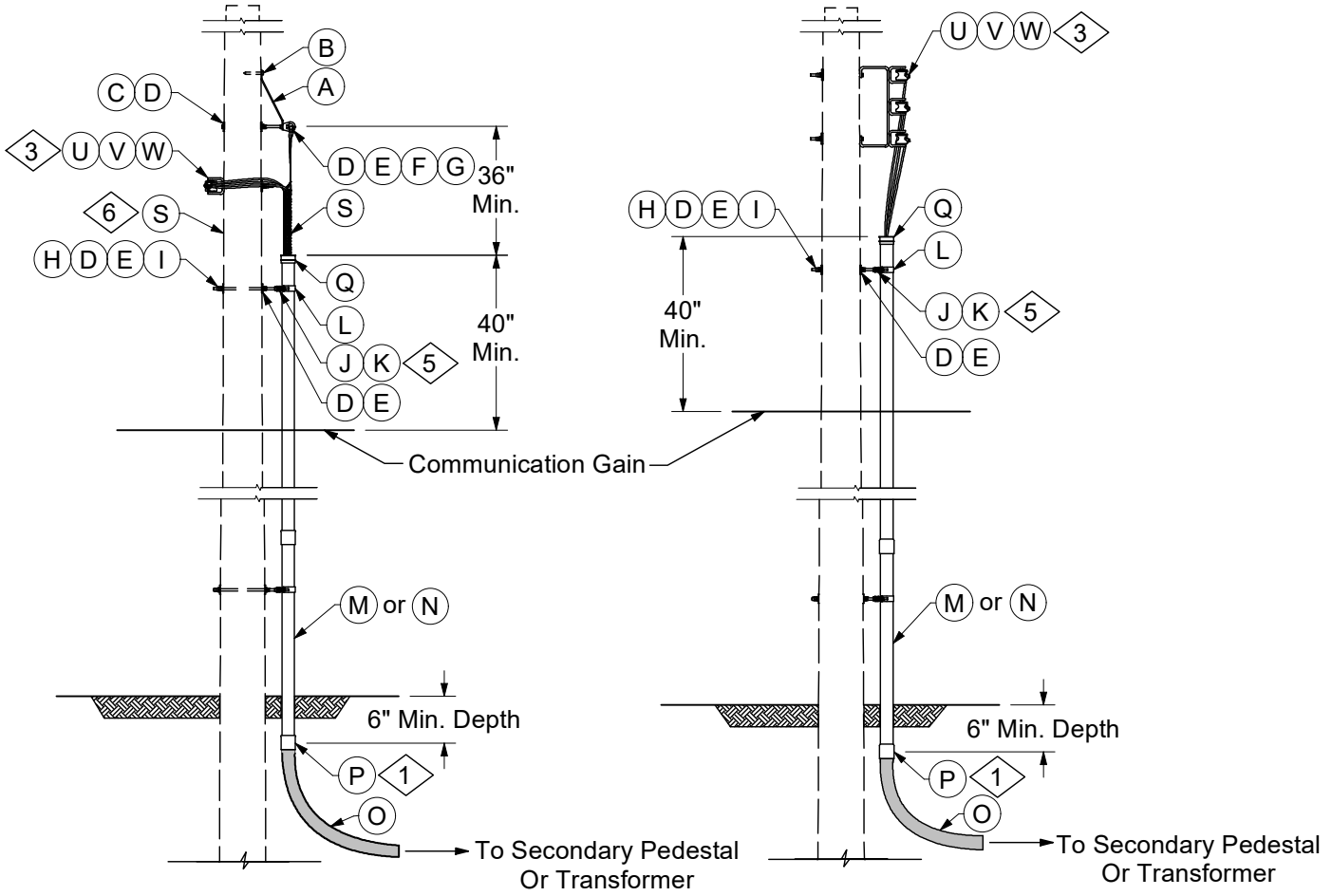
12. Insulate connectors with electrical tape or appropriate PG cover.

13. Items A,B,C,D,F,G, and U may be omitted if the weight of the cable is minimal, or can be supported by the secondary rack or lower spool insulators on the transformer.

14. To reduce the amount of congestion on a pole, it may be possible to eliminate multiple service risers and use a secondary riser with cables feeding a pedestal (Stock #12 05 049) or padmount secondary/service enclosure (Stock #54 07 236).

	ITEM	STK / DCS #	DESCRIPTION 14 02 02 **	01	02	03	04
	A	23 68 330	Link, Guy	1	1	1	1
	B	23 60 011	Lag Screw - 5/8" x 5"	1	1	1	1
	C	23 66 207	Washer, Curved, Square, 5/8"	8	8	8	8
	D	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	1	1	1	1
	E	23 66 134	Lock Washer - 5/8" Double Coil	7	7	7	7
	F	23 65 012	Eyenut, 5/8"	1	1	1	1
	G	23 68 181	Shackle - Deadend	1	1	1	1
	H	23 53 003	Bolt, DA, 5/8" Dia x 18" w/ 4 square nuts	3	3	3	3
	I	23 65 043	Lock Nut - 5/8" Square	3	3	3	3
9	J	23 06 086	Bracket - Standoff, 20"	3	3	3	3
7	K	23 65 053	Nut - 5/8" Jam	3	3	3	3
	L	23 67 189	Strap - Conduit 2-1/2" w/2" Bolts	6	-	-	-
		23 67 182	Strap - Conduit 3" w/2" Bolts	-	6	-	-
		23 67 183	Strap - Conduit 4" w/2" Bolts	-	-	6	-
		23 67 184	Strap - Conduit 5" w/2" Bolts	-	-	-	6
	M	12 01 263	Conduit - 2-1/2" Schedule 40 (ft.)	40	-	-	-
		12 01 279	Conduit - 3" Schedule 40 (ft.)	-	40	-	-
		12 01 278	Conduit - 4" Schedule 40 (ft.)	-	-	40	-
		12 01 303	Conduit - 5" Schedule 40 (ft.)	-	-	-	40
	N	12 01 274	Conduit - 2-1/2" Schedule 80 (ft.)	10	-	-	-
		12 01 276	Conduit - 3" Schedule 80 (ft.)	-	10	-	-
		12 01 273	Conduit - 4" Schedule 80 (ft.)	-	-	10	-
		12 01 272	Conduit - 5" Schedule 80 (ft.)	-	-	-	10
	O	12 51 264	Conduit - Bend 2-1/2", 24" Rad	2	-	-	-
10		12 51 253	Conduit - Bend 3", 24" Rad	-	2	-	-
		12 51 249	Conduit - Bend 4", 24" Rad	-	-	2	-
		12 51 206	Conduit - Bend 5", 36" Rad	-	-	-	2
	P	12 51 398	Conduit - Coupling 2-1/2" Bell End	2	-	-	-
		12 51 008	Conduit - Coupling 3", Bell End	-	2	-	-
		12 51 254	Conduit - Coupling 4" Bell End	-	-	2	-
		12 51 233	Conduit - Coupling 5" Bell End	-	-	-	2
	Q	12 51 265	Coupling - 2-1/2" Schedule 40	2	-	-	-
		12 51 158	Coupling - 3" Schedule 40	-	2	-	-
		12 51 157	Coupling - 4" Schedule 40	-	-	2	-
		12 51 156	Coupling - 5" Schedule 40	-	-	-	2
12,@	R	**07 00 25 00**	Clamp, Parallel Groove, PG**	6	6	6	6
@	S	40 53 666	Reducer - Conduit 3" x 2-1/2"	1	1	-	-
@	T	12 06 053	Solvent - Cement, PVC	1	1	1	1
@	U	23 17 207	Grip - Cable 1-3/4", 2" Dia	2	2	2	2
		23 17 220	Grip - Cable 3", 3-1/2" Dia	2	2	2	2
@	V	**59 40 00 12**	Cable (ft.)	40	40	40	40
@		279	Op Code, Install Cable Up Pole	2	2	2	2

REV	DATE	ENG	DESCRIPTION
13	01/01/24	JMW	Converted to new format
12	03/11/16	HLH	



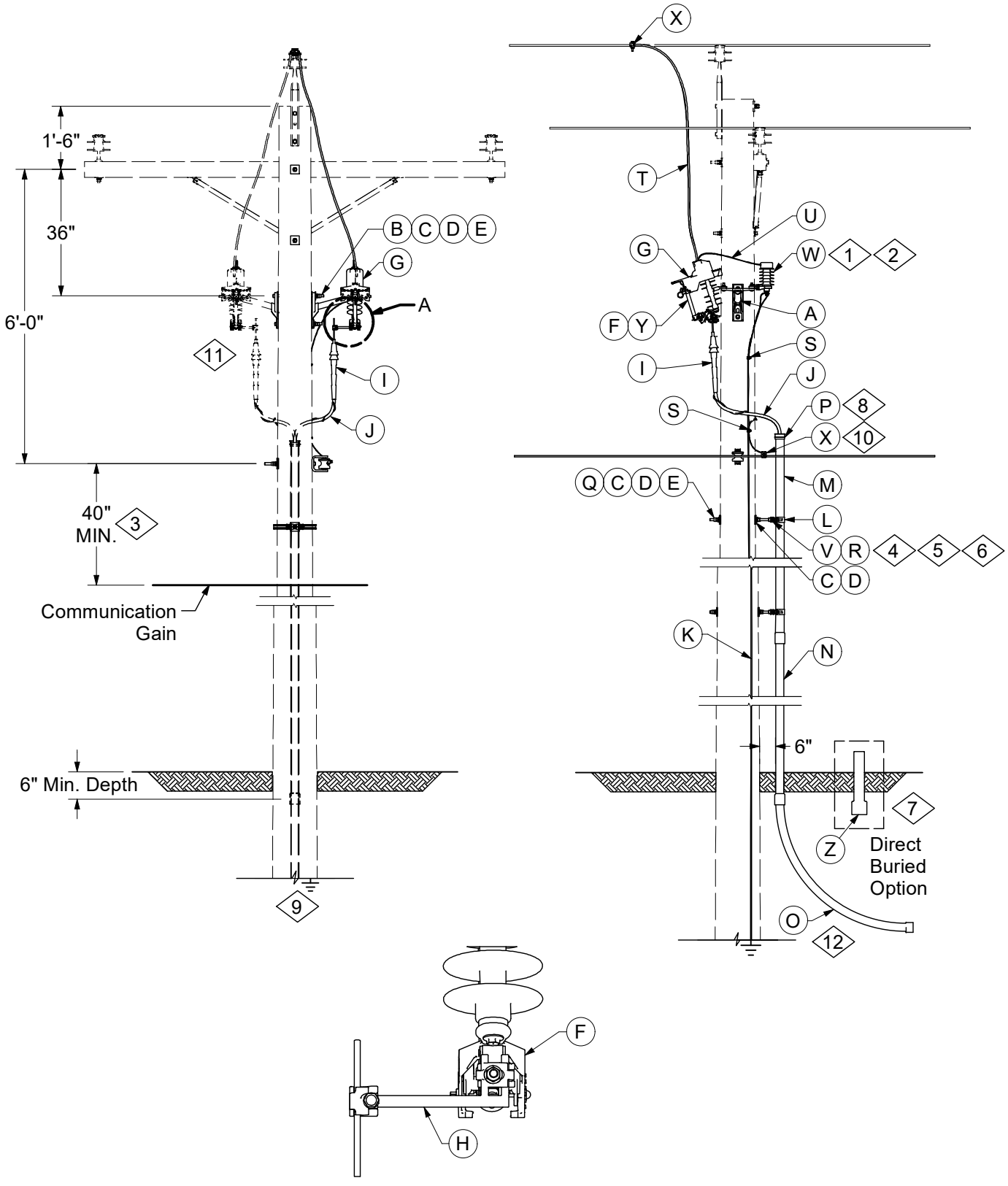
DCS #	DESCRIPTION
14 02 03 01	3" Conduit w/ Clevis
14 02 03 02	2-1/2" Conduit w/ Clevis
14 02 03 03	3" Conduit w/ Wire Rack
14 02 03 04	2-1/2" Conduit w/ Wire Rack

CONSTRUCTION NOTE(s):

1. If HDPE coilable duct is brought to bend, glue joint with epoxy cement.
2. If only one riser is being installed the bracket can be cut from Stock #23 06 099 to accommodate a single conduit
3. Insulate connectors with electrical tape or appropriate PG cover.
4. Quantities may be increased to allow for multiple risers.
5. See DCS **14 00 01 03** for standoff bracket placement and grounding requirements.
6. Attach a “Danger UG Feeds OH” sign below the secondary rack, and 5’ above ground line.
7. 36" Radius bends may be used to reduce difficulty in installing cable.
8. The bend should be completely below grade. Field conditions may make this impractical, and these cases, the top of the bend may be up to 6" above final grade.
9. Items A, B, C, D, E, F, and G may be ommited if the weight of the cable is minimal and can be secured to the secondary rack.

	ITEM	STK / DCS #	DESCRIPTION 14 02 03 **	01	02	03	04
	A	23 68 330	Link, Guy	1	1	-	-
	B	23 60 011	Lag Screw - 5/8" x 5"	1	1	-	-
	C	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	1	1	-	-
	D	23 66 207	Washer, Curved, Square, 5/8"	8	8	6	6
	E	23 66 134	Lock Washer - 5/8" Double Coil	7	7	6	6
	F	23 65 012	Eyenut, 5/8"	1	1	-	-
	G	23 68 181	Shackle - Deadend	1	1	-	-
	H	23 53 003	Bolt, DA, 5/8" Dia x 18" w/ 4 square nuts	3	3	3	3
	I	23 65 043	Lock Nut - 5/8" Square	3	3	3	3
2,5	J	23 06 087	Bracket - Standoff, 12"	3	3	3	3
	K	23 65 053	Nut - 5/8" Jam	3	3	3	3
	L	23 67 189	Strap - Conduit 2-1/2" w/2" Bolts	-	3	-	3
		23 67 182	Strap - Conduit 3" w/2" Bolts	3	-	3	-
	M	12 01 263	Conduit - 2-1/2" Schedule 40 (ft.)	-	20	-	20
		12 01 279	Conduit - 3" Schedule 40 (ft.)	20	-	20	-
	N	12 01 274	Conduit - 2-1/2" Schedule 80 (ft.)	-	10	-	10
		12 01 276	Conduit - 3" Schedule 80 (ft.)	10	-	10	-
	O	12 51 264	Conduit - Bend 2-1/2", 24" Rad	-	1	-	1
		12 51 253	Conduit - Bend 3", 24" Rad	1	-	1	-
	P	12 51 265	Coupling - 2-1/2", Schedule 40	-	1	-	1
		12 01 263	Coupling - 3", Schedule 40	1	-	1	-
	Q	12 51 398	Conduit - Coupling 2-1/2" Bell End	-	1	-	1
		12 51 008	Conduit - Coupling 3", Bell End	1	-	1	-
	R	16 02 585	Sign, Danger UG Feed	1	1	1	1
	S	23 17 220	Grip - Cable 3-1/2" Dia	1	1	-	-
	T	18 07 201	Cable - 600V 2-350 KCMIL x 1-4/0AWG	40	-	40	-
		18 07 202	Cable - 600V 2-3/0 AWG x 1-1/0AWG	-	40	-	40
@	U	**07 00 25 00**	Clamp, Parallel Groove, PG**	3	3	3	3
3,@	V	**06 01 01 01**	Secondary Clevis	1	1	-	-
		06 01 03 01	3 Wire Extended Cleavis Bracket	-	-	1	1
@	W	**09 01 10 ** **	Multiple Service Cable Installation	#	#	-	-
		09 01 28 00	Service Takeoff at Pole	-	-	1	1
@	X	12 56 099	Cement - Solvent, PVC	1	1	1	1
1,@	Y	12 06 126	Cement - Epoxy HDPE Duct to PVC	1	1	1	1

REV	DATE	ENG	DESCRIPTION
6	01/01/24	JMW	Converted to new format
5	11/18/15	HLH	



Detail A

REV	DATE	ENG	DESCRIPTION
22	01/01/24	JMW	Converted to new format
21	12/16/15	HLH	

DCS #	DESCRIPTION
14 12 01 01	#2 Direct Buried or In 2" Conduit/Duct
14 12 01 02	4/0 Direct Buried or In 2" Conduit/Duct
14 12 01 03	#2 Direct Buried or In 3" Conduit/Duct
14 12 01 04	4/0 Direct Buried or In 3" Conduit/Duct

CONSTRUCTION NOTE(s):

1. Keep arrester ground lead as short as possible.

2. On 13800 Gnd Y/7970 V terminal poles use 10 kV lightning arrester, Stock #10 01 146.

3. The NESC requires a minimum distance of 40" between the lowest point on the neutral/secondary bracket and the highest point of the communication hardware. The top of the conduit should be above the neutral. If abnormal clearances on pole require the top of the conduit to be below the neutral or secondary, the NESC requires 40" from the top of the conduit to the communication hardware.

4. See DCS **14 00 01 03** for standoff bracket placement and grounding requirements.

5. Some standoff brackets require that one of the nuts on the double arming bolt be replaced with a jam nut. The jam nut should then be inserted into the 5/8” slot on the standoff bracket. If the nut on the double arming bolt will fit into the 5/8” slot on the bracket - Do Not Use the jam nut.

6. On the front of the 20” standoff bracket, the following conduits may be mounted: (4)-2” conduits, (3)-2-1/2” conduits, (3)-3” conduits, (3)-4” conduits, (2)-5” conduits. Various combinations of conduits may also be mounted.

   On the front of the 12” standoff bracket, the following conduits may be mounted: (2)-2” conduits, (2)-2-1/2” conduits, (1)-3” & (1)-2” conduits, (1)-3” and (1)-2-1/2” conduit, (1)-4” conduit, and (1)-5” conduit.

7. To prevent damage to direct buried cables, install a cable shield (Stock #12 53 017) at the conduit entry and increase the quantity of cable shields shown in the Materials List by “1”.

8. Install a bell end fitting at the top end of the conduit to prevent cable damage.

9. Use DCS **12 00 10 04** for ground coil application on new pole installation.

10. Always connect the metallic shields of the riser cables to the system neutral with at least a #2 stranded copper wire. Be aware that the bare and/or covered 7-strand #10 copperweld ground wire may look like stranded #2 copper wire. Never substitute the copperweld ground wire for the #2 stranded copper wire when constructing the primary neutral buss.

11. More than one single phase riser can be on a pole. Generally, installing three to four single phase risers on a pole will require the use of a crossarm. Refer to DCS **14 12 05 ****** for proper spacing of cutouts.

12. The conduit bend should be completely below grade. Field conditions may make this impractical, and in these case, the top of the bend may be up to 6" above final grade.

REV	DATE	ENG	DESCRIPTION
22	01/01/24	JMW	Converted to new format
21	12/16/15	HLH	

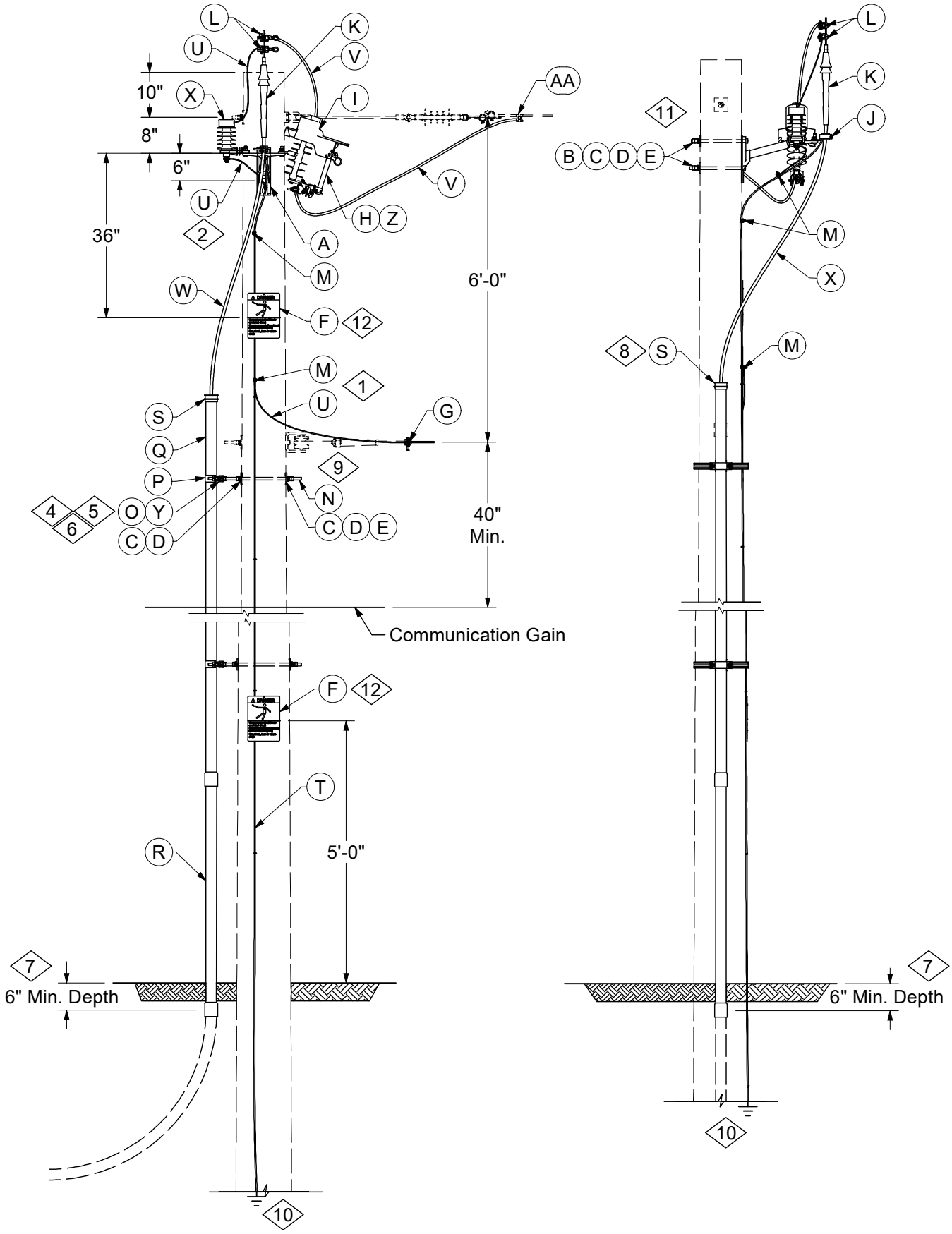
	ITEM	STK / DCS #	DESCRIPTION 14 12 01 **	01	02	03	04
	A	23 56 063	Bracket - Equipment Mount 3 Position	1	1	1	1
	B	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	2	2	2	2
	C	23 66 207	Washer, Curved, Square, 5/8"	8	8	8	8
	D	23 66 134	Lock Washer - 5/8" Double Coil	8	8	8	8
	E	23 65 043	Lock Nut - 5/8" Square	5	5	5	5
	F	54 07 208	Switch, Fused, Open Type	1	1	1	1
	G	23 17 411	Wildlife Guard - Cover Cutout	1	1	1	1
	H	17 55 828	Stirrup - Grounding, 1/2" x 7"	1	1	1	1
	I	**42 34 59 03**	Termination, 15kV, 4/0	-	1	-	1
		42 34 59 01	Termination, 15kV, #2 Al.	1	-	1	-
	J	18 07 238	Cable, 15kV, #2 (ft.)	35	-	35	-
		18 07 239	Cable, 15kV, 4/0 (ft.)	-	35	-	35
9	K	**12 00 10 04**	Grounding Unit	1	1	1	1
	L	23 67 190	Strap - Conduit 2" w/2" Bolts	3	3	-	-
		23 67 182	Strap - Conduit 3" w/2" Bolts	-	-	3	3
	M	12 01 280	Conduit - 2" Schedule 40 (ft.)	20	20	-	-
		12 01 279	Conduit - 3" Schedule 40 (ft.)	-	-	20	20
	N	12 01 275	Conduit - 2" Schedule 80 (ft.)	10	10	-	-
		12 01 276	Conduit - 3" Schedule 80 (ft.)	-	-	10	10
12	O	12 51 180	Conduit - Bend 2", 36" Rad	1	1	-	-
		12 51 173	Conduit - Bend 3", 36" Rad	-	-	1	1
8	P	40 83 491	Conduit - Coupling 2" Bell End	1	1	-	-
		12 51 008	Conduit - Coupling 3", Bell End	-	-	1	1
	Q	23 53 003	Bolt, DA, 5/8" Dia x 18" w/ 4 square nuts	3	3	3	3
	R	23 65 053	Nut - 5/8" Jam	3	3	3	3
	S	17 54 004	Connector - Split Bolt, #4 Sol CU thru #8 Sol CU	3	3	3	3
	T	18 51 025	Wire, Cu., #4 S.D. Covered (ft.)	10	-	10	-
		18 51 024	Wire, Cu., 1/0 S.D. Covered (ft.)	-	10	-	10
	U	18 51 021	Wire, #6 Cu, S.D. Covered (ft.)	2	2	2	2
4,@	V	23 06 086	Bracket - Standoff, 20"	3	3	3	3
		23 06 087	Bracket - Standoff, 12"	3	3	3	3
2,@	W	10 01 129	Arrester, Lightning, 9kV, 7.65kV MCOV	1	1	1	1
		10 01 146	Arrester, Lightning, 10kV, 8.4kV MCOV	1	1	1	1
@	X	**07 00 25 00**	Clamp, Parallel Groove, PG**	1	1	1	1
		07 00 21 00	Clamp, Hot Line, HLC*W	1	1	1	1
@	Y		Fuse Sized By Engineer	1	1	1	1
7,@	Z	12 53 017	Shield, Duct, Cable	1	1	1	1
		279	Op Code, Install Cable Up Pole	1	1	1	1

REV	DATE	ENG	DESCRIPTION
22	01/01/24	JMW	Converted to new format
21	12/16/15	HLH	

CABLE TERMINALS

Single Phase UG to OH Feed
#2 or 4/0 Cable

14 12 02 **
15kV
1 of 3



DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
4	01/01/24	JMW	Converted to new format
3	03/09/16	HLH	

DCS #	DESCRIPTION
14 12 02 01	#2 Cable in 2" Conduit/Duct
14 12 02 02	4/0 Cable in 2" Conduit/Duct
14 12 02 03	#2 Cable in 3" Conduit/Duct
14 12 02 04	4/0 Cable in 3" Conduit/Duct

CONSTRUCTION NOTE(s):

1. Always connect the metallic shields of the riser cables to the system neutral with at least a #2 stranded copper wire. Be aware that the bare and/or covered 7-stranded #10 copperweld ground wire may look like a stranded #2 copper wire. Never substitute the copperweld ground wire for the #2 stranded copper wire when constructing the primary neutral buss.

2. Keep arrester ground lead as short as possible. Aerial tap it to concentrics close to the termination.

3. On 13800 GndY/7970 V terminal poles use 10 kV lightning arrester, Stock #10 01 146.

4. See DCS **14 00 01 03** for standoff bracket placement and grounding requirements.

5. Some standoff brackets require that one of the nuts on the double arming bolt be replaced with a jam nut. The jam nut should then be inserted into the 5/8” slot on the standoff bracket. If the nut on the double arming bolt will fit into the 5/8” slot on the bracket - Do Not Use the jam nut.

6. On the front of the 20” standoff bracket, the following conduits may be mounted: (4)-2” conduits, (3)-2-1/2” conduits, (3)-3” conduits, (3)-4” conduits, (2)-5” conduits. Various combinations of conduits may also be mounted. On the front of the 12” standoff bracket, the following conduits may be mounted: (2)-2” conduits, (2)-2-1/2” conduits, (1)-3” & (1)-2” conduits, (1)-3” and (1)-2-1/2” conduit, and (1)-5” conduit.

7. The conduit bend should be completely below grade. Field conditions may make this impractical, and in these cases, the top of the conduit bend may be up to 6" above final grade.

8. Install a bell end coupling at the top end of the conduit to prevent cable damage.

9. The NESC requires a minimum distance of 40" between the lowest point on the neutral/secondary bracket and the highest point of the communication hardware. The top of the conduit should be above the neutral. If abnormal clearances on pole require the top of the conduit to be below the neutral or secondary, the NESC requires 40" from the top of the conduit to the communication hardware.

10. See DCS **12 00 10 04** for ground coil application on new pole installation. Use DCS **12 00 10 03** for ground rod on an existing pole.

11. See DCS **03 12 01 ****** for single phase deadend configuration.

12. Attach “Danger UG Feeds OH” sign approximately 5’-0" above the ground line, and 3’-0" below the cutout.

REV	DATE	ENG	DESCRIPTION
4	01/01/24	JMW	Converted to new format
3	03/09/16	HLH	

CABLE TERMINALS

Single Phase UG to OH Feed
#2 or 4/0 Cable

14 12 02 **
15kV
3 of 3

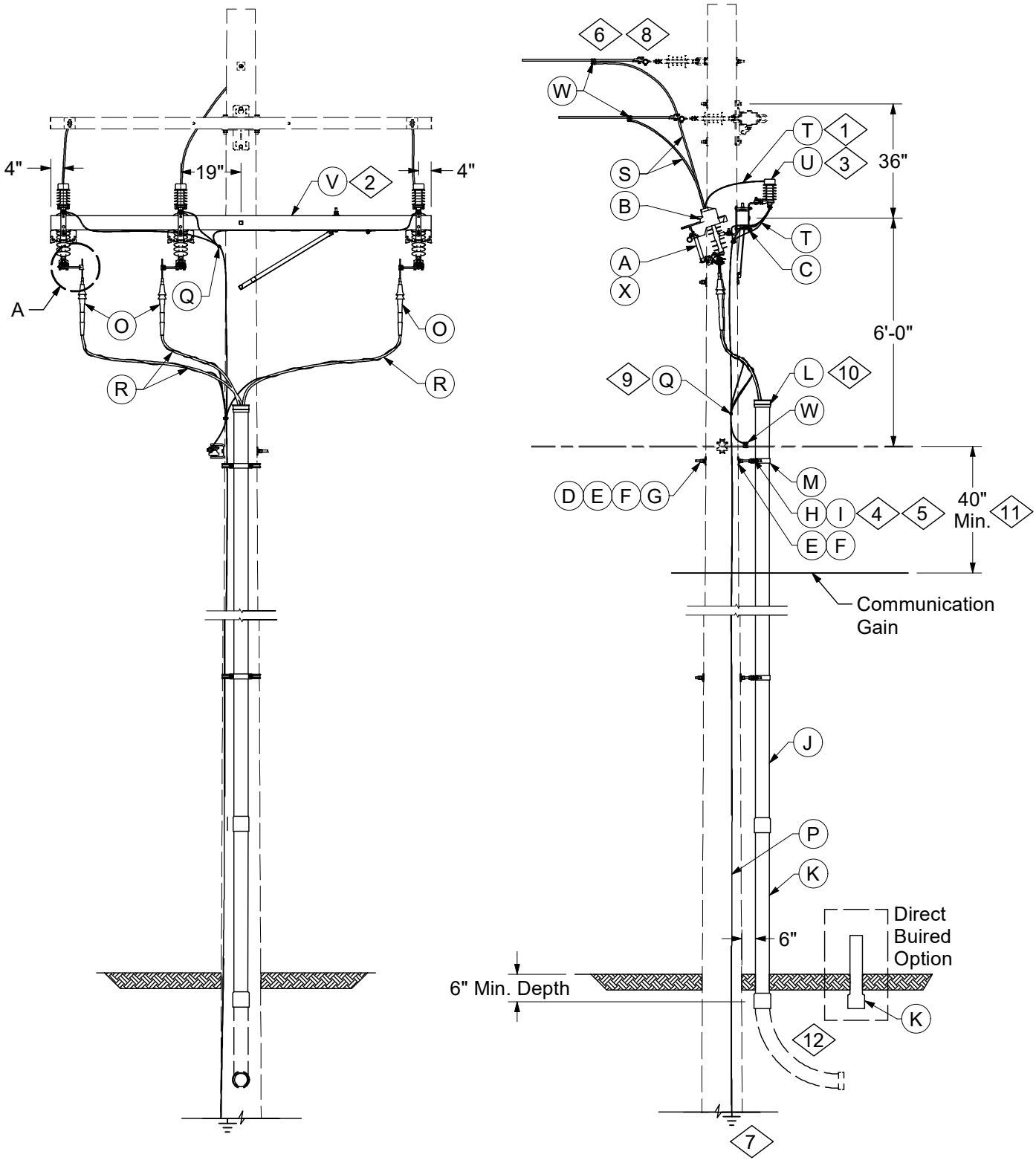
	ITEM	STK / DCS #	DESCRIPTION 14 12 02 **	01	02	03	04
	A	23 56 063	Bracket - Equipment Mount 3 Position	1	1	1	1
	B	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	2	2	2	2
	C	23 66 207	Washer, Curved, Square, 5/8"	8	8	8	8
	D	23 66 134	Lock Washer - 5/8" Double Coil	8	8	8	8
	E	23 65 043	Lock Nut - 5/8" Square	5	5	5	5
	F	16 02 585	Warning Sign - UG circuits feed OH circuits	2	2	2	2
	G	17 51 032	Clamp, Parallel Groove, for 1/0 (7) AAAC Static	2	2	2	2
	H	54 07 208	Switch, Fused, Open Type	1	1	1	1
	I	23 17 411	Wildlife Guard - Cover Cutout	1	1	1	1
	J	23 67 193	Bracket, Cable Positioner	1	1	1	1
	K	**42 34 59 01**	Termination, 15kV, #2	1	-	1	-
		42 34 59 03	Termination, 15kV, 4/0	-	1	-	1
	L	23 78 394	Clamp, Hotline	2	2	2	2
	M	17 54 004	Connector - Split Bolt, #4 Sol CU thru #8 Sol CU	3	3	3	3
5	N	23 53 003	Bolt, DA, 5/8" Dia x 18" w/ 4 square nuts	3	3	3	3
	O	23 65 053	Nut - 5/8" Jam	3	3	3	3
	P	23 67 190	Strap - Conduit 2" w/2" Bolts	3	3	-	-
		23 67 182	Strap - Conduit 3" w/2" Bolts	-	-	3	3
	Q	12 01 280	Conduit - 2" Schedule 40 (ft.)	20	20	-	-
		12 01 279	Conduit - 3" Schedule 40 (ft.)	-	-	20	20
	R	12 01 275	Conduit - 2" Schedule 80 (ft.)	10	10	-	-
		12 01 276	Conduit - 3" Schedule 80 (ft.)	-	-	10	10
1,8	S	40 83 491	Conduit - Coupling 2" Bell End	1	1	-	-
		12 51 008	Conduit - Coupling 3", Bell End	-	-	1	1
	T	**12 00 10 04**	Grounding Unit	1	1	1	1
	U	18 51 021	Wire, #6 Cu., S.D. Covered (ft.)	2	2	2	2
	V	18 51 025	Wire, Cu., #4 S.D. Covered (ft.)	10	-	10	-
		18 51 024	Wire, Cu., 1/0 S.D. Covered (ft.)	-	10	-	10
	W	18 17 238	Cable, 15kV, #2 (ft.)	35	-	35	-
		18 07 239	Cable, 15kV, 4/0 (ft.)	-	35	-	35
3,@	X	10 01 129	Arrester, Lightning, 9kV, 7.65kV MCOV	1	1	1	1
		10 01 146	Arrester, Lightning, 10kV, 8.4kV MCOV	1	1	1	1
4,6,@	Y	23 06 086	Bracket - Standoff, 20"	3	3	3	3
		23 06 087	Bracket - Standoff, 12"	3	3	3	3
@	Z		Fuse Sized By Engineer	1	1	1	1
@	AA	**07 00 25 00**	Clamp, Parallel Groove PG**	1	1	1	1
		07 00 21 00	Clamp, Hot Line, HLC*W	1	1	1	1
@		279	Op Code, Install Cable Up Pole	1	1	1	1

REV	DATE	ENG	DESCRIPTION
4	01/01/24	JMW	Converted to new format
3	03/09/16	HLH	

CABLE TERMINALS

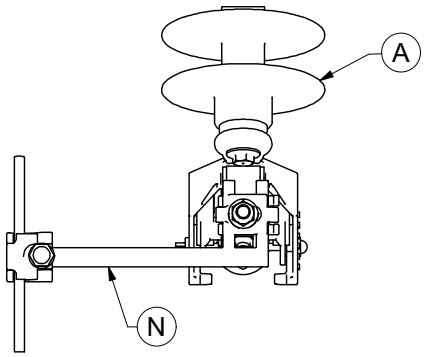
Three Phase Riser
#2 or 4/0 Cable

14 12 05 **
15kV
1 of 3



DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
18	01/01/24	JMW	Converted to new format
17	11/24/15	HLH	



Detail A

DCS #	DESCRIPTION
14 12 05 01	#2 - 3C Cable
14 12 05 03	4/0 - 3C Cable

CONSTRUCTION NOTES:

1. Keep arrester leads as short as possible.
2. 8’ crossarm available, Ameren Mo only.
3. On 13800 Grd/7970 V terminal poles use 10 kV lightning arrester, Stock #10 01 146.
4. If a longer bracket is required, use Stock #23 06 086 (20” long).
5. See DCS **14 00 01 03** for standoff bracket placement and grounding requirements.
6. See DCS **03 12 05 ****, **03 12 06 ****** or **03 12 09 ****** for through pole or deadend configuration.
7. See DCS **12 00 10 04** for ground coil application on new pole installation. Use DCS **12 00 10 03** for ground rod on an existing pole.
8. Underbuild construction requires deadend on pole w/FG extension, for deadend application.
9. Always connect the metallic shields on the riser cables to the system neutral with at least a #2 stranded copper wire. Be aware that the bare and / or covered 7-strand #10 copperweld ground wire may look like stranded #2 copper wire. Never substitute the copperweld ground wire for the #2 stranded copper wire when constructing the primary neutral buss.
10. Install a bell end coupling at the top end of the conduit to prevent cable damage.
11. The NESC requires a minimum distance of 40" between the lowest point on the neutral/secondary bracket and the highest point of the communication hardware. The top of the conduit should be above the neutral. If abnormal clearances on pole require the top of the conduit to be below the neutral or secondary, the NESC requires 40" from the top of the conduit to the communication hardware.
12. The conduit bend should be completely below grade. Field conditions may make this impractical, and in these cases, the top of the bend can be up to 6" above final grade.

REV	DATE	ENG	DESCRIPTION
18	01/01/24	JMW	Converted to new format
17	11/24/15	HLH	

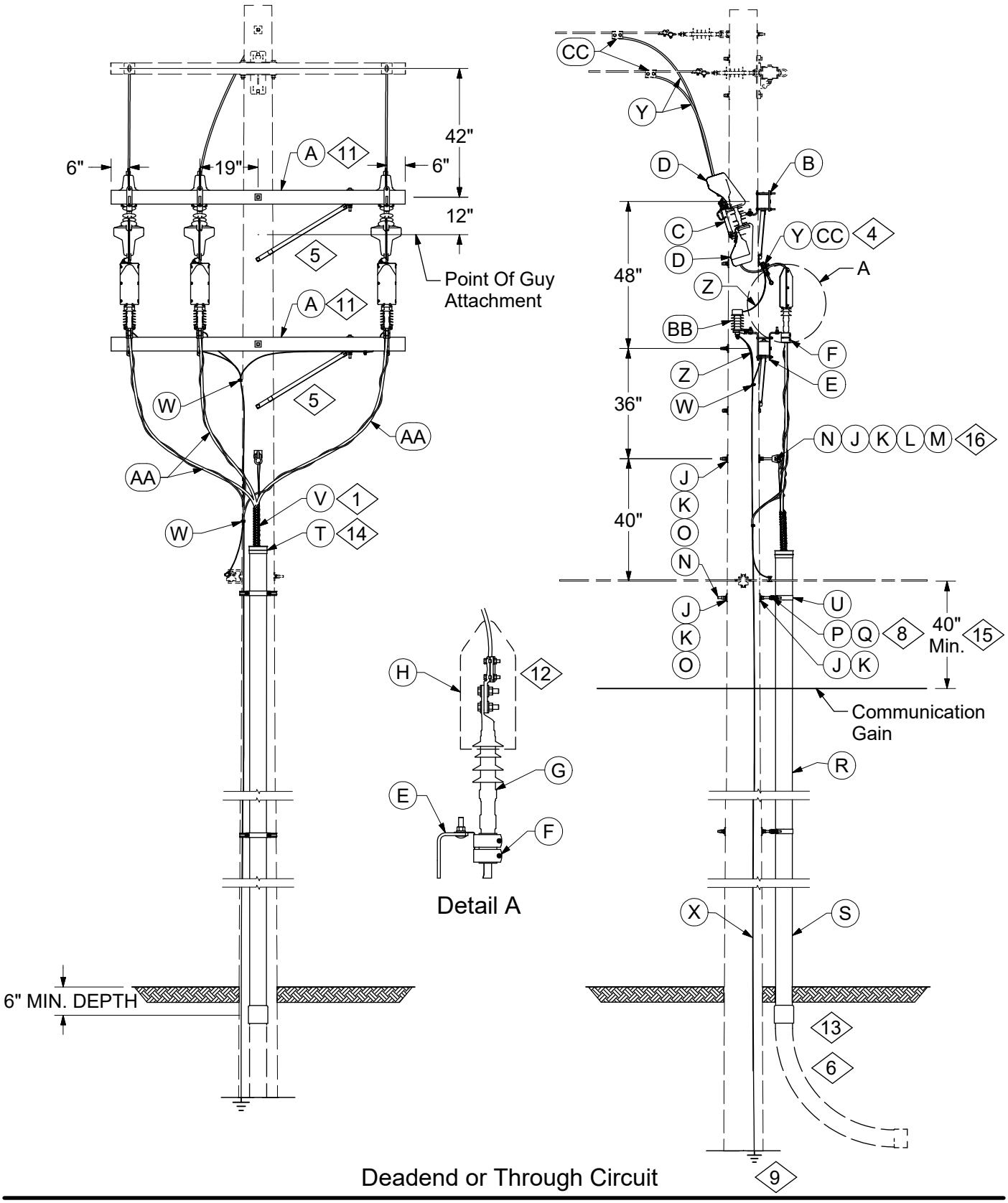
	ITEM	STK / DCS #	DESCRIPTION 14 12 05 **	01	03
	A	54 07 208	Switch, Fused, Open Type	3	3
	B	23 17 411	Wildlife Guard - Cover Cutout	3	3
	C	23 56 088	Bracket - Crossarm Double Sided NEMA	3	3
	D	23 53 003	Bolt, DA, 5/8" Dia x 18" w/ 4 square nuts	3	3
	E	23 66 207	Washer, Curved, Square, 5/8"	6	6
	F	23 66 134	Lock Washer - 5/8" Double Coil	6	6
	G	23 65 043	Lock Nut - 5/8" Square	3	3
4,5	H	23 06 087	Bracket - Standoff, 12"	3	3
	I	23 65 053	Nut - 5/8" Jam	3	3
	J	12 01 278	Conduit - 4" Schedule 40 (ft.)	20	20
	K	12 01 273	Conduit - 4" Schedule 80 (ft.)	10	10
	L	12 51 254	Conduit - Coupling 4" Bell End	1	1
	M	23 67 183	Strap - Conduit 4" w/2" Bolts	3	3
	N	17 55 828	Stirrup - Grounding, 1/2" x 7"	3	3
	O	**42 34 59 01**	Termination, 15kV, #2	3	-
		42 34 59 03	Termination, 15kV, 4/0	-	3
8	P	**12 00 10 04**	Grounding Unit	1	1
	Q	17 54 004	Connector - Split Bolt, #4 Sol CU thru #8 Sol CU	3	3
	R	18 07 237	Cable, 15 kV, #2−3C Al. (ft.)	35	-
		18 07 240	Cable, 15 kV, 4/0−3C Al. (ft.)	-	35
	S	18 51 025	Wire, Cu. , #4 S.D. Covered (ft.)	15	-
		18 51 024	Wire, Cu. , 1/0 S.D. Covered (ft.)	-	15
	T	18 51 021	Wire, #6 Cu. S.D. Covered (ft.)	20	20
3,@	U	10 01 129	Arrester, Lightning, 9kV, 7.65kV MCOV	3	3
		10 01 146	Arrester, Lightning, 10kV, 8.4kV MCOV	3	3
	V	**04 00 20 02**	Crossarm, Sgl, Wood, 8' on (Use only 1/2 of V-brace)	1	1
2,9,@		**04 00 20 03**	Crossarm, Sgl, Wood, 10' on (Use only 1/2 of V-brace)	1	1
		04 00 20 14	Crossarm - Tangent, F/G 8'	1	1
		04 00 20 16	Crossarm - Tangent, F/G 10'	1	1
@	W	**07 00 21 00**	Clamp, Hot Line, HLC*W	#	#
		07 00 25 00	Clamp, Parallel Groove, PG**	#	#
@	X		Fuse Sized By Engineer	3	3
		279	Op Code, Install Cable Up Pole	1	1

REV	DATE	ENG	DESCRIPTION
18	01/01/24	JMW	Converted to new format
17	11/24/15	HLH	

CABLE TERMINALS

Three Phase Riser
350-750 kcmil Cable w/ Vertical Switches

14 12 14 **
15kV
1 of 3



Deadend or Through Circuit

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
15	01/01/24	JMW	Converted to new format
14	11/03/16	WYW	

DCS #	DECSRIPTION
14 12 14 01	750 AL on 8' Crossarm
14 12 14 02	750 AL on 10' Crossarm
14 12 14 03	500 AL on 8' Crossarm
14 12 14 04	500 AL on 10' Crossarm
14 12 14 05	350 CU on 8' Crossarm
14 12 14 06	350 CU on 10' Crossarm
14 12 14 07	750 CU on 8' Crossarm
14 12 14 08	750 CU on 10' Crossarm

CONSTRUCTION NOTE(s):

1. Wrap cable with friction tape prior to installation of cable grip.
2. When guy is required, use 45” fiberglass strain insulator and select links to obtain maximum clearance.
3. For alternate construction call for split conduit with steel guard.
4. Strip 4" section of wire above terminator cover. This bare section will be used for the arrester connection or the ground set connection when grounding cable. Keep arrester leads as short as possible.
5. Use only one V brace on each crossarm.
6. Bend normally included in conduit instructions.
7. On 13800 Grd/7970 V terminal poles use 10 kV lightning arrester.
8. See DCS **14 00 01 03** for standoff Bracket placement and grounding requirements.
9. Use DCS **12 00 10 04** for ground coil application on new pole installation. Use DCS **12 00 10 03** for ground rod on existing pole.
10. See DCS Section 03 for through pole or deadend configuration.
11. Use 8’ arm with DCS **14 12 14 01** where easement or horizontal clearances are concern.
12. Omit grounding stud and use regular hardware, place cover over connectors.
13. The conduit bend should be completely below grade. Field conditions may make this impractical, and in these cases, the top of the bend may be up to 6" above final grade.
14. Install bell end coupling at top of conduit to prevent cable damage.
15. The NESC requires a minimum distance of 40" between the lowest point on the neutral/secondary bracket and the highest point of the communication hardware. The top of the conduit should be above the neutral. If abnormal clearances on pole require the top of the conduit to be below the neutral or secondary, the NESC requires 40" from the top of the conduit to the communication hardware.
16. Items J,K,L,N and M may be omitted if insufficient vertical distance, such as when cable terminal is added to an existing pole.

REV	DATE	ENG	DESCRIPTION
15	01/01/24	JMW	Converted to new format
14	11/03/16	WYW	

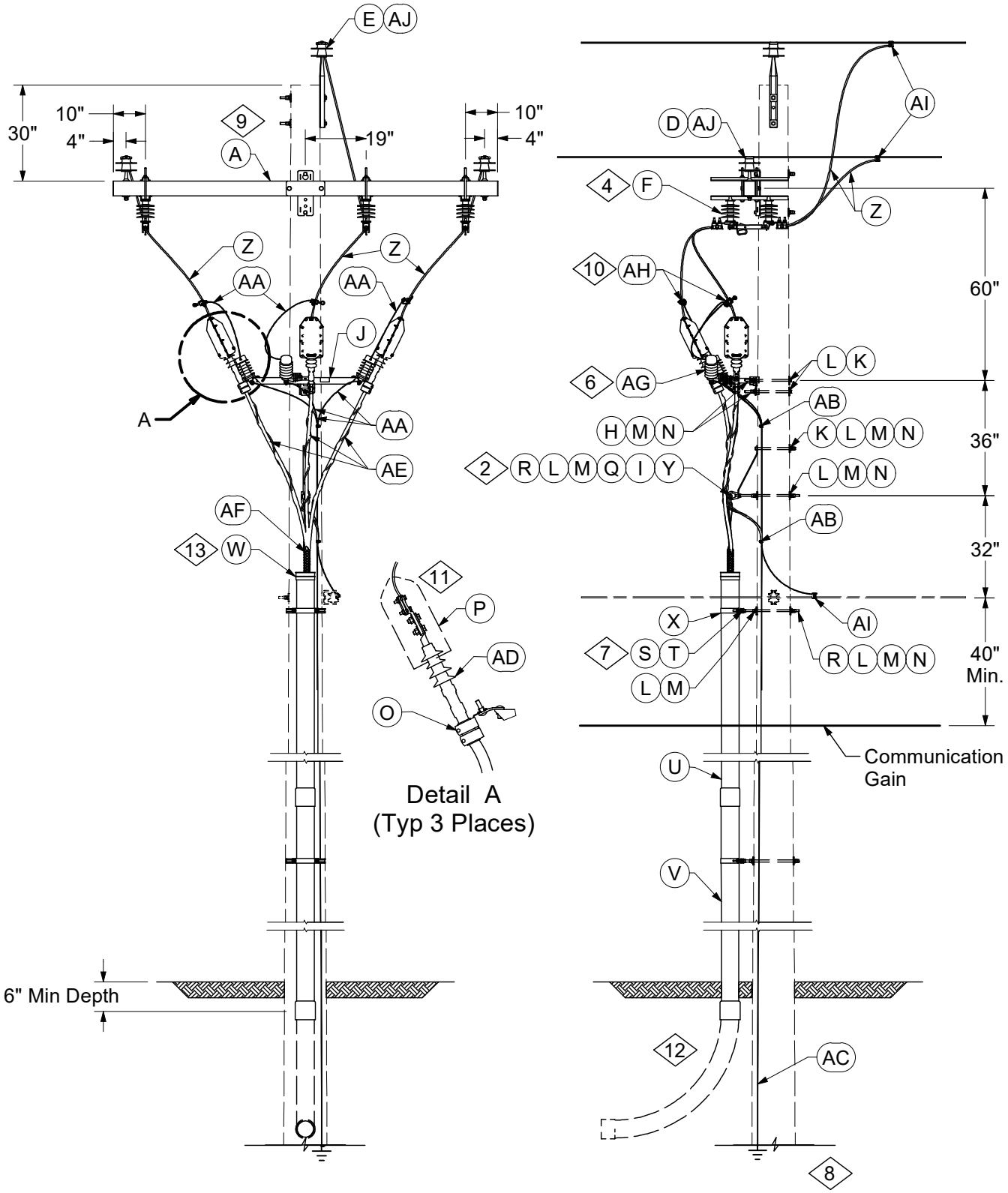
CABLE TERMINALS

Three Phase Riser

350-750 kcmil Cable w/ Vertical Switches

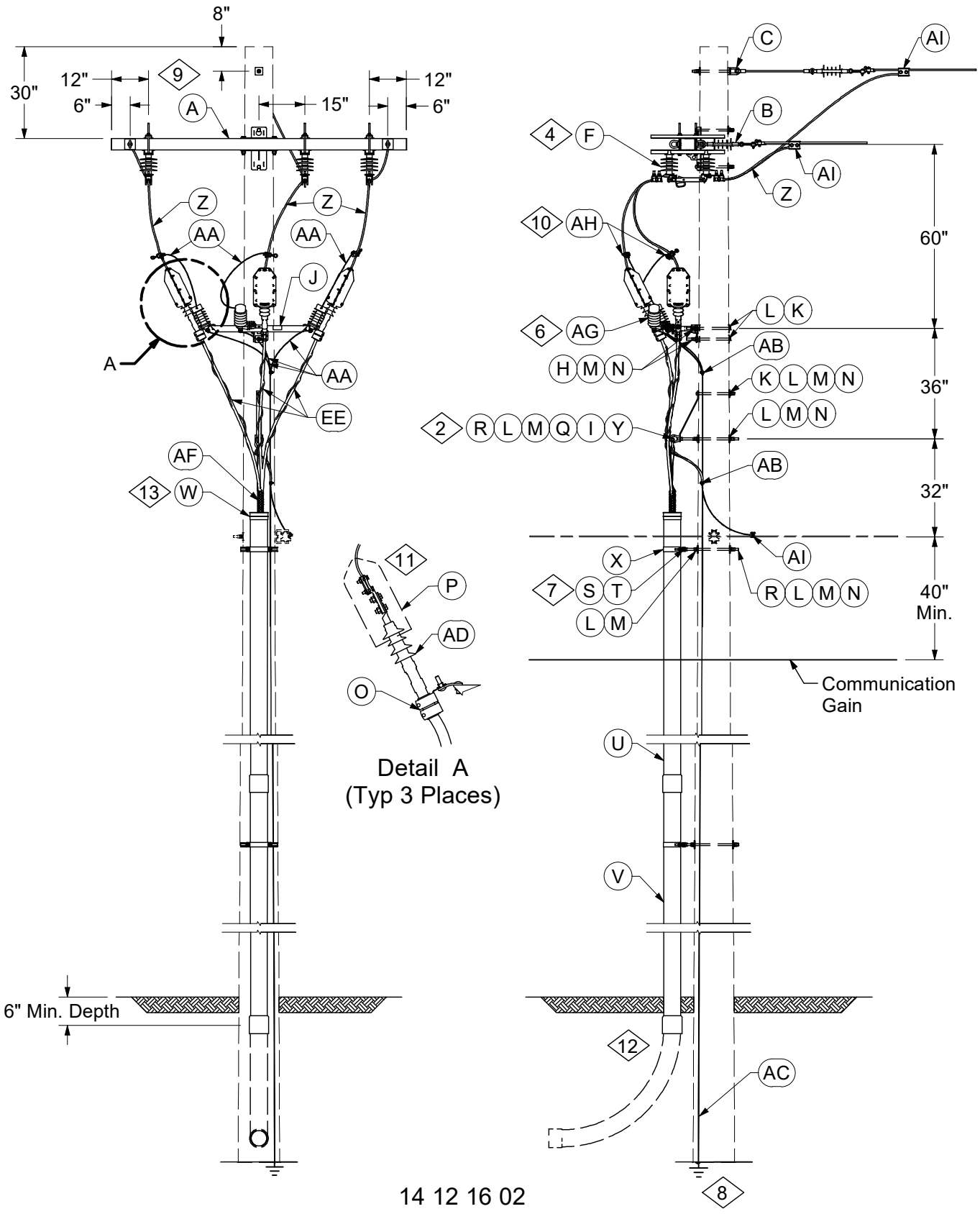
14 12 14 **
15kV
3 of 3

	ITEM	STK / DCS #	DESCRIPTION 14 12 14 **	01	02	03	04	05	06	07	08
5,11	A	**04 00 20 02**	Crossarm, 8' w/60" V Brace	2	-	2	-	2	-	2	-
		04 00 20 03	Crossarm, 10' w/60" V Brace	-	2	-	2	-	2	-	2
	B	17 58 054	Bracket, Arrester/Cutout Mounting	3	3	3	3	3	3	3	3
	C	54 07 296	Switch - Disconnect 15kV 600 Amp	3	3	3	3	3	3	3	3
	D	23 17 512	Wildlife Guard - Vertical Switch 600 Amp	6	6	6	6	6	6	6	6
	E	23 56 088	Bracket, Crossarm, Double Sided NEMA	3	3	3	3	3	3	3	3
	F	23 67 197	Bracket - Cable Support	3	3	3	3	3	3	3	3
12	G	**42 34 61 04**	Termination, 15kV, 750 kcmil AL	3	3	-	-	-	-	-	-
		42 34 61 10	Termination, 15kV, 500 kcmil AL	-	-	3	3	-	-	-	-
		42 34 61 06	Termination, 15kV, 350 kcmil Cu	-	-	-	-	3	3	-	-
		42 34 61 02	Termination, 15kV, 750 kcmil Cu	-	-	-	-	-	-	3	3
	H	23 17 257	Wildlife Guard - Extension Arm 35kV Pin Insulator	3	3	3	3	3	3	3	3
	I	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	1	1	1	1	1	1	1	1
	J	23 66 207	Washer, Curved, Square, 5/8"	8	8	8	8	8	8	8	8
	K	23 66 134	Lock Washer - 5/8" Double Coil	7	7	7	7	7	7	7	7
	L	23 65 012	Eyenut, 5/8"	1	1	1	1	1	1	1	1
	M	23 68 181	Shackle - Deadend	1	1	1	1	1	1	1	1
	N	23 53 003	Bolt, DA, 5/8" Dia x 18" w/ 4 square nuts	4	4	4	4	4	4	4	4
	O	23 65 043	Lock Nut - 5/8" Square	3	3	3	3	3	3	3	3
	P	23 65 053	Nut - 5/8" Jam	3	3	3	3	3	3	3	3
8	Q	23 06 087	Bracket - Standoff, 12"	3	3	3	3	3	3	3	3
	R	12 01 303	Conduit - 5" Schedule 40 (ft.)	20	20	20	20	20	20	20	20
	S	12 01 272	Conduit - 5" Schedule 80 (ft.)	10	10	10	10	10	10	10	10
14	T	12 51 233	Coupling, Bell End, 5”	1	1	1	1	1	1	1	1
	U	23 67 184	Strap - Conduit 5" w/2" Bolts	3	3	3	3	3	3	3	3
	V	23 17 245	Grip - Cable 2"-2.5" Dia., Split	1	1	1	1	1	1	1	1
	W	17 54 004	Connector - Split Bolt, #4 Sol CU thru #8 Sol CU	3	3	3	3	3	3	3	3
9	X	**12 00 10 04**	Grounding Unit	1	1	1	1	1	1	1	1
	Y	18 51 052	Wire, Cu. 350 S.D., Covered	35	35	35	35	35	35	35	35
	Z	18 51 021	Wire, #6 Cu., S.D., Covered	18	18	18	18	18	18	18	18
	AA	18 07 243	Cable, 750 kcmil AL	35	35	-	-	-	-	-	-
		17 07 410	Cable, 500 kcmil AL	-	-	35	35	-	-	-	-
		18 07 245	Cable, 350 kcmil Cu.	-	-	-	-	35	35	-	-
		18 07 244	Cable, 750 kcmil Cu.	-	-	-	-	-	-	35	35
7,@	BB	10 01 129	Arrester, Lightning, 9kV, 7.65kV MCOV	3	3	3	3	3	3	3	3
		10 01 146	Arrester, Lightning, 10kV, 8.4kV MCOV	3	3	3	3	3	3	3	3
@	CC	**07 00 21 00**	Clamp, Hot Line, HLC*W	5	5	5	5	5	5	5	5
		07 00 25 00	Clamp, Parallel Groove, PG**	5	5	5	5	5	5	5	5
		279	Op Code, Install Cable Up Pole	1	1	1	1	1	1	1	1



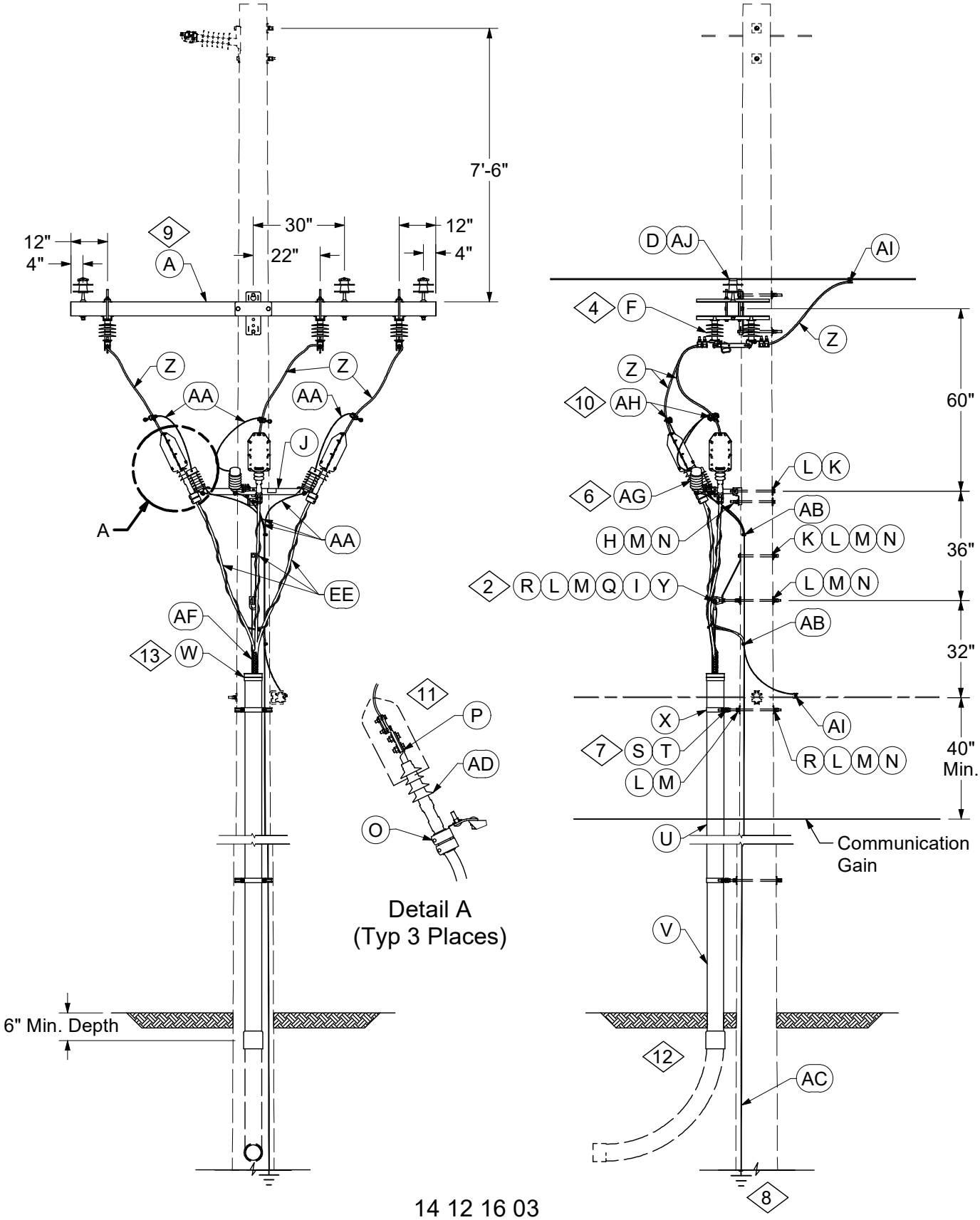
14 12 16 01
Thru Circuit w/ Pole Top Insulator
and w/o Underbuild

REV	DATE	ENG	DESCRIPTION
15	01/01/24	JMW	Converted to new format
14	01/04/16	HLH	



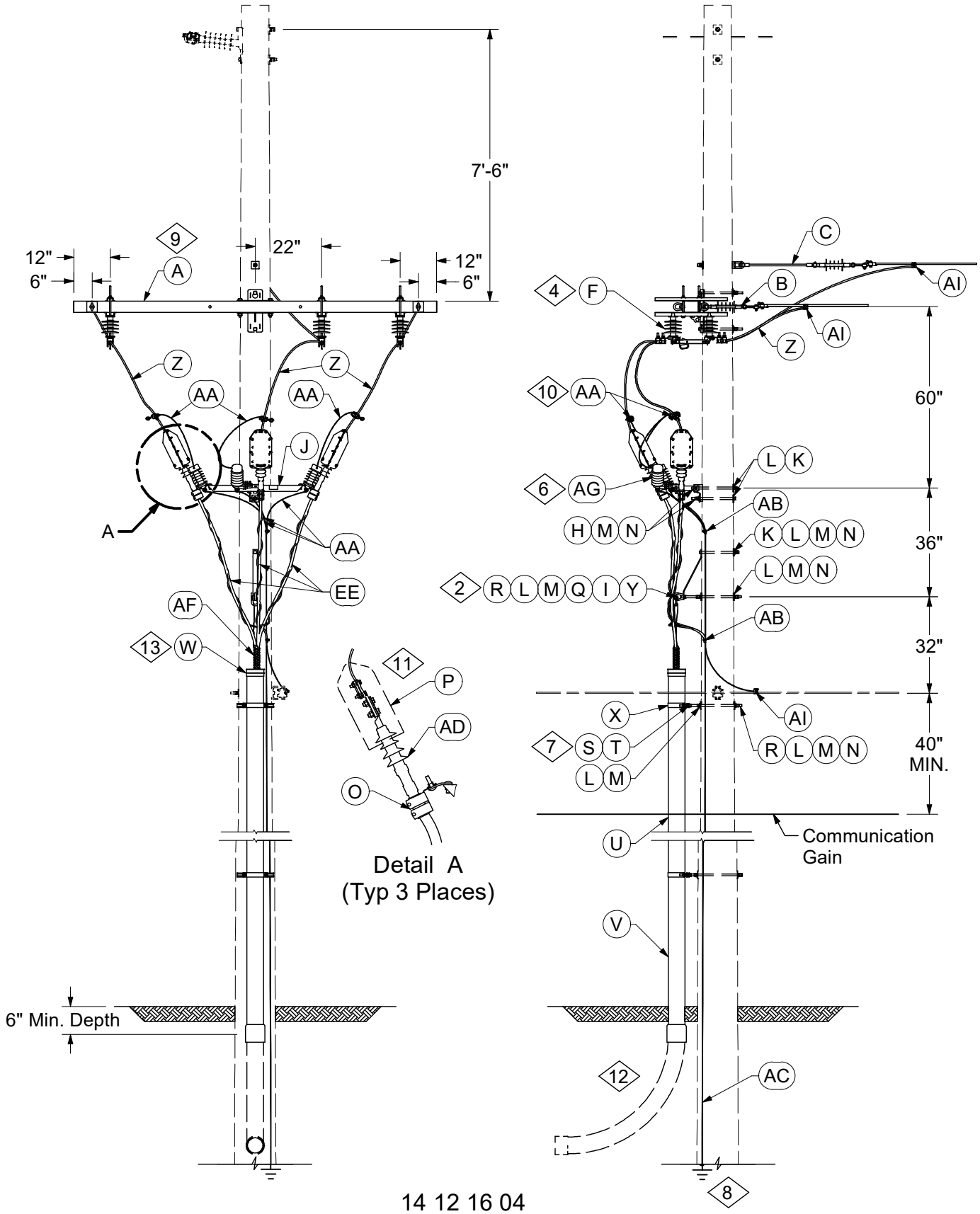
14 12 16 02
Deadend on Pole and Arm
w/o Underbuild

REV	DATE	ENG	DESCRIPTION
15	01/01/24	JMW	Converted to new format
14	01/04/16	HLH	



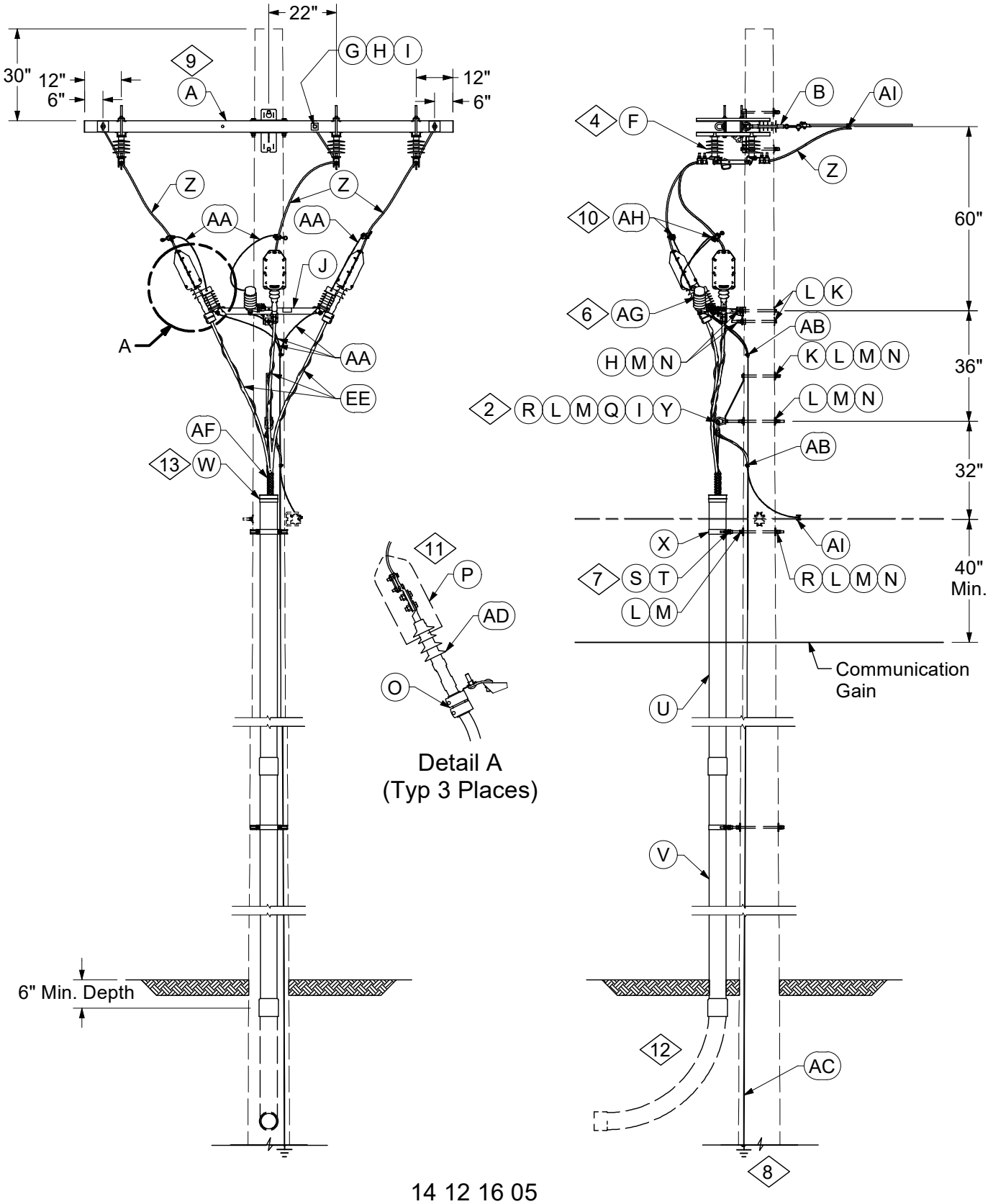
14 12 16 03
Thru Circuit as Underbuild

REV	DATE	ENG	DESCRIPTION
15	01/01/24	JMW	Converted to new format
14	01/04/16	HLH	



14 12 16 04
Deadend on Pole and Arm as Underbuild

REV	DATE	ENG	DESCRIPTION
15	01/01/24	JMW	Converted to new format
14	01/04/16	HLH	



14 12 16 05

Deadend on Arm w/o Underbuild

DCS #	DESCRIPTION
14 12 16 01	Thru Circuit w/ Pole Top Insulator and w/O Underbuild
14 12 16 02	Deadend on Pole and Arm w/O Underbuild
14 12 16 03	Thru Circuit as Underbuild
14 12 16 04	Deadend on Pole and Arm as Underbuild
14 12 16 05	Deadend on Arm w/O Underbuild

CONSTRUCTION NOTE(s):

1. Wrap cable with friction tape prior to installation of cable grip.

2. Items I,L,M,N,Q,R and Y may be omitted if insufficient vertical distance, such as when cable terminal is added to an existing pole.

3. When guy is required, use 45” fiberglass strain insulator and select links to obtain maximum clearance. If clearance cannot be met, use crossarm in place of termination bracket and move center phase out on arm, or use DCS **14 12 16 ****.

4. Switch blades should open away from the terminators.

5. Keep arrester primary and ground leads as short as possible.

6. On 13800 Grd/7970 V terminal poles use 10 kV lightning arrester .

7. See DCS **14 00 01 03** for standoff bracket placement and grounding requirements. Do not ground terminator bracket.

8. Use DCS **12 00 10 04** for ground coil application on new pole installation. Use DCS **12 00 10 03** for ground rod on an existing pole.

9. 8’ FG crossarm may be substituted as needed in MO only.

10. Strip 4" section of wire above terminator cover. This bare section will be used for the arrester connection or the ground set connection when grounding cables. Keep arrester leads as short as possible.

11. Omit grounding stud and use regular hardware, place cover over connectors.

12. The conduit bend should be completely below grade. Field conditions may make this impractical, and in theses cases, the top of the bend may be up to 6" above final grade.

13. Install bell end coupling at top end of conduit to prevent cable damage.

	ITEM	STK / DCS #	DESCRIPTION 14 12 16 **	01	02	03	04	05
	A	**04 00 41 16**	Crossarm FG 10' Tangent	1		1	-	-
9		**04 00 42 02**	Crossarm FG 8' D.E.	-	1	-	-	-
		04 00 42 03	Crossarm FG 10' D.E.	-	-	-	1	1
	B	**06 12 35 01** @	Deadend On Arm	-	2	-	2	3
	C	**06 12 30 01** @	Deadend On Pole	-	1	-	1	-
	D	**06 12 01 01**	Pin & Ins. On Arm	2	-	3	-	-
	E	**06 12 01 02**	Pin & Ins. On Pole	1	-	-	-	-
	F	54 07 204	Switch, Disc. 600A., 15 kV	3	3	3	3	3
	G	23 52 318	Bolt, Mach., 5/8" x 6" w/ square nut	-	-	-	-	1
	H	23 66 027	Washer, Flat, Square 5/8"	2	2	2	2	4
	I	23 65 012	Eyenut, 5/8"	1	1	1	1	2
16	J	17 08 057	Bracket, Mounting, Terminator	1	1	1	1	1
	K	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	2	2	2	2	2
	L	23 66 207	Washer, Curved, Square, 5/8"	10	10	10	10	10
	M	23 66 134	Lock Washer - 5/8" Double Coil	10	10	10	10	10
	N	23 65 043	Lock Nut - 5/8" Square	6	6	6	6	6
	O	23 67 197	Bracket - Cable Support	3	3	3	3	3
	P	23 17 417	Guard - Wildlife, Cover, Termination, #1 to 750 kcmil	3	3	3	3	3
	Q	23 68 330	Link, Guy	1	1	1	1	1
	R	23 53 003	Bolt, DA, 5/8" Dia x 18" w/ 4 square nuts	3	3	3	3	3
	S	23 06 087	Bracket - Standoff, 12"	3	3	3	3	3
	T	23 65 053	Nut - 5/8" Jam	3	3	3	3	3
	U	12 01 303	Conduit - 5" Schedule 40 (ft.)	20	20	20	20	20
	V	12 01 272	Conduit - 5" Schedule 80 (ft.)	10	10	10	10	10
	W	12 51 233	Coupling, Bell End, 5”	1	1	1	1	1
	X	23 67 184	Strap - Conduit 5" w/2" Bolts	3	3	3	3	3
	Y	23 68 181	Shackle - Deadend	1	1	1	1	1
	Z	18 51 052	Wire, Cu. 350 S.D., Covered	25	25	25	25	25
	AA	18 51 021	Wire, #6 Cu., S.D. Covered	25	25	25	25	25
	AB	17 54 004	Connector - Split Bolt, #4 Sol CU thru #8 Sol CU	2	2	2	2	2
8	AC	**12 00 10 04**	Grounding Unit	1	1	1	1	1
	AD	**42 34 61 02**	Termination, 15 kV, 750 kcmil Cu. CN	3	3	3	3	3
11,@		**42 34 61 04**	Termination, 15 kV, 750 kcmil Al. CN	3	3	3	3	3
		42 34 61 06	Termination, 15 kV, 350 kcmil Cu. CN	3	3	3	3	3
		42 34 61 10	Termination, 15 kV, 500 kcmil Al. CN	3	3	3	3	3
	AE	18 07 243	Cable - 750 kcmil Al. CN (ft.)	35	35	35	35	35
@		18 07 410	Cable - 500 kcmil Al. CN (ft.)	35	35	35	35	35
		18 07 245	Cable - 350 kcmil Cu. CN (ft.)	35	35	35	35	35
		18 07 244	Cable - 750 kcmil Cu. CN (ft.)	35	35	35	35	35
	AF	23 17 245	Grip, Cable Riser, 2"-2.5" OD	1	1	1	1	1
@		23 17 254	Grip, Cable Riser, 2.5"-3.0" OD	1	1	1	1	1
		23 17 220	Grip, Cable Riser, 3.0"-3.5" OD	1	1	1	1	1
		23 17 246	Grip, Cable Riser, 3.5"-4.0" OD	1	1	1	1	1
	AG	10 01 129	Arrester, Lightning, 9kV, 7.65 MCOV	3	3	3	3	3
6,@		10 01 146	Arrester, Lightning, 10kV, 8.4kV MCOV	3	3	3	3	3

REV	DATE	ENG	DESCRIPTION
15	01/01/24	JMW	Converted to new format
14	01/04/16	HLH	

	ITEM	STK / DCS #	DESCRIPTION 14 12 16 **	01	02	03	04	05
@	AH	23 78 394	Clamp, Hotline, #6 to 2/0	3	3	3	3	3
		23 78 183	Clamp, Hot Line, #6 to 4/0	3	3	3	3	3
@	AI	**07 00 25 00**	Clamp, Parallel Groove, PG**	5	5	5	5	5
@	AJ	**07 00 41 00**	Top Tie	3	-	3	-	-
		279	Op Code, Install Cable Up Pole	1	1	1	1	1

DESIGN NOTE(s):

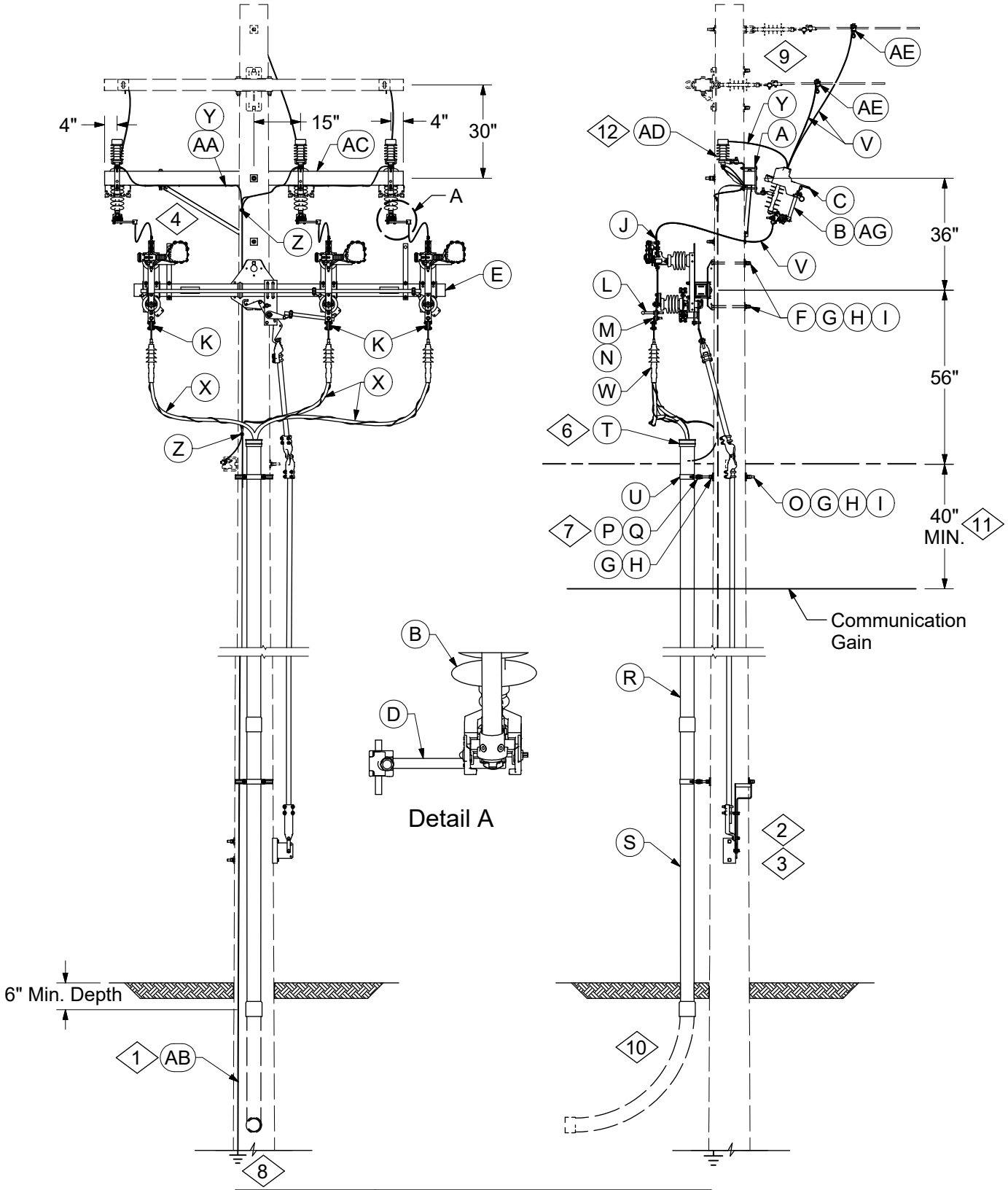
15. Limit deadend tension to 2000 lbs. per position on deadend.

16. If the cable riser is on a deadend pole, the down guy may be too close to the center phase terminator on the terminator bracket. If so, omit the terminator bracket and mount the terminators and arresters on a fiberglass crossarm as shown in DCS **14 12 14 **.**

CABLE TERMINALS

Three Phase Riser with Group Operated Switch
#2 or 4/0 Cable

14 12 17 **
15kV
1 of 3



DCS #	Description
14 12 17 01	#2 Cable Deaded or Through Cricuit
14 12 17 02	4/0 Cable Deaded or Through Cricuit

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
12	01/01/24	JMW	Converted to new format
11	01/04/16	HLH	

CONSTRUCTION NOTE(s):

1. Locate ground opposite operating rod. Do not install pole ground where it would bypass the operating rod insulator.
2. Locate lever assembly half way between switch and operation handle or a little above halfway point.
3. Connect ground to switch handle mounting. See DCS **12 69 11 **.**
4. Use only one V brace.
5. Always connect the metallic shields on the riser cables to the system neutral with at least a #2 stranded copper wire. Be aware that the bare and / or covered 7-strand #10 copperweld ground wire may look like stranded #2 copper wire. Never substitute the copperweld ground wire for the #2 stranded copper wire when constructing the primary neutral buss.
6. Install bell end coupling at top end of conduit to prevent cable damage. Conduit must be above neutral clevis or secondary bracket.
7. See DCS **14 00 01 03** for standoff bracket placement and grounding requirements.
8. Use DCS **12 00 10 04** for ground coil application on new pole installation.
   Use DCS **12 00 10 03** for ground rod on an existing pole.
9. See DCS **03 12 05 **** for through pole or deadend configuration.
10. The conduit bend should be completely below grade. Field conditions may make this impractical, and in these cases, the top of the bend may be up to 6" above final grade.
11. The NESC requires a minimum distance of 40" between the lowest point on the neutral/secondary bracket and the highest point of the communication hardware. The top of the conduit should be above the neutral. If abnormal clearances on pole require the top of the conduit to be below the neutral or secondary, the NESC requires 40" from the top of the conduit to the communication hardware.
12. On 13800 Gnd/7970 V terminal poles, use 10kV lightning arrester.

ITEM	STK / DCS #	DESCRIPTION 14 12 17 **	01	02
A	23 56 088	Bracket, Crossarm, Double Sided NEMA	3	3
B	54 07 208	Switch, Fused, Open Type	3	-
	54 07 209	Switch, Fused, 200A, 15kV	-	3
C	23 17 411	Wildlife Guard - Cover Cutout	3	3
D	17 55 828	Stirrup - Grounding, 1/2" x 7"	3	3
E	54 07 239	Switch - 15kV, Group Operated	1	1
F	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	2	2
G	23 66 207	Washer, Curved, Square, 5/8"	8	8
H	23 66 134	Lock Washer - 5/8" Double Coil	8	8
I	23 65 043	Lock Nut - 5/8" Square	5	5
J	17 05 215	Lug - Compression #2 AWG 600V	3	-
	17 05 194	Lug, Comp. Cu 4/0	-	3
K	17 54 177	Connector, Cable to Flat, Bronze, 1/0-500 kcmil	3	3
L	23 64 051	Stud - Grounding, 7" Long Ball End	3	3
M	21 53 046	Bolt, 1/2" X 2.375", CU SI ALLOY, HEX	9	9
N	12 56 053	Washer, Flat, 1/2", SS	24	24
O	23 53 003	Bolt, DA, 5/8" Dia x 18" w/ 4 square nuts	3	3

REV	DATE	ENG	DESCRIPTION
12	01/01/24	JMW	Converted to new format
11	01/04/16	HLH	

	ITEM	STK / DCS #	DESCRIPTION 14 12 17 **	01	02
	P	23 65 053	Nut - 5/8" Jam	3	3
7	Q	23 06 087	Bracket - Standoff, 12"	3	3
	R	12 01 278	Conduit - 4" Schedule 40 (ft.)	20	20
	S	12 01 273	Conduit - 4" Schedule 80 (ft.)	10	10
6	T	12 51 254	Conduit - Coupling 4" Bell End	1	1
	U	23 67 183	Strap - Conduit 4" w/2" Bolts	3	3
	V	18 51 025	Wire, Cu., #4 S.D. Covered (ft.)	40	-
		18 51 024	Wire, Cu., 1/0 S.D. Covered (ft.)	-	40
	W	**42 34 59 01**	Termination, 15kV, #2	3	-
		42 34 59 03	Termination, 15kV, 4/0	-	3
	X	18 07 238	Cable, 15kV, #2-1 C Al. (ft.)	105	-
		18 07 237	Cable, 15kV, #2-3 C Al. (ft.)	35	-
		18 07 239	Cable, 15kV, 4/0-1 C Al. (ft.)	-	105
		18 07 240	Cable, 15kV, 4/0-3 C Al. (ft.)	-	35
	Y	18 51 021	Wire, #6 Cu S.D. Covered (ft.)	12	12
	Z	17 54 004	Connector - Split Bolt, #4 Sol CU thru #8 Sol CU	2	2
	AA	23 64 001	Staple 3/8" x 2"	6	6
8	AB	**12 00 10 04**	Grounding Unit	1	1
4,@	AC	**04 00 20 02**	Crossarm, Sgl, Wood, 8' (1/2 of V-Brace)	1	1
		04 00 20 03	Crossarm, Sgl, Wood, 10' (1/2 of V-Brace)	1	1
12,@	AD	10 01 129	Arrester, Lightning, 9kV, 7.65 MCOV	3	3
		10 01 146	Arrester, Lightning, 10kV, 8.4kV MCOV	3	3
@	AE	**07 00 21 00**	Clamp, Hot Line, HLC*W	3	3
@	AF	**07 00 25 00**	Clamp, Parallel Groove, PG**	3	3
@	AG		Fuse Sized By Engineer	1	1
		279	Op Code, Install Cable Up Pole	1	1

DESIGN NOTE(s):

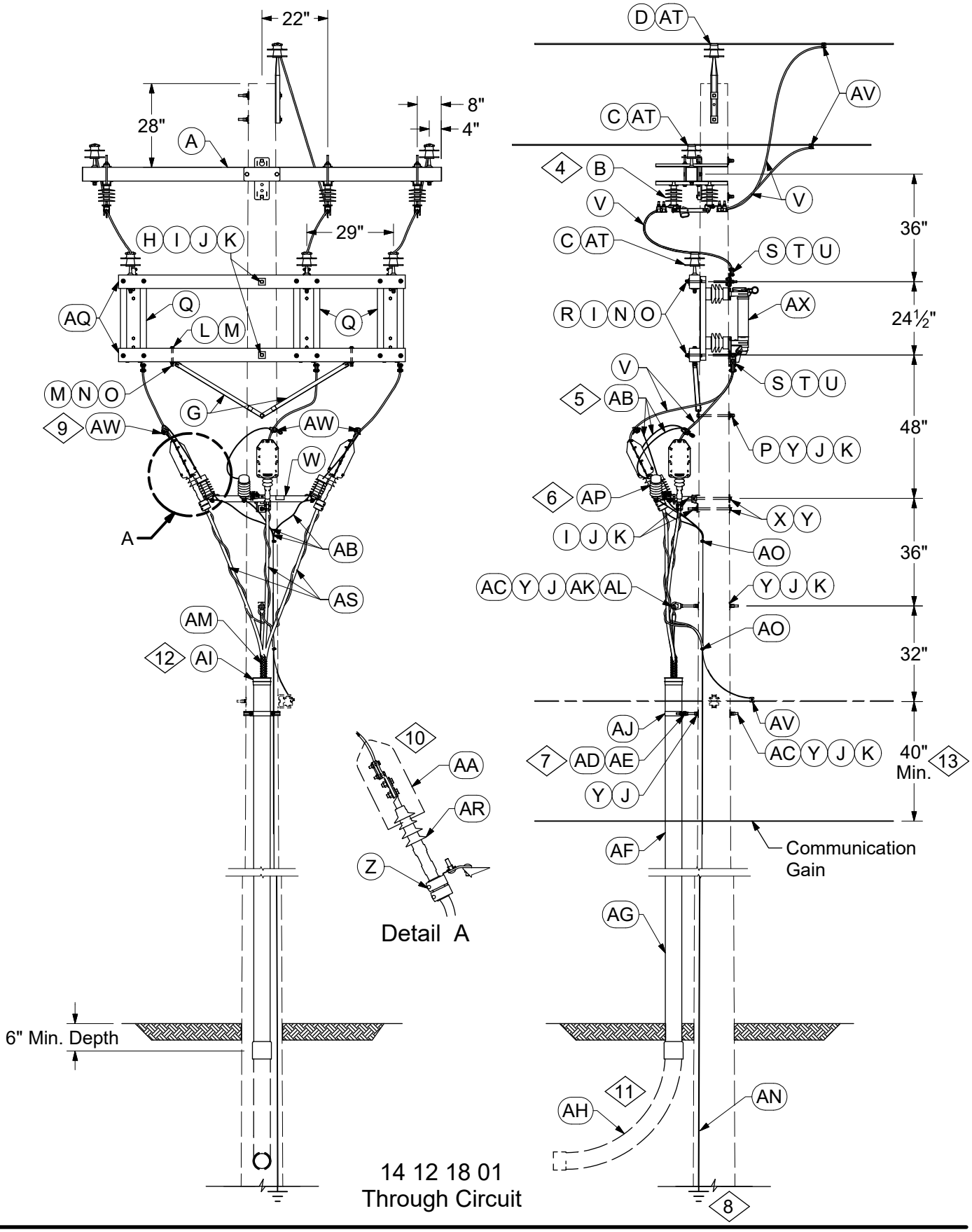
13. This DCS is to be used to mitigate ferroresonance conditions. See Engineering for questions or concerns.

REV	DATE	ENG	DESCRIPTION
12	01/01/24	JMW	Converted to new format
11	01/04/16	HLH	

CABLE TERMINALS

Three Phase Riser
With SM-5 Fuses

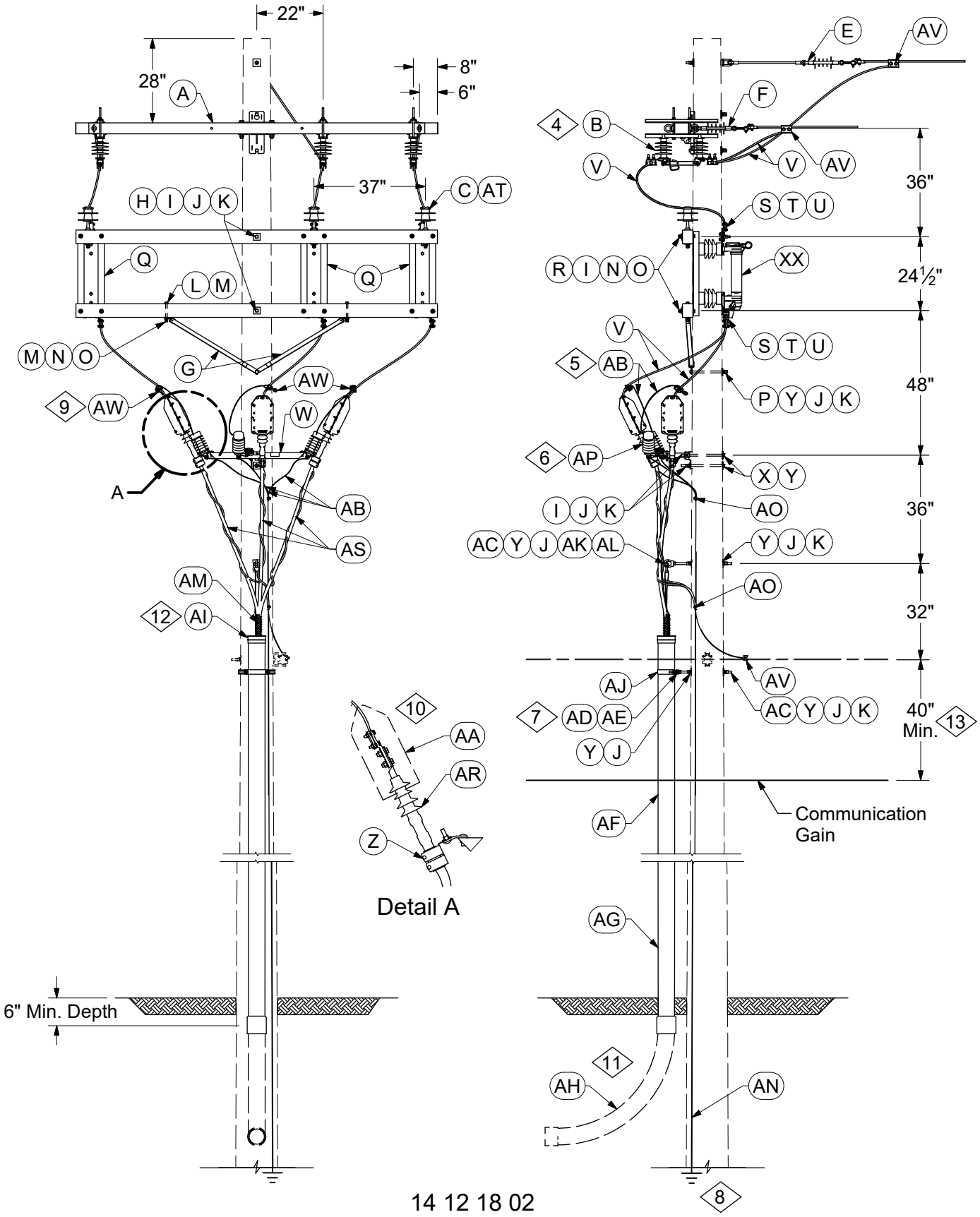
14 12 18 **
15kV
1 of 4



14 12 18 01
Through Circuit

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
2	01/01/24	JMW	Converted to new format
1	12/11/15	HLH	



14 12 18 02
Deadend Circuit

REV	DATE	ENG	DESCRIPTION
2	01/01/24	JMW	Converted to new format
1	12/11/15	HLH	

CONSTRUCTION NOTE(s):

1. Wrap cable with friction tapes prior to installation.
2. When guy is required, use 45" fiberglass strain insulator and select links to obtain maximum clearance.
3. For alternate construction call for split conduit with steel guard.

4. Switch blades should open away from the terminators.

5. Keep arrester primary and ground leads as short as possible.

6. On 13800 Gnd/7970 V terminal poles use the 10kV lightning arrester.

7. See DCS **14 00 01 03** for standoff bracket placement and grounding requirements.

8. Use DCS **12 00 10 04** for ground coil application on new pole installation. Use DCS **12 00 10 03** for grounding rod on an existing pole.

9. Strip 4" section of wire above terminator cover. This bare section will be used for the arrester connection or the ground set connection when grounding cables. Keep arrester leads as short as possible.

10. Omit grounding stud and use regular hardware, place cover over connectors.

11. The conduit bend should be completely below grade. Field conditions may make this impractical, and in these cases, the top of the bend may be up to 6" above final grade.

12. Install bell end coupling at top end of conduit to prevent cable damage. Conduit must be above neutral clevis or secondary bracket.

13. The NESC requires a minimum distance of 40" between the lowest point on the neutral/secondary bracket and the highest point of the communication hardware. The top of the conduit should be above the neutral. If abnormal clearances on pole require the top of the conduit to be below the neutral or secondary, the NESC requires 40" from the top of the conduit to the communication hardware.

DCS #	DESCRIPTION
14 12 18 01	Through Circuit
14 12 18 02	Deadend Circuit

	ITEM	STK / DCS #	DESCRIPTION 14 12 18 **	01	02
	A	**04 00 41 16**	Crossarm, FG 10' Tangent	1	-
		04 00 42 03	Crossarm, FG 10' Deaend	-	1
	B	54 07 204	Switch, Disc. 600A., 15kV	3	3
	C	**06 12 01 01**	Pin & Insulator on Arm	5	-
	D	**06 12 01 02**	Pin & Insulator on Pole Top	1	-
	E	**06 12 30 01 @**	Deadend on pole	-	1
	F	**06 12 35 01 @**	Deadend on Arm	-	2
	G	41 56 016	Brace - 60" V	2	2
	H	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	2	2
	I	23 66 027	Washer, Flat, Square 5/8"	5	5
	J	23 66 134	Lock Washer - 5/8" Double Coil	11	11
	K	23 65 043	Lock Nut - 5/8" Square	9	9
	L	23 52 038	Bolt, Mach., 1/2" x 6" w/ square nut	2	2
	M	23 66 017	Washer - Round 1/2"	16	16

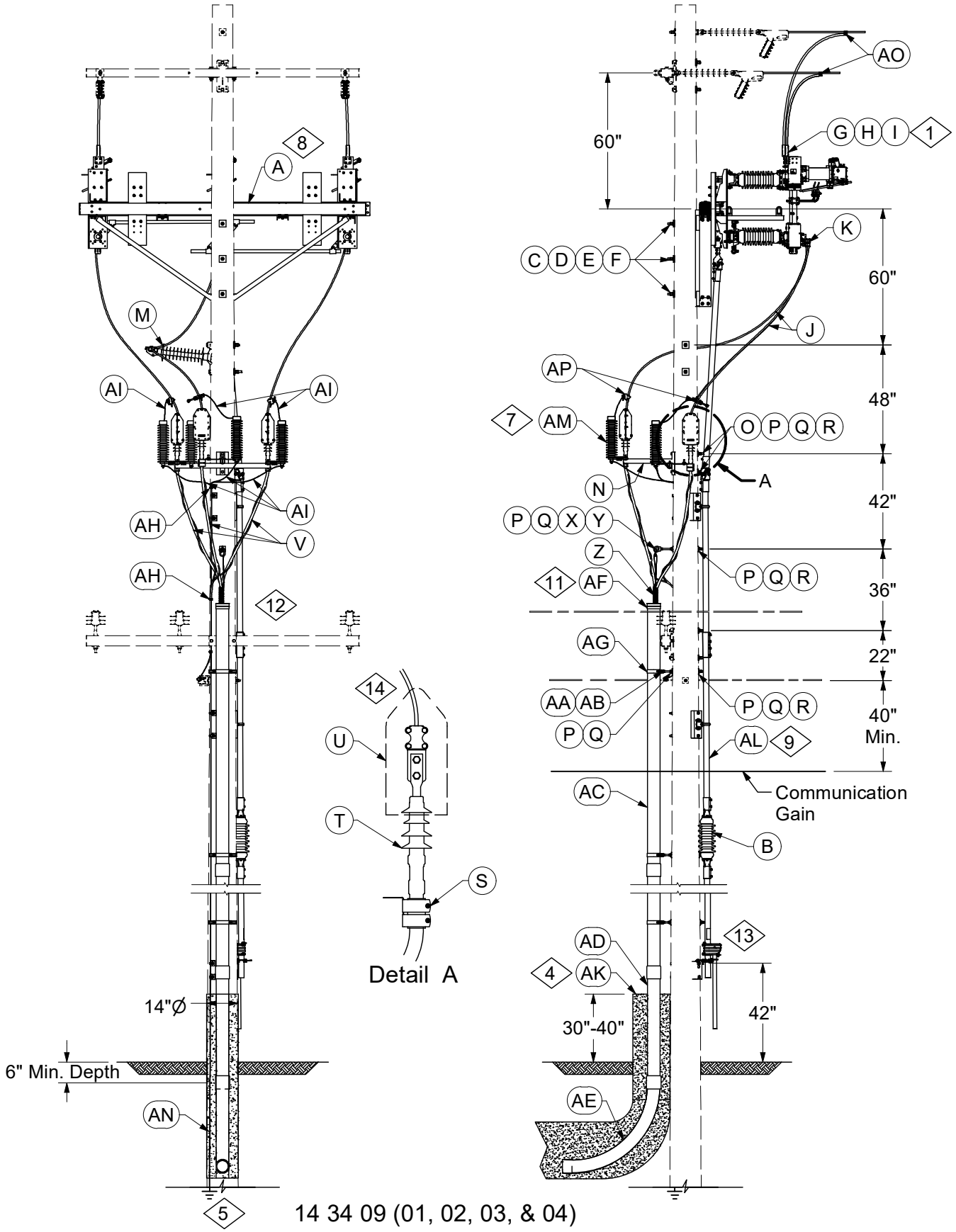
REV	DATE	ENG	DESCRIPTION
2	01/01/24	JMW	Converted to new format
1	12/11/15	HLH	

	ITEM	STK / DCS #	DESCRIPTION 14 12 18 **	01	02
	N	23 66 133	Lock Washer - Double Coil 1/2"	14	14
	O	23 65 056	Lock Nut - 1/2" Square	2	2
	P	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	1	1
	Q	54 03 051	Switch, 15kV, SM-5 Fuse Mounting, 400A	3	3
	R	23 52 036	Bolt, Mach., 1/2" x 5" w/ square nut	12	12
	S	17 54 303	Connector - Cable to Flat, #6-2/0	6	6
	T	23 52 248	Bolt, 1/2" X 1.5", GALV STL, HEX	12	12
	U	12 56 053	Washer, Flat, 1/2", SS	30	30
	V	18 15 023	Wire, 4/0 Cu, Poly Covered (ft.)	40	40
	W	17 08 057	Bracket, Mounting, Terminator	1	1
	X	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	2	2
	Y	23 66 207	Washer, Curved, Square, 5/8"	8	8
	Z	23 67 197	Bracket - Cable Support	3	3
	AA	23 17 417	Guard - Wildlife, Cover, Termination, #1 to 750 kcmil	3	3
	AB	18 51 021	Wire, #6 Cu, S.D. Covered (ft.)	12	12
	AC	23 53 003	Bolt, DA, 5/8" Dia x 18" w/ 4 square nuts	4	4
	AD	23 65 053	Nut - 5/8" Jam	3	3
7	AE	23 06 087	Bracket - Standoff, 12"	3	3
	AF	12 01 303	Conduit - 5" Schedule 40 (ft.)	20	20
	AG	12 01 272	Conduit - 5" Schedule 80 (ft.)	10	10
	AH	12 51 206	Conduit - Bend 5", 36" Rad	1	1
	AI	12 51 233	Coupling, Bell End, 5"	1	1
	AJ	23 67 184	Strap - Conduit 5" w/2" Bolts	3	3
	AK	23 65 012	Eyenut, 5/8"	1	1
	AL	23 68 181	Shackle - Deadend	1	1
	AM	23 17 246	Grip, Cable Riser, 3.5"-4.0" Dia. Split	1	1
8	AN	**12 00 10 04**	Grounding Unit	1	1
	AO	17 54 004	Connector - Split Bolt, #4 Sol CU thru #8 Sol CU	2	2
6,@	AP	10 01 129	Arrester, Lightning, 9kV, 7.65 MCOV	3	3
		10 01 146	Arrester, Lightning, 10kV, 8.4kV MCOV	3	3
@	AQ	41 01 014	8' Crossarm - 3-1/2" x 4-1/2"	2	2
		41 01 008	10' Crossarm - 3-1/2" x 4-1/2"	2	2
@	AR	**42 34 61 02**	Termination, 15kV, 750 kcmil Cu. CN	3	3
		42 34 61 04	Termination, 15kV, 750 kcmil Al. CN	3	3
@	AS	18 07 243	Cable, 750 kcmil Al., CN (ft.)	35	35
		18 07 244	Cable, 750 kcmil Cu., CN (ft.)	35	35
@	AT	**07 00 41 00**	Top Tie, TT*W	6	3
@	AU	**07 00 11 00**	Clamp, Deadend, DEC*W	-	3
@	AV	**07 00 25 00**	Clamp, Parallel Groove, PG**	4	1
@	AW	**07 00 21 00**	Clamp, Hot line, HLC*W	3	3
@	AX		Refill Fuse (Sized by Eng.)	3	3
		279	Op Code, Install Cable Up Pole	1	1

DESIGN NOTE(s):

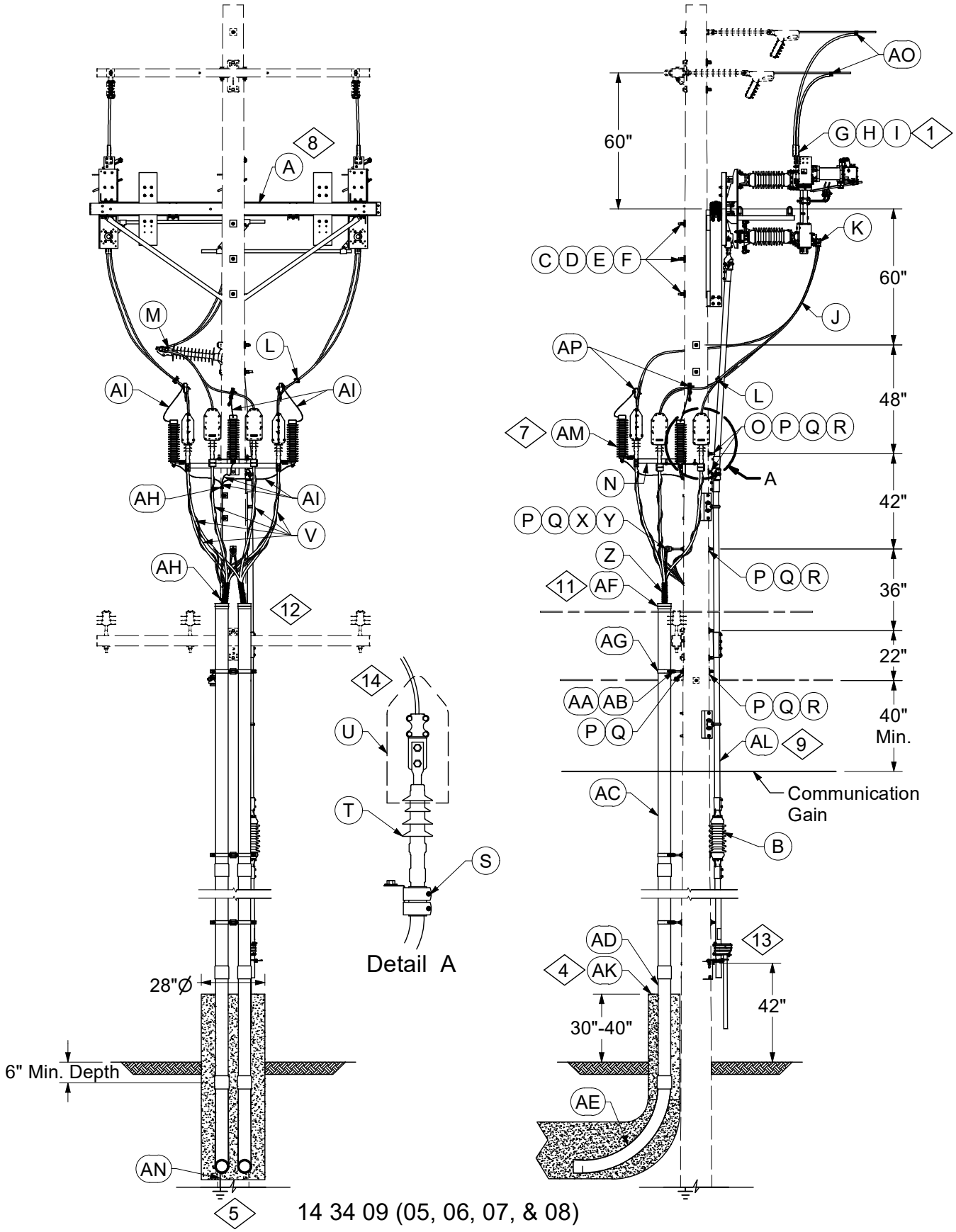
14. This DCS is to be used when fusing is above 200 amps or if high fault current.

REV	DATE	ENG	DESCRIPTION
2	01/01/24	JMW	Converted to new format
1	12/11/15	HLH	



14 34 09 (01, 02, 03, & 04)

REV	DATE	ENG	DESCRIPTION
13	01/01/24	JMW	Converted to new format
12	06/15/16	WYW	



14 34 09 (05, 06, 07, & 08)

REV	DATE	ENG	DESCRIPTION
13	01/01/24	JMW	Converted to new format
12	06/15/16	WYW	

DCS #	DESCRIPTION
14 34 09 01	Turner Switch w/ 750 kcmil cable & single conduit
14 34 09 02	Seeco Switch w/ 750 kcmil cable & single conduit
14 34 09 03	Turner Switch w/ 350 kcmil cable & single conduit
14 34 09 04	Seeco Switch w/ 350 kcmil cable & single conduit
14 34 09 05	Turner Switch w/ 750 kcmil cable & double conduit
14 34 09 06	Seeco Switch w/ 750 kcmil cable & double conduit
14 34 09 07	Turner Switch w/ 350 kcmil cable & double conduit
14 34 09 08	Seeco Switch w/ 350 kcmil cable & double conduit

CONSTRUCTION NOTE(s):

1. Use line conductor for leads to top of switch. Connect with aluminum compression lugs.
2. Extend PVC riser to 12” above operating rod insulator.
3. The minimum bending radius is 24” for both the 750 kcmil and 350 kcmil cables.
4. Concrete encasement should rise 30"-40" above grade.
5. Use DCS **12 00 10 03** for ground rod application on existing pole and DCS **12 69 11 **** for ground new pole installation.
6. Always connect the metallic shields of the riser cables to the system neutral with at least a #2 stranded copper wire. Be aware that the bare and/or covered 7-strand #10 copperweld ground wire may look like stranded #2 copper wire. Never substitute the copperweld ground wire for the #2 stranded copper wire when constructing the primary neutral buss.
7. Stock #10 01 137 - Arrester for grounded system.
   Stock #10 01 199 - Arrester for ungrounded system.
8. Turner TS2 weight - 1000 #
   Seeco weight - 1150 #
9. Order additional vertical steel pipe only if needed. Use Stock #32 01 821.
10. If there is no system neutral or shield wire available, install a pole ground per DCS **12 00 10 03** and bond all shields and ground wires to the #2 Cu wire.
11. Install bell end fitting at top end of conduit to prevent cable damage.
12. Conduit must be above distribution system crossarm, or the neutral clevis or secondary bracket. The NESC requires a minimum distance of 40" between the lowest point on the neutral/secondary bracket and the highest point of the communication hardware. The top of the conduit should be above the neutral. If abnormal clearances on pole require the top of the conduit to be below the neutral or secondary, the NESC requires 40" from the top of the conduit to the communication hardware.
13. Do not ground switch or terminator bracket. Ground switch handle.
14. Omit grounding stud and use regular hardware. Place cover over connectors.

	ITEM	STK / DCS #	DESCRIPTION 14 34 09 **	01	02	03	04	05	06	07	08
8	A	54 08 438	Turner, 3 Phase w/LBRK, Terminal Pole Mounting	1	-	1	-	1	-	1	-
		54 08 446	Seeco, 3 Phase w/ LBRK, Terminal Pole Mounting	-	1	-	1	-	1	-	1
	B	54 08 329	Kit, Vertical Mount Turner D Switch, 35kV	1	-	1	-	1	-	1	-
	C	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	3	3	3	3	3	3	3	3
	D	23 66 031	Washer, Curved, Square, 3/4"	3	3	3	3	3	3	3	3
	E	23 66 135	Lock Washer - 3/4" Double Coil	3	3	3	3	3	3	3	3
	F	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	3	3	3	3	3	3	3	3
1	G	**07 00 30 00**	Lug, Compression, AL, 4 Hole Pad	3	3	3	3	3	3	3	3
	H	21 56 078	Bolt, 1/2" X 2", 304 SS, HEX	12	12	12	12	2	12	12	12
	I	12 56 052	Washer, Belleville Spring, 1/2", SS	12	12	12	12	12	12	12	12
	J	18 51 032	Wire, Cu. 350 S.D., Covered	30	30	30	30	60	60	60	60
	K	17 54 955	Lug, 1/0 – 500 Cu.	3	3	3	3	6	6	6	6
	L	17 54 132	Connector- Wire, 8-350 kcmil, CU	-	-	-	-	3	3	3	3
	M	**06 69 03 ****	Horizontal L.P., 69kV, Clamptop	1	1	1	1	1	1	1	1
	N	17 08 058	Bracket, Terminator	1	1	1	1	1	1	1	1
	O	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	2	2	2	2	2	2	2	2
	P	23 66 207	Washer, Curved, Square, 5/8"	10	10	10	10	10	10	10	10
	Q	23 66 134	Lock Washer - 5/8" Double Coil	10	10	10	10	10	10	10	10
	R	23 65 043	Lock Nut - 5/8" Square	6	6	6	6	6	6	6	6
	S	23 67 197	Bracket - Cable Support	3	3	3	3	6	6	6	6
	T	**42 44 12 03**	Termination, 35 kV, 750 kcmil	3	3	-	-	6	6	-	-
		42 44 12 02	Termination, 35 kV, 350 kcmil	-	-	3	3	-	-	6	6
	U	23 17 417	Guard - Wildlife, Cover, Termination, #1 to 750 kcmil	3	3	3	3	6	6	6	6
	V	18 07 249	Cable, 35 kV, 750 kcmil	45	45	-	-	90	90	-	-
		18 07 250	Cable, 35 kV, 350 kcmil	-	-	45	45	-	-	90	90
	W	23 53 004	Bolt, DA, 5/8" Dia x 20" w/ 4 square nuts	4	4	4	4	4	4	4	4
	X	23 65 012	Eyenut, 5/8"	1	1	1	1	1	1	1	1
	Y	23 68 181	Shackle - Deadend	1	1	1	1	1	1	1	1
	Z	23 17 207	Grip - Cable 1-3/4", 2" Dia	1	1	1	1	2	2	2	2
	AA	23 06 087	Bracket - Standoff, 12"	3	3	3	3	-	-	-	-
		23 06 086	Bracket - Standoff, 20"	-	-	-	-	3	3	3	3
	AB	23 65 053	Nut - 5/8" Jam	3	3	3	3	3	3	3	3
	AC	12 01 303	Conduit - 5" Schedule 40 (ft.)	2	2	2	2	4	4	4	4
	AD	12 01 272	Conduit - 5" Schedule 80 (ft.)	1	1	1	1	2	2	2	2
	AE	12 51 206	Conduit - Bend 5", 36" Rad	1	1	1	1	2	2	2	2
11	AF	12 51 233	Coupling, Bell End, 5"	1	1	1	1	2	2	2	2
	AG	23 67 184	Strap - Conduit 5" w/2" Bolts	3	3	3	3	6	6	6	6
	AH	17 54 004	Connector - Split Bolt, #4 Sol CU thru #8 Sol CU	4	4	4	4	4	4	4	4
	AI	18 51 021	Wire, Cu, #6 S.D. Covered (ft)	6	6	6	6	6	6	6	6
	AJ	23 67 036	Step, Pole 5/8" x 10"	2	2	2	2	2	2	2	2
4,@	AK	**14 00 20 ** @**	Riser Guard, Concrete	1	1	1	1	1	1	1	1
9,@	AL	32 01 821	Pipe, Steel Galv. 2" x 10' w/ Coupling, Turner	1	1	1	1	1	1	1	1
7,@	AM	10 01 137	Arrester, Lightning, 27kV	3	3	3	3	3	3	3	3
		10 01 199	Arrester, Lightning, 27kV Gapped	3	3	3	3	3	3	3	3

REV	DATE	ENG	DESCRIPTION
13	01/01/24	JMW	Converted to new format
12	06/15/16	WYW	

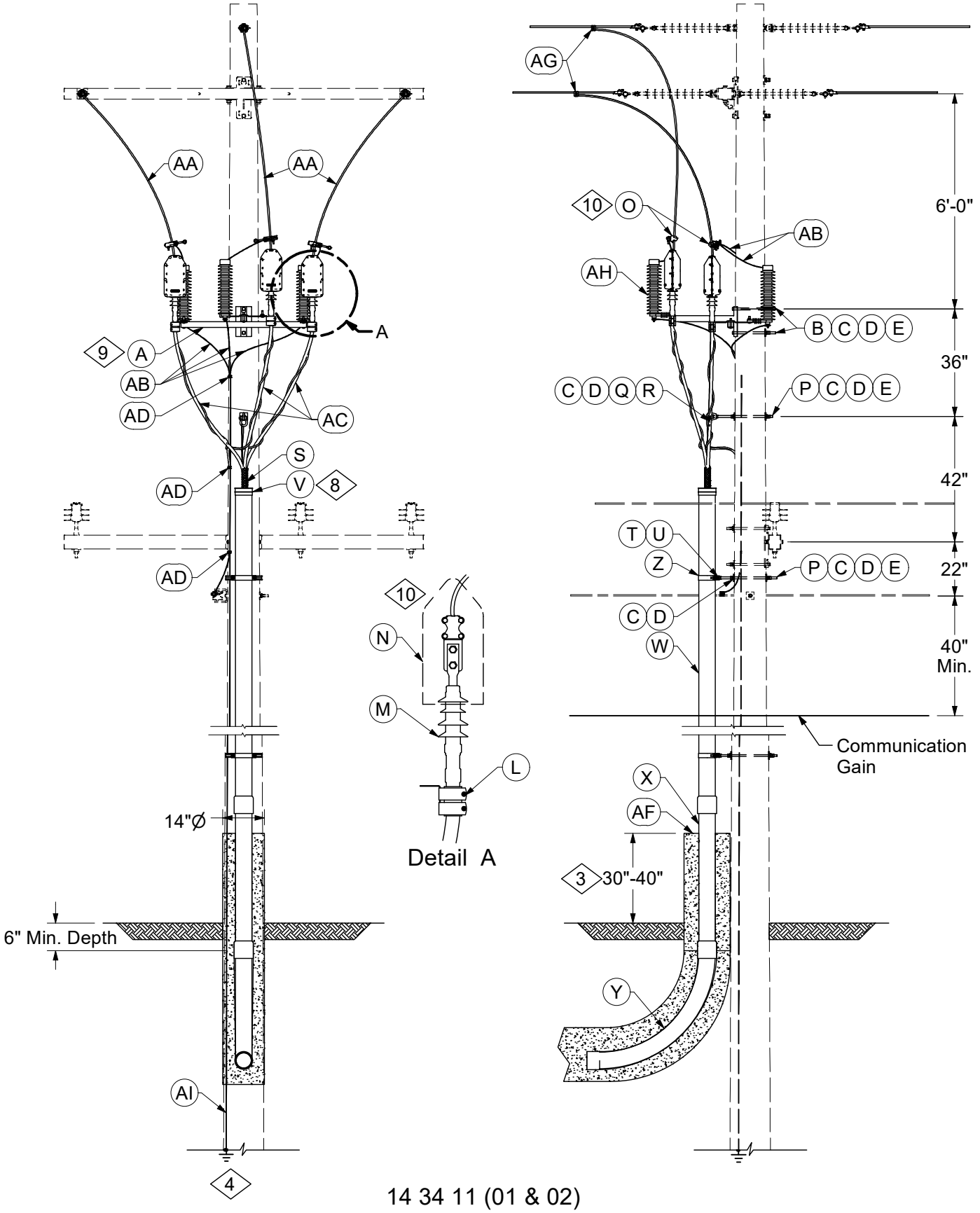
	ITEM	STK / DCS #	DESCRIPTION 14 34 09 **	01	02	03	04	05	06	07	08
5,@	AN	**12 69 11 ****	Grounding Unit for New Pole	1	1	1	1	1	1	1	1
		12 00 10 03	Grounding Unit for Existing	1	1	1	1	1	1	1	1
@	AO	**07 00 25 00**	Clamp, Parallel Groove, PG**	3	3	3	3	6	6	6	6
@	AP	**07 00 21 00**	Clamp, Hot Line, HLC*W	3	3	3	3	3	3	3	3
		279	Op Code, Install Cable Up Pole	3	3	3	3	3	3	3	3

DESIGN NOTE(s):

15. Switches & Terminals shall be on separate poles whenever possible.

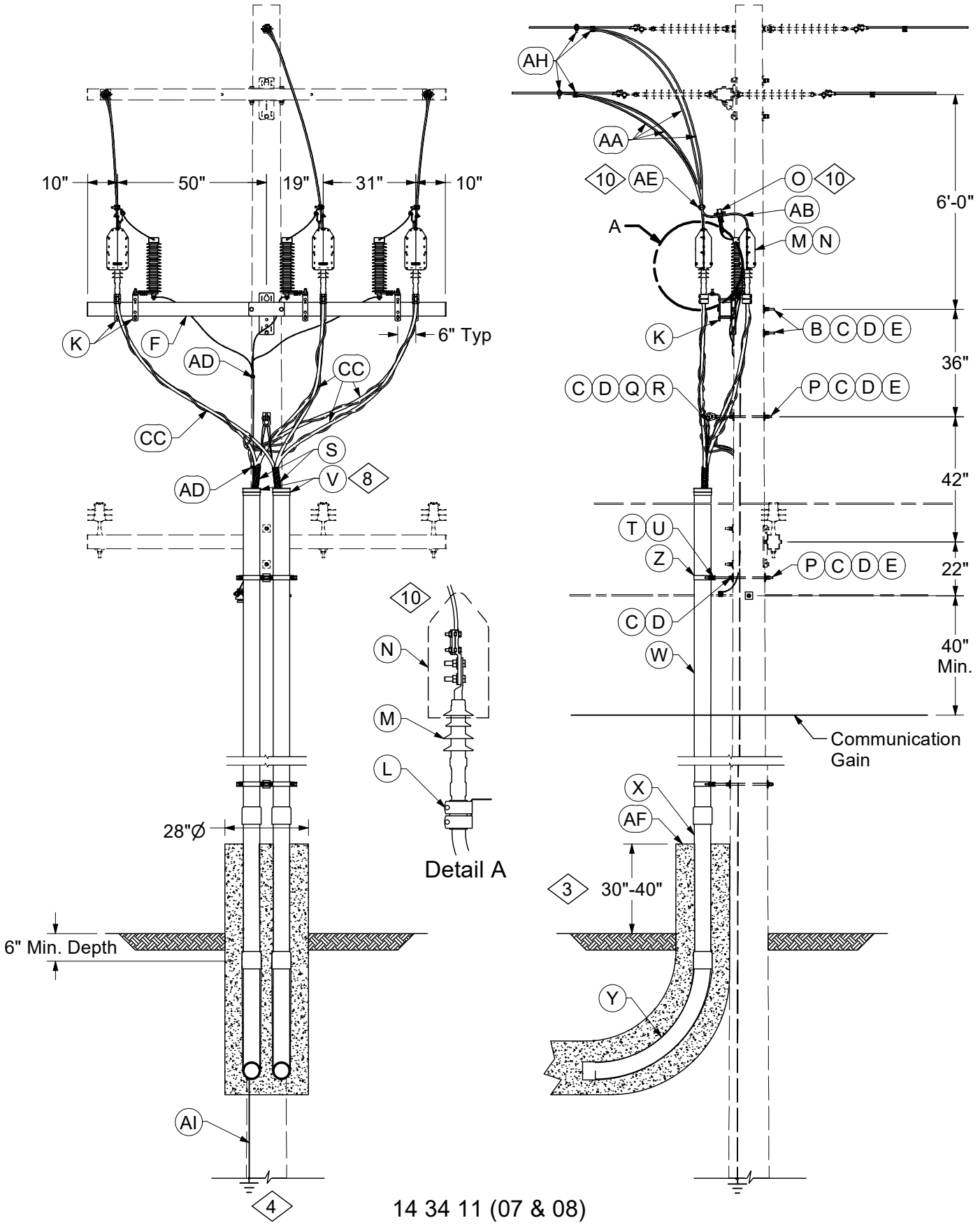
16. On deadend construction, down guy may be too close to the center phase terminator. If so, select crossarm option to mount terminators and arresters.

REV	DATE	ENG	DESCRIPTION
13	01/01/24	JMW	Converted to new format
12	06/15/16	WYW	



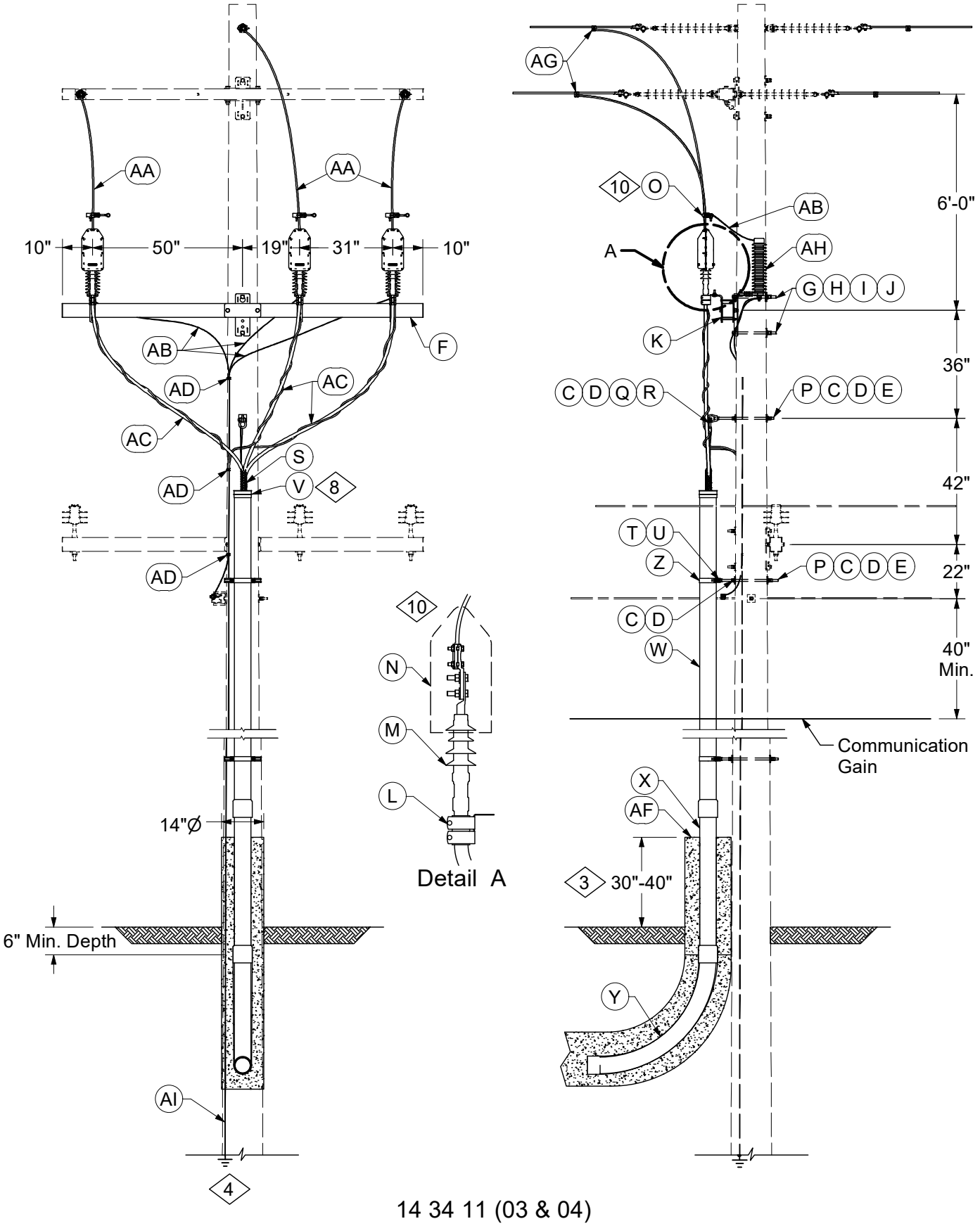
14 34 11 (01 & 02)

REV	DATE	ENG	DESCRIPTION
15	01/01/24	JMW	Converted to new format
14	03/11/16	WYW	



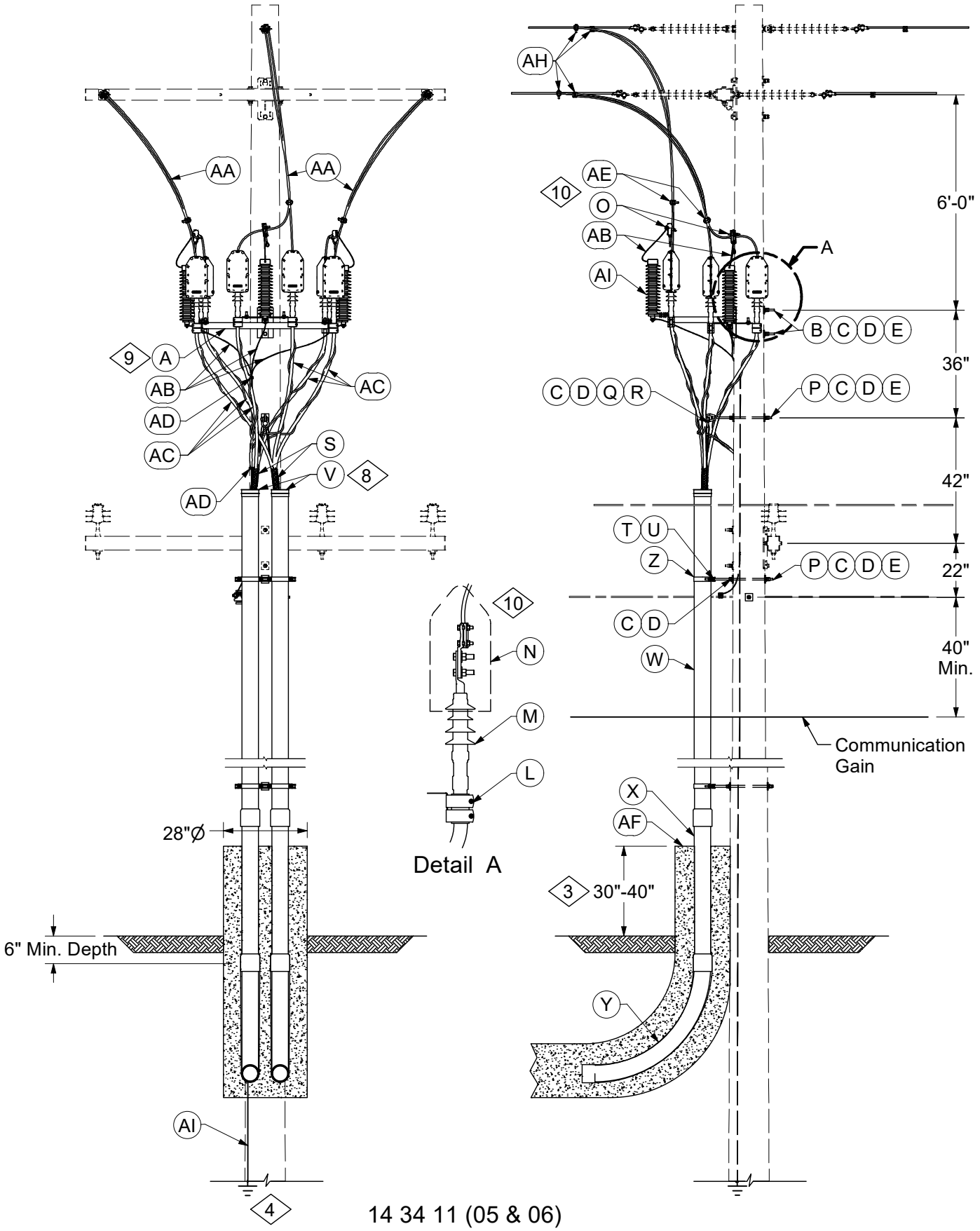
14 34 11 (07 & 08)

REV	DATE	ENG	DESCRIPTION
15	01/01/24	JMW	Converted to new format
14	03/11/16	WYW	



14 34 11 (03 & 04)

REV	DATE	ENG	DESCRIPTION
15	01/01/24	JMW	Converted to new format
14	03/11/16	WYW	



14 34 11 (05 & 06)

REV	DATE	ENG	DESCRIPTION
15	01/01/24	JMW	Converted to new format
14	03/11/16	WYW	

DCS #	DESCRIPTION
14 34 11 01	750 kcmil, Terminals on Bracket - Single Conduit
14 34 11 02	350 kcmil, Terminals on Bracket - Single Conduit
14 34 11 03	750 kcmil, Terminals on Crossarm - Single Conduit
14 34 11 04	350 kcmil, Terminals on Crossarm - Single Conduit
14 34 11 05	750 kcmil, Terminals on Bracket - Double Conduit
14 34 11 06	350 kcmil, Terminals on Bracket - Double Conduit
14 34 11 07	750 kcmil, Terminals on Crossarm - Double Conduit
14 34 11 08	350 kcmil, Terminals on Crossarm - Double Conduit

CONSTRUCTION NOTE(s):

1. For cable lengths, measure the distance to the grip thru bolt located 4'-0" below the terminator bracket or crossarm and add the amounts shown.

2. Cable minimum bending radius is 24" for both of the 750 kcmil and 350 kcmil cables.

◇3.◇ Concrete encasement should rise 30"-40" above grade.

◇4.◇ Use DCS **12 00 10 03** for ground rod on existing poles.
Use DCS **12 00 10 04** for ground coil application on new pole installation.

5. Always connect the metallic shields on the riser cables to the system neutral with at least a #2 stranded copper wire. Be aware that the bare and/or covered 7-strand #10 copperweld ground wire may look like stranded #2 copper wire. Never substitute the copperweld ground wire for the #2 stranded copper wire when constructing the primary neutral buss.

6. Stock #10 01 137 for grounded system; Stock #10 01 199 for ungrounded system.

7. Connect cable concentrics to pole ground wire. Connect pole ground to static and distribution system neutral if present.

◇8.◇ Install bell end fitting at top end of conduit to prevent cable damage. Conduit must be above distribution crossarm, or the neutral clevis or secondary bracket.

◇9.◇ Do not ground the termination bracket.

◇10.◇ Strip poly cover for arrester connection and for joining parallel cable with two bolt connector.

	ITEM	STK / DCS #	DESCRIPTION 14 34 11 **	01	02	03	04	05	06	07	08
9	A	17 08 058	Bracket, Terminator	1	1	-	-	1	1	-	-
	B	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	2	2	-	-	2	2	-	-
	C	23 66 207	Washer, Curved, Square, 5/8"	10	10	8	8	10	10	8	8
	D	23 66 134	Lock Washer - 5/8" Double Coil	10	10	8	8	10	10	8	8
	E	23 65 043	Lock Nut - 5/8" Square	6	6	4	4	6	6	4	4
11	F	41 01 285	Crossarm - Tangent, F/G 10'	-	-	1	1	-	-	1	1
	G	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	-	-	2	2	-	-	2	2
	H	23 66 031	Washer, Curved, Square, 3/4"	-	-	2	2	-	-	2	2
	I	23 66 135	Lock Washer - 3/4" Double Coil	-	-	2	2	-	-	2	2
	J	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	-	-	2	2	-	-	2	2
	K	23 56 088	Bracket, Crossarm, Double Sided NEMA	-	-	3	3	-	-	6	6
	L	23 67 197	Bracket - Cable Support	3	3	3	3	6	6	6	6

REV	DATE	ENG	DESCRIPTION
15	01/01/24	JMW	Converted to new format
14	03/11/16	WYW	

	ITEM	STK / DCS #	DESCRIPTION 14 34 11 **	01	02	03	04	05	06	07	08
	M	**42 44 12 02**	Termination, 35 kV, 350 kcmil	3	-	3	-	6	-	6	-
		42 44 12 03	Termination, 35 kV, 750 kcmil	-	3	-	3	-	6	-	6
	N	23 17 417	Guard - Wildlife, Cover, Termination, #1 to 750 kcmil	3	3	3	3	6	6	6	6
	O	23 78 183	Clamp, Hot line #6 to 400 kcmil	3	3	3	0	3	3	3	3
	P	23 53 004	Bolt, DA, 5/8" Dia x 20" w/ 4 square nuts	4	4	4	4	4	4	4	4
	Q	23 65 012	Eyenut, 5/8"	1	1	1	1	1	1	1	1
	R	23 68 181	Shackle - Deadend	1	1	1	1	1	1	1	1
	S	23 17 207	Grip - Cable 1-3/4", 2" Dia	1	1	1	1	2	2	2	2
	T	23 06 087	Bracket - Standoff, 12"	3	3	3	3	-	-	-	-
		23 06 086	Bracket - Standoff, 20"	-	-	-	-	3	3	3	3
	U	23 65 053	Nut - 5/8" Jam	3	3	3	3	3	3	3	3
	V	12 51 233	Coupling, Bell End, 5”	1	1	1	1	2	2	2	2
8	W	12 01 303	Conduit - 5" Schedule 40 (ft.)	20	20	20	20	40	40	40	40
	X	12 01 272	Conduit - 5" Schedule 80 (ft.)	10	10	10	10	20	20	20	20
	Y	12 51 206	Conduit - Bend 5", 36" Rad	1	1	1	1	2	2	2	2
	Z	23 67 184	Strap - Conduit 5" w/2" Bolts	3	3	3	3	6	6	6	6
	AA	18 51 052	Wire Cu. 350 S.D. Covered (ft.)	15	15	15	15	30	30	30	30
	AB	18 51 021	Wire Cu. #6 S.D., Covered (ft.)	25	25	25	25	50	50	50	50
	AC	18 07 249	Cable-35kV, 750 kcmil (ft.)	45	-	45	-	90	-	90	-
		18 07 250	Cable-35kV, 350 kcmil (ft.)	-	45	-	45	-	90	-	90
	AD	17 54 004	Connector - Split Bolt, #4 Sol CU - #8 Sol CU	4	4	4	4	4	4	4	4
	AE	17 54 130	Connnector- Wire, 8-350 kcmil, CU	-	-	-	-	3	3	3	3
3,@	AF	**14 00 20 ** @**	Riser Guard, Concrete	1	1	1	1	1	1	1	1
@	AG	**07 00 25 00**	Clamp, Parallel Groove, PG**	3	3	3	3	6	6	6	6
@	AH	10 01 137	Arrester, Lightning, 27kV	3	3	3	3	3	3	3	3
		10 01 199	Arrester, Lightning, 27kV Gapped	3	3	3	3	3	3	3	3
4,@	AI	**12 00 10 03**	Grounding Unit on Existing Poles	1	1	1	1	1	1	1	1
		12 00 10 04	Grounding Unit on New Poles	1	1	1	1	1	1	1	1
		279	Op Code, Install Cable Up Pole	3	3	3	3	6	6	6	6

DESIGN NOTE(s):

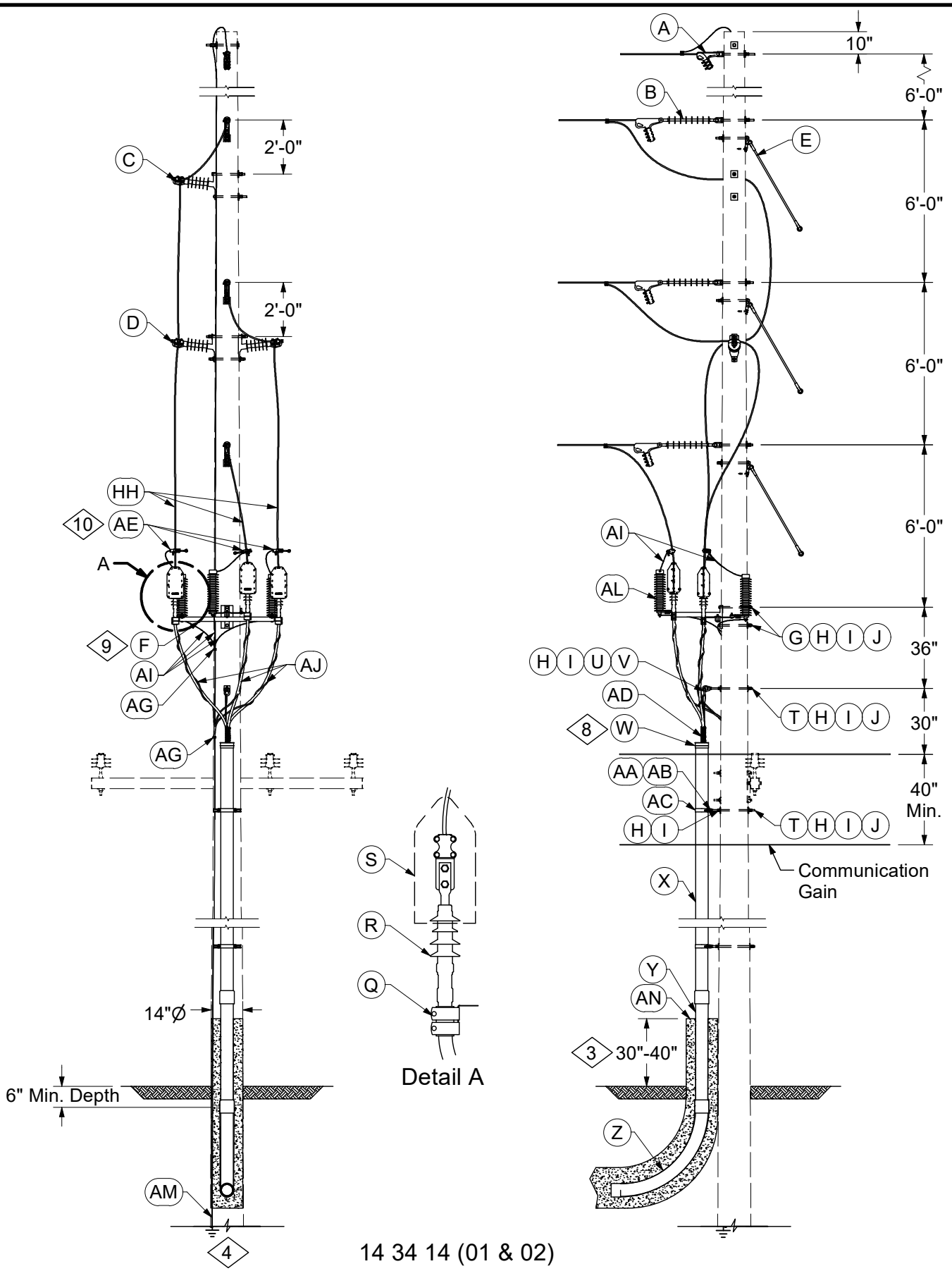
<11> On deadend construction, down guy may be too close to the center phase terminator. If so, select crossarm option to mount terminators and arresters

REV	DATE	ENG	DESCRIPTION
15	01/01/24	JMW	Converted to new format
14	03/11/16	WYW	

CABLE TERMINALS

Single Circuit Vertical Deadend
350 and 750 kcmil Cable, Single and Parallel Riser

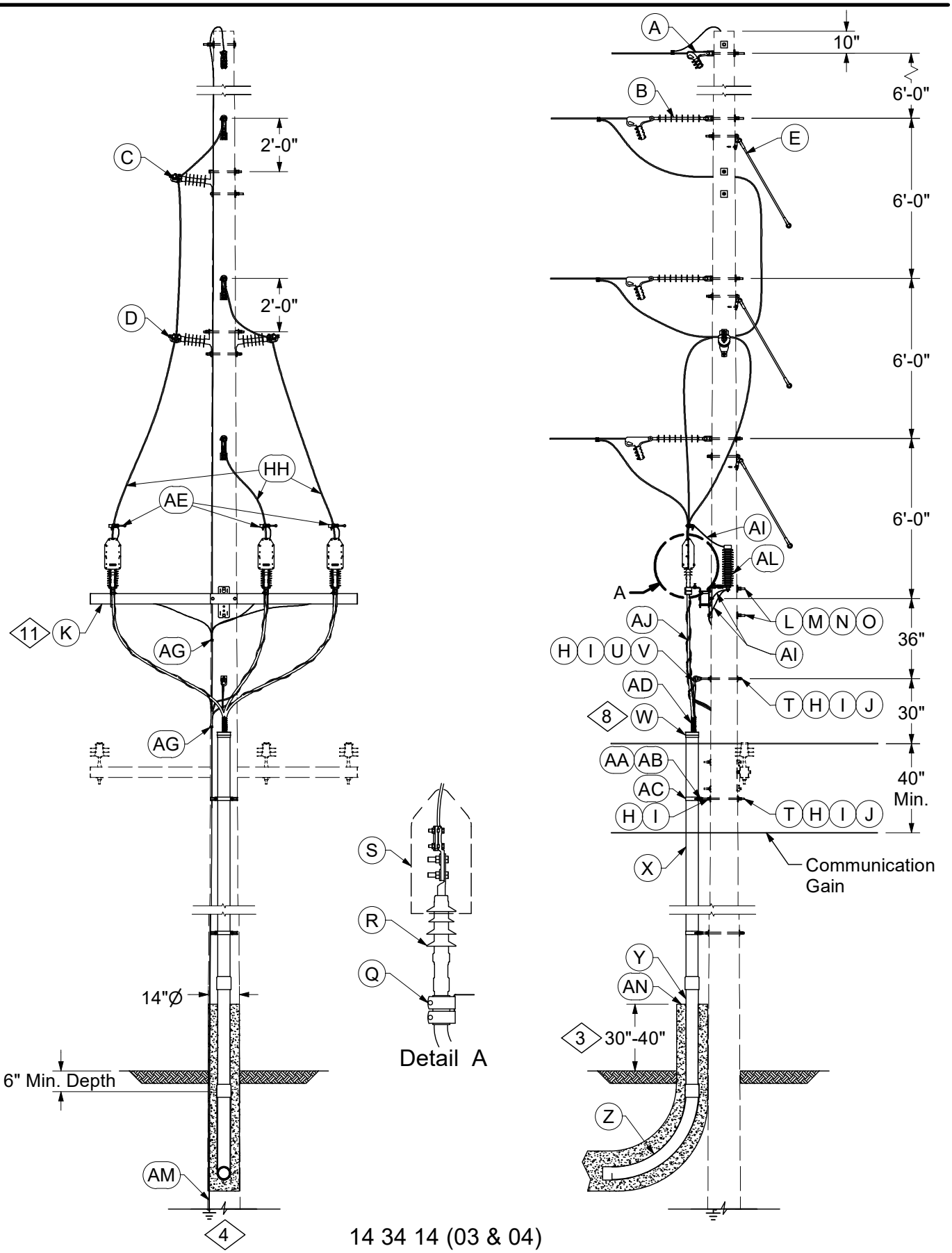
14 34 14 **
35kV
1 of 6



14 34 14 (01 & 02)

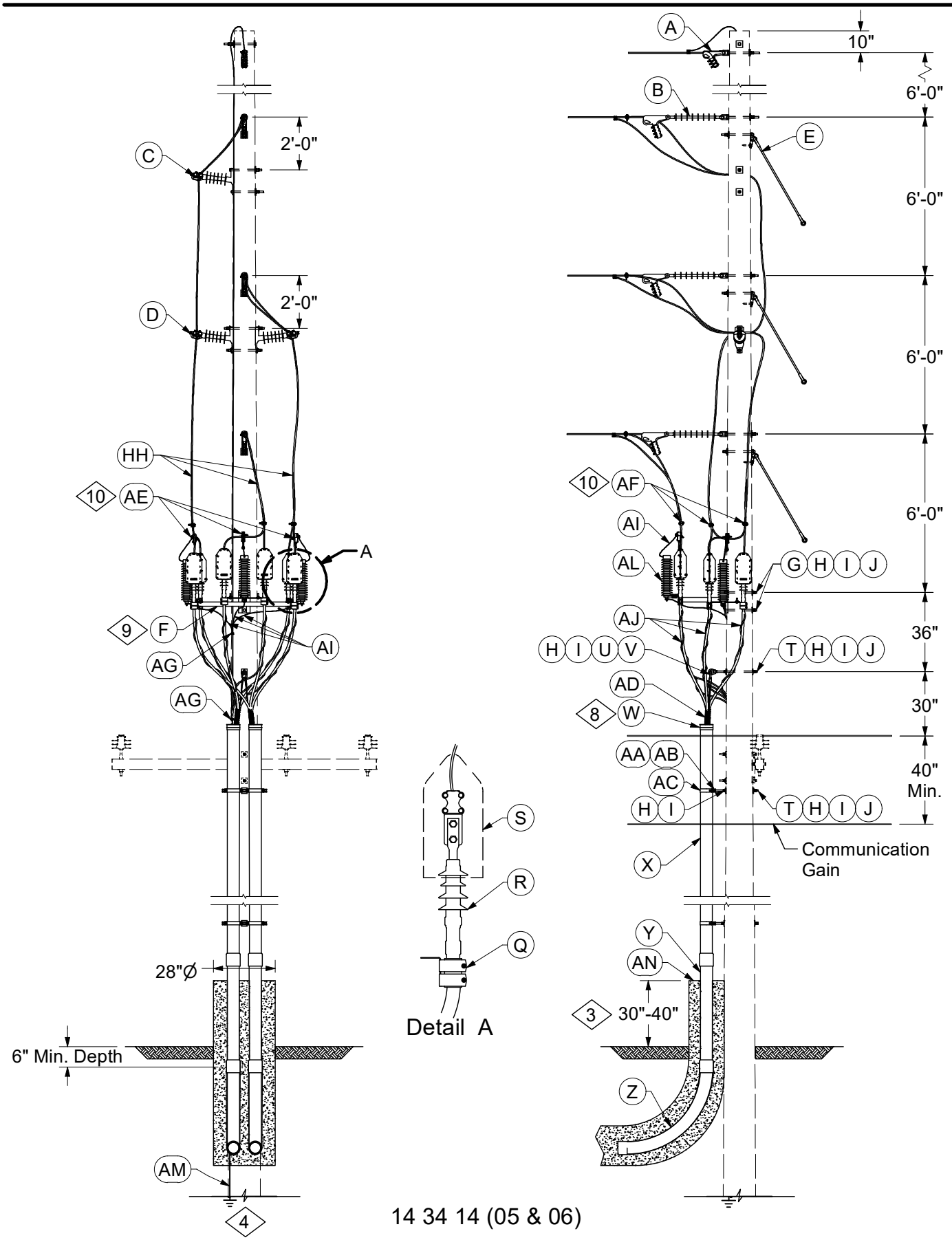
DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
17	01/01/24	JMW	Converted to new format
16	07/07/15	HLH	



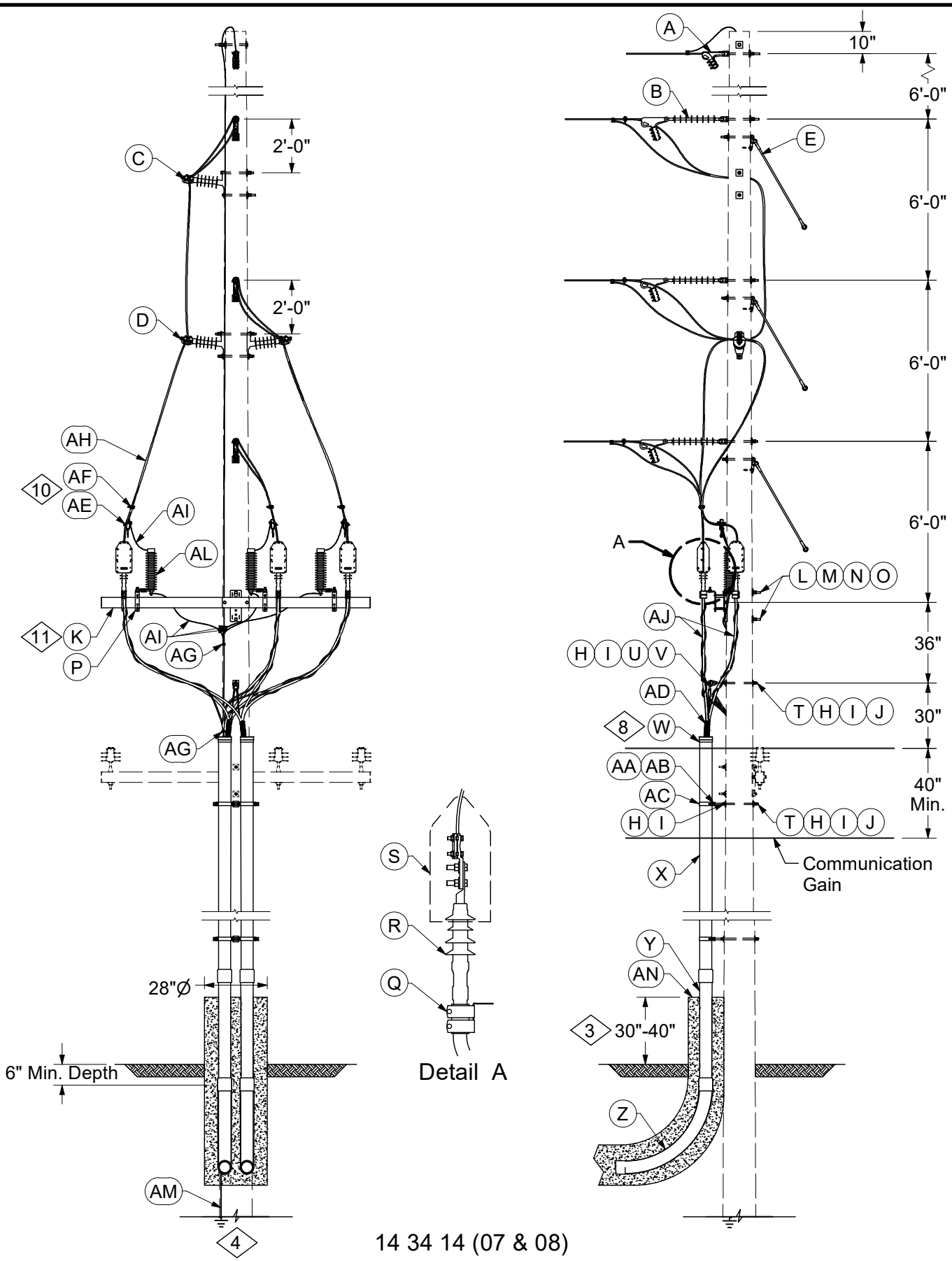
14 34 14 (03 & 04)

REV	DATE	ENG	DESCRIPTION
17	01/01/24	JMW	Converted to new format
16	07/07/15	HLH	



14 34 14 (05 & 06)

REV	DATE	ENG	DESCRIPTION
17	01/01/24	JMW	Converted to new format
16	07/07/15	HLH	



14 34 14 (07 & 08)

REV	DATE	ENG	DESCRIPTION
17	01/01/24	JMW	Converted to new format
16	07/07/15	HLH	

DCS #	DESCRIPTION
14 34 14 01	750 kcmil, Terminals on Bracket - Single Conduit
14 34 14 02	350 kcmil, Terminals on Bracket - Single Conduit
14 34 14 03	750 kcmil, Terminals on Crossarm - Single Conduit
14 34 14 04	350 kcmil, Terminals on Crossarm - Single Conduit
14 34 14 05	750 kcmil, Terminals on Bracket - Double Conduit
14 34 14 06	350 kcmil, Terminals on Bracket - Double Conduit
14 34 14 07	750 kcmil, Terminals on Crossarm - Double Conduit
14 34 14 08	350 kcmil, Terminals on Crossarm - Double Conduit

CONSTRUCTION NOTE(s):

1. For cable lengths, measure the distance to the grip thru bolt located 4'-0" below the terminator bracket or crossarm and add the amounts shown.

2. Cable minimum bending radius is 24" for both of the 750 kcmil and 350 kcmil cables.

◇3. Concrete encasement should rise 30"-40" above grade.

◇4. Use DCS **12 00 10 03** for ground rod on existing poles.
Use DCS **12 00 10 04** for ground coil application on new pole installation.

5. Always connect the metallic shields on the riser cables to the system neutral with at least a #2 stranded copper wire. Be aware that the bare and/or covered 7-strand #10 copperweld ground wire may look like stranded #2 copper wire. Never substitute the copperweld ground wire for the #2 stranded copper wire when constructing the primary neutral buss.

6. Stock #10 01 137 for grounded system; Stock #10 01 199 for ungrounded system.

7. Connect cable concentrics to pole ground wire. Connect pole ground to static and distribution system neutral if present.

◇8. Install bell end fitting at top end of conduit to prevent cable damage. Conduit must be above distribution crossarm, or the neutral clevis or secondary bracket.

◇9. Do not ground the termination bracket.

◇10. Strip poly cover for arrester connection and for joining parallel cable with two bolt connector.

	ITEM	STK / DCS #	DESCRIPTION 14 34 14 **	01	02	03	04	05	06	07	08
	A	**06 00 11 08 @**	Deadend Neutral	1	1	1	1	1	1	1	1
	B	**06 34 60 02 @**	Deadend, Pole	3	3	3	3	3	3	3	3
12	C	**06 34 03 03**	Insulator, Linepost, Polymer, Trunnion	1	1	1	1	1	1	1	1
12	D	**06 34 03 06**	Insulator, Linepost, Polymer, Trunnion, Double	1	1	1	1	1	1	1	1
	E	**11 00 56 02**	Hook Guy	3	3	3	3	3	3	3	3
9	F	17 08 058	Bracket, Terminator	1	1	-	-	1	1	-	-
	G	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	2	2	-	-	2	2	-	-
	H	23 66 207	Washer, Curved, Square, 5/8"	10	10	10	10	10	10	10	10
	I	23 66 134	Lock Washer - 5/8" Double Coil	10	10	10	10	10	10	10	10
	J	23 65 043	Lock Nut - 5/8" Square	6	6	6	6	6	6	6	6

REV	DATE	ENG	DESCRIPTION
17	01/01/24	JMW	Converted to new format
16	07/07/15	HLH	

	ITEM	STK / DCS #	DESCRIPTION 14 34 14 **	01	02	03	04	05	06	07	08
11	K	41 01 285	Crossarm - Tangent, F/G 10'	-	-	1	1	-	-	1	1
	L	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	-	-	2	2	-	-	2	2
	M	23 66 031	Washer, Curved, Square, 3/4"	-	-	2	2	-	-	2	2
	N	23 66 135	Lock Washer - 3/4" Double Coil	-	-	2	2	-	-	2	2
	O	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	2	-	2	2	-	-	2	2
	P	23 56 088	Bracket, Crossarm, Double Sided NEMA	-	-	3	3	-	-	6	6
	Q	23 67 197	Bracket - Cable Support	3	3	3	3	6	6	6	6
	R	**42 44 12 02**	Termination, 35kV, 350 kcmil	45	-	45	-	90	-	90	-
		42 44 12 03	Termination, 35kV, 750 kcmil	-	45	-	45	-	90	-	90
	S	23 17 417	Guard - Wildlife, Cover, Termination, #1 to 750 kcmil	3	3	3	3	6	6	6	6
	T	23 53 004	Bolt, DA, 5/8" Dia x 20" w/ 4 square nuts	4	4	4	4	4	4	4	4
	U	23 65 012	Eyenut, 5/8"	1	1	1	1	1	1	1	1
	V	23 68 181	Shackle - Deadend	1	1	1	1	1	1	1	1
8	W	12 51 233	Coupling, Bell End, 5”	1	1	1	1	2	2	2	2
	X	12 01 303	Conduit - 5" Schedule 40 (ft.)	20	20	20	20	40	40	40	40
	Y	12 01 272	Conduit - 5" Schedule 80 (ft.)	10	10	10	10	20	20	20	20
	Z	12 51 206	Conduit - Bend 5", 36" Rad	1	1	1	1	2	2	2	2
	AA	23 06 087	Bracket - Standoff, 12"	3	3	3	3	-	-	-	-
		23 06 086	Bracket - Standoff, 20"	-	-	-	-	3	3	3	3
	AB	23 65 053	Nut - 5/8" Jam	3	3	3	3	3	3	3	3
	AC	23 67 184	Strap - Conduit 5" w/2" Bolts	3	3	3	3	6	6	6	6
	AD	23 17 207	Grip - Cable 1-3/4", 2" Dia	1	1	1	1	2	2	2	2
	AE	23 78 183	Clamp, Hot line #6 to 400 kcmil	3	3	3	3	3	3	3	3
	AF	17 54 132	Connector- Wire, 8-350 kcmil, CU	-	-	-	-	3	3	3	3
	AG	17 54 004	Connector - Split Bolt, #4 Sol CU - #8 Sol CU	3	3	3	3	3	3	3	3
	AH	18 51 052	Wire, Cu. 350 S.D., Covered	30	30	30	30	60	60	60	60
	AI	18 51 021	Wire, Cu. #6, S.D. Covered	25	25	25	25	50	50	50	50
	AJ	18 07 249	Cable, 35kV, 750 kcmil	45	-	45	-	90	-	90	-
		18 07 250	Cable, 35kV, 350 Kcmil	-	45	-	45	-	90	-	90
@	AK	**07 00 25 00**	Clamp, Parallel Groove, PG**	3	3	3	3	6	6	6	6
@	AL	10 01 137	Arrester, Lightning, 27kV	3	3	3	0	3	3	3	0
		10 01 199	Arrester, Lightning, 27kV Gapped	3	3	3	3	3	3	3	3
4,@	AM	**12 00 10 04**	Grounding Unit	1	1	1	1	1	1	1	1
3,@	AN	**14 00 20 ** @**	Riser Guard, Concrete	1	1	1	1	1	1	1	1
		279	Op Code, Install Cable Up Pole	3	3	3	3	6	6	6	6

DESIGN NOTE(s):

<11> On deadend construction, down guy may be too close to the center phase terminator. If so, select crossarm option to mount terminators and arresters.

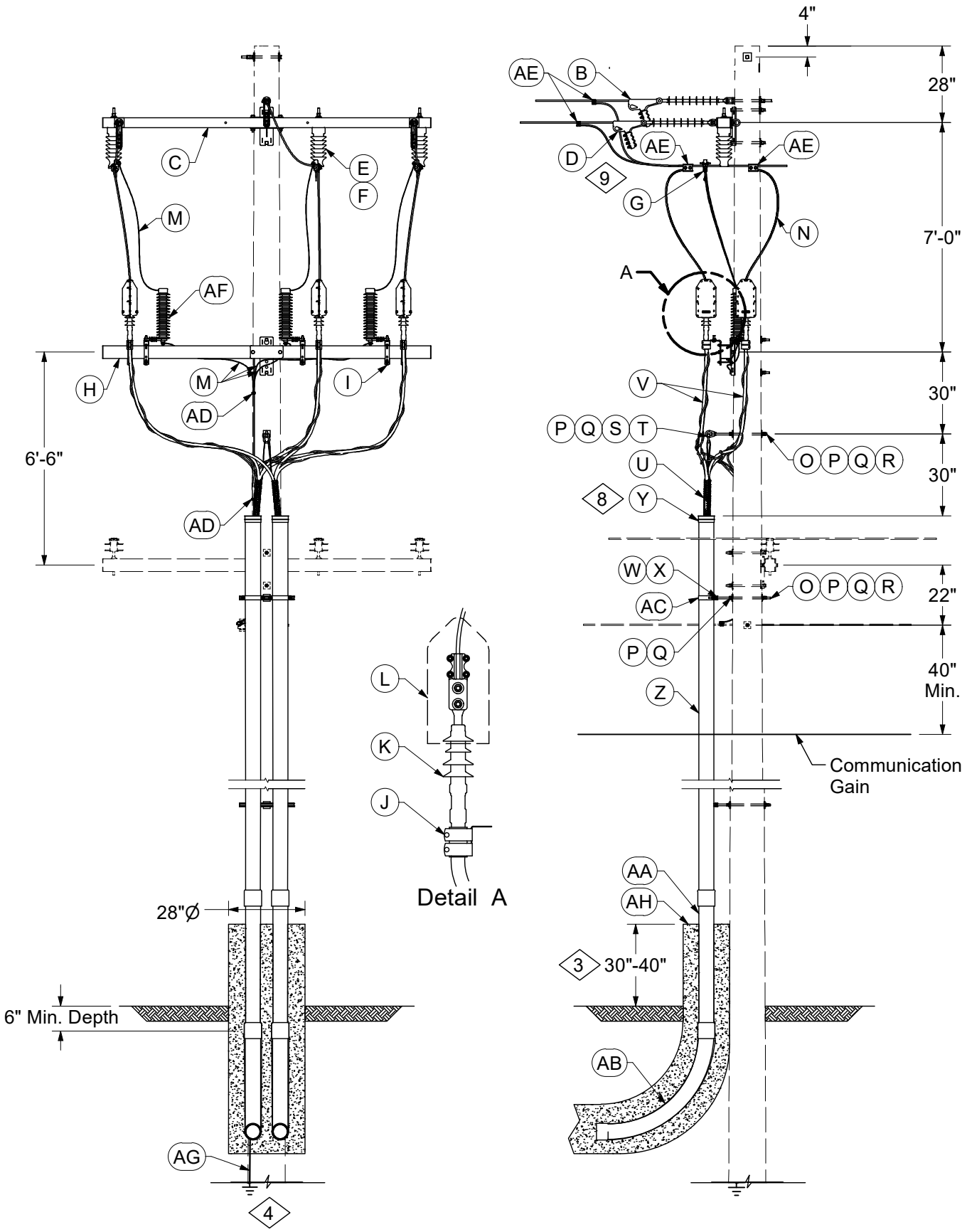
12. 69kV horizontal line post insulators may be substituted for 34kV insulators.

REV	DATE	ENG	DESCRIPTION
17	01/01/24	JMW	Converted to new format
16	07/07/15	HLH	

CABLE TERMINALS

Single Circuit Deadend
350 and 750 kcmil Cable, Parallel Riser

14 34 15 **
35kV
1 of 3



DISTRIBUTION
CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
15	01/01/24	JMW	Converted to new format
14	12/01/15	KSP	

DCS #	DESCRIPTION
14 34 15 01	350 kcmil Cable
14 34 15 02	750 kcmil Cable

CONSTRUCTION NOTE(s):

1. For cable lengths, measure the distance to the grip thru bolt located 4’-0" below the terminator bracket or crossarm and add the amounts shown.

2. Cable minimum bending radius is 24” for both of the 750 kcmil and 350 kcmil cables.

3. Concrete encasement should rise 30"-40" above grade.

4. Use DCS **12 00 10 03** for ground rod on existing poles.
   Use DCS **12 00 10 04** for ground coil application on new pole installation.

5. Always connect the metallic shields on the riser cables to the system neutral with at least a #2 stranded copper wire. Be aware that the bare and/or covered 7-strand #10 copperweld ground wire may look like stranded #2 copper wire. Never substitute the copperweld ground wire for the #2 stranded copper wire when constructing the primary neutral buss.

6. Stock #10 01 137 for grounded system; Stock #10 01 199 for ungrounded system.

7. Connect cable concentrics to pole ground wire. Connect pole ground to static and distribution system neutral if present.

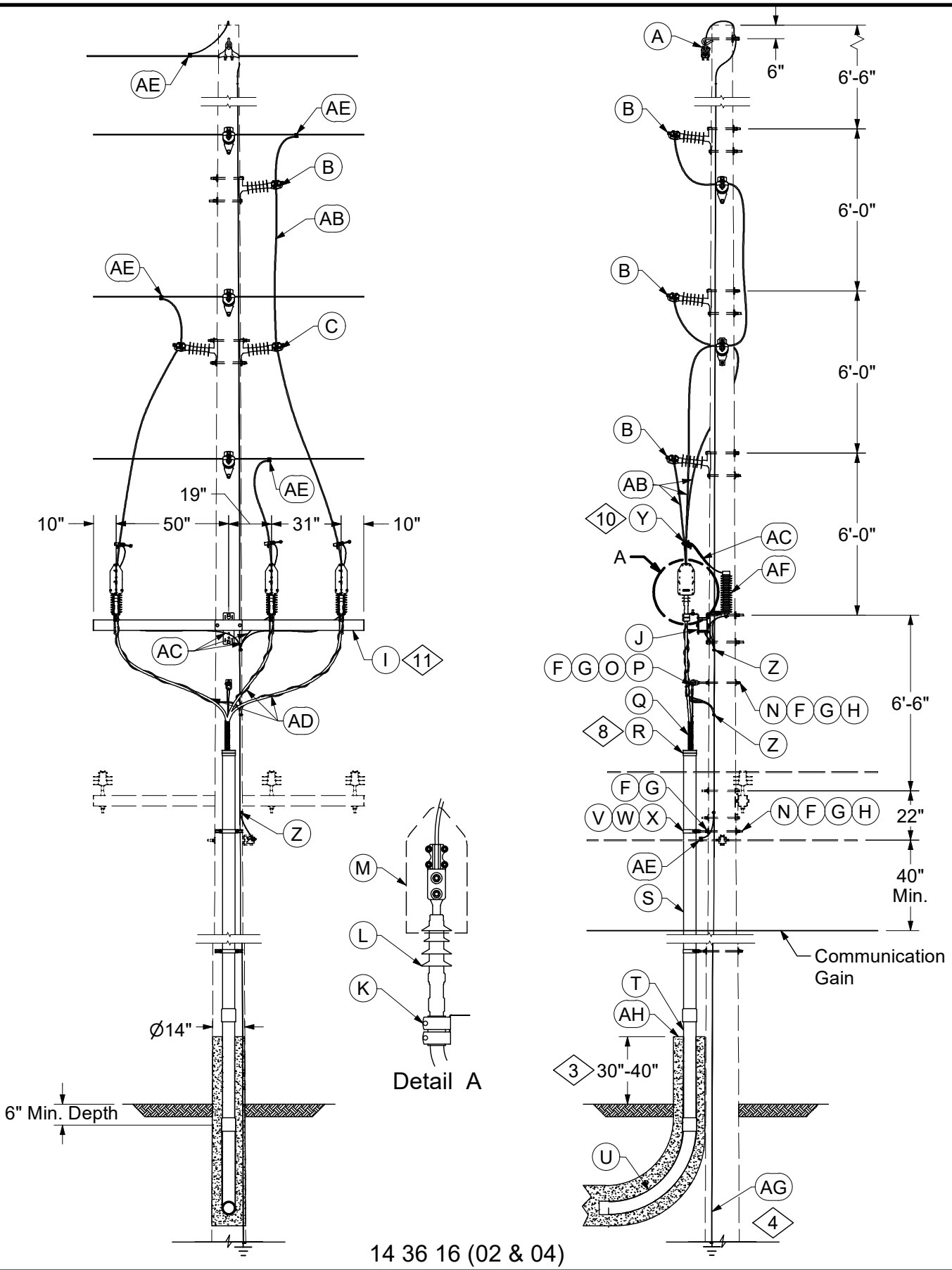
8. Install bell end fitting at top end of conduit to prevent cable damage. Conduit must be above distribution system crossarm, or the neutral clevis or secondary bracket. The NESC requires a minimum distance of 40" between the lowest point on the neutral/secondary bracket and the highest point of the communication hardware. The top of the conduit should be above the neutral. If abnormal clearances on pole require the top of the conduit to be below the neutral or secondary, the NESC requires 40" from the top of the conduit to the communication hardware.

9. Extend line conductor below crossarm to form bus.

REV	DATE	ENG	DESCRIPTION
15	01/01/24	JMW	Converted to new format
14	12/01/15	KSP	

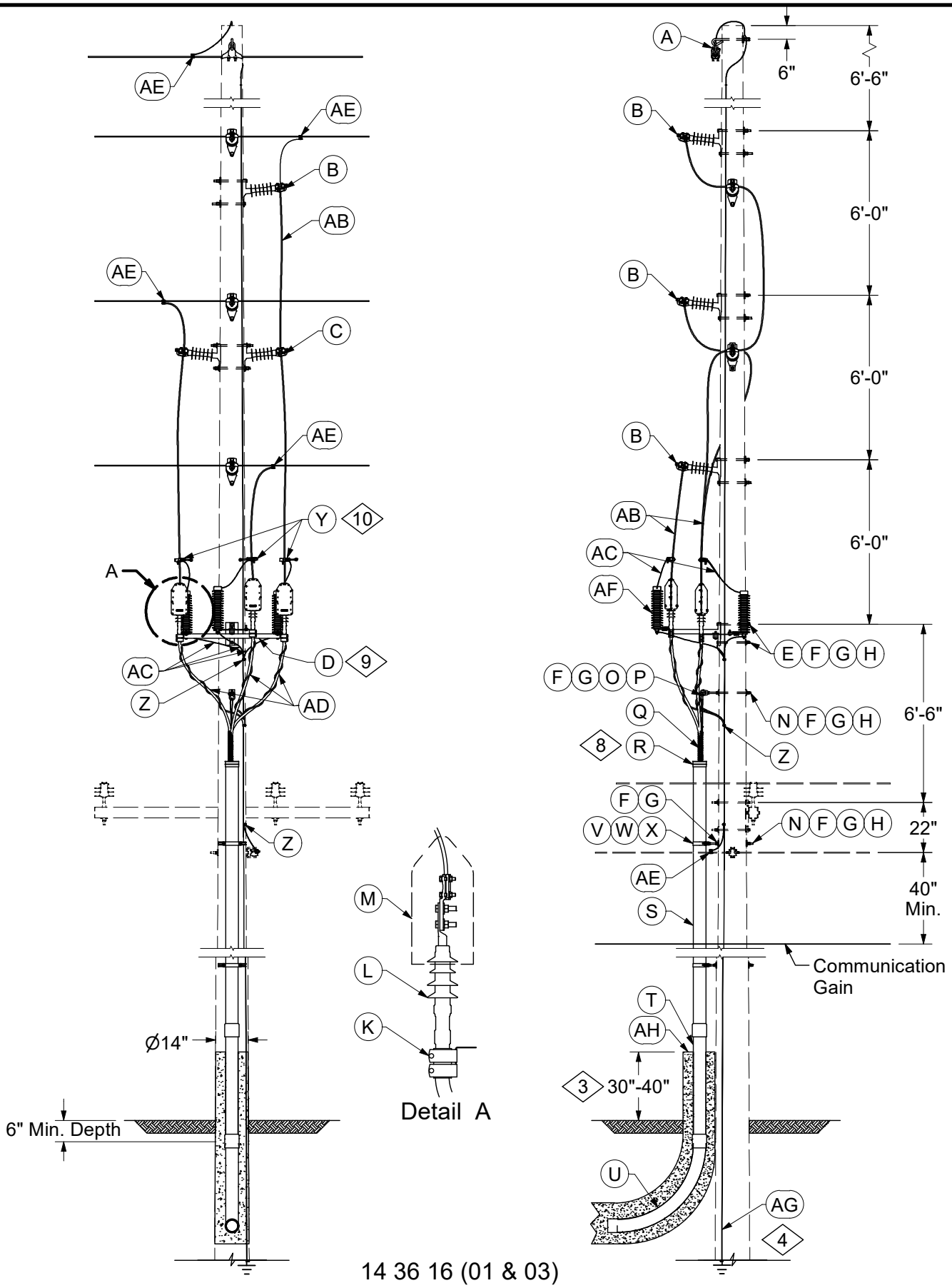
	ITEM	STK / DCS #	DESCRIPTION 14 34 15 **	01	02
	A	**06 00 11 08** @	Deadend Neutral	1	1
	B	**06 34 60 02** @	Deadend on Pole	1	1
	C	**04 00 42 03**	Crossarm, Deadend - 10'	1	1
	D	**06 34 68 11** @	Deadend on Crossarm	2	2
	E	25 05 064	Ins., L.P., 34kV, F Neck	3	3
	F	18 52 009	Tie for Bar Copper Cond.	3	3
	G	23 78 183	Clamp, Hot line #6 to 400 kcmil	3	3
	H	**04 00 41 16**	Crossarm, Tangent - 10'	1	1
	I	23 56 088	Bracket, Crossarm, Double Sided NEMA	6	6
	J	23 67 197	Bracket - Cable Support	6	6
	K	**42 44 12 02**	Termination, 35 kV, 350 kcmil	6	-
		42 44 12 03	Termination, 35 kV, 750 kcmil	-	6
	L	23 17 417	Guard - Wildlife, Cover, Termination, #1 to 750 kcmil	6	6
	M	18 51 021	Wire, Cu, #6 SD, Covered (ft.)	20	20
	N	18 51 052	Wire, Cu. 350 S.D., Covered (ft.)	30	30
	O	23 53 004	Bolt, DA, 5/8" Dia x 20" w/ 4 square nuts	4	4
	P	23 66 207	Washer, Curved, Square, 5/8"	8	8
	Q	23 66 134	Lock Washer - 5/8" Double Coil	8	8
	R	23 65 043	Lock Nut - 5/8" Square	4	4
	S	23 65 012	Eyenut, 5/8"	1	1
	T	23 68 181	Shackle - Deadend	1	1
	U	23 17 207	Grip - Cable 1-3/4", 2" Dia	2	2
	V	18 07 249	Cable, 35 kV 750 kcmil	-	95
		18 07 250	Cable, 35 kV 350 kcmil	95	-
	W	23 06 086	Bracket - Standoff, 20"	3	3
	X	23 65 053	Nut - 5/8" Jam	3	3
8	Y	12 51 233	Coupling, Bell End, 5”	2	2
	Z	12 01 303	Conduit - 5" Schedule 40 (ft.)	40	40
	AA	12 01 272	Conduit - 5" Schedule 80 (ft.)	20	20
	AB	12 51 206	Conduit - Bend 5", 36" Rad	2	2
	AC	23 67 184	Strap - Conduit 5" w/2" Bolts	2	2
	AD	17 54 004	Connector - Split Bolt, #4 Sol CU thru #8 Sol CU	3	3
@	AE	**07 00 25 00**	Clamp, Parallel Groove, PG**	9	9
@	AF	10 01 137	Arrester, Lightning, 27kV	3	3
		10 01 199	Arrester, Lightning, 27kV Gapped	3	3
4,@	AG	**12 00 10 03**	Grounding unit for existing pole	1	1
		12 00 10 04	Grounding unit for new pole	1	1
3,@	AH	**14 00 20** ** @	Riser Guard, Concrete	1	1
		279	Op Code, Install Cable Up Pole	6	6

REV	DATE	ENG	DESCRIPTION
15	01/01/24	JMW	Converted to new format
14	12/01/15	KSP	



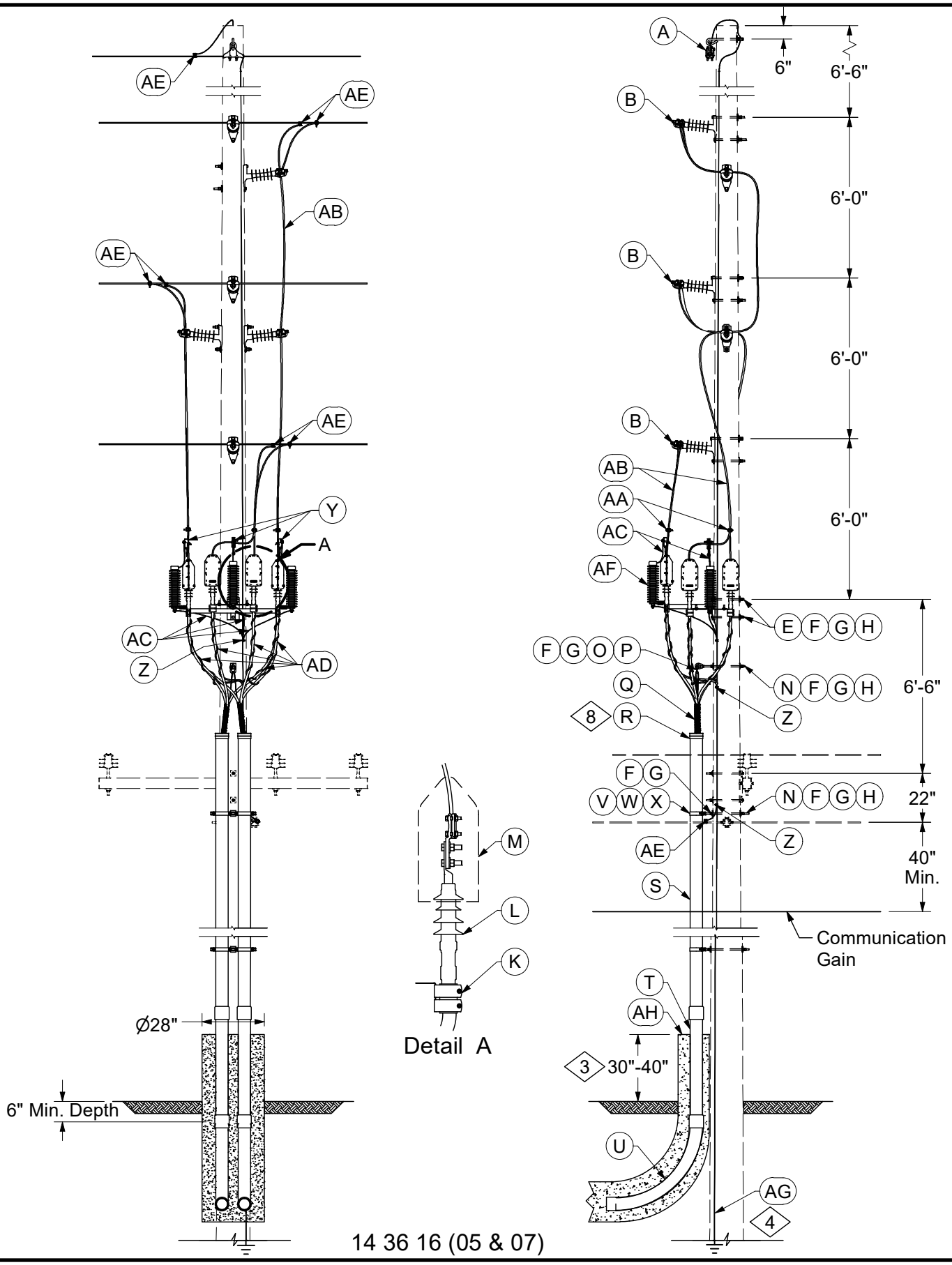
14 36 16 (02 & 04)

REV	DATE	ENG	DESCRIPTION
15	01/01/24	JMW	Converted to new format
14	08/12/15	HLH	



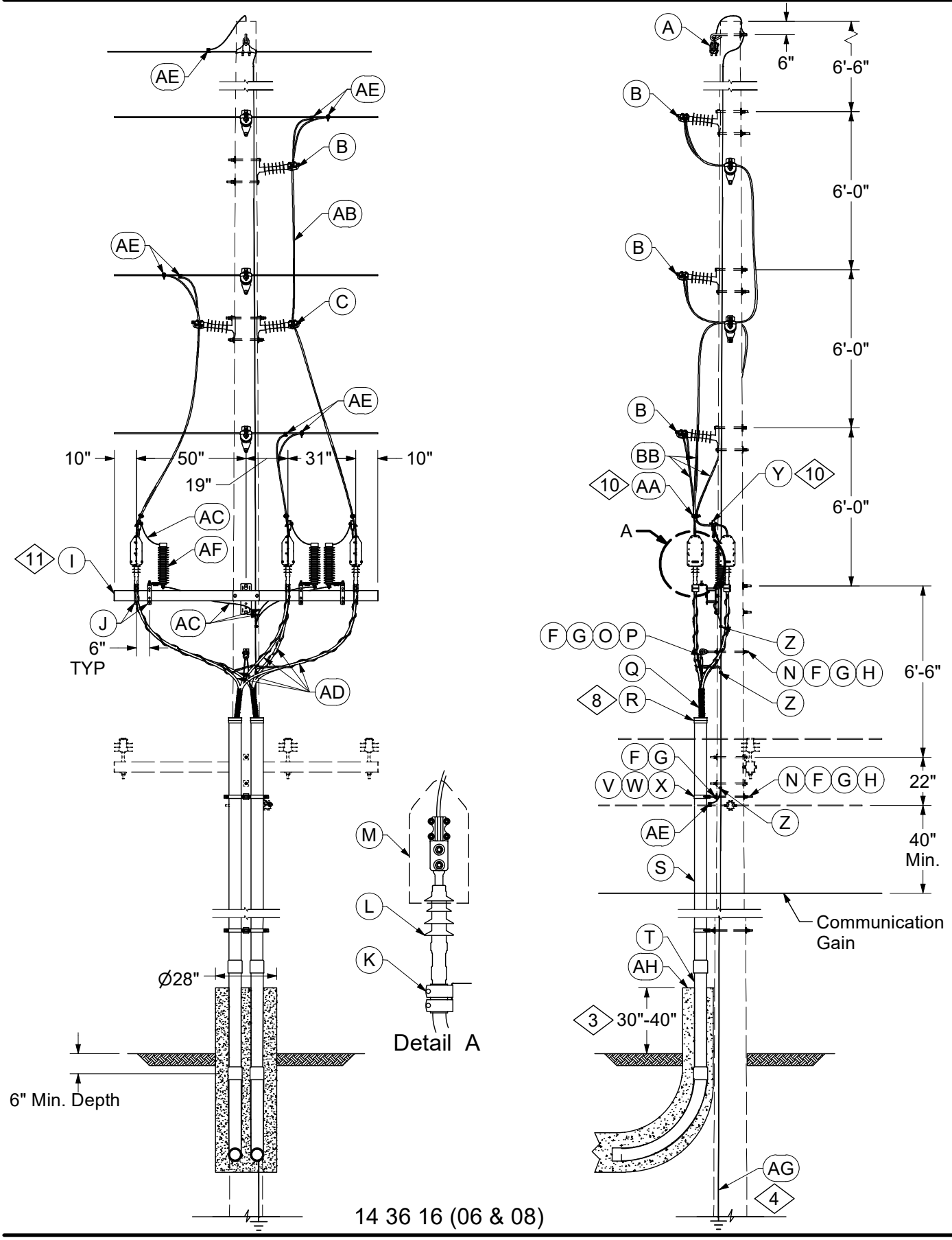
14 36 16 (01 & 03)

REV	DATE	ENG	DESCRIPTION
15	01/01/24	JMW	Converted to new format
14	08/12/15	HLH	



14 36 16 (05 & 07)

REV	DATE	ENG	DESCRIPTION
15	01/01/24	JMW	Converted to new format
14	08/12/15	HLH	



14 36 16 (06 & 08)

REV	DATE	ENG	DESCRIPTION
15	01/01/24	JMW	Converted to new format
14	08/12/15	HLH	

DCS #	DESCRIPTION
14 34 16 01	750 kcmil, Terminals on Bracket - Single Conduit
14 34 16 02	750 kcmil, Terminals on Crossarm - Single Conduit
14 34 16 03	350 kcmil, Terminals on Bracket - Single Conduit
14 34 16 04	350 kcmil, Terminals on Crossarm - Single Conduit
14 34 16 05	750 kcmil, Terminals on Bracket - Double Conduit
14 34 16 06	750 kcmil, Terminals on Crossarm - Double Conduit
14 34 16 07	350 kcmil, Terminals on Bracket - Double Conduit
14 34 16 08	350 kcmil, Terminals on Crossarm - Double Conduit

CONSTRUCTION NOTE(s):

1. For cable lengths, measure the distance to the grip thru bolt located 4'-0" below the terminator bracket or crossarm and add the amounts shown.

2. Cable minimum bending radius is 24" for both of the 750 kcmil and 350 kcmil cables.

◇3. Concrete encasement should rise 30"-40" above grade.

◇4. Use DCS **12 00 10 03** for ground rod on existing poles.
Use DCS **12 00 10 04** for ground coil application on new pole installation.

5. Always connect the metallic shields on the riser cables to the system neutral with at least a #2 stranded copper wire. Be aware that the bare and/or covered 7-strand #10 copperweld ground wire may look like stranded #2 copper wire. Never substitute the copperweld ground wire for the #2 stranded copper wire when constructing the primary neutral buss.

6. Stock #10 01 137 for grounded system; Stock #10 01 199 for ungrounded system.

7. Connect cable concentrics to pole ground wire. Connect pole ground to static and distribution system neutral if present.

◇8. Install bell end fitting at top end of conduit to prevent cable damage. Conduit must be above distribution crossarm, or the neutral clevis or secondary bracket.

◇9. Do not ground the termination bracket.

◇10. Strip poly cover for arrester connection and for joining parallel cable with two bolt connector.

	ITEM	STK / DCS #	DESCRIPTION 14 34 16 **	01	02	03	04	05	06	07	08
	A	**06 00 11 04** @	Static Support w/ Suspension Clamp	1	1	1	1	1	1	1	1
12	B	**06 34 03 03**	Insulator, Linepost, Polymer, Single	4	4	4	4	4	4	4	4
12	C	**06 34 03 06**	Insulator, Linepost, Polymer, Double	1	1	1	1	1	1	1	1
9	D	17 08 058	Bracket, Terminator	1	-	1	-	1	-	1	-
	E	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	2	-	2	-	2	-	2	-
	F	23 66 207	Washer, Curved, Square, 5/8"	10	10	10	10	10	10	10	10
	G	23 66 134	Lock Washer - 5/8" Double Coil	10	10	10	10	10	10	10	10
	H	23 65 043	Lock Nut - 5/8" Square	6	6	6	6	6	6	6	6
11	I	**04 00 41 16**	Crossarm - Tangent, F/G 10'	-	1	-	1	-	1	-	1
	J	23 56 088	Bracket - Crossarm Double Sided NEMA	-	3	-	0	-	6	-	6
	K	23 67 197	Bracket - Cable Support	3	3	3	3	6	6	6	6
	L	**42 44 12 03**	Termination, 35 kV, 750 kcmil	3	3	-	-	6	6	-	-
		42 44 12 02	Termination, 35 kV, 350 kcmil	-	-	3	3	-	-	6	6

REV	DATE	ENG	DESCRIPTION
15	01/01/24	JMW	Converted to new format
14	08/12/15	HLH	

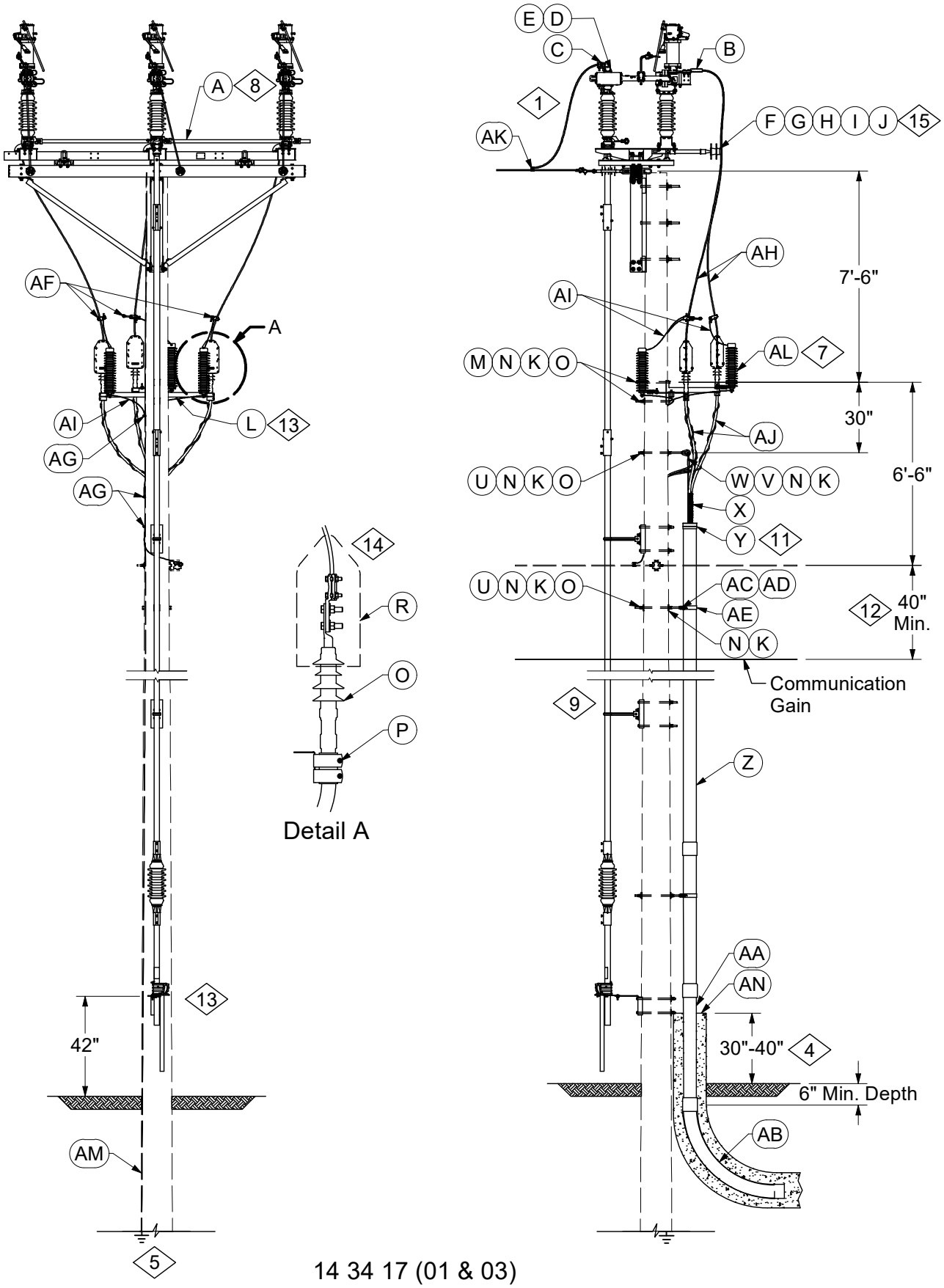
	ITEM	STK / DCS #	DESCRIPTION 14 34 16 **	01	02	03	04	05	06	07	08
	M	23 17 417	Guard - Wildlife, Cover, Termination, #1 to 750 kcmil	3	3	3	3	6	6	6	6
	N	23 53 004	Bolt, DA, 5/8" Dia x 20" w/ 4 square nuts	4	4	4	4	4	4	4	4
	O	23 65 012	Eyenut, 5/8"	1	1	1	1	1	1	1	1
	P	23 68 181	Shackle - Deadend	1	1	1	1	1	1	1	1
	Q	23 17 207	Grip - Cable 1-3/4", 2" Dia	1	1	1	1	2	2	2	2
8	R	12 51 233	Coupling, Bell End, 5”	1	1	1	1	2	2	2	2
	S	12 01 303	Conduit - 5" Schedule 40 (ft.)	20	20	20	20	40	40	40	40
	T	12 01 272	Conduit - 5" Schedule 80 (ft.)	10	10	10	10	20	20	20	20
	U	12 51 206	Conduit - Bend 5", 36" Rad	1	1	1	1	2	2	2	2
	V	23 06 087	Bracket - Standoff, 12"	3	3	3	3	-	-	-	-
		23 06 086	Bracket - Standoff, 20"	-	-	-	-	3	3	3	3
	W	23 65 053	Nut - 5/8" Jam	3	3	3	3	3	3	3	3
	X	23 67 184	Strap - Conduit 5" w/2" Bolts	3	3	3	3	3	3	3	3
	Y	23 78 183	Clamp, Hot line #6 to 400 kcmil	3	3	3	3	3	3	3	3
	Z	17 54 004	Connector - Split Bolt, #4 Sol CU thru #8 Sol CU	4	4	4	4	4	4	4	4
	AA	17 54 132	Connector - Wire, 8-350 kcmil, CU	-	-	-	-	3	3	3	3
	AB	18 51 052	Wire, Cu. 350 S.D., Covered	30	30	30	30	60	60	60	60
	AC	18 51 021	Wire, Cu. #6, S.D. Covered	25	25	25	25	50	50	50	50
	AD	18 07 249	Cable, 35kV, 750 kcmil	45	45	-	-	90	90	-	-
		18 07 250	Cable, 35kV, 350 kcmil	-	-	45	45	-	-	90	90
@	AE	**07 00 25 00**	Clamp, Parallel Groove, PG**	3	3	3	3	6	6	6	6
@	AF	10 01 137	Arrester, Lightning, 27kV	3	3	0	0	3	3	3	3
		10 01 199	Arrester, Lightning, 27kV Gapped	3	3	3	3	3	3	3	3
4,@	AG	**12 00 10 03**	Grounding Unit for Existing Pole	1	1	1	1	1	1	1	1
		12 00 10 04	Grounding Unit for New Pole	1	1	1	1	1	1	1	1
3,@	AH	**14 00 20 ** @**	Riser Guard, Concrete	1	1	1	1	1	1	1	1
		279	Op Code, Install Cable Up Pole	3	3	3	3	6	6	6	6

DESIGN NOTE(s):

11. On deadend construction, down guy may be too close to the center phase terminator. If so, select crossarm option to mount terminators and arresters.

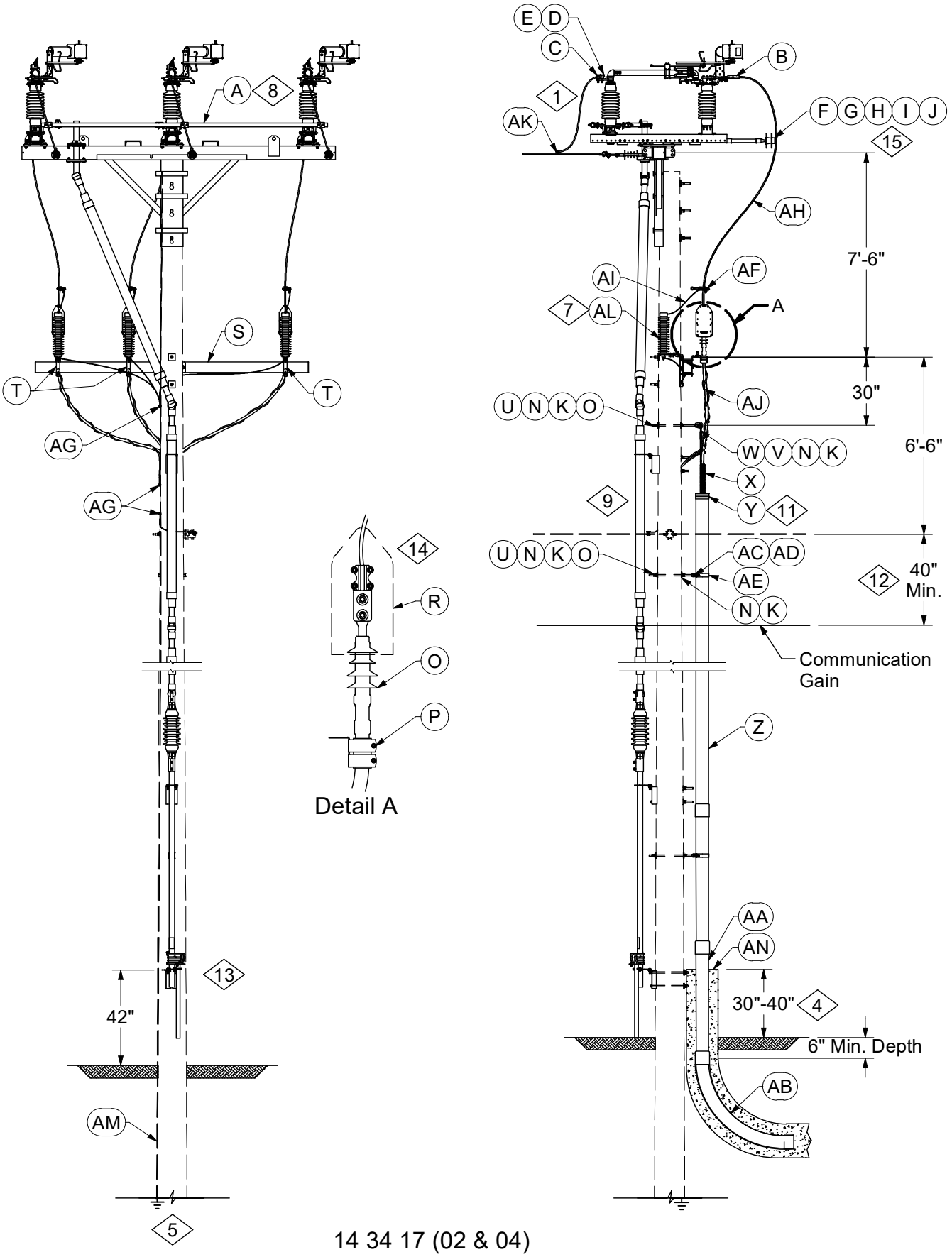
12. 69kV horizontal line post insulators may be submitted for 34kV insulators.

REV	DATE	ENG	DESCRIPTION
15	01/01/24	JMW	Converted to new format
14	08/12/15	HLH	



14 34 17 (01 & 03)

REV	DATE	ENG	DESCRIPTION
13	01/01/24	JMW	Converted to new format
12	12/15/15	WYW	



14 34 17 (02 & 04)

REV	DATE	ENG	DESCRIPTION
13	01/01/24	JMW	Converted to new format
12	12/15/15	WYW	

DCS #	DESCRIPTION
14 34 17 01	Turner Switch w/ 750 kcmil, Terminals on Bracket
14 34 17 02	Seeco Switch w/ 750 kcmil, Terminals on Crossarm
14 34 17 03	Turner Swtich w/ 350 kcmil, Terminals on Bracket
14 34 17 04	Seeco Switch w/ 350 kcmil, Terminals on Crossarm

CONSTRUCTION NOTE(s):

1. Use line conductor for leads to source on top of switch. Connect with aluminum compression lugs.

2. Extend PVC riser to 12” above operating rod insulator.

3. The minimum bending radius is 24” for both the 750 kcmil and 350 kcmil cables.

4. Concrete encasement should rise 30"-40" above grade.

5. Use DCS **12 00 10 03** for ground rod application on existing pole and DCS **12 69 11 ****** for ground new pole installation.

6. Always connect the metallic shields of the riser cables to the system neutral with at least a #2 stranded copper wire. Be aware that the bare and/or covered 7-strand #10 copperweld ground wire may look like stranded #2 copper wire. Never substitute the copperweld ground wire for the #2 stranded copper wire when constructing the primary neutral buss.

7. Stock #10 01 137 - Arrester for grounded system.
Stock #10 01 199 - Arrester for ungrounded system.

8. Turner TS2 weight - 1000 #
Seeco weight - 1150 #

9. Order additional vertical steel pipe only if needed. Use Stock #32 01 821.

10. If there is no system neutral or shield wire available, install a pole ground per DCS **12 00 10 03** and bond all shields and ground wires to the #2 Cu wire.

11. Install bell end fitting at top end of conduit to prevent cable damage.

12. Conduit must be above distribution system crossarm, or the neutral clevis or secondary bracket. The NESC requires a minimum distance of 40" between the lowest point on the neutral/secondary bracket and the highest point of the communication hardware. The top of the conduit should be above the neutral. If abnormal clearances on pole require the top of the conduit to be below the neutral or secondary, the NESC requires 40" from the top of the conduit to the communication hardware.

13. Do not ground switch or terminator bracket. Ground switch handle.

14. Omit grounding stud and use regular hardware. Place cover over connectors.

15. Mount pin insulator supports horizontally to switch frame to support leads from switch to terminators.

REV	DATE	ENG	DESCRIPTION
13	01/01/24	JMW	Converted to new format
12	12/15/15	WYW	

	ITEM	STK / DCS #	DESCRIPTION 14 34 17 **	01	02	03	04
8	A	54 08 437	Turner TSB Switch, 34kV, 1200A w/LBRK-Flat Top Mount	1	-	1	-
		54 08 447	Seeco, Three Phase with LBRK – Flat Top Mount	-	1	-	1
	B	17 54 955	Lug, 1/0 – 500 Cu.	3	3	3	3
1	C	**07 00 30 00**	Lug, Compression, AL, 4 hole pad	3	3	3	3
	D	21 56 078	Bolt, 1/2" X 2", 304 SS, HEX	12	12	12	12
	E	12 56 052	Washer, Belleville Spring, 1/2", SS	12	12	12	12
	F	23 62 115	Pin - Insulator, Pole Top, 30"	3	3	3	3
	G	25 05 069	Insulator, Pin Type, 12kV	3	3	3	3
	H	18 52 009	Tie, Hand For CU	3	3	3	3
	I	23 52 049	Bolt, Mach., 5/8" x 2" w/ square nut	3	3	3	3
	J	23 52 200	Bolt, Mach., 5/8" x 4" w/ square nut	3	3	3	3
	K	23 66 134	Lock Washer - 5/8" Double Coil	16	16	16	16
	L	17 08 058	Arrester, Bracket - L.A. and Pothead	1	-	1	-
	M	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	2	1	2	1
	N	23 66 207	Washer, Curved, Square, 5/8"	10	8	10	8
	O	23 65 043	Lock Nut - 5/8" Square	6	4	6	4
	P	23 67 197	Bracket - Cable Support	3	3	3	3
	Q	**42 44 12 03**	Termination, 35 kV, 750 kcmil	1	1	-	-
		42 44 12 02	Termination, 35 kV, 350 kcmil	-	-	1	1
	R	23 17 417	Guard - Wildlife, Cover, Termination, #1 to 750 kcmil	3	3	3	3
	S	**04 00 41 16**	Crossarm - Tangent, F/G 10'	-	1	-	1
	T	23 56 088	Bracket, Crossarm, Double Sided NEMA	-	3	-	3
	U	23 53 004	Bolt, DA, 5/8" Dia x 20" w/ 4 square nuts	4	4	4	4
	V	23 65 012	Eyenut, 5/8"	1	1	1	1
	W	23 68 181	Shackle - Deadend	1	1	1	1
	X	23 17 207	Grip - Cable 1-3/4", 2" Dia	1	1	1	1
11	Y	12 51 233	Coupling, Bell End, 5”	1	1	1	1
	Z	12 01 303	Conduit - 5" Schedule 40 (ft.)	20	20	20	20
	AA	12 01 272	Conduit - 5" Schedule 80 (ft.)	10	10	10	10
	AB	12 51 206	Conduit - Bend 5", 36" Rad	1	1	1	1
	AC	23 06 087	Bracket - Standoff, 12"	3	3	3	3
	AD	23 65 053	Nut - 5/8" Jam	3	3	3	3
	AE	23 67 184	Strap - Conduit 5" w/2" Bolts	3	3	3	3
	AF	23 78 183	Clamp, Hot line #6 to 400 kcmil	3	3	3	3
	AG	17 54 004	Connector - Split Bolt, #4 Sol CU thru #8 Sol CU	3	3	3	3
	AH	18 51 032	Wire, Cu. 350 S.D., Covered (ft)	30	30	30	30
	AI	18 51 021	Wire, Cu. #6, S.D. Covered (ft)	25	25	25	25
	AJ	18 07 249	Cable, 35kV, 750 kcmil (ft)	45	45	-	-
		18 07 250	Cable, 35kV, 350 kcmil (ft)	-	-	45	45
	AK	**07 00 25 00**	Clamp, Parallel Groove, PG**	4	4	4	4
7,@	AL	10 01 137	Arrester, Lightning, 27kV	3	3	3	3
		10 01 199	Arrester, Lightning, 27kV Gapped	3	3	3	3

REV	DATE	ENG	DESCRIPTION
13	01/01/24	JMW	Converted to new format
12	12/15/15	WYW	

	ITEM	STK / DCS #	DESCRIPTION 14 34 17 **	01	02	03	04
5,@	AM	**12 00 10 03**	Grounding unit for existing pole	1	1	1	1
		12 00 10 04	Grounding unit for new pole	1	1	1	1
4,@	AN	**14 00 20 ** @**	Riser Guard, Concrete	1	1	1	1
		279	Op Code, Install Cable Up Pole	3	3	3	3

DESIGN NOTE(s):

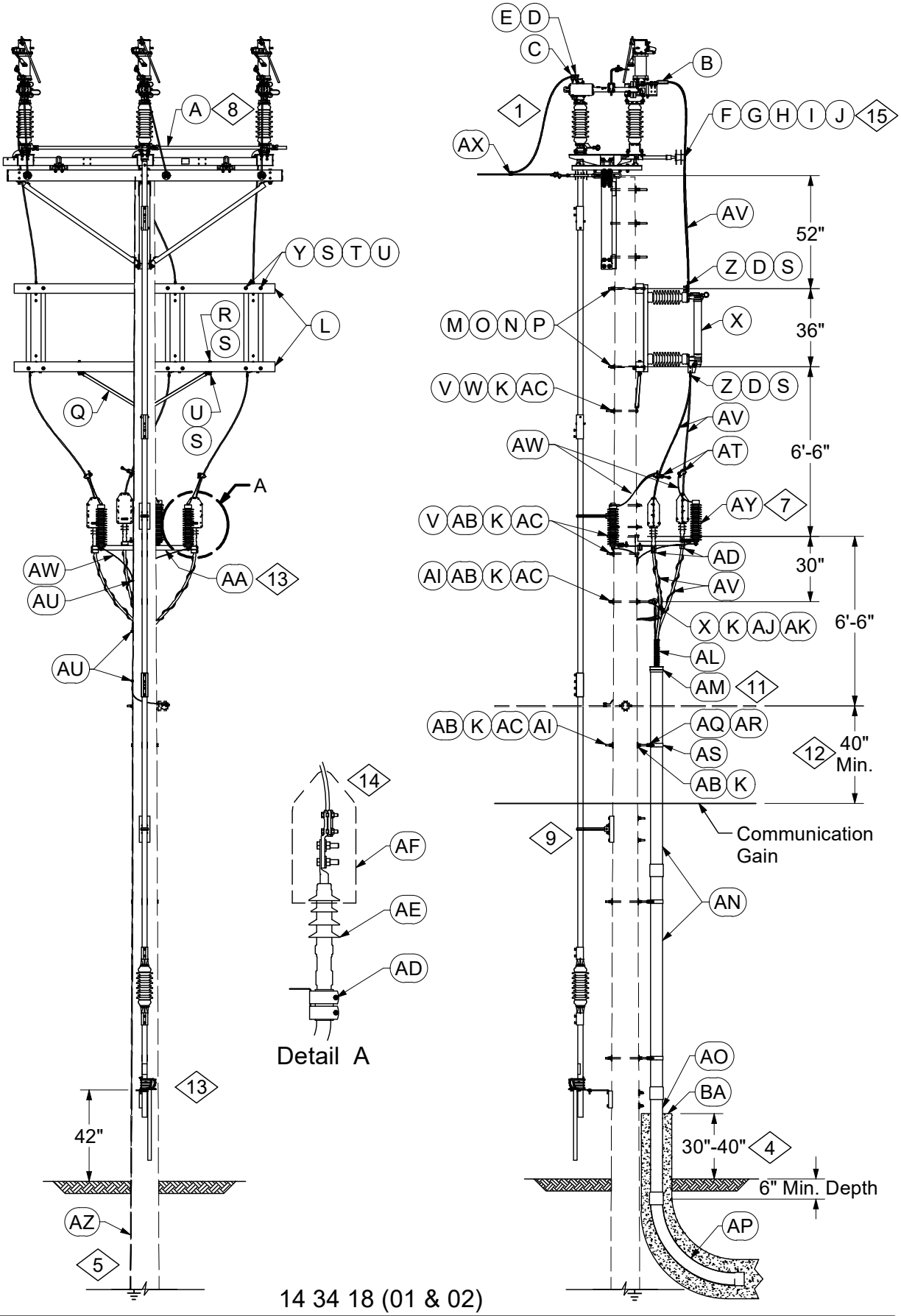
16. Maximum deadend tension per phase is: Turner = 300 lbs.
Seeco = 1,000 lbs.

REV	DATE	ENG	DESCRIPTION
13	01/01/24	JMW	Converted to new format
12	12/15/15	WYW	

CABLE TERMINALS

Switched Cable Terminal, Dead End
1/0 Cable

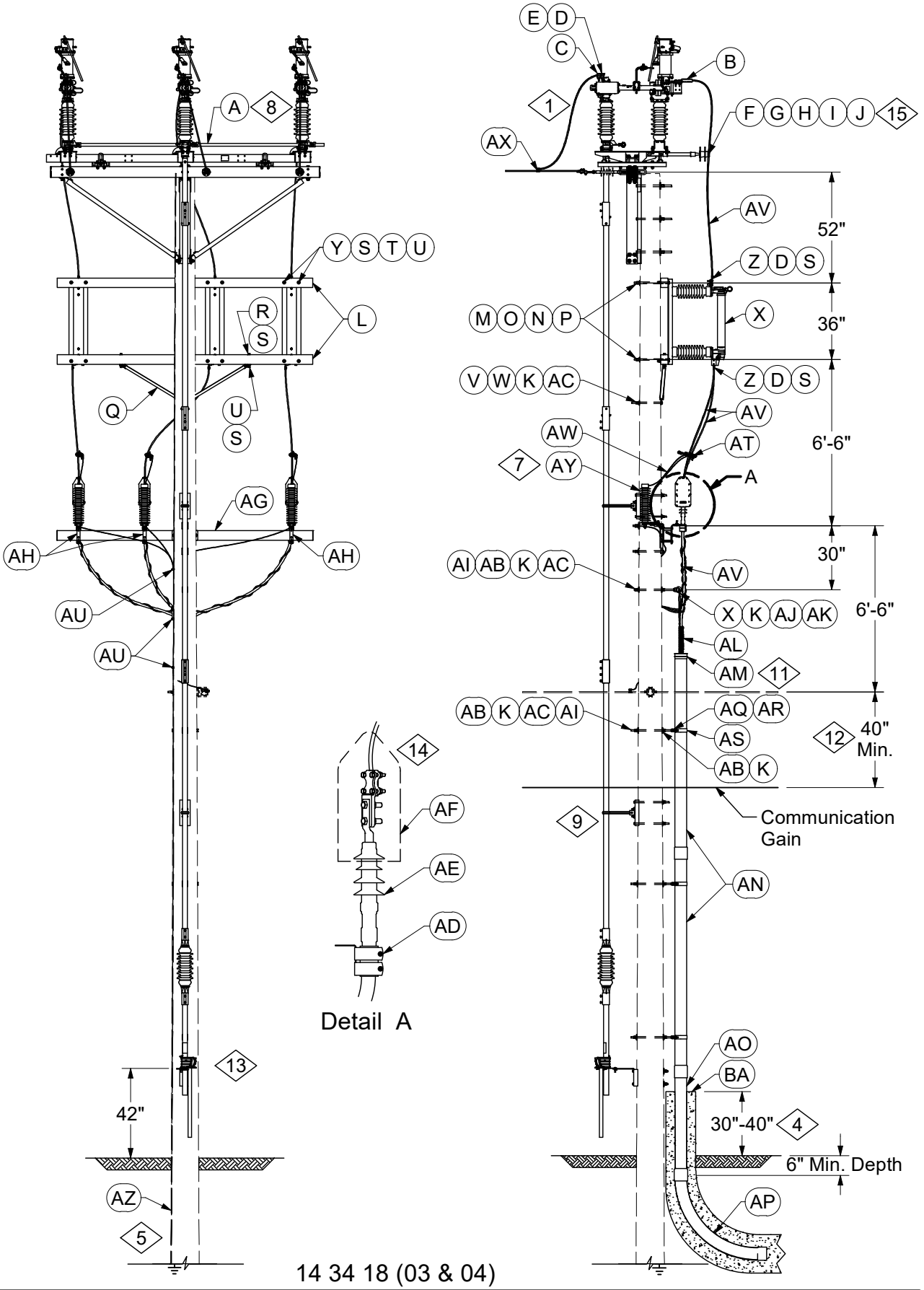
14 34 18 **
35kV
1 of 5



14 34 18 (01 & 02)

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
8	01/01/24	JMW	Converted to new format
7	12/15/15	WYW	



14 34 18 (03 & 04)

REV	DATE	ENG	DESCRIPTION
8	01/01/24	JMW	Converted to new format
7	12/15/15	WYW	

DCS #	DESCRIPTION
14 34 18 01	Turner Switch w/ Terminations on Bracket
14 34 18 02	Seeco Switch w/ Terminations on Bracket
14 34 18 03	Turner Switch w/ Terminations on Crossarm
14 34 18 04	Seeco Switch w/ Terminations on Crossarm

CONSTRUCTION NOTE(s):

1. Use line conductor for leads to source on top of switch. Connect with aluminum lugs.
2. Extend PVC riser to 12” above operating rod insulator.
3. The minimum bending radius is 24” for both the 750 kcmil and 350 kcmil cables.
4. Concrete encasement should rise 30"-40" above grade.
5. Use DCS **12 00 10 03** for ground rod application on existing pole and DCS **12 69 11 ****** for ground new pole installation.
6. Always connect the metallic shields of the riser cables to the system neutral with at least a #2 stranded copper wire. Be aware that the bare and/or covered 7-strand #10 copperweld ground wire may look like stranded #2 copper wire. Never substitute the copperweld ground wire for the #2 stranded copper wire when constructing the primary neutral bus.
7. Stock #10 01 137 - Arrester for grounded system.
   Stock #10 01 199 - Arrester for ungrounded system.
8. Turner TS2 weight - 1000 #
   Seeco weight - 1150 #
9. Order additional vertical steel pipe only if needed. Use Stock #32 01 821.
10. If there is no system neutral or shield wire available, install a pole ground per DCS **12 00 10 03** and bond all shields and ground wires to the #2 Cu wire.
11. Install bell end fitting at top end of conduit to prevent cable damage.
12. Conduit must be above distribution system crossarm, or the neutral clevis or secondary bracket. The NESC requires a minimum distance of 40" between the lowest point on the neutral/secondary bracket and the highest point of the communication hardware. The top of the conduit should be above the neutral. If abnormal clearances on pole require the top of the conduit to be below the neutral or secondary, the NESC requires 40" from the top of the conduit to the communication hardware.
13. Do not ground switch or terminator bracket. Ground switch handle.
14. Omit grounding stud and use regular hardware. Place cover over connectors.
15. Mount pin insulator supports horizontally to switch frame to support leads from switch to terminators.

REV	DATE	ENG	DESCRIPTION
8	01/01/24	JMW	Converted to new format
7	12/15/15	WYW	

	ITEM	STK / DCS #	DESCRIPTION 14 34 18 **	01	02	03	04
8	A	54 08 437	Turner TSB Switch, 34kV, 1200A w/LBRK-Flat Top Mount	1	-	1	-
		54 08 447	Seeco, Three Phase with LBRK – Flat Top Mount	-	1	-	1
	B	17 54 955	Lug, 1/0 − 500 Cu.	3	3	3	3
1	C	**07 00 30 00**	Lug, Compression, AL, 4 Hole Pad	3	3	3	3
	D	21 56 078	Bolt, 1/2" X 2", 304 SS, HEX	12	12	12	12
	E	12 56 052	Washer, Belleville Spring, 1/2", SS	12	12	12	12
	F	23 62 115	Pin - Insulator, Pole Top, 30"	3	3	3	3
	G	25 05 069	Insulator, Pin Type, 12kV	3	3	3	3
	H	18 52 009	Tie, Hand For CU	3	3	3	3
	I	23 52 049	Bolt, Mach., 5/8" x 2" w/ square nut	3	3	3	3
	J	23 52 200	Bolt, Mach., 5/8" x 4" w/ square nut	3	3	3	3
	K	23 66 134	Lock Washer - 5/8" Double Coil	11	11	11	11
	L	41 01 008	10' Crossarm - 3-1/2" x 4-1/2"	2	2	2	2
	M	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	2	2	2	2
	N	23 66 135	Lock Washer - 3/4" Double Coil	2	2	2	2
	O	23 66 131	Washer, Square, 3/4"	2	2	2	2
	P	23 65 042	Lock Nut - 3/4" Square	2	2	2	2
	Q	41 56 016	Brace - 60" V	2	2	2	2
	R	23 52 038	Bolt, Mach., 1/2" x 6" w/ square nut	2	2	2	2
	S	23 66 017	Washer - Round 1/2"	16	16	16	16
	T	23 66 133	Lock Washer - Double Coil 1/2"	14	14	14	14
	U	23 65 056	Lock Nut - 1/2" Square	14	14	14	14
	V	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	1	1	1	1
	W	23 66 027	Washer, Flat, Square 5/8"	1	1	1	1
	X	54 03 051	Switch, 15kV, SM-5 Fuse Mounting, 400A	3	3	3	3
	Y	23 52 036	Bolt, Mach., 1/2" x 5" w/ square nut	12	12	12	12
	Z	17 55 297	Lug - Comp., 1/0 Cu.	6	6	6	6
	AA	17 08 058	Arrester, Bracket - L.A. and Pothead	1	1	-	-
	AB	23 66 207	Washer, Curved, Square, 5/8"	10	10	10	10
	AC	23 65 043	Lock Nut - 5/8" Square	6	6	6	6
	AD	23 67 197	Bracket - Cable Support	3	3	3	3
	AE	**42 44 12 05**	Termination, 35 kV, 1/0	3	3	3	3
	AF	23 17 417	Guard - Wildlife, Cover, Termination, #1 to 750 kcmil	3	3	3	3
	AG	**04 00 41 16**	Crossarm - Tangent, F/G 10'	-	-	1	1
	AH	23 56 088	Bracket, Crossarm, Double Sided NEMA	-	-	3	3
	AI	23 53 004	Bolt, DA, 5/8" Dia x 20" w/ 4 square nuts	4	4	4	4
	AJ	23 65 012	Eyenut, 5/8"	1	1	1	1
	AK	23 68 181	Shackle - Deadend	1	1	1	1
	AL	23 17 207	Grip - Cable 1-3/4", 2" Dia	1	1	1	1
11	AM	12 51 233	Coupling, Bell End, 5”	1	1	1	1
	AN	12 01 303	Conduit - 5" Schedule 40 (ft.)	20	20	20	20
	AO	12 01 272	Conduit - 5" Schedule 80 (ft.)	10	10	10	10
	AP	12 51 206	Conduit - Bend 5", 36" Rad	1	1	1	1

REV	DATE	ENG	DESCRIPTION
8	01/01/24	JMW	Converted to new format
7	12/15/15	WYW	

	ITEM	STK / DCS #	DESCRIPTION 14 34 18 **	01	02	03	04
	AQ	23 06 087	Bracket - Standoff, 12"	3	3	3	3
	AR	23 65 053	Nut - 5/8" Jam	3	3	3	3
	AS	23 67 184	Strap - Conduit 5" w/2" Bolts	3	3	3	3
	AT	23 78 183	Clamp, Hot line #6 to 400 kcmil	3	3	3	3
	AU	17 54 004	Connector - Split Bolt, #4 Sol CU thru #8 Sol CU	5	5	5	5
	AV	18 51 024	Wire, 1/0 Cu, S.D. Covered (ft)	50	50	50	50
	AW	18 51 021	Wire, Cu. #6, S.D. Covered (ft)	25	25	25	25
@	AX	**07 00 25 00**	Clamp, Parallel Groove, PG**	4	4	4	4
7,@	AY	10 01 137	Arrester, Lightning, 27kV	3	3	3	3
		10 01 199	Arrester, Lightning, 27kV Gapped	3	3	3	3
5,@	AZ	**12 00 10 03**	Grounding Unit for existing pole	1	1	1	1
		12 00 10 04	Grounding Unit for new pole	1	1	1	1
4,@	BA	**14 00 20 ** @**	Riser Guard, Concrete	1	1	1	1
		279	Op Code, Install Cable Up Pole	3	3	3	3

DESIGN NOTE(s):

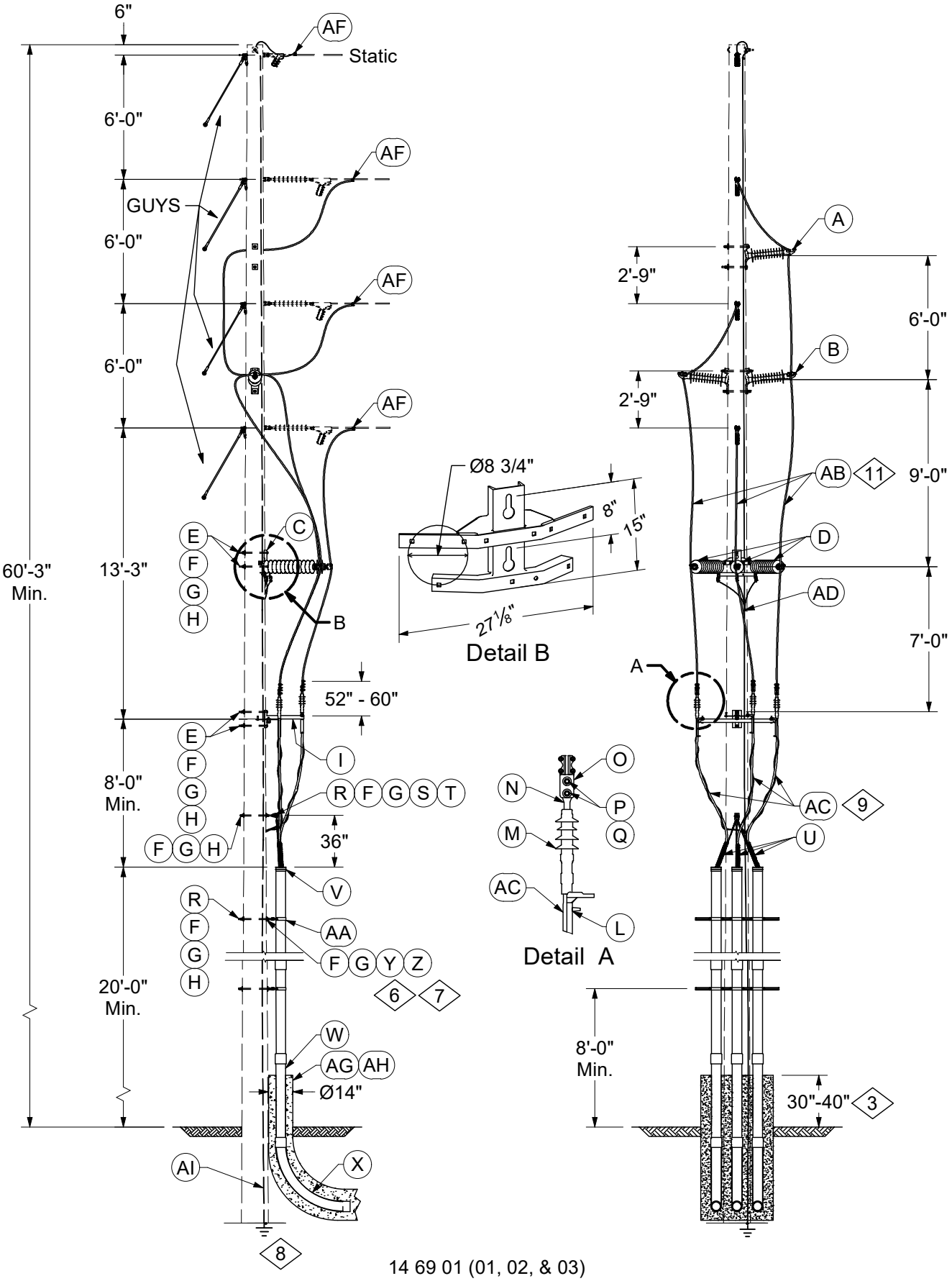
16. Maximum deadend tension per phase is: Turner = 300 lbs.
Seeco = 1,000 lbs.

CABLE TERMINALS

Terminal Pole

500 - 1000 kcmil Cables

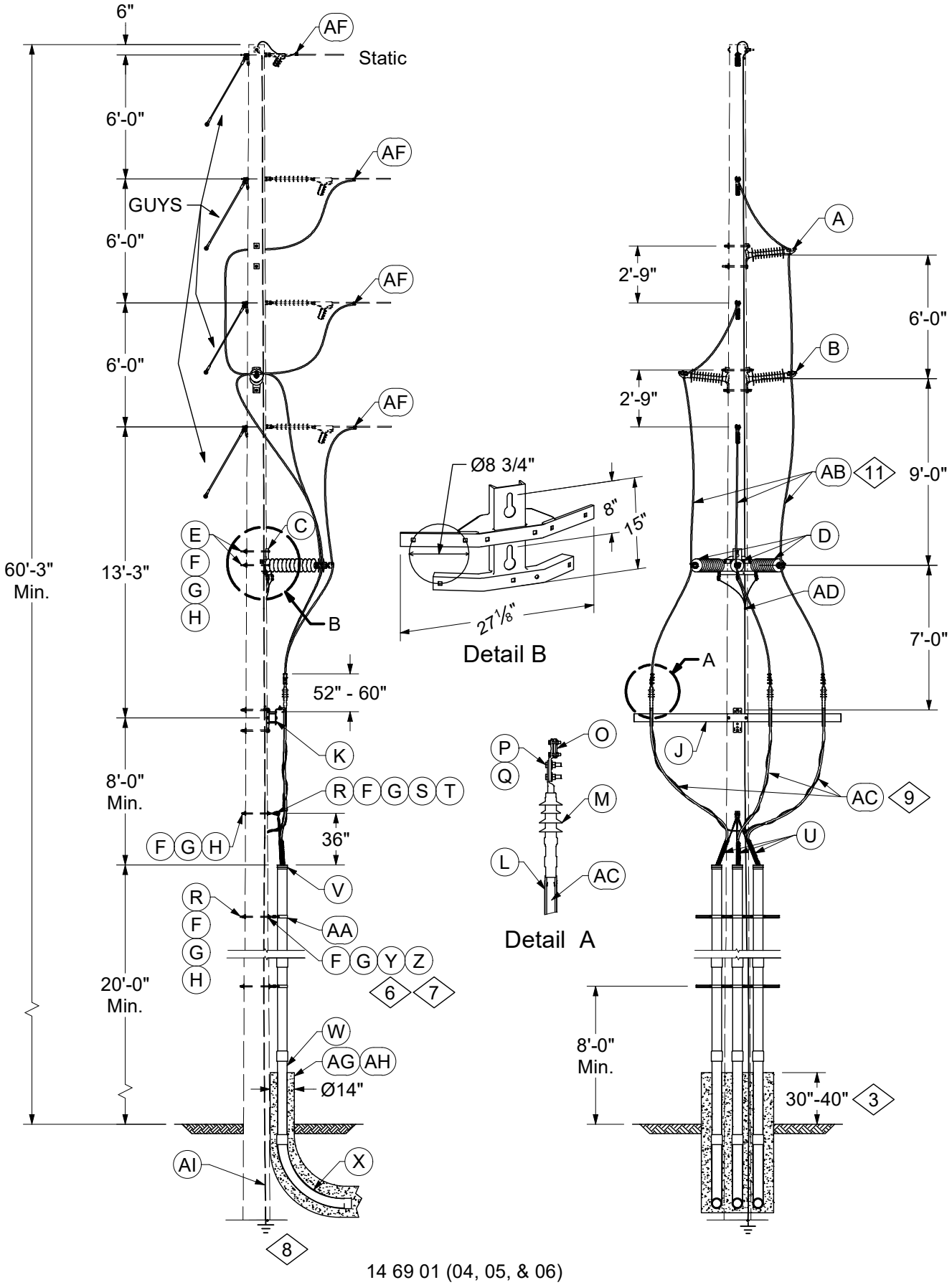
14 69 01 **
69kV
1 of 4



14 69 01 (01, 02, & 03)

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
7	01/01/24	JMW	Converted to new format
6	08/12/15	HLH	



14 69 01 (04, 05, & 06)

REV	DATE	ENG	DESCRIPTION
7	01/01/24	JMW	Converted to new format
6	08/12/15	HLH	

DCS #	DESCRIPTION
14 69 01 01	500 kcmil Terminations on Mounting Bracket
14 69 01 02	750 kcmil Terminations on Mounting Bracket
14 69 01 03	1000 kcmil Terminations on Mounting Bracket
14 69 01 04	500 kcmil Terminations on Crossarm
14 69 01 05	750 kcmil Terminations on Crossarm
14 69 01 06	1000 kcmil Terminations on Crossarm

CONSTRUCTION NOTE(s):

1. Wrap cable with tape prior to installing the grip.
2. Positioner is used to secure the terminator to the bracket. The weight of the cable is supported by the cable grip.
3. Concrete encasement should rise 30"-40" above grade.
4. Minimum pole height 70'-0".
5. See DCS **59 52 00 43** for Belleville Washer installation procedures.
6. Cut bracket to required mounting length.
7. See DCS **14 00 01 03** for standoff bracket placement and grounding requirements.
8. Use DCS **12 00 10 04** for ground coil application on new pole installation. Use **12 00 10 03** for ground rod on an existing pole.
9. Always connect the metallic shields of the riser cables to the system neutral with at least a #2 standard copper wire. Be aware that the bare and/or covered 7-strand #10 copperweld ground wire may look like stranded #2 copper wire. Never substitute the copperweld wire for the #2 stranded copper wire when constructing the primary neutral bus.
10. If there is no system neutral or shield wire available, install a pole ground per DCS **12 00 10 03** and bond all shield and ground wires to the #2 copper wire.
11. If avian protection is required, covered wire may be substituted for the bare 350 kcmil and 500 kcmil wire. If covered wire is needed, replace the bare 350 kcmil wire with Stock #18 51 052 and replace the bare 500 kcmil wire with Stock #18 51 022.

Caution: The covered wire incorporates a XLP covering that has a maximum temperature rating of 90° C. If the circuit is expected to operate above 90° C, the bare wire should be used.

	ITEM	STK / DCS #	DESCRIPTION 14 69 01 **	01	02	03	04	05	06
	A	**06 69 03 03**	Single - Horizontal Line Post Insulator, 69kV	1	1	1	1	1	1
	B	**06 69 03 04**	Double - Horizontal Line Post Insulator, 69kV	1	1	1	1	1	1
	C	23 06 119	Bracket - 3 Phase Intermediate Arrestor	1	1	1	1	1	1
	D	71 10 002	Arrester - 60kV	3	3	3	3	3	3
	E	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	4	4	4	2	2	2
	F	23 66 207	Washer, Curved, Square, 5/8"	12	12	12	10	10	10
	G	23 66 134	Lock Washer - 5/8" Double Coil	12	12	12	10	10	10
	H	23 65 043	Lock Nut - 5/8" Square	8	8	8	6	6	6
	I	17 08 058	Arrester, Bracket - L.A. and Pothead	1	1	1	-	-	-
	J	**04 00 41 16**	Crossarm - Tangent, F/G 10'	-	-	-	1	1	1
	K	23 56 088	Bracket - Crossarm Double Sided NEMA	-	-	-	3	3	3
	L	23 67 185	Cable Positioner	3	3	3	3	3	3
	M	17 07 179	Terminator Cable - 69kVI	3	3	3	3	3	3
	N	17 55 324	Lug - Compression, 500 Al., 2-Hole	3	-	-	3	-	-
		17 55 260	Lug - Compression, 750 Al., 2-Hole	-	3	-	-	3	-
		17 05 236	Lug - Compression, 1000 Cu., 2-Hole	-	-	3	-	-	3
	O	17 54 177	Connector, Cable to Flat, Bronze, 1/0-500 kcmil	3	3	3	3	3	3
	P	21 56 078	Bolt, 1/2" X 2", 304 SS, HEX	15	15	15	15	15	15
	Q	12 56 052	Washer, Belleville Spring, 1/2", SS	24	24	24	24	24	24
	R	23 53 004	Bolt, DA, 5/8" Dia x 20" w/ 4 square nuts	4	4	4	4	4	4
	S	23 65 012	Eyenut, 5/8"	1	1	1	1	1	1
	T	23 68 181	Shackle - Deadend	1	1	1	1	1	1
	U	23 17 220	Grip - Cable Riser, 3"-3.49" Dia., Split	-	3	3	-	3	3
		23 17 454	Grip - Cable Riser, 2.50"-2.99" Dia., Split	3	-	-	3	-	-
	V	12 51 233	Coupling, Bell End, 5"	3	3	3	3	3	3
	W	12 01 272	Conduit - 5" Schedule 80 (ft.)	12	12	12	12	12	12
	X	12 51 206	Conduit - Bend 5", 36" Rad	3	3	3	3	3	3
6,7	Y	23 06 099	Bracket - Standoff, 10'	3	3	3	3	3	3
	Z	23 65 053	Nut - 5/8" Jam	3	3	3	3	3	3
	AA	23 67 184	Strap - Conduit 5" w/2" Bolts	9	9	9	9	9	9
11	AB	18 52 023	Wire, 350 Bare Cu. (ft.)	60	60	-	60	60	-
		18 52 021	Wire, 500 Bare Cu. (ft.)	-	-	60	-	-	60
	AC	18 07 283	Cable, 69kV, 500 kcmil, Al. (ft.)	105	-	-	105	-	-
9		18 07 292	Cable, 69kV, 750 kcmil, Al. (ft.)	-	105	-	-	105	-
		18 07 408	Cable, 69kV, 1000 kcmil, Cu. (ft.)	-	-	105	-	-	105
	AD	17 54 004	Connector - Split Bolt, #4 Sol CU thru #8 Sol CU	4	4	4	4	4	4
8,@	AE	**12 00 10 03**	Grounding Unit for Existing Pole	1	1	1	1	1	1
		12 00 10 04	Grounding Unit for New Pole	1	1	1	1	1	1
@	AF	17 51 032	Clamp, Parallel Groove, for 1/0 (7) AAAC Static	4	4	4	4	4	4
@	AG	11 04 110	Tube, Concrete, 14" Dia.	3	3	3	3	3	3
@	AH	**14 00 20 ******	Riser Guard, Concrete	3	3	3	3	3	3
		279	Op Code, Install Cable Up Pole	3	3	3	3	3	3

REV	DATE	ENG	DESCRIPTION
7	01/01/24	JMW	Converted to new format
6	08/12/15	HLH	

OUTDOOR LIGHTING 15

LUMINAIRES DATA..... 15 00 01 01

PHOTOCONTROLS..... 15 00 03 01

MULTIPLE LIGHT CONTROL - REMOTE OPERATED..... 15 00 03 02

LUMINAIRE COMPONENTS - LED BRACKET MOUNT..... 15 70 13 **

LUMINAIRE COMPONENTS - HID DECORATIVE (POST TOP)..... 15 70 14 **

LUMINAIRE COMPONENTS - LED DECORATIVE (POST TOP)..... 15 70 15 **

LUMINAIRE COMPONENTS - LED DIRECTIONAL (FLOOD LIGHT)..... 15 70 17 **

STREET LIGHT BRACKETS - WOOD POLE..... 15 70 18 01

INSTALLATION ON WOOD POLE..... 15 74 01 **

INSTALLATION ON WOOD LINE POLE ABOVE COMMUNICATIONS..... 15 74 02 **

FIBERGLASS POLE 30' AND ABOVE - UG CIRCUIT..... 15 74 09 **

DIRECTIONAL (FLOOD) INSTALLATION..... 15 74 14 **

RISER FOR DIRECT BURIED CIRCUIT..... 15 74 50 01

DECORATIVE (POST TOP) FIBERGLASS POLE - 14' Mounting Height..... 15 75 05 01

DECORATIVE (POST TOP) FIBERGLASS POLE / CONDUIT - 14' Mounting Height..... 15 75 05 02

FIBERGLASS POLE / CONDUIT ACCESS HOLE INSTALLATION..... 15 75 05 03

SPLICE BOX INSTALLATION..... 15 75 05 04

DECORATIVE (POST TOP) ALUMINUM POLE - 14' MOUNTING HEIGHT..... 15 76 01 **

WOOD POLE - UG CIRCUIT..... 15 77 01 **

CUSTOMER OWNED UNMETERED STREET LIGHT INSTALLATION..... 15 78 00 00

BREAKAWAY POLE - 30' AND ABOVE UG CIRCUIT..... 15 80 10 **

OUTDOOR LIGHT TAGGING..... 15 90 01 01

This standard covers standard luminaires, respective stock codes and characteristics, mounting height, and reference chart.

1. Standard Luminaires

A. Bracket Mount (Area) Luminaires

All new installations will be made using Light Emitting Diode (LED) equivalent bracket mount luminaires. The existing High Pressure Sodium (HPS), Pulse-start Metal Halide (PMH), probe-start Metal Halide (MH) and Mercury Vapor (MV) luminaires are no longer available, and may remain in-service until the luminaire, lamp or photocontrol failure.

B. Directional (Flood) Luminaires

All new installations will be made using LED equivalent directional (flood) luminaires. The existing HPS, PMH, MH and MV luminaires are no longer available, and may remain in-service until the luminaire, lamp or photocontrol failure.

C. Decorative (Post Top) Luminaires

In Missouri all new lighting installations will be made using LED equivalent decorative (post top) luminaires. The existing HID post top luminaires are no longer available, and may remain in-service until the luminaire failure for Contemporary and Aspen. Existing HID Colonial and Early American post top luminaires may remain in-service until the luminaire, lamp or photocontrol failure.

In Illinois all new lighting installations will be made using LED equivalent decorative (post top) luminaires. The existing HID decorative (post top) luminaires are no longer available, and may remain in-service until the luminaire, lamp, or photocontrol failure.

Table 1 - Standard Luminaires

Stock #	Style	State	Lamp	Watts	IES Light Pattern	Volts	Correlated Color Temp. (1) (CCT) (Kelvin)	Lumens	Start/ OP Amps	Voltage Input Range	PF %
LED 100 W EQUIVALENT BRACKET MOUNT LUMINAIRE											
38 51 619	Bracket Mount	MO	LED	39	III, FIG. 2	120V/208V/ 240V/277V	3000	4,470	0.400	±5%	99%
38 51 641	Bracket Mount	MO	LED	39	V, FIG. 3	120V/208V/ 240V/277V	3000	4,470	0.400	±5%	99%
38 51 643	Bracket Mount	IL	LED	39	III, FIG. 2	120V/208V/ 240V/277V	3000	4,470	0.400	±5%	99%
38 51 644	Bracket Mount	IL	LED	39	V, FIG. 3	120V/208V/ 240V/277V	3000	4,470	0.400	±5%	99%

REV	DATE	ENG	DESCRIPTION
12	10/01/23	WYW	Converted To New Format
11	9/01/17	WYW	

Table 1 - Standard Luminaires (Continued)											
Stock #	Style	State	Lamp	Watts	IES Light Pattern	Volts	Correlated Color Temp. (1) (CCT) (Kelvin)	Lumens	Start/ OP Amps	Voltage Input Range	PF %
LED 250 W EQUIVALENT BRACKET MOUNT LUMINAIRE											
38 51 618	Bracket Mount	MO	LED	107	III, FIG. 2	120V/208V/ 240V/277V	3000	12,000	1.170	±5%	99%
38 51 617	Bracket Mount	MO	LED	107	III, FIG. 2	480V	3000	12,000	1.170	±5%	99%
38 51 645	Bracket Mount	IL	LED	107	III, FIG. 2	120V/208V/ 240V/277V	3000	12,000	1.170	±5%	99%
38 51 646	Bracket Mount	IL	LED	107	III, FIG. 2	480V	3000	12,000	1.170	±5%	99%
LED 400 W EQUIVALENT BRACKET MOUNT LUMINAIRE											
38 51 616	Bracket Mount	MO	LED	190	III, FIG. 2	120V/208V/ 240V/277V	3000/4000	22,000	1.600	±5%	100%
38 51 615	Bracket Mount	MO	LED	190	III, FIG. 2	480V	3000	22,000	1.600	±5%	100%
38 51 647	Bracket Mount	IL	LED	190	III, FIG. 2	120V/208V/ 240V/277V	3000	22,000	1.600	±5%	100%
38 51 648	Bracket Mount	IL	LED	190	III, FIG. 2	480V	3000	22,000	1.600	±5%	100%
LED 250W EQUIVALENT DIRECTIONAL/FLOOD LUMINAIRE											
38 51 626	Directional	MO	LED	91	6X6	120/208/ 240/277V	4000	15,000	0.475	±10%	90%
38 51 625	Directional	MO	LED	91	6X6	480V	4000	15,000	0.475	±10%	90%
38 51 649	Directional	IL	LED	91	6X6	120/208/ 240/277V	3000	15,000	0.475	±10%	90%
38 51 650	Directional	IL	LED	91	6X6	480V	3000	15,000	0.475	±10%	90%
LED 400W EQUIVALENT DIRECTIONAL/FLOOD LUMINAIRE											
38 51 624	Directional	MO	LED	124	6X6	120/208/ 240/277V	4000	20,000	0.875	±10%	90%
38 51 627	Directional	MO	LED	124	6X6	480V	4000	20,000	0.875	±10%	90%
38 51 651	Directional	IL	LED	124	6X6	120/208/ 240/277V	3000	20,000	0.875	±10%	90%
38 51 652	Directional	IL	LED	124	6X6	480V	3000	20,000	0.875	±10%	90%

Table 1 - Standard Luminaires (Continued)											
Stock #	Style	State	Lamp	Watts	IES Light Pattern	Volts	Correlated Color Temp. (1) (CCT) (Kelvin)	Lumens	Start/ OP Amps	Voltage Input Range	PF %
LED 400W EQUIVALENT DIRECTIONAL/FLOOD LUMINAIRE (Continued)											
38 51 628	Directional	MO	LED	248	6X6	120/208/ 240/277V	4000	38,000	0.875	±10%	90%
38 51 653	Directional	IL	LED	248	6X6	120/208/ 240/277V	3000	38,000	0.875	±10%	90%
38 51 669	Directional	IL	LED	248	6X6	480V	3000	38,000	0.875	±10%	90%
LED 100W EQUIVALENT RECTANGULAR/SHOEBOX LUMINAIRE											
38 51 637	Rectangular	IL	LED	44	III, FIG. 2	120/208/ 240/277V	3000	4,600	0.475	±10%	90%
LED 250W EQUIVALENT RECTANGULAR/SHOEBOX LUMINAIRE											
38 51 640	Rectangular	IL	LED	136	III, FIG. 2	120/208/ 240/277V	3000	16,000	0.610	±10%	90%
LED 400W EQUIVALENT RECTANGULAR/SHOEBOX LUMINAIRE											
38 51 638	Rectangular	IL	LED	183	III, FIG. 2	120/208/ 240/277V	3000	21,300	0.610	±10%	90%
38 51 639	Rectangular	IL	LED	183	III, FIG. 2	480V	3000	21,300	0.610	±10%	90%
HID DECORATIVE/POST TOP LUMINAIRE (No longer available for new installation)											
38 01 517	Early American	IL / MO	HPS	100	III, FIG. 2	120V	1,900	9,500	3.2/2.1	±5%	45%
38 01 518	Early American	IL / MO	HPS	100	V, FIG. 3	120V	1,900	9,500	3.2/2.1	±5%	45%
38 01 942	Early American	IL	MH	175	III, FIG. 2	120V	4,100	14,400	1.0/1.75	±10%	45%
38 01 961	Early American	IL	PMH	150	III, FIG. 2	120V	4,100	12,900	1.0/1.75	±10%	45%
38 01 624	Acorn	IL	HPS	100	V, FIG. 3	120V	1,900	9,500	3.2/2.1	±5%	45%
38 01 625	Acorn	IL	MH	175	V, FIG. 3	120V	4,100	14,400	1.0/1.75	±10%	45%
38 01 960	Acorn	IL	PMH	150	V, FIG. 3	120V	4,100	12,900	1.9/0.9	±10%	45%
38 01 524	Colonial	MO	HPS	100	III, FIG. 2	120V	1,900	9,500	3.2/2.1	±5%	45%
38 01 525	Colonial	MO	HPS	100	V, FIG. 3	120V	1,900	9,500	3.2/2.1	±5%	45%
38 01 513	Contemporary or Traditional	IL/MO	HPS	100	III, FIG. 2	120V	1,900	9,500	3.2/2.1	±5%	45%
38 01 514	Contemporary or Traditional	IL/MO	HPS	100	V, FIG. 3	120V	1,900	9,500	3.2/2.1	±5%	45%
38 01 584	Aspen	IL/MO	HPS	100	III, FIG. 2	120V	1,900	9,500	3.2/2.1	±5%	45%
38 01 585	Aspen	IL/MO	HPS	100	V, FIG. 3	120V	1,900	9,500	3.2/2.1	±5%	45%

REV	DATE	ENG	DESCRIPTION
12	10/01/23	WYW	Converted To New Format
11	9/01/17	WYW	

Table 1 - Standard Luminaires (Continued)											
Stock #	Style	State	Lamp	Watts	IES Light Pattern	Volts	Correlated Color Temp. ◇1 (CCT) (Kelvin)	Lumens	Start/ OP Amps	Voltage Input Range	PF %
LED 100W EQUIVALENT DECORATIVE/POST TOP LUMINAIRE											
38 51 620	Early American	MO/IL	LED	46	III, FIG. 2	120/208/ 240/277V	3000	4,654	0.700	±10%	88%
38 51 622	Early American	MO/IL	LED	46	V, FIG. 3	120/208/ 240/277V	3000	4,913	0.700	±10%	88%
38 51 632	Colonial	MO	LED	44	III, FIG. 2	120/208/ 240/277V	3000	3,898	0.700	±10%	88%
38 51 631	Colonial	MO	LED	44	V, FIG. 3	120/208/ 240/277V	3000	4,282	0.700	±10%	88%
38 51 621	Contemporary or Traditional	MO/IL	LED	49	III, FIG. 2	120/208/ 240/277V	3000	4,654	0.350	±10%	94%
38 51 623	Contemporary or Traditional	MO/IL	LED	49	V, FIG. 3	120/208/ 240/277V	3000	4,913	0.350	±10%	94%
38 51 633	Aspen	MO/IL	LED	37	III, FIG. 2	120/208/ 240/277V	3000	6,676	1.000	±10%	96%
38 51 634	Aspen	MO/IL	LED	37	V, FIG. 3	120/208/ 240/277V	3000	6,654	1.000	±10%	96%
38 51 666	Acorn	IL	LED	50	III, FIG. 3	120/208/ 240/277V	3000	6,654	0.800	±10%	96%
38 51 665	Acorn	IL	LED	50	V, FIG. 2	120/208/ 240/277V	3000	6,676	0.800	±10%	96%

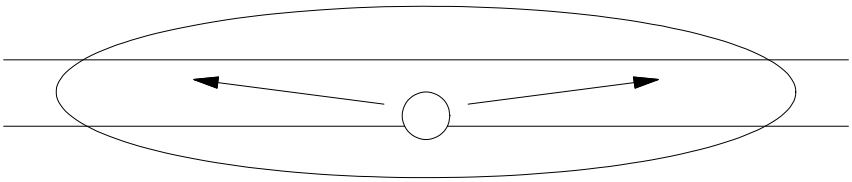
DESIGN NOTE(s):

◇1. Correlated Color Temperature (CCT) is the measure of light source color appearance in degrees Kelvin.

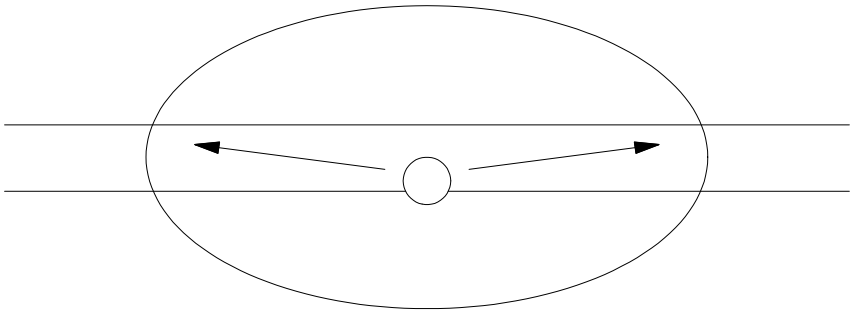
REV	DATE	ENG	DESCRIPTION
12	10/01/23	WYW	Converted To New Format
11	9/01/17	WYW	

2. Lighting Distribution Patterns

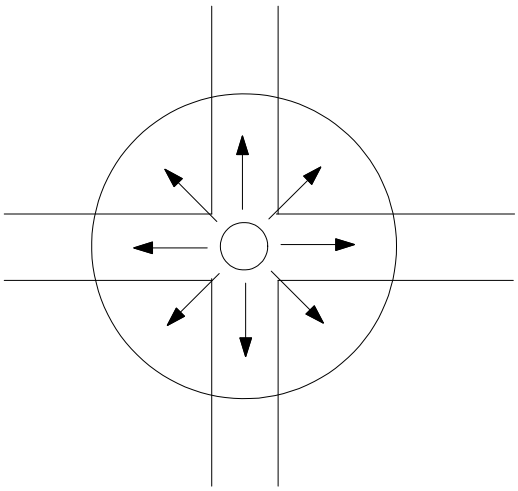
A. Type II - generally applicable to luminaires located at or near the side of relatively narrow roadways. In addition, the width of the roadway does not exceed 1.75 times the designed mounting height.
Type II lighting is suitable to wide walkways, as well as other long, narrow lighting



B. Type III - asymmetric arrangement as well. The ratio between the width of the illumination area and the height of the pole should be less than 2.75.
Type III lighting is suitable to the side of the area, allowing the light to project outward and fill the area.



C. Type V - a circular symmetry of candlepower distribution that is essentially the same at all lateral angles around the luminaire.
Type V lighting intends for luminaire mounting at or near the center of roadways, center islands of the parkway, and intersections.



REV	DATE	ENG	DESCRIPTION
12	10/01/23	WYW	Converted To New Format
11	9/01/17	WYW	

3. Identification

A. LED - All luminaires are shipped with the appropriate NEMA identification decal. If the decal is not installed it should be re-applied on the fixture so that it can be seen from the ground.

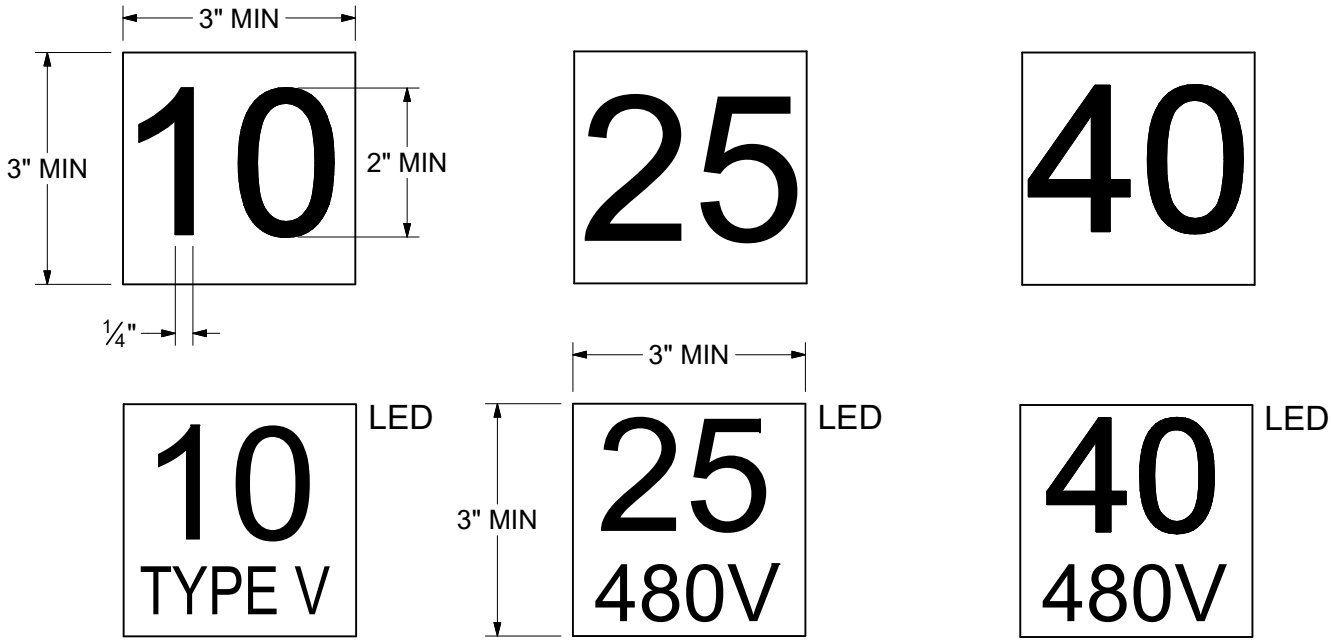
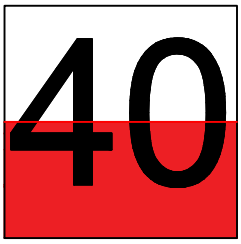


Table 2 - Identifying Code			
Identification Code	Lamp Wattage and LED Equivalent	Backround Color	Lamp Type
10	100W	GOLD	HIGH PRESSURE SODIUM (HPS)
15	150W	*HALF RED/HALF WHITE	PULSE-START METAL HALIDE (PMH)
17	175W	BLUE	MERCURY VAPOR (MV)
25	250W	RED	PROBE-START METAL HALIDE (MH)
40	400W	GOLD	HIGH PRESSURE SODIUM (HPS)
X1	1000W	RED	PROBE-START METAL HALIDE (MH)
10	100W EQV.	WHITE	LIGHT EMITTING DIODE (LED)
10 TYPE V	100W EQV.	WHITE	LIGHT EMITTING DIODE (LED)
25	250W EQV.	WHITE	LIGHT EMITTING DIODE (LED)
25 480V	250W EQV.	WHITE	LIGHT EMITTING DIODE (LED)
40	400W EQV.	WHITE	LIGHT EMITTING DIODE (LED)
40 480V	400W EQV.	WHITE	LIGHT EMITTING DIODE (LED)
X1	1000W EQV.	WHITE	LIGHT EMITTING DIODE (LED)

REV	DATE	ENG	DESCRIPTION
12	10/01/23	WYW	Converted To New Format
11	9/01/17	WYW	

B. Non LED - All luminaries will be labeled with wattage identification code. The horizontal burn identification is used for horizontal non-cutoff and directional flood luminaries. The vertical burn identification is used for post top luminaries.

PROBE START
METAL HALIDE



HORIZONTAL BURN
PULSE START
METAL HALIDE

VERTICAL BURN
PULSE START
METAL HALIDE

4. Luminaire Mounting Heights

Post top luminaires shall be mounted only on fiberglass poles purchased specifically for that purpose.

All other types of luminaires shall be mounted in accordance with the following table. The preferred height should be maintained whenever possible but the minimum heights may be used if this avoids a pole replacement. Mounting height is defined as the height from ground to the bottom of the refractor (glassware) on glass enclosed reflectors and to the bottom of the lamp on open type reflectors.

Table 3 - Luminaire Monting Heights

Light Emitting Diode (LED)	Min. MTG. Height (ft)	Preferred MTG. Height (ft)
LED 100W Equivalent Post Top	14	14
LED 100W Equivalent Bracket Mount	20	25
LED 250W Equivalent Directional/Flood		
LED 250W Equivalent Bracket Mount	25	30
LED 400W Equivalent Bracket Mount	30	35
LED 400W & 1000 W Eqivalent Directional/Flood.		

REV	DATE	ENG	DESCRIPTION
12	10/01/23	WYW	Converted To New Format
11	9/01/17	WYW	

5. Reference Chart

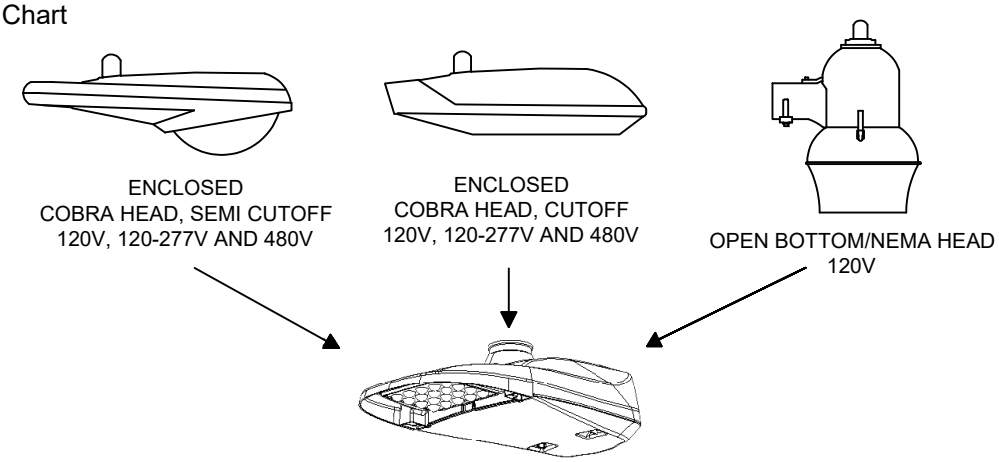


Table 4 - Luminare Equivalent Wattages - Bracket Mount Luminaires - Missouri						
STOCK #	LUMINAIRE I.D.	LIGHT EMITTING DIODE (LED)	HID FIXTURE WATTAGE			VOLTAGE
			MERCURY VAPOR (MV)	METAL HALIDE (MH) PULSE-START (PMH)	HIGH PRESS. SODIUM (HPS)	
38 51 619	10	39W	100/150/175/ 250W	150W & 175W	70W & 100W	120/208/240/277V
38 51 641	10 TYPE V	39W	100/150/175/ 250W	150W & 175W	70W & 100W	120/208/240/277V
38 51 618	25	140W	400W	250W	250W	120/208/240/277V
38 51 617	25 480V	140W	400W	250W	250W	480V
38 51 616	40	195W	1000W	400W	400W	120/208/240/277V
38 51 615	40 480V	195W	1000W	400W	400W	480V

Table 5 - Luminare Equivalent Wattages - Directional/Flood Luminaires - Missouri						
STOCK #	LUMINAIRE I.D.	LIGHT EMITTING DIODE (LED)	HID FIXTURE WATTAGE			VOLTAGE
			MERCURY VAPOR (MV)	METAL HALIDE (MH) PULSE-START (PMH)	HIGH PRESS. SODIUM (HPS)	
38 51 626	10	91W	400W	250W & 400W ◇2	250W	120/208/240/277V
39 51 625	25 480V	91W	400W	250W & 400W ◇2	250W	480V
40 51 624	40	124W	1000W	-	400W	120/208/240/277V
41 51 627	40 480V	124W	1000W	-	400W	480V
42 51 628	X1	248W	-	1000W	1000W	120/208/240/277V

REV	DATE	ENG	DESCRIPTION
12	10/01/23	WYW	Converted To New Format
11	9/01/17	WYW	

DESIGN NOTE(s):

2. In Missouri only the 400W Pulse Start Halide (PMH) and probe start Metal Halide (MH) directional (flood) luminaires will be replaced with the LED 250 W equivalent luminaire.

Table 6 - Luminare Equivalent Wattages - Bracket Mount Luminaires - Illinois						
STOCK #	LUMINAIRE I.D.	LIGHT EMITTING DIODE (LED)	HID FIXTURE WATTAGE			VOLTAGE
			MERCURY VAPOR (MV)	METAL HALIDE (MH) PULSE-START (PMH)	HIGH PRESS. SODIUM (HPS)	
38 51 643	10	39W	100/150175/ 250W	150W & 175W	70W & 100W	120/208/240/277V
38 51 644	10 TYPE V	39W	100/150175/ 250W	150W & 175W	70W & 100W	120/208/240/277V
38 51 645	25	107W	400W	250W	250W	120/208/240/277V
38 51 646	25 480V	107W	400W	250W	250W	480V
38 51 647	40	190W	1000W	400W	400W	120/208/240/277V
38 51 648	40 480V	190W	1000W	400W	400W	480V

Table 7 - Luminare Equivalent Wattages - Directional/Flood Luminaires - Illinois						
STOCK #	LUMINAIRE I.D.	LIGHT EMITTING DIODE (LED)	HID FIXTURE WATTAGE			VOLTAGE
			MERCURY VAPOR (MV)	METAL HALIDE (MH) PULSE-START (PMH)	HIGH PRESS. SODIUM (HPS)	
38 51 649	25	91W	400W	250W	250W	120/208/240/277V
38 51 650	25 480V	91W	400W	250W	250W	480V
38 51 651	40	124W	1000W	400W	400W	120/208/240/277V
38 51 652	40 480V	124W	1000W	400W	400W	480V
38 51 653	X1	248W	-	1000W	1000W	120/208/240/277V
38 51 669	X1 480V	248W	-	1000W	1000W	480V

REV	DATE	ENG	DESCRIPTION
12	10/01/23	WYW	Converted To New Format
11	9/01/17	WYW	

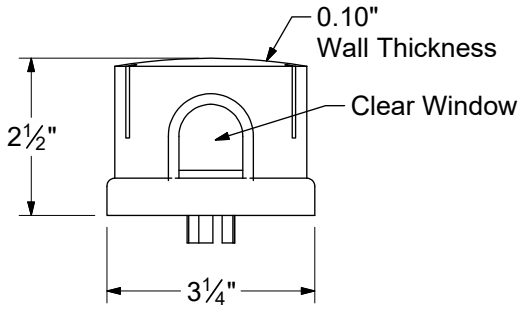


Figure 1
Heavy Duty
Long Life

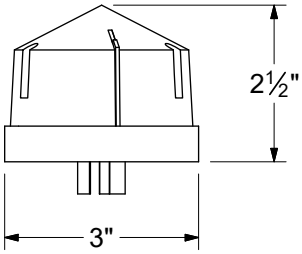


Figure 2
Standard Duty
Upward Looking

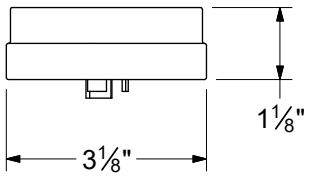


Figure 3
Shorting Cover

Photocontrols								
	Stock #	State	Voltage	Description	Housing Color	Window Orientation	Type	Housing Style Fig. No.
1,3,4	38 24 630	MO/IL	120-277V	Photocell, 1000W; Fail on	Black	North	Heavy Duty (Long Life, 20+ Years)	Fig. 1
1,3,4	38 51 629	MO/IL	480V	Photocell, 1000W; Fail on	Yellow	North	Heavy Duty (Long Life, 20+ Years)	Fig. 1
2,3,4	54 14 312	IL	120V	Photocell, Upward Looking, 1000W; Fail on	Clear	Upward	Standard Duty (10+ Years)	Fig. 2
	38 01 394	MO/IL	-	Plug, Shorting, Photoelectric Cell	-	-	Twistlock Receptacle	Fig. 3

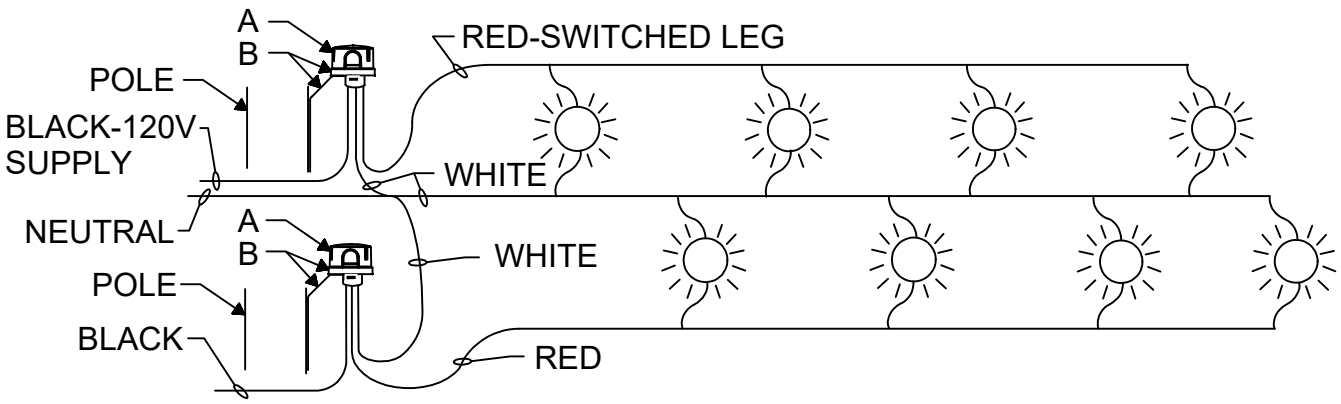
DESIGN NOTE(s):

1. Long life-heavy duty photocell must be used with Light Emitting Diode (LED) luminaire.
2. Upward looking photocontrol to be used ONLY when necessary to prevent mis-operation due to a point source of ambient light entering the photocontrol window. May be needed in area with a large number of lights where the light from one luminaire causes another to turn off.
3. Photocontrol must have instantaneous turn on and 3-5 second turn off delay.
4. See Material Specification 2.1.298 for more information.

Periodically, light from one luminaire will activate the photocell and shut off another light. For these circumstances, when simply re-aiming the photocell does not resolve the problem, a remote photocell mounting bracket is used.

In some circumstances, it is beneficial to operate multiple luminaires from one control. For these circumstances, a remote photocell mounting bracket or relay is used.

In both of the above situations, the photocell on the luminaire is replaced with a shorting plug. The photocell is rated at 15A while the relay is rated at 30A. See DCS **15 00 01 01** for current draw information in order to determine how many luminaires can be controlled by either the photocell or the relay. If multiple luminaires are used on 3-wire, single phase circuits, care should be taken to balance the load between the two phases in order to have the lights operated at the same time.

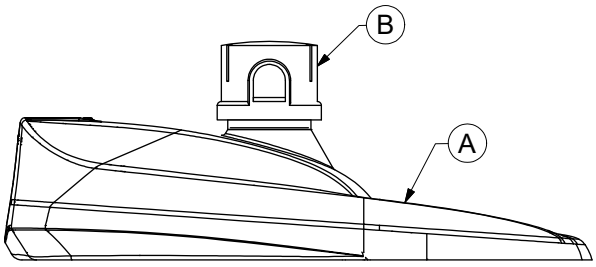


	ITEM	STK #	STATE	DESCRIPTION
1	A	38 51 630	MO/IL	PHOTOCELL, 120-277V, 1000W FAIL ON, BLACK, NORTH ORIENTED
		38 01 394	MO/IL	PLUG, SHORTING, PHOTOELECTRIC CELL
	B	38 01 376	MO/IL	PHOTOCELL BRACKET AND PHOTOCELL RECEPTACLE ASSEMBLY MOUNTING ON POLE OR CROSSARM W/RECEPTACLE
		38 01 275	MO/IL	RELAY, 120V, 30A MULTIPLE STREETLIGHTS

CONSTRUCTION NOTE(s):

1. For more information on photocontrol see DCS **15 00 03 01**.

REV	DATE	ENG	DESCRIPTION
0	10/01/23	WYW	New Standard, Moved from DCS 15 00 01 01



DCS #	DESCRIPTION	STK #	STATE
15 70 13 01	Luminaire, LED 100W EQ. 120-277V, Type III 3000K	38 51 619	MO
15 70 13 02	Luminaire, LED 100W EQ. 120-277V, Type V 3000K	38 51 641	MO
15 70 13 03	Luminaire, LED 250W EQ. 120-277V, Type III 3000K	38 51 618	MO
15 70 13 04	Luminaire, LED 250W EQ. 480V, Type III 3000K	38 51 617	MO
15 70 13 05	Luminaire, LED 400W EQ. 120-277V, Type III 3000K	38 51 616	MO
15 70 13 06	Luminaire, LED 400W EQ. 480V, Type III 3000K	38 51 615	MO
15 70 13 07	Luminaire, LED 100W EQ. 120-277V, Type III 3000K	38 51 643	IL
15 70 13 08	Luminaire, LED 100W EQ. 120-277V, Type V 3000K	38 51 644	IL
15 70 13 09	Luminaire, LED 250W EQ. 120-277V, Type III 3000K	38 51 645	IL
15 70 13 10	Luminaire, LED 250W EQ. 480V, Type III 3000K	38 51 646	IL
15 70 13 11	Luminaire, LED 400W EQ. 120-277V, Type III 3000K	38 51 647	IL
15 70 13 12	Luminaire, LED 400W EQ. 480V, Type III 3000K	38 51 648	IL

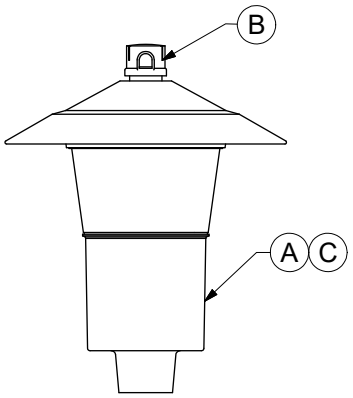
CONSTRUCTION NOTE(s):

1. Order light shield if there is a complaint of light trespass. Stock #38 51 675 (block back and side light) and Stock #38 51 676 (block back light) are setup for the "J" series LED. The "J" series LED is labeled with additional identification decal "J" next to the wattage identification decal.

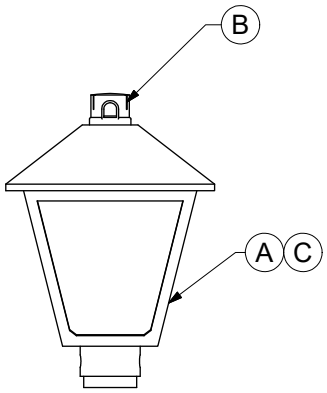
2. Stock #38 51 635 and Stock #38 51 636 work only on the LED without identification decal "J"

	ITEM	STK / DCS #	DESCRIPTION 15 70 13 **	01	02	03	04	05	06	07	08	09	10	11	12
	A	-	Luminaire - See chart above	1	1	1	1	1	1	1	1	1	1	1	1
	B	38 51 629	Photocell - 480V 1000W Heavy Duty	-	-	-	1	-	1	-	-	-	1	-	1
		38 51 630	Photocell - 120-277V 1000W Heavy Duty	1	1	1	-	1	-	1	1	1	-	1	-
1,2,@	C	38 51 675	Light Shield (J Series) - Back and Side (CUL DE SAC)	1	1	2	2	4	4	1	1	2	2	4	4
		38 51 676	Light Shield (J Series) - Back Side (House Side)	1	1	2	2	4	4	1	1	2	2	4	4
		38 51 635	Light Shield (G Series) - Back and Side (CUL DE SAC)	1	1	2	2	4	4	1	1	2	2	4	4
		38 51 636	Light Shield (G Series) - Back Side (House Side)	1	1	2	2	4	4	1	1	2	2	4	4

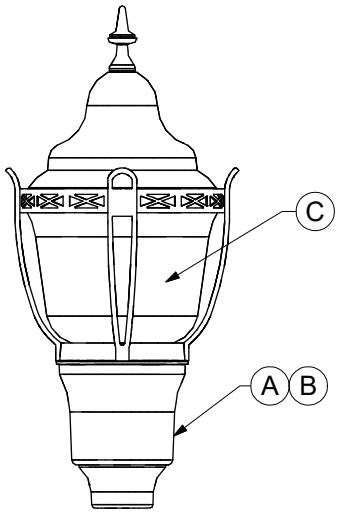
REV	DATE	ENG	DESCRIPTION
4	10/01/23	WYW	Converted to new format
3	01/01/20	WYW	



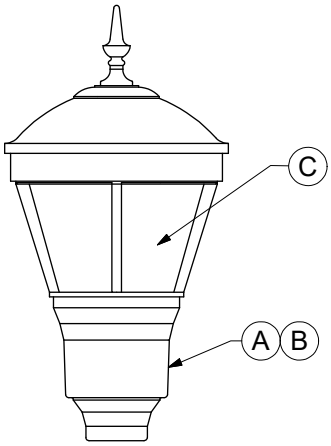
Colonial



Early American



Aspen



Contemporary

DCS #	DESCRIPTION	STK #	STATE
15 70 14 01	Colonial, 100W, HPS, Type III	38 01 524	MO
15 70 14 02	Colonial, 100W, HPS, Type V	38 01 525	MO
15 70 14 03	Early American, 100W, HPS, Type III	38 01 517	MO/IL
15 70 14 04	Early American, 100W, HPS, Type V	38 01 518	MO/IL
15 70 14 05	Contemporary, 100W, HPS, Type III	38 01 513	MO/IL
15 70 14 06	Contemporary, 100W, HPS, Type V	38 01 514	MO/IL
15 70 14 07	Aspen, 100W, HPS, Type III	38 01 584	MO/IL
15 70 14 08	Aspen, 100W, HPS, Type V	38 01 585	MO/IL
15 70 14 09	Early American, 150W, MH, Type III	38 01 942	IL
15 70 14 10	Early American, 150W, PMH, Type II	38 01 961	IL

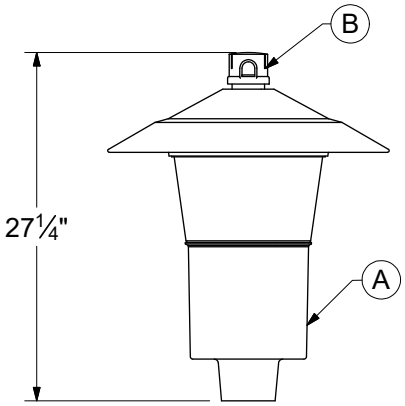
REV	DATE	ENG	DESCRIPTION
4	10/01/23	WYW	Converted to new format
3	12/21/17	WYW	

CONSTRUCTION NOTE(s):

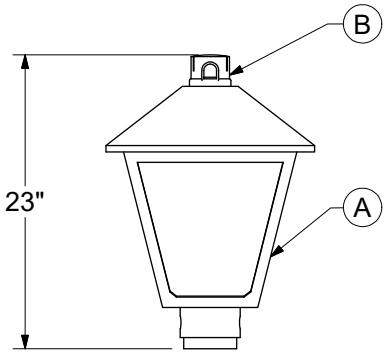
1. Position luminaire to facilitate service from the street.
2. For Type III lights, align refractor with street side.
3. Face eye of photocontrol north.

ITEM	STK / DCS #	DESCRIPTION 15 70 14 **	01	02	03	04	05	06	07	08	09	10
A	**15 70 14 ****	Luminaire	1	1	1	1	1	1	1	1	1	1
B	38 51 630	Photocell - 120V / 240V 1000W Heavy Duty	1	1	1	1	1	1	1	1	1	1
C	26 55 260	Lamp, 100W, HPS	1	1	1	1	1	1	1	1	-	-
	26 56 260	Lamp, 175W, MH	-	-	-	-	-	-	-	-	1	-
	26 05 087	Lamp, 150W, PMH	-	-	-	-	-	-	-	-	-	1

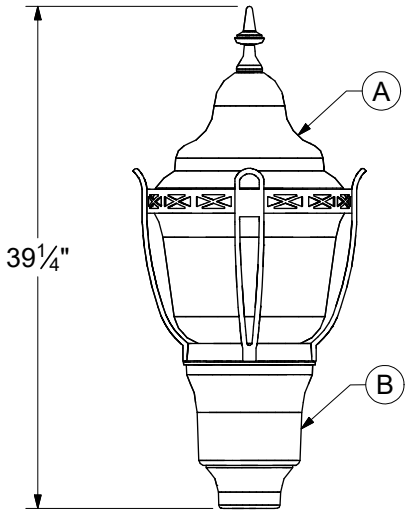
REV	DATE	ENG	DESCRIPTION
4	10/01/23	WYW	Converted to new format
3	12/21/17	WYW	



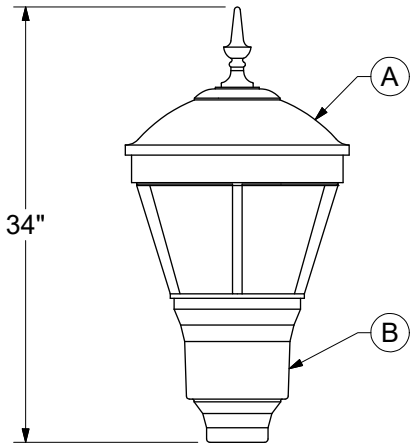
Colonial



Early American



Aspen



Contemporary

DCS #	DESCRIPTION	STK #	STATE
15 70 15 01	Early American, LED 100W Equiv., 120V-277V, Type III, 3000K	38 51 620	MO/IL
15 70 15 02	Early American, LED 100W Equiv., 120V-277V, Type V, 3000K	38 51 622	MO/IL
15 70 15 03	Colonial, LED 100W Equiv., 120V-277V, Type III, 3000K	38 51 632	MO
15 70 15 04	Colonial, LED 100W Equiv., 120V-277V, Type V, 3000K	38 51 631	MO
15 70 15 05	Contemporary or Traditional, LED 100W Equiv., 120V-277V, Type III, 3000K	38 51 621	MO/IL
15 70 15 06	Contemporary or Traditional, LED 100W Equiv., 120V-277V, Type V, 3000K	38 51 623	MO/IL
15 70 15 07	Aspen, LED 100W Equiv., 120V-277V, Type III, 3000K	38 51 633	MO/IL
15 70 15 08	Aspen, LED 100W Equiv., 120V-277V, Type V, 3000K	38 51 634	MO/IL

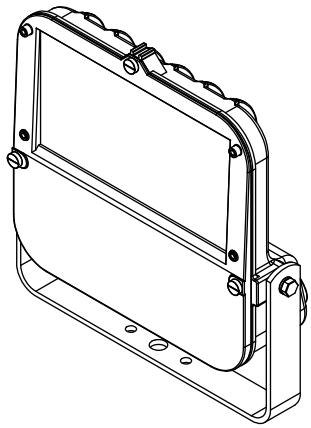
REV	DATE	ENG	DESCRIPTION
2	10/01/23	WYW	Converted to new format
1	09/29/17	WYW	

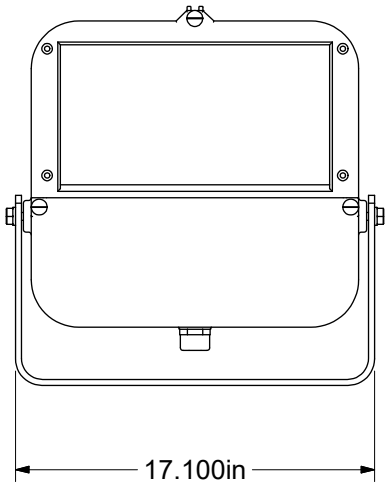
CONSTRUCTION NOTE(s):

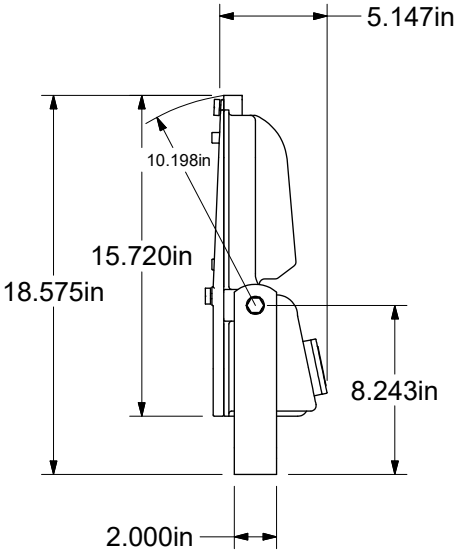
1. Align distribution light pattern Type III refractor with street side.
2. Face the eye of the photocell to the north.

	ITEM	STK / DCS #	STATE	DESCRIPTION 15 70 15 **	01	02	03	04	05	06	07	08
1	A	38 51 620	MO/IL	EARLY AMERICAN, LED 100W EQUIV., 120V-277V, TYPE III, 3000K	1	-	-	-	-	-	-	-
		38 51 622	MO/IL	EARLY AMERICAN, LED 100W EQUIV., 120V-277V, TYPE V, 3000K	-	1	-	-	-	-	-	-
		38 51 632	MO	COLONIAL, LED 100W EQUIVALENT, 120V-277V, TYPE III, 3000K	-	-	1	-	-	-	-	-
		38 51 631	MO	COLONIAL, LED 100W EQUIVALENT, 120V-277V, TYPE V, 3000K	-	-	-	1	-	-	-	-
		38 51 621	MO/IL	CONTEMPORARY OR TRADITIONAL, LED 100W EQUIV., 120V-277V, TYPE III, 3000K	-	-	-	-	1	-	-	-
		38 51 623	MO/IL	CONTEMPORARY OR TRADITIONAL, LED 100W EQUIV., 120V-277V, TYPE V, 3000K	-	-	-	-	-	1	-	-
		38 51 633	MO/IL	ASPEN, LED 100W EQUIVALENT, 120V-277V, TYPE III, 3000K	1	-	-	-	-	-	1	-
		38 51 634	MO/IL	ASPEN, LED 100W EQUIVALENT, 120V-277V, TYPE V, 3000K	-	-	-	-	-	-	-	1
2	B	38 51 630	MO/IL	PHOTOCONTROL / SWITCH, LOAD RATING 1000W, 120-277V, BLACK	1	1	1	1	1	1	1	1

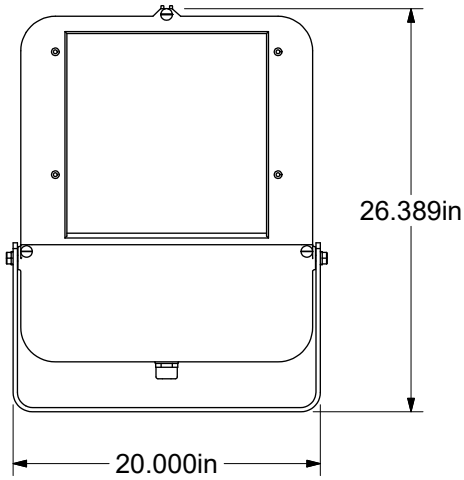
REV	DATE	ENG	DESCRIPTION
2	10/01/23	WYW	Converted to new format
1	09/29/17	WYW	



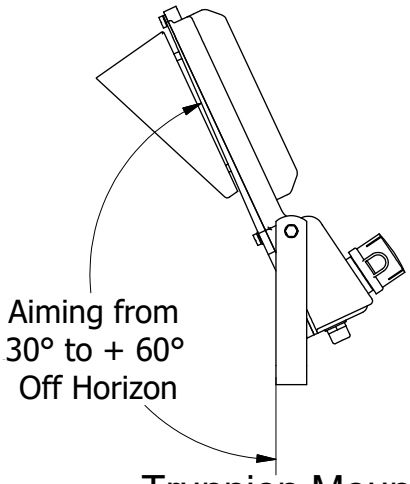




LED 250W & 400W Equivalent



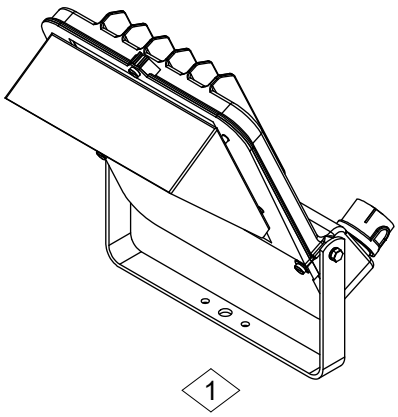
LED 1000W Equivalent



Trunnion Mount

DCS #	Ameren MO
15 70 17 01	LED 250W Equiv, 120−277V
15 70 17 02	LED 250W Equiv, 480V
15 70 17 03	LED 400W Equiv, 120−277V
15 70 17 04	LED 400W Equiv, 480V
15 70 17 05	LED 1000W Equiv, 120−277V

DCS #	Ameren IL
15 70 17 06	LED 250W Equiv, 120−277V
15 70 17 07	LED 250W Equiv, 480V
15 70 17 08	LED 400W Equiv, 120−277V
15 70 17 09	LED 400W Equiv, 480V
15 70 17 10	LED 1000W Equiv, 120−277V
15 70 17 11	LED 1000W Equiv, 480V



REV	DATE	ENG	DESCRIPTION
3	10/01/23	WYW	Converted To New Format
2	01/01/20	WYW	

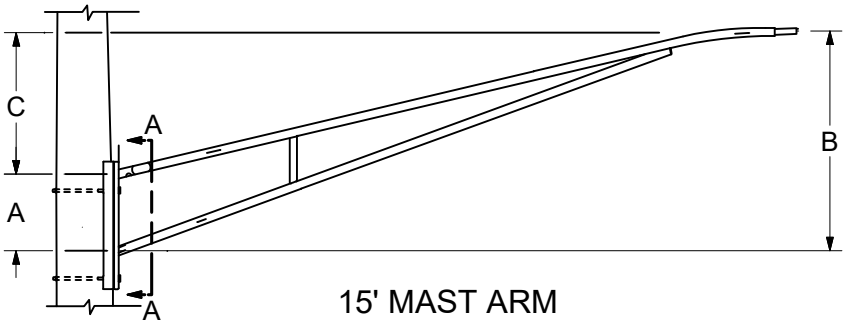
CONSTRUCTION NOTE(s):

1. Light shield is needed based on request.

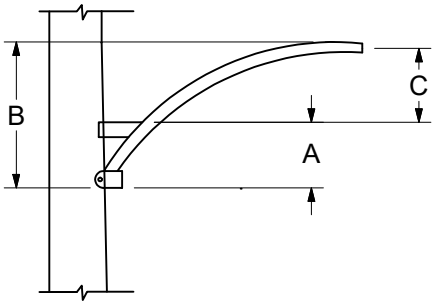
	ITEM	STK / DCS #	DESCRIPTION	01	02	03	04	05
	A	38 51 626	LUMINAIRE, LED 250W EQUIVALENT, 120V-277V, 6X6, 4000K CCT	1	-	-	-	-
		38 51 625	LUMINAIRE, LED 250W EQUIVALENT, 480V, 6X6, 4000K CCT	-	1	-	-	-
		38 51 624	LUMINAIRE, LED 400W EQUIVALENT, 120V−277V, 6X6, 4000K CCT	-	-	1	-	-
		38 51 627	LUMINAIRE, LED 400W EQUIVALENT, 480V, 6X6, 4000K CCT	-	-	-	1	-
		38 51 628	LUMINAIRE, LED 1000W EQUIVALENT, 120V−277V, 6X6, 4000K CCT		-	-	-	1
	B	38 51 630	PHOTOCONTROL / SWITCH, LOAD RATING 1000W, 120V−277V, BLACK	1	-	1	-	1
		38 51 629	PHOTOCONTROL / SWITCH, LOAD RATING 1000W, 480V, YELLOW	-	1	-	1	-
	C	38 51 656	Light Shield GE 1000W LED EQUV	-	-	-	-	1
@		38 51 657	Light Shield WORKS ONLY ON GE EFM Model 250W or 400W LED EQUV	1	1	1	1	-

	ITEM	STK / DCS #	DESCRIPTION	06	07	08	09	10	11
	A	38 51 649	LUMINAIRE, LED 250W EQUIVALENT, 120V−277V, 6X6, 3000K CCT	1	-	-	-	-	-
		38 51 650	LUMINAIRE, LED 250W EQUIVALENT, 480V, 6X6, 3000K CCT	-	1	-	-	-	-
		38 51 651	LUMINAIRE, LED 400W EQUIVALENT, 120V−277V, 6X6, 3000K CCT	-	-	1	-	-	-
		38 51 652	LUMINAIRE, LED 400W EQUIVALENT, 480V, 6X6, 3000K CCT	-	-	-	1	-	-
		38 51 653	LUMINAIRE, LED 1000W EQUIVALENT, 120−277V, 6X6, 3000K CCT	-	-	-	-	1	-
		38 51 669	LUMINAIRE, LED 1000W EQUIVALENT, 480V, 6x6, 3000K CCT	-	-	-	-	-	1
	B	38 51 630	PHOTOCONTROL / SWITCH, LOAD RATING 1000W, 120V−277V, BLACK	1	-	1	-	1	-
		38 51 629	PHOTOCONTROL / SWITCH, LOAD RATING 1000W, 480V, YELLOW	-	1	-	1	-	1
	C	38 51 656	Light Shield GE 1000W LED EQUV	-	-	-	-	1	1
@		38 51 657	Light Shield WORKS ONLY ON GE EFM Model 250W or 400W LED EQUV	1	1	1	1	-	-

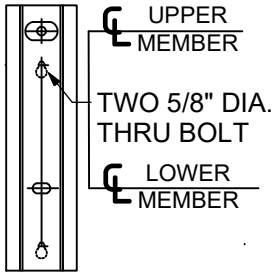
REV	DATE	ENG	DESCRIPTION
3	10/01/23	WYW	Converted To New Format
2	01/01/20	WYW	



15' MAST ARM



30" AND 6' BRACKETS



SECTION A-A

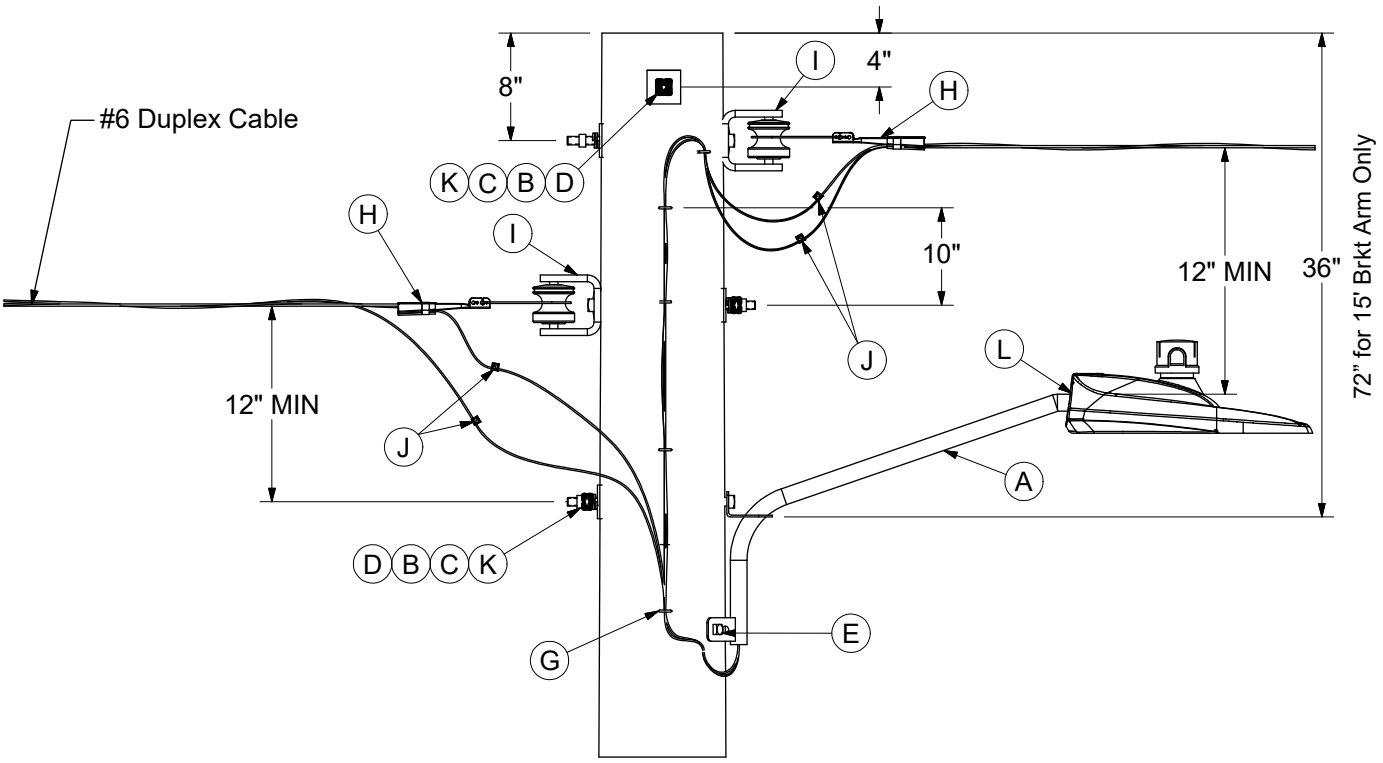
Bracket and Mast Arm Length/Dimentions			
BRACKET LENGTH	A	B	C
30"	11"	18"	7"
6'	11"	30"	19"
15'	21"	60"	39"

Stock#	Description
38 01 417	Bracket, St. Lt., 1-1/4" x 30"
38 01 249	Bracket, St. Lt., 1-1/4" x 6'-0"
38 01 705	Bracket, St. Lt., 1-1/4" x 15'-0"

REV	DATE	ENG	DESCRIPTION
0	10/01/23	WYW	New Standard, Moved from DCS 15 00 01 01

OUTDOOR LIGHTING
Installation On Wood Pole

15 74 01 **
1 of 1



DCS #	DESCRIPTION
15 74 01 01	1-1/4" x 30" Brkt.
15 74 01 02	1-1/4" x 6' Brkt.
15 74 01 03	1-1/4" x 15' Brkt.

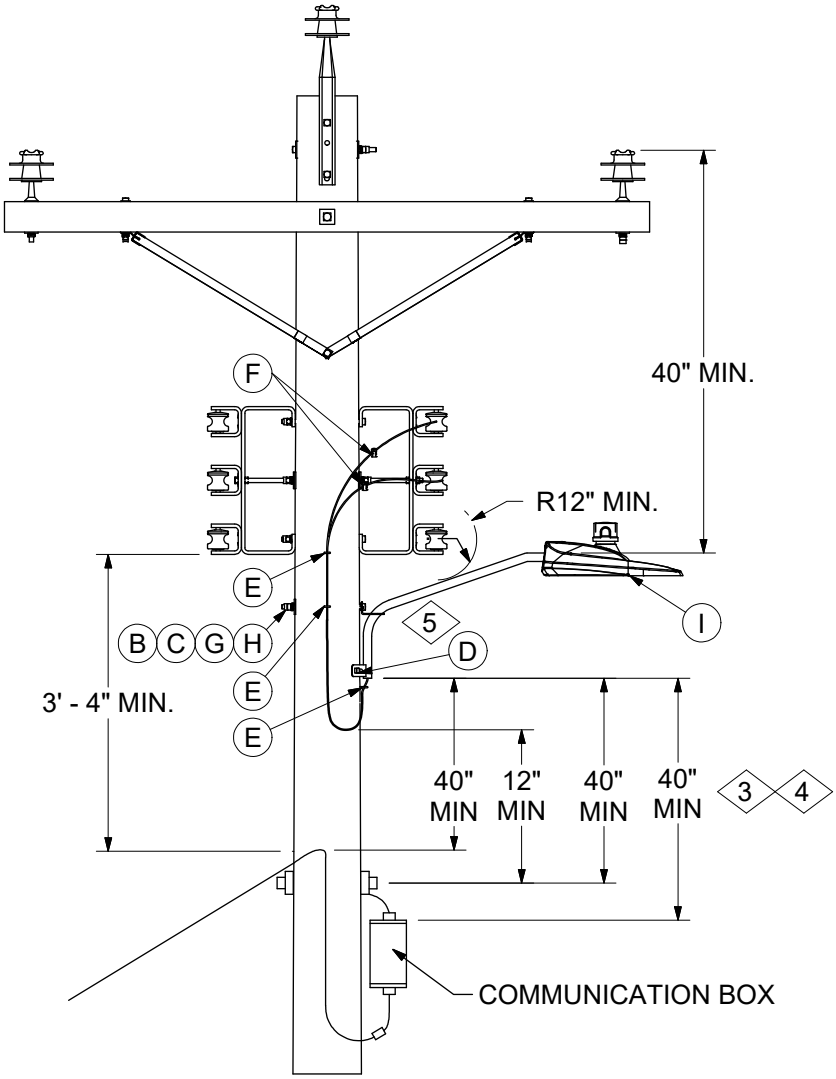
CONSTRUCTION NOTE(s):

1. For Composite Poles, it is preferred to use the fiberglass street light pole bracket (Stock #38 01 556 for 6' or Stock #38 01 746 for 8') as shown in DCS **15 74 09 ****. Transferring an existing wood pole street light bracket is acceptable. If the existing bracket is transferred, drill a pilot hole and use Stock #23 60 007 (½" lag) or Stock #23 60 005 (3/8" lag). Depending on pole size, additional washers maybe required (Stock #23 66 017 for ½" lags or Stock #23 66 016 for 3/8" lags).

	ITEM	STK / DCS #	DESCRIPTION 15 74 01 **	01	02	03
1	A	38 01 417	Streetlight Bracket, 30" x 1-1/4"	1	-	-
		38 01 249	Streetlight Bracket, 6' x 1-1/4"	-	1	-
		38 01 705	Streetlight Bracket, 15" x 1-1/4"	-	-	1
	B	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	2	2	3
	C	23 66 207	Washer, Curved, Square, 5/8"	2	2	2
	D	23 66 134	Lock Washer , 5/8" Double Coil	2	2	3
	E	23 60 007	Lag Screw, 1/2" x 4"	2	2	-
	F	18 57 104	Cable, 2#10 Cu, Poly	6	12	22
	G	23 64 001	Staple, 3/8" x 1-3/4" C.W.	3	3	3
	H	17 51 123	Clamp, DE, #6 AWG Duplex or #2 AWG Triplex	1	1	1
	I	**06 01 01 01**	Single Clevis	1	1	1
	J	17 54 382	Connector, Split Bolt with Spacer, #2 AWG Main/#10 AWG Cu Tap	2	2	2
	K	23 65 043	Lock Nut, 5/8" Square	2	2	3
@	L	**15 70 13 ****	St. Lt. Assembly	1	1	1

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
9	10/01/23	WYW	Updated, Converted To New Format
8	04/27/16	WYW	



DCS #	DESCRIPTION
15 74 02 01	1-1/4” x 30” Brkt.
15 74 02 02	1-1/4” x 6' Brkt.
15 74 02 04	1-1/4” x 15' Brkt.

CONSTRUCTION NOTES(s):

1. Refer to DCS **15 70 18 01** for selecting a street light bracket.

2. Face eye of photocell north.

3. If street light bracket is grounded, the vertical spacing between the bracket and communication attachments can be reduced to 20”. However, street light brackets may be grounded ONLY IF:

   A. When adding a light to a pole where none previously exists, there is no space available to install the light with the 40” bracket to communications attachment spacing without replacing the pole, or

   B. When replacing a pole with an existing light on it, there is no space available to install the light with the 40” bracket to communications attachment clearance and installing a taller pole would create uplift on adjacent poles.

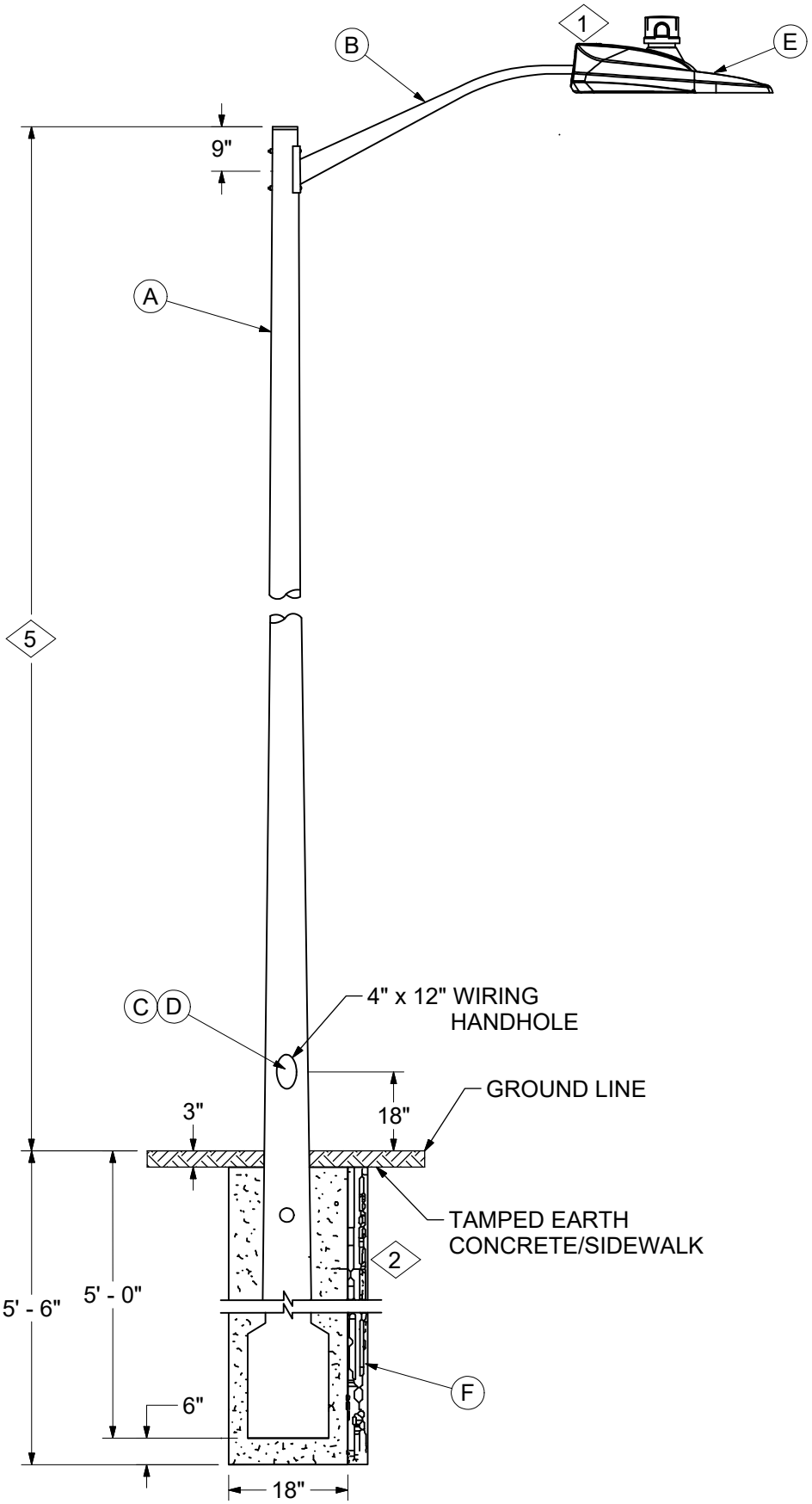
4. The 40" bracket to communications attachment clearance applies to all new lighting installations, all new communication attachments where lighting already exists, AND ON ALL POLES REPLACED FOR ANY REASON THAT HAVE EXISTING LIGHTING AND COMMUNICATION ATTACHMENTS. This is per NESC Rules 13A1 and 13B2 Exception 2.

5. If the light bracket needs to be grounded but the bracket is without ground provision, the ground clamp, Stock #40 59 318 needs to be ordered. Bracket may be grounded either by bonding to pole ground if present or to the system neutral.

6. For Composite Poles, it is preferred to use the fiberglass street light pole bracket (Stock #38 01 556 for 6' or Stock #38 01 746 for 8') as shown in DCS **15 74 09 ****. Transferring an existing wood pole street light bracket is acceptable. If the existing bracket is transferred, drill a pilot hole and use Stock #23 60 007 (½" lag) or Stock #23 60 005 (3/8" lag). Depending on pole size, additional washers maybe required (Stock #23 66 017 for ½" lags or Stock #23 66 016 for 3/8" lags).

	ITEM	STK / DCS #	DESCRIPTION 15 74 02 **	01	02	04
6	A	38 01 417	Streetlight Bracket, 30" x 1-1/4"	1	-	-
		38 01 249	Streetlight Bracket, 6' x 1-1/4"	-	1	-
		38 01 705	Streetlight Bracket, 15' x 1-1/4"	-	-	1
	B	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	1	1	2
	C	23 66 207	Washer, Curved, Square 5/8"	1	1	2
	D	23 60 007	Lag Screw - 1/2"x4"	2	2	-
	E	23 64 001	Staple, 3/8" x 1-3/4" C.W.	3	3	3
	F	17 54 382	Connector, Split, #2−#6AWG AL Main/#14 AWG Cu Tap	2	2	2
	G	23 66 134	Lock Washer - 5/8" Double Coil	1	1	2
	H	23 65 043	Lock Nut - 5/8" Square	1	1	2
@	I	**15 70 13 ** **	St. Lt. Assembly	1	1	1

REV	DATE	ENG	DESCRIPTION
8	10/01/23	WYW	Converted To New Format
7	04/01/19	WYW	



REV	DATE	ENG	DESCRIPTION
5	10/01/23	WYW	Converted To New Format
4	01/21/10	WYW	

DCS #	DESCRIPTION
15 74 09 01	30' Fiberglass Pole - Gray
15 74 09 02	35' Fiberglass Pole - Gray
15 74 09 03	30' Fiberglass Pole - Black
15 74 09 04	35' Fiberglass Pole - Black
15 74 09 05	35' Fiberglass Pole - Gray
15 74 09 06	40' Fiberglass Pole - Gray

CONSTRUCTION NOTE(s):

1. Face photocontrol north.

2. Rock or native soil backfill must be tamped to provide solid compaction around the pole. Refer to DCS **02 20 05 ****** for backfill.

3. OK to install second bracket at 180° if required.

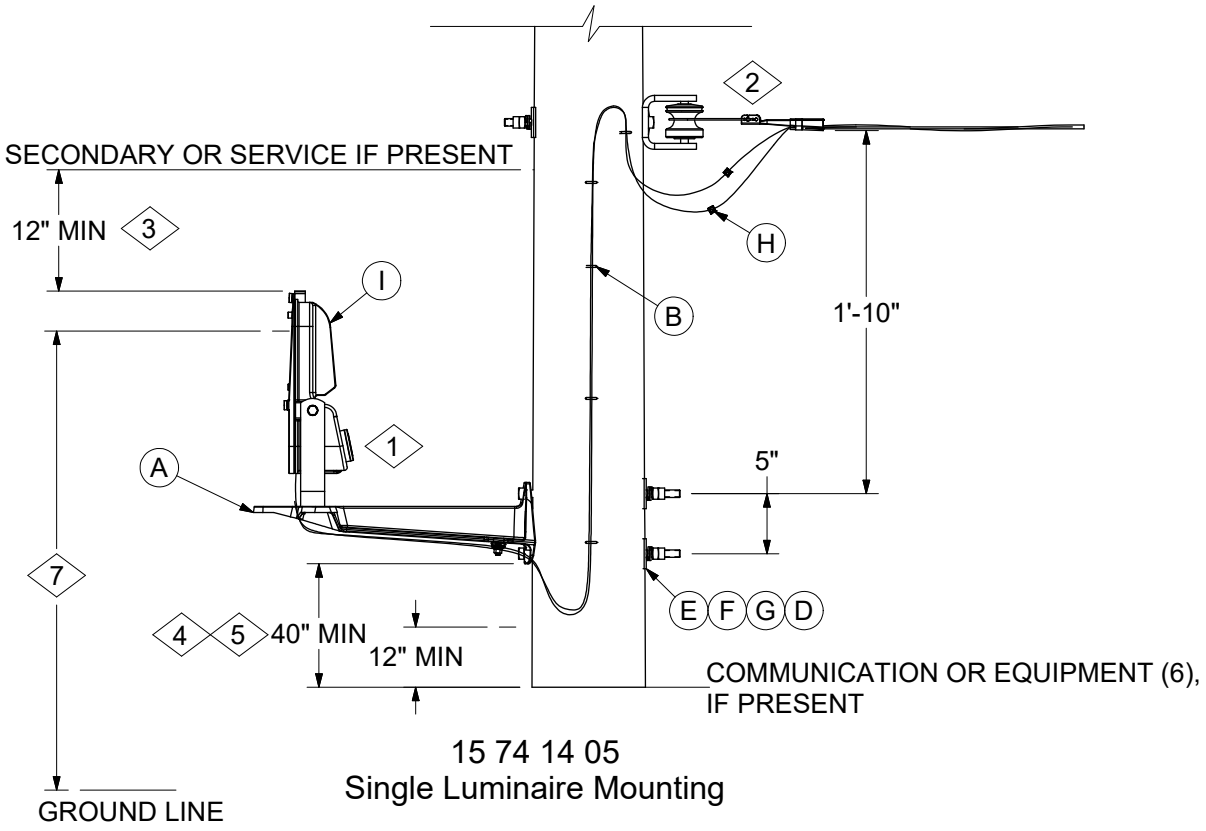
4. For MO only.

5. Mounting height reference:

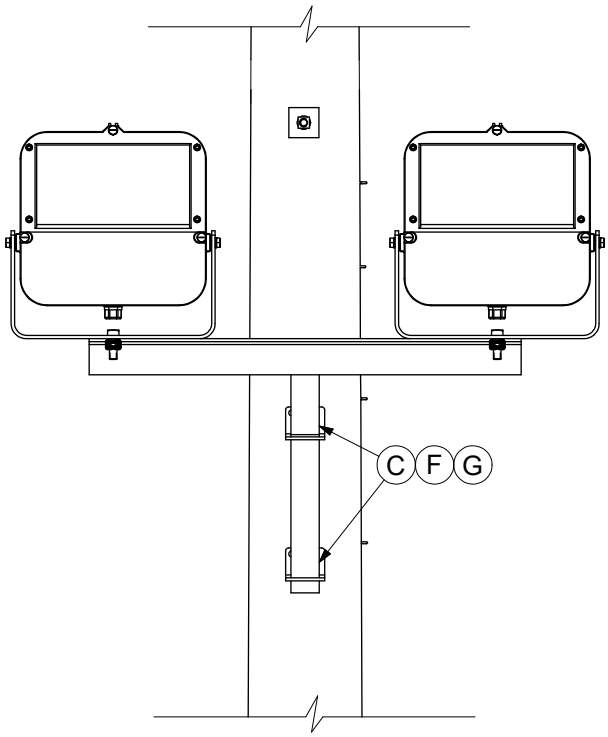
Luminaire Mounting Height		
Stock # FG Ploes	Pole Height (ft)	Luminaire Height - The Distance from the center of the lamp to the road surface (Mounted on 6 ft Bracket)
38 01 555	30	26'-3"
38 01 554	35	31'-3"
38 01 916	33	28'-3"
38 01 917	38	33'-3"
38 01 970	30	26'-3"
38 01 967	35	31'-3"

	ITEM	STK / DCS #	DESCRIPTION 15 74 09 **	01	02	03	04	05	06
	A	38 01 555	Pole, St. Lt., Fiberglass, 30’, Gray	1	-	-	-	-	-
		38 01 554	Pole, St. Lt., Fiberglass, 35’, Gray	-	1	-	-	-	-
		38 01 916	Pole, St. Lt., FG 33' Height, Heavy Duty, Gray	-	-	-	-	1	-
		38 01 917	Pole, St. Lt., FG 38' Height, Heavy Duty, Gray	-	-	-	-	-	1
4		38 01 970	Pole, St. Lt., Fiberglass, 30’, Black	-	-	1	-	-	-
4		38 01 967	Pole, St. Lt., Fiberglass, 35’, Black	-	-	-	1	-	-
	B	38 01 556	Bracket, AL. 6’	1	1	-	-	-	-
4		38 01 746	Bracket, AL. 8'	-	-	-	-	1	1
		38 01 968	Bracket, AL. Black, 6’	-	-	1	1	-	-
	C	18 57 104	Cable, St. Lt., #10−2 Cu, Black/White Covered (ft)	40	45	40	45	40	45
	D	17 01 116	Connector, Bolted/Set Screw #14−2/0, 3-Position, Rated for Al & Cu	2	2	2	2	2	2
@	E	**15 70 13 ** **	Street Light Luminaire and Photocontrol	1	1	1	1	1	1
@	F	**02 20 05 ** **	Back Fill	#	#	#	#	#	#

REV	DATE	ENG	DESCRIPTION
5	10/01/23	WYW	Converted To New Format
4	01/21/10	WYW	



15 74 14 05
Single Luminaire Mounting



15 74 14 06
Double Luminaire Mounting

REV	DATE	ENG	DESCRIPTION
12	10/01/23	WYW	Converted To New Format
11	05/29/18	WYW	

CONSTRUCTION NOTE(s):

1. Face photocontrol north, but multiple luminaires at the same location, adjust photocell socket to face control away from nearby light sources.

2. Connect the phase and neutral correctly to the terminal inside of the luminaires.

3. Increase this dimension by 4” if open service wires extend directly out over photocell.

4. If street light bracket is grounded, the vertical spacing between the bracket and communication attachments can be reduced to 20”. However, street light brackets may be grounded ONLY IF:

   A. When adding a light to a pole where none previously exists, there is no space available to install the light with the 40” bracket to communications attachment spacing without replacing the pole, or

   B. When replacing a pole with an existing light on it, there is no space available to install the light with the 40” bracket to communications attachment clearance and installing a taller pole would create up lift on adjacent poles.

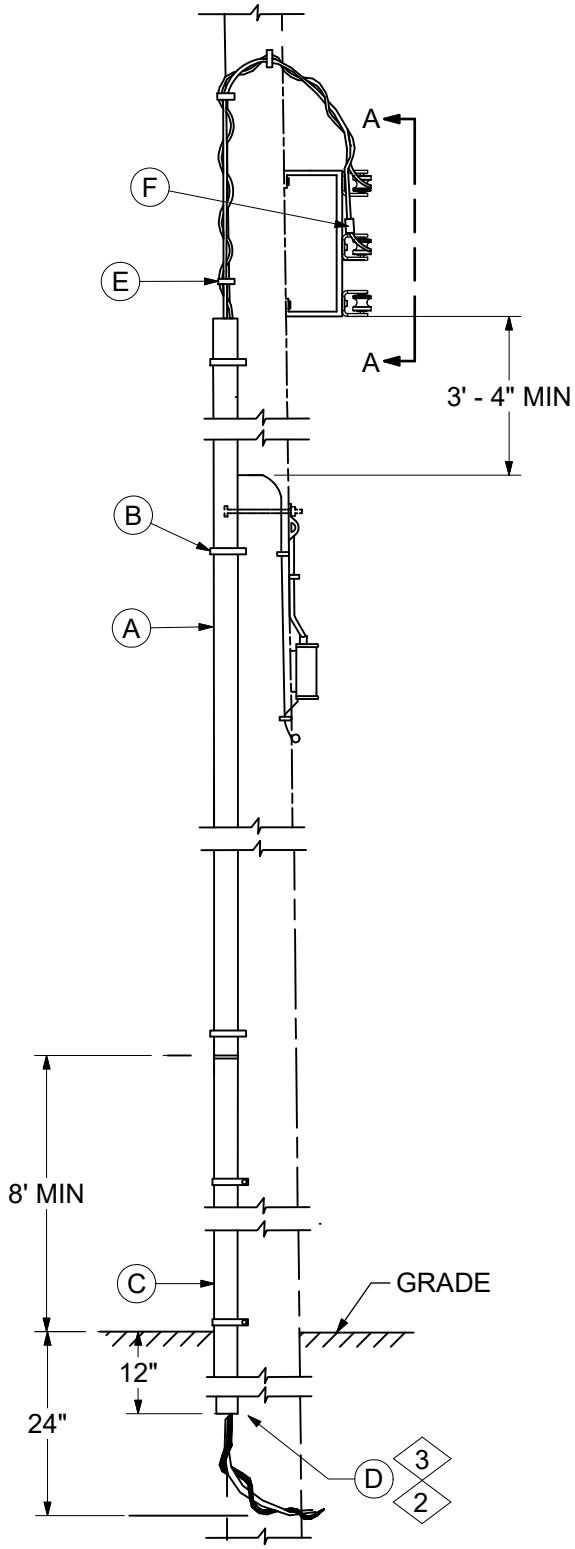
5. The 40” bracket to communications attachment clearance applies to all new lighting installations, all new communication attachments where lighting already exists, AND ON ALL POLES REPLACED FOR ANY REASON THAT HAVE EXISTING LIGHTING AND COMMUNICATION ATTACHMENTS. This is per NESC Rules13A1 and 13B2 Exception 2.

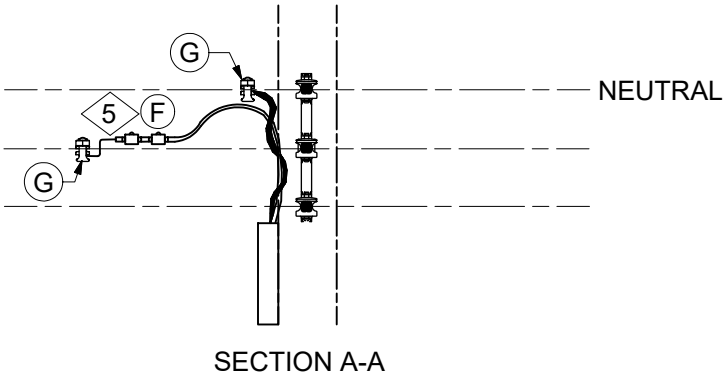
6. Equipment means non-current carrying metal parts of equipment, including metal supports for cables or conductors metal support braces that are attached to metal supports or are less than 1 inch from transformer cases or hangers that are not effectively grounded, and metal or nonmetallic supports or braces associated with communication cables or conductors. Antennas, photovoltaic panels, power supplies, loading coils, etc., shall also be considered equipment for the purpose of measuring clearances under this rule.

7. For minimum mounting height, refer to DCS **15 00 01 01**

	ITEM	STK / DCS #	DESCRIPTION 15 74 14 **	05	06
	A	38 01 683	Bracket, Floodlight, 18”	1	-
	B	23 64 001	Staple, 3/8" x 1-3/4" C.W.	6	5
	C	38 01 726	Bracket - Double Flood Mounting	-	1
	D	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	2	2
	E	23 66 207	Washer, Curved, Square, 5/8"	2	2
	F	23 66 134	Lock Washer - 5/8" Double Coil	2	2
	G	23 65 043	Lock Nut - 5/8" Square	2	2
	H	17 54 382	Connector, Split Bolt with Spacer, 2# AWG Main / #10 AWG Cu Tap	2	2
@	I	**15 70 17 ** **	Luminaire, Directional Flood	1	2

REV	DATE	ENG	DESCRIPTION
12	10/01/23	WYW	Converted To New Format
11	05/29/18	WYW	





SECTION A-A

REV	DATE	ENG	DESCRIPTION
5	10/01/23	WYW	Converteed to New Format
4	03/12/07	WYW	

CONSTRUCTION NOTE(s):

1. If the customer furnishes the cable, it must be approved by the National Electric Code for direct burial and exposure to sunlight. The customer cable should extend to the base of the pole or to a point designated by Ameren (normally 2'−0" inside the customer's property line). The customer must provide enough cable to allow the connections to be made on the pole.

2. It is recommended that direct buried cable be installed in conduit under driveways and parking areas.

3. Drive the lag screw into the pole so that the schedule 80 conduit will rest on the head; thus preventing the conduit from sliding down.

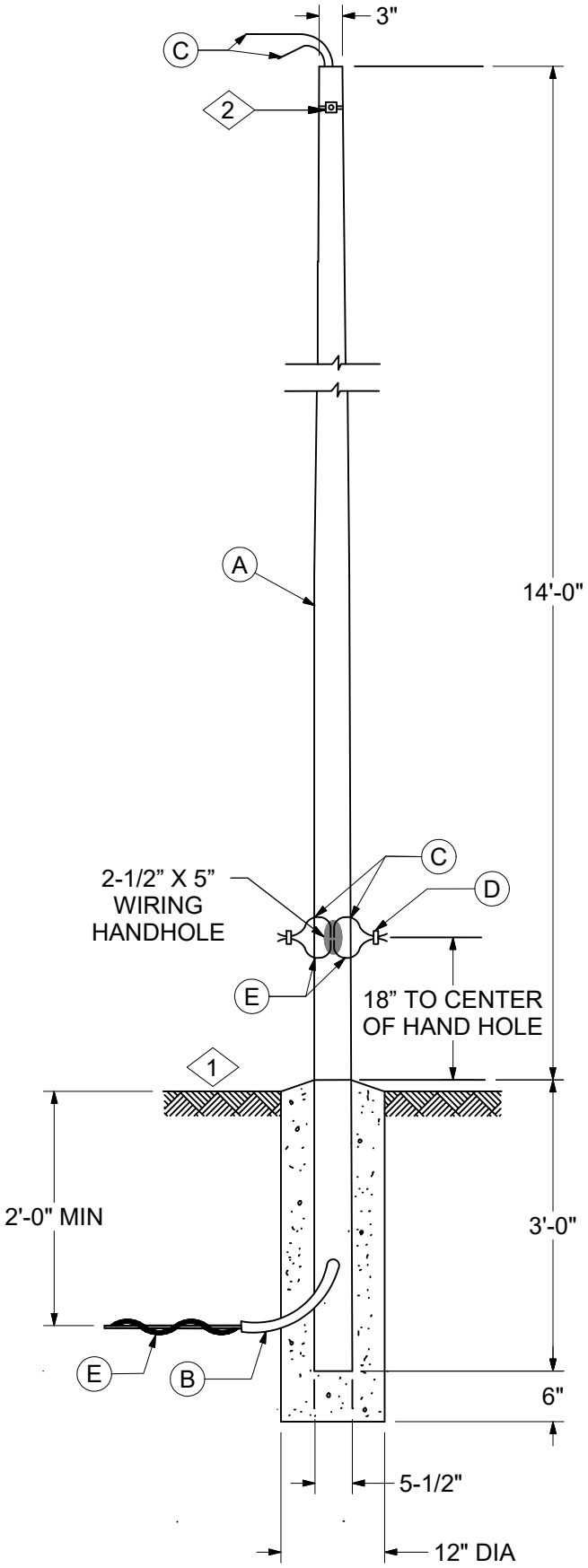
4. If triplex cable is used, two fuses are required. Additional fuse sizes are available:

Fuses	
STK #	**DESCRIPTION**
20 76 138	15 AMP
20 76 142	60 AMP
20 76 143	100 AMP

5. Install the fuse parallel to the wire so that the spring-loaded indicator can flip open to show that the fuse has blown.

	ITEM	STK / DCS #	DESCRIPTION 15 74 50 **	01
	A	12 01 178	Conduit − Plastic, 2" (ft)	15
	B	27 60 035	Iron − Hanger (ft)	10
	C	12 01 275	Conduit − Plastic, Sch 80, 2" (ft)	10
3	D	23 60 007	Screw − Lag, 1/2" x 4"	1
	E	23 64 027	Staple, 5/8" x 2"	1
4,5	F	20 76 139	Fuse − Secondary, 30 Amp	1
@	G	**07 00 25 00**	Clamp, Parallel Groove	3
	-	278	Op Code, Install Cable Up Pole	1

REV	DATE	ENG	DESCRIPTION
5	10/01/23	WYW	Converteed to New Format
4	03/12/07	WYW	



REV	DATE	ENG	DESCRIPTION
9	10/01/23	WYW	Converted To New Format
8	01/21/10	WYW	

CONSTRUCTION NOTE(s)

1. Rock or native soil backfill must be tamped to provide solid compaction around the pole. Refer to DCS **02 20 05 **** for backfill

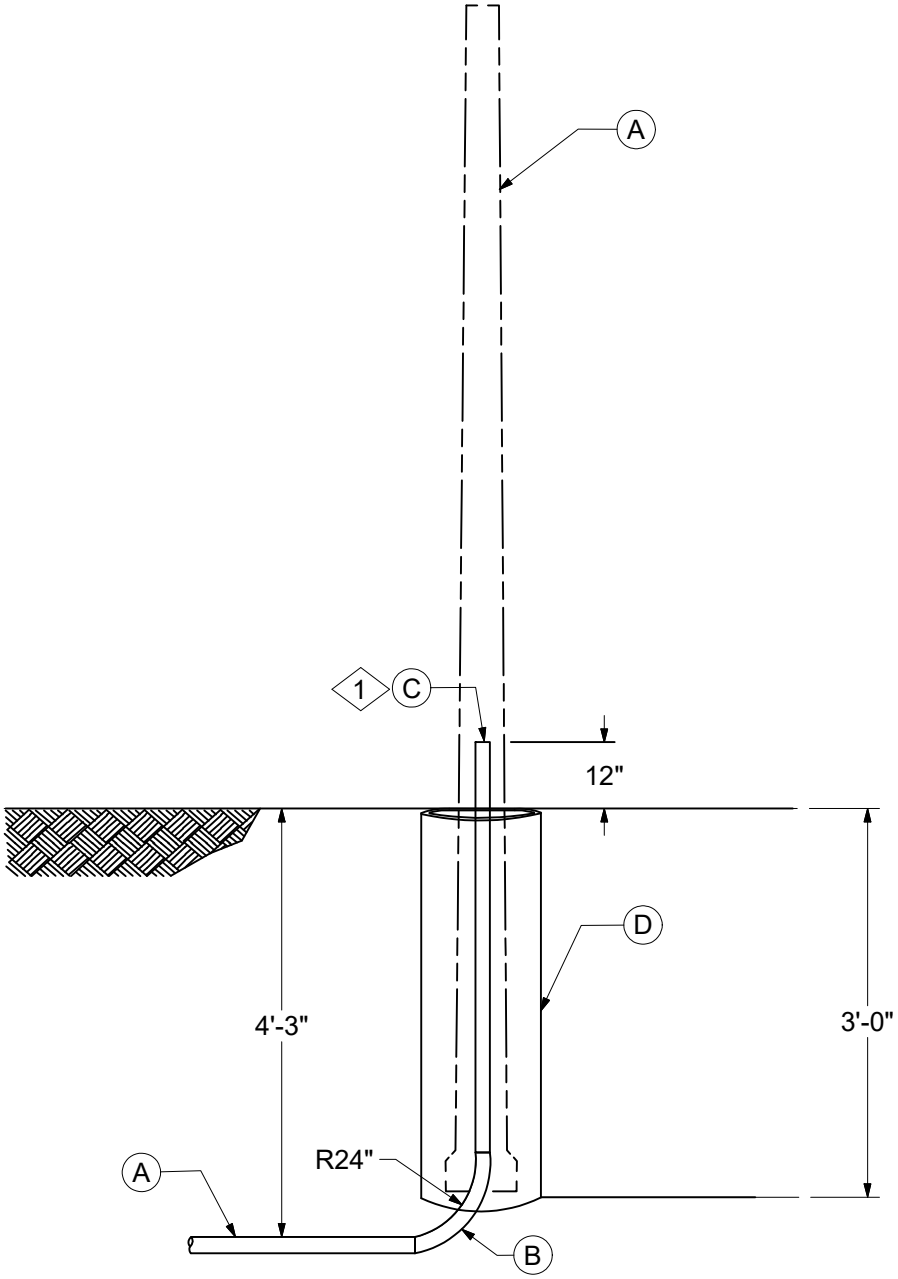
2. Generally, only one tag per street light shall be installed. If more than one street light installed on the same pole, one tag per street light is required, and each tag should be installed on the same quadrant of the light. The tag should be installed visibly from the ground level but not reachable from public. See DCS **15 90 01 01** for more details.

3. In Missouri residential developments, the contractor will install 1—1/2 inch conduit to the pole site. Ameren will install the pole and the cable.

4. For fused underground streetlight cable at pad mount transformer or pedestal, refer to DCS **52 00 01 ****.

	ITEM	STK / DCS #	DESCRIPTION 15 75 05 **	01
	A	38 01 526	Pole, F/G, Black, 17' w / hand hole	1
	B	12 51 148	Conduit, Poly, 1"	2
	C	18 57 104	Cable, 2#10, Cu, Poly	17
	D	17 01 116	Connector, Bolt/Set Screw, #14–2/0, 3Pos.	2
@	E	18 07 252	Cable, Duplex, #6 Al	#

REV	DATE	ENG	DESCRIPTION
9	10/01/23	WYW	Converted To New Format
8	01/21/10	WYW	



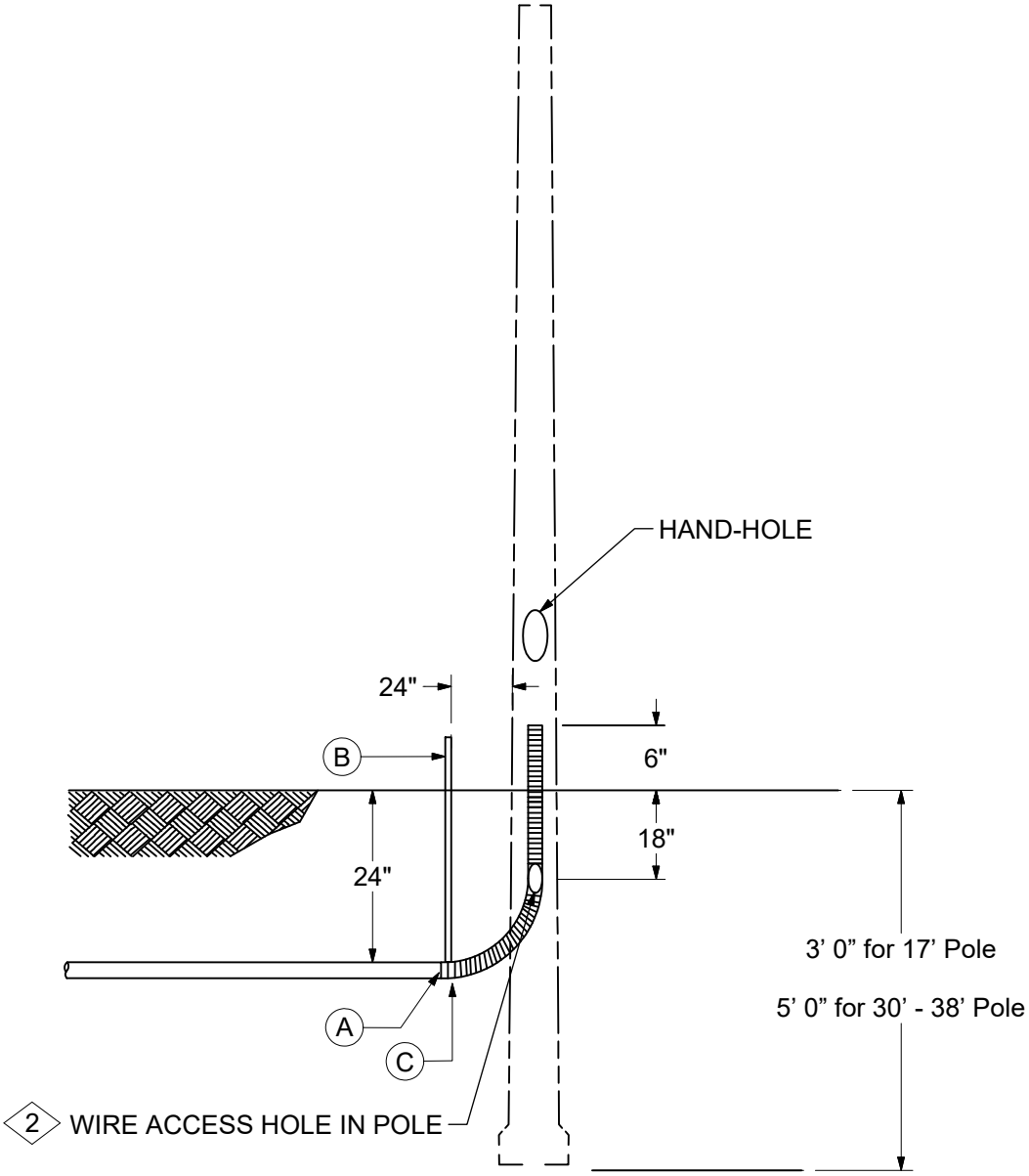
CONSTRUCTION NOTE(s):

1. Seal exposed tube and conduit with plug and tape.

2. Conduit must be centered in tube and both conduit and tube must be plumb before backfilling, Refer to DCS **02 20 05**** for backfill.

ITEM	STK / DCS #	DESCRIPTION 15 75 05 **	02
A	12 01 298	Conduit − Plastic, PVC, Sch. 40, 1−1/2” X 20’ w Coupling	#
B	12 51 331	Bend − Plastic, 1−1/2”, 24” Rad.	1
C	12 51 330	Plug − Conduit, Plastic, 1−1/2”	1
D	-	Pipe − Plastic Culvert, 18” I.D., 3ft (Customer Provided)	1

REV	DATE	ENG	DESCRIPTION
2	10/01/23	WYW	Moved from Conduit SPEC 3A-Conduit Enter from Bottom of Pole
1	08/17/10	WYW	

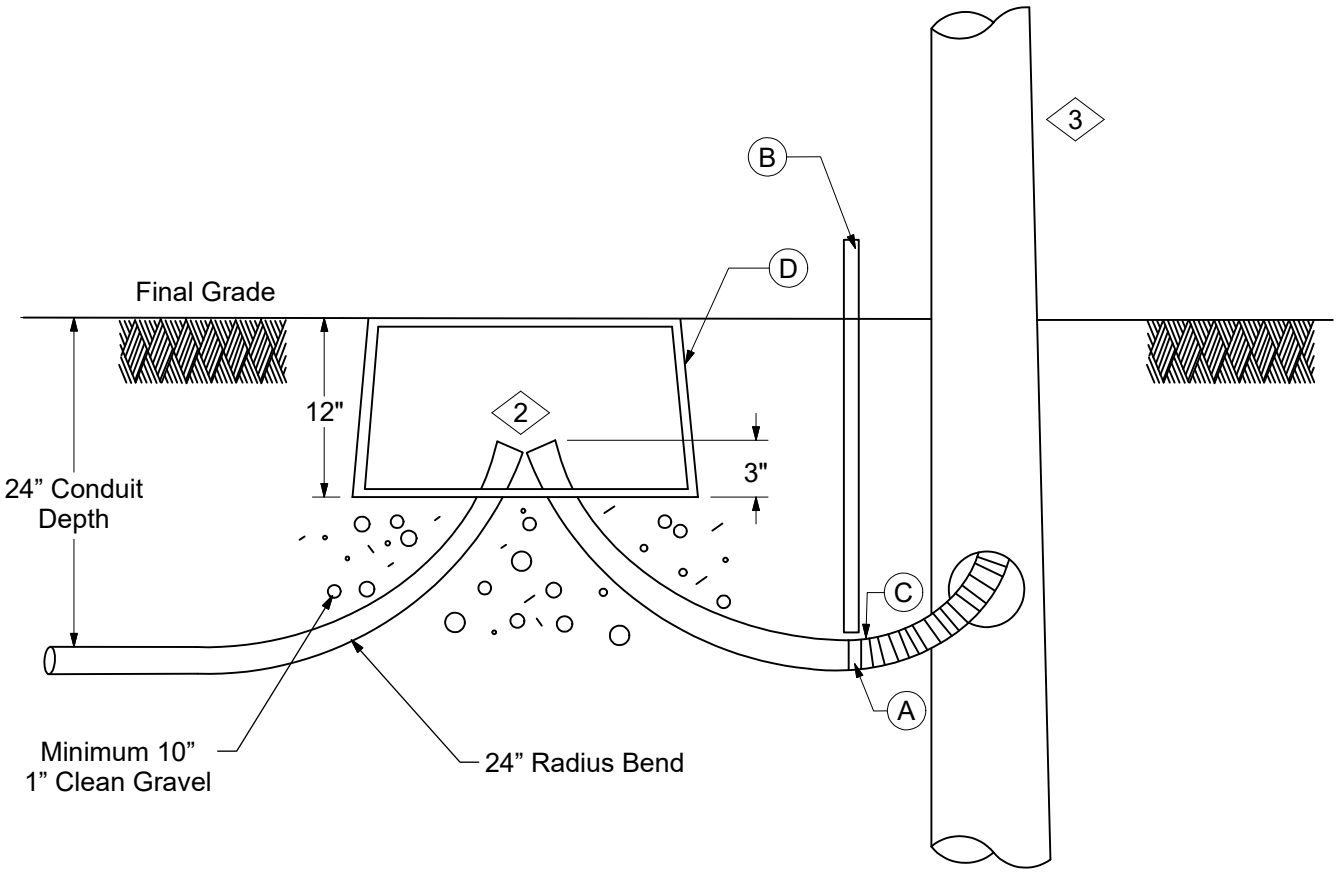


CONSTRUCTION NOTE(s):

1. Material installed by contractor.
2. Remove grommet and enlarge hole.

ITEM	STK / DCS #	DESCRIPTION 15 75 05 **	03
A	12 51 330	Plug − Conduit 1−1/2"	1
B	49 55 520	Marker − Buried Conduit	1
C	12 51 329	Conduit Reducer 2" to 1−1/2"	1

REV	DATE	ENG	DESCRIPTION
1	10/01/23	WYW	Moved Data from DCS 15 75 05 02
0	01/21/10	WYW	

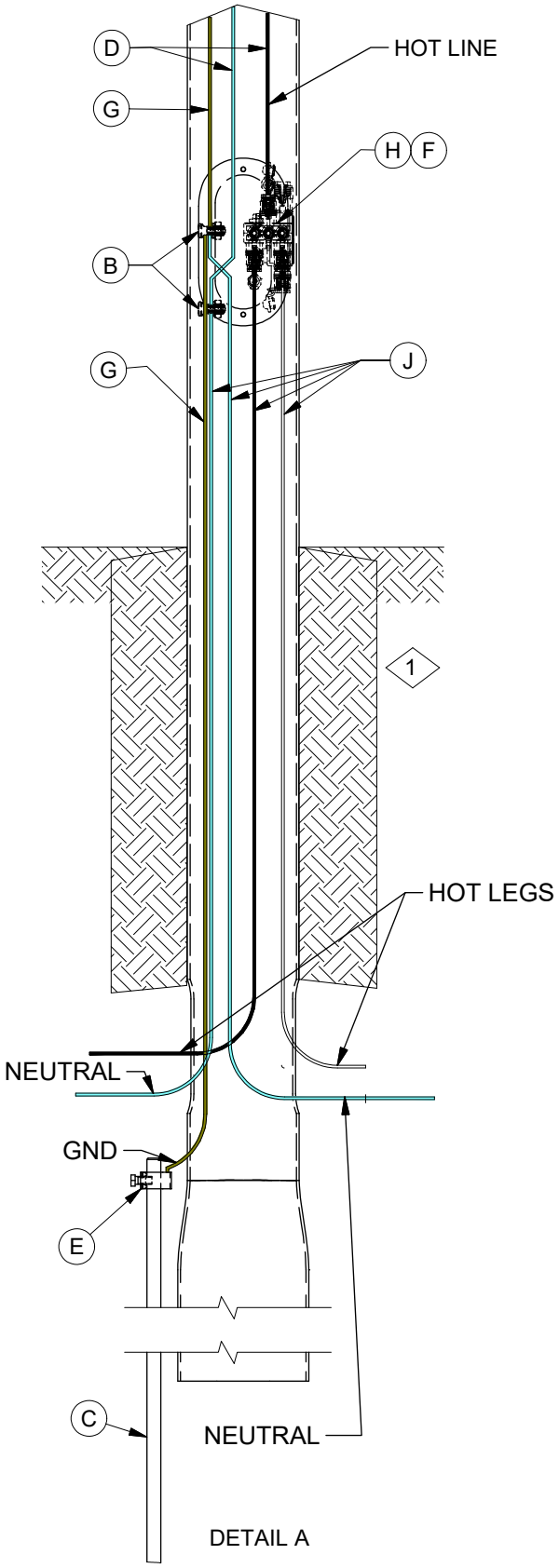


CONSTRUCTION NOTE(s):

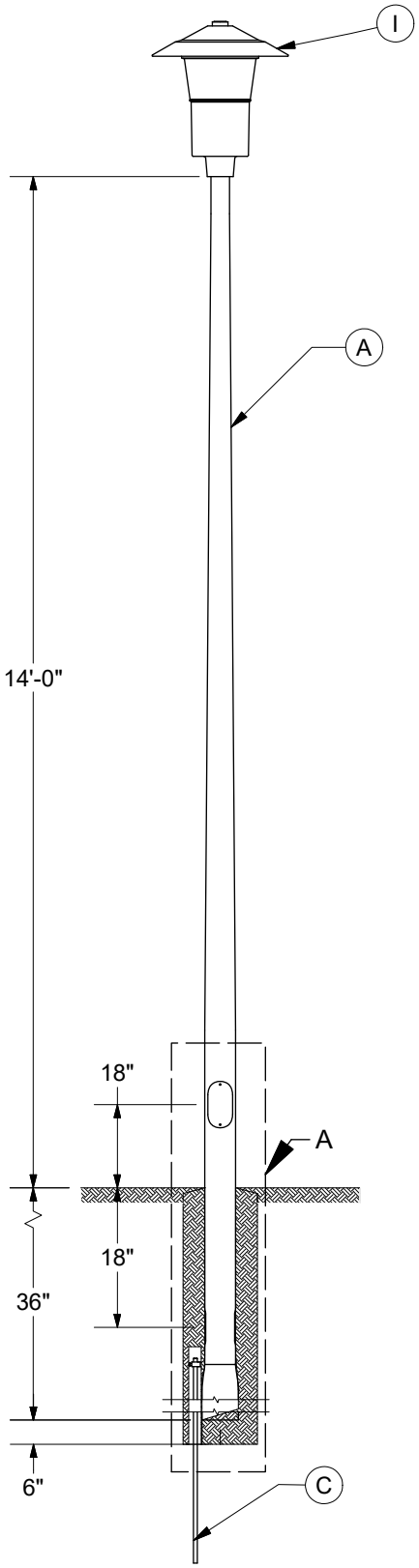
1. Customer installs Ameren supplied box.
2. Customer cut top of conduit bend so 3" stub extends thru bottom of box.
3. Street Light Pole Installed by Ameren

	ITEM	STK / DCS #	DESCRIPTION 15 75 05 **	04
	A	12 51 330	Plug − Conduit 1−1/2”	1
	B	49 55 520	Marker − Buried Conduit	1
	C	12 51 329	Conduit Reducer 2” to 1−1/2”	1
1	D	12 06 106	Poly Splice Box 9 3/4” (W) x 14” (L) x 12” (D)	1

REV	DATE	ENG	DESCRIPTION
0	10/01/23	WYW	Moved Data from DCS 15 75 05 03

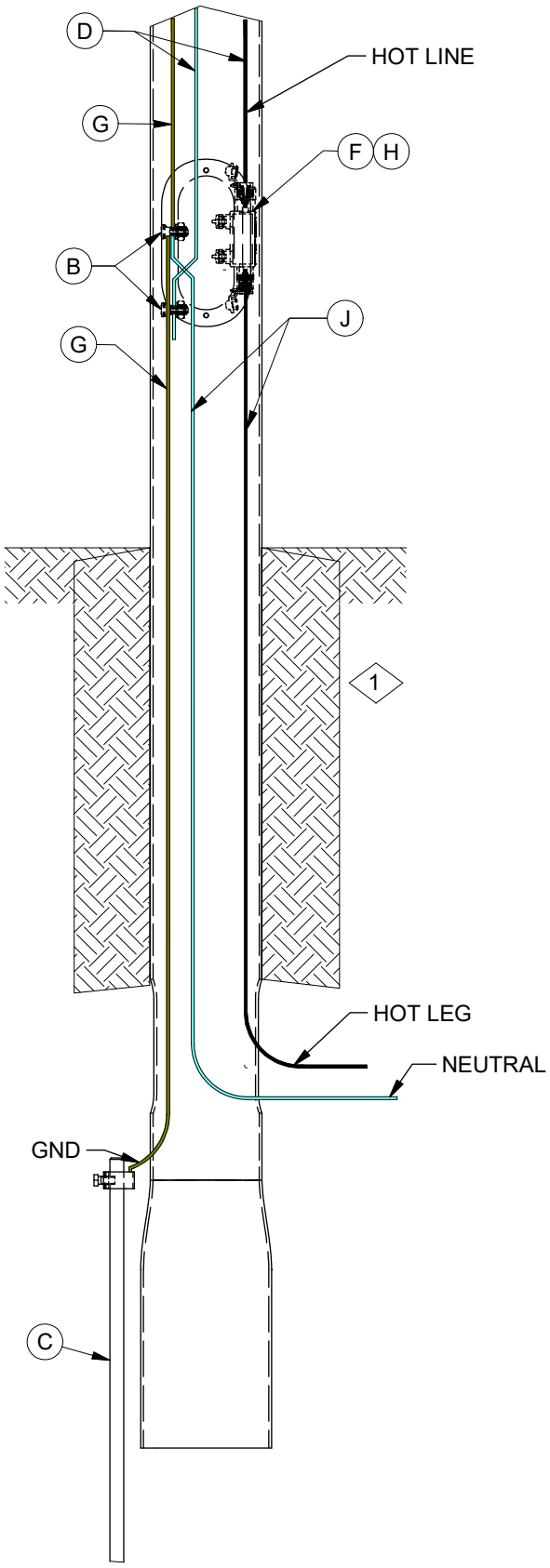


DETAIL A

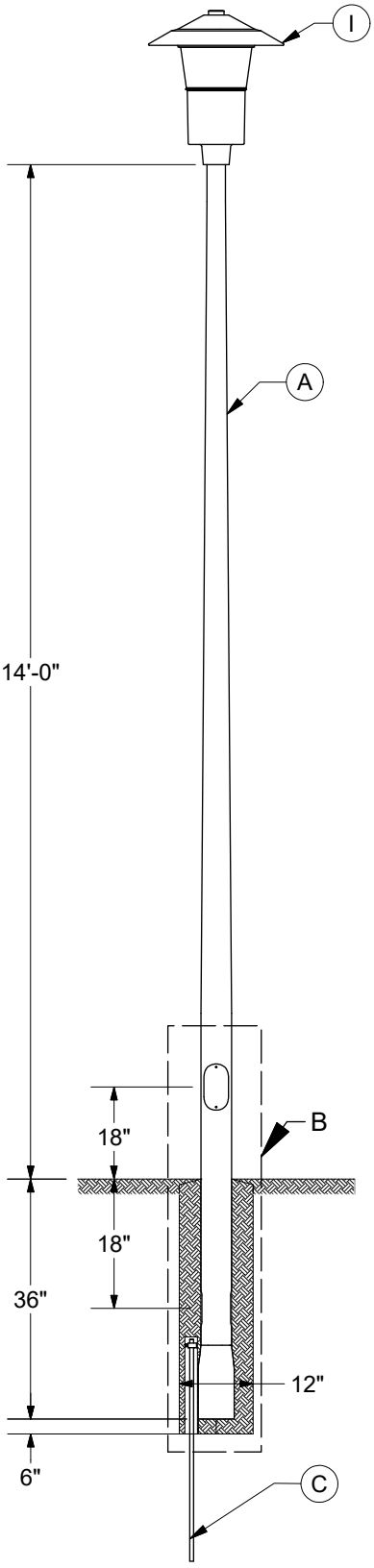


15 76 01 01

REV	DATE	ENG	DESCRIPTION
0	10/01/23	WYW	New Standard



DETAIL B



15 76 01 02

REV	DATE	ENG	DESCRIPTION
0	10/01/23	WYW	New Standard

DCS #	DESCRIPTION
15 76 01 01	Multi-Light
15 76 01 02	Single-Light

CONTRUCTION NOTE(s):

1. Rock or native soil must be tamped to provide solid compaction around the pole. Refer to DCS **02 20 05 ****
for more detail.

2. Generally only one tag per street light shall be installed. If more than one street light installed on the same pole, one tag street light is required, and each tag should be installed on the same quadrant of the light. The tag should be installed visibly from the ground level but not reachable from public. Refer to DCS **15 90 01 01** for more details.

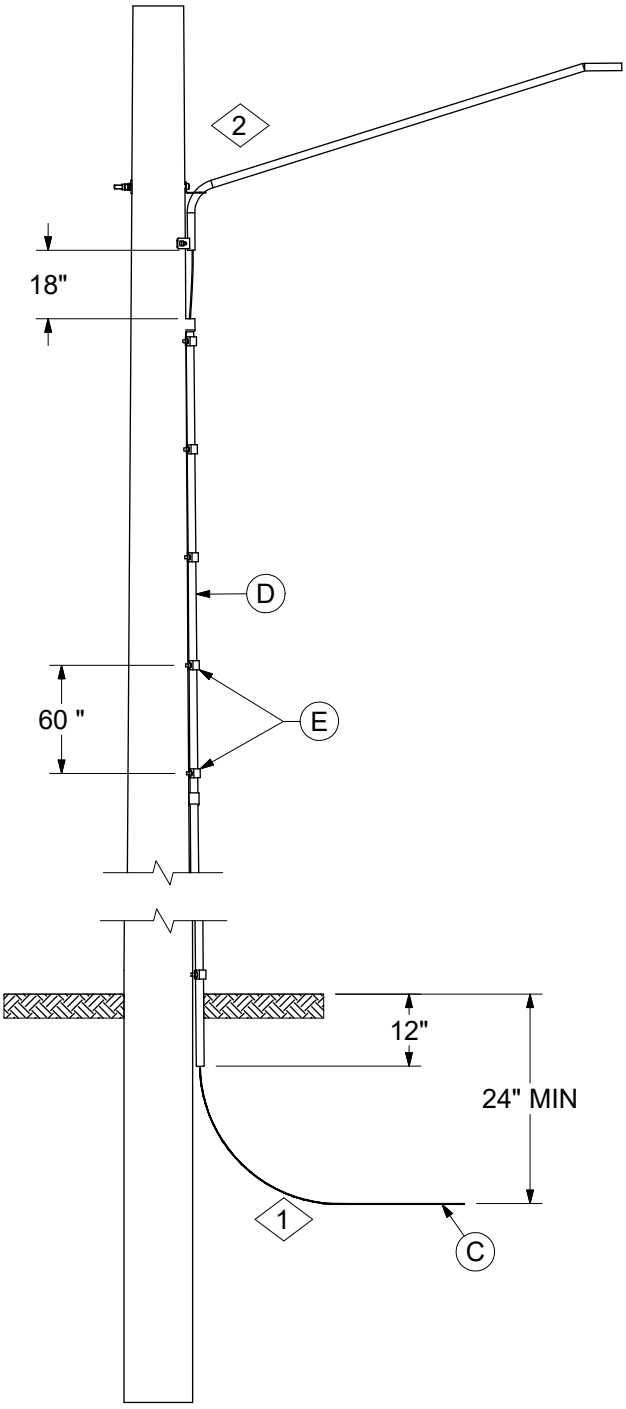
3. In Missouri residential developments, the contractor will install 1-1/2 inch conduit to the pole site. Ameren will install the pole and the cable. In Illinois residential developments, Ameren will install direct burial unless the customer provides a complete conduit system.

4. For fused underground streetlight cable at pad mount transformer or pedestal, refer to DCS **52 00 01 ****.

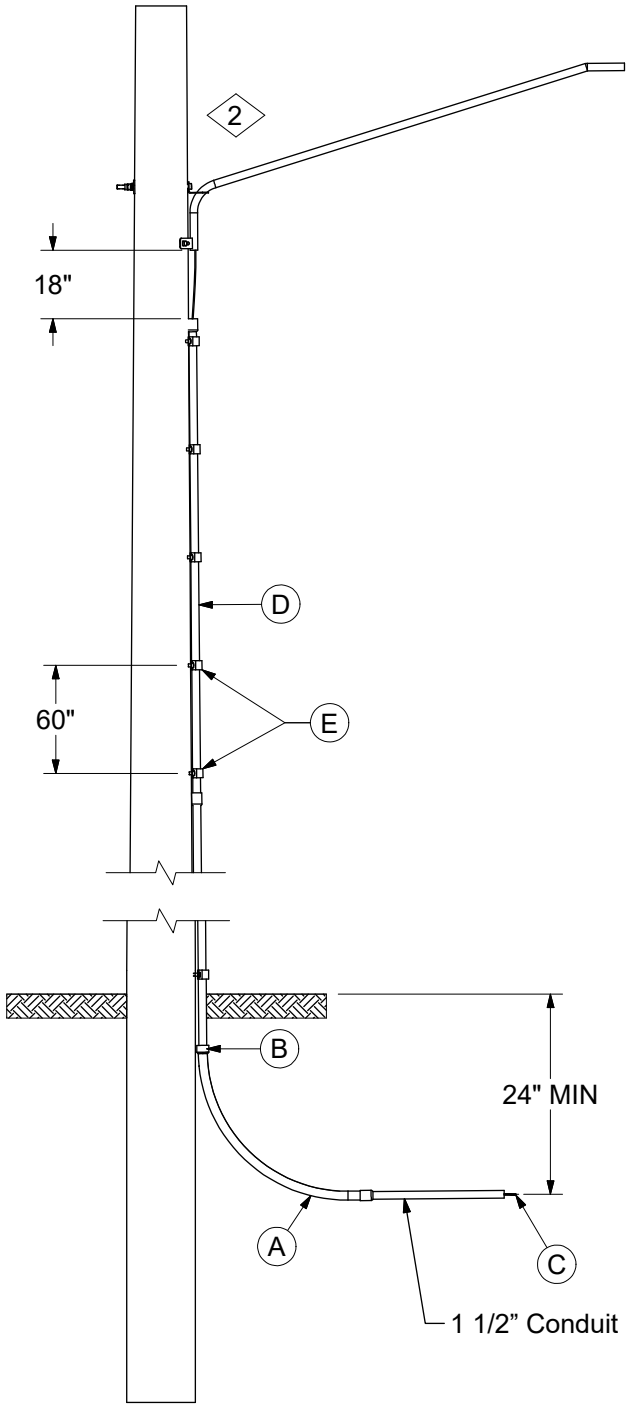
5. See DCS **29 00 17 02** for minimum required ground clearance to bottom of antenna. Use clearance "Secondary & Service Conductors 0 to 750 Volts".

	ITEM	STOCK #	DESCRIPTION 15 76 01 **	01	02
	A	38 51 663	Pole - Aluminum, Black, w/Hand Hole	1	1
	B	17 54 004	Connector - Split Bolt, #4 Sol CU thru #8 Sol CU	2	2
	C	23 63 027	Ground Rod, 5/8" x 8'	1	1
	D	18 07 104	Cable, 2#10, Cu, Poly (ft)	17	17
	E	17 52 032	Clamp, Ground Rod 5/8"	1	1
	F	20 52 110	Fuse, 10 Amp	1	2
	G	18 52 019	Wire, S.D. #6 Cu, Bare, (ft)	10	10
	H	20 56 544	Connector, #14 thru 1/0 Wire, One to Two Way Fusible Link	1	-
		20 56 543	Connector, #14 thru 1/0 Wire, One to One Fusible Link	-	1
@	I	**15 70 15 ** **	Luminaire, Post Top	1	1
@	J	18 07 252	Cable - Duplex #6 Al. (ft)	#	#

REV	DATE	ENG	DESCRIPTION
0	10/01/23	WYW	New Standard



15 77 01 03
Direct Buried



15 77 01 04
In Conduit

REV	DATE	ENG	DESCRIPTION
7	10/01/23	WYW	Converted To New Format
6	01/21/10	WYW	

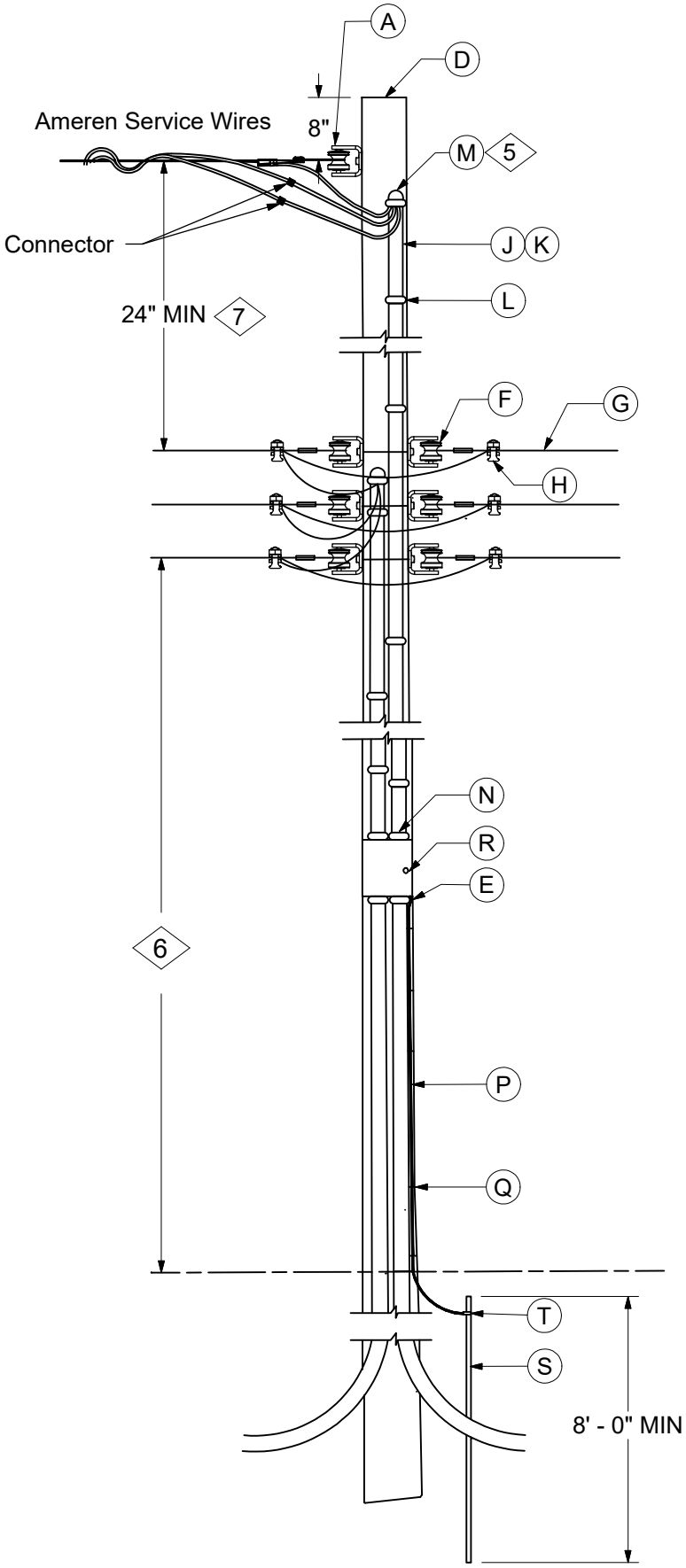
CONSTRUCTION NOTE(s):

1. As an underground alternative, where multiple lights are being installed direct bury a “T” splice per DCS **41 15 31 00** to avoid running the cable up and down the pole.

2. Pole, bracket, and luminaire are listed separately.

3. Refer to DCS **02 20 05 **** for backfill.

	ITEM	STK / DCS #	DESCRIPTION 15 77 01 **	03	04
	A	12 51 331	Conduit, Bend, 1-1/2", 24" Rad	-	1
	B	40 83 425	Conduit Reducer, 1-1/2" to 1"	-	1
@	C	18 07 252	Cable, URD, Duplex #6, Al (ft)	#	#
@	D	12 01 332	Conduit, Schedule 80, 1"	#	#
@	E	40 73 377	Strap, 1" w/ 1-Hole & 1/4" Bolt	#	#



REV	DATE	ENG	DESCRIPTION
3	10/01/23	WYW	Moved Data from DCS 25 01 05 00
2	10/21/10	WYW	

CONSTRUCTION NOTE(s):

1. Customer to notify company of location of service pole, size of lighting load, and if overhead conductor, size of wire and length of span to next pole. Company will then determine pole size and guying requirements and notify customer. Guying to be avoided by using self sustained poles where possible. If guying is required, customer will supply guy and anchor in traffic free location.

2. Customer to provide a fused disconnect switch in a suitable watertight enclosure. This device shall meet all requirements of the National Electrical Code and National Electrical Safety Code and be approved by local inspection authorities. The enclosure is to be provided with a provision for locking. The enclosure shall be grounded.

3. All construction to comply with the National Electrical Code or National Electrical Safety Code as applicable.

4. If customer installs a light on this pole, such light shall clear Ameren service wires by not less than 24 inches.

◇5. Locate 15" from the top of pole & 5" to side of center line of bracket.

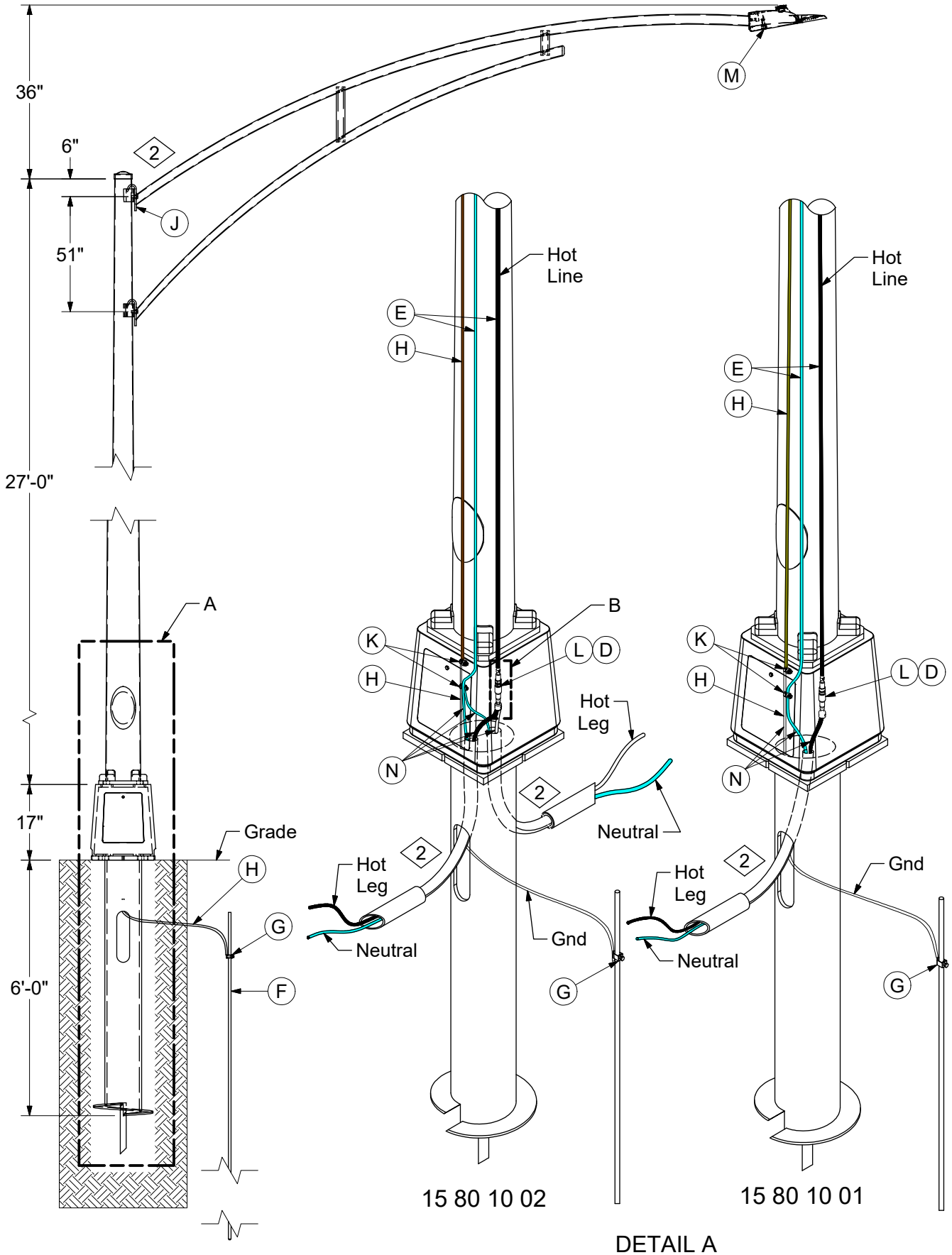
◇6. See DCS **09 00 03 01** for minimum clearance.

◇7. Allow 15" of service cable for the connection.

	Material Provided In Place And Owned By Ameren			
	ITEM	**STK / DCS #**	**DESCRIPTION** **15 78 00 ****	**00**
	A	**06 01 01 01**	Secondary Clevis	1
@	B	**07 00 25 00**	Connector	2

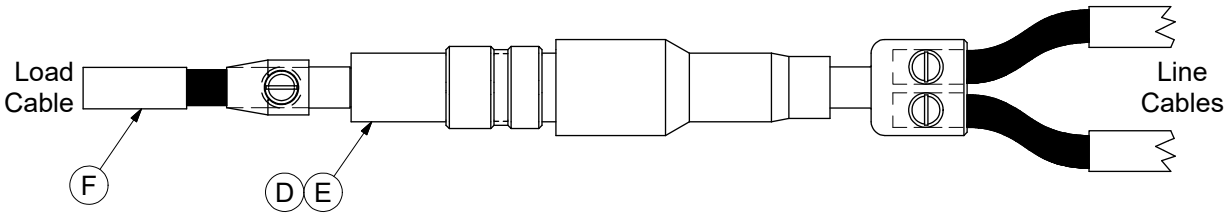
	Material Provided In Place And Owned By Customer		
	ITEM	**DESCRIPTION** **15 78 00 ****	**00**
1	A	Pole	1
	E	Grounding Lug	1
	F	Secondary Clevis	6
	G	Distribution Wire	-
	H	Clamp, PG	6
	J	Metallic Conduit	-
	K	Service Entrance Cable	-
	L	Conduit Straps	-
	M	Entrance Caps	2
	N	Connectors (Water Tight)	2
	P	Ground Wire	-
	Q	Staples	-
2	R	Fused Disconnect SW. Raintight	1
	S	Ground Rod	1
	T	Ground Rod Lug	1
1	U	Guy & Anchor (If Req'd.)	1

REV	DATE	ENG	DESCRIPTION
3	10/01/23	WYW	Moved Data from DCS 25 01 05 00
2	10/21/10	WYW	



DETAIL A

REV	DATE	ENG	DESCRIPTION
0	10/01/23	WYW	New Standard



DETAIL B

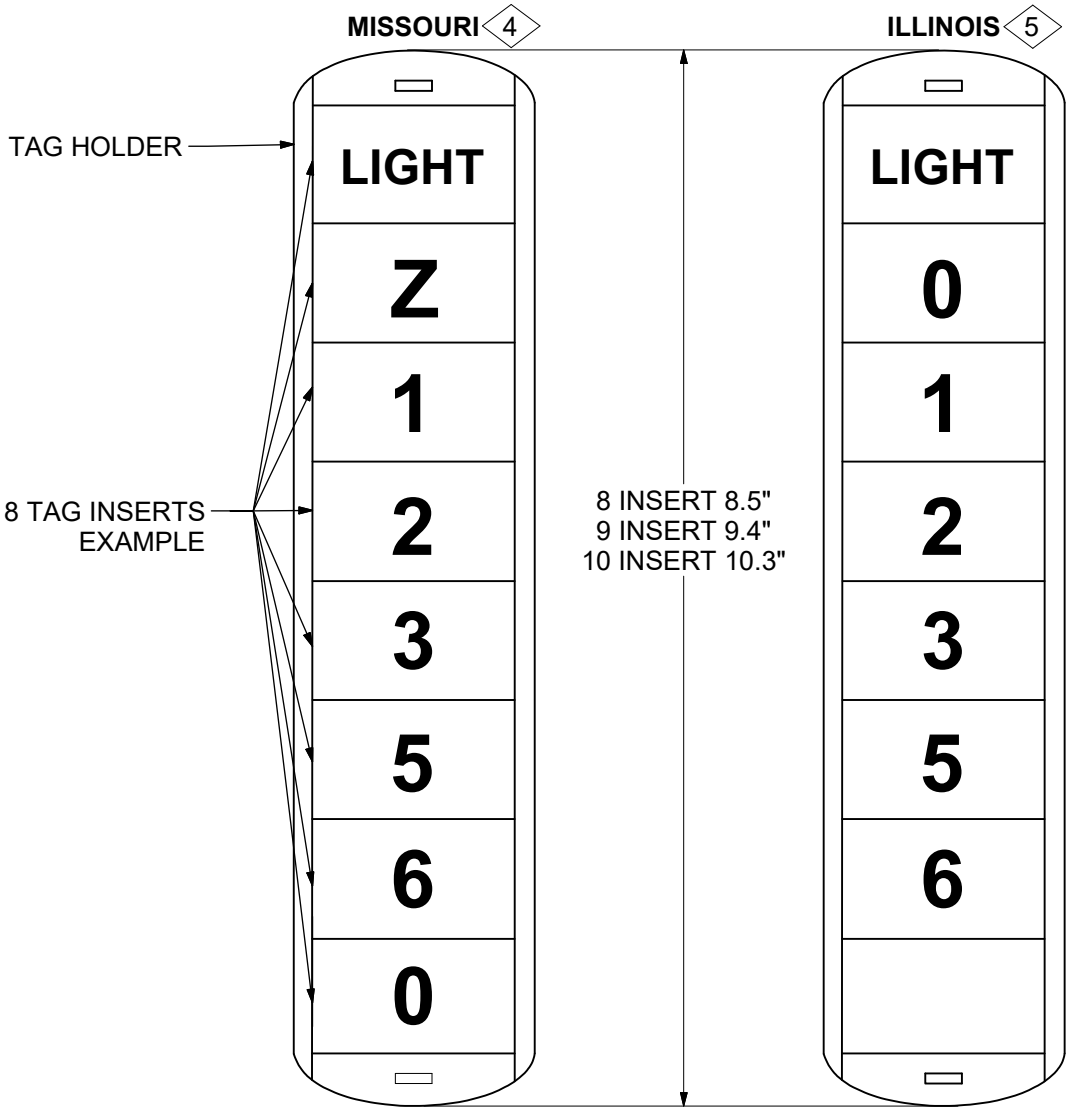
CONSTRUCTION NOTE(s):

1. For 120 Volt circuit, use one fuse in energized line and one fuse slug (Stock #38 01 507) in neutral.
2. Wrap plastic tie around wires where they enter bracket.
3. For fused underground streetlight cable at padmount transformer or pedestal, refer to DCS **52 00 01 ****.

DCS #	DESCRIPTION
15 80 10 01	Breakaway, In-Line
15 80 10 02	Breakaway, In-Line "Y"

	ITEM	STK / DCS #	DESCRIPTION 15 80 10 **	01	02
	A	10 00 10 081	Pole, Galv. , 30 ft, Anchor Base with 12 ft Bracket	1	1
	B	10 00 10 082	Base, Breakaway , Al., T-Base	1	1
	C	23 13 162	Foundation, Screw-in, 5 ft	1	1
	D	38 01 509	Fuse - 10 Amp 600V	1	2
	E	18 57 104	Cable, 2#10 Cu, Covered (ft)	50	50
	F	23 13 069	Ground Rod - 5/8" x 8'	1	1
	G	17 52 032	Clamp, Ground Rod 5/8"	1	1
	H	18 52 019	Wire, #6 Cu, S.D., Bare (ft)	50	50
	I	12 51 148	Conduit, Poly, 1" (ft)	10	10
	J	25 54 074	Tie Cable - 1/2" x 6" Poly, (ft)	2	4
	K	17 54 004	Connector - Split Bolt, #4 Sol CU thru #8 Sol CU	2	2
@	L	20 76 141	Fuseholder, In-Line, 600V, Breakaway, #12 to #2 Cu/Al	1	-
		38 01 504	Fuseholder, In-Line, "Y", 600V, Breakaway, #12 to #2 Cu/Al	-	1
@	M	**15 70 13 ** **	Luminaire, LED Bracket Mount	1	1
@	N	18 07 252	Cable - Duplex, #6 Al (ft)	#	#

REV	DATE	ENG	DESCRIPTION
0	10/01/23	WYW	New Standard



CONSTRUCTION NOTE(s):

1. The street lighting tags will be produced by construction district personnel after obtaining the proper designation and abbreviation from the appropriate authority.

2. The street lighting tags will consist of a holder and various inserts. The holder will accommodate a maximum of eight, nine, and ten inserts. It is necessary to crimp each end of the holder to prevent the number from sliding out. A sample tag with eight inserts is shown.

3. Install a street light number about 10 ft. from the ground, so that is visible for general public, but still out of reach. Generally only one tag per street light shall be installed. If more than one street light is installed on the same street lighting pole, one tag per street light is required, and each tag should be installed on the same quadrant as the light. The tag should be installed visibly from the ground level but not reachable from public.

4. In Missouri use light tag, followed by a letter and six numbers

5. In Illinois use light tag and six numbers.

6. Tag Attachment Methods

   A. Tire Wire - Stock #40 59 197
   Whenever a tag is attached directly to a non-wood street lighting pole, a tie wire shall be used for the attachment.

   B. Galvanized Nails - Stock #21 57 047
   Whenever a tag is attached directly to a wood pole, two galvanized nails shall be used for the attachment.

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

8. Tag Holder and Inserts
   Street lighting tags will be produced using the following stock items.

STK / DCS #	Description
16 16 047	Holder, Tag, Aluminum, 8 inserts
16 16 048	Holder, Tag, Aluminum, 9 inserts
16 16 049	Holder, Tag Aluminum, 10 inserts
16 16 050	Tag, "LIGHT"
16 01 195	Tag, "0" ◇7◇
16 01 196	Tag, "1"
16 01 197	Tag, "2"
16 01 198	Tag, "3"
16 01 199	Tag, "4"
16 01 200	Tag, "5"
16 01 201	Tag, "6 or 9"
16 01 202	Tag, "7"
16 01 203	Tag, "8"
16 01 204	Tag, "A"
16 01 205	Tag, "B"
16 01 206	Tag, "C"
16 01 207	Tag, "D"
16 01 208	Tag, "E"
16 01 209	Tag, "F"
16 01 210	Tag, "G"

STK / DCS #	Description
16 01 211	Tag, "H"
16 01 303	Tag, "I"
16 01 304	Tag, "J"
16 01 305	Tag, "K"
16 01 306	Tag, "L"
16 01 307	Tag, "M"
16 01 308	Tag, "N"
16 01 309	Tag, O"
16 01 212	Tag, P"
16 01 310	Tag, "Q"
16 01 311	Tag, "R"
16 01 213	Tag, "S"
16 01 214	Tag, "T"
16 01 312	Tag, "U"
16 01 313	Tag, "V"
16 01 314	Tag, "W"
16 01 215	Tag, "X"
16 01 216	Tag, "Y"
16 01 217	Tag, "Z"

REV	DATE	ENG	DESCRIPTION
4	10/01/23	WYW	Converted To New Format
3	06/30/17	ZSD	

CAPACITORS & REGULATORS 16

CAPACITOR BANK WIRING SCHEMATIC, SINGLE PHASE, FIXED - 5kV, 15kV.....16 00 02 00

CAPACITOR BANK WIRING SCHEMATIC, THREE PHASE,
SWITCHED AND FIXED - 5kV, 15kV, 34kV.....16 00 05 00

SWITCHED CAP BANK CONTROL AND WIRING,
TIME, TEMP, AND VOLTAGE - COMMUNICATING - 5kV, 15kV, 35kV.....16 00 24 **

SWITCHED CAP BANK CONTROL AND WIRING,
TIME, TEMP, VOLTAGE, CURRENT, AND VAR - COMMUNICATING - 5kV, 15kV, 35kV.....16 00 26 **

FIXED CAPACITOR INSTALLATION, SINGLE PHASE - 5kV, 15kV.....16 15 01 **

FIXED CAP BANK INSTALLATION, THREE PHASE - 5kV, 15kV.....16 15 02 **

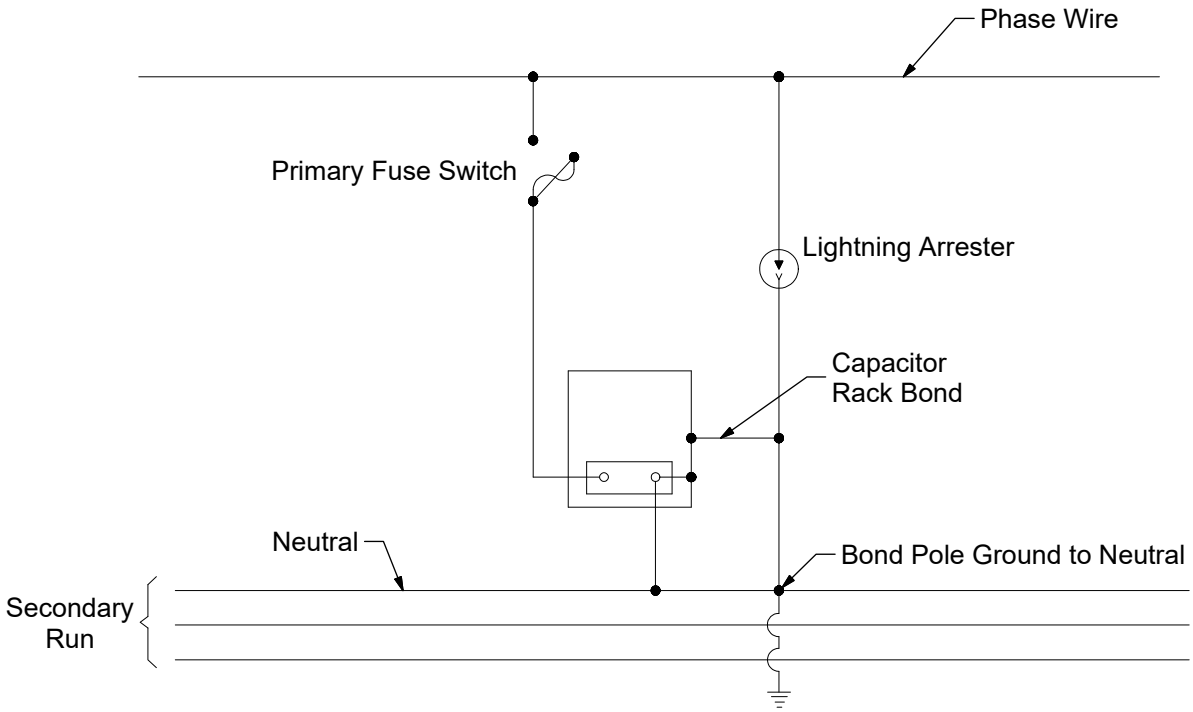
SWITCHED CAP BANK INSTALLATION, THREE PHASE - COMMUNICATING - 5kV, 15kV.....16 15 03 **

INSTALLATION OF 1kVA TRANSFORMER, CAPACITOR BANK - 15kV.....16 15 05 01

SWITCHED CAP BANK INSTALLATION, THREE PHASE - COMMUNICATING - 35kV.....16 34 02 **

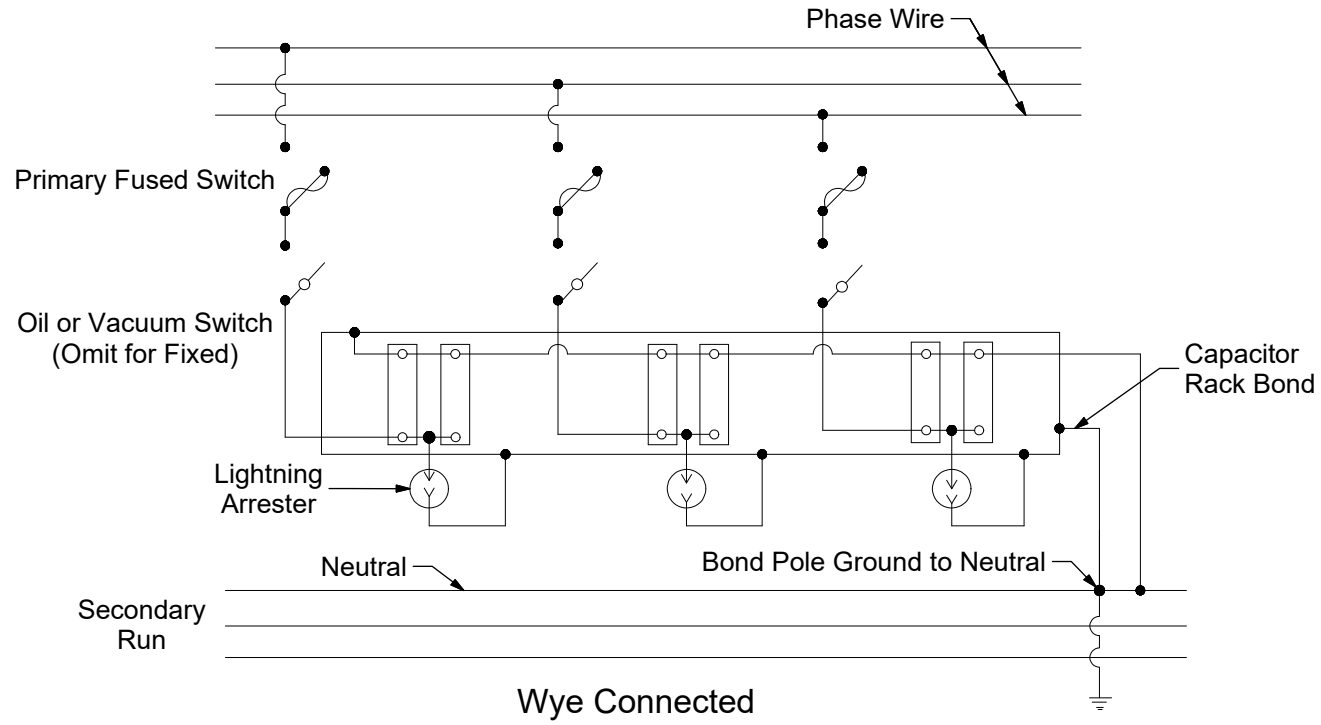
REGULATOR POLE MOUNTED, SINGLE PHASE - 5kV, 15kV.....16 80 01 **

REGULATOR POLE MOUNTED, THREE PHASE - 5kV, 15kV.....16 80 03 01

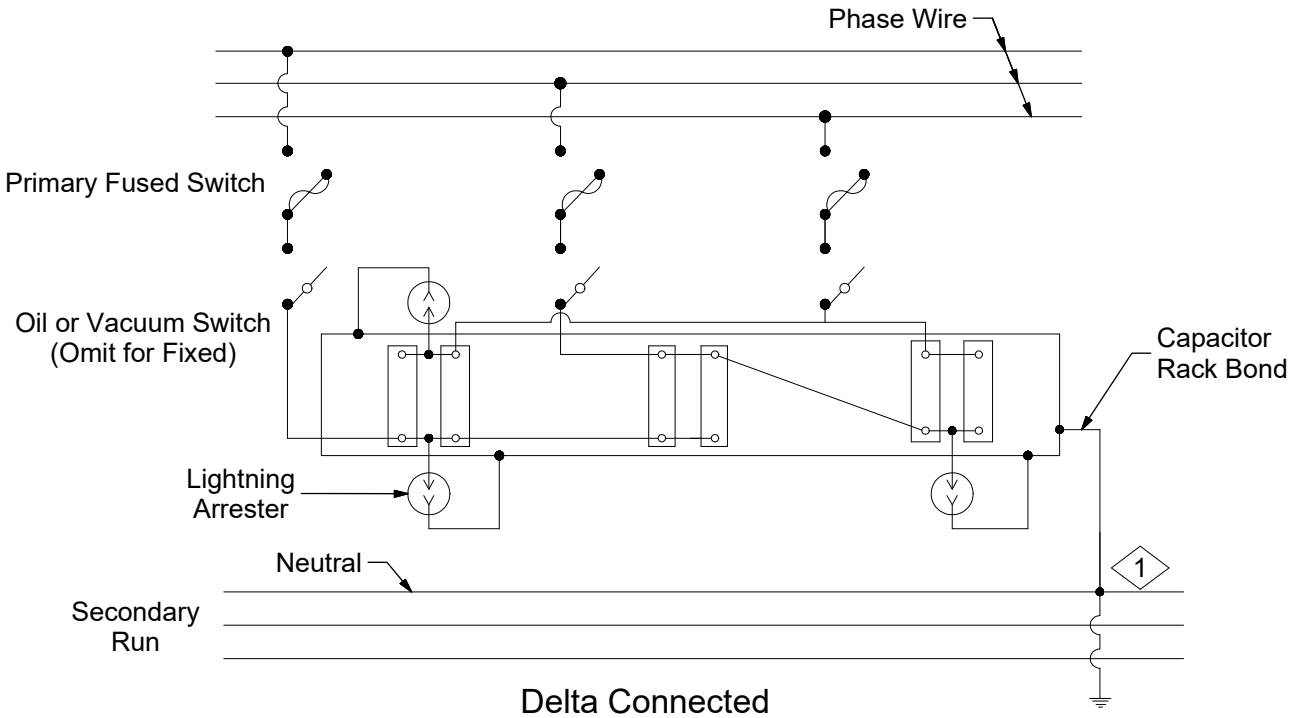


CONSTRUCTION NOTE(s):

1. See DCS **16 15 01 **** for single phase fixed capacitor installation.



Wye Connected

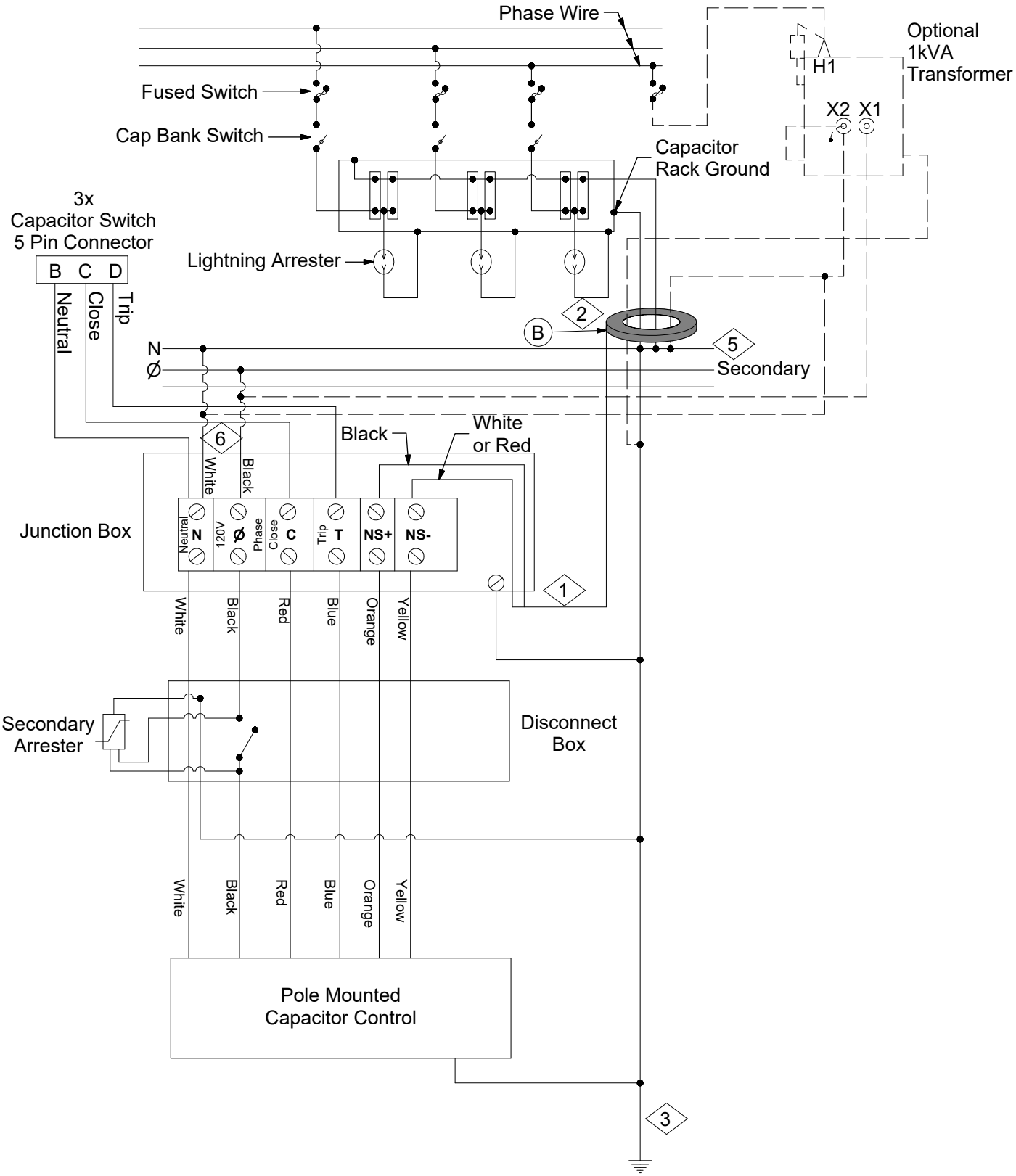


Delta Connected

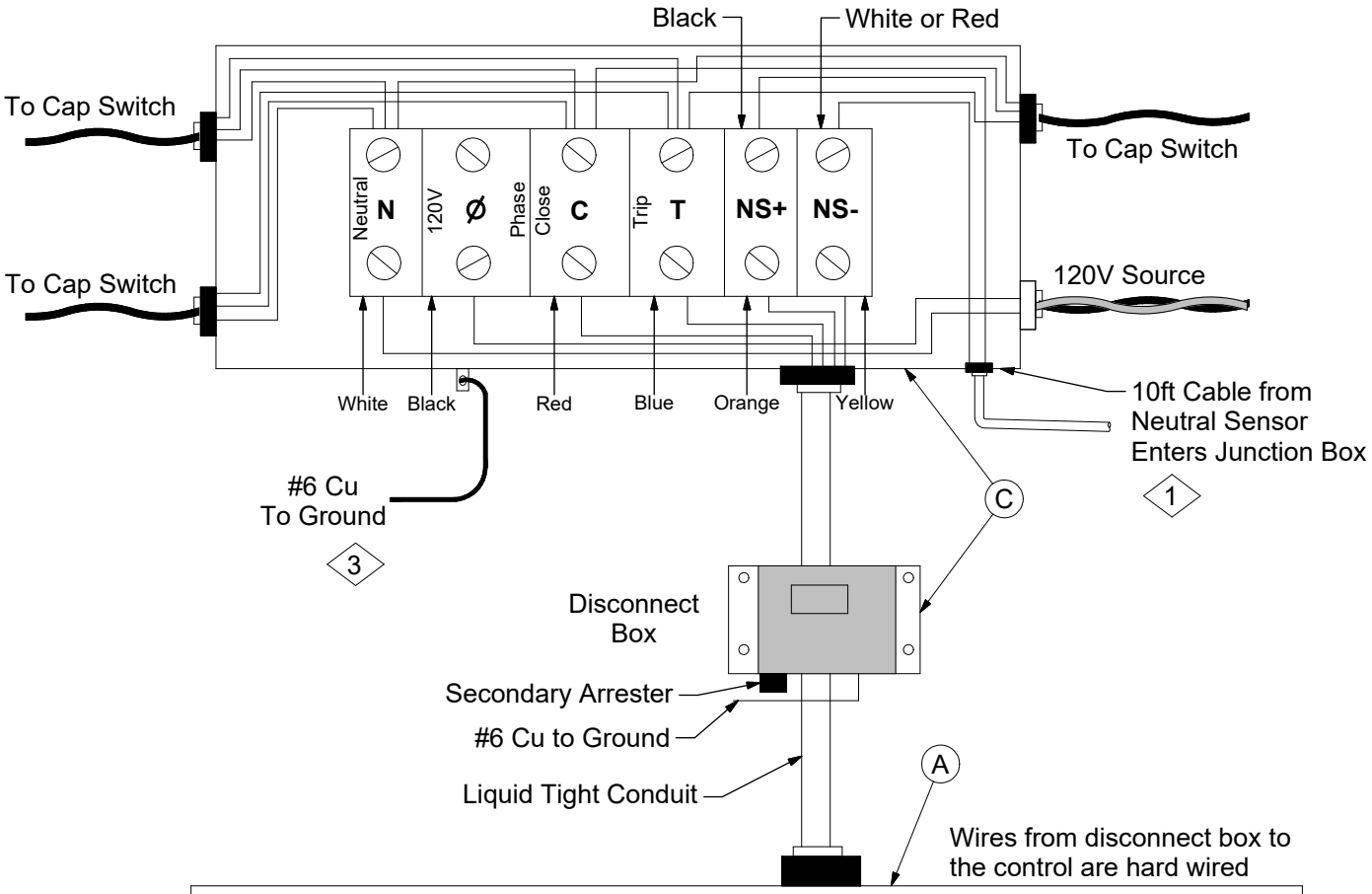
CONSTRUCTION NOTE(s):

1. Bond between pole ground and neutral shall only be made when neutral is common to primary and/or static.

REV	DATE	ENG	DESCRIPTION
6	10/01/23	DT	Converted to new format, Added Note 1
5	5/15/16	WYW	



REV	DATE	ENG	DESCRIPTION
8	10/01/23	DT	Updated Drawing, Removed S&C Controller, Added Note 5, 6, & 9
7	1/01/20	DT	

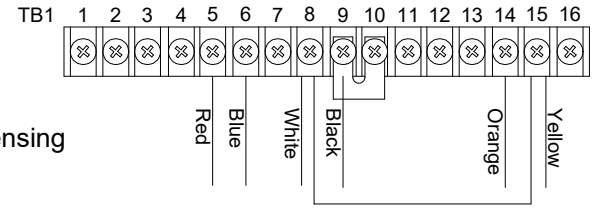


INPUT TERMINALS

Beckwith M-6280A

5 Close
6 Open
8 Neutral
9 Ac- Line- Switch Power
10 Ac- Line- Control Power and Sensing
14 Neutral Sensor Hot (+)
15 Neutral Sensor Return (-)

Input Terminal Block



REV	DATE	ENG	DESCRIPTION
8	10/01/23	DT	Updated Drawing, Removed S&C Controller, Added Note 5, 6, & 9
7	1/01/20	DT	

CONSTRUCTION NOTE(s):

1. Neutral current sensor output can reach 40V if sensor wires are not terminated when current is present on wires routed through sensor. Terminate the neutral sensor wires in the junction box. The black neutral sensor wire connects to the NS+ terminal and the white or red neutral sensor wire connects to the NS- terminal.

2. The neutral current sensor, if equipped, shall be mounted below the bank. All connections between the cap bank neutral or cap bank ground, including any equipment installed on the capacitor rack frame, and pole ground or neutral shall pass through the neutral current sensor in the same direction to capture all the neutral current. No other wires should pass through the sensor. The sensor shall be installed on the wires between the capacitor rack and their connections to pole ground and the distribution system neutral using a staple to secure a wire above and below the sensor. If a 1kVA transformer is installed on the cap bank frame, the neutral and ground wires from the transformer must also pass through the neutral current sensor. If transformer is mounted on pole, the transformer neutral and ground wires do not need to be routed through sensor unless it's ground connection is made between sensor and cap bank frame. The sensor cable should be routed to the junction box.

3. The junction box, disconnect box, capacitor rack and capacitor control shall be connected to pole ground.

4. See DCS **16 15 03 ** ** for distribution capacitor bank installation. See DCS **16 34 02 ** ** for 34 kV capacitor bank installation.

5. Bond between pole ground and neutral shall only be made when neutral is common to primary and/or static.

6. If capacitor controller will be powered off secondary, connect #10 white conductor to distribution neutral and #10 black conductor to 120V supply. If 1kVA transformer is being installed on cap bank; route #10 white conductor and connect to #4 neutral lead connected to X2, route #10 black conductor and connect to #4 supply lead connected to X1.

	ITEM	STK / DCS #	DESCRIPTION 16 00 24 **	01
	A	69 11 307	Control, Communicating, Time, Temp, Volt - Beckwith	1
	B	69 11 304	Neutral Current Sensor - Beckwith, with 10' cable w/o Connector	1
	C	54 17 498	Junction Box (6-terminal)/Disconnect Box, Pre-Wired with 35' Liquidtight Cable	1
	D	17 54 182	Connector, Split Bolt	4
7,@	E	69 59 001	Communications Kit, Coax and Antenna (VO only)	1
7,@	F	69 59 003	GE Orbit ECR Cell Modem (VO Only)	1
		16 08 298	GE Orbit ECR Cell Modem	1
7,@	G	16 16 078	Low Profile Omnidirectional Antenna	1
7,@	H	16 16 181	Coax. Cable, 2ft Jumper with SMA (male) to N (male)	1

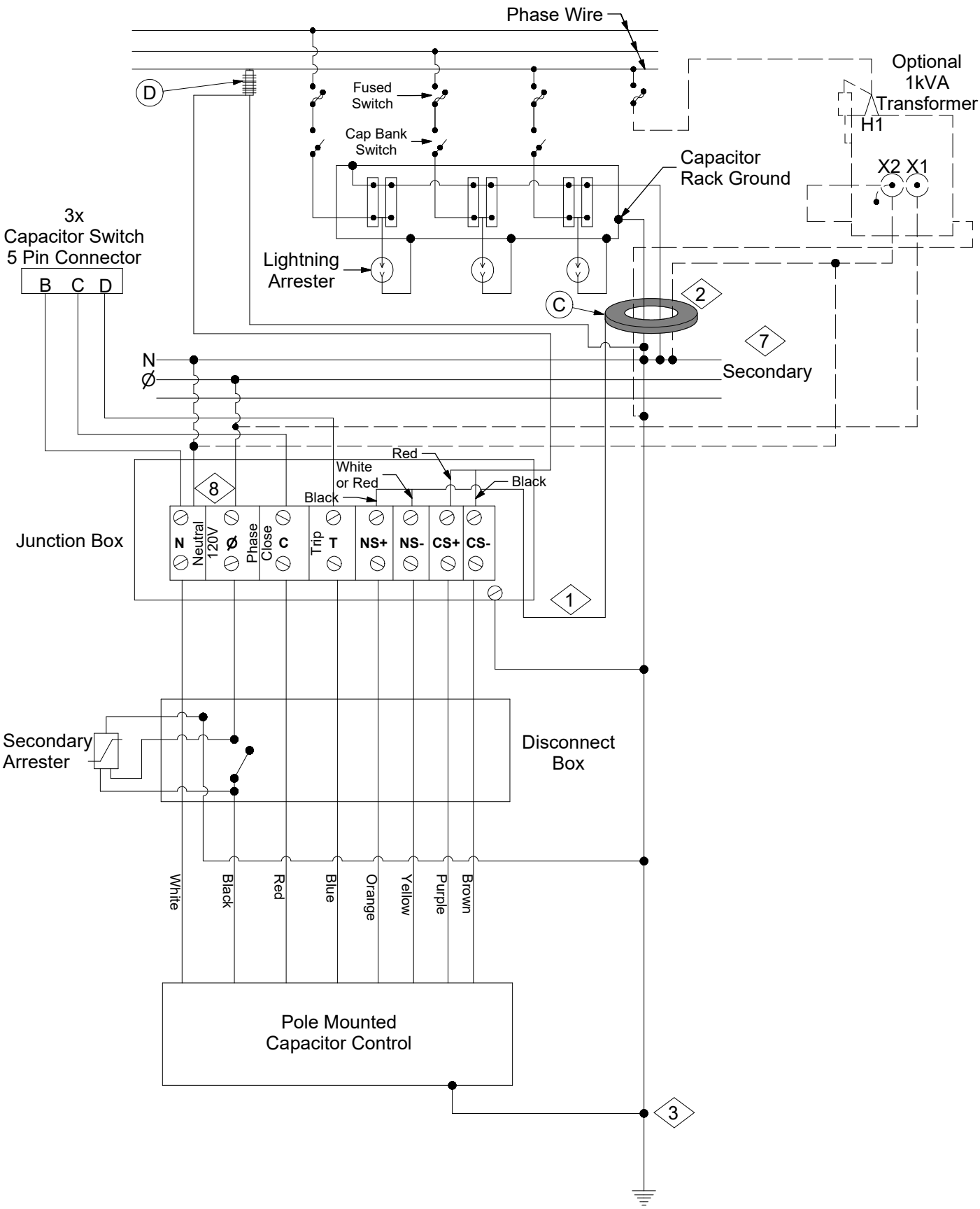
DESIGN NOTE(s):

7. Illinois uses Stock #69 59 001 and Stock #69 59 003 for VO only. Missouri and Illinois uses Stock #16 08 298, Stock #16 16 078, and Stock #16 16 181 if SCADA control is needed (not for Illinois VO).

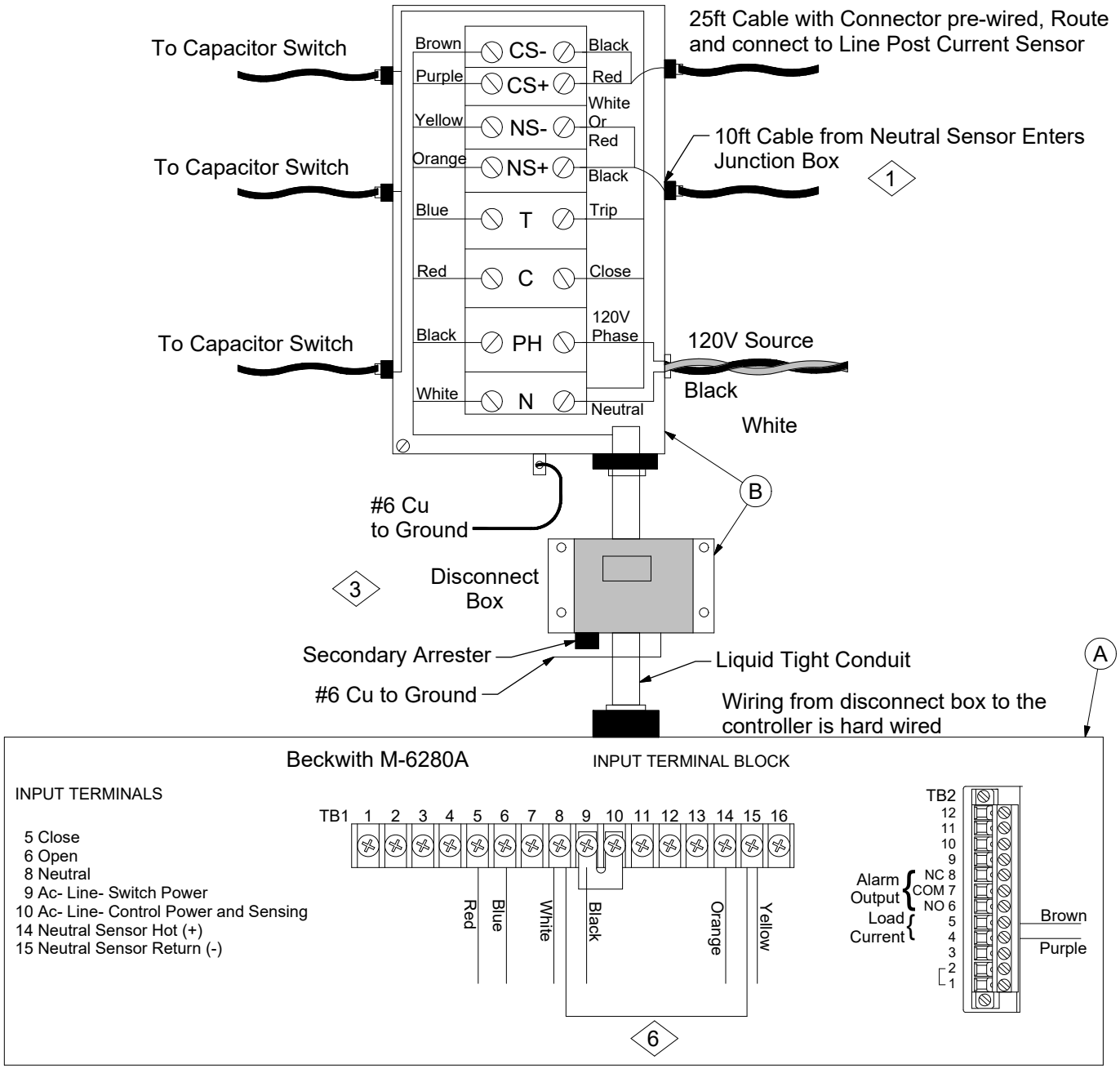
8. For VO circuits, 120V controller supply shall be from a transformer no more than 1 span (250') away loaded below 100% of nameplate.

9. Communicating cap bank controllers may be used on non-communicating applications using local settings.

REV	DATE	ENG	DESCRIPTION
8	10/01/23	DT	Updated Drawing, Removed S&C Controller, Added Note 5, 6, & 9
7	1/01/20	DT	



REV	DATE	ENG	DESCRIPTION
6	10/01/23	DT	Updated Drawing, Removed S&C Controller, Added Note 7, 8, & 11
5	01/01/20	DT	



REV	DATE	ENG	DESCRIPTION
6	10/01/23	DT	Updated Drawing, Removed S&C Controller, Added Note 7, 8, & 11
5	01/01/20	DT	

CONSTRUCTION NOTE(s):

1. Neutral current sensor output can reach 40V if sensor wires are not terminated when current is present on wires routed through sensor. Terminate the neutral sensor wires in the junction box. The black neutral sensor wire connects to the NS+ terminal and the white or red neutral sensor wire connects to the NS- terminal.

2. The neutral current sensor, if equipped, shall be mounted below the bank. All connections between the cap bank neutral or cap bank ground, including any equipment installed on the capacitor rack frame, and pole ground or neutral shall pass through the neutral current sensor in the same direction to capture all the neutral current. No other wires should pass through the sensor. The sensor shall be installed on the wires between the capacitor rack and their connections to pole ground and the distribution system neutral using a staple to secure a wire above below the sensor. If a 1kVA transformer is installed on the cap bank frame, the neutral and ground wires from the transformer must also pass through the neutral current sensor. If transformer is mounted to pole, the transformer neutral and ground wires do not need to be routed through sensor unless it's ground connection is made between sensor and cap bank frame. The sensor cable should be routed to the junction box.

3. The junction box, disconnect box, capacitor rack, capacitor control, and current sensor shall be bonded to pole ground.

4. Contact Standards Engineer for the replacement line post current sensor cable.

5. See DCS **16 15 03 **** for distribution capacitor bank installation. See DCS **16 34 02 **** for 34 kV capacitor bank installation.

6. For Beckwith controllers, connect jumper wire from TB1-8 to TB1-15 when neutral sensor is used. When neutral current sensor is not used, connect jumper wire from TB2-4 to the ground stud to the right of TB-1.

7. Bond between pole ground and neutral shall only be made when neutral is common to primary and/or static.

8. If capacitor controller will be powered off secondary, connect #10 white conductor to distribution neutral and #10 black conductor to 120V supply. If 1kVA transformer is being installed on cap bank; route #10 white conductor and connect to #4 neutral lead connected to X2, route #10 black conductor and connect to #4 supply lead connected to X1.

DCS #	DESCRIPTION
16 00 26 03	Current and VAR Sensing for 15kV and below with Beckwith Controller
16 00 26 04	Current and VAR Sensing for 34kV with Beckwith Controller

	ITEM	STK / DCS #	DESCRIPTION 16 00 26 **	03	04
	A	69 11 316	Control, Time, Temp, Volt, Current or VAR - Beckwith	1	1
	B	54 17 512	Junction Box (8-terminal)/Disconnect Box, Pre-Wired w/ 35' Liquidtight Conduit	1	1
	C	69 11 304	Sensor, Neutral Current with 10' Cable - Beckwith	1	1
	D	69 11 297	Sensor, Current, Line Post Type, 15kV	1	-
		69 11 202	Sensor, Current, Line Post Type, 35kV	-	1
	E	23 64 034	Stud, 5/8" x 7"	1	1
	F	21 75 008	Washer, Flat, 5/8"	2	2
	G	17 54 182	Connector, Split Bolt	5	5
	H	18 51 021	Wire, #6 Cu., S.D. Poly Covered	7	7
9,@	I	69 59 001	Communications Kit, Coax and Antenna (VO Only)	1	1
9,@	J	69 59 003	GE Orbit ECR Cell Modem (VO Only)	1	1
		16 08 298	GE Orbit ECR Cell Modem	1	1
9,@	K	16 16 078	Low Profile Omnidirectional Antenna	1	1
9,@	L	16 16 181	Coax. Cable, 2ft Jumper with SMA (male) to N (male)	1	1

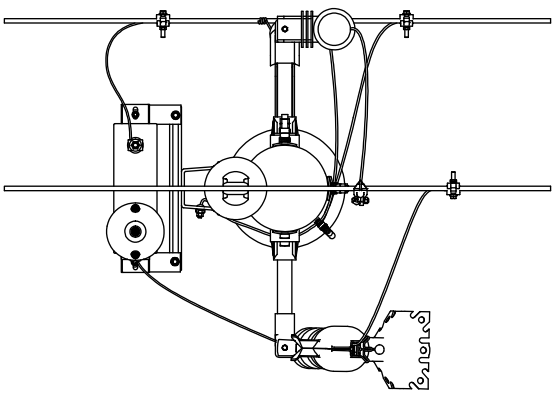
DESIGN NOTE(s):

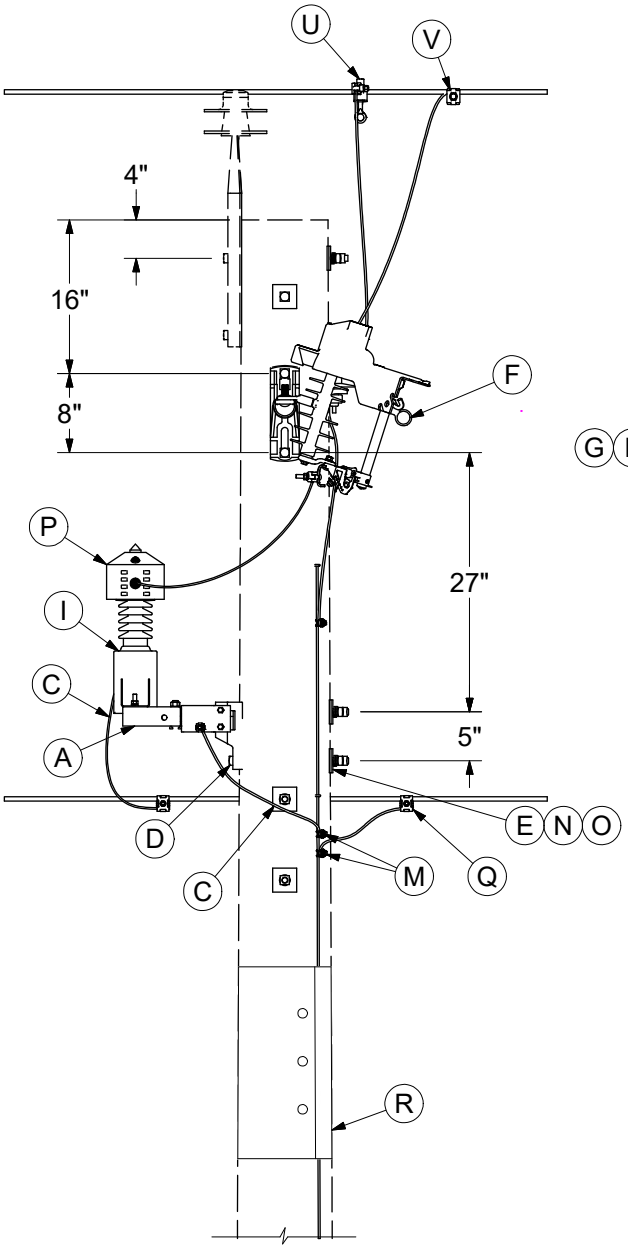
9. Illinois uses Stock #69 59 001 and Stock #69 59 003 for VO only. Missouri and Illinois uses Stock #16 08 298, Stock #16 16 078 and Stock #16 16 181 if SCADA control is needed (not for Illinois VO).

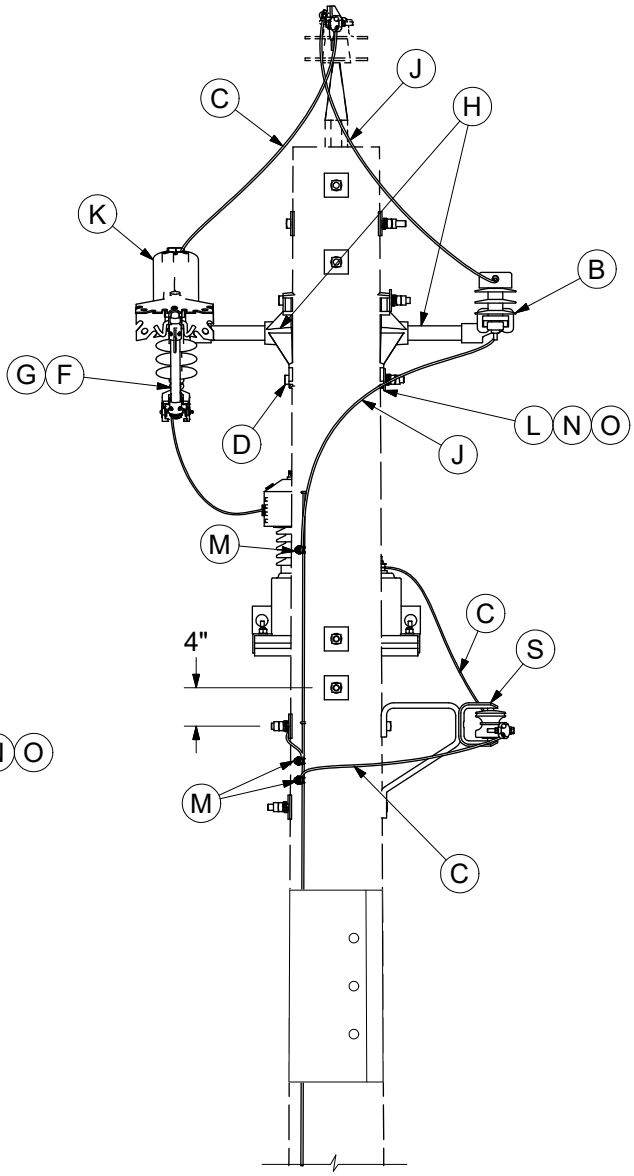
10. For VO circuits, 120V controller supply shall be from a transformer no more than 1 span (250') away loaded below 100% of nameplate.

11. Communicating cap bank controllers may be used on non-communicating applications using local settings.

REV	DATE	ENG	DESCRIPTION
6	10/01/23	DT	Updated Drawing, Removed S&C Controller, Added Note 7, 8, & 11
5	01/01/20	DT	







REV	DATE	ENG	DESCRIPTION
8	10/01/23	DT	updated Drawing, Updated BOM, New Note 2, 3, 4, & 5
7	12/15/16	WYW	

CONSTRUCTION NOTE(s):

1. Minimum clearance from the ground to the bottom of the capacitor mount or capacitor cell, whichever is lower, shall be 15'-0".

2. A minimum of 6" of clearance is required between neutral and bottom of capacitor mount, or capacitor cell, which-ever is closer. Capacitor cell sizes vary based on kVAR, voltage, manufacturer, and age.

3. See DCS #**16 00 02 00** for single phase capacitor wiring schematic.

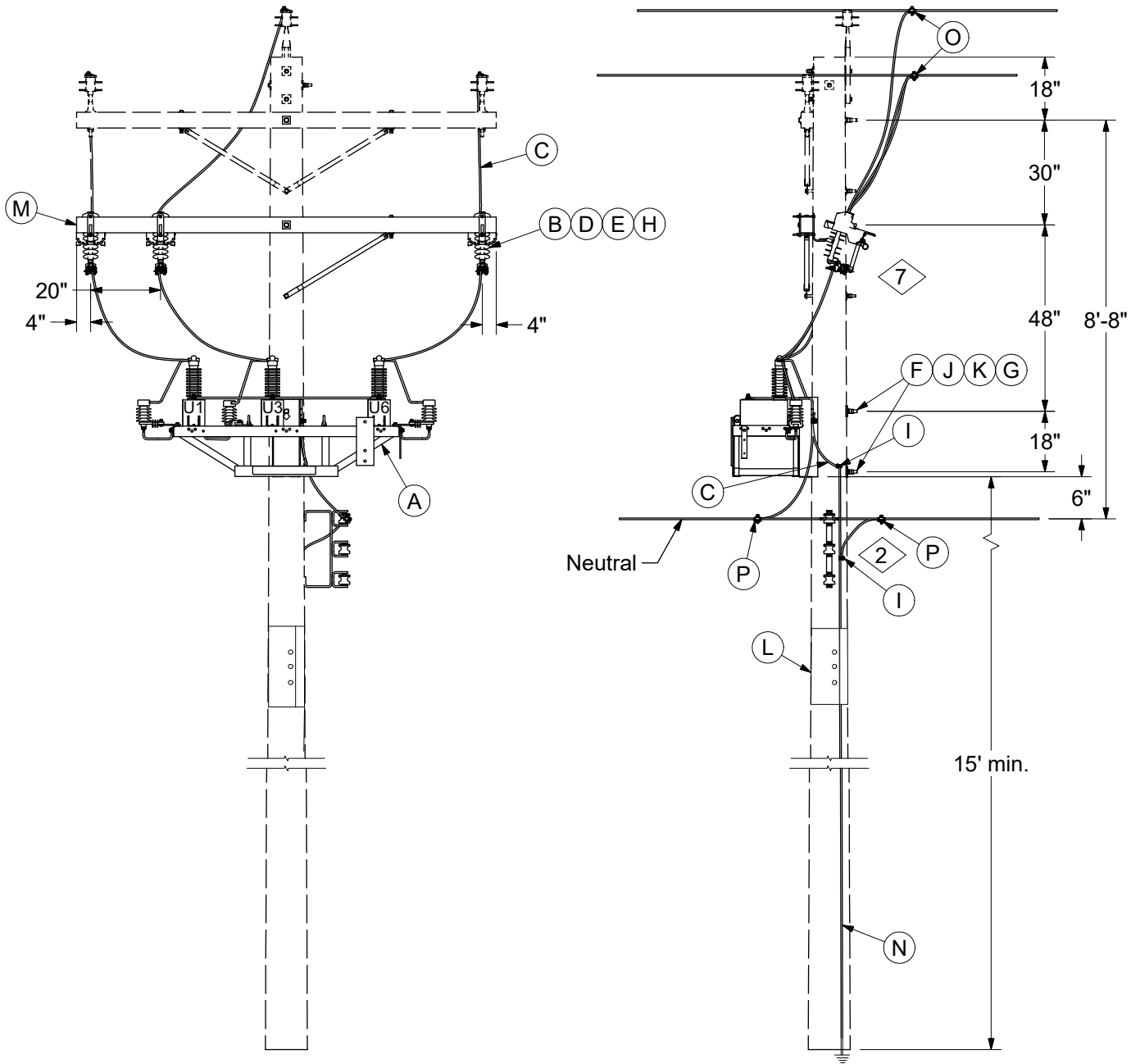
4. Pole wrap, Stock #23 17 473 comes in 100 ft. roll.

	ITEM	STK / DCS #	DESCRIPTION 16 15 01 **	01	02	03	04	05	06
	A	69 11 002	Capacitor, Hanger	1	1	1	1	1	1
	B	10 01 144	Arrester, Lightning, 10kV	-	-	1	1	1	1
		10 01 133	Arrester, Lightning, 3 kV	1	1	-	-	-	-
	C	18 51 025	#4 Wire, Riser, Poly Covered	10	10	10	10	10	10
	D	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	4	4	4	4	4	4
	E	23 66 207	Washer, Curved, Square, 5/8"	2	2	2	2	2	2
	F	54 07 208	Switch, Fused, Open Type, 100 Amp	1	1	1	1	1	1
	G	20 53 084	Link, Fuse - 12T	-	-	1	-	-	-
		20 53 085	Link, Fuse - 15T	-	-	-	1	1	-
		20 53 087	Link, Fuse - 30T	-	-	-	-	-	1
		20 53 089	Link, Fuse - 25T	1	-	-	-	-	-
		20 53 097	Link, Fuse - 50K	-	1	-	-	-	-
	H	23 06 127	Bracket - Standoff, 12" FG	2	2	2	2	2	2
	I	69 11 029	Cap, 7.2kV, 50kVAR, Two Bushing	-	-	1	-	-	-
		69 11 030	Cap, 2.4kV, 50kVAR, Two Bushing	1	-	-	-	-	-
		69 11 043	Cap, 7.2kV, 100kVAR, Single Bushing	-	-	-	1	-	-
		69 11 044	Cap, 2.4kV, 100kVAR, Single Bushing	-	1	-	-	-	-
		69 11 069	Cap, 7.96kV, 100kVAR, Single Bushing	-	-	-	-	1	-
		69 11 294	Cap, 7.62kV, 200kVAR, Single Bushing	-	-	-	-	-	1
	J	18 51 021	Wire, Cu, #6 SD., Poly Covered	6	6	6	6	6	6
	K	23 17 411	Wildlife Guard - Cover Cutout	1	1	1	1	1	1
	L	23 66 027	Washer, Flat, Square 5/8"	2	2	2	2	2	2
	M	17 54 182	Connector - Split Bolt, #4 Str. to 1/0 Str.	3	3	3	3	3	3
	N	23 66 134	Lock Washer - 5/8" Double Coil	4	4	4	4	4	4
	O	23 65 043	Lock Nut - 5/8" Square	4	4	4	4	4	4
	P	69 58 296	Wildlife Guard - Transformer Bushing Cover	1	1	1	1	1	1
@	Q	**07 00 25 00** @	PG Clamp, PG*W	1	1	1	1	1	1
@	R	23 17 473	Animal Guard - Pole Wrap	#	#	#	#	#	#
@	S	**03 01 ** ** ** @**	Secondary Configuration	1	1	1	1	1	1
@	T	**12 00 10 01**	Grounding Unit - Ground Coil	1	1	1	1	1	1
		12 00 10 02	Grounding Unit - Ground Rod	1	1	1	1	1	1
@	U	**07 00 21 00 @**	Clamp, Hot Line, HLC*W	1	1	1	1	1	1
@	V	**07 00 21 00 @**	Clamp, Hot Line, HLC*W	1	1	1	1	1	1
		07 00 25 00 @	Clamp, Parallel Groove, PG*	1	1	1	1	1	1

DESIGN NOTE(s):

5. Capacitors wired line to ground shall only be installed on circuits with a continuous primary neutral and/or static from substation.

REV	DATE	ENG	DESCRIPTION
8	10/01/23	DT	updated Drawing, Updated BOM, New Note 2, 3, 4, & 5
7	12/15/16	WYW	



CONSTRUCTION NOTE(s):

1. Capacitor rack frame shall be bonded to pole ground.

◇2. Bond between pole ground and neutral shall only be made when neutral is common to primary or static.

3. For wiring schematic, refer to DCS **16 00 05 00**.

4. Pole Wrap, Stock #23 17 473, comes on roll of 100 ft.

REV	DATE	ENG	DESCRIPTION
11	10/01/23	DT	Updated Drawing, Updated BOM, New note 2, 3, 4, & 6
10	12/15/16	WYW	

	ITEM	STK / DCS #	DESCRIPTION 16 15 02 **	01	02	03	04	09	05	06	07	08
	A	69 11 085	Capacitor Bank - Fixed, 300kVAR 14.4kV Delta	-	-	-	-	-	-	-	1	-
		69 11 072	Capacitor Bank - Fixed, 600kVAR 13.8kV Wye	-	-	-	-	-	-	1	-	-
		69 11 073	Capacitor Bank - Fixed, 300kVAR 13.8kV Wye	-	-	-	-	-	1	-	-	-
		69 11 222	Capacitor Bank - Fixed, 600kVAR 13.2kV Wye	-	-	-	-	1	-	-	-	-
		69 11 062	Capacitor Bank - Fixed, 600kVAR 12kV Wye	-	-	-	1	-	-	-	-	-
		69 11 061	Capacitor Bank - Fixed, 300kVAR 12kV Wye	-	-	1	-	-	-	-	-	-
		69 11 057	Capacitor Bank - Fixed, 600kVAR 4kV Wye	-	1	-	-	-	-	-	-	-
		69 11 083	Capacitor Bank - Fixed, 600kVAR 14.4kV Delta	-	-	-	-	-	-	-	-	1
		69 11 055	Capacitor Bank - Fixed, 300kVAR 4kV Wye	1	-	-	-	-	-	-	-	-
	B	54 07 208	Switch, Fused, Open Type 100A	3	3	3	3	3	3	3	3	3
	C	18 51 025	Wire, #4 Riser	24	24	24	24	24	24	24	24	24
	D	20 53 200	Link, Fuse - 80T	-	3	-	-	-	-	-	-	-
		20 53 085	Link, Fuse - 15T	-	-	3	-	-	-	-	-	-
		20 53 084	Link, Fuse - 12T	-	-	-	-	-	3	-	3	-
		20 53 089	Link, Fuse - 25T	-	-	-	-	-	-	3	-	3
		20 53 087	Link, Fuse - 30T	-	-	-	3	3	-	-	-	-
		20 53 088	Link, Fuse - 40T	3	-	-	-	-	-	-	-	-
	E	23 17 411	Wildlife Guard - Cover Cutout	3	3	3	3	3	3	3	3	3
	F	23 52 097	Bolt, Mach., 3/4" x 12" w/ square nut	2	2	2	2	2	2	2	2	2
	G	23 66 031	Washer, Curved, Square, 3/4"	2	2	2	2	2	2	2	2	2
	H	17 58 054	Bracket, Switch, Arrester	3	3	3	3	3	3	3	3	3
	I	17 54 182	Connector - Split Bolt, #4 Str. to 1/0 Str.	2	2	2	2	2	2	2	2	2
	J	23 65 042	Lock Nut - 3/4" Square	2	2	2	2	2	2	2	2	2
	K	23 66 135	Lock Washer - 3/4" Double Coil	2	2	2	2	2	2	2	2	2
4,@	L	23 17 473	Animal Guard - Pole Wrap	#	#	#	#	#	#	#	#	#
5,@	M	**04 00 20 03**	Crossarm w/ Brace, 10'	1	1	1	1	1	1	1	1	1
		04 00 41 16	FG Crossarm 10' Tangent	1	1	1	1	1	1	1	1	1
@	N	**12 00 10 01**	Grounding Unit - Ground Coil	1	1	1	1	1	1	1	1	1
		12 00 10 02	Grounding Unit - Ground Rod	1	1	1	1	1	1	1	1	1
@	O	**07 00 21 00 @**	Clamp, Hot Line, HLC*W	3	3	3	3	3	3	3	3	3
		07 00 25 00 @	Clamp, PG, PG*	3	3	3	3	3	3	3	3	3
@	P	**07 00 25 00 @**	Clamp, PG, PG*	2	2	2	2	2	2	2	2	2

DESIGN NOTE(s):

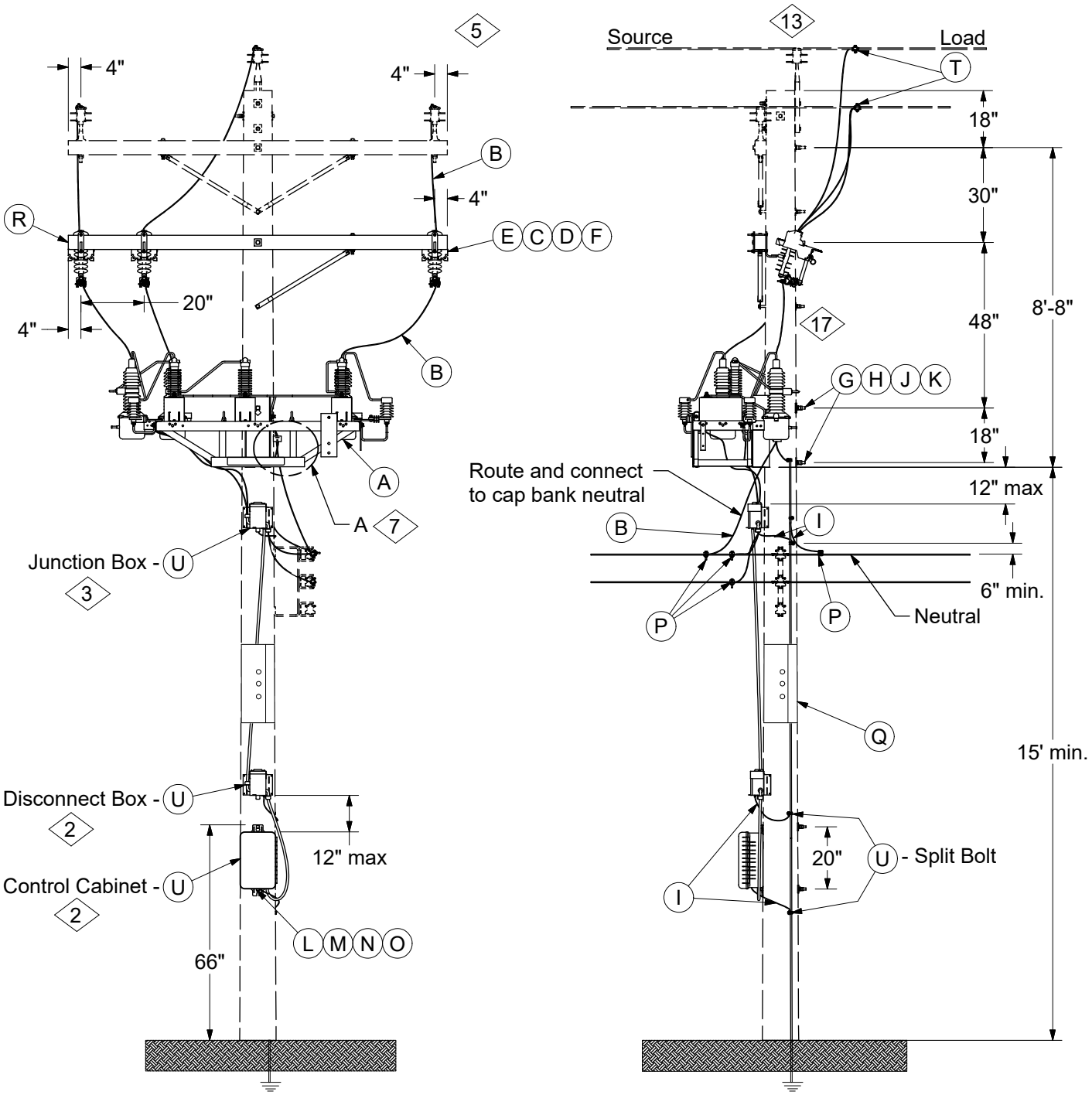
5. 8'-0" Crossarms may be substituted when required.

6. Grounded wye cap banks shall only be installed on circuits with a continuous neutral and/or static from substation.

OPERATIONS NOTE(s):

◇7.◇ Loadbreak tool (Stock #83 38 028) must be used to operate switches.

REV	DATE	ENG	DESCRIPTION
11	10/01/23	DT	Updated Drawing, Updated BOM, New note 2, 3, 4, & 6
10	12/15/16	WYW	



REV	DATE	ENG	DESCRIPTION
12	10/01/23	DT	Updated Drawing, Updated BOM, New Note 9, 10, 12, 14, &16
11	4/1/19	DT	

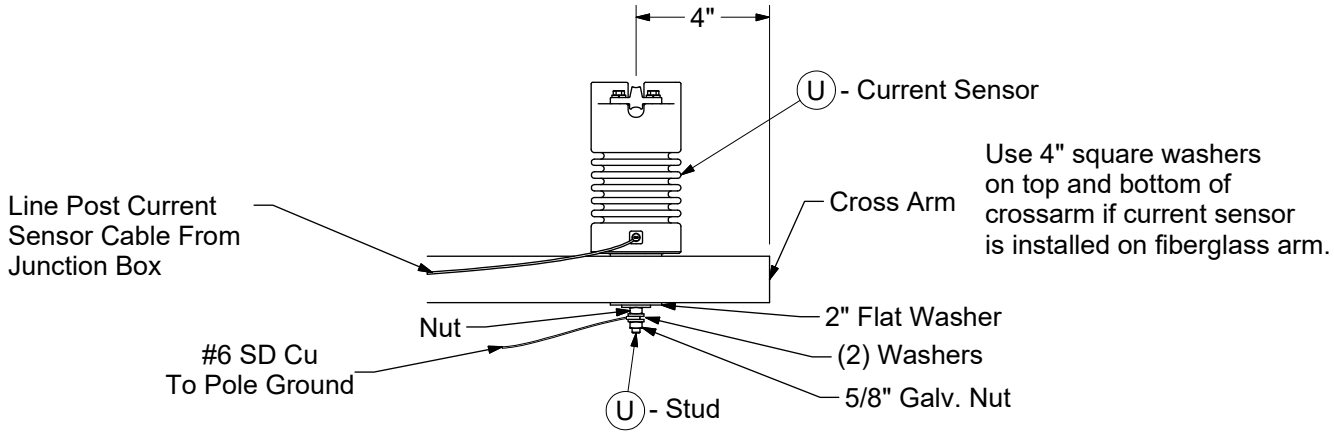
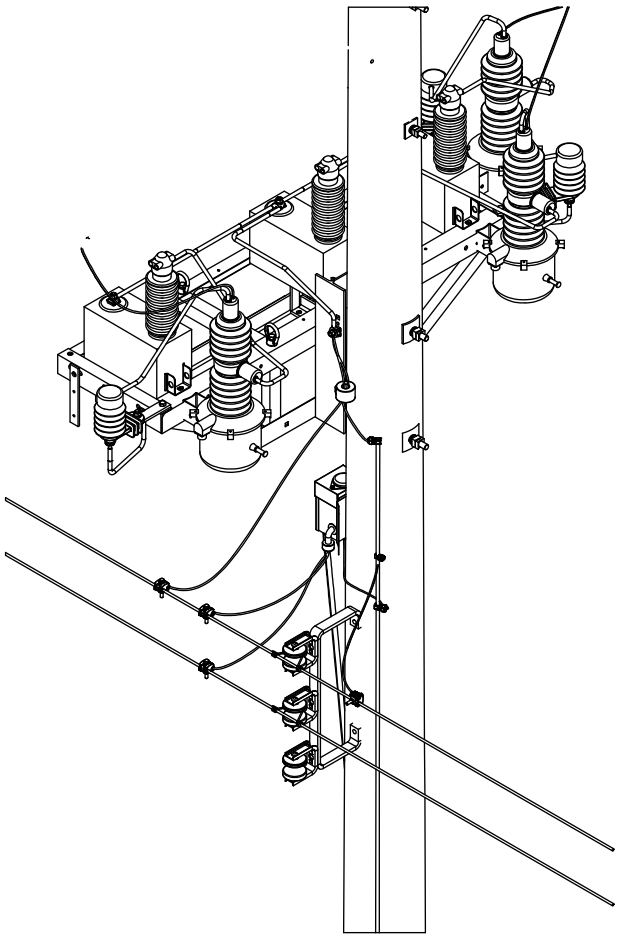
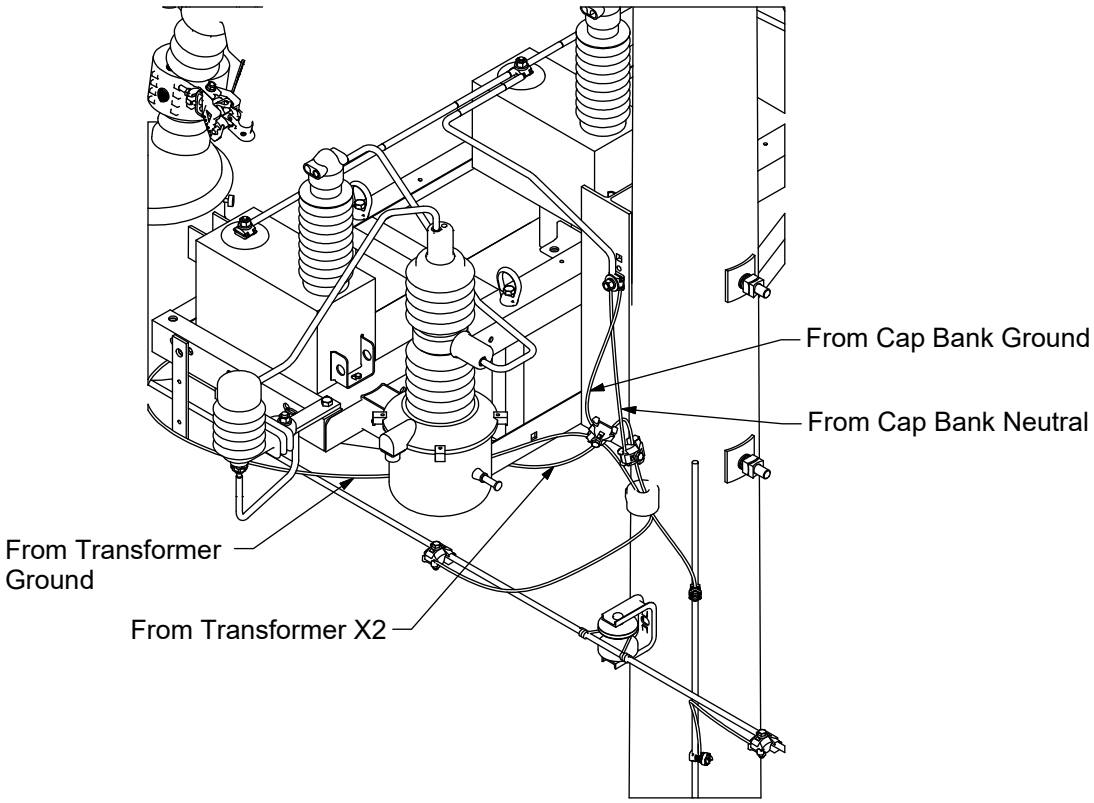


Figure 1



Detail A
Without 1kVA Transformer on Cap Bank



Detail A

With 1kVA Transformer on Cap Bank

REV	DATE	ENG	DESCRIPTION
12	10/01/23	DT	Updated Drawing, Updated BOM, New Note 9, 10, 12, 14, &16
11	4/1/19	DT	

CONSTRUCTION NOTE(s):

1. Minimum clearance from the ground to the bottom of the capacitor rack shall be 15 feet.

2. Clearance from the ground to the top of the control cabinet shall be 66" from the ground. The bottom of disconnect box shall be installed 1'-0" max above the top of control cabinet. The next hand or foot hold shall be 8' or greater above the top of the disconnect box.

3. The top of the junction box shall be mounted a maximum of 1'-0" below the capacitor bank frame. Leads to the capacitor switches shall be secured to the frame of the bank with wire ties. The junction box/meter socket kit includes 35'-0" of pre-wired liquid-tight conduit. The liquid-tight must be stapled every 2'-0". Excess liquid-tight shall be coiled with tie wire and secured to the pole between the junction box and the disconnect box.

4. For capacitor bank wiring schematic, refer to DCS **16 00 05 00**. For capacitor control wiring schematic with current sensor, refer to DCS **16 00 26 00**. For capacitor control wiring schematic without current sensor, refer to DCS **16 00 24 00**.

5. For installations with a current sensor, the current sensor will be installed in place of an insulator, the current sensor stud shall be bonded to pole ground and the sensor cable shall be secured with a staple, refer to Figure 1 If current sensor is installed on fiberglass crossarm, the current sensor cable and current sensor ground wire shall be trained to the bottom of the crossarm using 6 groundwire clips, Stock #23 68 746.

6. Low voltage wires from line post current sensor should be connected in the junction box on the bank before the primary wire is energized on the sensor. However, if the primary on the sensor is energized, as long as the base of the sensor is grounded the sensor wires are safe to connect (low output current and voltage).

7. Neutral current sensor output can reach 40V if sensor wires are not terminated when current is present on wires routed through sensor. Neutral current sensors are not required on delta wired cap banks. For material and connection in the junction box; for installations without current sensor refer to DCS **16 00 24 00**, with current sensor refer to DCS **16 00 26 00**. The neutral current sensor, if equipped, shall be mounted below the bank. All connections between the cap bank neutral or cap bank ground, including any equipment installed on the capacitor rack frame, and the pole ground or neutral shall pass through the neutral current sensor in the same direction to capture all the neutral current. No other wires should pass through the sensor. The sensor shall be installed on the wires between the capacitor rack and their connections to pole ground and the distribution system neutral using a staple to secure a wire above and below the sensor. If a 1kVA transformer is installed on the cap bank frame, the neutral and ground wires from the transformer must also pass through the neutral current sensor. If transformer is mounted on pole, the transformer neutral and ground wires do not need to be routed through sensor unless it's ground connection is made between sensor and cap bank frame. The sensor cable should be routed to the junction box. See Detail A.

8. The junction box, disconnect box, capacitor rack, capacitor control, and current sensor, if equipped, must be connected to pole ground.

9. Bond between pole ground and neutral shall only be made when neutral is common to primary and/or static.

10. If capacitor controller will be powered off secondary, connect #10 white conductor to distribution neutral and #10 black conductor to 120V supply. If 1kVA transformer is being installed on cap bank; route #10 white conductor and connect to #4 neutral lead connected to X2, route #10 black conductor and connect to #4 supply lead connected to X1.

11. If a 120V voltage source for the controller is not available from the circuit the capacitor bank is being installed on, refer to DCS **16 15 05 01** for 1kVA transformer installation.

12. Pole wrap comes in 100 ft. roll.

	ITEM	STK / DCS #	DESCRIPTION 16 15 03 **	01	02	03	04	05	06	07	08	11	12	09	10
	A	69 11 225	Cap. Bank - Sw. 1200kVAR 13.2kV	-	-	-	-	-	-	-	-	-	1	-	-
		69 11 071	Cap. Bank - Sw. 600kVAR 13.8kV	-	-	-	-	-	-	1	-	-	-	-	-
		69 11 084	Cap. Bank - Sw. 300kVAR 14.4kV, Delta	-	-	-	-	-	-	-	-	-	-	1	-
		69 11 074	Cap. Bank - Sw 1200kVAR 13.8kV	-	-	-	-	-	-	-	1	-	-	-	-
		69 11 031	Cap. Bank - Sw. 300kVAR 4kV	1	-	-	-	-	-	-	-	-	-	-	-
		69 11 226	Cap. Bank - Sw. 600kVAR 13.2kV	-	-	-	-	-	-	-	-	1	-	-	-
		69 11 077	Cap. Bank - Sw. 600kVAR 14.4kV, Delta	-	-	-	-	-	-	-	-	-	-	-	1
		69 11 019	Cap. Bank - Sw. 300kVAR 12kV	-	-	1	-	-	-	-	-	-	-	-	-
		69 11 032	Cap. Bank - Sw. 600kVAR 12kV	-	-	-	1	-	-	-	-	-	-	-	-
		69 11 058	Cap. Bank - Sw. 1200kVAR 12kV	-	-	-	-	1	-	-	-	-	-	-	-
		69 11 086	Cap. Bank - Sw. 300kVAR 13.8kV	-	-	-	-	-	1	-	-	-	-	-	-
		69 11 036	Cap. Bank - Sw. 600kVAR 4kV	-	1	-	-	-	-	-	-	-	-	-	-
	B	18 51 025	Wire, #4 Cu Poly, Riser	24	24	24	24	24	24	24	24	24	24	24	24
	C	54 07 208	Switch, Fused, 100A, 15kV	3	3	3	3	3	3	3	3	3	3	3	3
	D	17 58 054	Bracket, Switch, Arrester	3	3	3	3	3	3	3	3	3	3	3	3
	E	23 17 411	Wildlife Guard - Cover Cutout	3	3	3	3	3	3	3	3	3	3	3	3
	F	20 53 089	Link, Fuse - 25T	-	-	-	-	-	-	3	-	-	-	-	3
		20 53 084	Link, Fuse - 12T	-	-	-	-	-	3	-	-	-	-	3	-
		20 53 090	Link, Fuse - 65T	-	-	-	-	3	-	-	-	-	3	-	-
		20 53 087	Link, Fuse - 30T	-	-	-	3	-	-	-	-	3	-	-	-
		20 53 085	Link, Fuse - 15T	-	-	3	-	-	-	-	-	-	-	-	-
		20 53 200	Link, Fuse - 80T	-	3	-	-	-	-	-	-	-	-	-	-
		20 53 088	Link, Fuse - 40T	3	-	-	-	-	-	-	3	-	-	-	-
	G	23 52 097	Bolt - Mach. 3/4" x 12"	2	2	2	2	2	2	2	2	2	2	2	2
	H	23 66 031	Washer, Curved, Square, 3/4"	2	2	2	2	2	2	2	2	2	2	2	2
	I	18 51 021	Wire, Cu, #6 S.D., Poly Covered	10	10	10	10	10	10	10	10	10	10	10	10
	J	23 66 135	Lock Washer - 3/4" Double Coil	2	2	2	2	2	2	2	2	2	2	2	2
	K	23 65 042	Lock Nut - 3/4" Square	2	2	2	2	2	2	2	2	2	2	2	2
	L	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	2	2	2	2	2	2	2	2	2	2	2	2
	M	23 66 207	Washer, Curved, Square, 5/8"	2	2	2	2	2	2	2	2	2	2	2	2
	N	23 66 134	Lock Washer - 5/8" Double Coil	2	2	2	2	2	2	2	2	2	2	2	2
	O	23 65 043	Lock Nut - 5/8" Square	2	2	2	2	2	2	2	2	2	2	2	2
@	P	**07 00 25 00@**	Clamp - Parallel Groove, PG*	4	4	4	4	4	4	4	4	4	4	4	4
12,@	Q	23 17 473	Animal Guard - Pole Wrap	#	#	#	#	#	#	#	#	#	#	#	#
14,@	R	**04 00 20 03**	Crossarm, w/ Brace 10'	1	1	1	1	1	1	1	1	1	1	1	1
		04 00 41 16	Crossarm, FG, 10' Tangent	1	1	1	1	1	1	1	1	1	1	1	1
@	S	**12 00 10 02**	Grounding Unit - Ground Rod	1	1	1	1	1	1	1	1	1	1	1	1
		12 00 10 01	Grounding Unit - Ground Coil	1	1	1	1	1	1	1	1	1	1	1	1
@	T	**07 00 21 00@**	Clamp - Hot Line, HLC*W	3	3	3	3	3	3	3	3	3	3	3	3
		07 00 25 00@	Clamp - Parallel Groove, PG*	3	3	3	3	3	3	3	3	3	3	3	3
@	U	**16 00 24 00@**	Control, Time, Temp, Volt, Beckwith	1	1	1	1	1	1	1	1	1	1	1	1
		16 00 26 00@	Control, Capacitor, Current or VAR	1	1	1	1	1	1	1	1	1	1	1	1
5,@	V	23 68 746	Grounding Clips	#	#	#	#	#	#	#	#	#	#	#	#

REV	DATE	ENG	DESCRIPTION
12	10/01/23	DT	Updated Drawing, Updated BOM, New Note 9, 10, 12, 14, &16
11	4/1/19	DT	

DESIGN NOTE(s):

13. Capacitor control settings or SCADA may require source and load to be reversed from configuration shown for current or VAR controlled schemes.

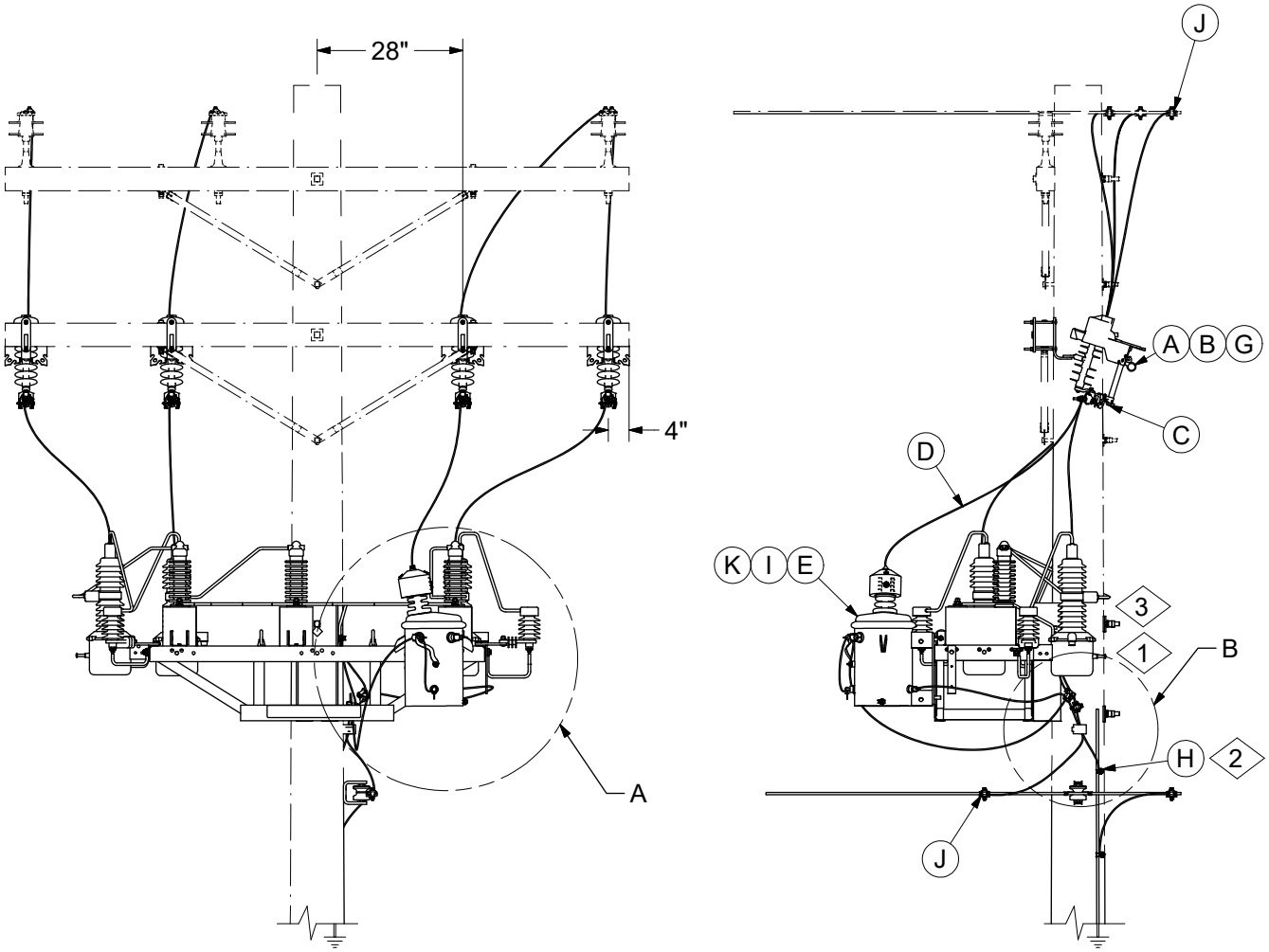
14. Grounded wye cap banks shall only be installed on circuits with a continuous primary neutral and/or static from substation.

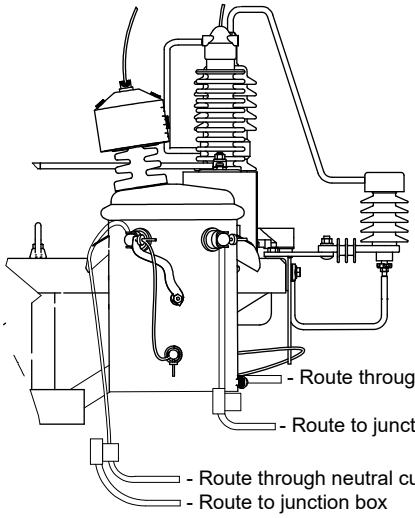
15. 8'-0" Crossarms may be substituted when required.

16. Communicating cap bank controller can be used in non-communicating applications with local settings.

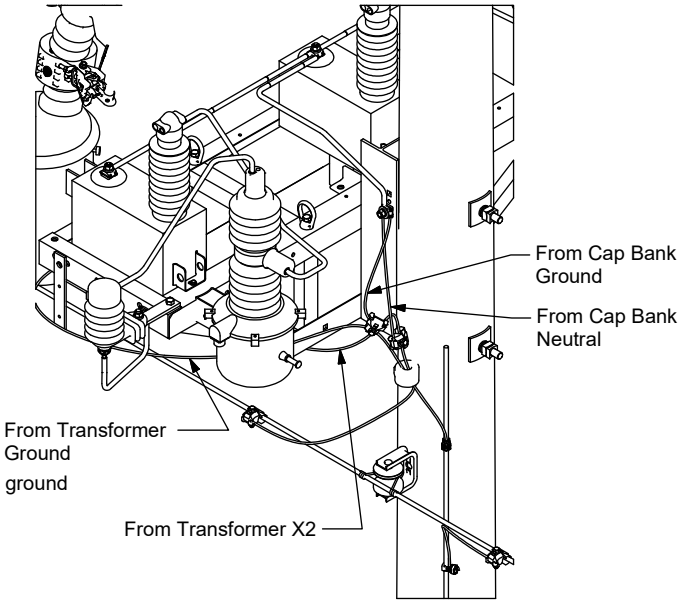
OPERATIONS NOTE(s):

17. Loadbreak tool, Stock #83 38 028, must be used to open cutout switches. Capacitor bank oil/vacuum switches should be primary method used to operate bank.





Detail A



Detail B

REV	DATE	ENG	DESCRIPTION
2	10/01/23	DT	Updated drawing, Updated BOM, New Note 4
1	4/01/19	DT	

CONSTRUCTION NOTE(s):

1. Typical mounting location is shown. Transformer may be mounted in other positions where mounting bracket is provided.

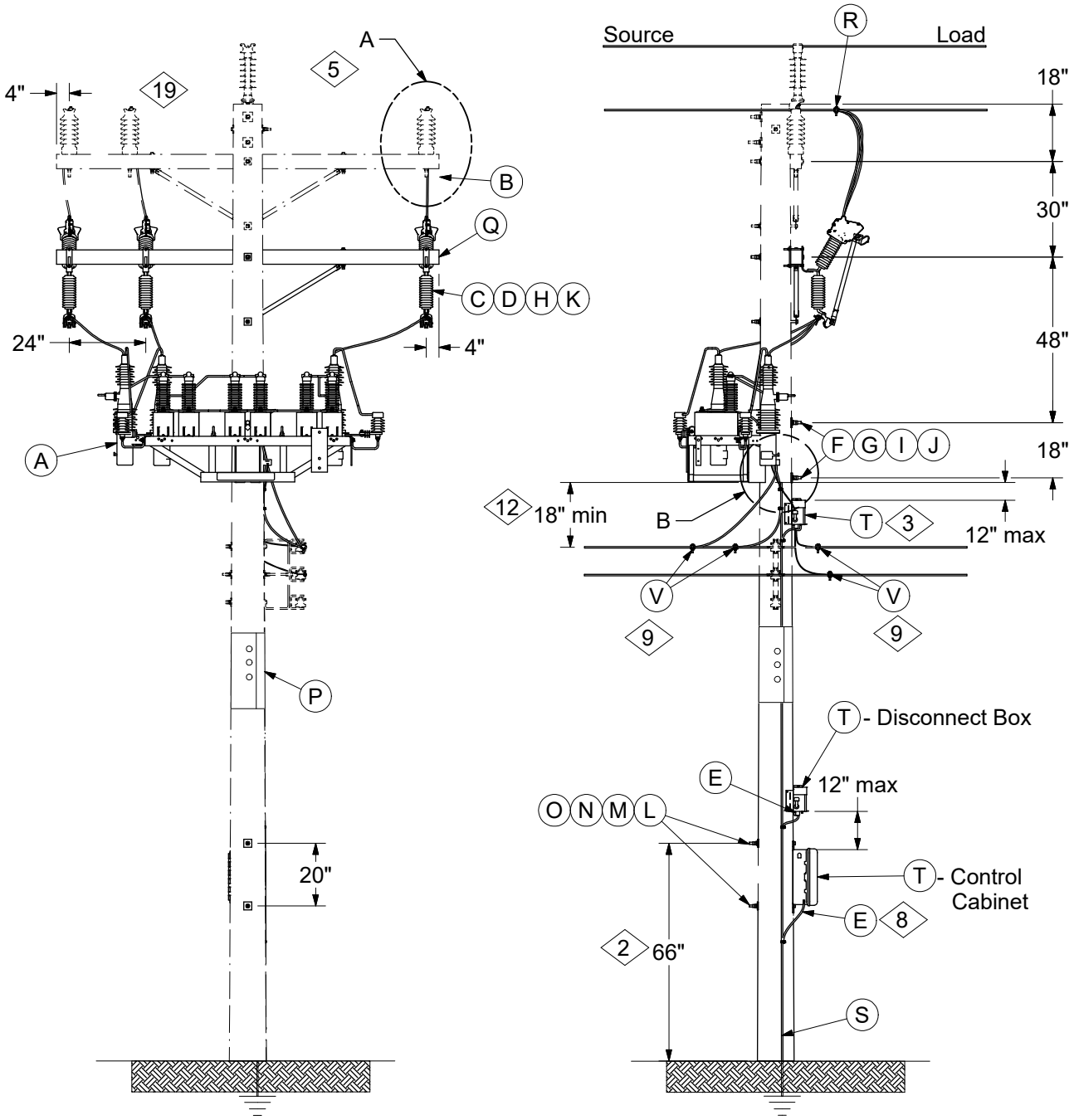
2. The transformer shall have two ground connections; one ground connection should be between the transformer ground and pole ground and one should be between X2 and the system neutral. The transformer shall have a ground strap between X2 and transformer ground. The capacitor bank shall have a ground between the capacitor rack and pole ground, the capacitor bank neutral should connect to the system neutral.

3. From junction box, route #10 white conductor and connect to #4 neutral lead connected to X2, route #10 black conductor and connect to #4 supply lead connected to X1.

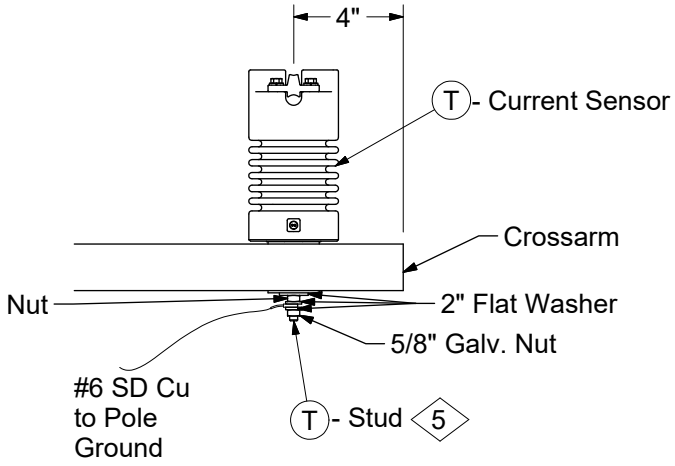
4. For capacitor bank wiring diagram, refer to DCS **16 00 05 00**. For capacitor control wiring diagram with current sensor, refer to DCS **16 00 26 ****. For capacitor control wiring diagram without current sensor, refer to DCS **16 00 24 ****. For capacitor bank installation, see DCS **16 15 03 ****.

	ITEM	STK / DCS #	DESCRIPTION 16 15 05 **	01
	A	54 07 208	Switch, Fused, Open Type	1
	B	17 58 054	Bracket, Switch, Arrester	1
	C	20 53 197	Link, Fuse, 0.75X	1
	D	18 51 025	Wire, #4 Riser (ft)	16
	E	23 52 049	Bolt, Mach., 5/8" x 2" w/ square nut	2
	F	40 59 156	Tie, Nylon, Black	3
	G	23 17 411	Wildlife Guard - Cover Cutout	1
	H	17 54 182	Connector - Split Bolt, #4 Str. to 1/0 Str.	3
	I	23 65 043	Locknut, 5/8"	2
@	J	**07 00 25 00 @**	Clamp, Parallel Groove, PG*	2
@	K	MK0001F	Transformer, 7200V, 1kVA	1
		SK0001F	Transformer, 7620V, 1kVA	1

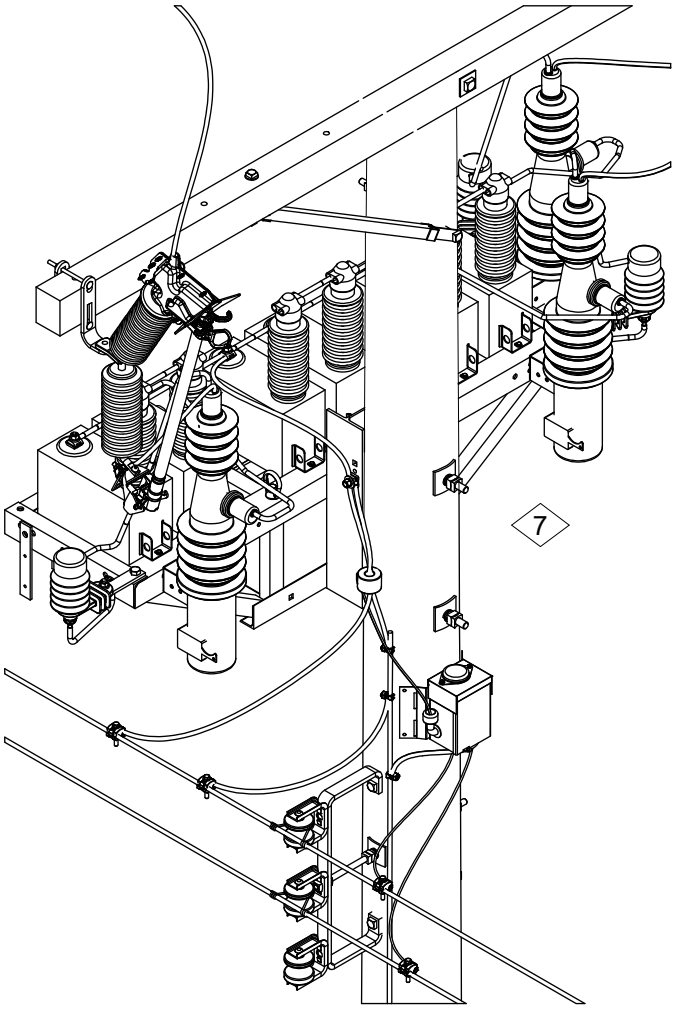
REV	DATE	ENG	DESCRIPTION
2	10/01/23	DT	Updated drawing, Updated BOM, New Note 4
1	4/01/19	DT	



REV	DATE	ENG	DESCRIPTION
7	10/01/23	DT	Updated drawing, Updated BOM, Updated Notes
6	07/30/16	WYW	



Detail A



Detail B

REV	DATE	ENG	DESCRIPTION
7	10/01/23	DT	Updated drawing, Updated BOM, Updated Notes
6	07/30/16	WYW	

CONSTRUCTION NOTE(s):

1. Minimum clearance from the ground to the bottom of the capacitor rack shall be 15 feet.

2. Clearance from the ground to the top of the control cabinet shall be 5’-6” from the ground. The bottom of disconnect box shall be installed 1’-0" max above the top of control cabinet. The next hand or foot hold shall be 8’-0" or greater above the top of the disconnect box.

3. The top of the junction box shall be mounted a maximum of 1’-0" below the capacitor bank frame. Leads to the capacitor switches shall be secured to the frame of the bank with tie wire. The junction box/meter socket kit includes 35’ of pre-wired liquid-tight conduit. The liquid- tight must be stapled every 2’-0". Excess liquid-tight shall be coiled with tie wire and secured to the pole between the junction box and the disconnect box.

4. For capacitor bank wiring schematic, refer to DCS **16 00 05 00**. For capacitor control wiring schematic with current sensor,refer to DCS **16 00 26 00**. For capacitor control wiring schematic without current sensor, refer to DCS **16 00 24 00**.

5. For installations with a current sensor, the current sensor will be installed in place of an insulator, the current sensor stud shall be bonded to pole ground and the sensor cable shall be secured with a staple, refer to detail A. If current sensor is installed on fiberglass crossarm, the current sensor cable and current sensor ground wire shall be trained to the bottom of the crossarm using 6 groundwire clips, Stock #23 28 746.

6. Low voltage wires from line post current sensor should be connected in the junction box on the bank before the primary wire is energized on the sensor. However, if the primary on the sensor is energized, as long as the base of sensor is grounded, the sensor wires are safe to connect (low output current and voltage).

7. Neutral current sensor output can reach 40V if sensor wires are not terminated when current is present on wires routed through sensor. For material and connection in the junction box; for installations without current sensor refer to DCS **16 00 24 00**, with current sensor refer to DCS 1**6 00 26 00**. The neutral current sensor, shall be mounted below the bank. All connections between the cap bank neutral or cap bank ground, including any equipment installed on the capacitor rack frame, and the pole ground or neutral shall pass through the neutral current sensor in the same direction to capture all the neutral current. No other wires should pass through the sensor. The sensor shall be installed on the wires between the capacitor rack and their connections to pole ground and the distribution system neutral using a staple to secure a wire above and below the sensor. The sensor cable should be routed to the junction box. See Detail B.

8. The junction box, disconnect box, capacitor rack, capacitor control, and current sensor, if equipped, must be connected to pole ground.

9. Bond between pole ground and neutral shall only be made when neutral is common to primary and/or static.

10. Connect #10 white conductor to neutral and #10 black conductor to 120 V supply.

11. The 120V voltage source for the controller shall come from a transformer on the circuit the capacitor bank is being installed on.

12. The minimum distance from the capacitor bank frame to the secondary line conductor is 18”. If underbuild on pole, bank lower mounting bolt must be 24” or more above the underbuild line conductor.

13. Pole wrap comes in 100 ft. rolls.

Size	DCS#
2400kVAR	**16 34 02 02**
4500kVAR	**16 34 02 04**

	ITEM	STK / DCS #	DESCRIPTION 16 34 02 **	02	04
	A	69 11 301	Capacitor Bank - Switched 4500kVAR 34.5kV	-	1
		69 11 302	Capacitor Bank - Switched 2400kVAR 34.5kV	1	-
	B	18 51 025	Wire, #4 Cu, Poly Covered	25	25
	C	54 06 052	Switch, Fused, SMD−20, 34kV	3	3
	D	20 04 355	Refill, Fuse, SMU 80E Slow	-	3
		20 04 343	Refill, Fuse, SMU 50K	3	-
	E	18 51 021	Wire, Cu, #6 S.D., Poly Covered	20	20
	F	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	2	2
	G	23 66 031	Washer, Curved, Square, 3/4"	2	2
	H	17 58 054	Bracket, Arrester/Cutout Mounting	3	3
	I	23 66 135	Lock Washer - 3/4" Double Coil	2	2
	J	23 65 042	Lock Nut - 3/4" Square	2	2
	K	23 17 532	Bird Guard, 34kV SMD20	3	3
	L	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	2	2
	M	23 66 207	Washer, Curved, Square, 5/8"	2	2
	N	23 66 134	Lock Washer - 5/8" Double Coil	9	2
	O	23 65 043	Lock Nut - 5/8" Square	2	2
13,@	P	23 17 473	Wildlife Protection - Pole Wrap	#	#
16,@	Q	**04 00 41 16**	Crossarm, FG, 10'	1	1
		04 00 20 03	Crossarm, Wood, 10'	1	1
@	R	**07 00 21 00 @**	Clamp, Hotline, HLC*W	3	3
		07 00 25 00 @	Clamp, Parallel Groove, PG*	3	3
@	S	**12 00 10 10 @**	Grounding Unit - Ground Rod	1	1
		12 00 10 09 @	Grounding Unit - Ground Coil	1	1
@	T	**16 00 26 00 @**	Control, Capacitor, Current or VAR	1	1
		16 00 24 00 @	Control, Capacitor, Time, Temp Voltage	1	1
19,@	U	23 17 526	Wildlife Cover, Pin Insulator	#	#
@	V	**07 00 25 00 @**	Clamp, Parallel Groove, PG	4	4
5,@	W	23 68 746	Grounding Clip	#	#

REV	DATE	ENG	DESCRIPTION
7	10/01/23	DT	Updated drawing, Updated BOM, Updated Notes
6	07/30/16	WYW	

DESIGN NOTE(s):

14. Capacitor control settings or SCADA may require source and load to be reversed from configuration shown for current or VAR control schemes.

15. Grounded wye cap banks shall only be installed on circuits with a continuous primary neutral and/or static from substation.

16. 8'-0" crossarms may be substituted when required.

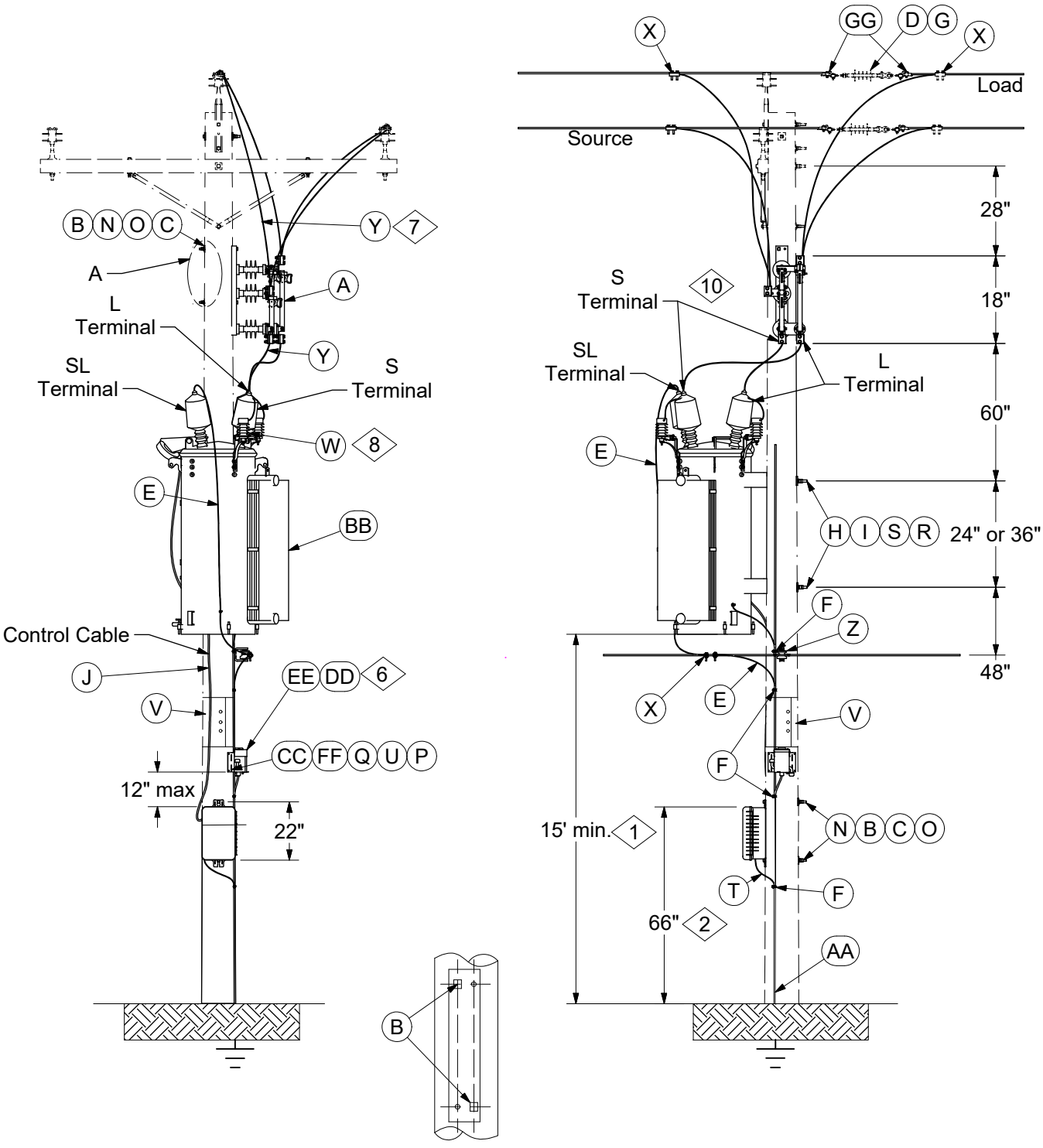
17. Communicating cap bank controller can be used in non-communicating applications with local settings.

18. If static is present, maintain 8'-0" separation between static wire and upper bolt of phase crossarm.

19. If middle phase is on crossarm, pin insulator cover required for center phase. If current sensor is installed on crossarm for middle phase, install pin insulator cover over outer phase on same side of pole.

OPERATIONS NOTE(s):

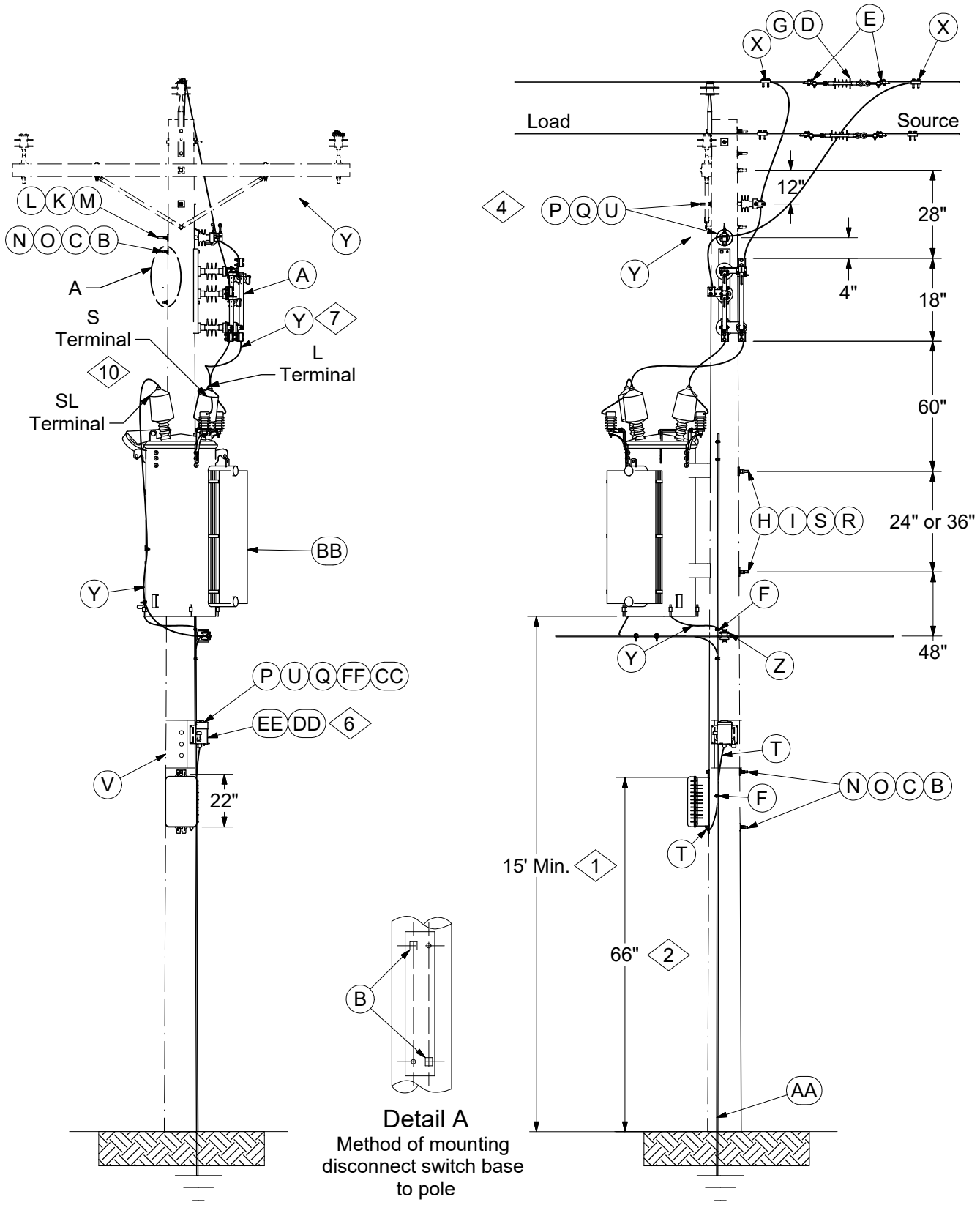
20. Loadbreak tool (Stock #84 26 042) must be used to open cutout switches. Cap bank oil/vacuum switches should be primary method used to operate bank.



Detail A
Method of mounting disconnect
switch base to pole

16 80 01 01
Option 1

REV	DATE	ENG	DESCRIPTION
8	10/01/23	DT	Updated Drawing, Updated BOM, New Notes 3, 7-10, 12, & 13
7	4/01/19	DT	



Detail A
Method of mounting disconnect switch base to pole

16 80 01 02 - Near & Center Phase
16 80 01 03 - Far Phase
Option 2

REV	DATE	ENG	DESCRIPTION
8	10/01/23	DT	Updated Drawing, Updated BOM, New Notes 3, 7-10, 12, & 13
7	4/01/19	DT	

CONSTRUCTION NOTE(s):

1. Minimum clearance from the ground to the bottom of the regulator tank shall be 15'-0".

2. Clearance from ground to the top of the control cabinet shall be 5'-6" from the ground. If a communications box is present, there shall be a maximum of 1'-0" between the top of control cabinet and bottom of comm box. The next hand or foot hold shall be 8'-0" or greater above the control cabinet, or comm box.

3. 7620V regulators come set for 7200V, 2500V come set for 2400V. If a different voltage is required, the appropriate tap must be selected by moving a connector on the terminal strip under the hand hole on top of the regulator.

4. Install a vice top insulator to train the wire from the right side of the switch to the far phase.

5. When practical, tap change position indicator should be located on street side of pole.

6. For Illinois VO only. If required, the communications box shall be mounted to the pole by bolting an H bar bracket to the pole with a 5/8" bolt for the top and bottom of the cabinet. 3/8" bolts shall be used to mount the cabinet to the T slot of the H bar. The maximum vertical separation between regulator control cabinet and communication box shall be 12". The communications box shall be bonded to pole ground.

7. Maximum conductor size for regulator leads, between bypass switch and regulator, shall be 1/0 for 100 and 150 amp regulators. Leads between bypass switch and line conductor shall be sized based on line conductor.

8. Use 10kV arresters for 7620V regulator. Use 3kV arresters for 2500V regulator.

9. Pole wrap comes in 100 ft. rolls.

10. See Figure 1 for regulator wiring schematic.

Regulator Table					
Stock Number - Regulator Line	**Voltage**	**Amps**	**kVA**	**Weight in lbs. Eaton**	**Weight in lbs. GE**
69 09 078	2500	200	50	1200	-
69 09 125	2500	400	100	2526	-
69 09 126	2500	668	167	2509	-
69 09 005	7620	100	76.2	1270	1499
69 09 007	7620	150	114.3	1585	1613
69 09 006	7620	219	167	1975	1905

	ITEM	STK / DCS #	DESCRIPTION 16 80 01 **	01	02	03
	A	54 07 455	Switch, By-Pass, 600A	1	1	1
	B	23 52 309	Bolt, Mach., 1/2" x 16" w/ square nut	4	4	4
	C	23 66 118	Washer, Square, 1/2"	4	4	4
	D	25 06 052	Insulator, Susp. 15kV	1	1	1
	E	18 51 025	Wire, #4 Cu Poly, Riser	12	12	12
	F	17 54 005	Connector - Split Bolt, #2 Solid to #6 Solid	4	4	4
	G	23 59 064	Link Figure 8	1	1	1
	H	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	2	2	2
	I	23 66 031	Washer, Curved, Square, 3/4"	2	2	2
	J	23 64 001	Staple - Ground Wire, Serrated Cu Clad	16	16	16
4	K	25 05 143	Insulator, Vice Top, 12kV	-	1	2
	L	23 62 128	Adapter Pin for Vice Top Insulator	-	1	2
	M	23 53 002	Bolt, DA, 5/8" Dia x 16" w/ 4 Square Nuts	-	1	2
	N	23 65 056	Lock Nut - 1/2" Square	4	4	4
	O	23 66 133	Lock Washer - Double Coil 1/2"	4	4	4
	P	23 65 043	Lock Nut - 5/8" Square	2	4	6
	Q	23 66 134	Lock Washer - 5/8" Double Coil	2	3	4
	R	23 65 042	Lock Nut - 3/4" Square	2	2	2
	S	23 66 135	Lock Washer - 3/4" Double Coil	2	2	2
	T	18 51 021	Wire, Cu, #6 S.D., Poly	6	6	6
	U	23 66 207	Washer, Curved, Square, 5/8"	2	4	6
9,@	V	23 17 473	Animal Guard - Pole Wrap	#	#	#
8,@	W	10 01 145	Arrester - Lightning, 10kV	1	2	2
		10 01 256	Arrester - Lightning, 3kV	2	2	2
@	X	**07 00 25 00 @**	Clamp - Parallel Groove, PG*	4	4	4
7,@	Y	**07 00 80 00 @**	Wire, Poly, S.D. (ft.), PLW*W	50	50	50
@	Z	**03 01 00 00 @**	Secondary Configuration	1	1	1
@	AA	**12 00 10 01**	Grounding Unit, 7#10CW, Ground Coil	1	1	1
		12 00 10 02	Ground Unit, 7#10CW, Ground Rod	1	1	1
@	BB	Regulator Table	Regulator	1	1	1
11,@	CC	62 51 563	Bracket, H Bar (VO Only)	2	2	2
11,@	DD	69 59 004	Kit, Communications (VO Only)	1	1	1
11,@	EE	69 59 003	Radio, GE Orbitz, ECR, Single Port (VO Only)	1	1	1
11,@	FF	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	2	2	2
@	GG	**07 00 11 00 @**	Clamp, Deadend, DEC*W	2	2	2

REV	DATE	ENG	DESCRIPTION
8	10/01/23	DT	Updated Drawing, Updated BOM, New Notes 3, 7-10, 12, & 13
7	4/01/19	DT	

DESIGN NOTE(s):

11. Stock #s 62 51 563, 69 59 004, 69 59 003, and 23 52 068 are only for Illinois VO project.

12. 7620V regulators have taps for 2400V, 4160V, 7200V, 7620V, and 7970V. 2500V regulators have taps for 2400V and 2500V. Regulator kVA ratings are based on nameplate circuit voltage rating and will change based on circuit voltage. Nameplate current ratings remain the same when installed on different circuit voltages.

13. Regulators shall only be installed line to ground on grounded wye distribution circuits with a continuous neutral.

14. Use Option 1 or 2 that places the switch in the most favorable position to operate (road side if no other preference).

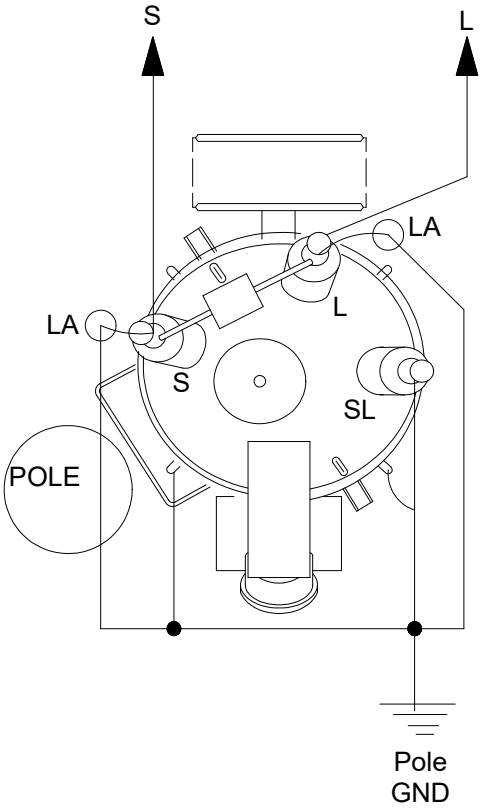


Figure 1
Regulator Wiring Schematic

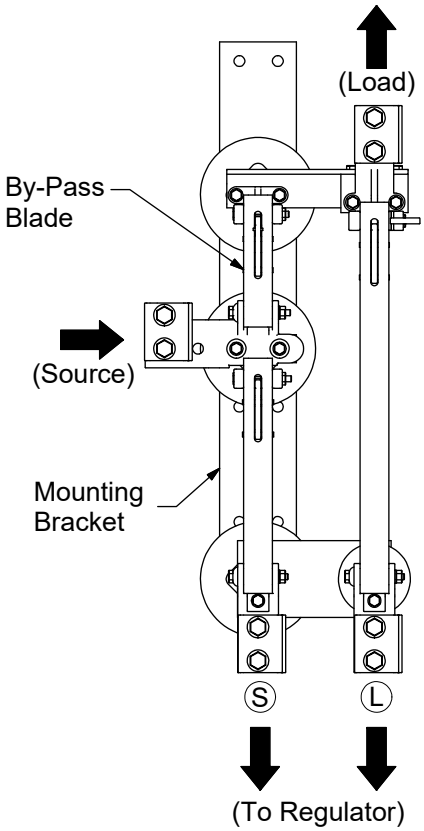
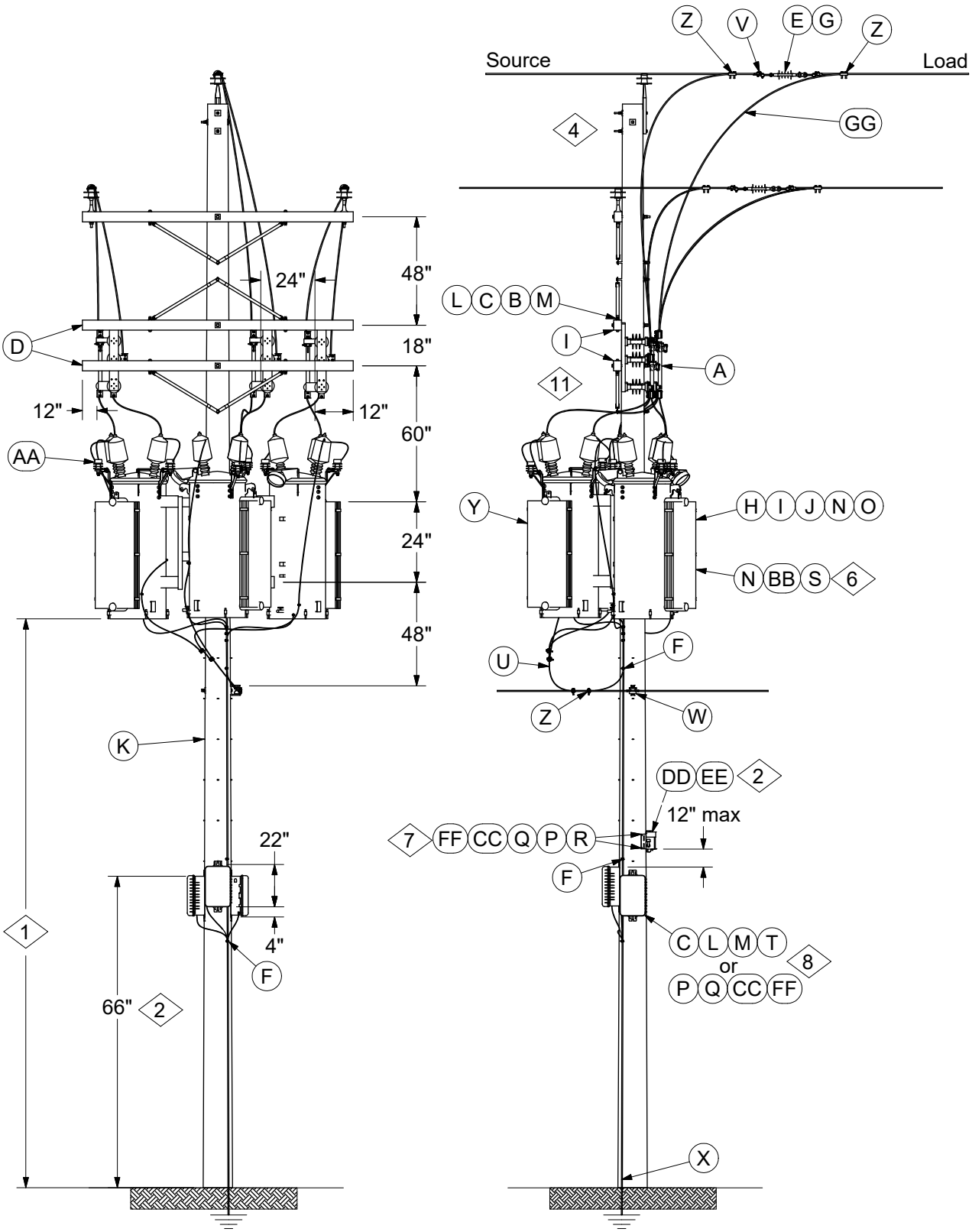


Figure 2
By-Pass Switch

OPERATING NOTE(s):

15. To by-pass regulator: See Figure 2
    A. Set regulator on neutral position. (Follow appropriate procedures to verify regulator is on neutral)
    B. Close the short by-pass blade.
    C. Open the source and load blades.

16. To re-energize regulator: See Figure 2
    A. With by-pass blade closed, set regulator on neutral position.
    B. Close the source side blade only to test the regulator.
    C. Close the source and load blades to the regulator.
    D. Open the short by-pass blade.
    E. Place regulator in service.



REV	DATE	ENG	DESCRIPTION
11	10/01/23	DT	Udated Drawing, Updated BOM, New Notes 3, 4, 9, 10, 11, 13, &14
10	04/01/19	DT	

CONSTRUCTION NOTE(s):

1. Minimum clearance from the ground to the bottom of the regulator tank shall be 15'-0".

2. Clearance from ground to the top of the control cabinet shall be 5'-6" from the ground. If a communications box is present, there shall be a maximum of 1'-0" between the top of the control cabinet and bottom of comm box. The next hand or foot hold shall be 8'-0" or greater above the control cabinet.

3. 7620V regulators come set for 7200V, 2500V regulators come set for 2400V. If a different voltage is required, the appropriate tap must be selected by moving a connector on the terminal strip under the hand hole on top of the regulator.

4. Maximum conductor size for regulator leads, between bypass switch and regulator, shall be 1/0 for 100 and 150 amp regulators. Leads between bypass switch and line conductor shall be sized on line conductor.

5. Use 10kV arresters for 7620V regulator. Use 3kV arresters for 2500V regulator.

6. Each Eaton 219A regulator requires an adapter plate (Stock #69 58 127) and two 3/4" x 2" machine bolts and two 3/4" lock nuts. GE 219A regulators do not require adapter plate.

7. For Illinois VO only. If required, the communications box shall be mounted to the pole by bolting an H bar bracket to the pole with a 5/8" bolt for the top and bottom of the cabinet. 3/8" bolts shall be used to mount the cabinet to the T slot of the H bar, two 5/8" bolts and two H bars are required. The maximum vertical separation between regulator control cabinet and communication box shall be 12". The communications box shall be bonded to pole ground.

8. For installations without enough space to mount control cabinets directly to pole with 1/2" bolts, control cabinet may be mounted to the pole by bolting and H bar bracket to the pole with a 5/8" bolts for the top and bottom of the cabinet. 3/8" bolts would then be used to mount the cabinet to the T slot of the H bar. A total of four 5/8" bolts, locking hardware and six H bars would be required.

9. Bond between pole ground and neutral shall only be made if neutral is common to primary.

10. Pole wrap comes in 100 ft roll.

11. For regulator wiring schematic, see Figure 2.

REV	DATE	ENG	DESCRIPTION
11	10/01/23	DT	Udated Drawing, Updated BOM, New Notes 3, 4, 9, 10, 11, 13, &14
10	04/01/19	DT	

Regulator Table					
Regulator-Stock #	**Voltage**	**Amps**	**kVA**	**Weight (lbs) Per Unit**	**Weight (lbs) per unit**
				Eaton	GE
69 09 078	2500	200	50	1200	-
69 09 125	2500	400	100	2526	-
69 09 126	2500	668	167	2509	-
69 09 005	7620	100	76.2	1270	1499
69 09 007	7620	150	114.3	1585	1613
69 09 006	7620	219	167	1975	1905

	ITEM	STK / DCS #	DESCRIPTION 16 80 03 **	01
	A	54 07 455	Switch, By-Pass, 600A	3
	B	23 52 038	Bolt, Mach., 1/2" x 6" w/ square nut	12
	C	23 66 118	Washer, Square, 1/2"	16
	D	**04 00 20 03**	Crossarm w/ Brace 10'	2
	E	25 06 052	Insulator, Susp. 15kV	3
	F	17 54 005	Connector - Split Bolt	10
	G	23 59 064	Link Figure 8	3
	H	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	2
	I	23 66 031	Washer, Curved, Square, 3/4"	2
	J	23 17 202	Mounting Unit, 3 Pos. Heavy (Three 75kVA to 167kVA Trans.)	1
	K	23 64 028	Staple	48
	L	23 65 056	Lock Nut - 1/2" Square	16
	M	23 66 133	Lock Washer - Double Coil 1/2"	16
	N	23 65 042	Lock Nut - 3/4" Square	8
	O	23 66 135	Lock Washer - 3/4" Double Coil	2
	P	23 65 043	Lock Nut - 5/8" Square	6
	Q	23 66 134	Lock Washer - 5/8" Double Coil	6
	R	23 66 027	Washer, Flat, Square 5/8"	6
	S	23 52 321	Bolt, Mach., 3/4" x 2" w/ square nut	6
	T	23 52 310	Bolt, Mach, 1/2" x 18"	4
	U	18 51 025	Wire #4, Cu Poly Riser	36
@	V	**07 00 11 00** @	Clamp, Deadend DEC*W	6
@	W	**03 01 ** ** ** @	Secondary Configuration	1
@	X	**12 00 10 02**	Grounding Unit - Ground Rod , 7#10	1
		12 00 10 01	Grounding Unit - Ground Coil, 7#10	1
@	Y	Regulator Table	Regulator	3
@	Z	**07 00 25 00** @	Clamp - Parallel Groove	8
5,@	AA	10 01 145	Arrester, Lightning, 10kV	6
		10 01 256	Arrester, Lightning, 3 kV	6
6,@	BB	69 58 127	Adapter, Mounting Plate 36” to 24” Lug Spacing	3
7,8,@	CC	62 51 563	Bracket, H Bar	8
7,10,@	DD	69 59 004	Kit, Communications (VO only)	1
7,10,@	EE	69 59 002	Radio, GE Orbitz, MCR, 4 Port (VO Only)	1
7,8,@	FF	23 52 068	Bolt, Mach., 5/8" x 16"	6
4,@	GG	**07 00 80 00** @	Wire, Poly, S.D. (ft.) PLW*W	150
10,@	HH	23 17 473	Pole Wrap, Animal Guard	#

REV	DATE	ENG	DESCRIPTION
11	10/01/23	DT	Udated Drawing, Updated BOM, New Notes 3, 4, 9, 10, 11, 13, &14
10	04/01/19	DT	

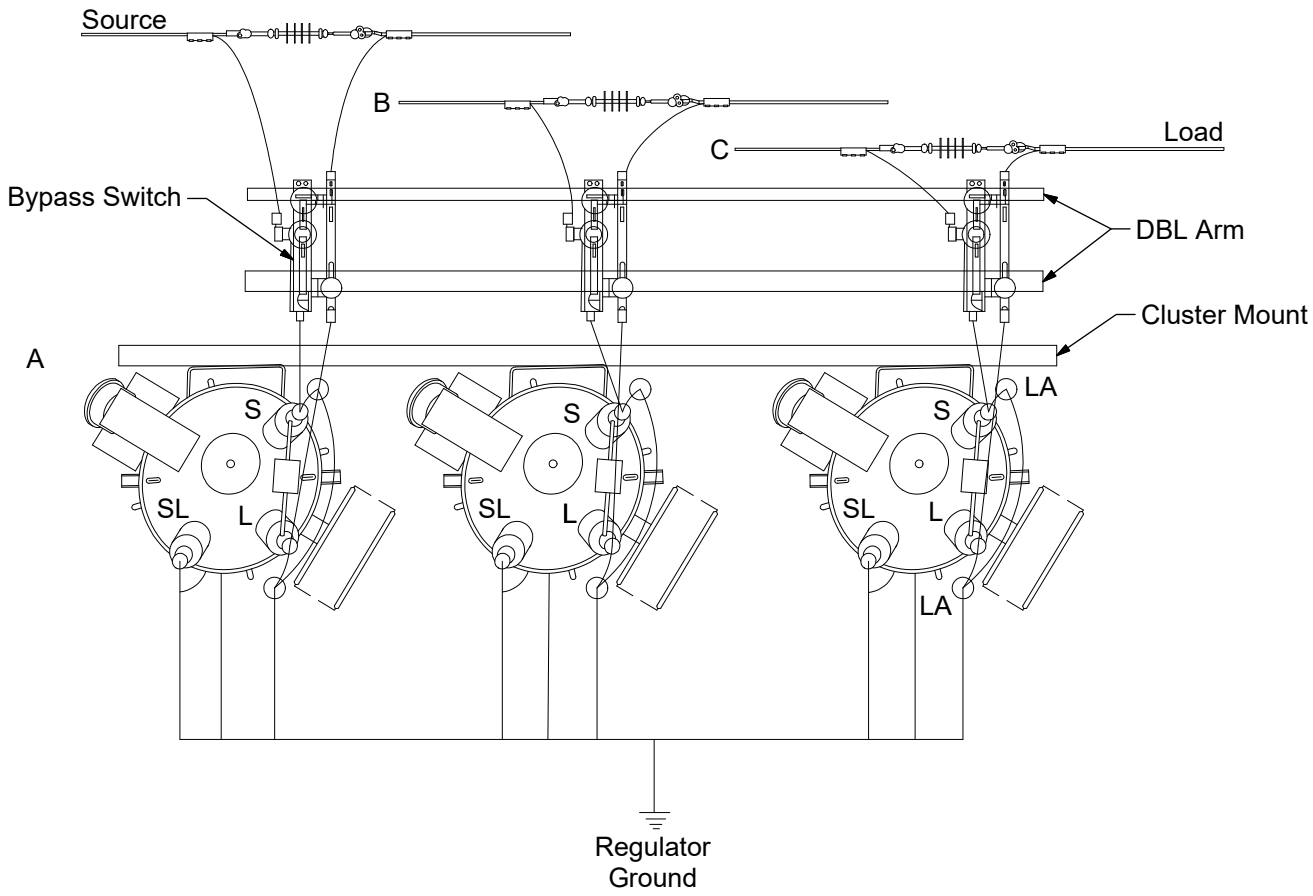


Figure 1
Regulator Wiring Schematic
Grounded Wye

REV	DATE	ENG	DESCRIPTION
11	10/01/23	DT	Udated Drawing, Updated BOM, New Notes 3, 4, 9, 10, 11, 13, &14
10	04/01/19	DT	

DESIGN NOTE(s):

12. Stock #69 59 004 and Stock #69 59 002 are only for Illinois VO project.

13. 7620V regulators have taps for 2400V, 4160V, 7200V, 7620V, and 7970V. 2500V regulators have taps for 2400V and 2500V. Regulator kVA ratings are based on nameplate circuit voltage rating and will change based on circuit voltage. Nameplate current ratings remain the same when installed on different circuit voltages.

14. Regulators may only be installed in a wye configuration when there is a continuous distribution neutral and/or static from the substation.

OPERATIONS NOTE(s):

15. To By-Pass Regulator, See Figure 2

    A. Set regulator on neutral position. (Follow appropriate procedures to verify regulator is on neutral.)

    B. Close the short by-pass blade.

    C. Use load-buster tool and open the load blade.

    D. Open the source blade.

16. To Re-Engergize Regulator, See Figure 2

    A. With by-pass blade closed, set regulator on neutral position.

    B. Close the source side blade only to test the regulator.

    C. Close the source and load blades to the regulator.

    D. Open the short by-pass blade.

    E. Place regulator in service.

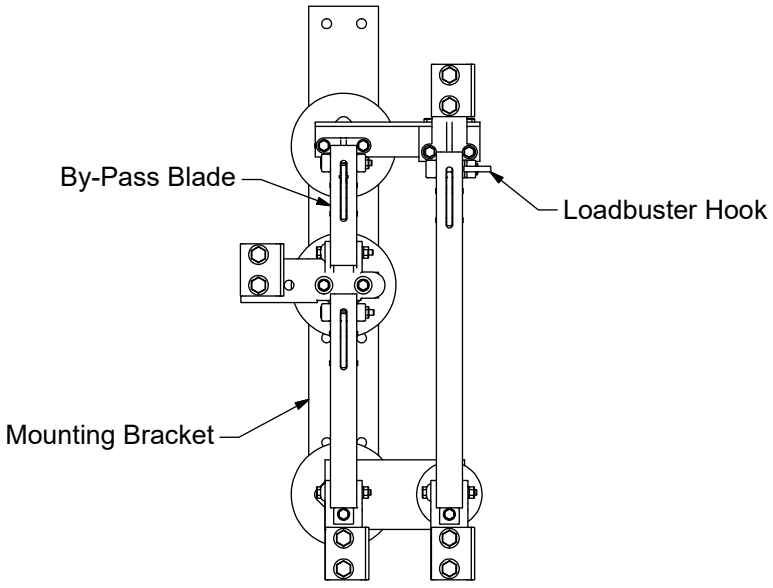
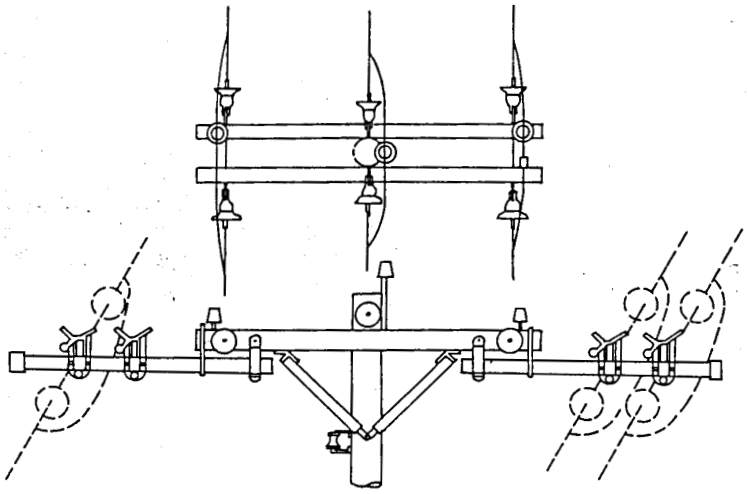


Figure 2
Bypass Switch

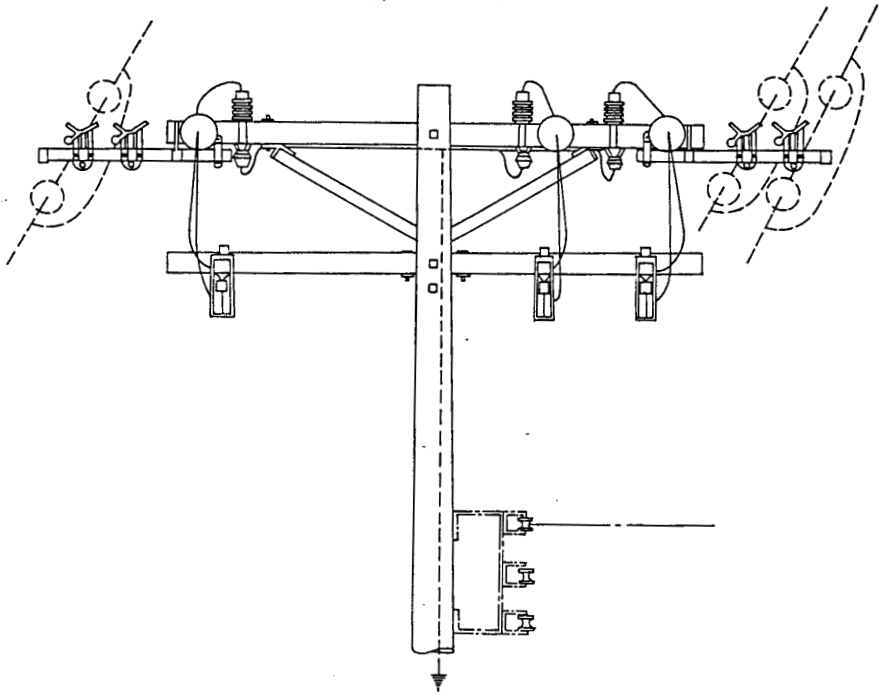
LABOR OPERATIONS 17

TABLE OF CONTENTS

RECONDUCTORING 4KV LOOPOVER AND SWITCH POLE	17–21–40–**
RECONDUCTORING CROSSARM OR ARMLESS 1, 2, AND 3 PHASE	17–31–10–**
RECONDUCTORING ANGLE OR DEADEND	17–31–11–**
RECONDUCTORING FLOATING ANGLE	17–31–12–**
RECONDUCTORING 12KV TRANSFORMERS WITH OR WITHOUT SWITCHES	17–31–30–**
RECONDUCTORING SWITCH POLE – BREAKOFFS	17–31–40–**
RECONDUCTORING 12KV SWITCH POLES – LOOPOVERS	17–31–41–**
260 JUMPER	17–31–50–**
252 & 255 JUMPER 12KV & ABOVE	17–31–51–**



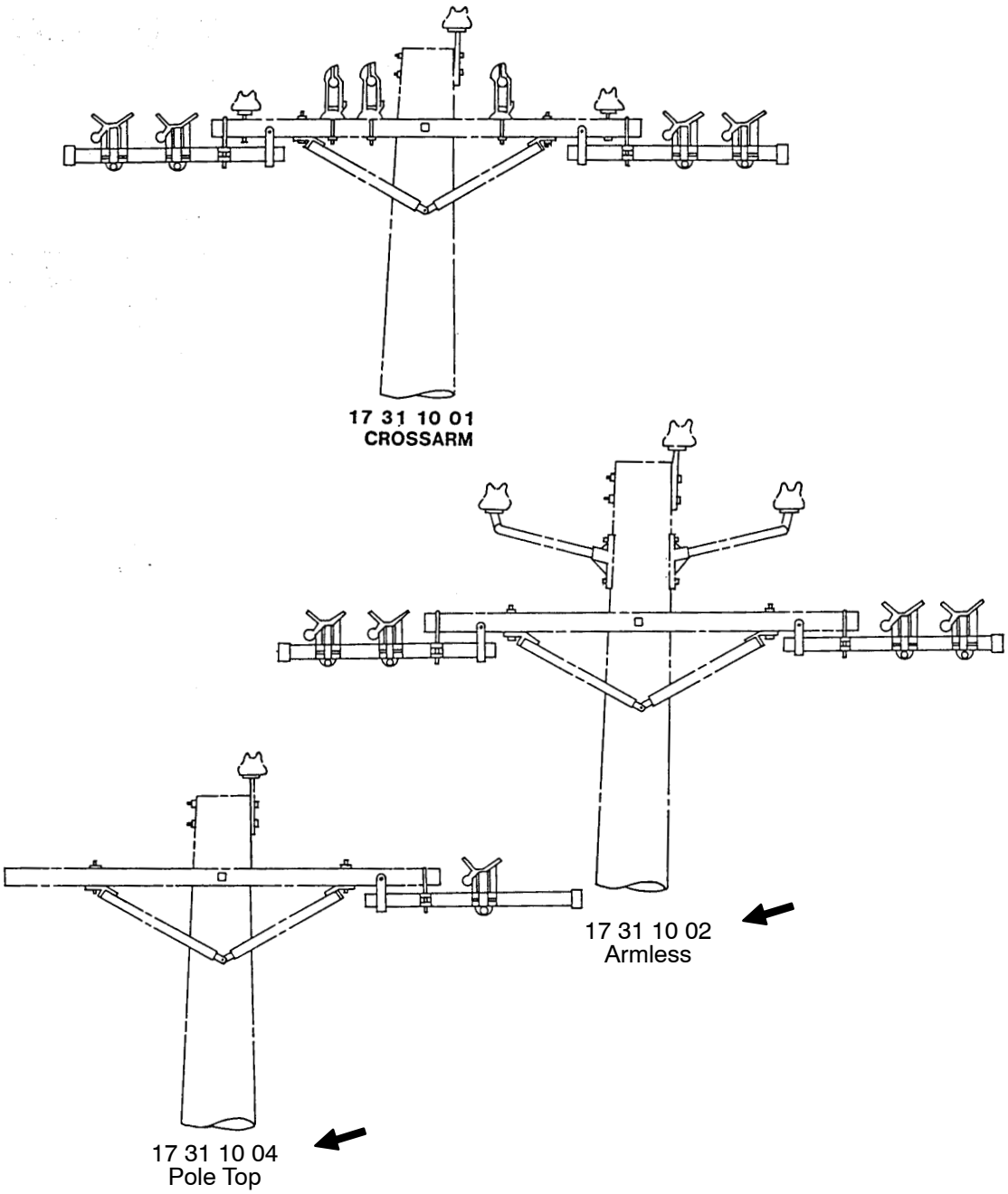
3Ø 17 21 40 01
2Ø 17 21 40 02



3Ø 17 21 40 03
2Ø 17 21 40 04

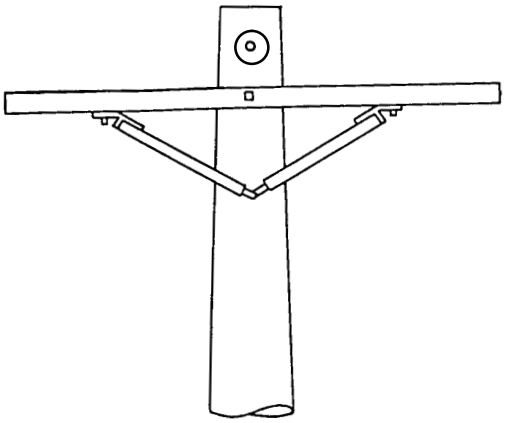
1. Above quantities assume that new switches will be installed.
2. If switch is not replaced or R&R'd, Estimate 4 additional Code 260s per switch.

		Description **17 21 40 ****	**01**	**02**	**03**	**04**
	996	Epoxi Arms	4	4	4	4
	912	R & R Disc Insulators	6	4	6	4
1 2	260	Jumper	12	8	6	4



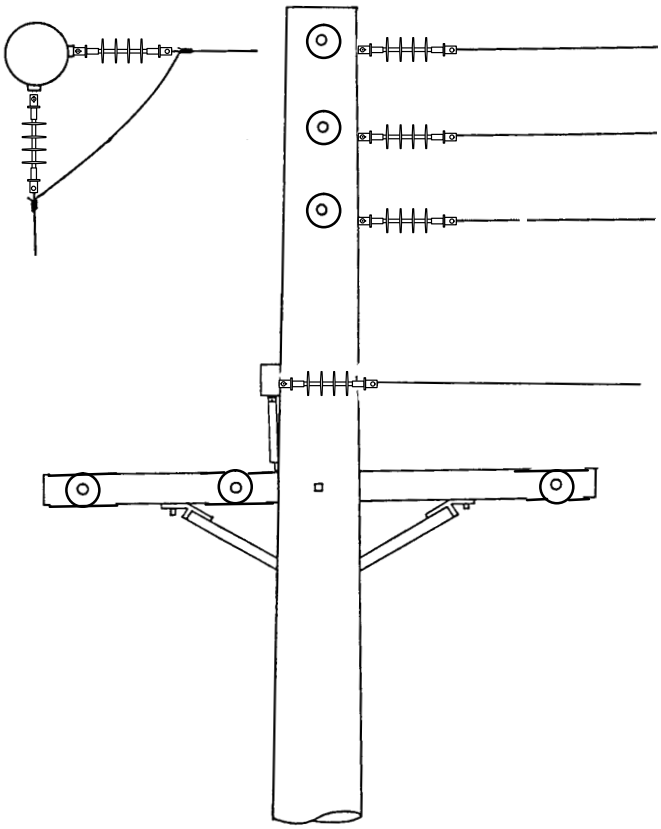
	Stnd. / Stk. No.	Description 17 31 10 **	01	02	04
	996	Epoxi Arms	4	4	2
	TARM	Crossarm Single, 6 Ft.		2	2

DEADEND



4 kV 17 31 11 01
12kV 17 31 11 03

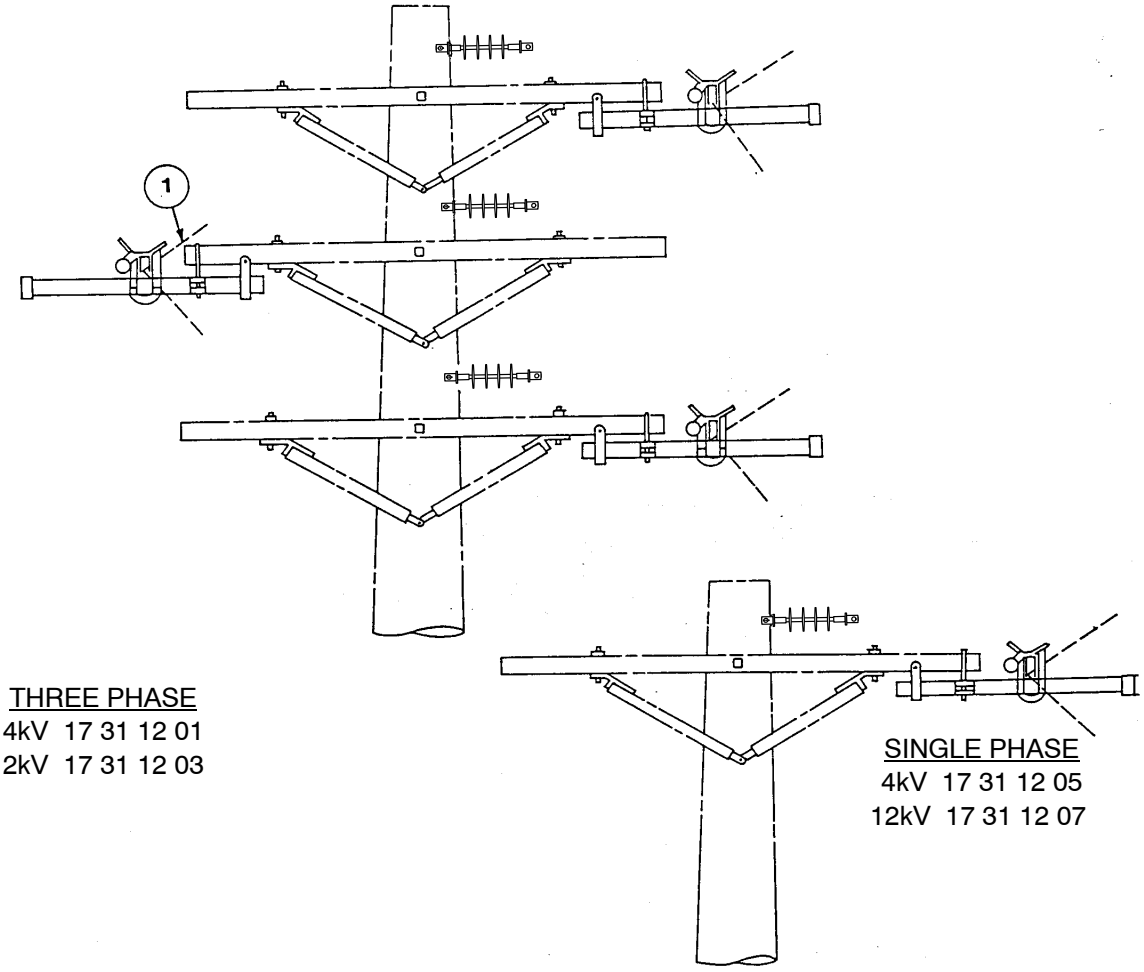
90° CORNER



4 kV 17 31 11 05
12kV 17 31 11 07

1. Minus out each 255 jumper on which a 252 connector is installed.

	Stnd. / Stk. No.	H/C	Description 17 31 11 **	01	03	05	07
	TARM		Crossarm Sgle, 6 Ft.	2	2		
	TARM		Crossarm Sgle, 8 Ft.			4	4
	912		R&R Insulator	1		6	
	912	H	R&R Insulator		1		6
	260		Jumper Inst & REM			12	6
	255		Jumper Inst & REM				6
@	252		Connector Energized Ea	@	@	@	@

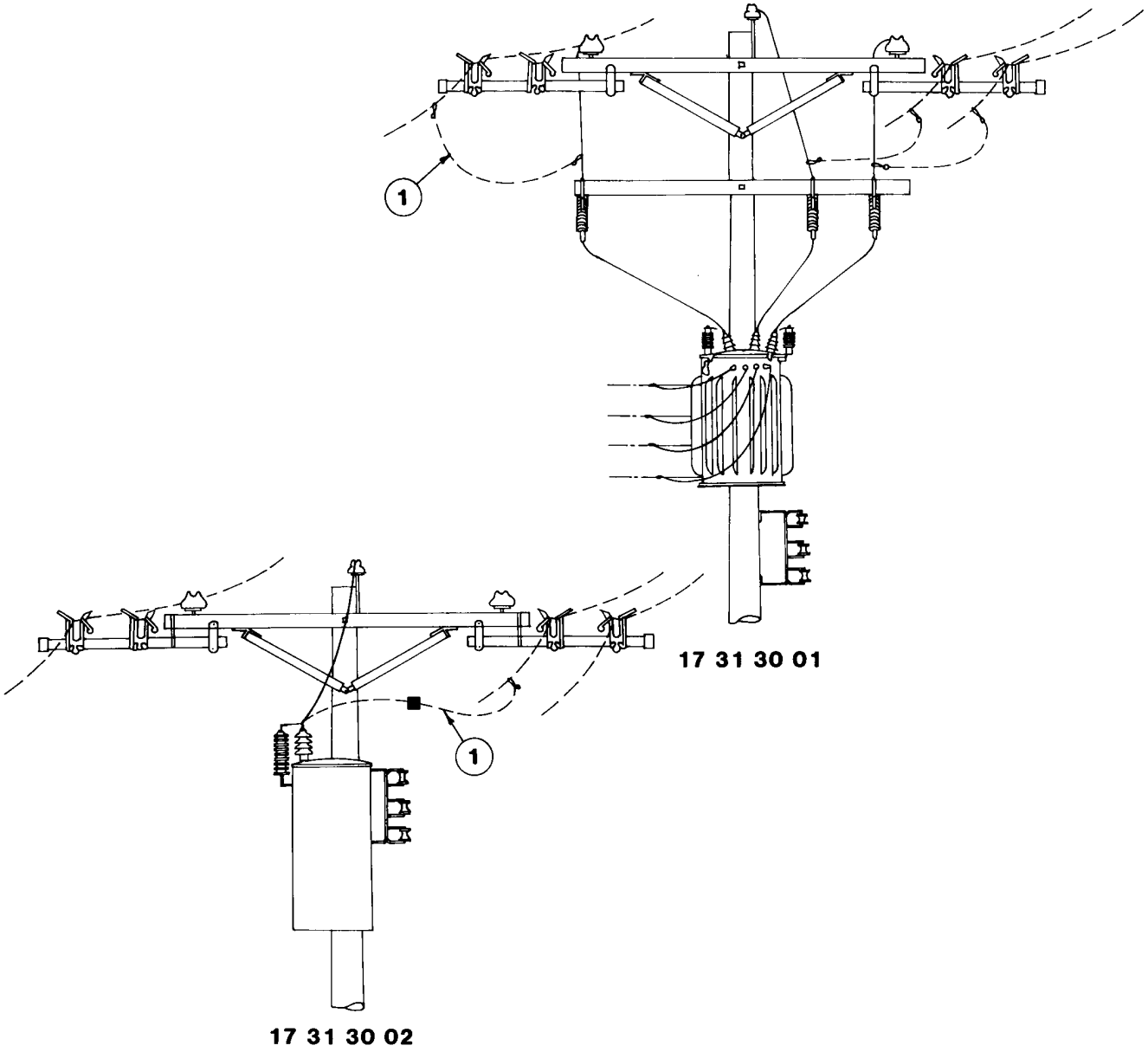


THREE PHASE
4kV 17 31 12 01
12kV 17 31 12 03

SINGLE PHASE
4kV 17 31 12 05
12kV 17 31 12 07

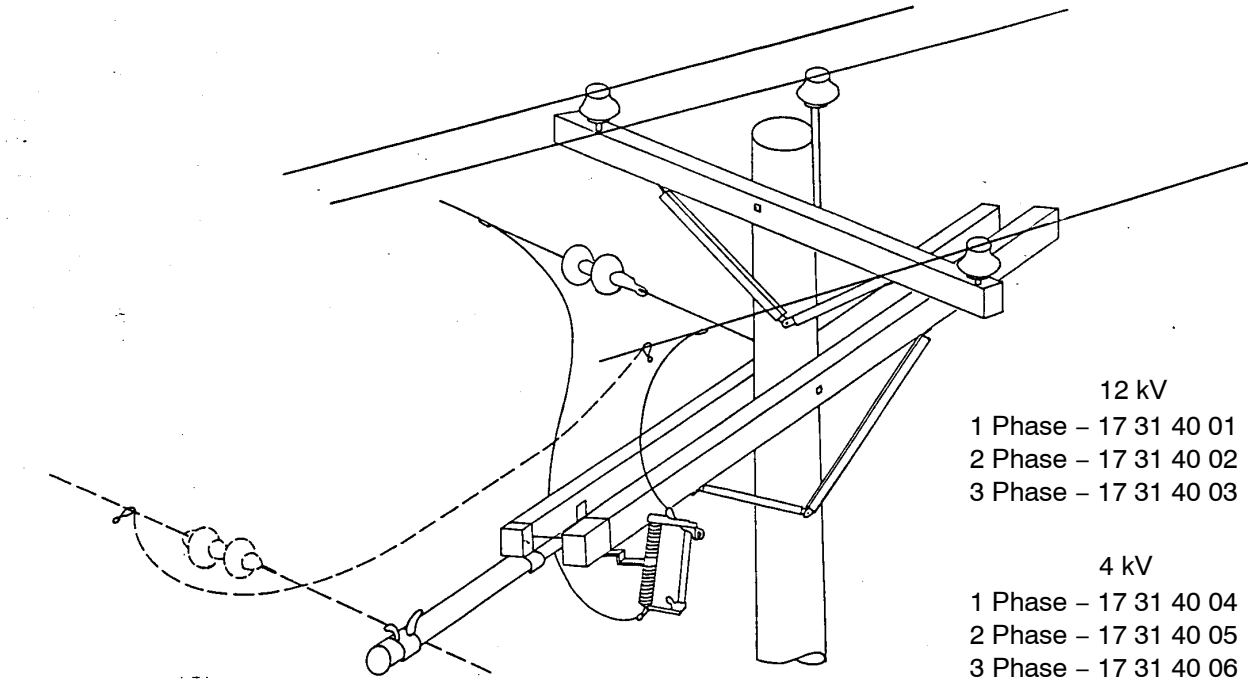
1. Splice – Add approx. 6” length of wire
2. 270 – De energized wire, #6–4/0 is spliced under tension.
3. 275 – De energized wire. 336 or larger is spliced under tension.
4. H 270 – Energized, 12 kV or above, wire, #6–4/0 is spliced.
5. H 275 – Energized, 12 kV or above, wire, 336 or larger is spliced.

	Stnd. / Stk. No.	H/C	Description 17 31 12 **	01	03	05	07
	TARM		Crossarm Single 6 Ft.	6	6	2	2
2 @	996		Epoxi Arm	6	6	2	2
3 @	270		Splice 6 Thru 4/0	2			
4 @	275		Splice 336 & Above	2			
5 @	270	H	SP 6 Thru 4/0 12kV		2		
	275	H	SP 336 & Above 12kV		2		
	260		Jumper	2			
	255		Jumper		2		



1. If transformer outage can be obtained, use Code 260.

		Description 17 31 30 **	01	02
	996	Epoxi Arms	4	4
@	255	Jumper	12	4
@	260	Jumper	12	4

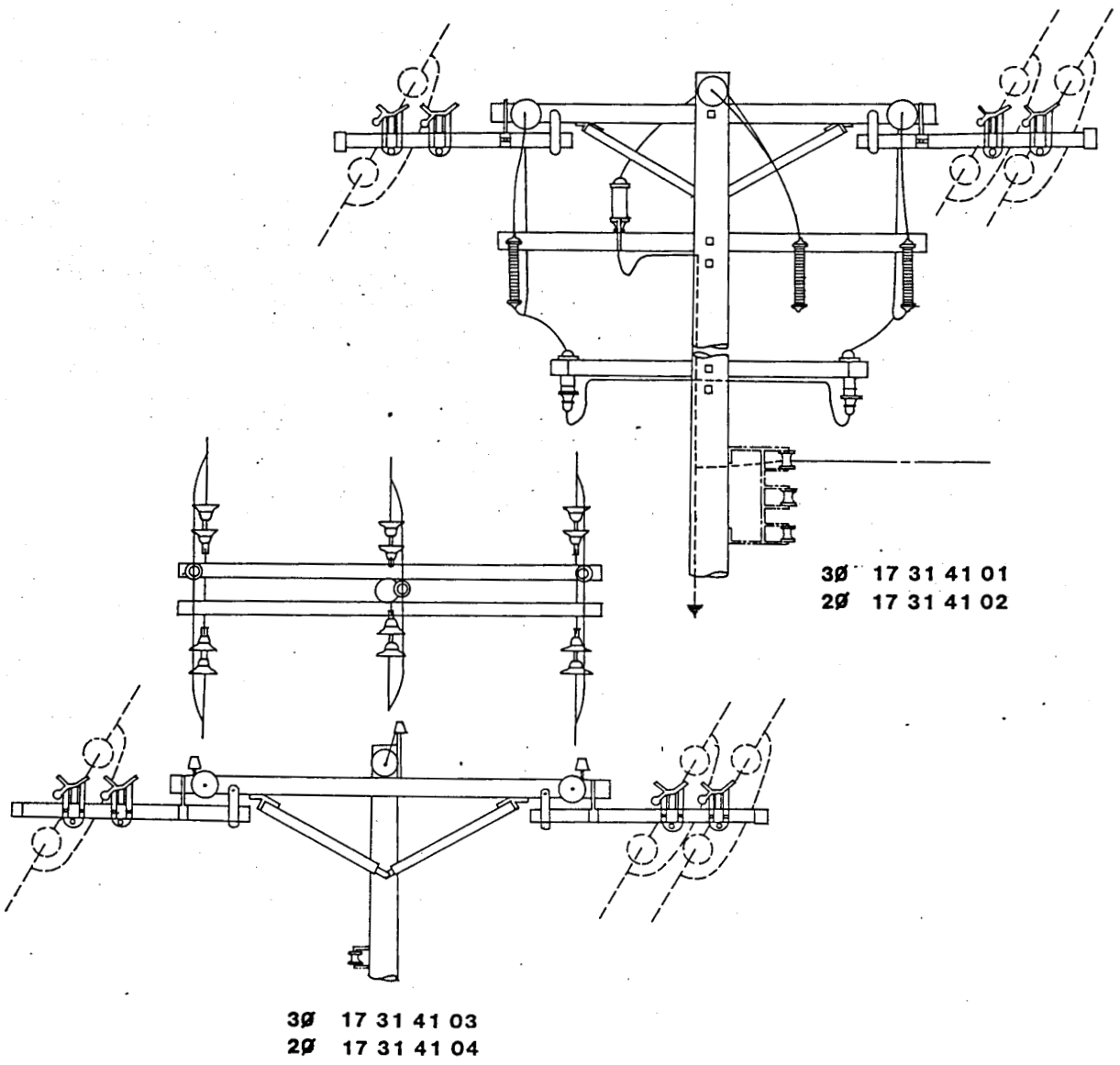


12 kV
1 Phase – 17 31 40 01
2 Phase – 17 31 40 02
3 Phase – 17 31 40 03

4 kV
1 Phase – 17 31 40 04
2 Phase – 17 31 40 05
3 Phase – 17 31 40 06

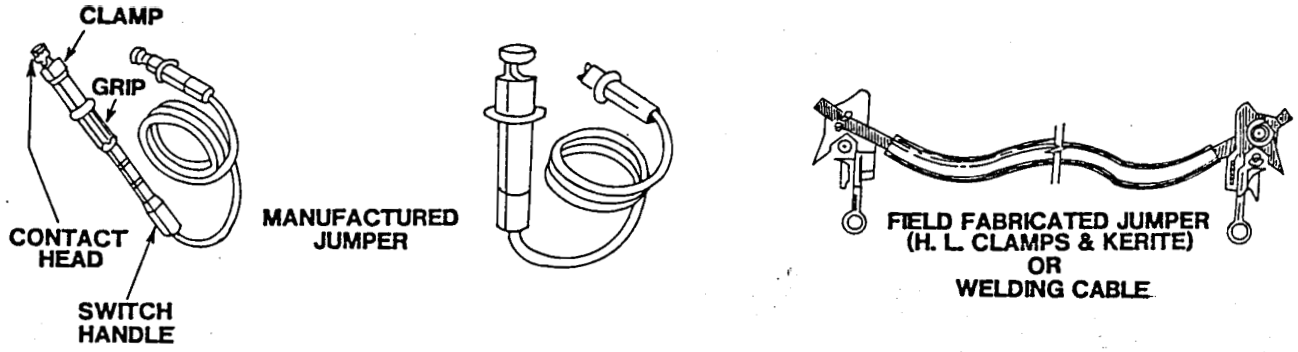
1. Group for 12kV #6 thru 1/0 existing switch is refused or converted to solid blade.
2. Group for 12kV 336 thru 556 complete switch may be replaced.
3. Where P.G. connections are installed using rubber gloves, estimate a Code 255 and minus out one corresponding Code 252. 252 energized connectors (each). Minus out one 255 for each jumper on which a 252 connector is installed.

		H/C	Description 17 31 40		01	02	03	04	05	06
	996		Epoxi Arms		2	4	4	2	4	4
	912		R&R Insulators					1	2	3
	912	H	R&R Insulators		1	2	3			
			Breakoff Description		Quantities Estimated/Reported					
5 @			Existing Breakoff	New Breakoff						
	260		Switched	Switched	5	10	15	6	12	18
	255				1	2	3	0	0	0
	260		Not Switched	Not Switched	2	4	6	4	8	12
3 @	255				2	4	6			
4 @	260		Not Switched	Switched	1	2	3	3	6	9
5 @	255				2	4	6			
	260		Switched	Not Switched	2	4	6	3	6	9
	255				1	2	3	0	0	0
			New Wire 336 or Larger							
@2	260		100 Amp 200 Switch	600 Amp Switch	1	2	3	2	4	6
@3	255				1	2	3	0	0	0
@2	252				1	2	3			
@3	260		Not Switched	Not Switched	2	4	6	4	8	12
@2	255				2	4	6			
@3	252				@	@	@			
@2	260		Not Switched	600 Amp Switch	1	2	3	3	6	9
@3	255				2	4	6			
@2	252				1	2	3			
@3	260		Switched	Not Switched	2	4	6	3	6	9
@2	255				1	2	3			
@3	252				@	@	@			

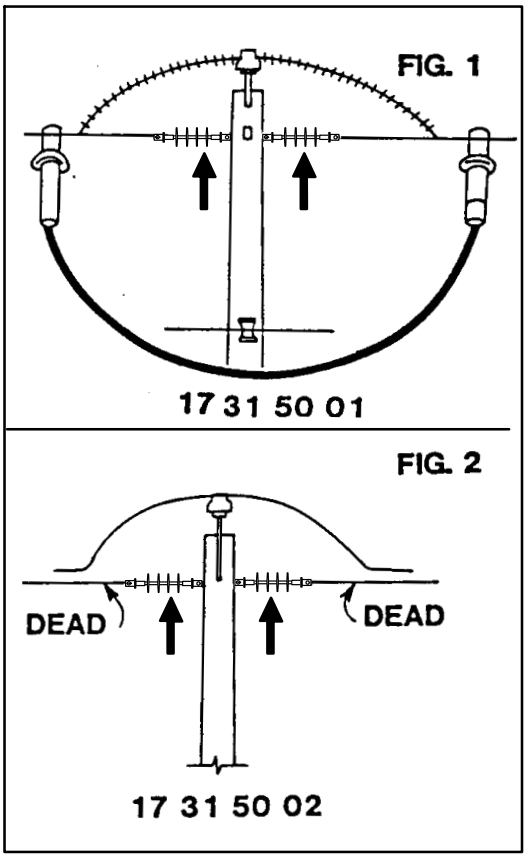


1. Above quantities assume that new switches will be installed.
2. If switch is not replaced or R&R'd, Estimate 4 additional Code 260s per switch.

	Stk. No or Code	H/C	Description 17 31 41 **	01	02	03	04
	996		Epoxi Arms	4	4	4	4
	912	H	R&R Insulators	6	4	6	4
1	255		Jumper	3	2	6	4
1 2	260		Jumper	3	2	6	4



Stnd. / Stk. No.	Description 17 31 50 **	01	02	03	04	05	06
260	Inst. & REM. 5kV, Jumpers, Loopovers	2					
260	5 & 12kV, Dead Loopovers		1				
260	1st, Conn. REM. De–energizes jumper Loopover			1			
260	Secondary Split				2		
260	Inst. or REM. Primary Taps – Phase Cuts Etc.					1	
260	Open Loop & Reconnect to Itself Hot						1

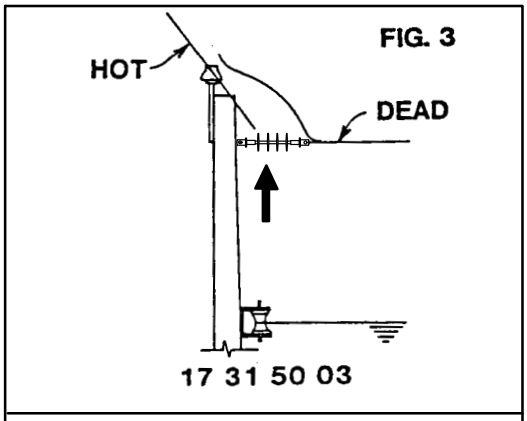


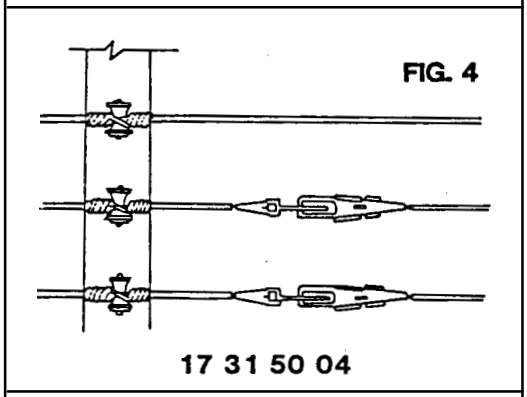
INSTALL OR REMOVE JUMPERS

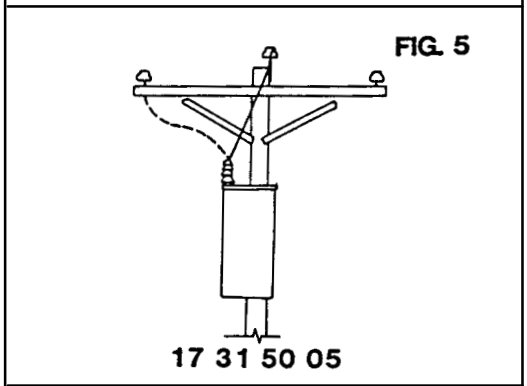
This operation code is to be estimated in the following cases. Do not report with Code 255 or 252.

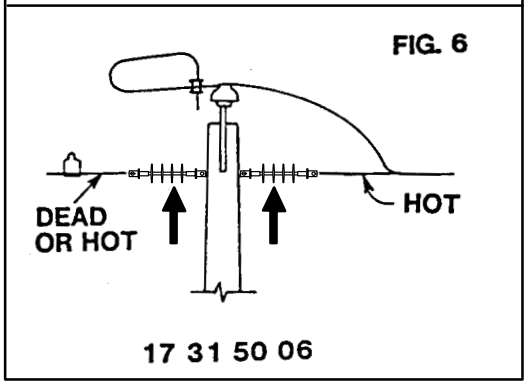
Installing or removing 5kV jumpers, loopovers, or looparounds. (Fig. 1)

Installing 12kV jumpers, loopovers, or looparounds and the first connection is to de–energized primary. (Figs. 2 & 3)









The first connection (connector or clamp) removed de–energizes the jumper, loopover or looparound. (Fig. 3)

Opening or closing secondary splits (Fig. 4), grounding single phase primary (Fig. 3), installing or removing temporary jumpers (Fig. 1), or as a supplemental ground from the neutral to the ground rod on a three phase cluster grounding set.

Installing or removing energized primary taps (hot line clamps) and no major items are reported. (Figs. 3 & 5)

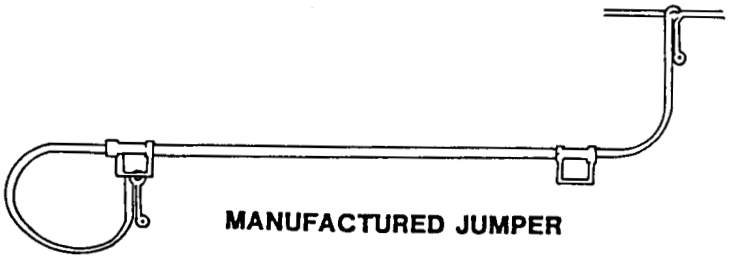
If an energized jumper is disconnected, remains energized and is reconnected to itself or the same energized phase (using hot line clamps or stirrups), estimate Code 260. (Fig. 6)

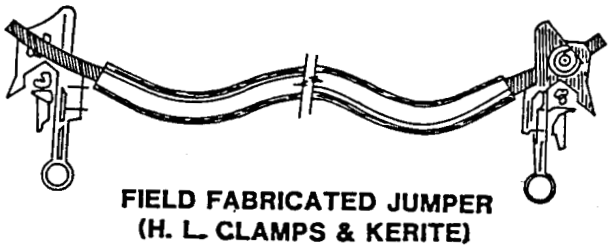
Installing or removing energized primary connections on existing reclosers and sectionalizers.

Do not estimate Code 260 when estimated major material items, such as switches, are connected or disconnected.

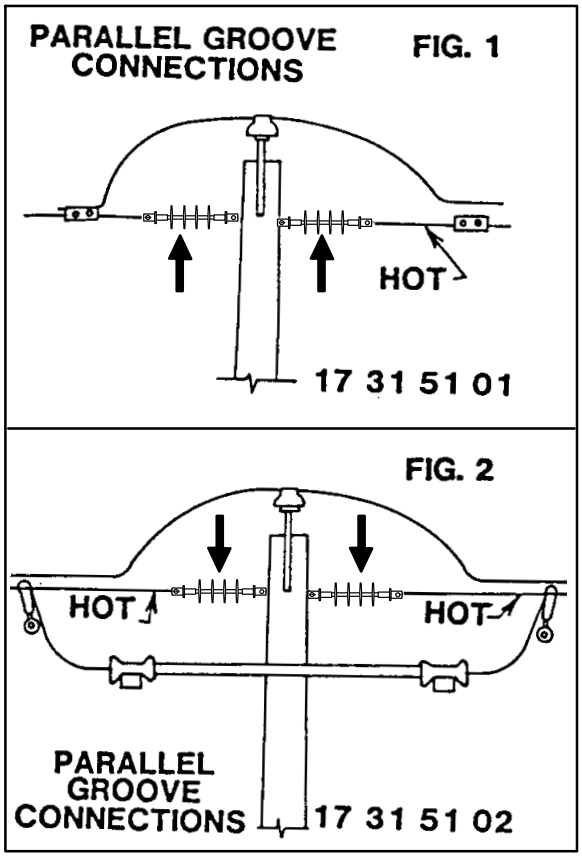
Do not estimate with stirrup clamps or with hot line clamps that are not already connected to a loopover, looparound, or loopunder. Not to be used for permanent connections on secondary or neutral.

Estimate only a quantity of one ”each” for the installation or removal of a jumper, loopover, loopunder, or looparound.





Stnd. / Stk. No.	Description 17 31 51 **	01	02	03	04	05	06
252	Install Hot Connection (Parallel Groove)	1					
255	Inst. Jumper & Loopovers (Parallel Groove)		3				
255	Remove Connection – Tap Remains Hot			1			
255	Inst. or REM. Hot Taps & Jumpers				6		
255	Inst. or REM. Hot Taps & Jumpers					2	
255	Install Temporary Jumpers						3



252
INSTALL OR REMOVE ENERGIZED (12KV OR ABOVE) PRIMARY CONNECTIONS

Estimate this operation code in the following cases:

Installing connector, such as a parallel groove clamp, on energized primary using hot sticks. (12kV or above) (Fig. 1)

Only a quantity of one Code 252 should be estimated unless two connectors (such as parallel groove clamps) on the same jumper are installed hot. In this case, a quantity of 2 Code 252s should be estimated. (Figs. 2 & 5) If the above is installed using rubber gloves, replace Code 252 with Code 255. If energized P.G. clamp is removed using hot sticks or gloves, report as Code 255.

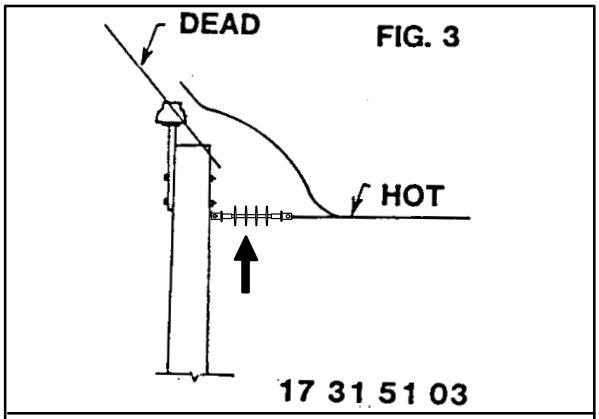


FIG. 3

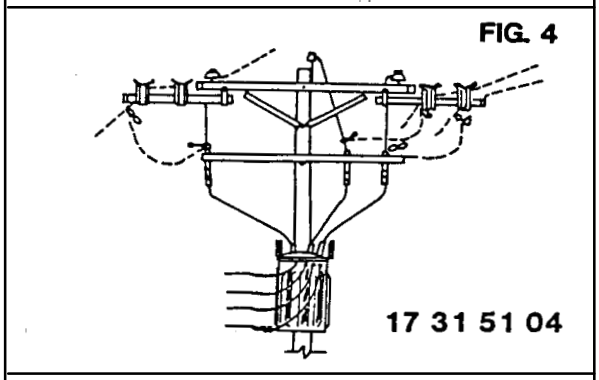


FIG. 4

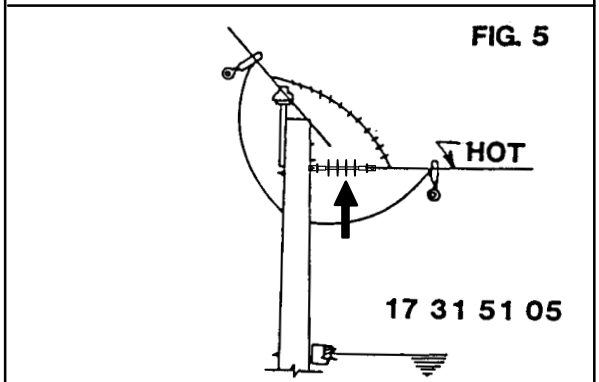


FIG. 5

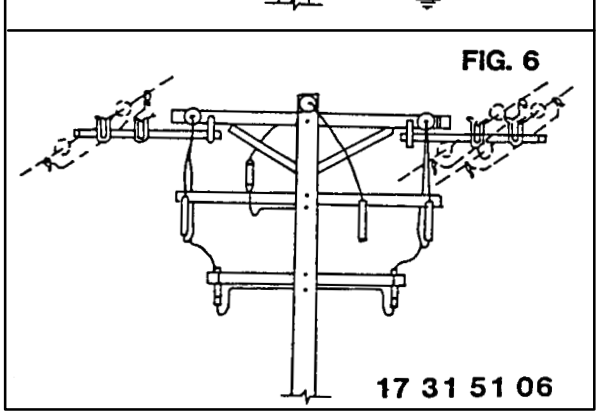


FIG. 6

<u>255</u>

Installing loopovers, looparounds, or jumpers and the first end connected (Hot Line Clamp) is to energized primary. (12kV or above) (Fig. 2, 4, & 5)

If an energized jumper is disconnected, remains energized, and is reconnected to itself or the same energized phase using hot line clamps or stirrups, estimate Code 260 (Fig. 6)

Do NOT estimate Code 255 with Code 260 or when major material, such as switches, are connected or disconnected when working on 5kV. Do NOT estimate Code 255, 260, or 252 on the same jumper.

Do NOT estimate Codes 255 or 260 for closing or opening a switch.

FIBER OPTIC COMMUNICATION 18

INSTALLATION GUIDE FOR OPGW AND ADSS....18 00 01 01

OPGW TANGENT OR CORNER ≤ 30°....18 05 10 **

OPGW CORNER ≥ 30° ≤ 60°....18 05 11 **

OPGW 90° CONTINUOUS CORNER WITHOUT SPLICE....18 05 12 **

OPGW 90° CORNER WITH SPLICE....18 05 13 **

OPGW TO ADSS TRANSITION....18 05 14 **

OPGW TO UNDERGROUND TRANSITION....18 05 15 **

OPGW DEAD END WITH SPLICE....18 05 16 **

ADSS FORMED WIRE TANGENT OR CORNER ≤ 30°....18 10 01 01

ADSS FORMED WIRE DEAD END ≥ 30° ≤ 90° WITHOUT SPLICE....18 10 02 **

ADSS FORMED WIRE DEAD END WITH SPLICE....18 10 03 **

ADSS FORMED WIRE DEAD END OR CORNER ≤ 30° WITH SPLICE....18 10 04 **

ADSS VIBRATION DAMPER....18 10 05 **

ADSS IN-LINE SPLICE WITH CABLE HOLDER....18 10 06 **

UNDERGROUND FIBER WITH SPLICE....18 20 01 **

UNDERGROUND FIBER WITHOUT SPLICE....18 20 02 **

UNDERGROUND FIBER BORED HIGHWAY CROSSING....18 20 03 **

UNDERGROUND FIBER BORED RAILROAD CROSSING....18 20 04 **

UNDERGROUND FIBER AT SUBSTATION....18 20 05 **

STEEL POLE OPGW TO UNDERGROUND FIBER....18 30 01 **

STEEL POLE ADSS TO UNDERGROUND FIBER....18 30 02 **

LATTICE TOWER OPGW TO UNDERGROUND FIBER....18 40 01 **

LATTICE TOWER ADSS TO UNDERGROUND FIBER....18 40 02 **

1. Introduction

Composite Optical Groundwire (OPGW) was developed to provide a large capacity telecommunications system utilizing overhead power transmission lines. Serving the additional purpose of an overhead ground wire, the OPGW is constructed of aluminum clad steel strands and aluminum alloy strands stranded with stainless steel tubes or surrounding a fiber unit (core) which contains optical fibers.

Table 1 - Fiber Optic Cable

Cable Type	Fiber Count	Outside Diameter (in)	Rated Breaking Strength, RBS (lbs)	Reel Length (ft)	Stock #
OPGW	48	0.508	19,837	10,500	27 59 086
				21,000	27 59 080
	72		19,555	10,500	27 59 087
				21,000	27 59 088
ADSS	48	0.528	4,943	-	18 16 285
	72	0.559	5,455		27 59 084
UG	72	0.400	-		18 66 671

Table 2 - Underground Microduct Options

Style	Outside/Inside Diameter (mm)	Stock #
3-way	18/14	12 01 338
4-way	18/14	12 01 341
7-way	18/14	12 01 339
Single	18/14	12 01 344
Single LSZH (Low Smoke Zero Halogen)	18/14	12 01 345

2. Precautions

A. Care must be taken to avoid damaging the OPGW during handling and stringing operations. Avoid sharp bends to the cable and take precautions to prevent crushing the OPGW during placement. The transmission quality of the optical fibers can potentially be degraded if the OPGW is subjected to excessive pulling tensions or excessively small bend diameters.

B. Following values shall be considered to help prevent damage to the OPGW

a. Maximum Stringing Tensions listed in DCS **07 00 07 06**

b. Minimum Bend Radius as follows:
During Installation (Dynamic): 20 x Diameter
After Installation (Static): 15 x Diameter

c. Pulling Speed:
60 meters per minute, or
195 feet per minute, or
3.6 km per hour, or
2.2 miles per hour.

d. Minimum distance from puller and tensioner to the stringing block:
3:1 Ratio

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Converted to new format
1	04/01/19	KR	

3. Installation

A. For guidance on splicing or network communication please contact the DCC at (866) 896-0662.

B. The contractor shall provide mechanical protection to the cable where it runs along the surface or edge of a structure or pulling devices.

C. At the locations where a splice is required, additional cable length must be provided to physically accommodate the splicing process.

a. The length of each cable end shall be not less than 115 feet from the base of the structure (ground level), or as otherwise noted on the Drawings, remembering that about 20 feet of cable shall be cut off to assure no damaged fiber is used.

b. If additional length is required, due to limited access for splicing vehicles, it shall be included, as required, and with the approval of the Ameren Construction Services or Ameren Engineering.

D. The fiber shall be neatly coiled and securely attached to the structure on bracketing of the splice enclosure, as specified on the Drawings referenced in the Appendices. The diameter of the coil shall be a minimum of three feet or as required based on the minimum allowed bending radii.

E. The Contractor shall handle all fiber optic cable in strict accordance with the cable manufacturer's specifications and procedures.

F. If any Owner-provided materials appear to be damaged or defective, the Contractor shall immediately report the details to the Construction Manager, who shall provide written directions regarding the corrective actions, storage, or disposal of these materials.

G. If the cable must be temporarily stored overnight while in the process of splicing, the cable ends shall be sealed to prevent water migration and the cable coils stored out of the reach of vandals. It is unacceptable to temporarily store cable at the base of the pole, unless the structure is in a safe and secured location.

H. All cables splice boxes, and associated components shall be fully assembled and labeled prior to field-testing. Any testing performed on incomplete systems shall be redone on completion of the work.

I. Fiber shall be segregated by tray, conduit, innerduct, or other innerduct methods for protection.

J. Where ADSS fiber is placed underground, it shall have its own conduit and be designated as such or be segregated by using innerduct within the conduit or trench system.

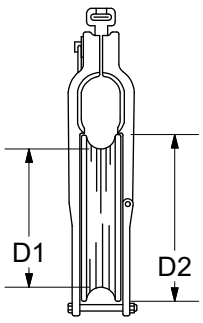
a. Innerduct will also be used in the main cable tray application within the control house.

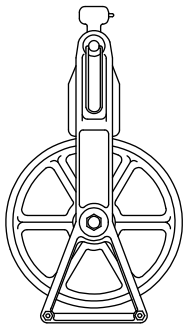
b. Within the confines of an enclosure, fiber jumpers should be segregated by a separate tray system, to ensure bend radii and cable weight concerns are mitigated.

K. Contractor shall mark conduits leaving Ameren Property with approved marking methods that should be prescribed in project documentation.

L. Kickstand or hold-offs will be required on any angled structures.

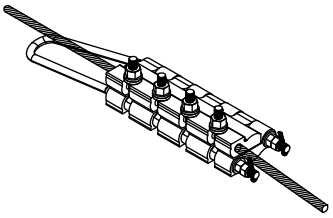
M. Use properly sized and line Stringing Blocks (do NOT use Array-type Stringing Blocks)



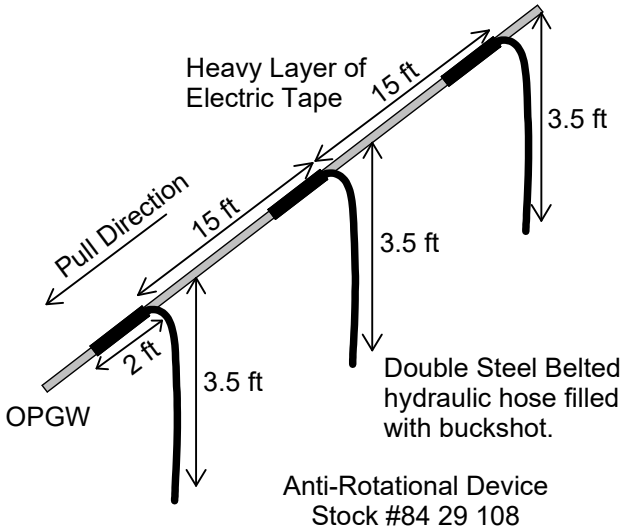


Stucture Angle (θ)	Bottom Groove Diameter (D1)	Typical Stringing Block (minimum) (D2)
First & last structures	21"	28"
Tangent Structures θ < 20	12"	16"
Tangent Structures 20 < θ < 45	18"	24"
Tangent Structures 45 < θ < 60	24"	32"
Tangent Structures 60 < θ < 90	31"	41"
Bull Wheel Diameter for 90°		

N. Use Anti-Rotational Device (Stock #84 29 108) and OPGW stringing tool (Stock #85 21 130):

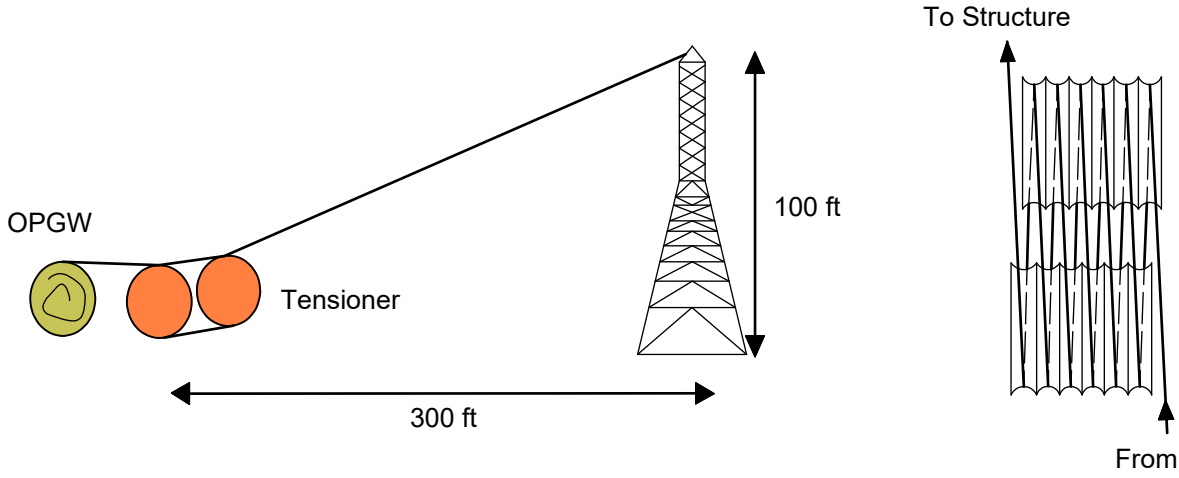


OPGW Stringing tool
Come-along (Pocket book grip)
Stock #85 21 130



Anti-Rotational Device
Stock #84 29 108

O. Tensioner shall be positioned 3x structure height from first structure and reeved Right-to-Left.

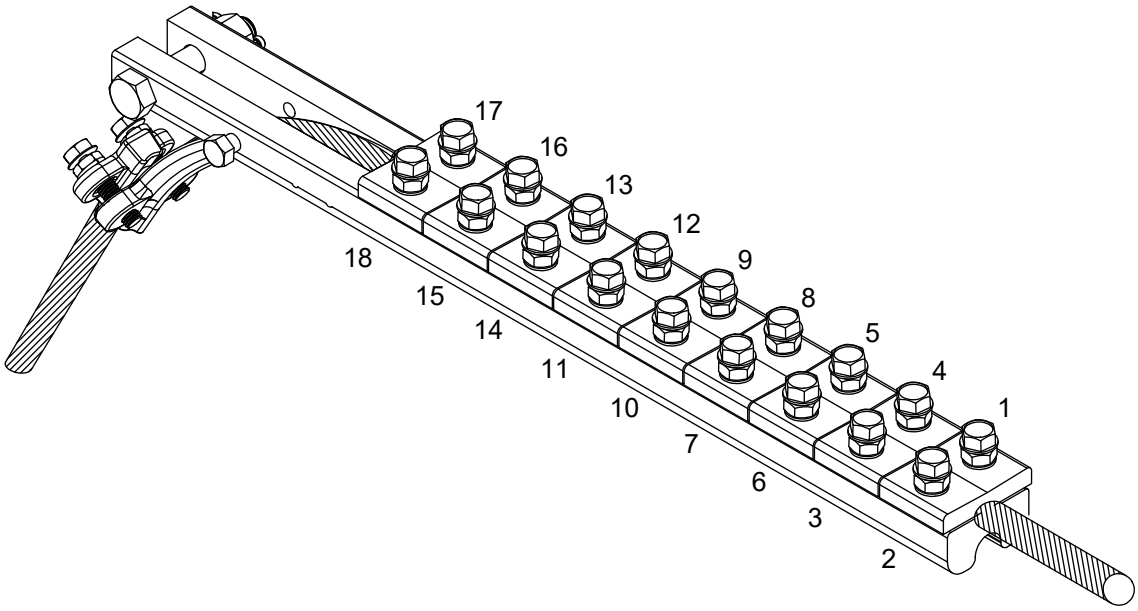


REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Converted to new format
1	04/01/19	KR	

P. Prior to pulling, tighten bolts and loosen inner tail of OPGW Reel.

Q. Pulling speed shall not exceed 200 ft/minute. Pulling tension shall not exceed 3,967 lbs (20% RBS). Do not exceed 48 hours in blocks prior to clipping in.

R. Deadend bolts shall be torqued to 40 ft-lbs and tightened in sequence at 5 ft-lbs increments.



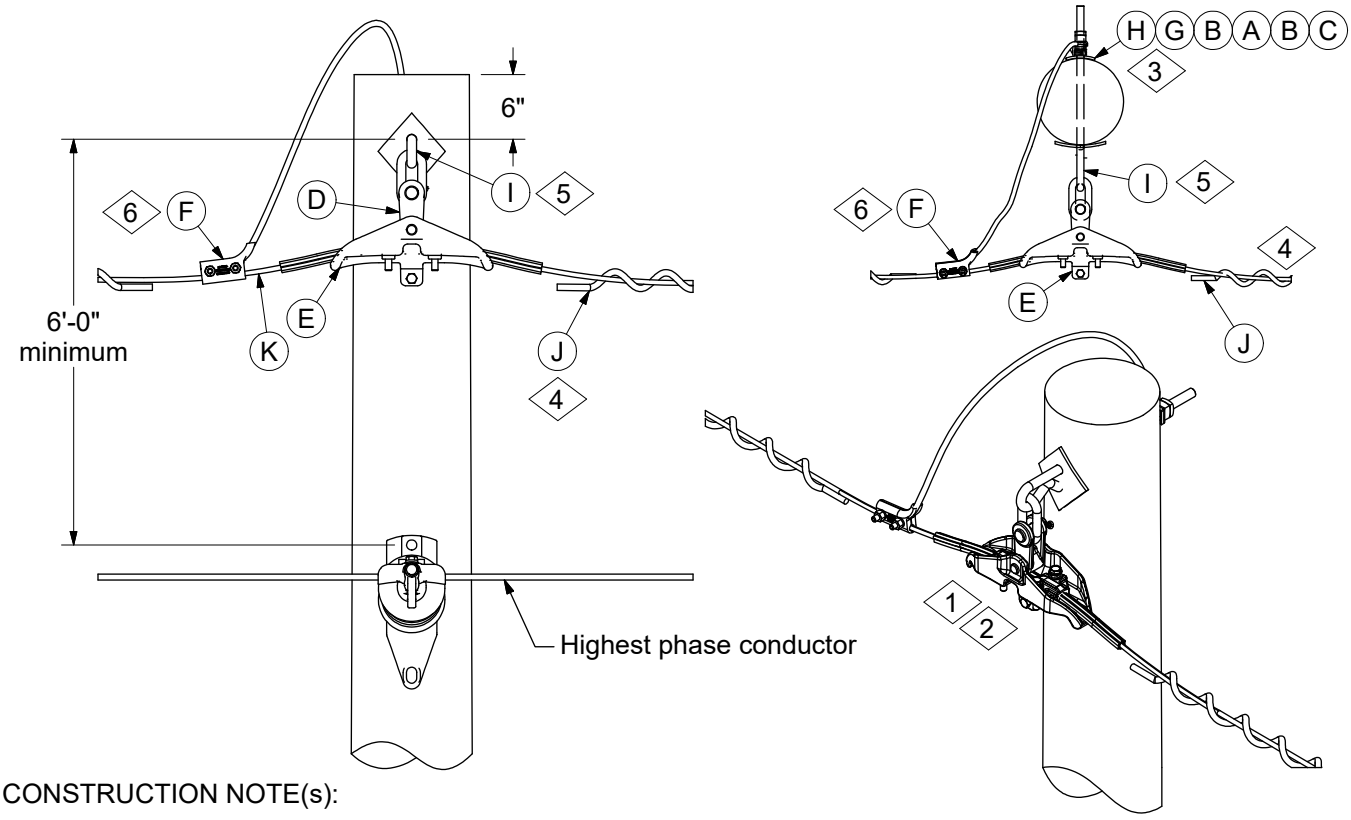
Bolted Deadend
(Stock #23 68 732)

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Converted to new format
1	04/01/19	KR	

FIBER OPTIC COMMUNICATION

OPGW Tangent or Corner ≤ 30°

18 05 10 **
1 of 2



CONSTRUCTION NOTE(s):

1. Mark center of clamp location on OPGW cable with ink (not tape) when aligning armor rods and clamp body on OPGW.

2. Be sure to finger tighten bolts on clamp to ensure bolts are not compressed onto the OPGW, and alternate tightening. Tighten until break away bolt heads shear off.

3. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

	ITEM	STK / DCS #	DESCRIPTION 18 05 10 **	01
	A	23 68 496	Clip, Bonding, 3/4" Bolt Dia.	1
	B	23 15 001	Nut, Square, 3/4"	2
	C	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	1
	D	23 58 127	Clevis Eye	1
	E	23 67 502	OPGW Supension Clamp w/ Armor Rods	1
	F	17 52 217	Clamp for bonding OPGW Static to Pole Ground	1
	G	23 66 135	Lock Washer - 3/4" Double Coil	1
	H	23 66 031	Washer, Curved, Square, 3/4"	1
5,@	I	23 68 458	Static Support Bracket 3/4" x 14"	1
4,@	J	23 67 319	Spiral Vibration Damper	2
@	K	27 59 087	72-ct OPGW 10,500ft Reel	#
		27 59 088	72-ct OPGW 21,000ft Reel	#
@	L	**12 00 10 ** @**	Grounding Unit	1

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Added Note 5; provided locking hardware & OPGW stock #s
1	07/01/20	KR	

DESIGN NOTE(s):

4. Spiral Vibration Dampers are used on 350' and above spans only.

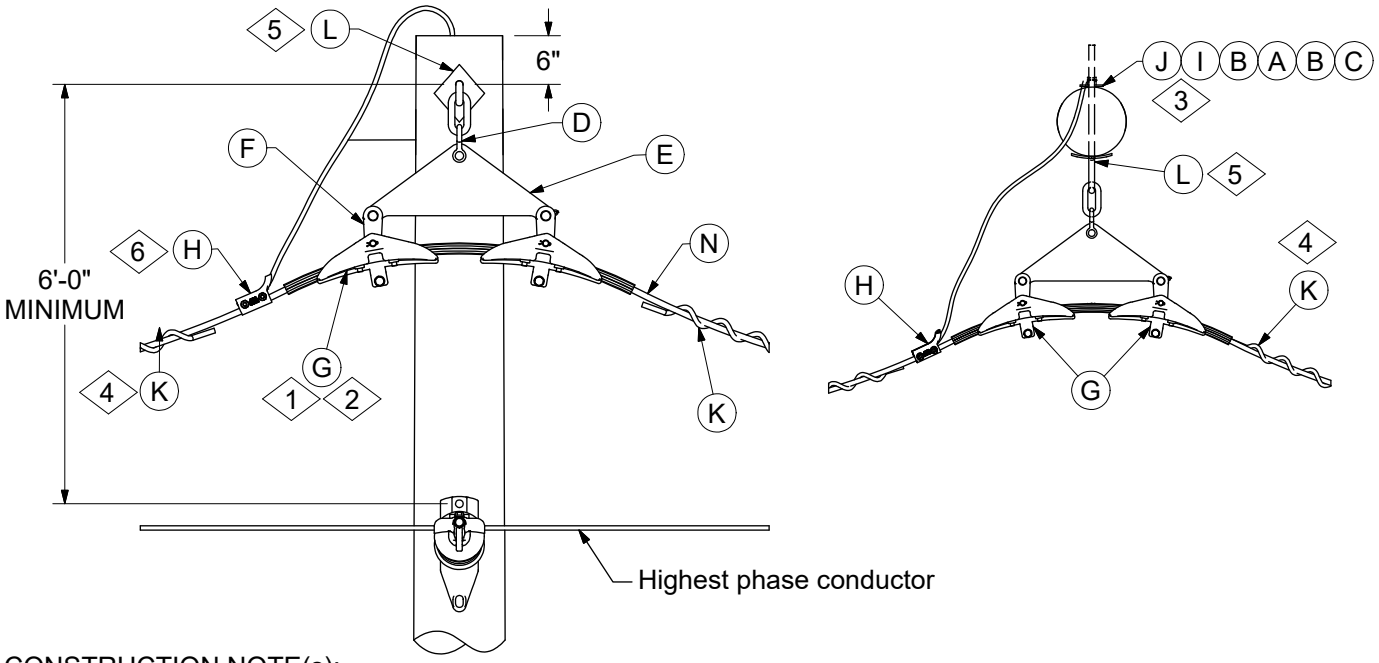
5. For larger wood or composite poles 16" static support (Stock #23 68 459), 18" static support (Stock #23 68 460), or 20" static support (Stock #23 68 614) will be required.

6. Use Stock #17 52 235 for OPGW to 110.8 ACSR and Stock #17 52 233 for OPGW to 1/0 AAAC connections.

FIBER OPTIC COMMUNICATION

OPGW Tangent or Corner ≥ 30° ≤ 60°

18 05 11 **
1 of 1



CONSTRUCTION NOTE(s):

1. Mark Center of clamp location on OPGW with ink (not tape) when aligning armor rods and clamp body on OPGW.

2. Be sure to finger tighten bolts on clamp to ensure bolts are not compressed onto the OPGW, and alternate tightening. Tighten until break away bolt heads shear off.

3. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

	ITEM	STK / DCS #	DESCRIPTION 18 05 11 **	01
	A	23 68 496	Clip, Bonding, 3/4" Bolt Dia.	1
	B	23 15 001	Nut, Square, 3/4"	2
	C	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	1
	D	23 68 368	Anchor shackle	1
	E	23 17 437	Yoke Plate	1
	F	23 58 127	Clevis Eye	2
	G	23 67 501	OPGW Suspension Clamp w/ Armor Rods	2
	H	17 52 217	Clamp for bonding OPGW Static to Pole Ground	1
	I	23 66 135	Lock Washer - 3/4" Double Coil	1
	J	23 66 031	Washer, Curved, Square, 3/4"	1
4,@	K	23 67 319	Spiral Vibration Damper	2
5,@	L	23 68 458	Static Support Bracket 3/4" x 14"	1
@	M	27 59 087	72-ct OPGW 10,500 ft Reel	#
		27 59 088	72-ct OPGW 21,000 ft Reel	#
@	N	**12 00 10 ** @**	Grounding Unit	1

DESIGN NOTE(s):

4. Spiral vibration dampers are used on 350’ and above spans only.

5. For larger wood poles or composite poles 16” static support (Stock #23 68 459), 18” static support (Stock #23 68 460), or 20”static support (Stock #23 68 614) will be required.

6. Use Stock #17 52 235 for OPGW to 110.8 ACSR and Stock #17 52 233 for OPGW to 1/0 AAAC connections.

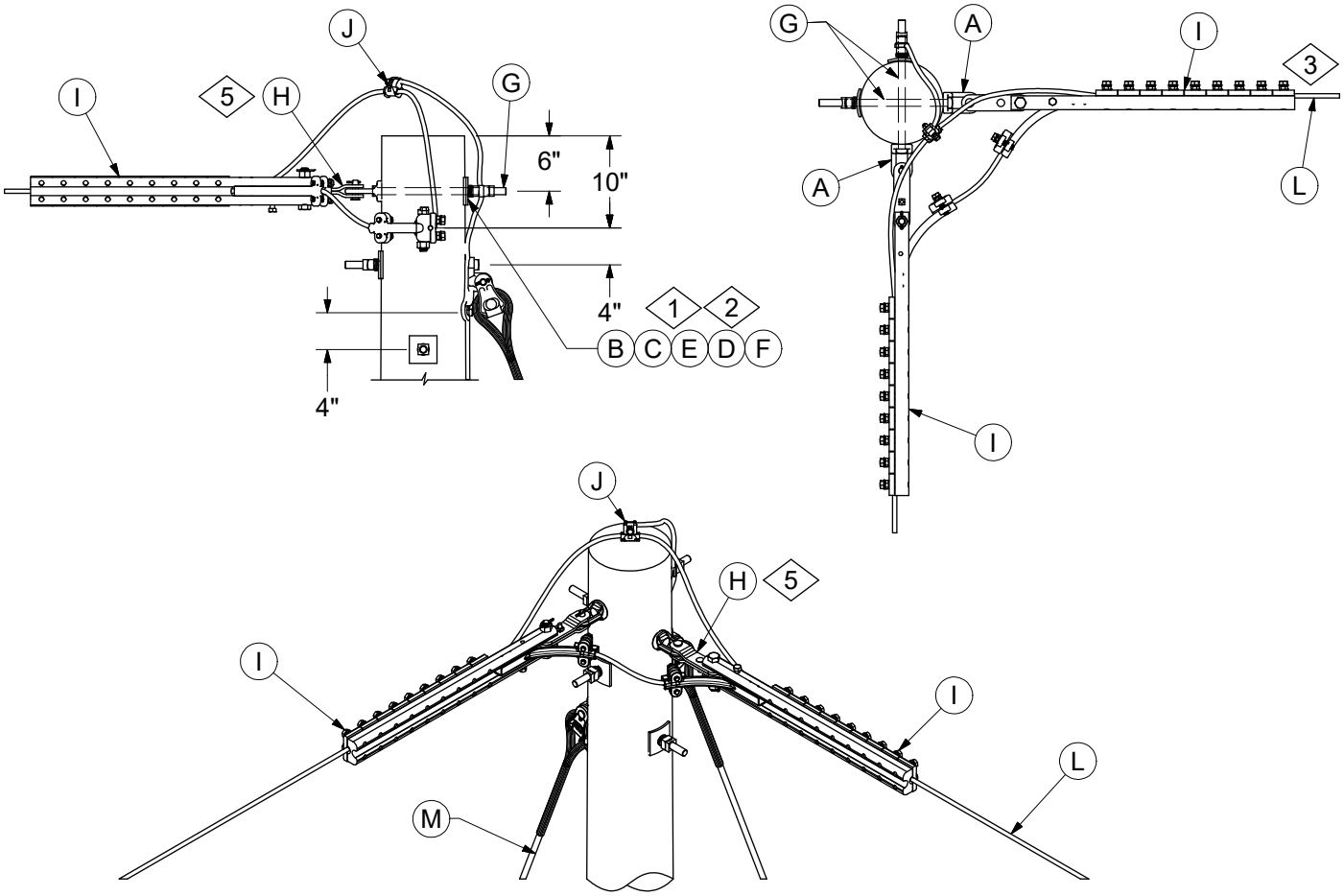
DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Added Note 5; Rev'd BOM/drawing w/ locking hardware & OPGW stk #s
1	07/01/20	KR	

FIBER OPTIC COMMUNICATION

OPGW 90° Continuous Corner Without Splice

18 05 12 **
1 of 2



CONSTRUCTION NOTE(s):

1. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

2. Use longer machine bolts for larger wood or composite poles if required.

	ITEM	STK / DCS #	DESCRIPTION 18 05 12 **	01
	A	23 59 095	Eyelet, 3/4"	2
	B	23 66 031	Washer, Curved, Square, 3/4"	4
	C	23 66 135	Lock Washer - 3/4" Double Coil	4
	D	23 15 001	Nut, Square, 3/4"	1
	E	23 68 496	Clip, Bonding, 3/4" Bolt Dia.	1
	F	23 65 042	Lock Nut - 3/4" Square	4
	G	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	4
5	H	23 59 042	Link Extension - 6" Clevis Eye	2
	I	23 68 732	Bolted Deadend	2
	J	17 51 137	Clamp, Parallel Groove	1
	K	18 66 678	Bonding Wire, 60"	1
@	L	27 59 087	72-ct OPGW 10,500ft Reel	#
		27 59 088	72-ct OPGW 21,000ft Reel	#
@	M	**11 00 4* ** @**	Guying Unit	2
@	N	**12 00 10 ** @**	Grounding Unit	1

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated Notes; Rev'd BOM/drawings w/ locking hardware & OPGW stk #s
1	07/01/20	KR	

DESIGN NOTE(s):

3. Spiral vibration dampers (Stock #23 67 319) are used on 350’ and above spans only.

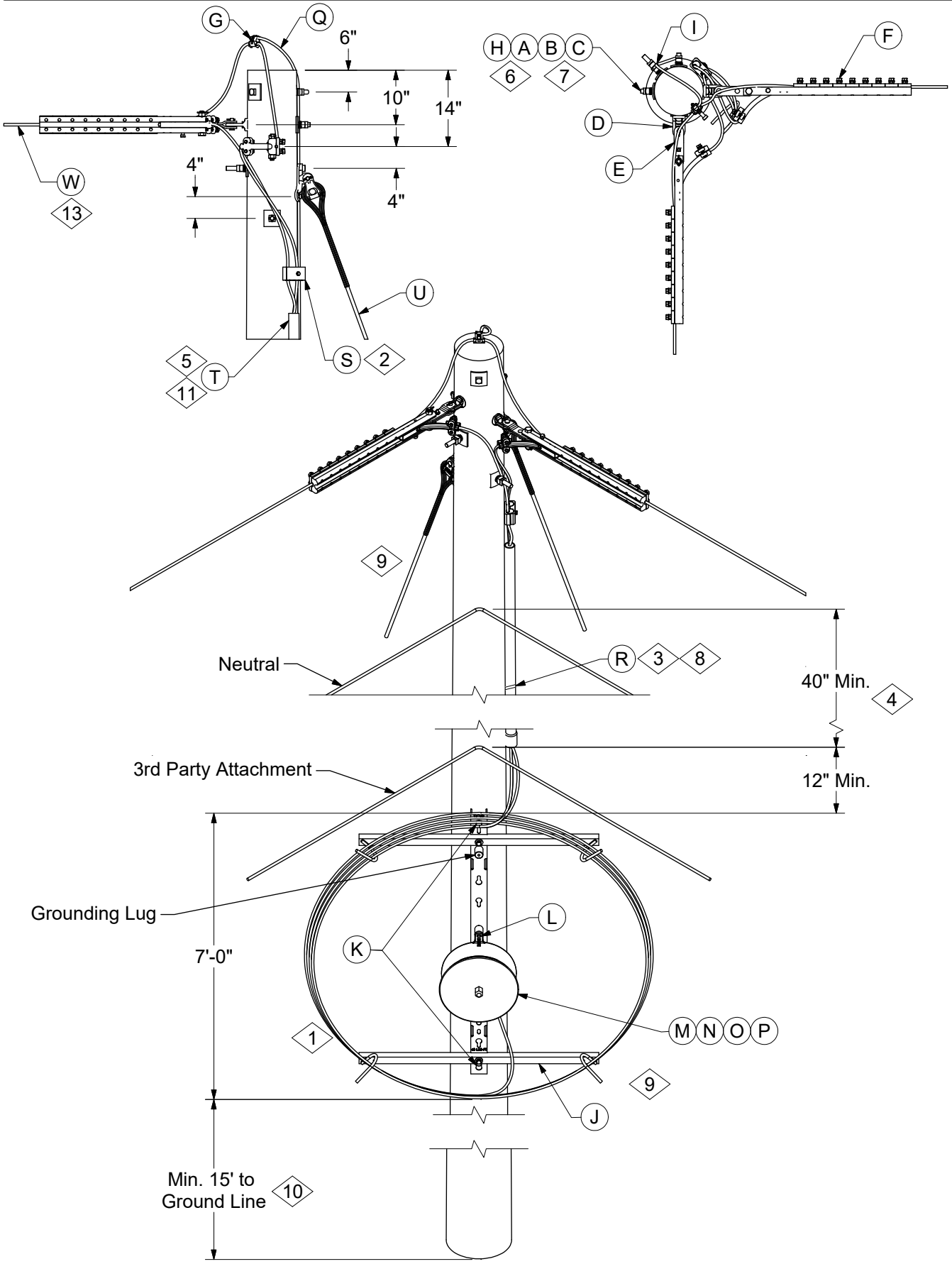
4. Use Stock #17 52 235 for OPGW to 110.8 ACSR and Stock #17 52 233 for OPGW to 1/0 AAAC connections.

5. For loopovers, use 12" extension link (Stock #23 68 783).

FIBER OPTIC COMMUNICATION

OPGW 90° Corner with Splice

18 05 13 **
1 of 3



DISTRIBUTION
CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Added front/top views; Updated drawing/BOM/notes
1	07/01/20	KR	

CONSTRUCTION NOTE(s):

1. Coil 100' of extra fiber optic cable around coil bracket.
2. Install downlead clamps every 10'.
3. To attach Iron Hanger (Stock #27 60 035) around conduit on a Composite pole use #10 Self Tapping screws (Stock #21 76 679).
4. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from the other third party attachments.
5. The conduit shall be installed through the entire energized zone on the pole.
6. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.
7. User longer machine bolts for larger wood or composite poles if requried.
8. In place of Stock #27 60 035, following conduit straps may be used: 2.5" Conduit Strap (Stock #23 67 189), 3" Conduit Strap (Stock #23 67 182), and 4" Conduit Strap (Stock #23 67 183).
9. The fiberglass guy strain insulator must fall at least 12" below the bottom loop of the coiled fiber.

	ITEM	STK / DCS #	DESCRIPTION 18 05 13 **	01
	A	23 66 135	Washer, Lock, Double Coil 3/4"	3
	B	23 66 031	Washer, Square for 3/4" bolt	3
7	C	23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	2
	D	23 59 095	Eyelet, for 3/4" bolt	2
	E	23 59 042	Extension Link 6"	2
	F	23 68 732	Bolted Deadend	2
	G	17 51 137	Clamp, Parallel Groove	4
	H	23 65 042	Lock Nut - 3/4" Square	3
	I	23 68 496	Clip, Bonding, 3/4" Bolt Dia.	1
	J	40 54 480	Coil Bracket	1
	K	23 60 011	Lag Screw - 5/8" x 5" galvanized	2
	L	23 52 031	Bolt 1/2" x 3" with Galv. Nut	2
	M	40 54 478	Splice Enclosure	1
	N	17 60 734	Splice Protector Sleeve	10
	O	40 54 481	Connector Kit, OPGW	1
	P	40 54 479	Furcation Kit, OPGW	2
	Q	18 66 678	Bonding Wire, 60"	1
3,8,@	R	27 60 035	Strap, Iron Hanger	#
2,@	S	17 52 220	Downlead Clamp, OPGW	1
5,11,@	T	12 01 230	Conduit, PVC, 1.5" x 10', Sch. 40	1
9,@	U	**11 00 4* ** @**	Guying Unit	2
@	V	**12 00 10 ** @**	Grounding Unit	1
@	W	27 59 087	72-ct OPGW 10,500ft Reel	#
		27 59 088	72-ct OPGW 21,000ft Reel	#

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Added front/top views; Updated drawing/BOM/notes
1	07/01/20	KR	

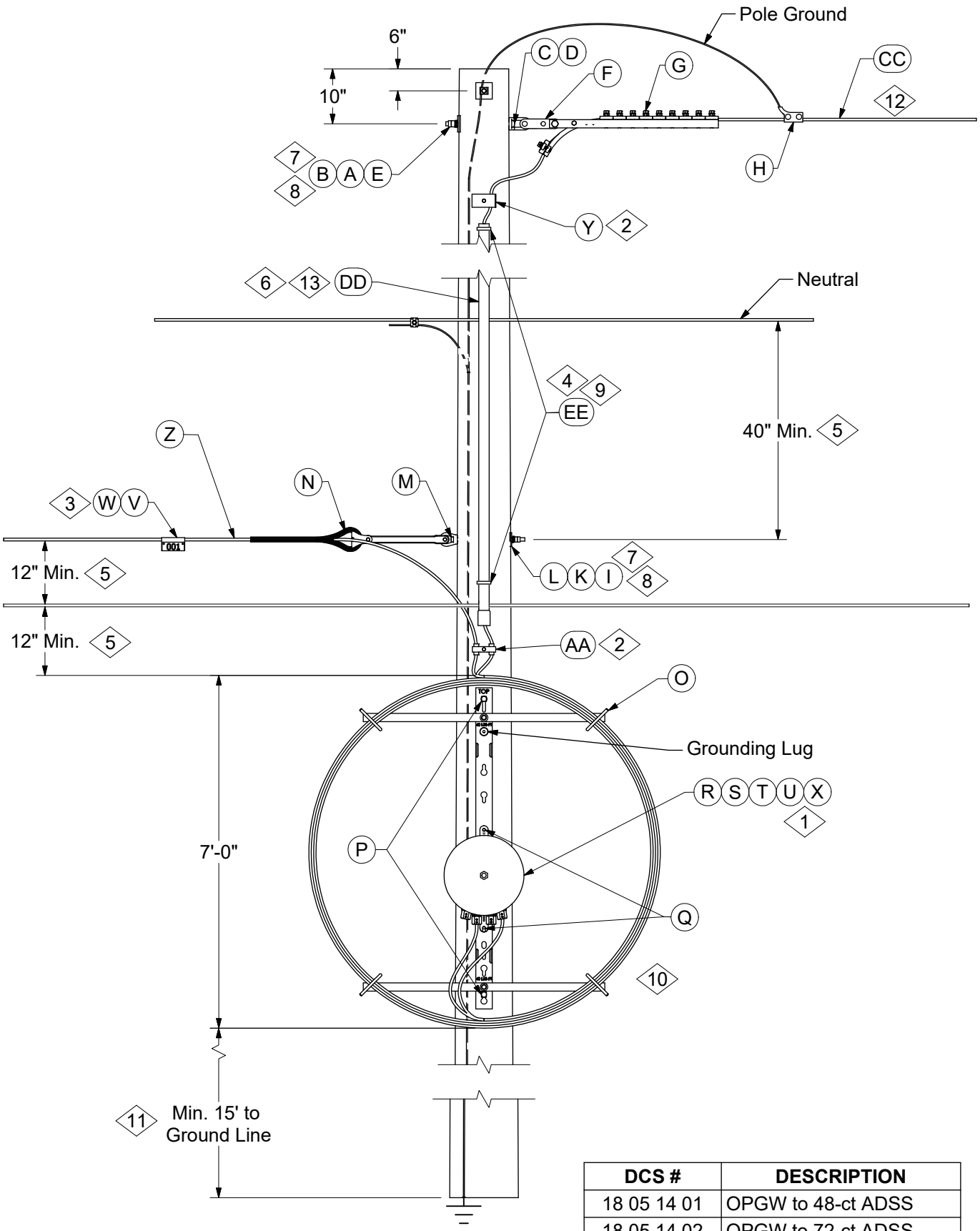
DESIGN NOTE(s):

10. Bottom loop of coiled fiber optic cable shall be located a minimum of 15' above ground.

11. For alternate construction, call for split conduit: 2" (Stock#12 51 217), 3" (Stock #12 51 218), 4" (Stock #12 51 219), or 5" (Stock #12 51 220)

12. Use Stock #17 52 235 for OPGW to 110.8 ACSR and Stock #17 52 233 for OPGW to 1/0 AAAC connections.

13. Spiral vibration dampers (Stock #23 67 319) are used on 350' and above spans only.



DCS #	DESCRIPTION
18 05 14 01	OPGW to 48-ct ADSS
18 05 14 02	OPGW to 72-ct ADSS

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, Notes, & Drawing
1	07/01/20	KR	

CONSTRUCTION NOTE(s):

1. Coil 100' of extra fiber optic cable around coil bracket.
2. Install downlead clamps every 10'.
3. ADSS Tags should be attached with zip ties on overhead ADSS fiber optic cable within 10' of the pole.
4. To attach Iron Hanger (Stock #27 60 035) around conduit on a Composite pole use #10 Self Tapping screws (Stock #21 76 679).
5. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.
6. The conduit shall be installed through the entire energized zone on the pole.
7. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.
8. Use longer machine bolts for larger wood or composite poles if required.
9. In place of Stock #27 60 035, following conduit straps may be used: 2.5" Conduit Strap (Stock #23 67 189), 3" Conduit Strap (Stock #23 67 182), and 4" Conduit Strap (Stock #23 67 183).
10. The fiberglass guy strain insulator must fall at least 12" below the bottom loop of the coiled fiber.

	ITEM	STK / DCS #	DESCRIPTION 18 05 14 **	01	02
	A	23 66 135	Lock Washer - 3/4" Double Coil	2	2
	B	23 66 031	Washer, Curved, Square, 3/4"	2	2
	C	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	2	2
	D	23 59 095	Eyelet, 3/4"	1	1
	E	23 65 042	Lock Nut - 3/4" Square	2	2
	F	23 59 042	Link Extension - 6" Clevis Eye	1	1
	G	23 68 732	Bolted Deadend	1	1
	H	17 52 217	Clamp for bonding OPGW Static to Pole Ground	1	1
	I	23 65 043	Lock Nut - 5/8" Square	1	1
	J	23 68 496	Clip, Bonding, 3/4" Bolt Dia.	1	1
	K	23 66 134	Lock Washer - 5/8" Double Coil	1	1
	L	23 66 207	Washer, Curved, Square, 5/8"	2	2
	M	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	1	1
	N	23 68 747	Formed Wire Deadend, 48−ct ADSS	1	-
		23 68 778	Formed Wire Deadeand, 72-ct ADSS	-	1
	O	40 54 480	Coil Bracket	1	1
	P	23 60 011	Lag Screw - 5/8" x 5"	2	2
	Q	23 52 031	Bolt 1/2" x 3" with Galv. Nut	2	2
	R	40 54 478	Splice Enclosure	1	1
	S	17 60 734	Splice Protector Sleeve	10	10
	T	17 62 293	Connector Kit, 48-ct ADSS	1	-
		17 62 296	Connector Kit, 72-ct ADSS	-	1
	U	40 54 479	Furcation Kit, OPGW	2	2
3	V	16 01 647	ID Tag, ADSS	1	1
	W	40 89 494	Nylon Zip Tie	2	2
	X	40 54 481	Connector Kit, OPGW	1	1
2,@	Y	17 52 220	Downlead Clamp, OPGW	#	#
@	Z	27 59 084	72-ct ADSS	#	#
2,@	AA	17 02 177	Downlead Clamp, for 48-ct and 72-ct ADSS	#	#
@	BB	**12 00 10 ** @**	Grounding Unit	1	1
@	CC	27 59 087	72-ct OPGW 10,500ft Reel	#	#
		27 59 088	72-ct OPGW 21,000ft Reel	#	#
13,@	DD	12 01 230	Conduit, PVC, 1.5" x 10', Sch. 40	#	#
4,9,@	EE	27 60 035	Strap, Iron Hanger	#	#
10,@	FF	**11 00 4* ** @**	Guying Unit	1	1

DESIGN NOTE(s):

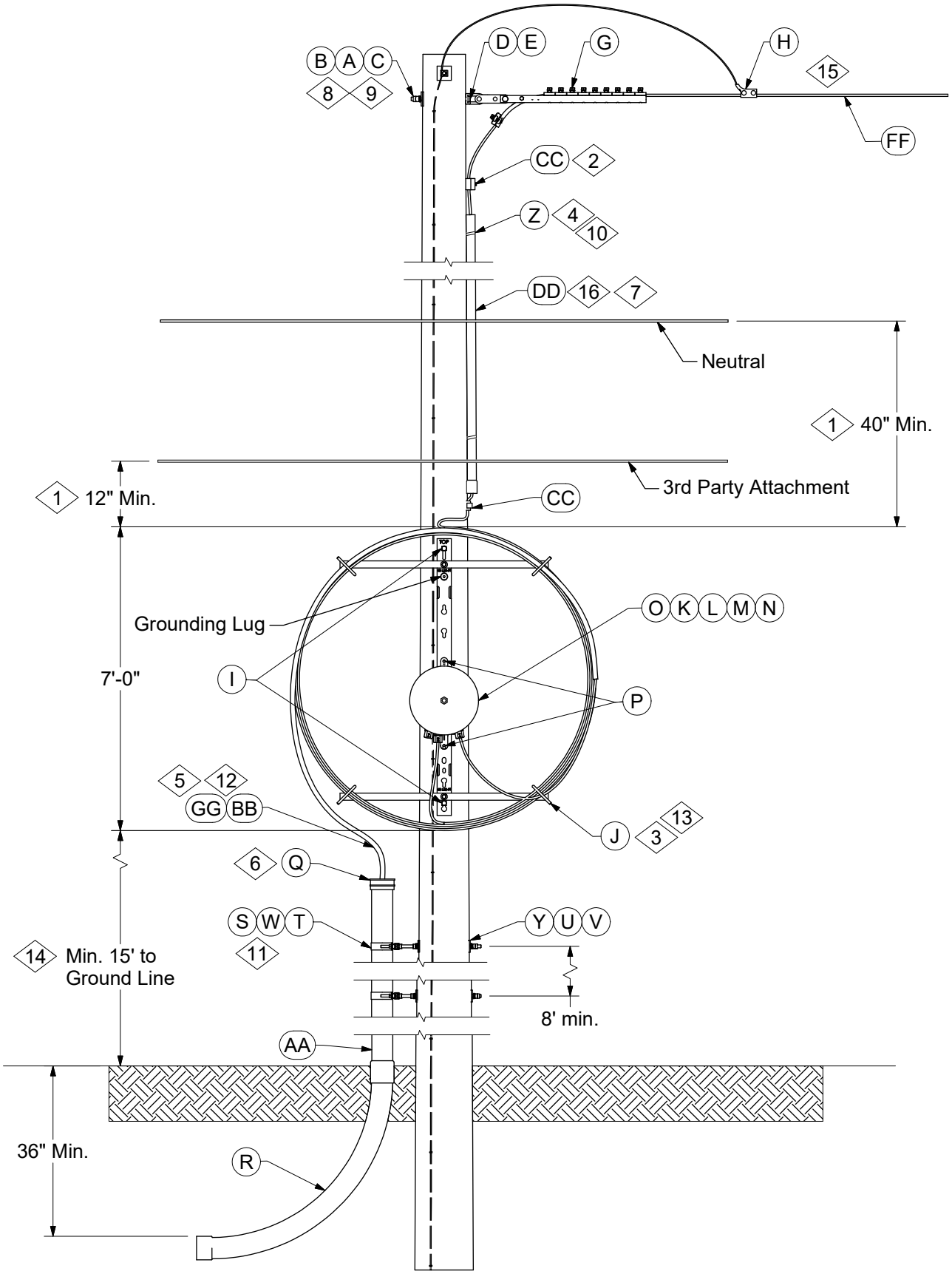
11. Bottom loop of coiled fiber optic cable shall be located minimum of 15' above ground.

12. Spiral vibration dampers (Stock #23 67 319) are used on 350' and above spans only.

13. For alternate construction, call for split conduit: 2" (Stock #12 51 217), 3" (Stock #12 51 218), 4" (Stock #12 51 219), or 5" (Stock #12 51 220).

14. Use Stock #17 52 235 for OPGW to 110.8 ACSR and Stock #17 52 233 for OPGW to 1/0 AAAC connections.

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, Notes, & Drawing
1	07/01/20	KR	



REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM & Notes
1	07/01/20	KR	

CONSTRUCTION NOTE(s):

1. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.

2. Install downlead clamps every 10'.

3. Coil 100' of extra fiber optic cable around coil bracket.

4. To attach Iron Hanger (Stock #27 60 035) around conduit on a Composite pole use #10 Self Tapping screws (Stock #21 76 679).

5. Bring HDPE 1-1/4" conduit (Stock #12 01 334) or future path up the riser. Wrap HDPE conduit 3/4 turn (opening points down) around coil bracket and close unused microducts with end caps (Stock #12 01 343).

6. Top of conduit may be sealed with polyurethane expanding foam (Stock #31 53 082). Expanding foam must be used with dispensing gun (Stock #85 20 073).

7. The conduit shall be installed through the entire energized zone on the pole.

8. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

9. Use longer machine bolts for larger wood or composite poles if required.

10. In place of Stock #27 60 035, following conduit straps may be used: 2.5" Conduit Strap (Stock #23 67 189), 3" Conduit Strap (Stock #23 67 182), and 4" Conduit Strap (Stock #23 67 183).

11. To install standoff brackets on composite poles, pole band hardware (Stock #23 17 511) may be used instead of hardware requiring the pole to be drilled.

12. A combination of 1-1/4" HDPE conduit (Stock #12 01 334) and single microducts may be used in place of futurepath where necessary:
    - Single microduct (Stock #12 01 344)
    - LSZH microduct (Stock #12 01 345)

13. The fiberglass guy strain insulator must fall at least 12" below the bottom loop of the coiled fiber.

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM & Notes
1	07/01/20	KR	

	ITEM	STK / DCS #	DESCRIPTION 18 05 15 **	01
	A	23 66 135	Lock Washer - 3/4" Double Coil	2
	B	23 66 031	Washer, Curved, Square, 3/4"	2
	C	23 65 042	Lock Nut - 3/4" Square	2
	D	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	2
	E	23 59 095	Eyelet, 3/4"	1
	F	23 59 042	Link Extension - 6" Clevis Eye	1
	G	23 68 732	Bolted Deadend	1
	H	17 52 217	Clamp for bonding OPGW Static to Pole Ground	1
	I	23 60 011	Lag Screw - 5/8" x 5"	2
	J	40 54 480	Coil Bracket	1
	K	40 54 479	Furcation Kit, OPGW	1
	L	17 04 247	Connector Kit, UG Fiber Optic Cable	1
	M	40 54 481	Connector Kit, OPGW	1
	N	17 60 734	Splice Protector Sleeve	10
	O	40 54 478	Splice Enclosure	1
	P	23 52 031	Bolt, Mach., 1/2" x 3" w/ square nut	4
	Q	12 51 254	Conduit - Coupling 4" Bell End	1
	R	12 51 176	Conduit, PVC, Bend 4" x 90°, 36" Radius, Sch. 40	1
	S	23 53 003	Bolt, DA, 5/8" Dia x 18" w/ 4 square nuts	2
	T	23 65 053	Nut - 5/8" Jam	2
	U	23 66 134	Lock Washer - 5/8" Double Coil	3
	V	23 65 043	Lock Nut - 5/8" Square	3
	W	23 06 087	Bracket - Standoff, 12"	2
	X	23 68 496	Clip, Bonding, 3/4" Bolt Dia.	1
	Y	23 66 207	Washer, Curved, Square, 5/8"	3
4,10,@	Z	27 60 035	Strap, Iron Hanger	#
@	AA	12 01 278	Conduit, PVC, 4" x 10', Sch. 40	#
@	BB	18 66 671	72-ct UG Fiber Optic Cable	#
2,@	CC	17 52 220	Downlead Clamp, OPGW	#
16,@	DD	12 01 230	Conduit, PVC, 1.5" x 10', Sch. 40	1
@	EE	**12 00 10 ** @**	Grounding Unit	1
@	FF	27 59 087	72-ct OPGW 10,5000ft Reel	#
		27 59 088	72-ct OPGW 21,000ft Reel	#
12,@	GG	12 01 338	HDPE Microduct, 3-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 339	HDPE Microduct, 7-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 341	HDPE Microduct, 4-Way, w/ 20 AWG Cu Tracer Wire	#
13,@	HH	**11 00 4* ** @**	Guying Unit	1

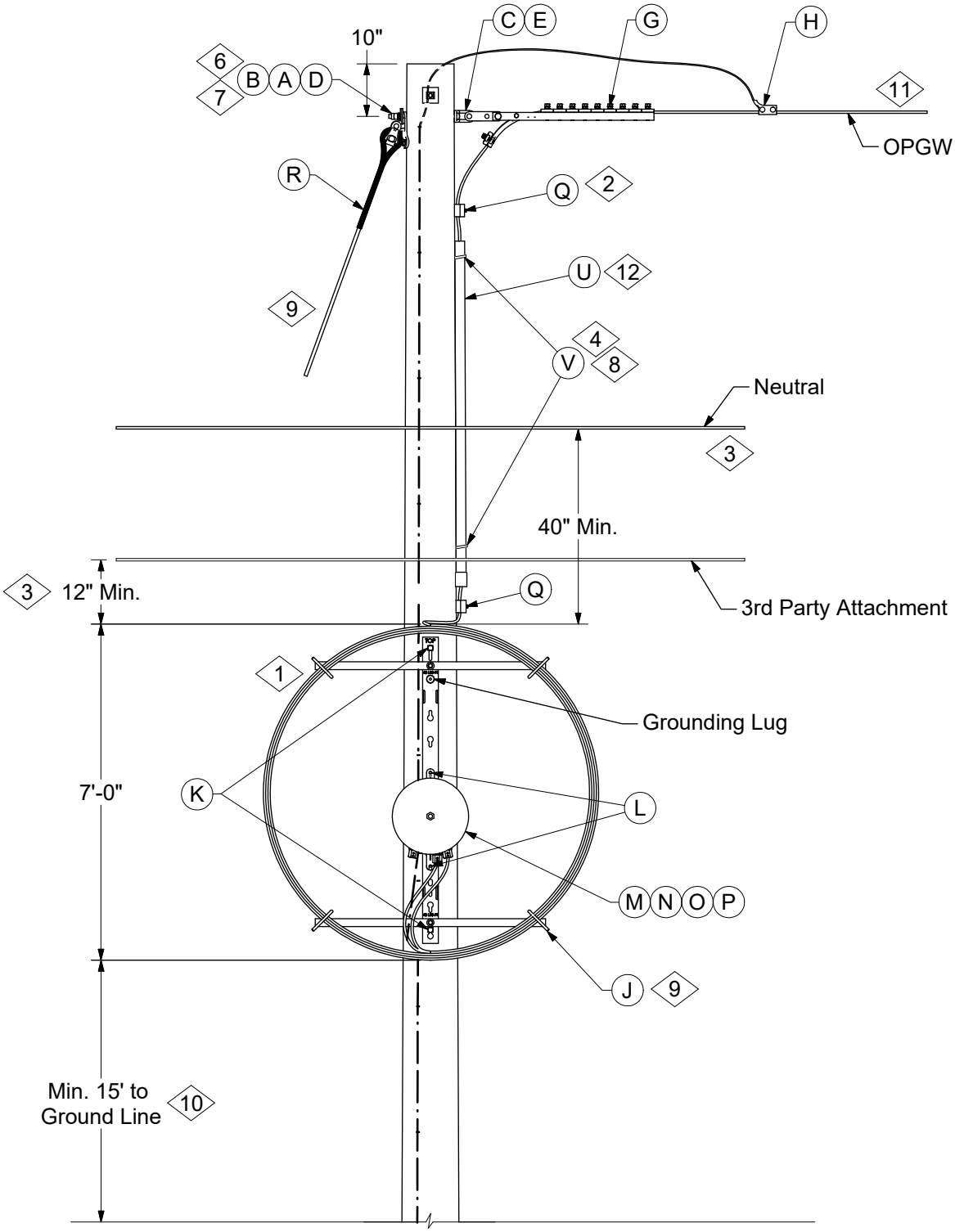
DESIGN NOTE(s):

14. Bottom loop of coiled fiber optic cable shall be located a minimum of 15' above ground.

15. Spiral vibration dampers (Stock #23 67 319) are used on 350' and above spans only.

16. For alternate construction, call for split conduit: 2" (Stock #12 51 217), 3" (Stock #12 51 218), 4" (Stock #12 51 219), or 5" (Stock #12 51 220).

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM & Notes
1	07/01/20	KR	



DCS #	DESCRIPTION
18 05 16 01	OPGW Deadend w/ Splice
18 05 16 02	OPGW Deadend w/o Splice

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Added 18 05 16 02, updated BOM & Notes
1	07/01/20	KR	

CONSTRUCTION NOTE(s):

1. Coil 100' of extra fiber optic cable around coil bracket.
2. Install downlead clamps every 10'.
3. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.
4. To attach Iron Hanger (Stock #27 60 035) around conduit on a Composite pole use #10 Self Tapping screws (Stock #21 76 679).
5. The conduit shall be installed through the entire energized zone on the pole.
6. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.
7. Use longer machine bolts for larger wood or composite poles if required.
8. In place of Stock #27 60 035, following conduit straps may be used: 2.5" Conduit Strap (Stock #23 67 189), 3" Conduit Strap (Stock #23 67 182), and 4" Conduit Strap (Stock #23 67 183).
9. The fiberglass guy strain insulator must fall at least 12" below the bottom loop of the coiled fiber.

	ITEM	STK / DCS #	DESCRIPTION 18 05 16 **	01	02
	A	23 66 135	Lock Washer - 3/4" Double Coil	2	2
	B	23 66 031	Washer, Square for 3/4" bolt	2	2
	C	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	2	2
	D	23 65 042	Lock Nut - 3/4" Square	2	2
	E	23 59 095	Eyelet, 3/4"	1	1
	F	23 59 042	Link Extension - 6" Clevis Eye	1	1
	G	23 68 732	Bolted Deadend	1	1
	H	17 52 217	Clamp for bonding OPGW Static to Pole Ground	1	1
	I	23 68 496	Clip, Bonding, 3/4" Bolt Dia.	1	1
	J	40 54 480	Coil Bracket	1	-
	K	23 60 011	Lag Screw - 5/8" x 5"	2	-
	L	23 52 031	Bolt 1/2" x 3" with Galv. Nut	2	-
	M	40 54 478	Splice Enclosure	1	-
	N	17 60 734	Splice Protector Sleeve	10	-
	O	40 54 481	Connector Kit, OPGW	1	-
	P	40 54 479	Furcation Kit, OPGW	2	-
2,@	Q	17 52 220	Downlead Clamp, OPGW	#	-
9,@	R	**11 00 4* ** @**	Guying Unit	1	1
@	S	**12 00 10 ** @**	Grounding Unit	1	-
@	T	27 59 087	72-ct OPGW 10,500ft Reel	#	#
		27 59 088	72-ct OPGW 21,000ft Reel	#	#
5,12,@	U	12 01 230	Conduit, PVC, 1.5" x 10', Sch. 40	1	-
4,8,@	V	27 60 035	Strap, Iron Hanger	#	-

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Added 18 05 16 02, updated BOM & Notes
1	07/01/20	KR	

DESIGN NOTE(s):

10. Bottom loop of coiled fiber optic cable shall be located a minimum of 15' above ground.

11. Spiral vibration dampers (Stock #23 67 319) are used on 350' and above spans only.

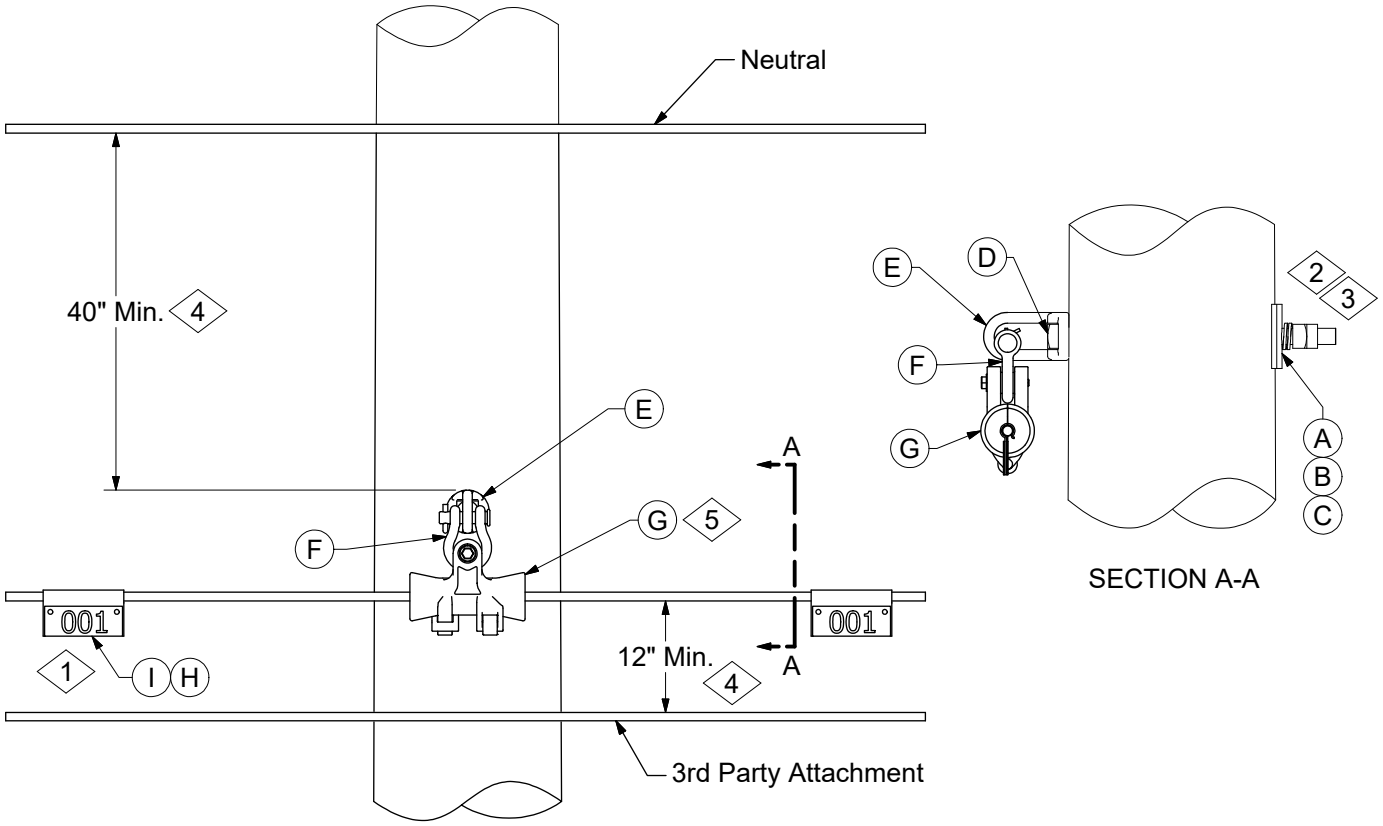
12. For alternate construction, call for split conduit: 2" (Stock #12 51 217), 3" (Stock #12 51 218), 4" (Stock #12 51 219), or 5" (Stock #12 51 220).

13. Use Stock #17 52 235 for OPGW to 110.8 ACSR and Stock #17 52 233 for OPGW to 1/0 AAAC connections.

FIBER OPTIC COMMUNICATION

ADSS Tangent or Corner < 30°

18 10 01 01
1 of 1



CONSTRUCTION NOTE(s):

1. ADSS Tags should be attached with zip ties on overhead ADSS fiber optic cable within 10' of pole.

2. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

3. Use longer machine bolts for larger wood or composite poles if required.

4. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.

	ITEM	STK / DCS #	DESCRIPTION 18 10 01 **	01
	A	23 66 031	Washer, Curved, Square, 3/4"	1
	B	23 66 135	Lock Washer - 3/4" Double Coil	1
	C	23 65 042	Lock Nut - 3/4" Square	1
	D	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	1
	E	23 59 095	Eyelet, 3/4"	1
	F	23 68 181	Shackle - Deadend	1
5	G	17 01 119	Clamp, Suspension, ADSS	1
	H	16 01 647	ID Tag, ADSS	2
	I	40 89 494	Nylon Zip Tie	4
@	J	27 59 084	72-ct ADSS	#

DESIGN NOTE(s):

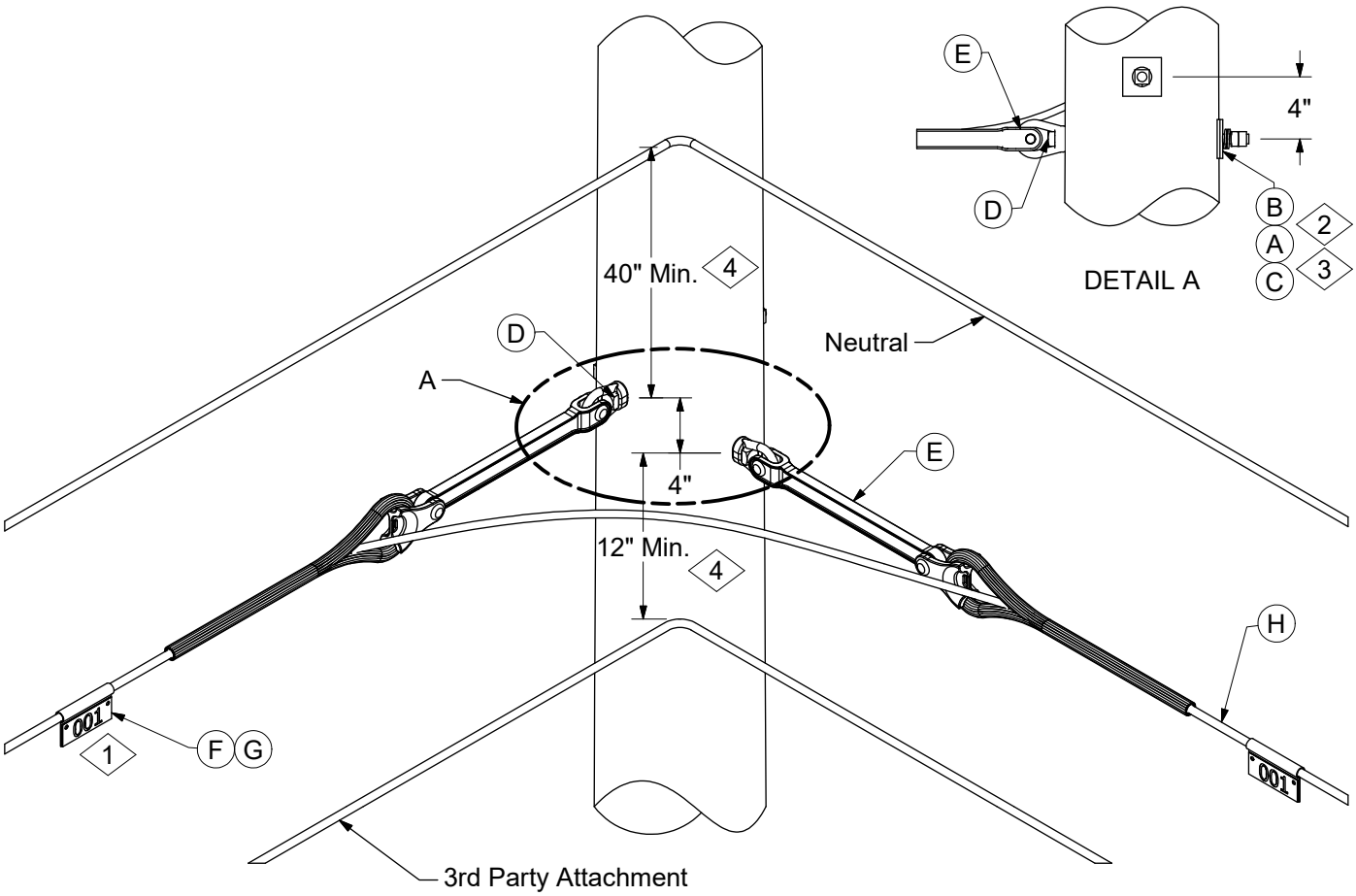
5. For spans > 600 feet use Stock #23 68 750 for 48-ct ADSS and Stock #23 68 779 for 72-ct ADSS.

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Added Notes 2 & 3; revised BOM, drawing, & Note 4; Added side view detail
1	07/01/20	KR	

FIBER OPTIC COMMUNICATION

ADSS Deadend Corner Without Splice ≥ 30° ≤ 90°

18 10 02 **
1 of 1



CONSTRUCTION NOTE(s):

1. ADSS Tags should be attached with zip ties on overhead ADDS fiber optic cable within 10' of the pole.

2. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

3. Use longer machine bolts for larger wood or composite poles if required.

4. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.

	ITEM	STK / DCS #	DESCRIPTION 18 10 02 **	01	02
	A	23 66 134	Lock Washer - 5/8" Double Coil	2	2
	B	23 66 207	Washer, Curved, Square, 5/8"	2	2
	C	23 65 043	Lock Nut - 5/8" Square	2	2
	D	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	2	2
	E	23 68 747	Formed Wire Deadend, 48-ct ADSS	2	-
		23 68 778	Formed Wire Deadend, 72-ct ADSS	-	2
	F	16 01 647	ID Tag, ADSS	2	2
1	G	40 89 494	Nylon Zip Tie	4	4
@	H	27 59 084	72-ct ADSS	#	#
@	I	**11 00 4* ** @**	Guying Unit	1	1

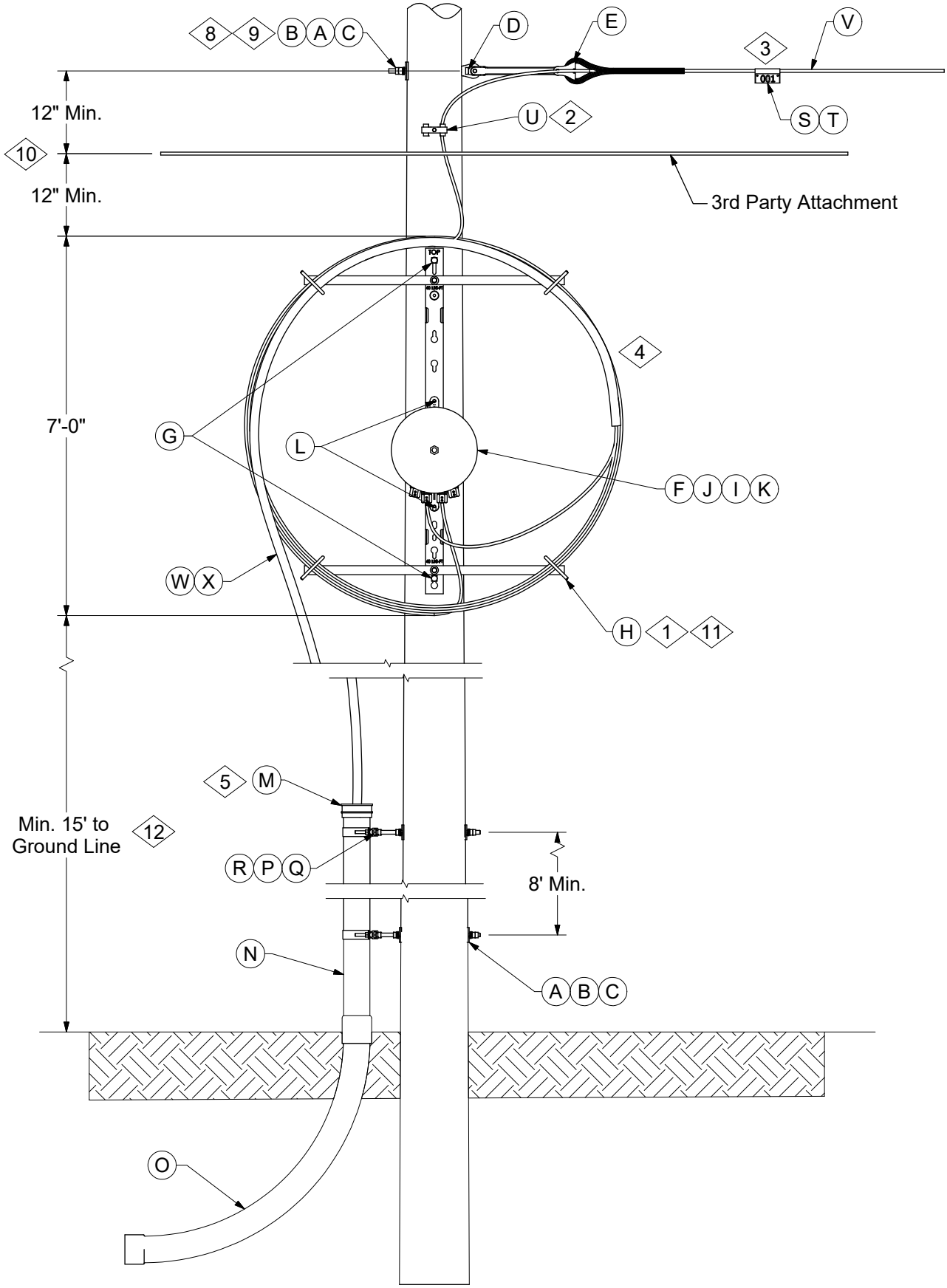
DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Added ISO & detail views, Notes 2, 3 & 4
1	07/01/20	KR	

FIBER OPTIC COMMUNICATION

ADSS Deadend Transition to Underground

18 10 03 **
1 of 3



DISTRIBUTION
CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM & Notes
1	07/01/20	KR	

CONSTRUCTION NOTE(s):

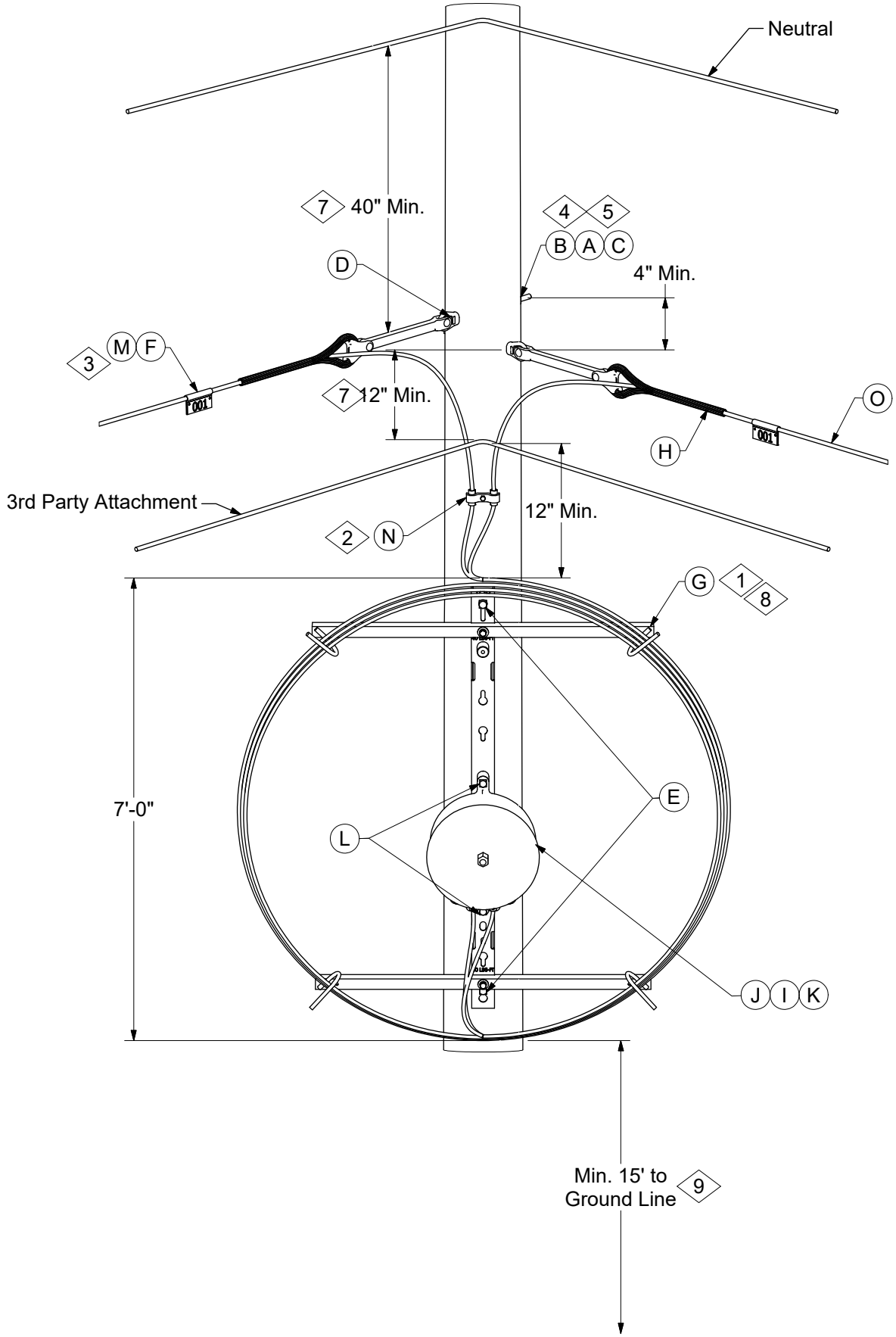
1. Coil 100' of extra fiber optic cable around splice rack.
2. Install downlead clamps every 10'.
3. ADSS Tags should be attached with zip ties on overhead ADSS fiber optic cable within 10' of pole.
4. Bring HDPE 1-1/4" conduit (Stock #12 01 334) or future path up the riser. Wrap HDPE conduit 3/4 turn (opening points down) around coil bracket and close unused microducts with end caps (Stock #12 01 343).
5. Top of conduit may be sealed with polyurethane expanding foam (Stock #31 53 082). Expanding foam must be used with dispensing gun (Stock #85 20 073).
6. A combination of 1-1/4" HDPE conduit (Stock #12 01 334) and single microducts may be used in place of futurepath where necessary:
   - Single microduct (Stock #12 01 344)
   - LSZH microduct (Stock #12 01 345)
7. For any splicing or network communication issues please contact the DCC at (866) 896-0662.
8. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.
9. Use longer machine bolts for larger wood or composite poles if required.
10. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.
11. The fiberglass guy strain insulator must fall at least 12" below the bottom loop of the coiled fiber.

	ITEM	STK / DCS #	DESCRIPTION 18 10 03 **	01	02
	A	23 66 207	Washer, Curved, Square, 5/8"	4	4
	B	23 66 134	Lock Washer - 5/8" Double Coil	4	4
	C	23 65 043	Lock Nut - 5/8" Square	2	2
	D	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	1	1
	E	23 68 747	Formed Wire Deadend, 48−ct ADSS	1	-
		23 68 778	Formed Wire Deadend, 72-ct ADSS	-	1
	F	17 04 247	Connector Kit, UG Fiber Optic Cable	1	1
	G	23 60 011	Lag Screw - 5/8" x 5"	2	2
	H	40 54 480	Coil Bracket	1	1
	I	17 60 734	Splice Protector Sleeve	10	10
	J	40 54 478	Splice Enclosure	1	1
	K	17 62 293	Connector Kit, 48-ct ADSS	1	-
		17 62 296	Connector Kit, 72-ct ADSS	-	1
	L	23 52 031	Bolt, 1/2" x 3" with Galv. Nut	2	2
5	M	12 51 254	Conduit - Coupling 4" Bell End	1	1
	N	12 01 278	Conduit, PVC, 4" x 10', Sch. 40	1	1
	O	12 51 176	Conduit, PVC, Bend, 4" x 90°, 36" Radius, Sch. 40	1	1
	P	23 53 003	Bolt, DA, 5/8" Dia x 18" w/ 4 square nuts	2	2
	Q	23 65 053	Nut - 5/8" Jam	2	2
	R	23 06 087	Bracket - Standoff, 12"	2	2
3	S	16 01 647	ID Tag, ADSS	1	1
	T	40 89 494	Nylon Zip Tie	2	2
2,@	U	17 02 177	Downlead Clamp, for 48-ct and 72-ct ADSS	#	#
@	V	27 59 084	72-ct ADSS	#	#
@	W	18 66 671	72-ct UG Fiber Optic Cable	#	#
	X	12 01 338	HDPE Microduct, 3-Way, w/ 20 AWG Cu Tracer Wire	#	#
4,6,@		12 01 339	HDPE Microduct, 7-Way, w/ 20 AWG Cu Tracer Wire	#	#
		12 01 341	HDPE Microduct, 4-Way, w/ 20 AWG Cu Tracer Wire	#	#
11,@	Y	**11 00 4* ** @**	Guying Unit	1	1

DESIGN NOTE(s):

12. Bottom loop of fiber optic cable shall be located a minimum of 15' above ground.

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM & Notes
1	07/01/20	KR	



REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Converted to new format
1	07/01/20	KR	

CONSTRUCTION NOTE(s):

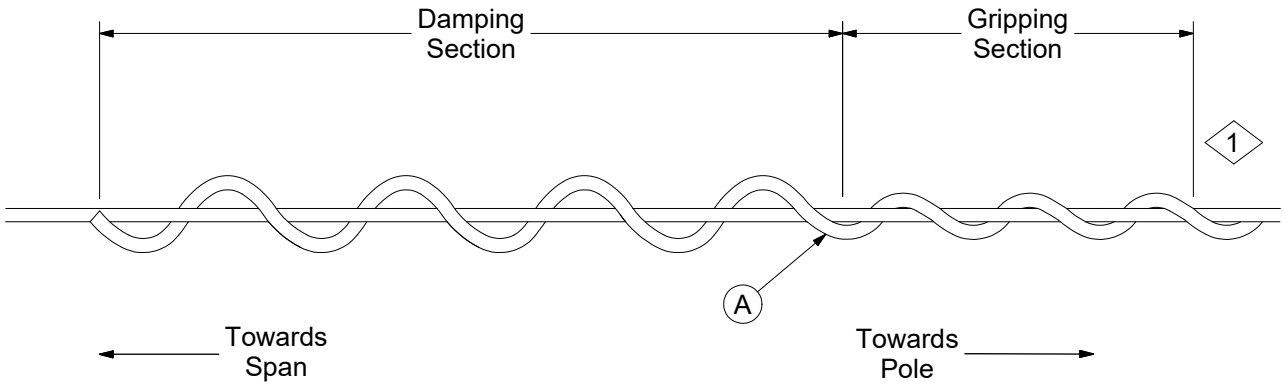
1. Coil 100' of extra fiber optic cable around coil bracket.
2. Install downlead clamps every 10'.
3. ADSS Tags should be attached with zip ties on overhead ADSS fiber optic cable within 10' of pole.
4. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.
5. Use longer machine bolts for larger wood or composite poles if required.
6. For any splicing or network communication issues please contact the DCC at (866) 896-0662.
7. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.
8. The fiberglass guy strain insulator must fall at least 12" below the bottom loop of the coiled fiber.

	ITEM	STK / DCS #	DESCRIPTION 18 10 04 **	01	02
	A	23 66 134	Lock Washer - 5/8" Double Coil	2	2
	B	23 66 207	Washer, Curved, Square, 5/8"	2	2
	C	23 65 043	Lock Nut - 5/8" Square	2	2
	D	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	2	2
	E	23 60 011	Lag Screw - 5/8" x 5"	2	2
	F	40 89 494	Nylon Zip Tie	4	4
	G	40 54 480	Coil Bracket	1	1
	H	23 68 747	Formed Wire Deadend, ADSS 48-ct Fiber	2	-
		23 68 778	Formed Wire Deadend, ADSS 72-ct Fiber	-	2
	I	17 60 734	Splice Protector Sleeve	10	10
	J	40 54 478	Splice Enclosure	1	1
	K	17 62 293	Connector Kit, 48-ct ADSS	1	-
		17 62 296	Connector Kit, 72-ct ADSS	-	1
	L	23 52 031	Bolt, Mach., 1/2" x 3" w/ square nut	2	2
3	M	16 01 647	ID Tag, ADSS	2	2
2,@	N	17 02 177	Downlead Clamp, for 48-ct and 72-ct ADSS	#	#
@	O	27 59 084	72-ct ADSS	#	#
8,@	P	**11 00 4* ** @**	Guying Unit	1	1

DESIGN NOTE(s):

9. Bottom loop of coiled fiber optic cable shall be located a minimum of 15' above ground.

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Converted to new format
1	07/01/20	KR	



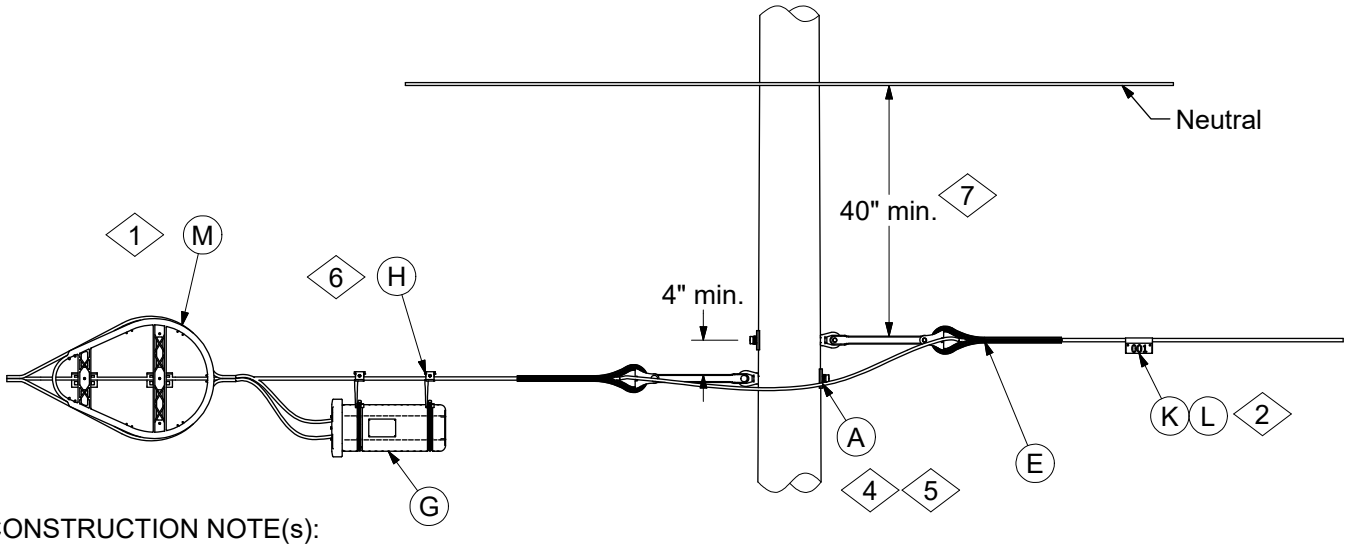
CONSTRUCTION NOTE(s):

1. Gripping section features smaller helix than damping section.

2. Dampers shall be used when cable spans exceed 350' and/or tension exceeds 15% of the rated cable breaking strength.

ITEM	STK / DCS #	DESCRIPTION 18 10 05 **	01
A	17 13 306	Vibration Damper - ADSS	1

REV	DATE	ENG	DESCRIPTION
1	01/01/23	KR	Revised Note 1, Converted to new format
0	04/01/19	KR	



CONSTRUCTION NOTE(s):

1. Coil 50' of extra fiber optic cable.

2. ADSS tags should be attached with zip ties on overhead ADSS fiber optic cable within 10' of pole.

3. This standard can also be used on a tangent application.

4. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.

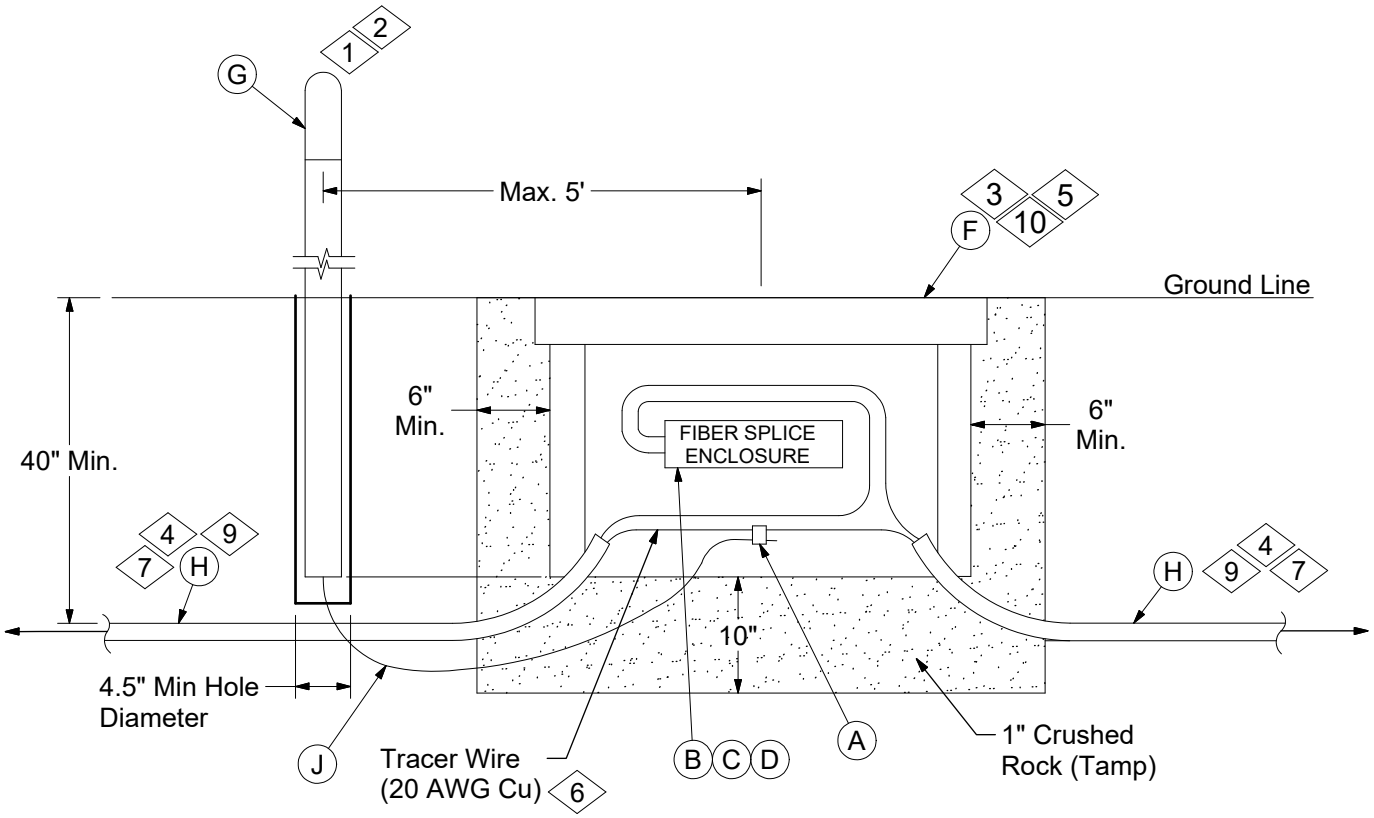
5. Use longer machine bolts for larger wood or composite poles if required.

6. Use Stock #23 56 117 for aerial mounting of Stock #40 54 502 splice enclosure.

7. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.

	ITEM	STK / DCS #	DESCRIPTION 18 10 06 **	01	02
	A	23 66 207	Washer, Curved, Square, 5/8"	2	2
	B	23 66 134	Lock Washer - 5/8" Double Coil	2	2
	C	23 65 043	Lock Nut - 5/8" Square	2	2
	D	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	2	2
	E	23 68 747	Formed Wire Deadend, ADSS 48-ct Fiber	2	-
		23 68 778	Formed Wire Deadend, ADSS 72-ct Fiber	-	2
	F	40 89 742	Splice Tray, 24 ct.	2	3
	G	40 54 494	Splice Enclosure	1	1
6	H	17 73 139	Aerial Mounting Bracket for Splice Enclosure	1	1
	I	17 60 734	Splice Protector Sleeve	10	10
	J	17 62 293	Connector Kit, 48-ct ADSS	1	-
		17 62 296	Connector Kit, 72-ct ADSS	-	1
2	K	16 01 647	ID Tag, ADSS	1	1
	L	40 89 494	Nylon Zip Tie	2	2
@	M	17 02 178	Cable Holder (Snowshoe) ADSS	#	#
@	N	27 59 084	72-ct ADSS	#	#

REV	DATE	ENG	DESCRIPTION
0	01/01/23	KR	New



CONSTRUCTION NOTE(s):

1. Install fiber markers with test paddle (Stock #16 16 283) max. 5' from the center of hand-hole and at beginning and end of each run.

2. Install buried fiber markers without test paddle (Stock #16 16 292) directly over buried fiber midway between hand-holes or no more than 1000' in rural areas.

3. Hand-holes shall be installed at grade at beginning and end points of farmable fields. In rural areas that exceed 4500' spacing install two (2) fiber markers with test paddles, one on each side of the hand-hole, for protection. Preferred method of installation is at each property corner location. UG fiber shall be installed min. 60" below grade in farmable fields.

4. Fiber runs ≤ 300' may be pushed or pulled (pulling tape Stock #83 36 251). Fiber runs > 300' shall be installed using the blown fiber method when using 3-, 4-, or 7-way HDPE Microducts.

5. Coil 50' of fiber optic cable per run (100' total). Splice-thru remaining unused microducts using straight-thru connectors (Stock #12 01 342).

6. Ensure tracer wire is continuous by using the tracer wire connector (Stock #40 89 744).

7. End caps (Stock #12 01 343) shall be installed on all unused microducts.

8. For any splicing or network communication issues please contact the DCC at (866) 896-0662.

9. A combination of 1-1/4" HDPE conduit (Stock #12 01 334) and single microducts may be used in place of the futurepath where necessary:
   - Single microduct (Stock #12 01 344)
   - LSZH microduct (Stock #12 01 345)

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM & Notes
1	07/01/20	KR	

	ITEM	STK / DCS #	DESCRIPTION 18 20 01 **	01
	A	40 89 744	Connector, tracer wire	1
	B	40 89 742	Splice Tray, 24 ct.	3
	C	40 54 494	Splice Box	1
	D	40 54 495	Splice Box Hand-Hole Stand	1
@	E	12 01 342	Straight-thru connectors for microducts	#
10,@	F	12 56 129	Hand-hole (larger) 49 x 32 x 24	1
		12 56 131	Hand-hole (smaller) 37 x 26 x 24	1
1,2,@	G	16 16 283	Orange Fiber Cable Marker w/ Test Paddle	#
		16 16 292	Orange Fiber Cable Marker w/o Test Paddle	#
		16 16 349	Flush Mount Cable Marker	#
7,9,@	H	12 01 338	HDPE Microduct, 3-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 339	HDPE Microduct, 7-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 341	HDPE Microduct, 4-Way, w/ 20 AWG Cu Tracer Wire	#
4,@	I	83 36 251	Pulling Tape	#
6,@	J	18 66 689	#12 Orange Tracer Wire	#
4,5,@	K	18 66 671	72-ct UG Fiber Optic Cable	#

DESIGN NOTE(s):

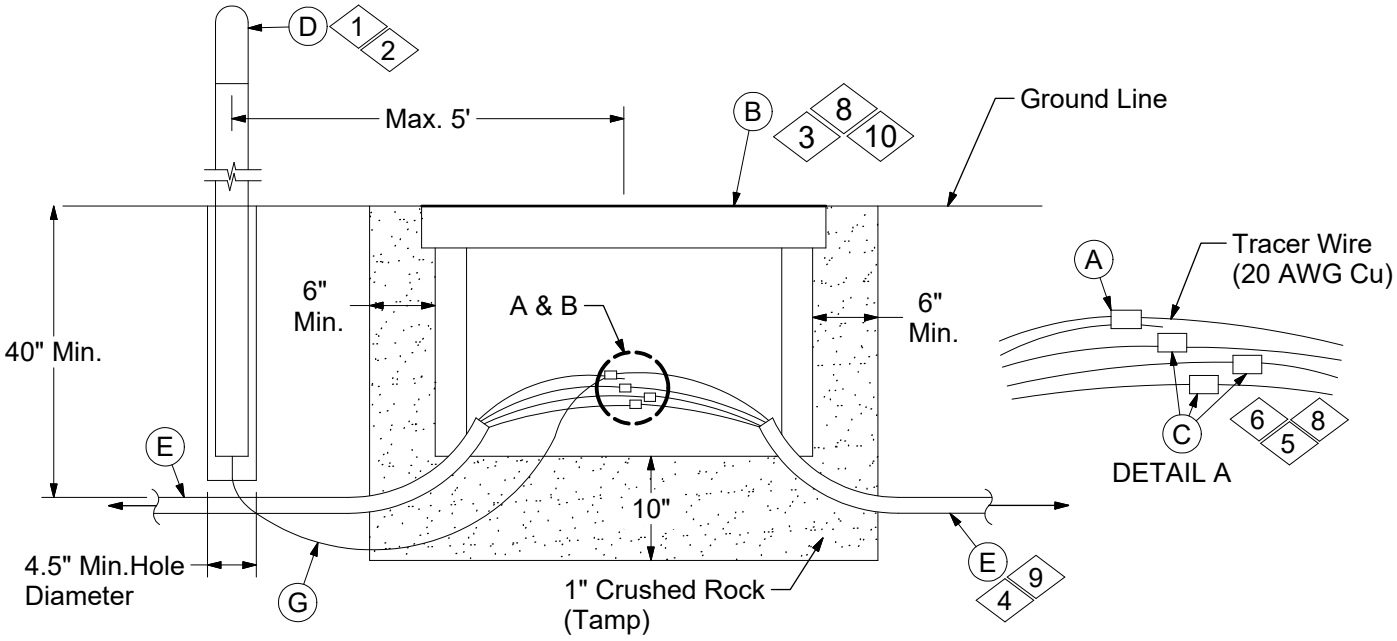
10 Hand-holes shall be installed no further apart than 2500' in urban areas and 4500' in rural land. Hand-holes are required at each alignment angle for pulling locations (splice not required for pulling purposes).

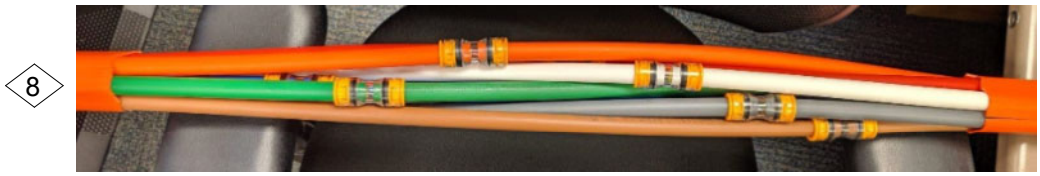
REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM & Notes
1	07/01/20	KR	

FIBER OPTIC COMMUNICATION

Underground Fiber without Splice

18 20 02 **
1 of 2





DETAIL B

CONSTRUCTION NOTE(s):

1. Install fiber markers with test paddle (Stock #16 16 283) max. 5' North of center of hand-hole and at beginning and end of each run.

2. Install buried fiber markers without test paddle (Stock #16 16 292) directly over buried fiber midway between hand-holes or no more than 1000' in rural areas.

3. Hand-holes shall be installed at grade at beginning and end points of farmable fields. In rural areas that exceed 4500' spacing install two (2) fiber markers with test paddles, one on each side of the hand-hole, for protection. Preferred method of installation is at each property corner location. UG fiber shall be installed min. 60" below grade in farmable fields.

4. Fiber runs ≤ 300' may be pushed or pulled (pulling tape Stock #83 36 251). Fiber runs > 300' shall be installed using the blown fiber method when using 3-, 4-, or 7-Way HDPE Microducts.

5. Splice-thru each of the microducts using straight-thru connectors (Stock #12 01 342).

6. Ensure tracer wire is continuous by using the tracer wire connector (Stock #40 89 744).

7. For any splicing or network communication issues please contact the DCC at (866) 896-0662.

8. Where hand-holes are not feasible slide a section of schedule 80 pipe over the spliced microducts for bearing protection (Detail B). The pipe should extend at least 1' beyond the uncut end of the future path.

9. A combination of 1-1/4" HDPE conduit (Stock #12 01 334) and single microducts may be used in place of the futurepath where necessary:
   - Single microduct (Stock #12 01 344)
   - LSZH microduct (Stock #12 01 345)

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated Drawing, BOM, & Notes
1	07/01/20	KR	

	ITEM	STK / DCS #	DESCRIPTION 18 20 02 **	01
	A	40 89 744	Connector, Tracer Wire	1
8,10,@	B	12 56 129	Hand-hole (larger) 49 x 32 x 24	1
		12 56 131	Hand-hole (smaller) 37 x 26 x 24	1
5,@	C	12 01 342	Straight-thru Connectors for Microducts	#
1,2,@	D	16 16 283	Orange Fiber Cable Marker w/ Test Paddle	#
		16 16 292	Orange Fiber Cable Marker w/o Test Paddle	#
		16 16 349	Flush Mount Cable Marker	#
9,@	E	12 01 338	HDPE Microduct, 3-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 339	HDPE Microduct, 7-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 341	HDPE Microduct, 4-Way, w/ 20 AWG Cu Tracer Wire	#
4,@	F	83 36 251	Pulling Tape	#
6,@	G	18 66 689	#12 Orange Tracer Wire	#
@	H	18 66 671	72-ct UG Fiber Optic Cable	#

DESIGN NOTE(s):

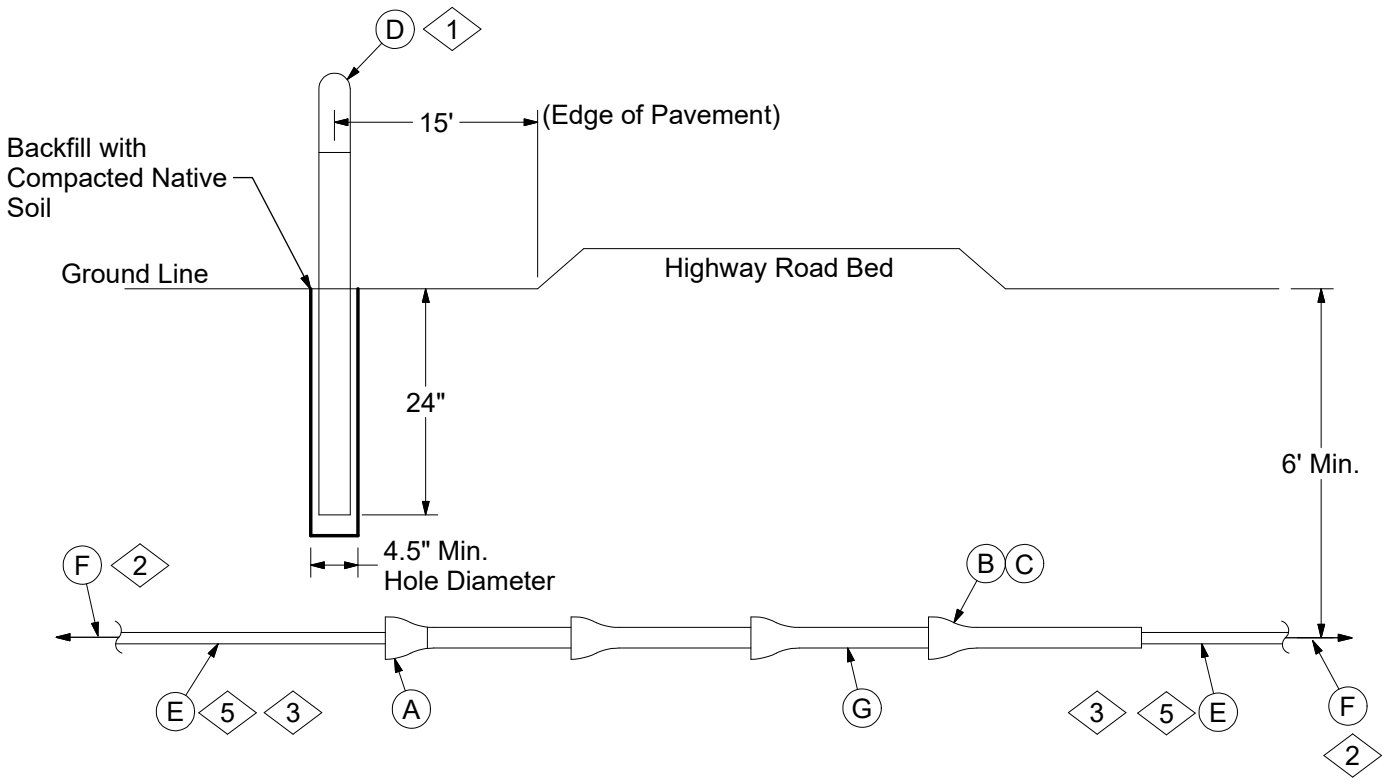
10. Hand-holes shall be installed no further apart than 2500' in urban areas and 4500' in rural land. Hand-holes are required at each alignment angle for pulling locations (splice not required for pulling purposes).

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated Drawing, BOM, & Notes
1	07/01/20	KR	

FIBER OPTIC COMMUNICATION

Underground Fiber Bored Highway Crossing

18 20 03 **
1 of 1



CONSTRUCTION NOTE(s):

1. Install fiber marker without test paddle (Stock #16 16 292) 15' from edge of pavement directly over buried fiber.

2. Fiber runs ≤ 300' may be pushed or pulled (pulling tape Stock #83 36 251). Fiber runs > 300' shall be installed using the blown fiber method when using 3-, 4-, or 7-Way HDPE Microducts.

3. End caps (Stock #12 01 343) shall be installed on all unused microducts.

4. For any splicing or network communication issues please contact the DCC at (866) 896-0662.

5. A combination of 1-1/4" HDPE conduit (Stock #12 01 334) and single microducts may be used in place of the futurepath where necessary:
   - Single Microduct (Stock #12 01 344)
   - LSZH microduct (Stock #12 01 345)

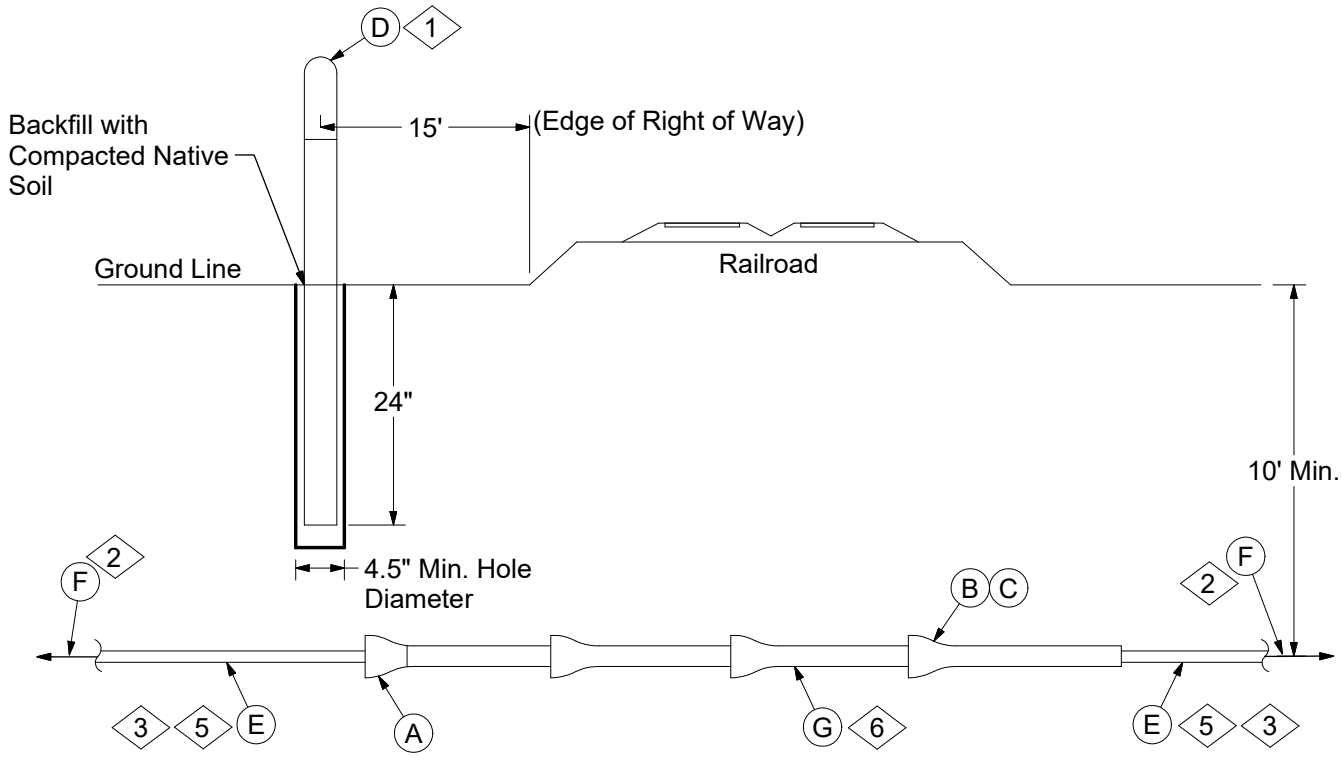
	ITEM	STK / DCS #	DESCRIPTION 18 20 03 **	01
	A	12 51 254	Bell End Fitting	1
	B	30 58 068	PVC Primer, Purple, 10 Ounce Container	1
	C	12 56 100	PVC Solvent Cement, Yellow	1
1,@	D	16 16 292	Orange Fiber Cable Marker without Test Paddle	#
	E	12 01 338	HDPE Microduct, 3-Way, w/ 20 AWG Cu Trace Wire	#
3,5,@		12 01 341	HDPE Microduct, 4-Way, w/ 20 AWG Cu Trace Wire	#
		12 01 339	HDPE Microduct, 7-Way, w/ 20 AWG Cu Trace Wire	#
2,@	F	83 36 251	Pulling Tape	#
@	G	12 01 278	Conduit, PVC, 4" x 10', Sch. 40	#
@	H	18 66 671	72-ct UG Fiber Optic Cable	#

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM & Notes
1	07/01/20	KR	

FIBER OPTIC COMMUNICATION

Underground Fiber Bored Railroad Crossing

18 20 04 **
1 of 1



CONSTRUCTION NOTE(s):

1. Install fiber marker without test paddle (Stock #16 16 292) 15' from edge of right-of-way directly over buried fiber.

2. Fiber runs ≤ 300' may be pushed or pulled (pulling tape Stock #83 36 251). Fiber runs > 300' shall be installed using the blown fiber method when using 3-, 4-, or 7-Way HDPE Microducts.

3. End caps (Stock #12 01 343) shall be installed on all unused microducts.

4. For any splicing or network communication issues please contact the DCC at (866) 896-0662.

5. A combination of 1-1/4" HDPE conduit (Stock #12 01 334) and single microducts may be used in place of the futurepath where necessary:
   - Single microduct (Stock #12 01 344)
   - LSZH microduct (Stock #12 01 345)

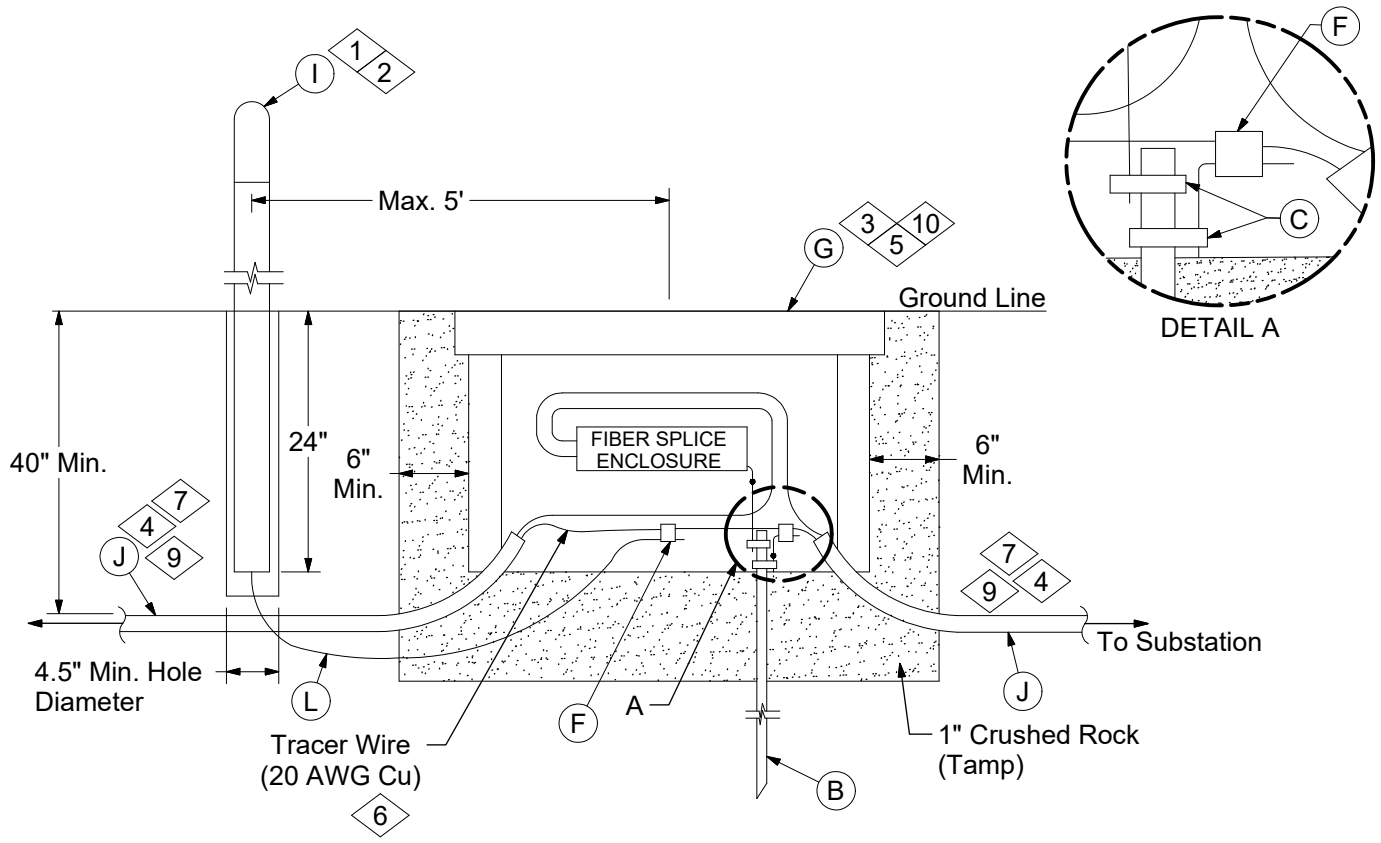
	ITEM	STK / DCS #	DESCRIPTION 18 20 04 **	01
	A	12 51 254	Bell End Fitting	1
	B	30 58 068	PVC Primer, Purple, 10 Ounce Container	1
	C	12 56 100	PVC Solvent Cement, Yellow	1
1,@	D	16 16 292	Orange Fiber Cable Marker w/o Test Paddle	#
3,5,@	E	12 01 338	HDPE Microduct, 3-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 341	HDPE Microduct, 4-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 339	HDPE Microduct, 7-Way, w/ 20 AWG Cu Tracer Wire	#
2,@	F	83 36 251	Pulling Tape	#
6,@	G	12 01 278	Conduit, PVC, 4" x 10', Sch. 40	#
@	H	18 66 671	72-ct UG Fiber Optic Cable	#

DESIGN NOTE(s):

6. When using steel conduit use Stock #40 83 343 in place of PVC.

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM & Notes
1	07/01/20	KR	



CONSTRUCTION NOTE(s):

1. Install fiber markers with test paddle (Stock #16 16 283) max. 5' from the center of hand-hole and at beginning and end of each run.

2. Install buried fiber markers without test paddle (Stock #16 16 292) directly over buried fiber midway between hand-holes or no more than 1000' in rural areas.

3. Hand-holes shall be installed at grade at beginning and end points of farmable fields. In rural areas that exceed 4500' spacing install two (2) fiber markers with test paddles, one on each side of the hand-hole, for protection. Preferred method of installation is at each property corner location. UG fiber shall be installed min. 60" below grade in farmable fields.

4. Fiber runs ≤ 300' may be pushed or pulled (pulling tape Stock #83 36 251). Fiber runs > 300' shall be installed using the blown fiber method when using 3-, 4-, or 7-way HDPE Microducts.

5. Coil 50' of fiber optic cable per run (100' total). Splice-thru remaining unused microducts using straight-thru connectors (Stock #12 01 342).

6. Ensure tracer wire is continuous by using the tracer wire connector (Stock #40 89 744).

7. End caps (Stock #12 01 343) shall be installed on all unused microducts.

8. For any splicing or network communication issues please contact the DCC at (866) 896-0662.

9. A combination of 1-1/4" HDPE conduit (Stock #12 01 334) and single microducts may be used in place of the futurepath where necessary:
   - Single microduct (Stock #12 01 344)
   - LSZH microduct (Stock #12 01 345)

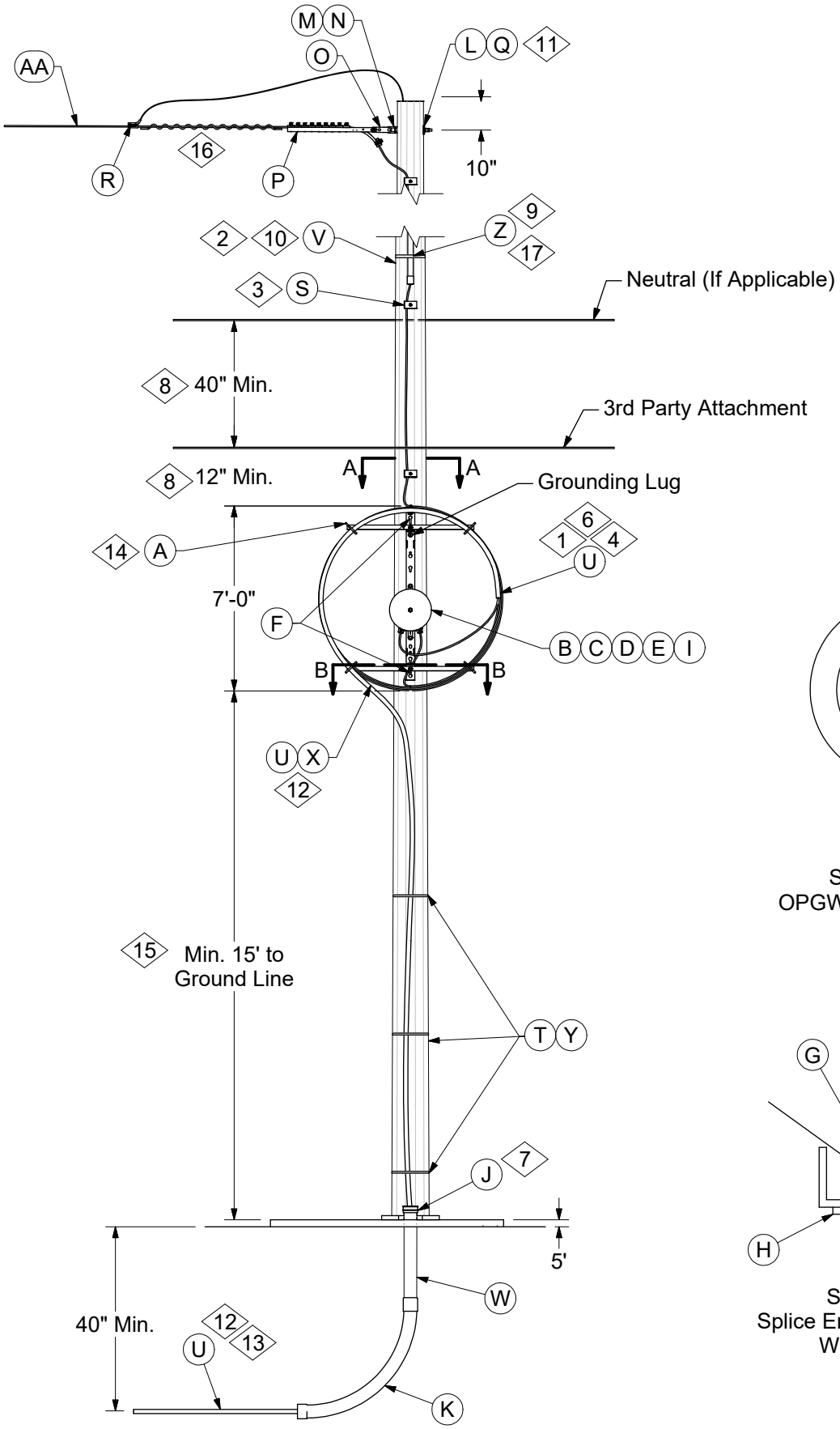
REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM & Notes
1	07/01/20	KR	

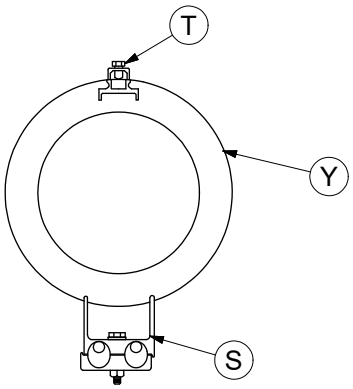
	ITEM	STK / DCS #	DESCRIPTION 18 20 05 **	01
	A	40 89 742	Splice Tray, 24ct.	3
	B	23 13 069	Ground Rod 5/8"x8' Copperweld	1
	C	17 52 032	Grounding Clamp	2
	D	40 54 494	Splice Box	1
	E	40 54 495	Splice Box Hand-Hole Stand	1
	F	40 89 744	Connector, Tracer Wire	1
10,@	G	12 56 129	Hand-hole (larger) 49 x 32 x 24	1
		12 56 131	Hand-hole (smaller) 37 x 26 x 24	1
5,@	H	12 01 342	Straight-Thru Connectors for Microducts	#
1,2,@	I	16 16 283	Orange Fiber Cable Marker w/ Test Paddle	#
		16 16 292	Orange Fiber Cable Marker w/o Test Paddle	#
		16 16 349	Flush Mount Cable Marker	#
7,9,@	J	12 01 338	HDPE Microduct, 3-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 339	HDPE Microduct, 7-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 341	HDPE Microduct, 4-Way, w/ 20 AWG Cu Tracer Wire	#
4,@	K	83 36 251	Pulling Tape	#
6,@	L	18 66 689	#12 Oranger Tracer Wire	#
@	M	18 52 025	#2 Solid Cu Ground Wire	#
@	N	18 66 671	72-ct UG Fiber Optic Cable	#

DESIGN NOTE(s):

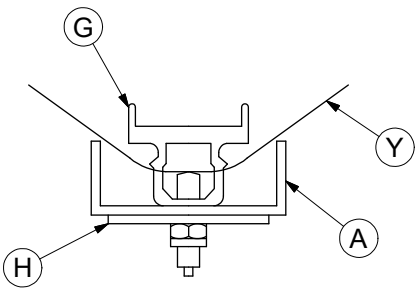
<10> Hand-holes shall be installed no further apart than 2500' in urban areas and 4500' in rural land. Hand-holes are required at each alignment angle for pulling locations (splice not required for pulling purposes).

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM & Notes
1	07/01/20	KR	





SECTION A-A
OPGW Downlead Clamp
Assembly



SECTION B-B
Splice Enclosure Attachment
Without Bracket

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, drawing, & Notes
1	07/01/20	KR	

CONSTRUCTION NOTE(s):

1. Coil 100' of extra fiber optic cable around coil bracket.
2. To attach iron hanger to pole use #10 self tapping screws (Stock #21 76 679).
3. Install downlead clamps every 10'.
4. End caps (Stock #12 01 343) shall be installed on all unused microducts.
5. For any splicing or network communication issues please contact the DCC at (866) 896-0662.
6. Bring HDPE 1-1/4" conduit (Stock #12 01 334) or future path up the riser. Wrap HDPE conduit 3/4 turn (opening points down) around coil bracket and close unused microducts with end caps (Stock #12 01 343).
7. Top of conduit may be sealed with polyurethane expanding foam (Stock #31 53 082). Expanding foam must be used with dispensing gun (Stock #85 20 073).
8. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.
9. The conduit shall be installed through the entire energized zone on the pole.
10. In place of Stock #27 60 035, following conduit straps may be used: 2.5" Conduit Strap (Stock #23 67 189), 3” Conduit Strap (Stock #23 67 182), and 4” Conduit Strap (Stock #23 67 183).
11. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.
12. A combination of 1-1/4" HDPE conduit (Stock #12 01 334) and single microducts may be used in place of futurepath where necessary:
    - Single microduct (Stock #12 01 344)
    - LSZH microduct (Stock #12 01 345)
13. Where 3-, 4-, or 7-Way HDPE Microducts are not feasible, 1-1/4" HDPE conduit (Stock #12 01 334) may be used.
14. If guying is utilized, the fiberglass guy strain insulator must fall at least 12" below the bottom loop of the coiled fiber.

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, drawing, & Notes
1	07/01/20	KR	

	ITEM	STK / DCS #	DESCRIPTION 18 30 01 **	01
	A	40 54 480	Coil Bracket	1
	B	17 60 734	Splice Protector Sleeve	10
	C	40 54 478	Splice Enclosure	1
	D	40 54 479	Furcation Kit, OPGW	1
	E	40 54 481	Connector Kit, OPGW	1
	F	23 52 024	Machine Bolt, Galv., 1/2" x 1-1/4", w/ Nut	2
	G	23 67 499	Banding Clamp, with 5/8" Stud and Nut	2
	H	23 66 027	Washer, Square, for 5/8" Bolt	2
	I	17 04 247	Connector Kit, UG Fiber Optic Cable	1
	J	12 51 254	Conduit - Coupling 4" Bell End	1
	K	12 51 176	Conduit, PVC, Bend, 4" x 90°, 36" Radius, Sch. 40	1
	L	23 66 031	Washer, Curved, Square, 3/4"	1
	M	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	1
	N	23 59 095	Eyelet, 3/4"	1
	O	23 59 042	Link Extension - 6" Clevis Eye	1
	P	23 68 732	Bolted Deadend	1
	Q	23 65 042	Lock Nut - 3/4" Square	1
	R	17 52 217	Clamp for bonding OPGW Static to Pole Ground	1
3,@	S	17 52 219	Downlead Clamp	#
@	T	23 67 500	Banding Clamp, w/ 5/8" Bolt	#
	U	12 01 338	HDPE Microduct, 3-Way, w/ 20 AWG Cu Tracer Wire	#
4,12,13,@		12 01 339	HDPE Microduct, 7-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 341	HDPE Microduct, 4-Way, w/ 20 AWG Cu Tracer Wire	#
2,10,@	V	27 60 035	Strap, Iron Hanger	#
@	W	12 01 278	Conduit, PVC, 4" x 10', Sch. 40	#
@	X	18 66 671	72-ct UG Fiber Optic Cable	#
@	Y	22 12 084	Banding, Stainless Steel	#
17,@	Z	12 01 230	Conduit, PVC, 1.5" x 10', Sch. 40	#
	AA	27 59 087	72-ct OPGW 10,500ft Reel	#
@		27 59 088	72-ct OPGW 21,000ft Reel	#
@	BB	**12 00 10 10**	Grounding Unit	1

DESIGN NOTE(s):

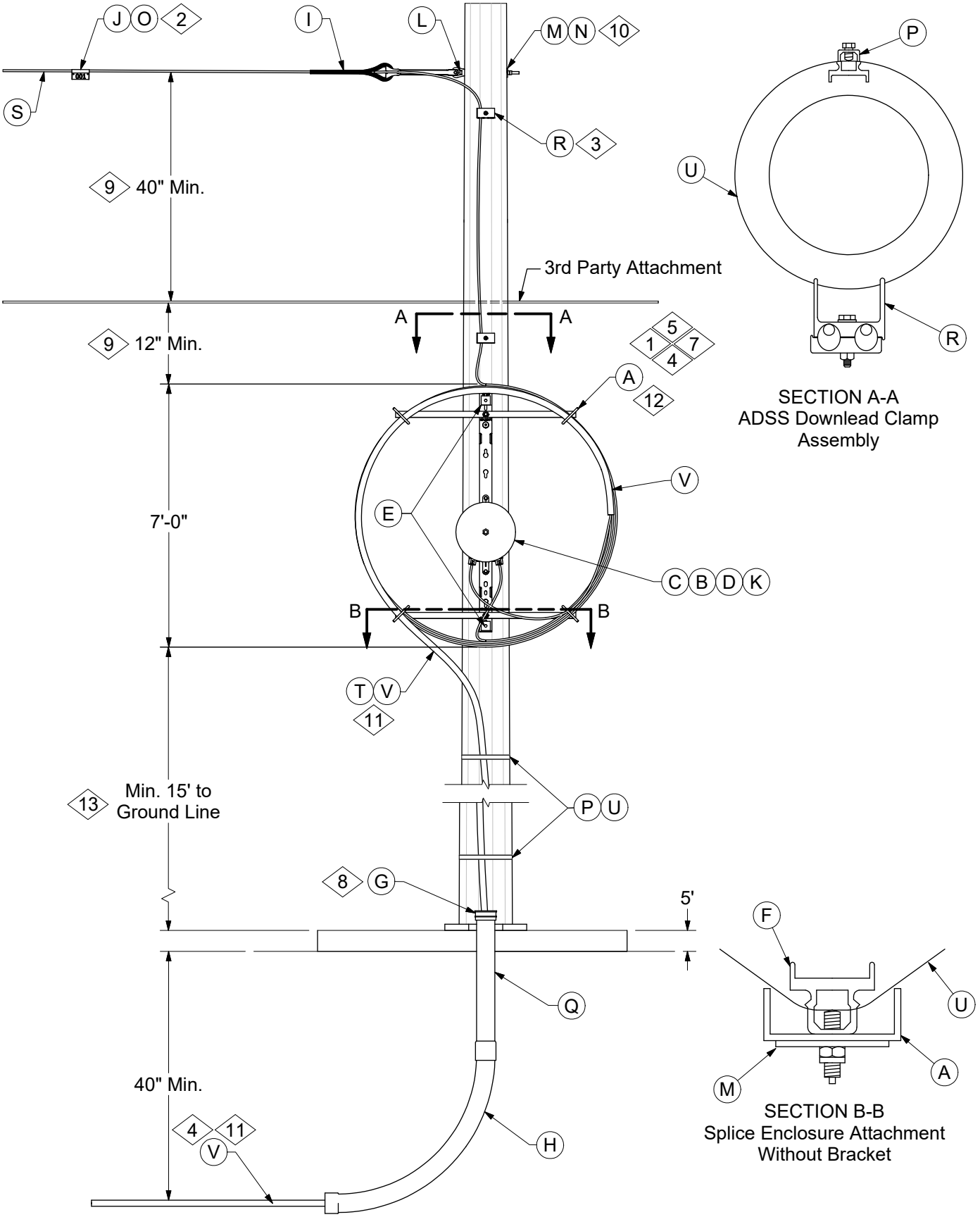
15. Bottom loop of coiled fiber optic cable shall be located a minimum of 15' above ground.

16. Spiral vibration dampers (Stock #23 67 319) are used on 350' and above spans only.

17. For alternate construction, call for split conduit: 2" (Stock #12 51 217), 3" (Stock #12 51 218), 4" (Stock #12 51 219), or 5" (Stock #12 51 220).

18. Use Stock #17 52 235 for OPGW to 110.8 ACSR and Stock #17 52 233 for OPGW to 1/0 AAAC connections.

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, drawing, & Notes
1	07/01/20	KR	



DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, drawing, & Notes
1	07/01/20	KR	

CONSTRUCTION NOTE(s):

1. Coil 100’ of extra fiber optic cable around coil bracket.
2. ADSS Tags should be attached with zip ties on overhead ADSS fiber optic cable within 10’ of pole.
3. Install downlead clamps every 10’.
4. Where 3-, 4-, or 7-Way HDPE Microducts are not feasible, 1-1/4" HDPE conduit (Stock #12 01 334) may be used.
5. End caps (Stock #12 01 343) shall be installed on all unused microducts.
6. For any splicing or network communication issues please contact the DCC at (866) 896-0662.
7. Bring HDPE 1-1/4" conduit (Stock #12 01 334) or future path up the riser. Wrap HDPE conduit 3/4 turn (opening points down) around coil bracket and close unused microducts with end caps (Stock #12 01 343).
8. Top of conduit may be sealed with polyurethane expanding foam (Stock #31 53 082). Expanding foam must be used with dispensing gun (Stock #85 20 073).
9. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.
10. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.
11. A combination of 1-1/4" HDPE conduit (Stock #12 01 334) and single microducts may be used in place of futurepath where necessary:
    - Single microduct (Stock #12 01 344)
    - LSZH microduct (Stock #12 01 345)
12. If guying is utilized, the fiberglass guy strain insulator must fall at least 12" below the bottom loop of the coiled fiber.

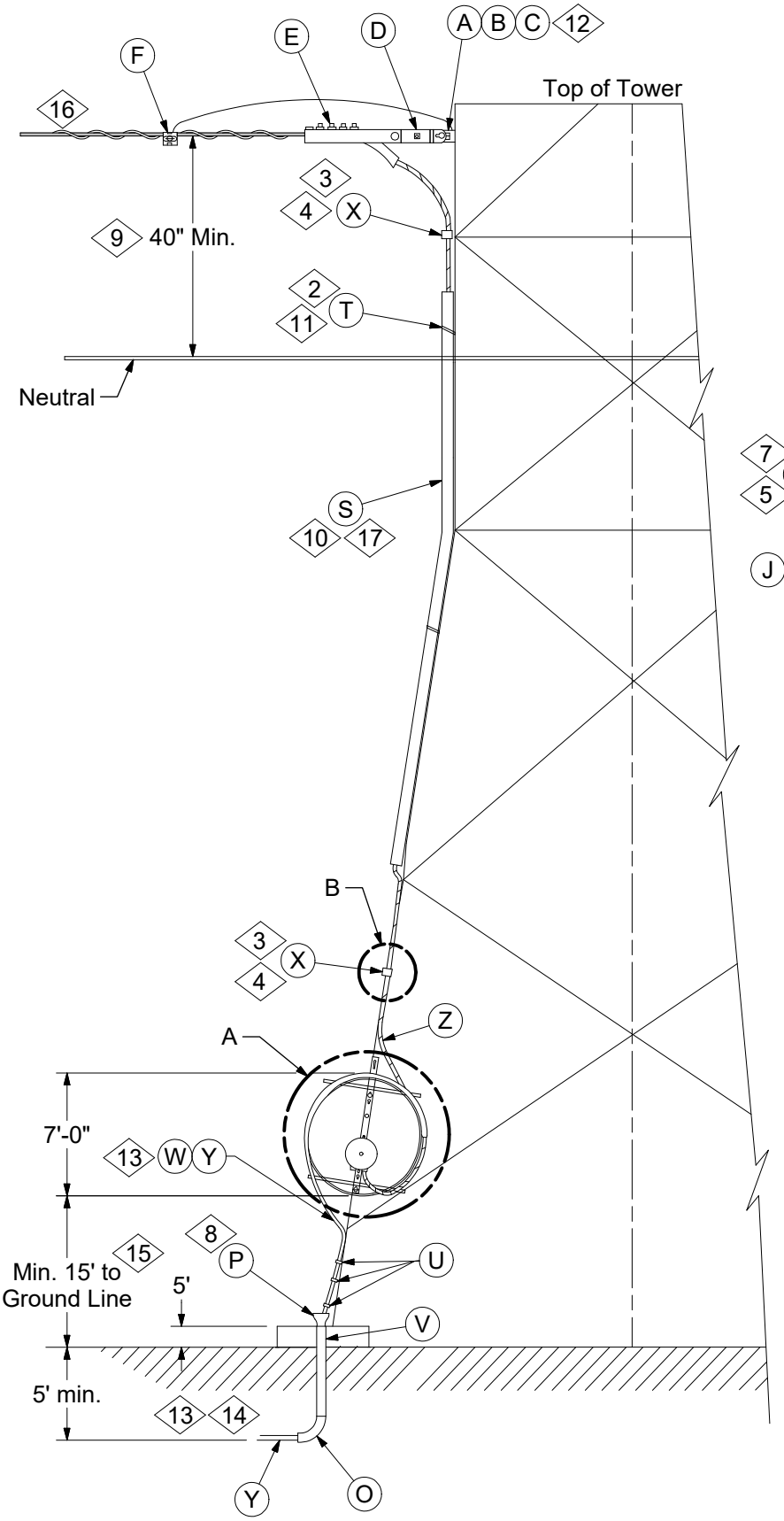
REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, drawing, & Notes
1	07/01/20	KR	

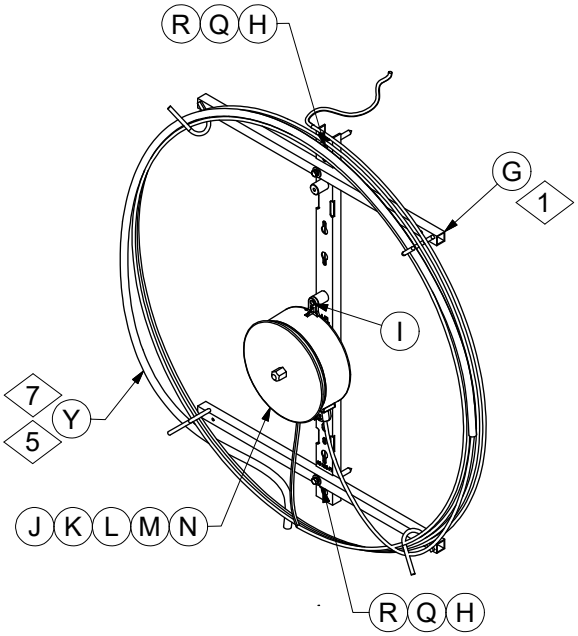
	ITEM	STK / DCS #	DESCRIPTION 18 30 02 **	01	02
	A	40 54 480	Coil Bracket	1	1
	B	17 60 734	Splice Protector Sleeve	10	10
	C	40 54 478	Splice Enclosure	1	1
	D	17 62 293	Connector Kit, 48-ct ADSS	1	-
		17 62 296	Connector Kit, 72-ct ADSS	-	1
	E	23 52 024	Machine Bolt, Galv. 1/2" x 1-1/4" w/ Nut	2	2
	F	23 67 499	Banding Clamp, with 5/8" Stud and Nut	2	2
	G	12 51 254	Conduit - Coupling 4" Bell End	1	1
	H	12 51 176	Conduit, PVC, Bend, 4" x 90°, 36" Radius, Sch. 40	1	1
	I	23 68 747	Formed Wire Deadend, 48−ct ADSS	1	-
		23 68 778	Formed Wire Deadend, 72-ct ADSS	-	1
2	J	16 01 647	ID Tag, ADSS	1	1
	K	17 04 247	Connector Kit, UG Fiber Optic Cable	1	1
	L	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	1	1
	M	23 66 027	Washer, Flat, Square 5/8"	2	2
	N	23 65 043	Lock Nut - 5/8" Square	1	1
	O	40 89 494	Nylon Zip Tie	2	2
@	P	23 67 500	Banding Clamp, with 5/8" Bolt	#	#
@	Q	12 01 278	Conduit, PVC, 4" x 10', Sch. 40	#	#
3,@	R	17 52 219	Downlead Clamp	#	#
@	S	27 59 084	72-ct ADSS	#	#
@	T	18 66 671	72-ct UG Fiber Optic Cable	#	#
@	U	22 12 084	Banding, Stainless Steel	#	#
4,5,11,@	V	12 01 338	HDPE Microduct, 3-Way w/ 20 AWG Cu Tracer Wire	#	#
		12 01 339	HDPE Microduct, 7-Way w/ 20 AWG Cu Tracer Wire	#	#
		12 01 341	HDPE Microduct, 4-Way w/ 20 AWG Cu Tracer Wire	#	#

DESIGN NOTE(s):

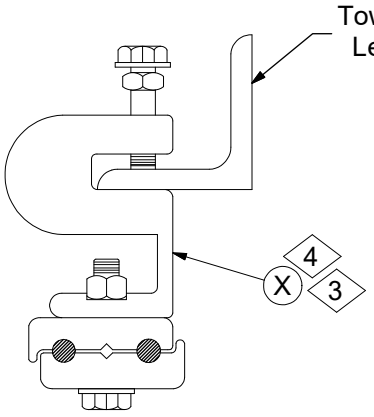
13 Bottom loop of coiled fiber optic cable shall be located a minimum of 15' above ground.

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, drawing, & Notes
1	07/01/20	KR	





DETAIL A
Fiber Optic Splice Enclosure



DETAIL B
OPGW Downlead Clamp

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, drawing, & Notes
1	07/01/20	KR	

CONSTRUCTION NOTE(s):

1. Coil 100' of extra fiber optic cable around coil bracket.
2. To attach iron hanger to pole use #10 self tapping screws (Stock #21 76 679).
3. Install downlead clamps every 10'.
4. For lattice tower web thickness greater than 0.75" use stock code (Stock #17 52 228). For web thickness less than 0.75" use stock code (Stock #17 52 221).
5. End caps (Stock #12 01 343) shall be installed on all unused microducts.
6. For any splicing or network communication issues please contact the DCC at (866) 896-0662.
7. Bring HDPE 1-1/4" conduit (Stock #12 01 334) or future path up the riser. Wrap HDPE conduit 3/4 turn (opening points down) around coil bracket and close unused microducts with ends caps (Stock #12 01 343)
8. Top of conduit may be sealed with polyurethane expanding foam (Stock #31 53 082). Expanding foam must be used with dispensing gun (Stock #85 20 073).
9. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.
10. The conduit shall be installed through the entire energized zone on the pole.
11. In place of Stock #27 60 035, following conduit straps may be used: 2.5" Conduit Strap (Stock #23 67 189), 3” Conduit Strap (Stock #23 67 182), and 4” Conduit Strap (Stock #23 67 183).
12. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.
13. A combination of 1-1/4" HDPE conduit (Stock #12 01 334) and single microducts may be used in place of futurepath where necessary:
    - Single microduct (Stock #12 01 344)
    - LSZH microduct (Stock #12 01 345)
14. Where 3-, 4-, or 7-Way HDPE Microducts are not feasible, 1-1/4" HDPE conduit (Stock #12 01 334) may be used.

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, drawing, & Notes
1	07/01/20	KR	

	ITEM	STK / DCS #	DESCRIPTION 18 40 01 **	01
	A	23 66 031	Washer, Square for 3/4" Bolt	1
	B	23 52 254	Mach. Bolt, Galv., 3/4" x 16"	1
	C	23 59 095	Eyelet, for 3/4" Bolt	1
	D	23 59 042	Extension Link, 6"	1
	E	23 68 732	Bolted Deadend	1
	F	17 52 217	Clamp for Bonding OPGW Static to Pole Ground	1
	G	40 54 480	Coil Bracket	1
	H	23 52 200	Bolt, Mach., 5/8" x 4" w/ square nut	2
	I	23 52 031	Mach. Bolt, Galv., 1/2" x 3", w/ Nut	2
	J	40 54 478	Splice Enclosure	1
	K	17 60 734	Splice Protector Sleeve	10
	L	17 04 247	Connector Kit, UG Fiber Optic Cable	1
	M	40 54 481	Connector Kit, OPGW	1
	N	40 54 479	Furcation Kit, OPGW	2
	O	12 51 176	Conduit, PVC, Bend, 4" x 90°, 36" Radius, Sch. 40	1
	P	12 51 254	Bell End Fitting	1
	Q	23 66 027	Washer, Flat, Square 5/8"	2
	R	23 65 043	Lock Nut - 5/8" Square	2
10,17,@	S	12 01 230	Conduit, PVC, 1.5" x 10', Sch. 40	#
2,11,@	T	27 60 035	Strap, Iron Hanger	#
@	U	40 89 494	Nylon Zip Tie	#
@	V	12 01 278	Conduit, PVC, 4" x 10', Sch. 40	#
@	W	18 66 671	72-ct UG Fiber Optic Cable	#
3,4,@	X	17 52 221	Downlead Clamp	#
		17 52 228	Downlead Clamp	#
5,13,14,@	Y	12 01 338	HDPE Microduct, 3-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 339	HDPE Microduct, 7-Way, w/ 20 AWG Cu Tracer Wire	#
		12 01 341	HDPE Microduct, 4-Way, w/ 20 AWG Cu Tracer Wire	#
@	Z	27 59 087	72-ct OPGW 10,500ft Reel	#
		27 59 088	72-ct OPGW 21,000ft Reel	#

DESIGN NOTE(s):

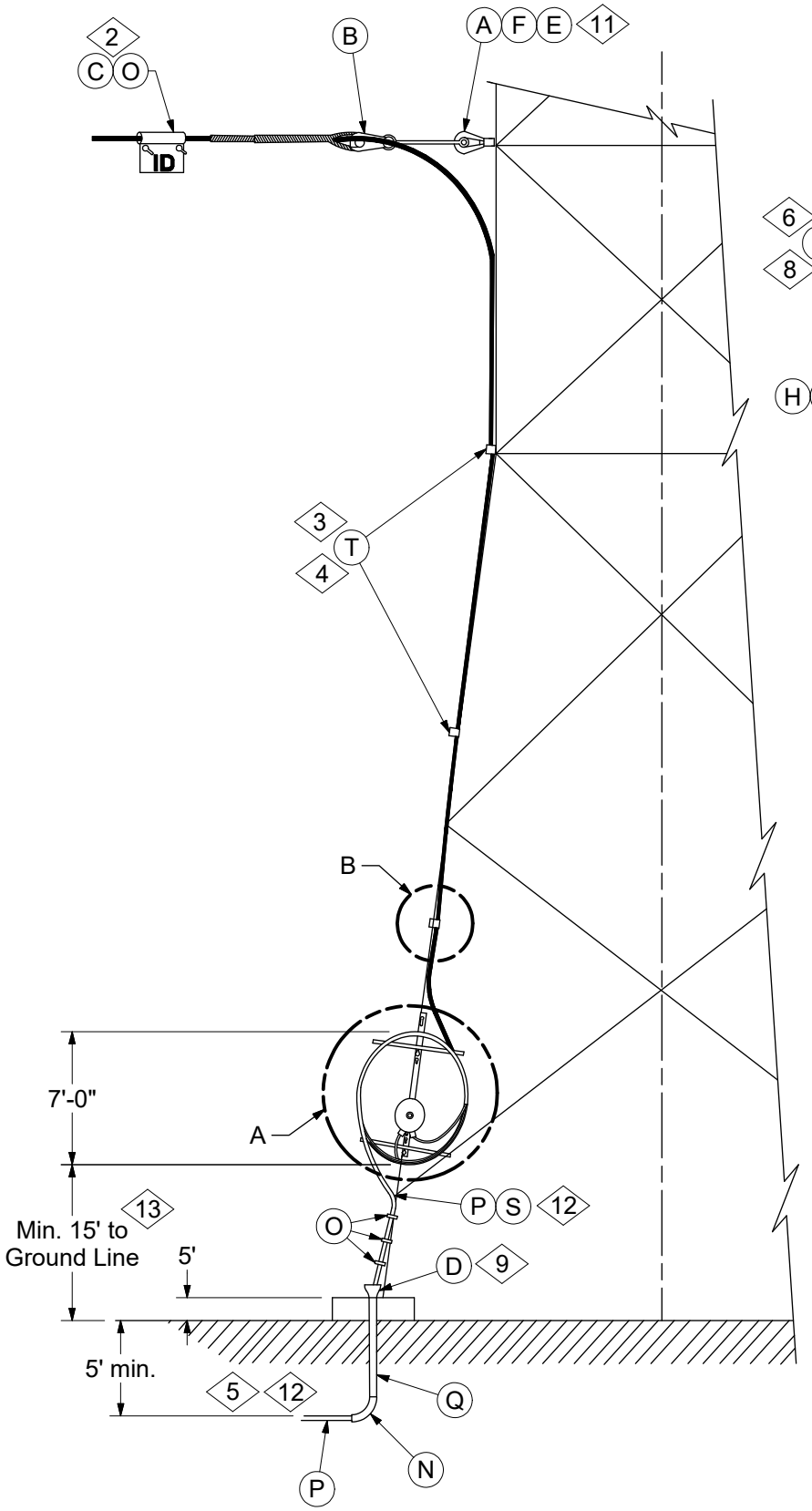
15. Bottom loop of coiled fiber optic cable shall be located a minimum of 15' above ground.

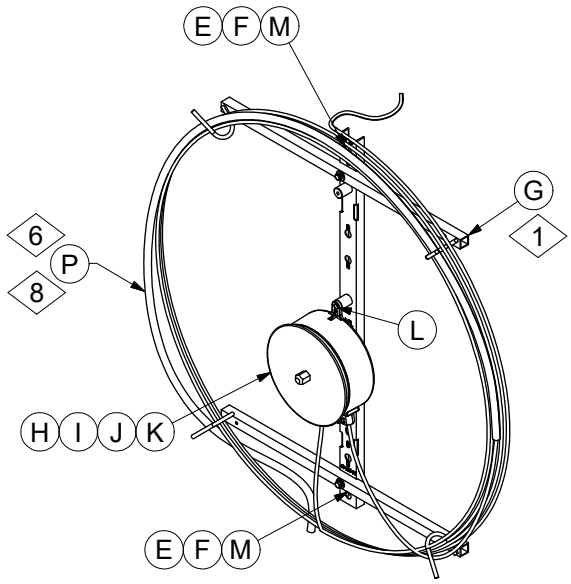
16. Spiral vibration dampers (Stock #23 67 319) are used on 350' and above spans only.

17. For alternate construction, call for split conduit: 2" (Stock #12 51 217), 3" (Stock #12 51 218), 4" (Stock #12 51 219), or 5" (Stock #12 51 220).

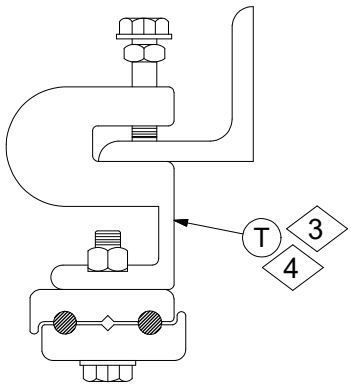
18. Use Stock #17 52 235 for OPGW to 110.8 ACSR and Stock #17 52 233 for OPGW to 1/0 AAAC connections.

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, drawing, & Notes
1	07/01/20	KR	





DETAIL A
Fiber Optic Splice Enclosure



DETAIL B
ADSS Downlead Clamp

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, drawing, & Notes
1	07/01/20	KR	

CONSTRUCTION NOTE(s):

1. Coil 100’ of extra fiber optic cable around coil bracket.
2. ADSS Tags should be attached with zip ties on overhead ADSS fiber optic cable within 10’ of pole.
3. Install downlead clamps every 10’.
4. For lattice tower web thickness greater than 0.75" use stock code (Stock #17 52 228). For web thickness less than 0.75" use stock code (Stock #17 52 221).
5. Where 3-, 4-, or 7-Way HDPE Microducts are not feasible, 1-1/4" HDPE conduit (Stock #12 01 334) may be used.
6. End caps (Stock #12 01 343) shall be installed on all unused microducts.
7. For any splicing or network communication issues please contact the DCC at (866) 896-0662.
8. Bring HDPE 1-1/4" conduit (Stock #12 01 334) or future path up the riser. Wrap HDPE conduit 3/4 turn (opening points down) around coil bracket and close unused microducts with ends caps (Stock #12 01 343).
9. Top of conduit may be sealed with polyurethane expanding foam (Stock #31 53 082). Expanding foam must be used with dispensing gun (Stock #85 20 073).
10. The NESC requires a minimum distance of 40" between the lowest point of the neutral/secondary bracket and the top of the coiled fiber. Bottom or top loops of coiled fiber must maintain 12" or greater clearance from other third party attachments.
11. Assemble items in order listed. Square nut provided with bolt is used after double coil washer. Double coil washer not needed on composite poles. Lock nuts must be placed after nut included with bolt stock number.
12. A combination of 1-1/4" HDPE conduit (Stock #12 01 334) and single microducts may be used in place of futurepath where necessary:
    - Single microduct (Stock #12 01 344)
    - LSZH microduct (Stock #12 01 345)

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, drawing, & Notes
1	07/01/20	KR	

	ITEM	STK / DCS #	DESCRIPTION 18 40 02 **	01	02
	A	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	1	1
	B	23 68 747	Formed Wire Deadend, 48-ct ADSS	1	-
		23 68 778	Formed Wire Deadend, 72-ct ADSS	-	1
	C	16 01 647	ID Tag, ADSS	1	1
	D	12 51 254	Bell End Fitting	1	1
	E	23 65 043	Lock Nut - 5/8" Square	3	3
	F	23 66 027	Washer, Flat, Square 5/8"	3	3
	G	40 54 480	Coil Bracket	1	1
	H	17 60 734	Splice Protector Sleeve	10	10
	I	40 54 478	Splice Enclosure	1	1
	J	17 62 293	Connector Kit, 48-ct ADSS	1	-
		17 62 296	Connector Kit, 72-ct ADSS	-	1
	K	17 04 247	Connector Kit, UG Fiber Optic Cable	1	1
	L	23 52 024	Machine Bolt, Galv., 1/2" x 1-1/4", w/ Nut	2	2
	M	23 52 200	Bolt, Mach., 5/8" x 4" w/ square nut	2	2
	N	12 51 176	Conduit, PVC, Bend, 4" x 90°, 36" Radius, Sch. 40	1	1
@	O	40 89 494	Nylon Zip Tie	#	#
	P	12 01 338	HDPE Microduct, 3-Way, w/ 20 AWG Cu Trace Wire	#	#
5,8,12,@		12 01 339	HDPE Microduct, 7-Way, w/ 20 AWG Cu Trace Wire	#	#
		12 01 341	HDPE Microduct, 4-Way, w/ 20 AWG Cu Trace Wire	#	#
@	Q	12 01 278	Conduit, PVC, 4" x 10', Sch. 40	#	#
@	R	27 59 084	72-ct ADSS	#	#
@	S	18 66 671	72-ct UG Fiber Optic Cable	#	#
	T	17 52 221	Downlead Clamp	#	#
3,4,@		17 52 228	Downlead Clamp	#	#

DESIGN NOTE(s):

13. Bottom loop of coiled fiber optic cable shall be located a minimum of 15' above ground.

REV	DATE	ENG	DESCRIPTION
2	01/01/23	KR	Updated BOM, drawing, & Notes
1	07/01/20	KR	

METER INSTALLATIONS 25

PRIMARY METERING INSTALLATIONS..... 25 00 01 01

PRIMARY METERING STRUCTURE - 1-PHASE OVERHEAD TO OVERHEAD LOAD SIDE - 5KV.....MO ONLY.... 25 04 01 00

PRIMARY METERING - 3-PHASE OVERHEAD TO OVERHEAD LOAD SIDE 3W & 4W SM-5 FUSE - 5KV.....MO ONLY.... 25 04 10 **

PRIMARY METERING - 1-PHASE OVERHEAD TO OVERHEAD & UNDERGROUND LOAD SIDE - 15kV.....MO ONLY.... 25 12 01 **

PRIMARY METERING STRUCTURE - 3-PHASE OVERHEAD TO UNDERGROUND LOAD SIDE 3W & 4W 200 AMP - 15kV.....MO ONLY.... 25 12 07 **

PRIMARY METERING STRUCTURE - 3-PHASE OVERHEAD TO UNDERGROUND LOAD SIDE 4W SM-5 FUSE - 5kV, 15kV.....MO ONLY.... 25 12 08 01

PRIMARY METERING STRUCTURE - 3-PHASE OVERHEAD TO OVERHEAD LOAD SIDE 3W & 4W 200 AMP - 5kV, 15kV.....MO ONLY.... 25 12 09 **

PRIMARY METERING STRUCTURE - UNDERGROUND 3-PH 3W - 5kV, 15kV.....IL ONLY.... 25 12 10 **

PRIMARY METERING STRUCTURE - OVERHEAD 3-PH 3W - 5kV, 15kV.....IL ONLY.... 25 12 15 **

PRIMARY METERING STRUCTURE - 3-PH 4W PREFERRED - CT/PT COMBO UNIT - 5kV, 15kV.....IL ONLY.... 25 12 20 01

RETAIL/WHOLESALE CUSTOMER OWNED PRIMARY STRUCTURE - W/MAIN DISCONNECT/OVERHEAD PROTECTION - 5kV, 15kV.....IL ONLY.... 25 12 30 **

RETAIL/WHOLESALE CUSTOMER OWNED PRIMARY STRUCTURE - W/MAIN DISCONNECT/UNDERGROUND PROTECTION - 5kV, 15kV.....IL ONLY.... 25 12 31 **

PRIMARY METERING STRUCTURE - 3-PHASE OVERHEAD 3W - 35kV.....MO ONLY.... 25 34 01 00

PRIMARY METERING STRUCTURE - OVERHEAD 3-PH 3W - 35kV.....IL ONLY.... 25 34 02 00

PRIMARY METERING STRUCTURE - OVERHEAD 3-PH 4W - 35kV.....IL ONLY.... 25 34 02 01

PRIMARY METERING STRUCTURE - 3-PHASE OVERHEAD 3W - 69kV.....MO ONLY.... 25 69 01 00

PRIMARY METERING STRUCTURE - OVERHEAD 3-PH 3W - 69kV.....IL ONLY.... 25 69 02 00

PRIMARY METERING STRUCTURE - OVERHEAD 3-PH 4W - 69kV.....IL ONLY.... 25 69 02 01

AMI/AMR INSTALLATIONS - CLEARANCE REQUIREMENTS..... 25 90 00 00

AMI ROUTER INSTALLATIONS - AMI ROUTER AND WOOD POLE MOUNTING BRACKET..... 25 91 10 00

AMI ROUTER INSTALLATIONS - WOOD POLE MOUNTING WITH SECONDARY ONLY..... 25 91 10 01

AMI ROUTER INSTALLATIONS - WOOD POLE MOUNTING WITH TRANSFORMER..... 25 91 10 02

AMI AUXILIARY DEVICES - FUSED DISCONNECT SWITCH FOR COLLECTOR INSTALLATIONS..... 25 91 50 02

AMI AUXILIARY DEVICES - POLE TOP ANTENNA ARRESTER CONNECTIONS..... 25 91 50 03

SMART METER NETWORK GATEWAY INSTALLATIONS - WOOD POLE MOUNTING WITH SECONDARY ONLY..... 25 92 00 **

SMART METER NETWORK GATEWAY WITH SECTOR ANTENNA - WOOD POLE MOUNTING IN SUPPLY SPACE WITH COMMUNICATION.....25 92 01 00

SMART METER NETWORK GATEWAY INSTALLATIONS - STREET LIGHT BRACKET MOUNTING.....25 92 01 01

SMART METER NETWORK GATEWAY WITH SECTOR ANTENNA - WOOD POLE MOUNTING WITH SECONDARY ONLY.....25 92 02 00

SMART METER NETWORK GATEWAY WITH SECTOR ANTENNA - WOOD POLE MOUNTING IN SUPPLY SPACE WITH COMMUNICATION.....25 92 02 01

SMART METER NETWORK GATEWAY WITH SECTOR ANTENNA - WOOD POLE MOUNTING IN COMMUNICATION.....25 92 03 01

SMART METER NETWORK GATEWAY INSTALLATIONS - STREETLIGHT MOUNTING.....25 92 10 00

SMART METER NETWORK GATEWAY WITH SECTOR ANTENNA - STREETLIGHT MOUNTING.....25 92 10 02

SMART METER ROUTER INSTALLATION - STREETLIGHT MOUNTING.....25 92 11 **

AMI SMART METER ROUTER - PEDESTAL INSTALLATIONS.....25 92 20 00

Primary metering pole mounted installations may be either Company owned, or Customer owned. These installations are generally applicable to large lighting and power loads.

1. Company Owned - Illinois

   If the station being primary metered is owned by Ameren, all necessary equipment will be furnished and installed by Ameren.

2. Customer Owned - Missouri

   A. If the station being primary metered is owned by the customer, the customer must furnish and install the following equipment. This equipment shall be installed in accordance with appropriate Ameren Primary Metering Standards.

      a. Pole

      b. Pole framing

      c. Switches

      d. Lightning arresters

      e. All primary wiring including electrical rated pvc conduit when required, except that Ameren will connect the customer's primary leads to the supply conductors and to the current and potential transformers. The customer must leave sufficient lengths of wire for making these connections.

      f. Secondary wiring when required; Ameren will make connections to Secondary Supply. The customer must leave sufficient lengths of wire for making these connections.

   B. Ameren will furnish and install the following equipment will complete metering connections.

      a. Devices to connect customer's primary or secondary leads to the supply conductors.

      b. Current, potential transformers, cluster mounting, and bracket.

      c. Devices to connect customer's primary wiring to current and potential transformers.

      d. Meter enclosure, meter, and mounting framework.

      e. All metering wiring including conduit to connect current and potential transformers to the meter.

3. Ameren Meter Department

   Ameren's Meter Department must be notified of job as early as possible to insure availability of equipment to be provided; includes metering enclosures and transformers - cluster mounts or units, are shop wired.

REV	DATE	ENG	DESCRIPTION
3	01/01/24	WYW	Converted to new format
2	09/22/11	WYW	

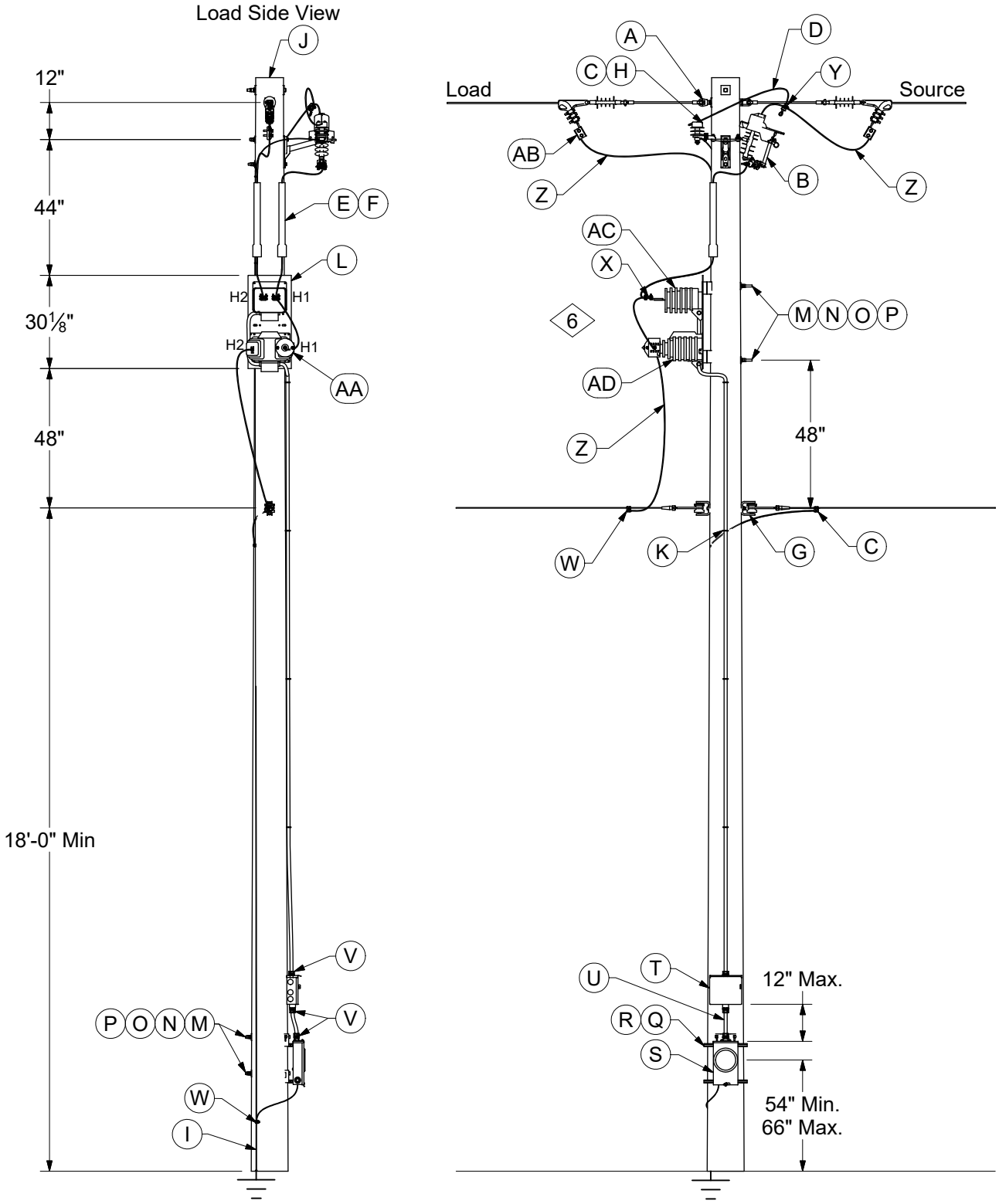
METER INSTALLATIONS

Primary Meter Structure

1-Phase Overhead to Overhead Load Side

25 04 01 00
5kV
1 of 3

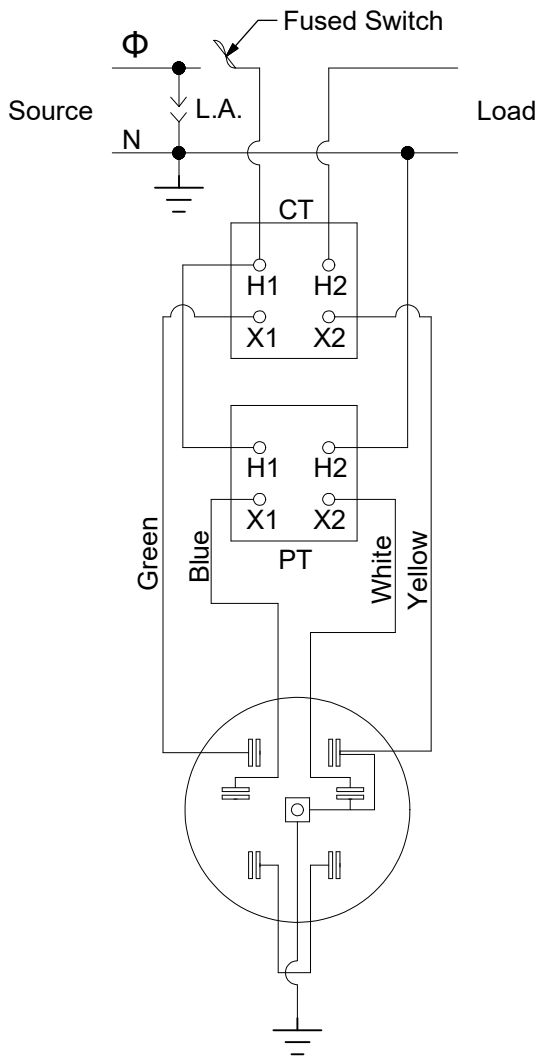
MISSOURI ONLY



DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
9	01/01/24	WYW	Converted to new format
8	09/23/11	WYW	

MISSOURI ONLY



Meter Socket
Wiring Diagram

CONSTRUCTION NOTE(s):

1. Ground instrument transformer cases.
2. Metering equipment should be within reach of a 29'-0" extension ladder.
3. If metered primary exceeds 2 spans, additional arresters must be installed on first pole beyond meter pole.
4. When meter pole is on customer property, a disconnect switch shall be provided one span before.
5. Secondary wire lead on meter cluster is 30'-0" standard length. For taller poles, special order meter cluster with longer lead to meet max. height requirement for connection box.

◇6.◇ CT is installed above the PT.

REV	DATE	ENG	DESCRIPTION
9	01/01/24	WYW	Converted to new format
8	09/23/11	WYW	

MISSOURI ONLY

	ITEM	STK / DCS #	DESCRIPTION - Customer Provides and Installs Material 25 04 01 **	00
	A	**06 12 30 03 @**	Double Deadend with FG Extensions	1
	B	**10 12 01 01 @**	Switch, Fused, Open Type	1
	C	17 54 004	Connector - Split Bolt, #4 Sol Cu. Thru #8 Sol Cu.	2
	D	18 51 021	Wire, #6 Cu. Covered, S.D. (ft.)	35
	E	12 01 178	Conduit − Plastic, 2”	2
	F	27 60 035	Iron Hanger (ft.)	5
	G	**06 01 01 02**	Clevis - Secondary	2
	H	10 01 133	Arrester, Lightning, 3kV	1
@	I	**12 00 10 ****	Grounding Unit	1
@	J	**02 00 02 01**	Pole	1

	ITEM	STK / DCS #	DESCRIPTION - Ameren Provides and Installs Material 25 04 01 **	00
	K	23 64 033	Staple - Coated Steel 1-1/2" x 3"	4
	L	69 04 112	CT/PT Metering Platform	1
	M	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	4
	N	23 66 027	Washer, Flat, Square 5/8"	4
	O	23 66 134	Lock Washer - 5/8" Double Coil	4
	P	23 65 043	Lock Nut - 5/8" Square	4
	Q	62 51 563	Bracket - Meter Socket Hanging	2
	R	23 60 007	Lag Screw - 1/2" x 4"	2
	S	40 04 210	Meter Enclosure	1
	T	40 01 120	Box - Secondary Connection	1
	U	40 02 054	Conduit 1", Flex (ft.)	1
	V	40 53 612	Conduit - Connector 1" Steel	3
	W	17 54 373	Connector - Split Bolt, #14 AWG Str. to #2 AWG Str.	2
	X	17 54 303	Connector, Cable to Flat, #6-2/0	2
	Y	23 78 394	Clamp, Hot Line	1
	Z	18 53 018	Wire, #2 Cu., Covered, S.D., 5kV (ft.)	30
	AA	69 58 296	Guard, Wildlife, PT (H1) Bushing	1
@	AB	**07 00 25 00 @**	Clamp, Parallel Groove	2
@	AC	Meter Shop	Current Transformer	1
@	AD	Meter Shop	Potential Transformer	1
		285	Op Code, Install Primary Metering	1

REV	DATE	ENG	DESCRIPTION
9	01/01/24	WYW	Converted to new format
8	09/23/11	WYW	

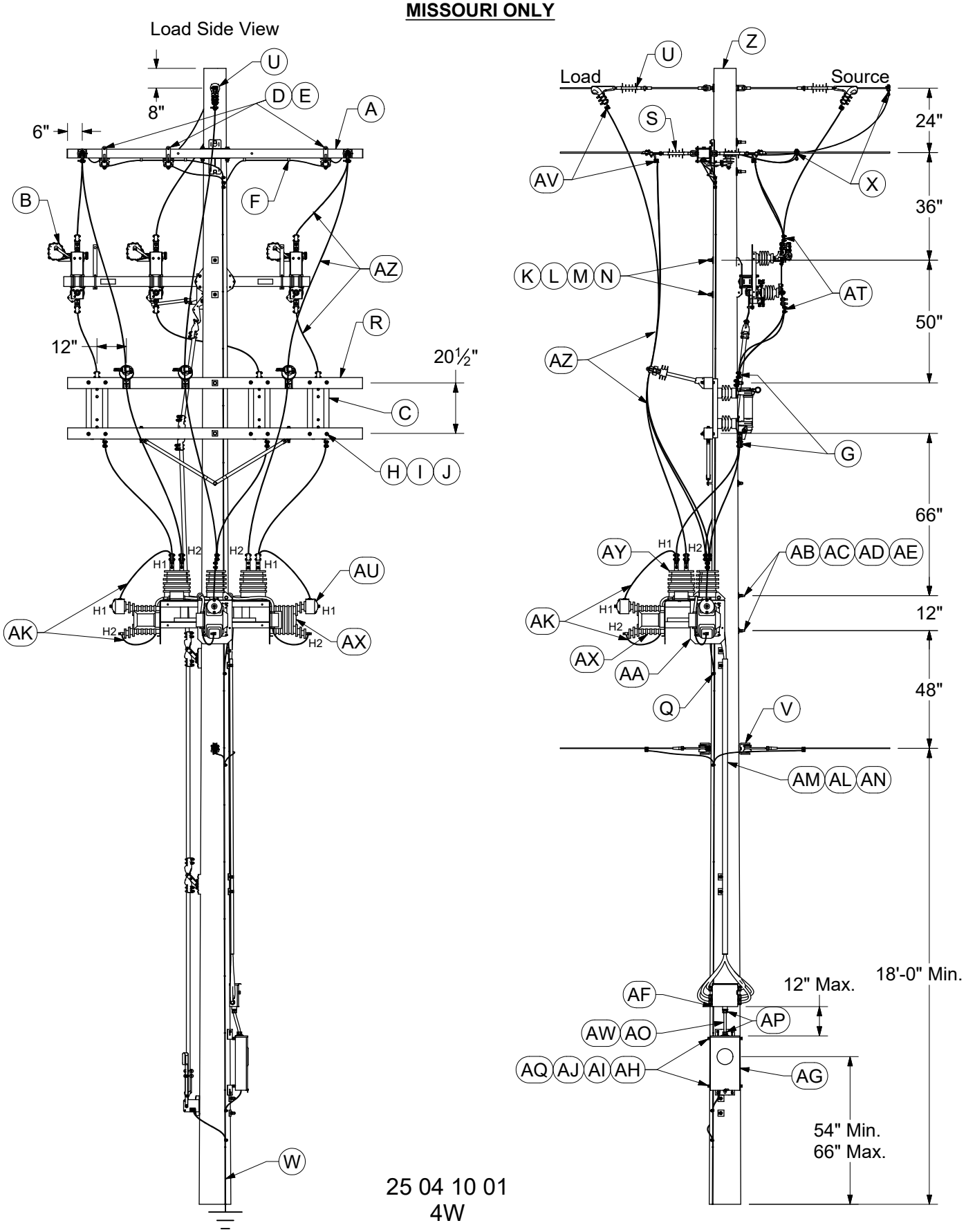
METER INSTALLATIONS

Primary Meter Structure

3-Phase OH to OH Load Side 3W & 4W SM-5 Fuse

25 04 10 **
5kV
1 of 6

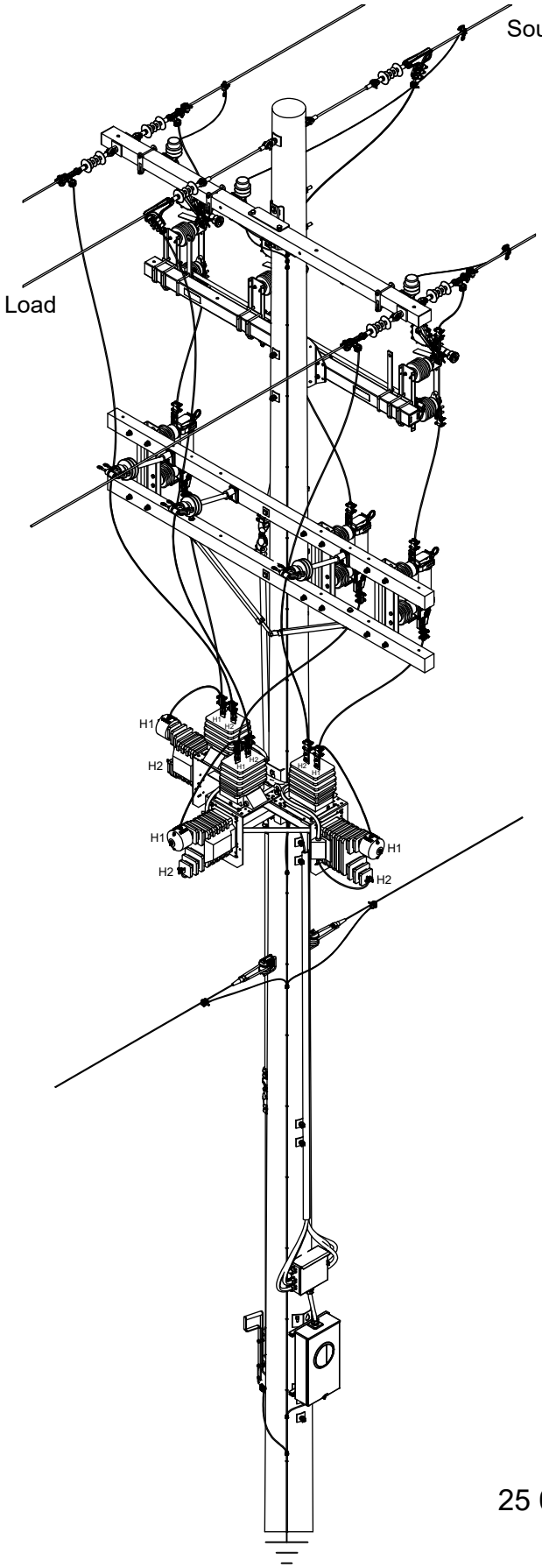
MISSOURI ONLY

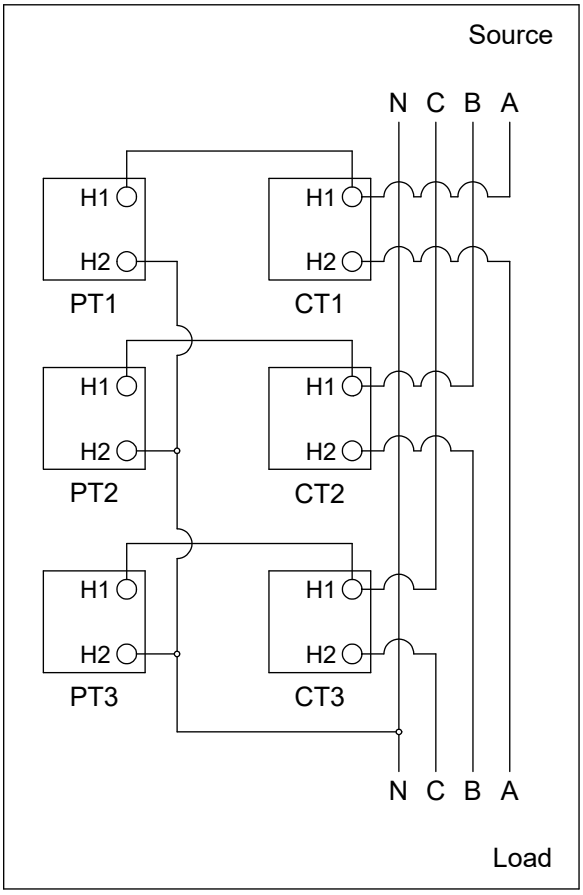


25 04 10 01
4W

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
12	01/01/24	WYW	Converted to new format
11	05/01/12	WYW	

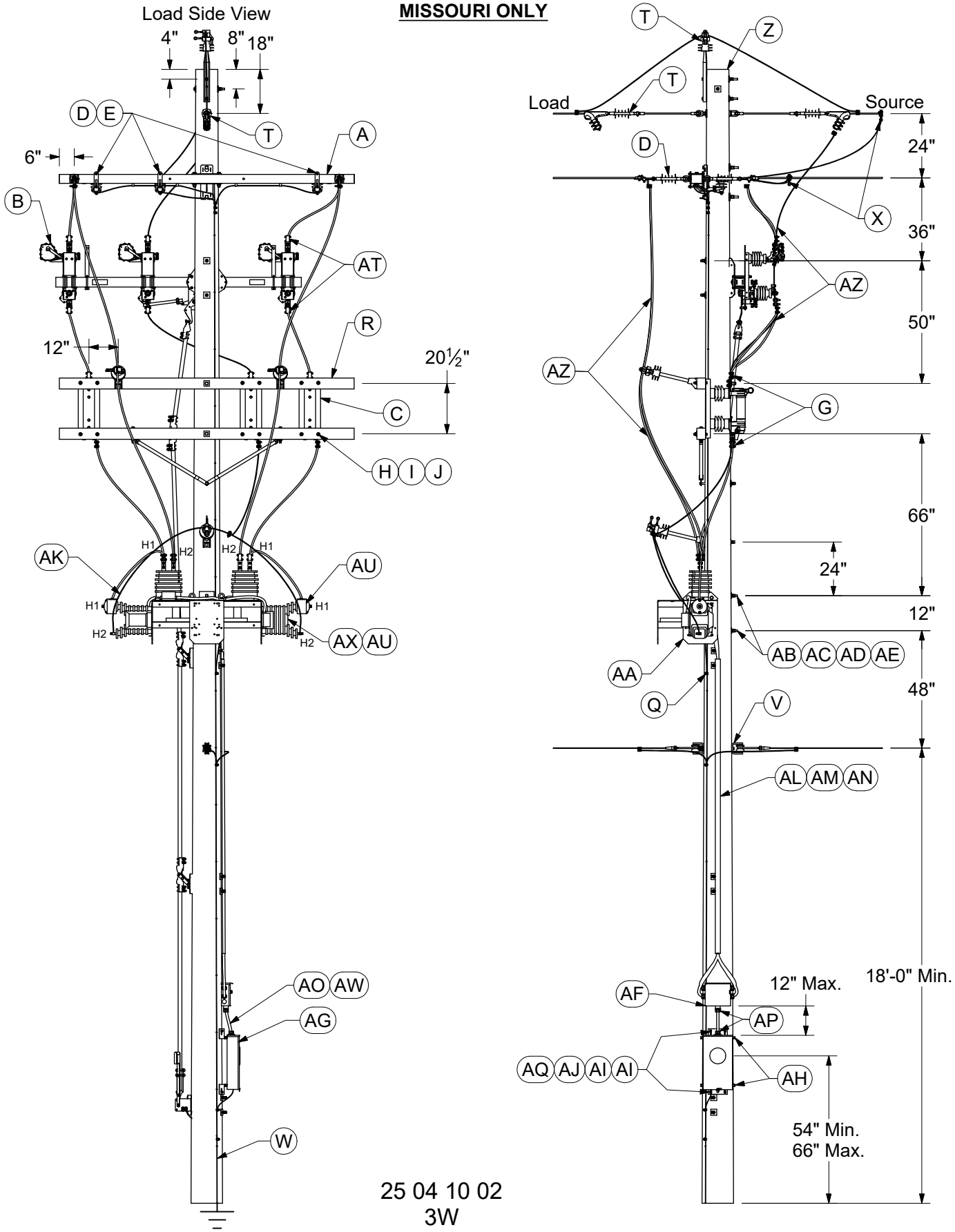




25 04 10 01
4W

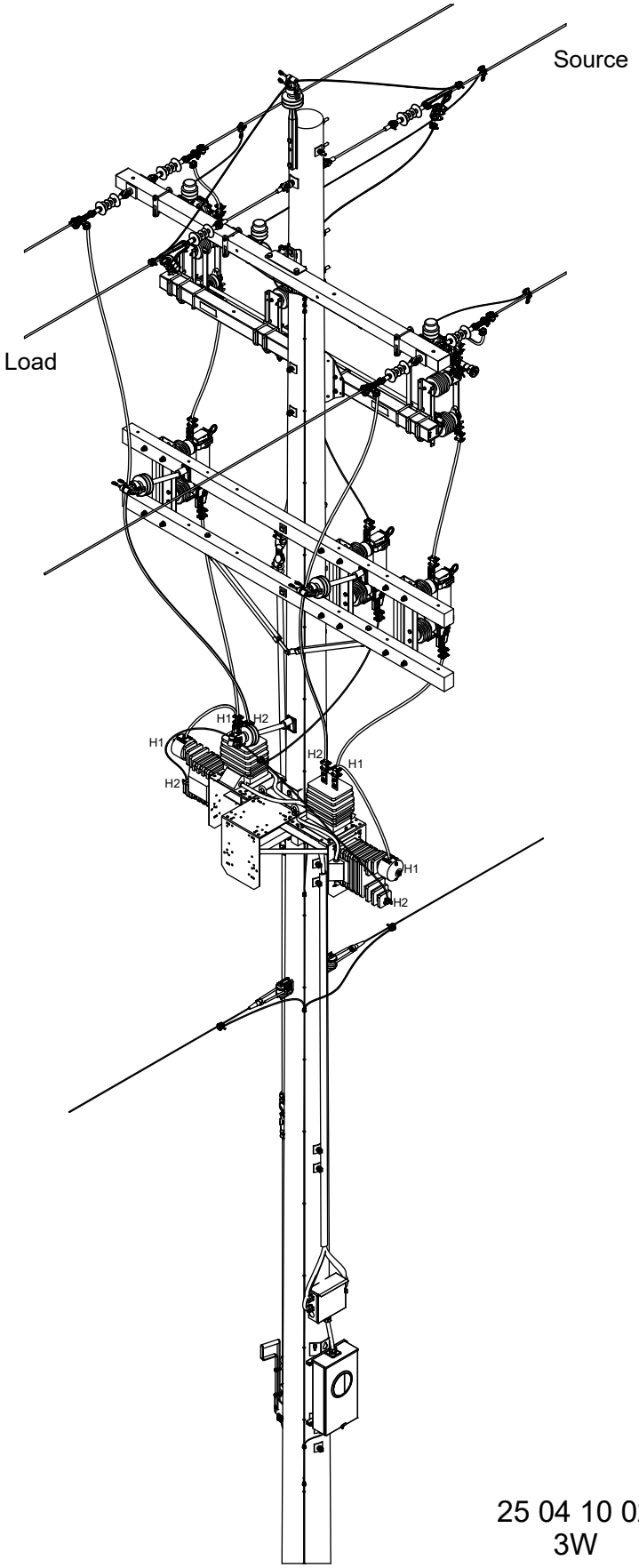
REV	DATE	ENG	DESCRIPTION
12	01/01/24	WYW	Converted to new format
11	05/01/12	WYW	

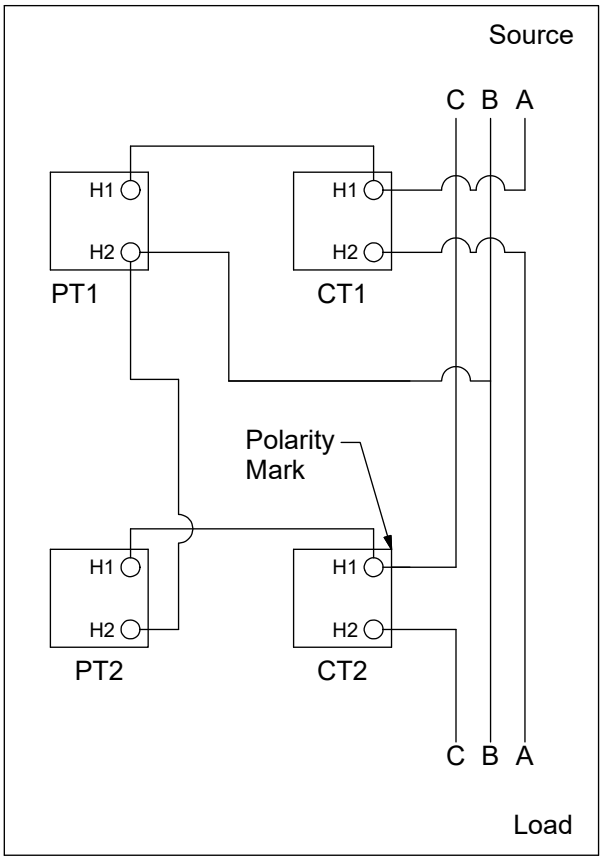
MISSOURI ONLY



25 04 10 02
3W

REV	DATE	ENG	DESCRIPTION
12	01/01/24	WYW	Converted to new format
11	05/01/12	WYW	





25 04 10 02
3W

REV	DATE	ENG	DESCRIPTION
12	01/01/24	WYW	Converted to new format
11	05/01/12	WYW	

DCS #	DESCRIPTION
25 04 10 01	5kV, 3-Ph, 4W
25 04 10 02	5kV, 3-Ph, 3W

CONSTRUCTION NOTE(s):

1. When meter pole is on customer property, switch shall be provided one span before.

2. Secondary wire lead on meter cluster is 30'-0" standard length. For tall poles, special order meter cluster with longer lead to meet maximum height requirement for connection box.

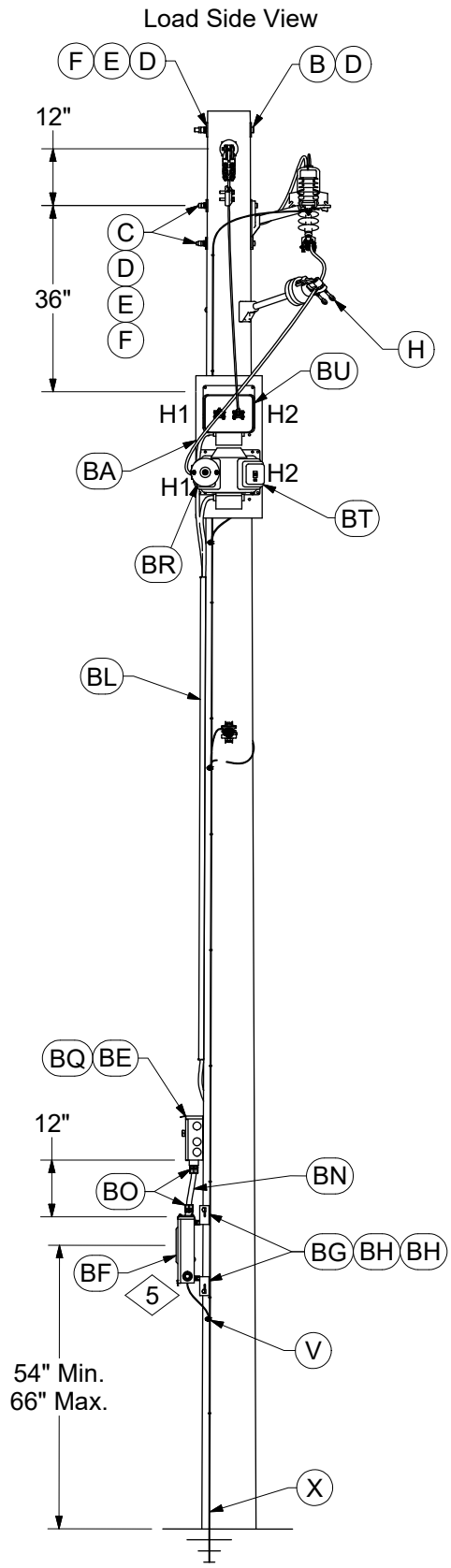
	ITEM	STK / DCS #	DESCRIPTION - Customer Provides and Installs Material 25 04 10 **	01	02
	A	**04 00 42 03 @**	Crossarm, Deadend, FG, 10'	1	1
	B	54 07 239	Switch - 15kV, Group Operated	1	1
	C	54 03 051	Switch, 15kV, SM-5 Fuse Mounting, 400A	3	3
	D	10 01 133	Arrester, Lightning, 3 kV	3	3
	E	17 58 054	Bracket, Arrester/Cutout Mounting	3	3
	F	23 68 746	Grounding Clip	4	4
	G	17 54 303	Connector - Cable to Flat, #6-2/0	12	12
	H	23 52 036	Bolt, Mach., 1/2" x 5" w/ square nut	12	12
	I	23 66 133	Lock Washer - Double Coil 1/2"	12	12
	J	23 65 056	Lock Nut - 1/2" Square	12	12
	K	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	2	2
	L	23 66 207	Washer, Curved, Square, 5/8"	2	2
	M	23 66 134	Lock Washer - 5/8" Double Coil	2	2
	N	23 65 043	Lock Nut - 5/8" Square	2	2
	O	17 54 127	Clamp, PG, Bronze, Cable to Flat, #8 Sol to #4 Str Wire for 3/8" bolt	1	1
	P	18 51 021	Wire, #6 Cu, S.D., Covered (ft.)	35	35
	Q	17 54 004	Connector - Split Bolt, #4 Sol to #8 Sol Cu	4	4
	R	**04 00 20 03 @**	Crossarm, Wood, 10'	2	2
	S	**06 12 35 02 @**	Double Deadend on Crossarm	2	2
	T	**06 12 30 04 @**	Pole Top, Loopover w/ FG Extension	-	1
	U	**06 12 30 03 @**	Double Deadend on Pole, FG Extensions	1	-
	V	**06 01 01 02**	Double Clevis	1	1
@	W	**12 00 10 ****	Grounding Unit	1	1
@	X	**07 00 21 00 @**	Clamp, Hotline	3	3
@	Y	**10 00 01 01 @**	Fuse Refill for SM-5 (Size by Engineering)	3	3
@	Z	**02 00 02 01**	Pole	1	1

REV	DATE	ENG	DESCRIPTION
12	01/01/24	WYW	Converted to new format
11	05/01/12	WYW	

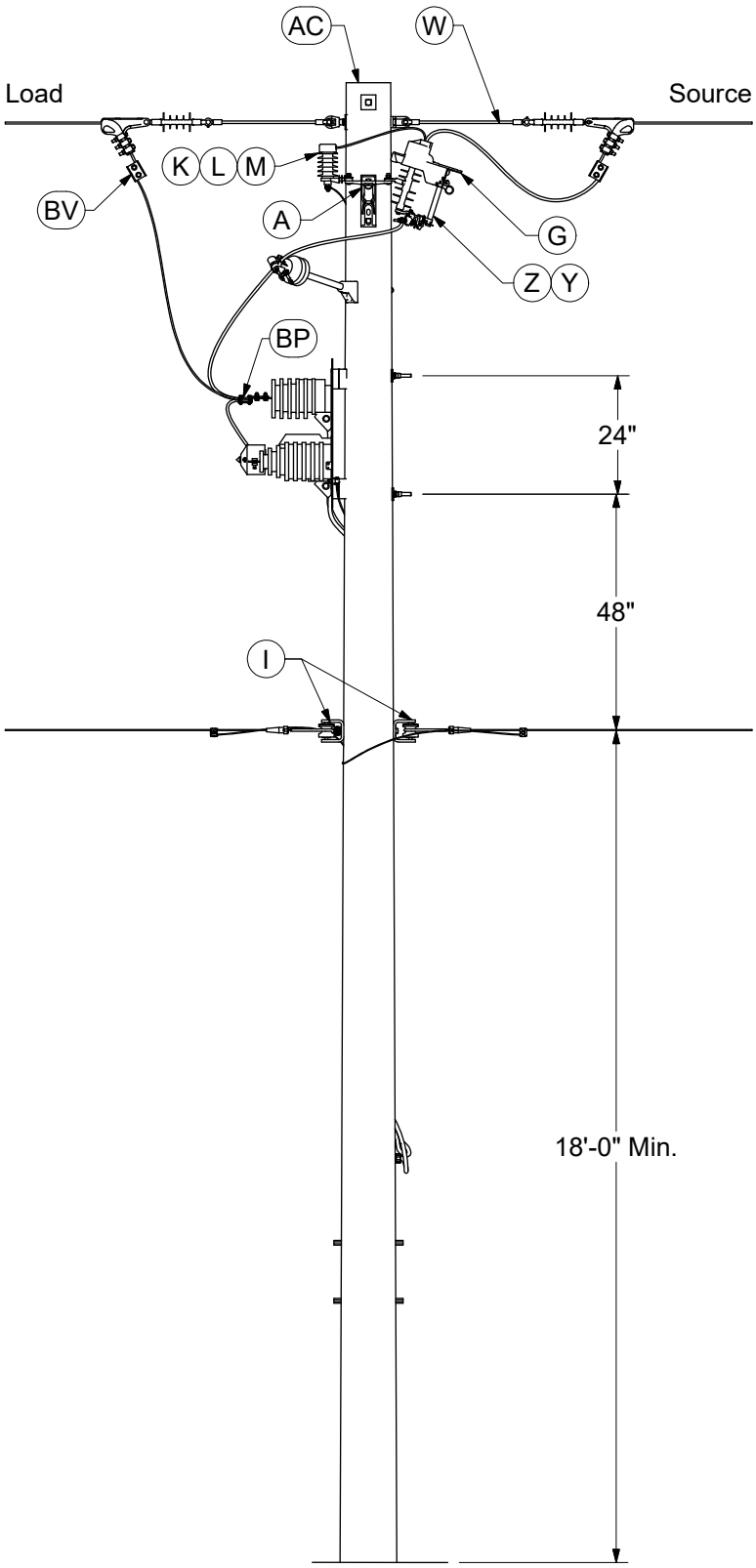
MISSOURI ONLY

	ITEM	STK / DCS #	DESCRIPTION - Ameren Provides and Installs Material 25 04 10 **	01	02
	AA	23 17 294	Mounting - Primary Metering Unit, Cluster Mount for Three Phase	1	1
	AB	23 52 068	Bolt, Mach., 5/8" x 16" w/ Square Nut	2	2
	AC	23 66 207	Washer, Curved, Square, 5/8"	2	2
	AD	23 66 134	Lock Washer - 5/8" Double Coil	2	2
	AE	23 65 043	Lock Nut - 5/8" Square	2	2
	AF	40 01 120	Enclosure - Secondary Connection	1	1
	AG	40 04 245	Socket, Meter, 600 V, 3 Phase, 4 wire	1	-
		40 04 246	Socket, Meter, 600 V, 3 Phase, 3 Wire	-	1
	AH	62 51 563	Bracket - Meter Socket Hanging	2	2
	AI	23 60 007	Lag Screw - 1/2" x 4"	6	6
	AJ	23 65 056	Lock Nut - 1/2" Square	6	6
	AK	18 53 018	Wire, #2 Cu, S.D., 5kV (ft.)	30	60
	AL	18 11 065	Cord, Hrd Srv, 2-#14 Cu, 600V	180	120
	AM	12 51 217	Conduit - PVC, Split, 2" x 10'	1	1
	AN	27 60 035	Iron Hanger, Galv., 3/4" wide (ft.)	2	2
	AO	12 51 303	Conduit, Flex, 1", Steel	2	2
	AP	40 53 612	Conduit - Connector 1" Steel	2	2
	AQ	21 66 039	Screw, Cap, Hex Head, 3/8" - 16 TPI x 2"	2	2
	AR	17 54 004	Connector, Split Bolt, #4 Sol Cu to #8 Sol Cu	4	4
	AS	17 54 303	Connector, Cable to Flat #4 to 250 kcmil, Spade Type, Bronze	6	6
	AT	17 05 195	Lug - Compression, 500 kcmil, 600V	6	6
	AU	69 58 296	Guard, Wildlife, PT (H1) Bushing	3	5
@	AV	**07 00 25 00 @**	Clamp, Parallel Groove, PG*	6	5
@	AW	Meter Shop	Wire Pack, Color Coded, 10-#12 (ft.)	5	2
@	AX	Meter Shop	Potential Transformer	3	2
@	AY	Meter Shop	Current Transformer	3	2
@	AZ	**07 00 80 00 @**	Lead Wire, PH (ft.)	#	#
		286	Op Code, Install Primary Metering	1	1

REV	DATE	ENG	DESCRIPTION
12	01/01/24	WYW	Converted to new format
11	05/01/12	WYW	

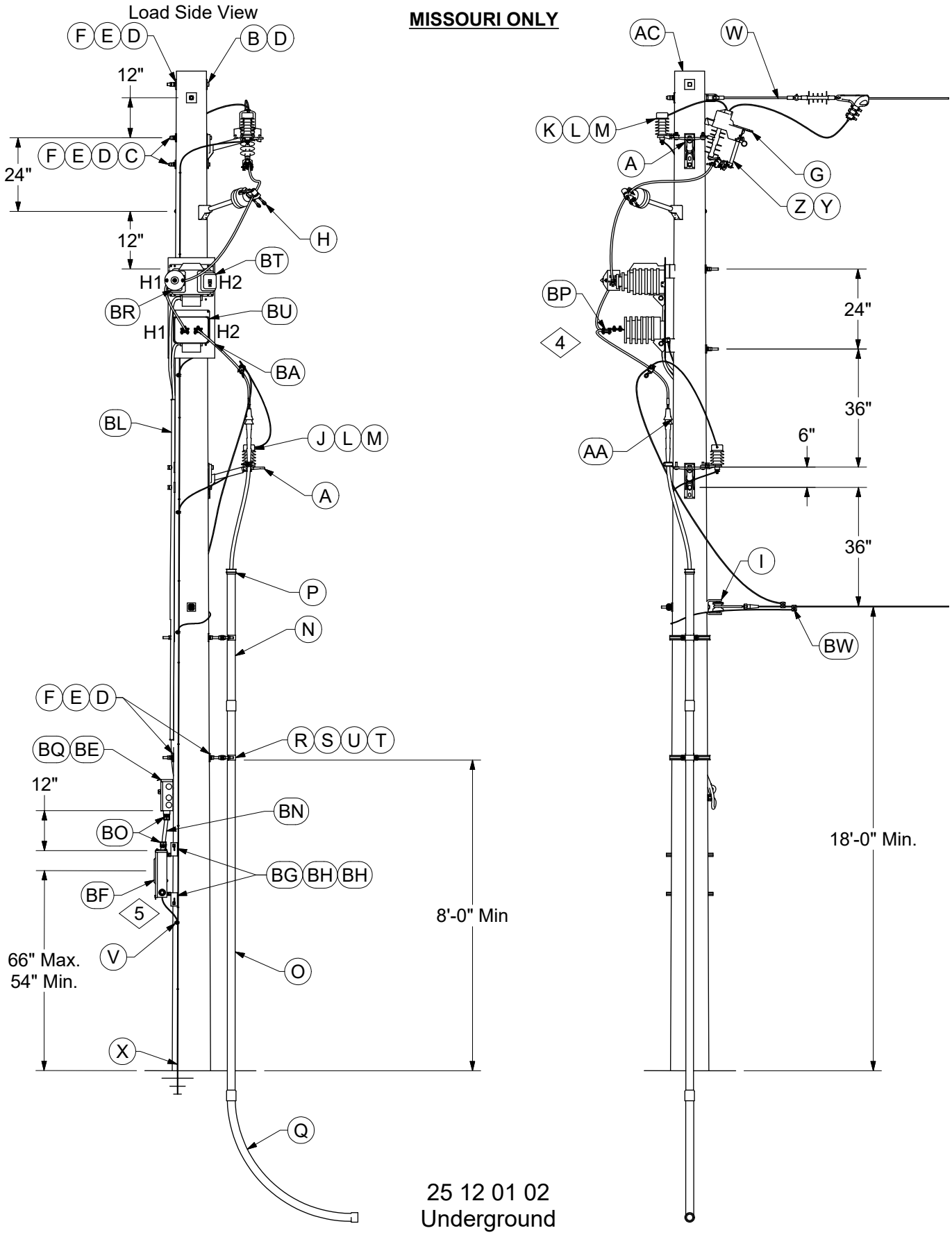


MISSOURI ONLY



25 12 01 01
Overhead

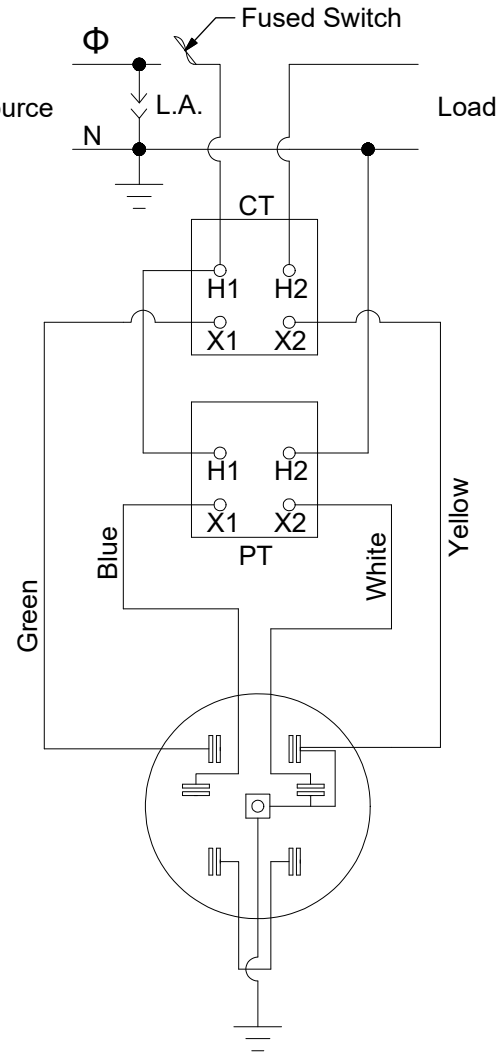
REV	DATE	ENG	DESCRIPTION
9	01/01/24	WYW	Converted to new format
8	05/01/12	WYW	



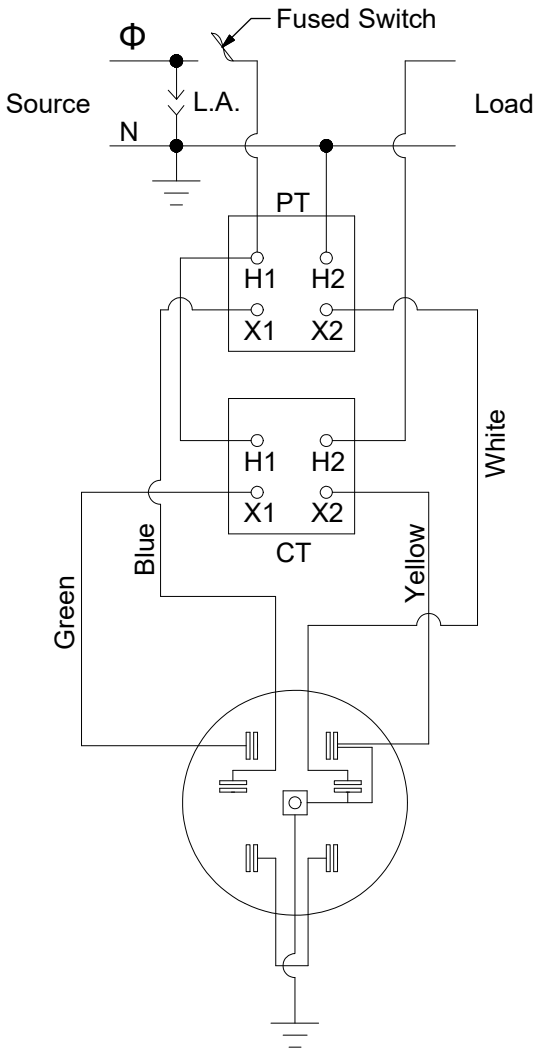
25 12 01 02
Underground

REV	DATE	ENG	DESCRIPTION
9	01/01/24	WYW	Converted to new format
8	05/01/12	WYW	

MISSOURI ONLY



25 12 01 01



25 12 01 02

CONSTRUCTION NOTE(s):

1. Ground all instrument transformers.
2. If metered primary exceeds two spans, additional pole arresters must be installed on first pole beyond meter pole.
3. Ground clearance 4'-0". Barriers shall be installed for protection against vehicular traffic if necessary.
4. P.T. is installed above the C.T.
5. Rotate grounding unit and meter enclosure to give best clearance and climbing space.
6. When meter pole is located on customer property, disconnect switches shall be provided one span before.
7. Secondary wire lead on meter cluster is 30'-0" standard length. For tall poles, special order meter cluster with longer lead to meet max. height requirement for connection box.

REV	DATE	ENG	DESCRIPTION
9	01/01/24	WYW	Converted to new format
8	05/01/12	WYW	

MISSOURI ONLY

	ITEM	STK / DCS #	DESCRIPTION - Customer Provides and Installs Material 25 12 01 **	01	02
	A	23 56 063	Bracket - Equipment Mount 3 Position	1	2
	B	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	1	1
	C	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	2	5
	D	23 66 207	Washer, Curved, Square, 5/8"	4	12
	E	23 66 134	Lock Washer - 5/8" Double Coil	4	12
	F	23 65 043	Lock Nut - 5/8" Square	4	12
	G	23 17 411	Wildlife Guard - Cover Cutout	1	1
	H	**06 12 20 04**	Insulator, Standoff, 18"	1	1
	I	**06 01 01 01**	Clevis - Secondary	2	1
	J	10 01 129	Arrester, Lightning, Terminal Pole, 9kV	-	1
	K	10 01 144	Arrester, Lightning, 10kV	1	1
	L	18 51 021	Wire, #6 Cu, S.D., Covered (ft.)	12	12
	M	23 78 394	Clamp, Hotline, #6 to 2/0	1	2
	N	12 01 280	Conduit - 2" Schedule 40 (ft.)	-	20
	O	12 01 275	Conduit - 2" Schedule 80 (ft.)	-	10
	P	40 83 491	Conduit - Coupling 2" Bell End	-	1
	Q	12 51 180	Conduit - Bend 2", 36" Rad	-	1
	R	23 67 190	Strap - Conduit 2" w/2" Bolts	-	2
	S	23 65 053	Nut - 5/8" Jam	-	2
	T	23 53 003	Bolt, DA, 5/8" Dia x 18" w/ 4 square nuts	-	2
	U	23 06 087	Bracket - Standoff, 12"	-	2
	V	17 53 003	Connector, Split Bolt, #4 Sol Cu to #8 Sol Cu	2	2
	W	**06 12 30 03 @**	Double Deadend w/ FG Extensions	1	-
		06 12 30 01 @	Straight Deadend w/ FG Extension	-	1
@	X	**12 00 10 ** **	Grounding Unit	1	1
@	Y	**10 00 01 01 @**	Fuse Sized by Engineer	1	1
@	Z	54 07 208	Switch, Fused, 100A, 15kV	1	1
		54 07 209	Switch, Fused, 200A, 15kV	1	1
@	AA	**42 34 59 01**	Termination, 15kV, #2	-	1
		42 34 59 03	Termination, 15kV, 4/0	-	1
@	AB	18 07 239	Cable, 15kV, 4/0 (ft.)	-	35
		18 17 238	Cable, 15kV, #2 (ft.)	-	35
@	AC	**02 00 02 01**	Pole	1	1

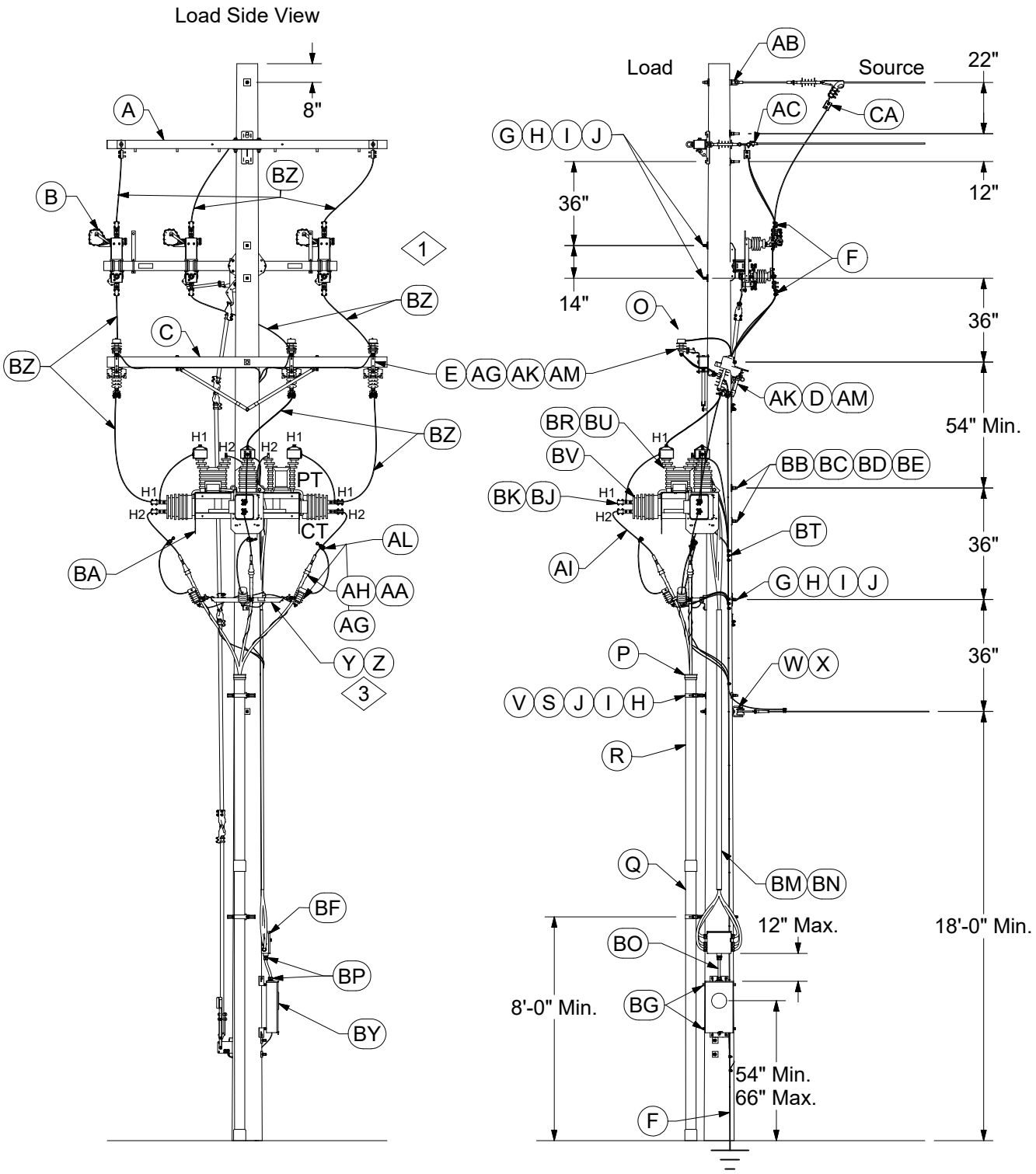
REV	DATE	ENG	DESCRIPTION
9	01/01/24	WYW	Converted to new format
8	05/01/12	WYW	

MISSOURI ONLY

	ITEM	STK / DCS #	DESCRIPTION - Ameren Provides and Installs Material 25 12 01 **	01	02
	BA	69 04 112	CT/PT Metering Platform	1	1
	BB	23 66 134	Lock Washer - 5/8" Double Coil	2	2
	BC	23 65 043	Lock Nut - 5/8" Square	2	2
	BD	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	2	2
	BE	40 01 120	Box - Secondary Connection	1	1
	BF	40 04 210	Meter Enclosure	1	1
	BG	62 51 563	Bracket - Meter Socket Hanging	2	2
	BH	23 60 007	Lag Screw - 1/2" x 4"	4	4
	BI	23 65 056	Lock Nut - 1/2" Square	2	2
	BJ	18 51 019	Wire, #2 Cu, Covered, S.D., 15kV (ft.)	30	30
	BK	18 11 065	Cord, Hrd Srv, 2-#14 Cu, 600V	30	30
	BL	12 51 217	Conduit - 2" Split SCH 40	1	1
	BM	27 60 035	Iron Hanger, Galv., 3/4" Wide (ft.)	2	2
	BN	12 51 303	Conduit, Flex, 1", Non-Metallic	1	1
	BO	40 53 612	Conduit - Connector 1" Steel	2	2
	BP	17 54 303	Connector - Cable to Flat, #6-2/0	2	2
	BQ	21 66 039	Screw, Hex Head Cap, 3/8”x2”	4	4
	BR	69 58 296	Wildlife Guard - Transformer Bushing Cover	1	1
@	BS	Meter Shop	Wire Pack, Color Coded, 10-#12 (ft.)	5	5
@	BT	Meter Shop	Potential Transformer	1	1
@	BU	Meter Shop	Current Transformer	1	1
@	BV	**07 00 80 00 @**	Lead Wire, PH (ft.)	#	#
@	BW	**07 00 25 00 @**	Clamp, Parallel Groove	6	6
		285	Op Code, Install Primary Metering	1	1

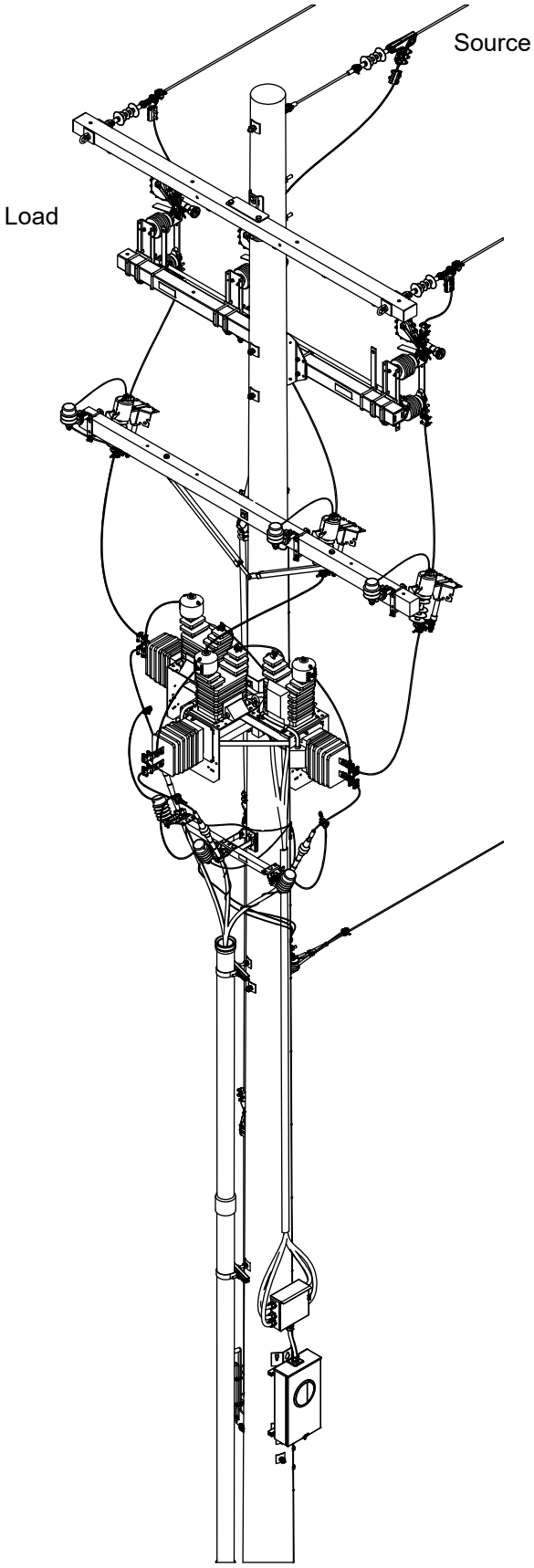
REV	DATE	ENG	DESCRIPTION
9	01/01/24	WYW	Converted to new format
8	05/01/12	WYW	

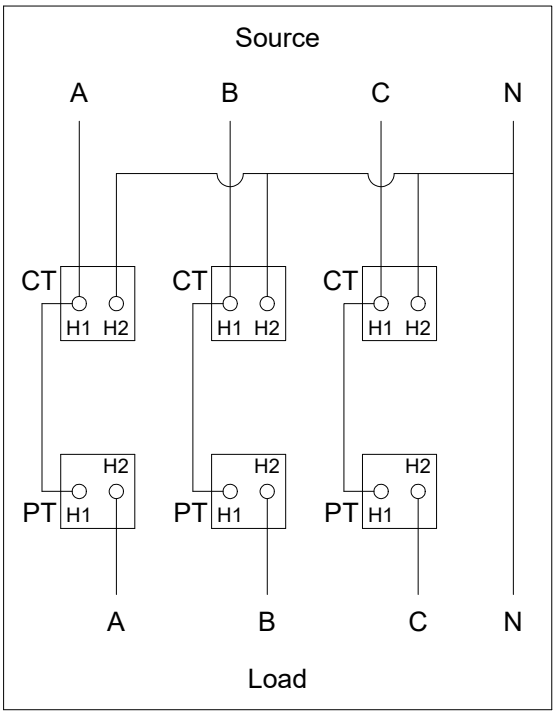
MISSOURI ONLY



25 12 07 02
4 Wire

MISSOURI ONLY

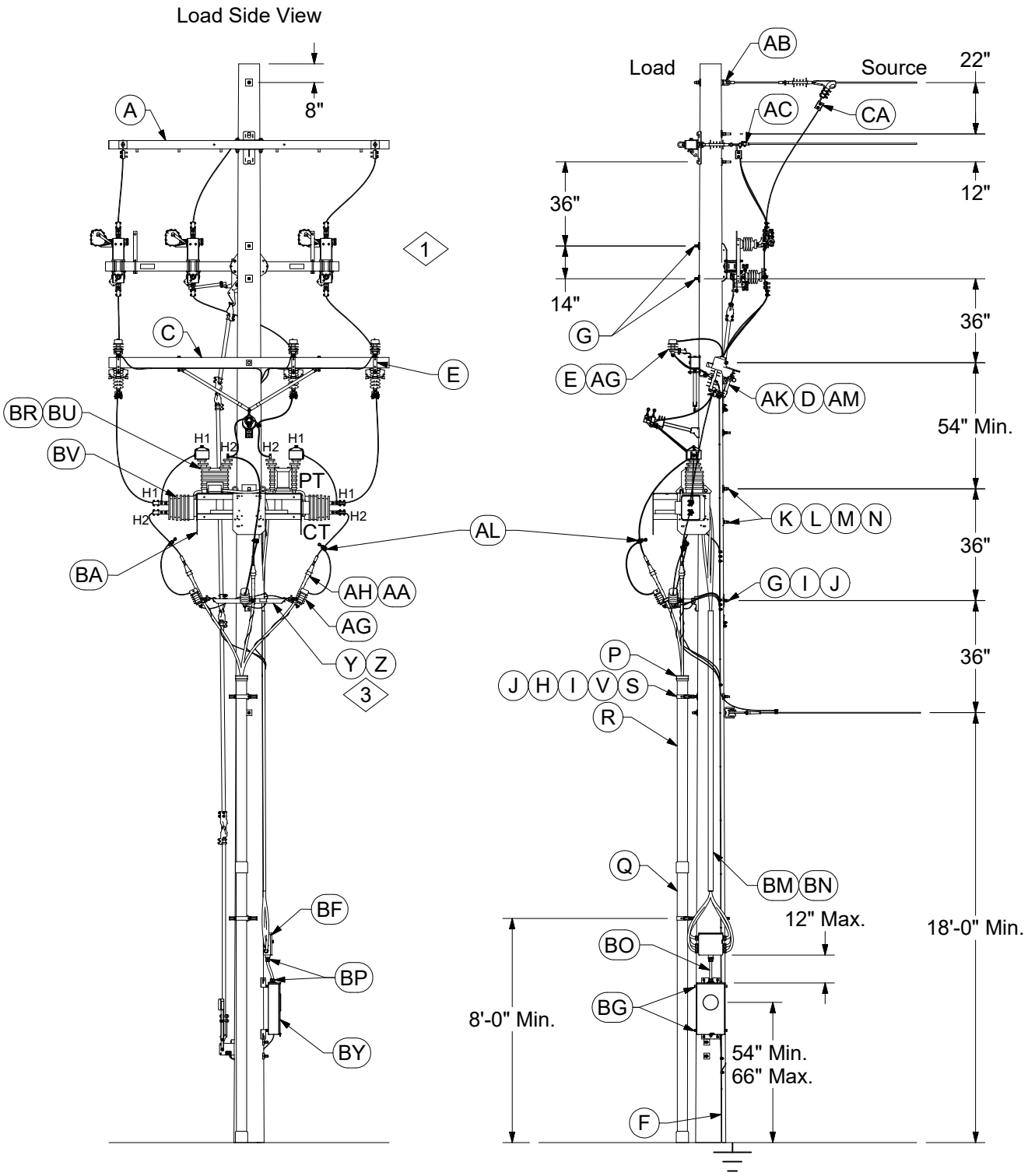




25 12 07 02
4 Wire

REV	DATE	ENG	DESCRIPTION
17	01/01/24	WYW	Converted to new format
16	07/01/20	WYW	

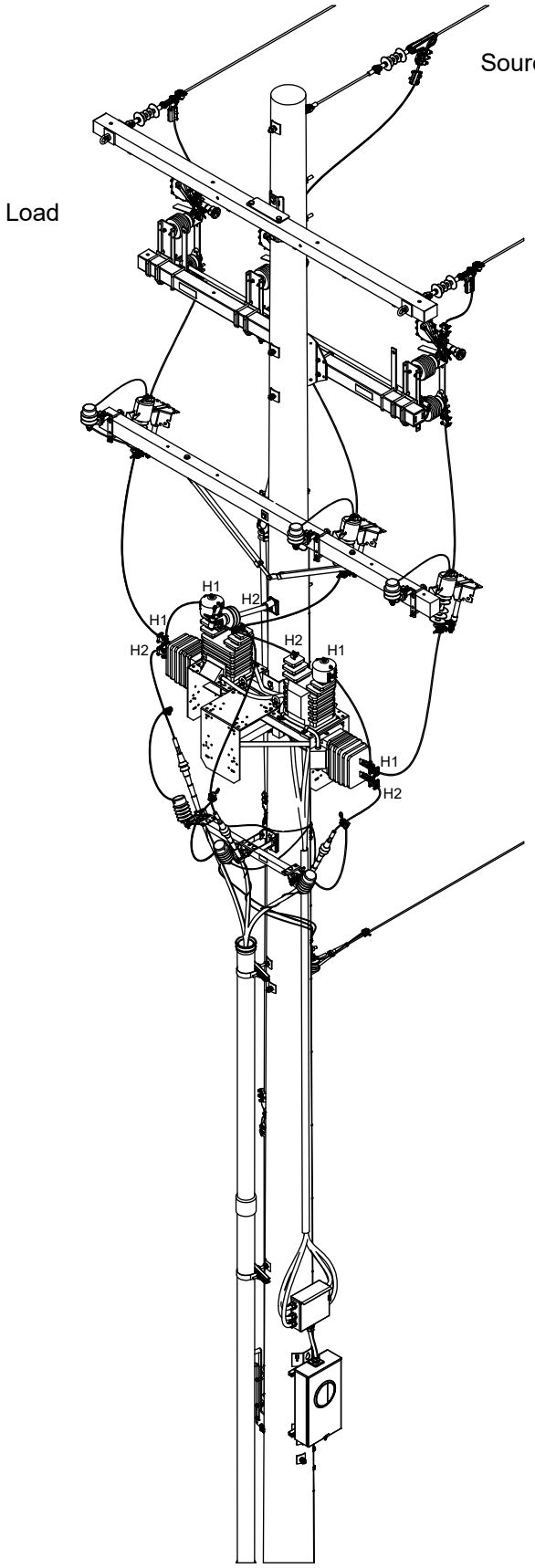
MISSOURI ONLY

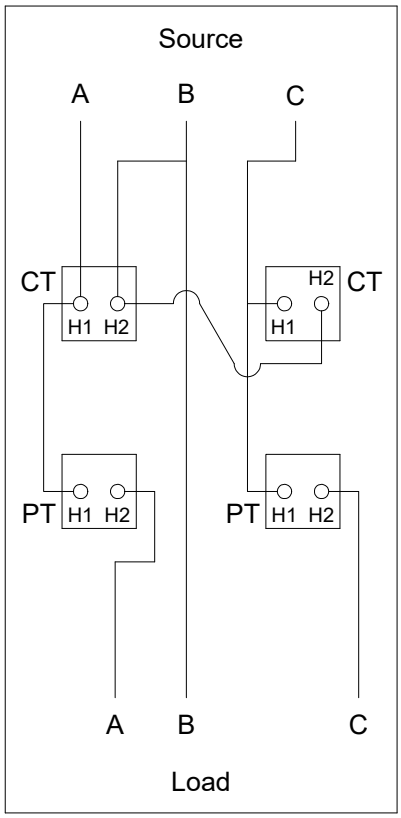


25 12 07 04
3 Wire

REV	DATE	ENG	DESCRIPTION
17	01/01/24	WYW	Converted to new format
16	07/01/20	WYW	

MISSOURI ONLY





25 12 07 04
3 Wire

REV	DATE	ENG	DESCRIPTION
17	01/01/24	WYW	Converted to new format
16	07/01/20	WYW	

MISSOURI ONLY

CONSTRUCTION NOTE(s):

1. When meter pole is on customer property, switch shall be provided one span before.

2. Secondary wire lead on meter cluster is 30 ft. standard length. For tall poles, special order meter clusters with longer lead to meet max. height requirement for connection box.

3. Terminator mounting bracket is either Aluma Form (TB-EMB=1-6-PA-35-UE) or Hubbell (CBT-EMB-1-6-PA-35-UE). It is no longer stocked by Ameren.

MISSOURI ONLY

DCS #	DESCRIPTION
25 12 07 02	5kV, 15kV, 3-Ph, 4W
25 12 07 04	5kV, 15kV, 3-Ph, 3W

	ITEM	STK / DCS #	DESCRIPTION - Customer Provides and Installs Material 25 12 07 **	02	04
	A	**04 00 42 03 @**	Crossarm - Deadend, F/G 10'	1	1
	B	54 07 239	Switch - 15kV, Group Operated	1	1
	C	**04 00 20 03 @**	10' Crossarm	1	1
	D	23 17 411	Wildlife Guard - Cover Cutout	3	3
	E	23 56 088	Bracket - Crossarm Double Sided NEMA	3	3
	F	17 54 177	Connector, Cable to Flat, Bronze, 1/0-500 kcmil	6	6
	G	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	3	3
	H	23 66 207	Washer, Curved, Square, 5/8"	3	3
	I	23 66 134	Lock Washer - 5/8" Double Coil	3	3
	J	23 65 043	Lock Nut - 5/8" Square	3	3
	K	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	1	1
	L	23 66 031	Washer, Curved, Square, 3/4"	2	2
	M	23 66 135	Lock Washer - 3/4" Double Coil	1	1
	N	23 65 042	Lock Nut - 3/4" Square	1	1
	O	18 51 021	Wire, #6 Cu, S.D. Covered (ft.)	12	12
	P	12 51 254	Conduit - Coupling 4" Bell End	1	1
	Q	12 01 273	Conduit - 4" Schedule 80 (ft.)	10	10
	R	12 01 278	Conduit - 4" Schedule 40 (ft.)	20	20
	S	23 67 183	Strap - Conduit 4" w/ 2" Bolts	3	3
	T	23 06 087	Bracket - Standoff, 12"	3	3
	U	23 53 003	Bolt, DA, 5/8" Dia x 18" w/ 4 square nuts	3	3
	V	23 65 053	Nut - 5/8" Jam	3	3
	W	**06 01 01 03**	Single Clevis	1	1
	X	17 54 004	Connector - Split Bolt, #4 Sol Cu. Thru #8 Sol Cu.	4	4
	Y	17 08 057	Bracket, Mounting, Terminator	1	1
	Z	23 60 011	Lag Screw - 5/8" x 5"	1	1
	AA	23 67 193	Bracket, Cable Positioner	3	3
	AB	**06 12 30 03 @**	Deadend on Pole with FG Extension	1	1
	AC	**06 12 35 01 @**	Single Deadend on FG Crossarm	2	2
@	AD	18 51 024	Wire, Cu, 1/0, S.D. Covered (ft.)	20	20
		18 51 025	Wire, Cu, #4, S.D. Covered (ft.)	20	20
@	AE	17 05 197	Lug, Compression, 4/0, Cu	3	3
		17 05 215	Lug, Compression, #2, Cu	3	3
@	AF	**04 00 20 02 @**	Crossarm, Wood, 8' (Use 1/2 of V-Brace)	1	1
		04 00 20 03 @	Crossarm, Wood, 10' (Use 1/2 of V-Brace)	1	1
@	AG	**12 00 01 01**	Arrester, Lightning	6	6
@	AH	**42 34 59 ****	Termination, 15kV, #2 - 4/0 AWG Cable	3	3

REV	DATE	ENG	DESCRIPTION
17	01/01/24	WYW	Converted to new format
16	07/01/20	WYW	

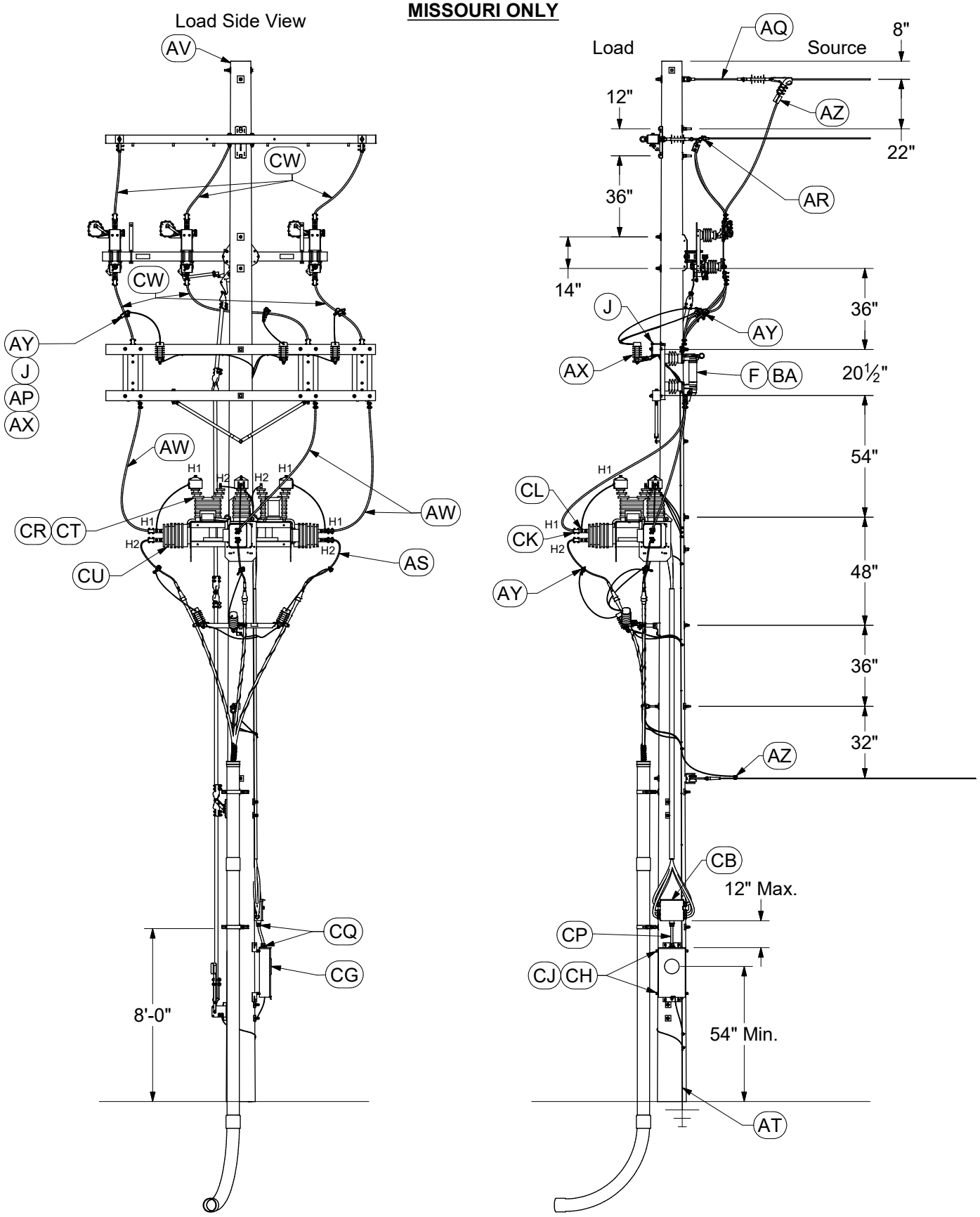
MISSOURI ONLY

	ITEM	STK / DCS #	DESCRIPTION - Customer Provides and Installs (Continued) 25 12 07 **	02	04
@	AI	18 07 237	Cable, 15kV, #2 (ft.)	35	35
		18 07 240	Cable, 15kV, #4/0 (ft.)	35	35
@	AJ	**12 00 10 ****	Grounding Unit	1	1
@	AK	54 07 208	Switch, Fused, 100A, 15kV	3	3
		54 07 209	Switch, Fused, 200A, 15kV	3	3
@	AL	**07 00 21 00 @**	Hot Line Clamp	6	6
@	AM	**10 00 01 01 @**	Fuse (Sized by Engineer)	3	3
@	AN	**02 00 02 01**	Pole	1	1

	ITEM	STK / DCS #	DESCRIPTION - Ameren Provides and Installs Material 25 12 07 **	02	04
	BA	23 17 294	Mounting - Primary Metering Unit	1	1
	BB	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	2	2
	BC	23 66 207	Washer, Curved, Square, 5/8"	2	2
	BD	23 66 134	Lock Washer - 5/8" Double Coil	2	2
	BE	23 65 043	Lock Nut - 5/8" Square	2	2
	BF	40 01 120	Box - Secondary Connection	1	1
	BG	62 51 563	Bracket - Meter Socket Hanging	2	2
	BH	23 60 007	Lag Screw - 1/2" x 4"	6	6
	BI	23 65 056	Lock Nut - 1/2" Square	6	6
	BJ	17 54 303	Connector - Cable to Flat, #6-2/0	6	4
	BK	17 55 121	Lug, Cu, #8 to 1/0 AWG, 5/16 in.	3	2
	BL	18 11 065	Cord, Hrd Srv, 2-#14, Cu, 600V	180	120
	BM	12 51 217	Conduit - 2" Split SCH 40, 2" x 10'	1	1
	BN	27 60 035	Iron Hanger (ft.)	2	2
	BO	40 52 468	Conduit, Flex, 1-1/2", Non-Metallic	1	1
	BP	40 52 072	Connector, Conduit, 1-1/2", Steel	2	2
	BQ	21 66 039	Screw, Hex Head Cap, 3/8”x2”	2	2
	BR	69 58 296	Wildlife Guard - Transformer Bushing Cover	3	2
	BS	17 54 145	Connector, Two Bolt, Cu, #8 - 1/0	-	1
	BT	17 54 142	Connector, PG, Cu, #8 - 750 kcmil	1	1
@	BU	Meter Shop	Potential Transformer, 15kV	3	2
@	BV	Meter Shop	Current Transformer	3	2
@	BW	Meter Shop	Wire Pack of 10 #12, Color Coded (ft.)	5	5
@	BX	18 51 019	Wire, #2 Cu, S.D., Covered (ft.)	30	60
		18 53 018	Wire, #2 Cu, S.D., Covered, 5kV, (ft.)	30	60
@	BY	40 04 245	Socket, Meter, Instrument Rated, Pre-Wired, 13-Terminal	1	-
		40 04 246	Socket, Meter, 600 V, Instrument Rated, Pre-Wired, 8-Terminal	-	1
@	BZ	**07 00 80 00 @**	Lead Wire, PH (ft.)	#	#
@	CA	**07 00 25 00 @**	Clamp, Parallel Groove	3	3
		286	Op Code, Install Primary Metering	1	1

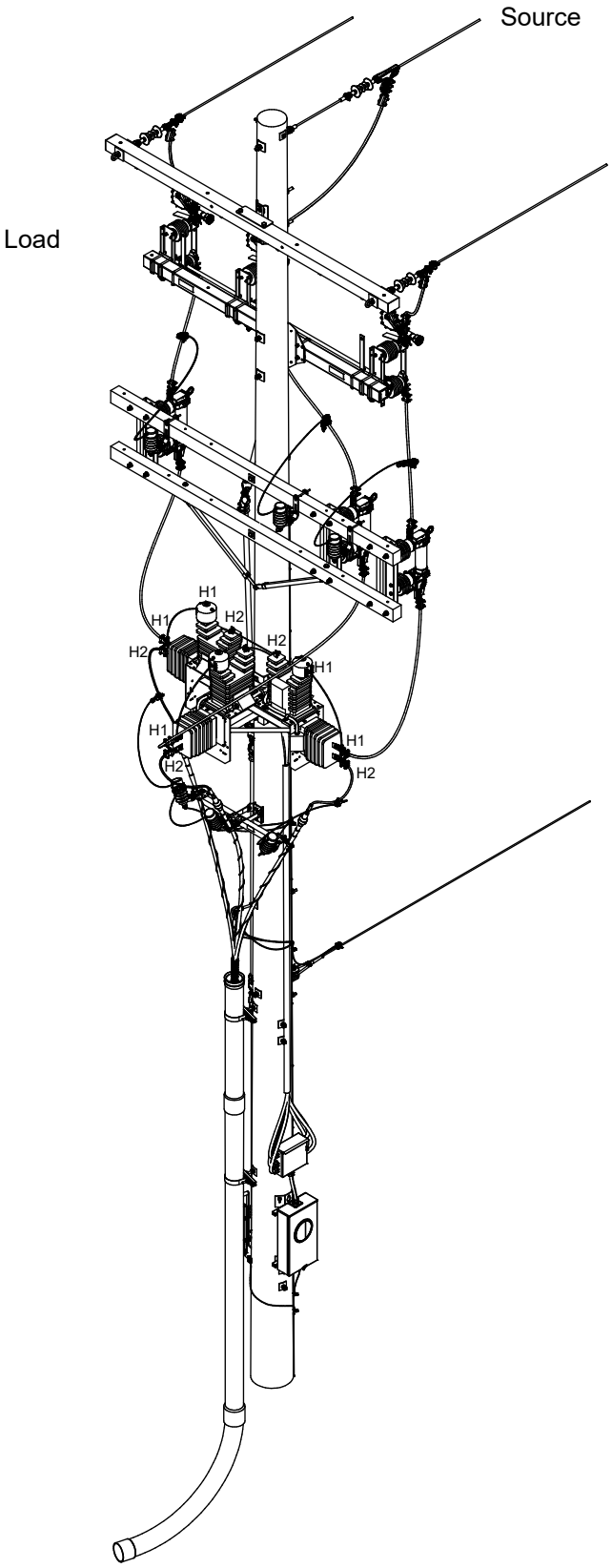
REV	DATE	ENG	DESCRIPTION
17	01/01/24	WYW	Converted to new format
16	07/01/20	WYW	

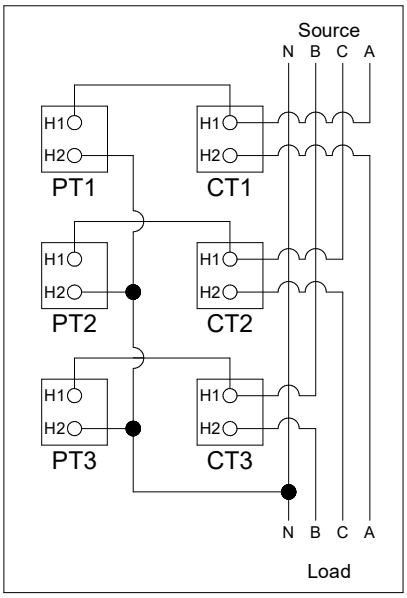
MISSOURI ONLY



REV	DATE	ENG	DESCRIPTION
1	01/01/24	WYW	Converted to new format
0	03/10/16	WYW	

MISSOURI ONLY





4 Wire

REV	DATE	ENG	DESCRIPTION
1	01/01/24	WYW	Converted to new format
0	03/10/16	WYW	

MISSOURI ONLY

CONSTRUCTION NOTE(s):

1. When meter pole is on customer property, switch shall be provided one span before.
2. Secondary wire lead on meter cluster is 30 ft. standard length. For tall poles, special order meter cluster with longer lead to meet max. height requirement for connection box.
3. Terminator mounting bracket is either Aluma Form (TB-EMB-1-6-PA-35-UE) or Hubbell (CTB-EMB-1-6-PA-35-UE). It is no longer stocked by Ameren.
4. Fuse sized by Ameren Engineer.
5. Ground all instrument transformers, arresters, and mounting assembly to the grounding unit.
6. Install barriers for protection against vehicular traffic where necessary.
7. Maintain a minimum of 15" clearance between 15kV phases or phase to ground.
8. Maintain minimum of 5'-0" clearance between the aluminum mounting platform and the crossarm.
9. Maintain a minimum of 40" between the energized conductors and the pole on climbing side of the pole; maintain a minimum of 19" between the energized lateral and vertical conductors and the pole on non climbing side of the pole. Reference from NESC, Rule 239E.
10. Maintain a minimum of 40" between any part of the aluminum mounting platform and conductors of 4 or 12kV underbuild.
11. For wire color coding on PT and CT secondaries, refer to System Meter drawings.
12. If metering structure is located within a substation, the metering and L.A. ground wires must be connected to the substation ground mat.
13. To enhance the protection of the metering equipment, ensure that the tap for the phase conductor to the arrester is as short as possible in distance.

MISSOURI ONLY

ITEM	STK / DCS #	DESCRIPTION - Customer Provides and Installs Material 25 12 08 **	01
A	04 00 42 03 @	Crossarm - Deadend, F/G 10'	1
B	41 01 008	10' Crossarm, Wood, 3-1/2" x 4-1/2"	2
C	41 56 016	Brace - 60" V	2
D	54 07 239	Switch - 15kV, Group Operated	1
E	17 54 177	Connector, Cable to Flat, Bronze, 1/0-500 kcmil	6
F	54 03 051	Switch, 15kV, SM-5 Fuse Mounting, 400A	3
G	17 54 303	Connector - Cable to Flat, #6-2/0	12
H	23 52 248	Bolt, 1/2" X 1.5", GALV STL, HEX	12
I	12 56 053	Washer, Flat, 1/2", SS	50
J	17 58 054	Bracket, Arrester/Cutout Mounting	3
K	23 52 036	Bolt, Mach., 1/2" x 5" w/ square nut	12
L	23 52 038	Bolt, Mach., 1/2" x 6" w/ square nut	2
M	23 66 017	Washer - Round 1/2"	12
N	23 66 133	Lock Washer - Double Coil 1/2"	14
O	23 65 056	Lock Nut - 1/2" Square	2
P	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	3
Q	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	5
R	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	2
S	23 66 207	Washer, Curved, Square, 5/8"	14
T	23 66 134	Lock Washer - 5/8" Double Coil	16
U	23 65 043	Lock Nut - 5/8" Square	14
V	23 52 254	Bolt, Mach., 3/4" x 16" w/ square nut	2
W	23 66 131	Washer, Square, 3/4"	2
X	23 66 031	Washer, Curved, Square, 3/4"	10
Y	23 66 135	Lock Washer - 3/4" Double Coil	7
Z	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	1
AA	23 53 003	Bolt, DA, 5/8" Dia x 18" w/ 4 square nuts	2
AB	23 65 053	Nut - 5/8" Jam	2
AC	23 06 087	Bracket - Standoff, 12"	2
AD	12 01 303	Conduit - 5" Schedule 40 (ft.)	1
AE	12 01 272	Conduit - 5" Schedule 80 (ft.)	1
AF	12 51 206	Conduit - Bend 5", 36" Rad	1
AG	12 51 233	Coupling, Bell End, 5"	1
AH	23 67 184	Strap - Conduit 5" w/ 2" Bolts	2
AI	23 65 012	Eyenut, 5/8"	1
AJ	23 68 181	Shackle - Deadend	1
AK	23 17 207	Grip - Cable 1-3/4", 2" Dia	1
AL	17 54 004	Connector - Split Bolt, #4 Sol Cu - #8 Sol Cu	1
AM	17 08 057	Bracket, Mounting, Terminator	1
AN	23 67 193	Bracket, Cable Positioner	3
AO	23 60 011	Lag Screw - 5/8" x 5"	1
AP	18 51 021	Wire, #6 Cu., Covered, S.D. (ft.)	25

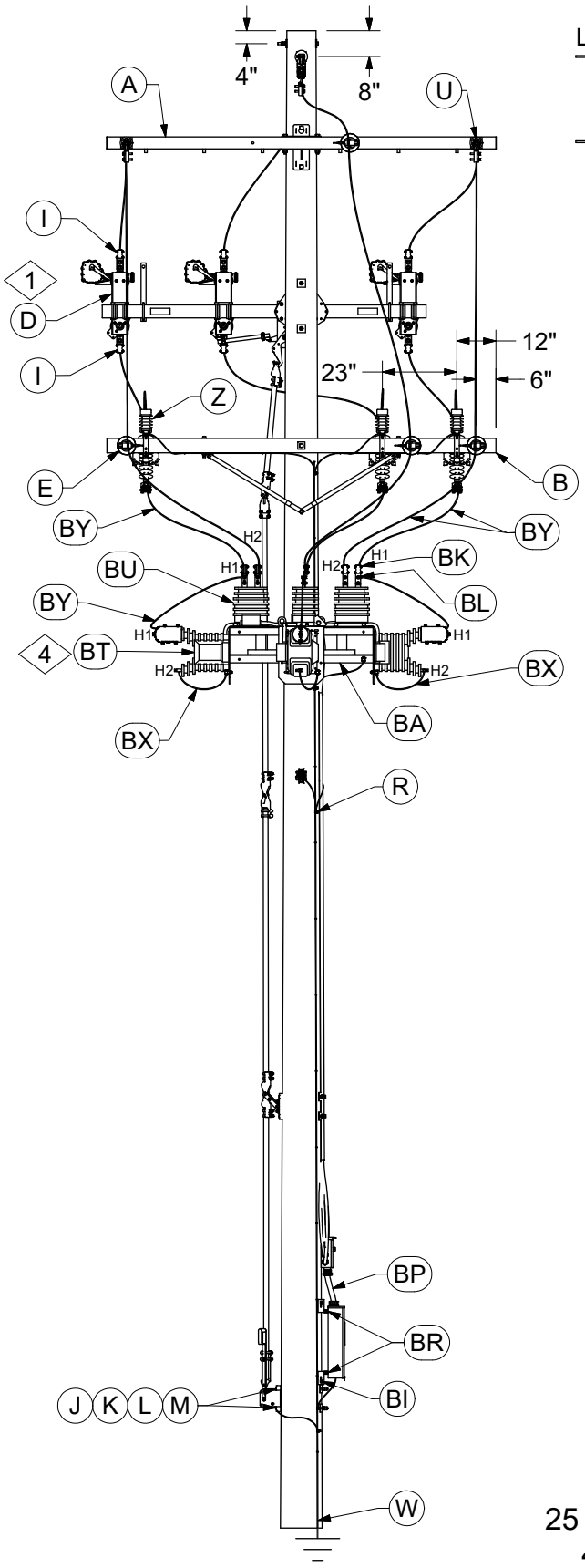
MISSOURI ONLY

	ITEM	STK / DCS #	DESCRIPTION - Customer Provides and Installs (Continued) 25 12 08 **	01
	AQ	06 12 30 03 @	Deadend on Pole, FG Extension	1
	AR	06 12 35 01 @	Single Deadend on FG Crossarm	2
@	AS	18 07 243	Cable, 750 kcmil Al, CN (ft.)	#
		18 07 244	Cable, 750 kcmil Cu, CN (ft.)	#
@	AT	42 34 61 02 @	Termination, 15kV, 750 kcmil Cu. CN	3
		42 34 61 04 @	Termination, 15kV, 750 kcmil Al. CN	3
@	AU	12 00 10 **	Grounding Unit	1
@	AV	02 00 02 01	Pole	1
@	AW	07 00 80 00 @	Lead Wire, PH (ft.)	1
@	AX	12 00 01 01 @	Arrester, Lightning	1
@	AY	07 00 21 00 @	Hot Line Clamp	1
@	AZ	07 00 25 00 @	Clamp, Parallel Groove	1
@	BA	10 00 01 01 @	Fuse Sized by Engineer	1

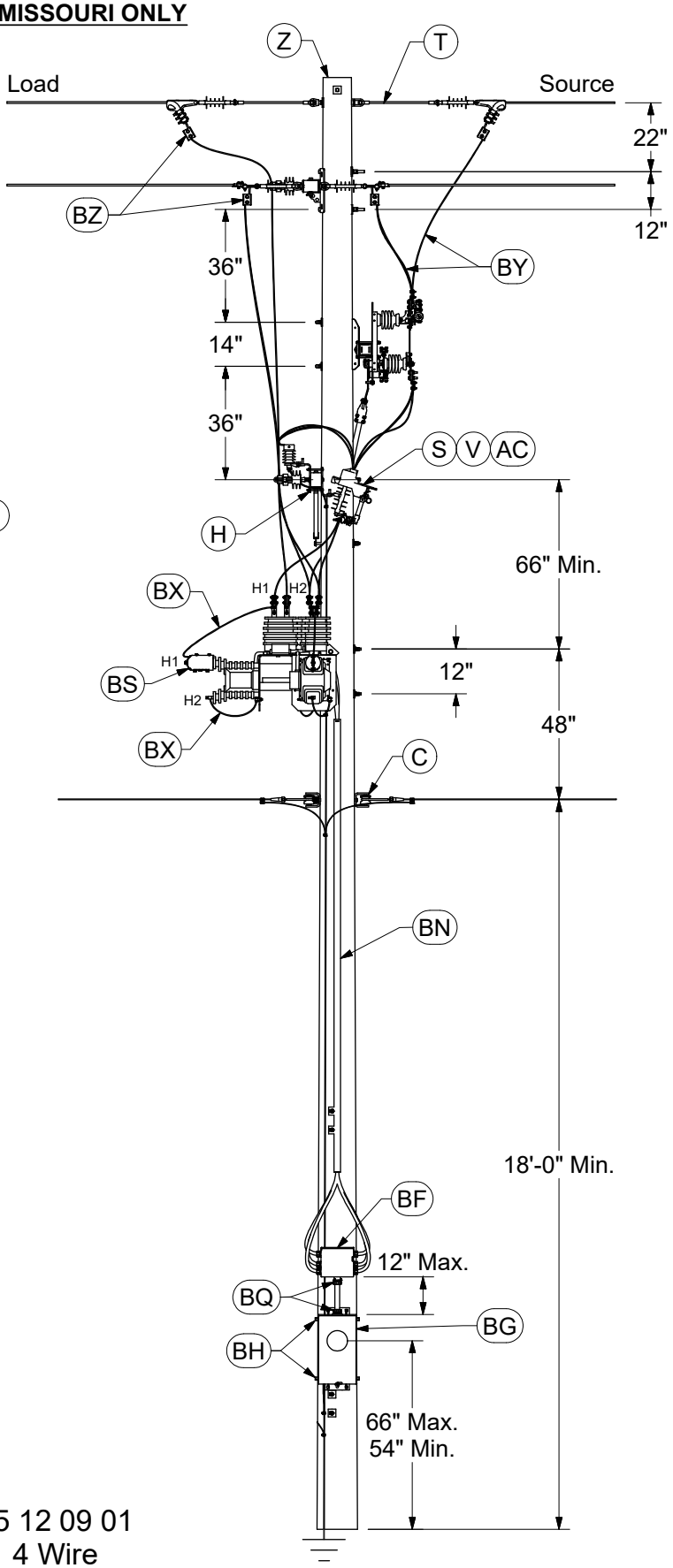
	ITEM	STK / DCS #	DESCRIPTION - Ameren Provides and Installs Material 25 12 08 **	01
	CA	23 17 294	Mounting - Primary Metering Unit, Cluster Mount for Three Phase	1
	CB	40 01 120	Box - Secondary Connection	1
	CC	23 52 068	Bolt, Mach., 5/8" x 16" w/ Square Nut	1
	CD	23 66 207	Washer, Curved, Square, 5/8"	1
	CE	23 66 134	Lock Washer - 5/8" Double Coil	1
	CF	23 65 043	Lock Nut - 5/8" Square	1
	CG	40 04 245	Socket, Meter, 600 V, 3 Phase, 4 wire	1
	CH	62 51 563	Bracket - Meter Socket Hanging	2
	CI	21 66 039	Screw, Hex Head Cap, 3/8”x2”	4
	CJ	23 60 007	Lag Screw - 1/2" x 4"	4
	CK	17 54 303	Connector - Cable to Flat, #6-2/0	1
	CL	17 55 121	Lug, Cu, #8 to 1/0 AWG, 5/16 in.	3
	CM	18 11 065	Cord, Hrd Srv, 2-#14Cu, 600V	1
	CN	12 51 217	Conduit - 2" Split SCH 40	1
	CO	27 60 035	Iron Hanger, Galv., 3/4" wide (ft.)	2
	CP	40 52 468	Conduit, Flex, 1-1/2", Non-Metallic (ft.)	20
	CQ	40 52 072	Connector, Conduit, 1-1/2", Steel	2
	CR	69 58 296	Guard, Wildlife, PT (H1) Bushing	3
@	CS	18 51 019	Wire, #2 Cu, Covered S.D. (ft.)	30
		18 53 018	Wire, #2 Cu, S.D. 5kV (ft.)	30
@	CT	Meter Shop	Potential Transformer	3
@	CU	Meter Shop	Current Transformer	3
@	CV	Meter Shop	Wire Pack, Color Coded, 10-#12 (ft.)	5
@	CW	07 00 80 00 @	Lead Wire, PH (ft.)	#
@	CX	07 00 25 00 @	Clamp, Parallel Groove	6
		286	Op Code, Install Primary Metering	1

REV	DATE	ENG	DESCRIPTION
1	01/01/24	WYW	Converted to new format
0	03/10/16	WYW	

Load Side View



MISSOURI ONLY

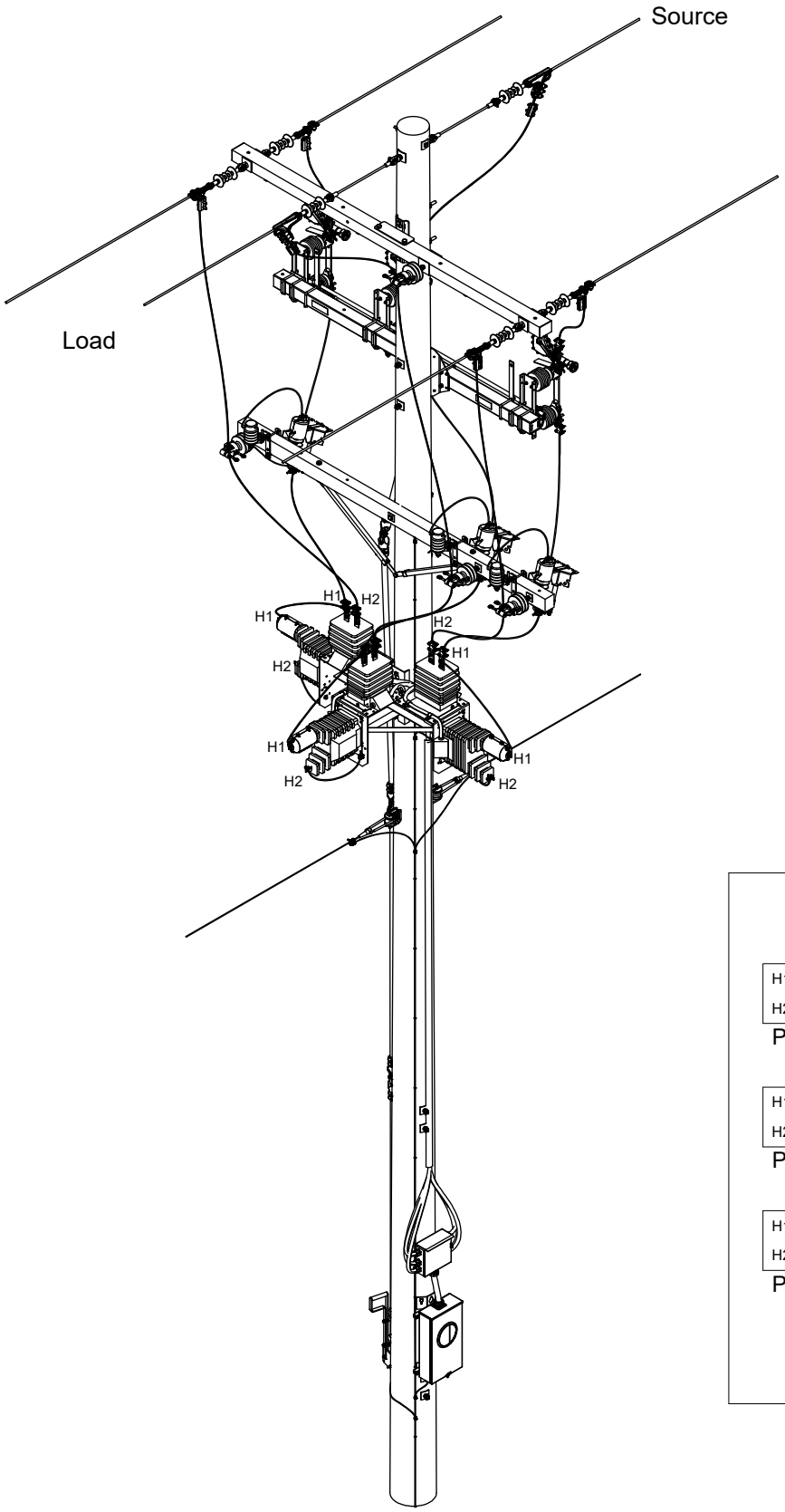


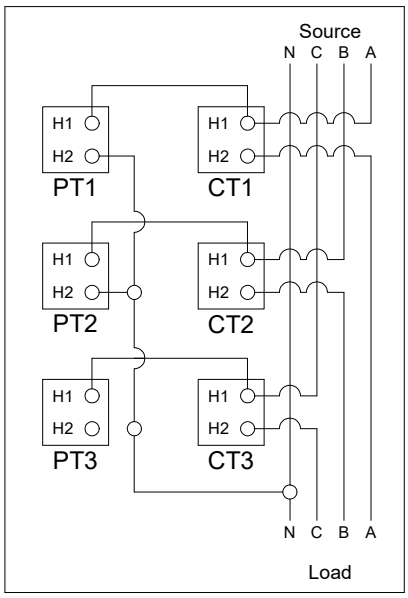
25 12 09 01

4 Wire

REV	DATE	ENG	DESCRIPTION
13	01/01/24	WYW	Converted to new format
12	09/23/11		

MISSOURI ONLY

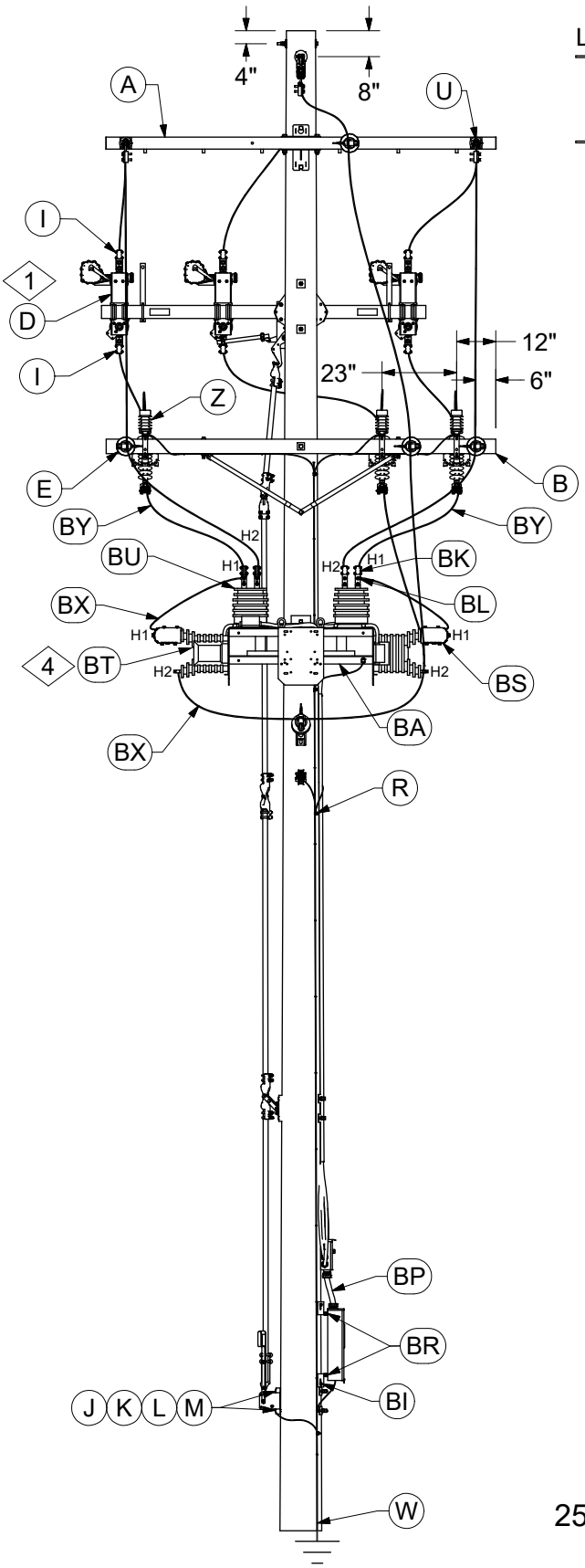




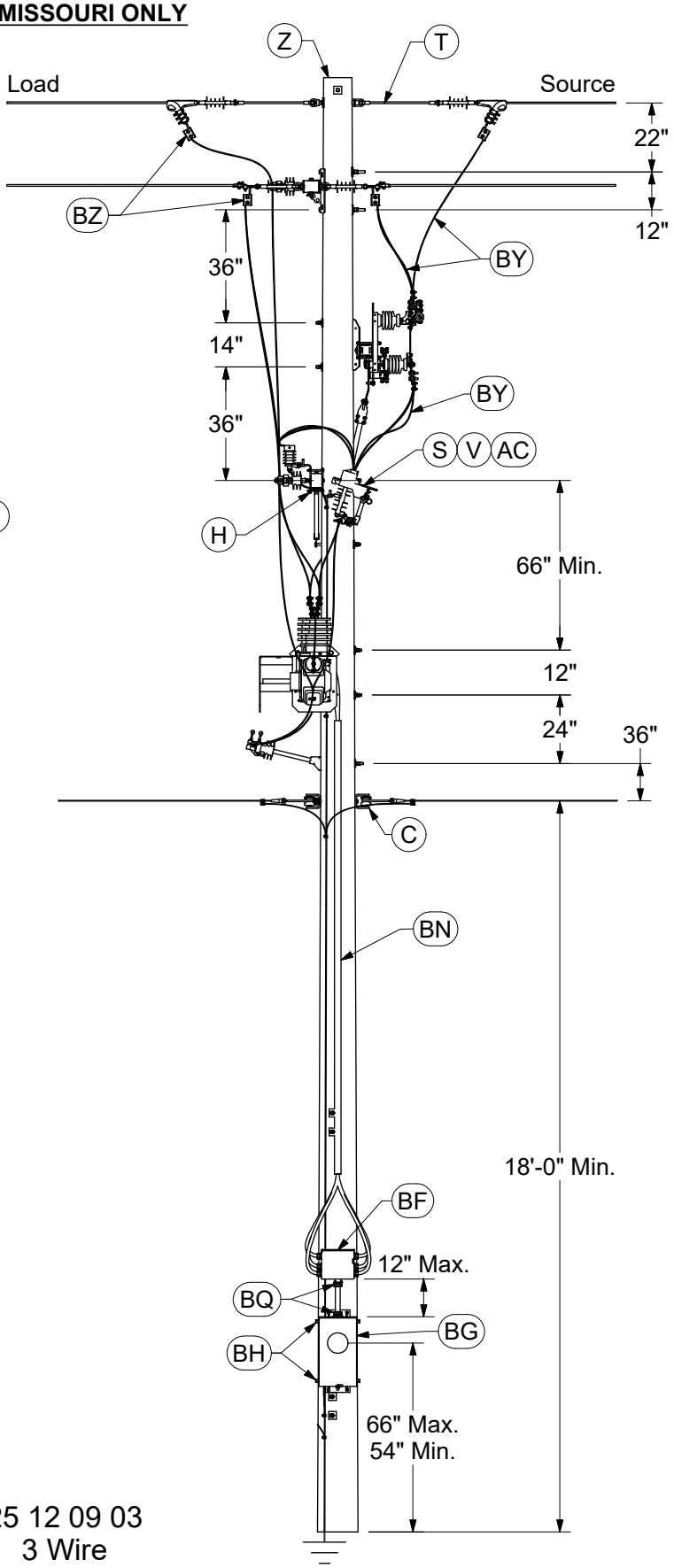
25 12 09 01
4 Wire

REV	DATE	ENG	DESCRIPTION
13	01/01/24	WYW	Converted to new format
12	09/23/11		

Load Side View



MISSOURI ONLY

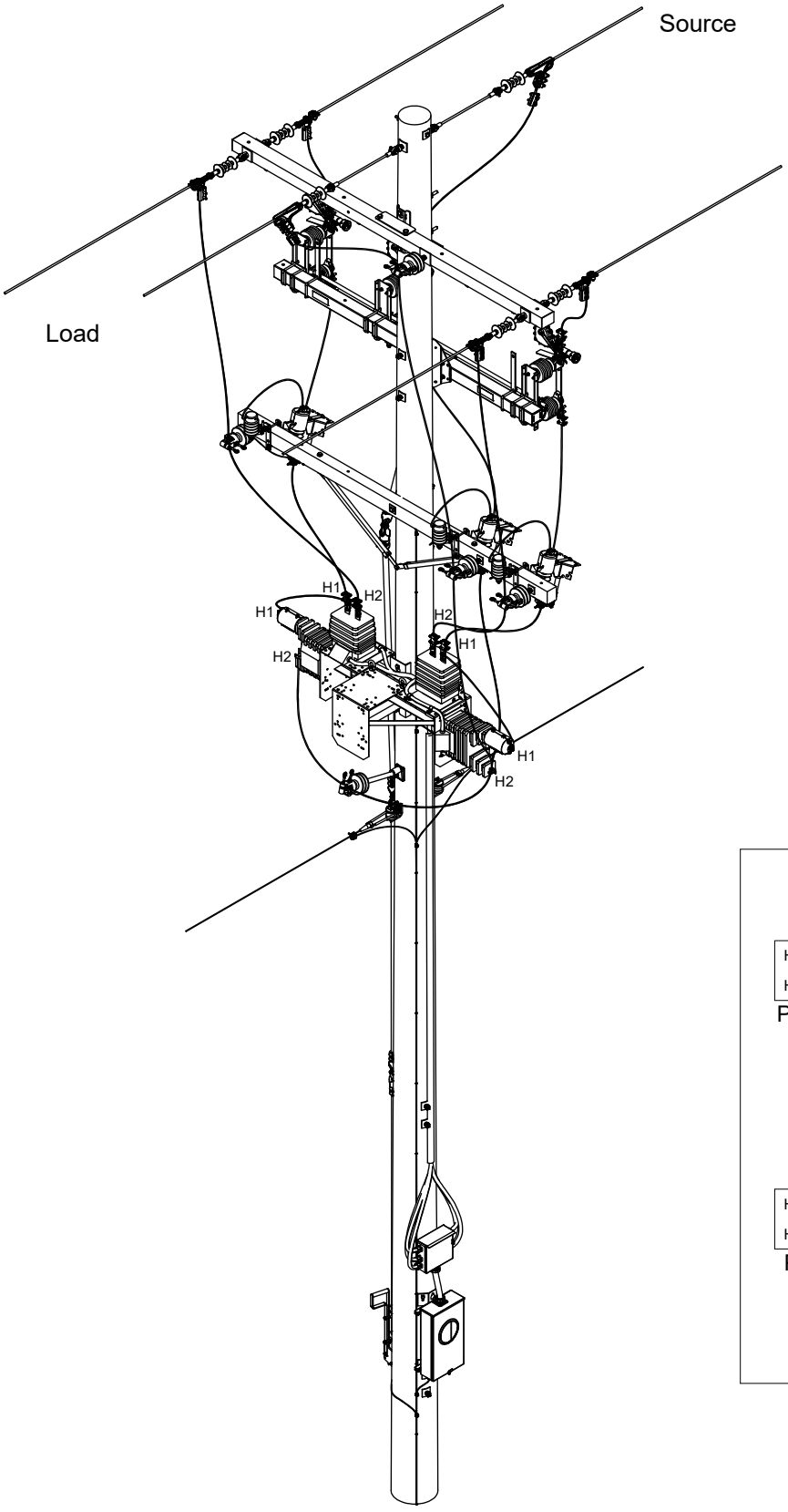


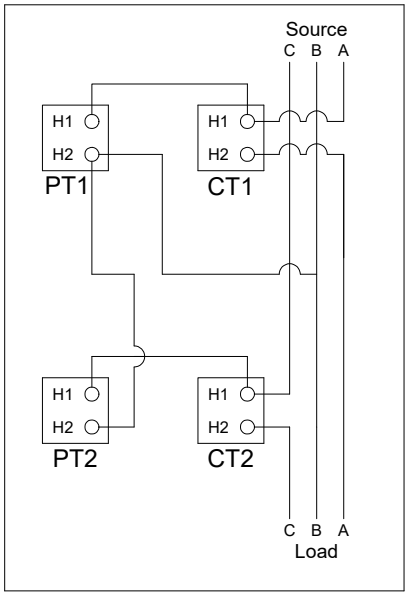
25 12 09 03
3 Wire

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
13	01/01/24	WYW	Converted to new format
12	09/23/11		

MISSOURI ONLY





25 12 09 03
3 Wire

REV	DATE	ENG	DESCRIPTION
13	01/01/24	WYW	Converted to new format
12	09/23/11		

MISSOURI ONLY

CONSTRUCTION NOTE(s):

1. When meter pole is on customer property, switch shall be provided one span before.

2. Secondary wire lead on meter cluster is 30 ft. standard length. For tall poles, special order meter cluster with longer lead to meet maximum height requirement for connection box.

3. Switch is to be operated with rotating or reciprocating control rod accessible from ground level. Control rod to be furnished with insulating section above handle.

4. C.T.s are installed above the P.T.s.

DCS #	DESCRIPTION
25 12 09 01	5kV, 15kV, 3-PH, 4W
25 12 09 03	5kV, 15kV, 3-PH, 3W

	ITEM	STK / DCS #	DESCRIPTION - Customer Provides and Installs Material 25 12 09 **	01	03
	A	**04 00 42 03 @**	Crossarm - Deadend, F/G, 10'	1	1
	B	**04 00 20 03 @**	Crossarm - Wood, 10'	1	1
	C	**06 01 01 02**	Double Clevis	1	1
	D	54 07 239	Switch - 15kV, Group Operated	1	1
	E	25 05 143	Insulator, Vice Top, 12kV	-	2
	F	23 62 028	Pin, Insulator, Long Shank	-	2
	G	23 66 132	Washer, Flat, Sq., 4" x 4", w/ 13/16" Hole	-	4
	H	23 56 088	Bracket - Crossarm Double Sided NEMA	3	3
	I	17 54 177	Connector, Cable to Flat, Bronze, 1/0-500 kcmil	3	6
	J	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	6	4
	K	23 66 207	Washer, Curved, Square, 5/8"	6	6
	L	23 66 134	Lock Washer - 5/8" Double Coil	6	6
	M	23 65 043	Lock Nut - 5/8" Square	6	6
	N	23 52 038	Bolt, Mach., 1/2" x 6" w/ square nut	12	12
	O	23 66 133	Lock Washer - Double Coil 1/2"	12	12
	P	23 65 056	Lock Nut - 1/2" Square	12	12
	Q	18 51 021	Wire, #6 Cu, S.D., Covered (ft.)	35	35
	R	17 54 004	Connector - Split Bolt, #4 Sol CU thru #8 Sol CU	6	6
	S	23 17 411	Wildlife Guard - Cover Cutout	3	3
	T	**06 12 30 03 @**	Deadend on Pole, FG Extension	1	1
	U	**06 12 35 02 @**	Double Deadend on FG Crossarm	2	2
@	V	54 07 208	Switch, Fused, 100A, 15kV	3	3
		54 07 209	Switch, Fused, 200A, 15kV	3	3
@	W	**12 00 10 ****	Grounding Unit	1	1
@	X	**12 00 01 01 @**	Arrester, Lightning	3	3
@	Y	**07 00 80 00 @**	Lead Wire, PH (ft.)	#	#
@	Z	**02 00 02 01**	Pole	1	1
@	AA	**07 00 21 00 @**	Hot Line Clamp	3	3
@	AB	**07 00 25 00 @**	Clamp, Parallel Groove	3	3
@	AC	**10 00 01 01 @**	Fuse Sized by Engineer	3	3

REV	DATE	ENG	DESCRIPTION
13	01/01/24	WYW	Converted to new format
12	09/23/11		

MISSOURI ONLY

	ITEM	STK / DCS #	DESCRIPTION - Ameren Provides and Installs Material 25 12 09 **	01	03
	BA	23 17 294	Mounting - Primary Metering Unit, Cluster Mount for 2CTs & 2PTs	1	1
	BB	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	4	4
	BC	23 66 207	Washer, Curved, Square, 5/8"	4	4
	BD	23 66 134	Lock Washer - 5/8" Double Coil	4	4
	BE	23 65 043	Lock Nut - 5/8" Square	4	4
	BF	40 01 120	Box - Secondary Connection	1	1
	BG	40 04 245	Socket, Meter, Instrument Rated, 13 Terminal, 600V	1	-
		40 04 246	Socket, Meter, Instrument Rated, 8 Terminal, 600V	-	1
	BH	62 51 563	Bracket - Meter Socket Hanging	2	2
	BI	23 60 007	Lag Screw - 1/2" x 4"	4	4
	BJ	23 65 056	Lock Nut - 1/2"	2	2
	BK	17 54 303	Connector - Cable to Flat, #6-2/0	6	4
	BL	17 55 121	Lug, Cu, #8 to 1/0 AWG, 5/16 in.	3	2
	BM	18 11 065	Cord, Hrd Srv, 2-#14 Cu, 600V	180	120
	BN	12 51 217	Conduit - 2" Split SCH 40	1	1
	BO	27 60 035	Iron Hanger, Galv., 3/4" Wide (ft.)	2	2
	BP	40 52 072	Conduit, Flex, 1-1/2", Non-Metallic	1	1
	BQ	40 52 072	Conduit Fitting, Liquid-tight, Flex, 1-1/2”	2	2
	BR	21 66 039	Screw, Cap, Hex Head, Steel, 3/8" - 16 TPI x 2"	2	2
	BS	69 58 296	Guard, Wildlife, PT Bushing	3	2
@	BT	Meter Shop	Potential Transformer	3	2
@	BU	Meter Shop	Current Transformer	3	2
@	BV	Meter Shop	Wire Pack, Color Coded, 10-#12 (ft.)	5	5
@	BW	Meter Shop	Wire, #2 Cu, S.D. Covered (ft.)	20	20
@	BX	18 51 019	Wire, Cu, #2, S.D., Covered (ft.)	30	30
		18 53 018	Wire, Cu, #2, S.D., 5kV, Covered (ft.)	30	30
@	BY	**07 00 80 00 @**	Lead Wire, PH, (ft.)	#	#
@	BZ	**07 00 25 00 @**	Clamp, Parallel Groove	6	6
		286	Op Code, Install Primary Metering	1	1

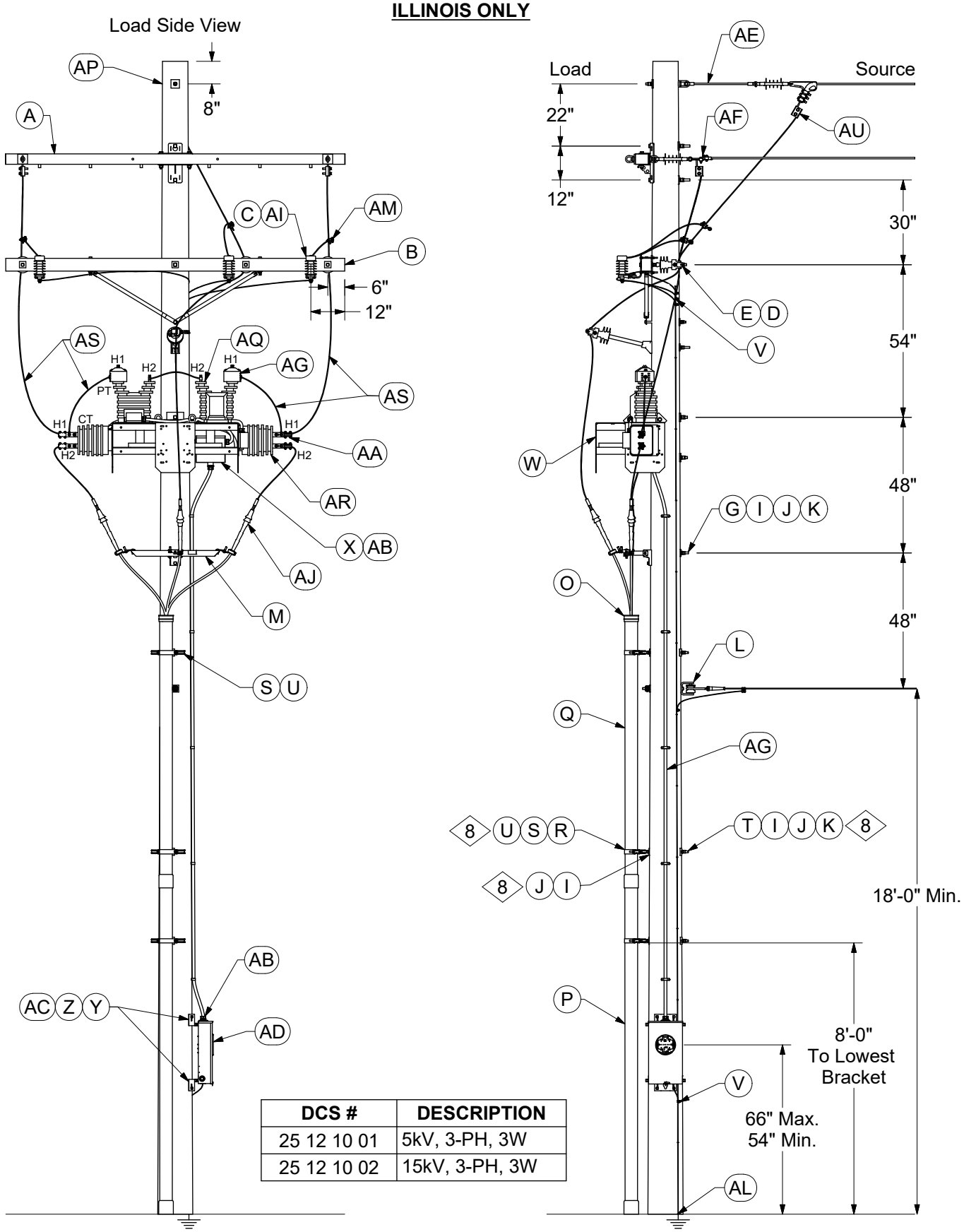
REV	DATE	ENG	DESCRIPTION
13	01/01/24	WYW	Converted to new format
12	09/23/11		

METER INSTALLATIONS

Primary Metering Structure
Underground 3-PH 3W

25 12 10 **
5kV, 15kV
1 of 4

ILLINOIS ONLY

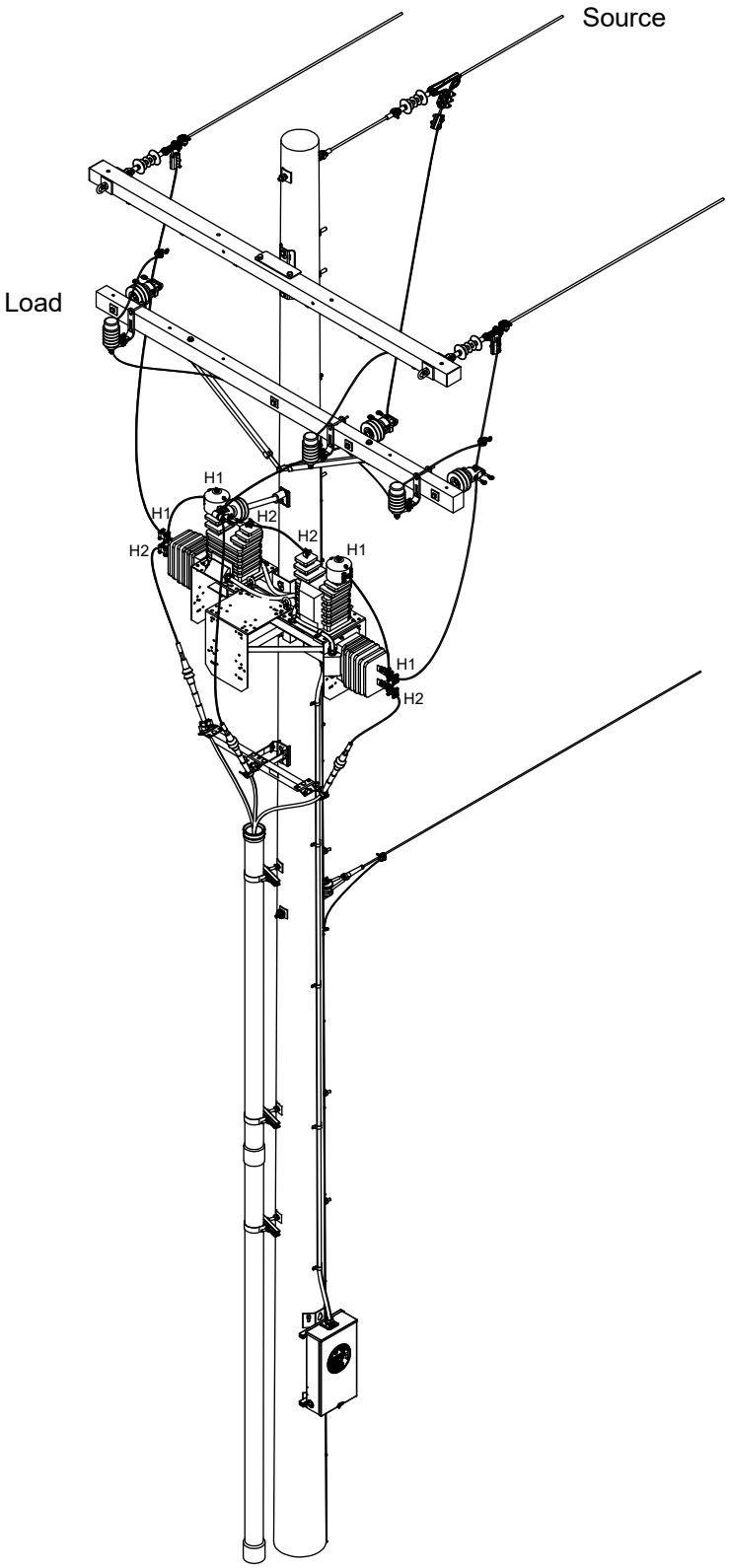


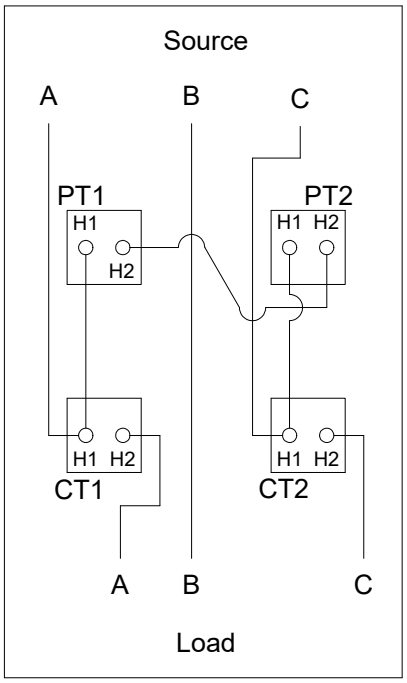
DCS #	DESCRIPTION
25 12 10 01	5kV, 3-PH, 3W
25 12 10 02	15kV, 3-PH, 3W

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
8	01/01/24	WYW	Combined with DCS 25 12 11 **
7	12/15/15	WYW	

ILLINOIS ONLY





3 Wire

REV	DATE	ENG	DESCRIPTION
8	01/01/24	WYW	Combined with DCS 25 12 11 **
7	12/15/15	WYW	

ILLINOIS ONLY

CONSTRUCTION NOTE(s):

1. Ground all instrument transformers, arrestors, and mounting assembly to the grounding unit.

2. Install barriers for protection against vehicular traffic where necessary.

3. Maintain a minimum of 40" between the energized conductors and the pole on climbing side of the pole as per DCS **29 00 18 01**; maintain a minimum of 19" between the energized lateral and vertical conductors and the pole on non-climbing side of the pole as per DCS **29 00 17 12**.

4. A customer-owned group-operated disconnect switch shall be installed on an adjacent structure on the customer side of the meter structure. The switch or subsequent breaker shall be capable of breaking the maximum current expected on the line.

5. For wire color coding on PT and CT secondaries, refer to System Metering drawings.

6. If metering structure is located within a substation, the metering and arrestors ground wires must be connected to the substation ground mat.

7. To enhance the protection of the metering equipment ensure that the tap for the phase conductor to the arrestor is as short as possible in distance. Install arrestors to load side on the adjacent pole if multiple span exposure on the load side exists and arrestors may be installed on adjacent poles.

◇8.◇ This material is provided by customer.

ITEM	STK / DCS #	DESCRIPTION - Ameren Provides and Installs Material 25 12 10 **	01	02
A	**04 00 42 03 @**	Crossarm - Deadend, F/G, 10'	1	1
B	**04 00 20 03 @**	10' Single Wood Arm	1	1
C	17 58 054	Bracket, Arrester/Cutout Mounting	3	3
D	23 62 128	Adapter Pin for Vice Top Insulator	3	3
E	25 05 143	Insulator, Vice Top, 12kV	4	4
F	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	1	1
G	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	1	1
H	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	5	5
I	23 66 207	Washer, Curved, Square, 5/8"	10	10
J	23 66 134	Lock Washer - 5/8" Double Coil	10	10
K	23 65 043	Lock Nut - 5/8" Square	7	7
L	**06 01 01 01**	Single Clevis	1	1
M	17 08 057	Bracket, Mounting, Terminator	1	1
N	18 51 021	Wire, #6 Cu, Covered S.D. (ft.)	12	12
O	12 51 254	Conduit - Coupling 4" Bell End	1	1
P	12 01 273	Conduit - 4" Schedule 80 (ft.)	10	10
Q	12 01 278	Conduit - 4" Schedule 40 (ft.)	20	20
R	23 67 183	Strap - Conduit 4" w/2" Bolts	3	3
S	23 06 087	Bracket - Standoff, 12"	3	3
T	23 53 003	Bolt, DA, 5/8" Dia x 18" w/ 4 square nuts	3	3
U	23 65 053	Nut - 5/8" Jam	3	3
V	17 54 004	Connector - Split Bolt, #4 Sol CU thru #8 Sol CU	5	5
W	23 17 294	Mounting - Primary Metering Unit, Cluster Mount for Three Phase	1	1
X	40 01 120	Box - Secondary Connection	1	1

REV	DATE	ENG	DESCRIPTION
8	01/01/24	WYW	Combined with DCS 25 12 11 **
7	12/15/15	WYW	

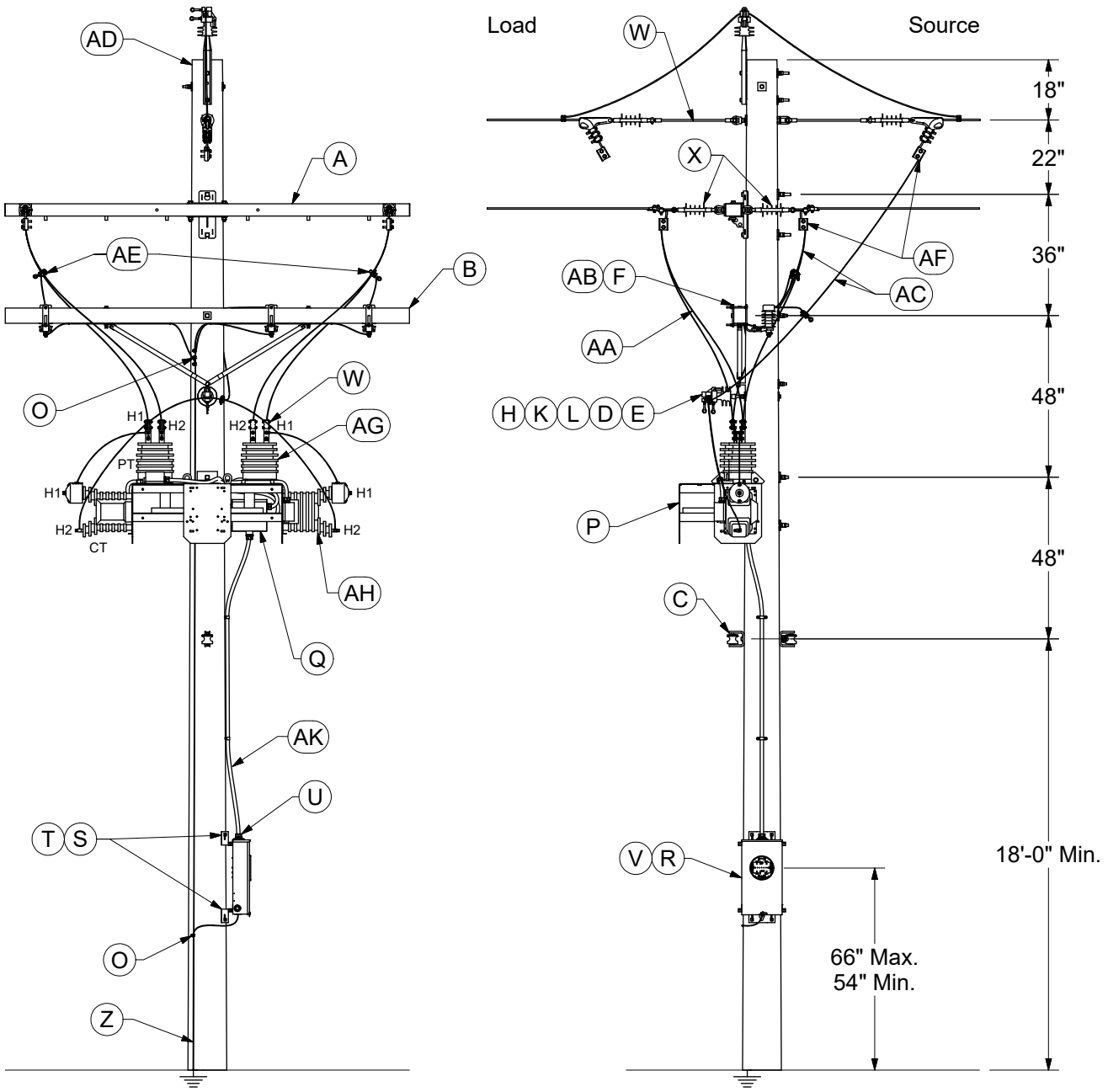
ILLINOIS ONLY

	ITEM	STK / DCS #	DESCRIPTION - Ameren Provides and Installs Material 25 12 10 **	01	02
	Y	62 51 563	Bracket - Meter Socket Hanging	2	2
	Z	23 60 007	Lag Screw - 1/2" x 4"	6	6
	AA	17 54 303	Connector - Cable to Flat, #6-2/0	6	6
	AB	40 53 612	Conduit - Connector 1" Steel	2	2
	AC	21 66 039	Screw, Hex Head Cap, 3/8"x2"	4	4
	AD	40 54 378	Meter Socket - 600V 8 Terminal	1	1
	AE	**06 12 30 03 @**	Deadend on Pole, FG Extension	1	1
	AF	**06 12 35 01 @**	Single Deadend on FG Crossarm	2	2
	AG	69 58 296	Wildlife Guard - Transformer Bushing Cover	2	2
@	AH	12 51 303	Conduit, Flex, 1", Non-Metallic	#	#
@	AI	18 21 024	Wire, Cu, 1/0 S.D., Covered (ft.)	20	20
		18 21 025	Wire, Cu, #4 S.D., Covered (ft.)	20	20
@	AJ	**12 00 01 01**	Arrester. Lightning	6	6
@	AK	**42 34 59 ****	Termination, 15kV, #2 - 4/0 AWG Cable	3	3
@	AL	18 07 237	Cable, 15kV, #2 (ft.)	#	#
		18 07 240	Cable, 15kV, 4/0 (ft.)	#	#
@	AM	**12 00 10 ****	Grounding Unit	1	1
@	AN	**07 00 21 00 @**	Hot Line Clamp	6	6
@	AO	**10 00 01 01 @**	Fuse (Sized by Engineer)	3	3
@	AP	**02 00 02 01**	Pole	1	1
@	AQ	Meter Shop	Potential Transformer	2	2
@	AR	Meter Shop	Current Transformer	2	2
@	AS	Meter Shop	Wire Pack of 10 #12, Color Coded (ft.)	25	25
@	AT	18 51 019	Wire, #2 Cu, Covered, S.D. (ft.)	-	#
		18 53 018	Wire, #2 Cu, Covered, 5kV, S.D. (ft.)	#	-
@	AU	**07 00 25 00 @**	Clamp, Parallel Groove	6	6
		286	Op Code, Install Primary Metering	1	1

REV	DATE	ENG	DESCRIPTION
8	01/01/24	WYW	Combined with DCS 25 12 11 **
7	12/15/15	WYW	

ILLINOIS ONLY

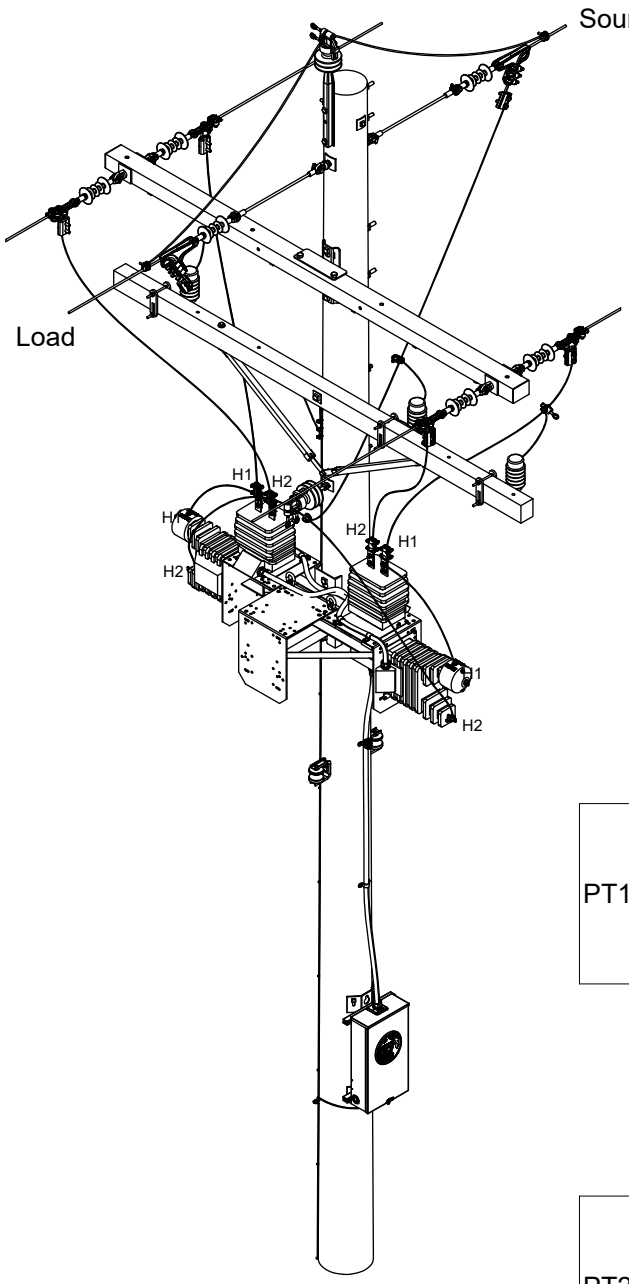
Load Side View

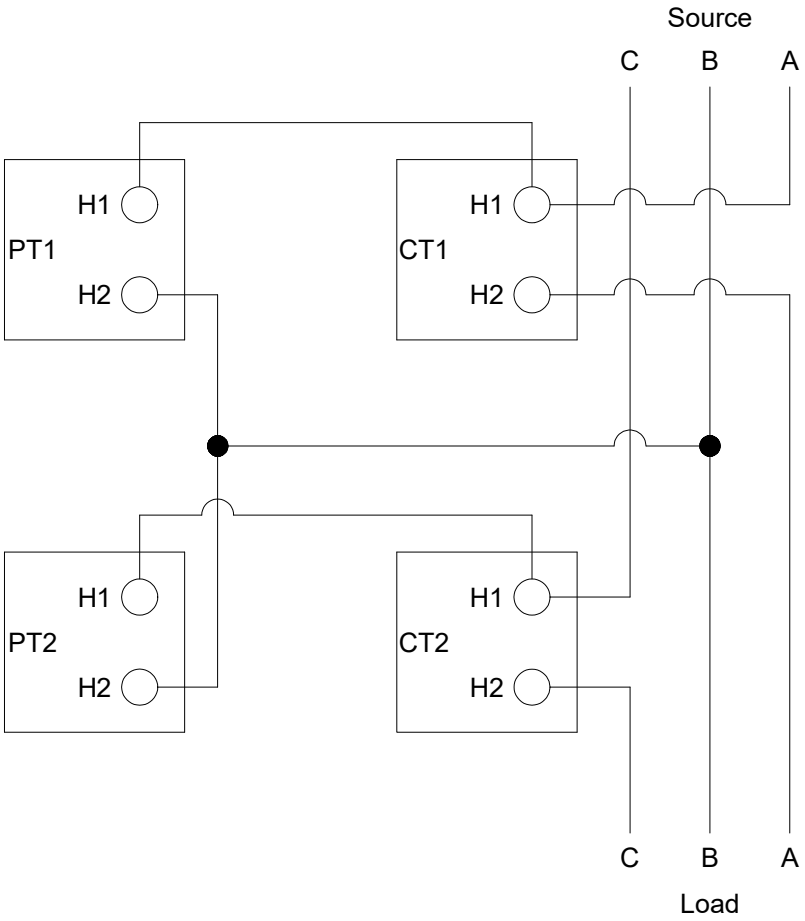


DCS #	DESCRIPTION
25 12 15 01	5kV, 3-PH, 3W
25 12 15 02	15kV, 3-PH, 3W

REV	DATE	ENG	DESCRIPTION
0	01/01/24	WYW	New - Moved from DCS 25 12 12 **

ILLINOIS ONLY





REV	DATE	ENG	DESCRIPTION
0	01/01/24	WYW	New - Moved from DCS 25 12 12 **

ILLINOIS ONLY

CONSTRUCTION NOTE(s):

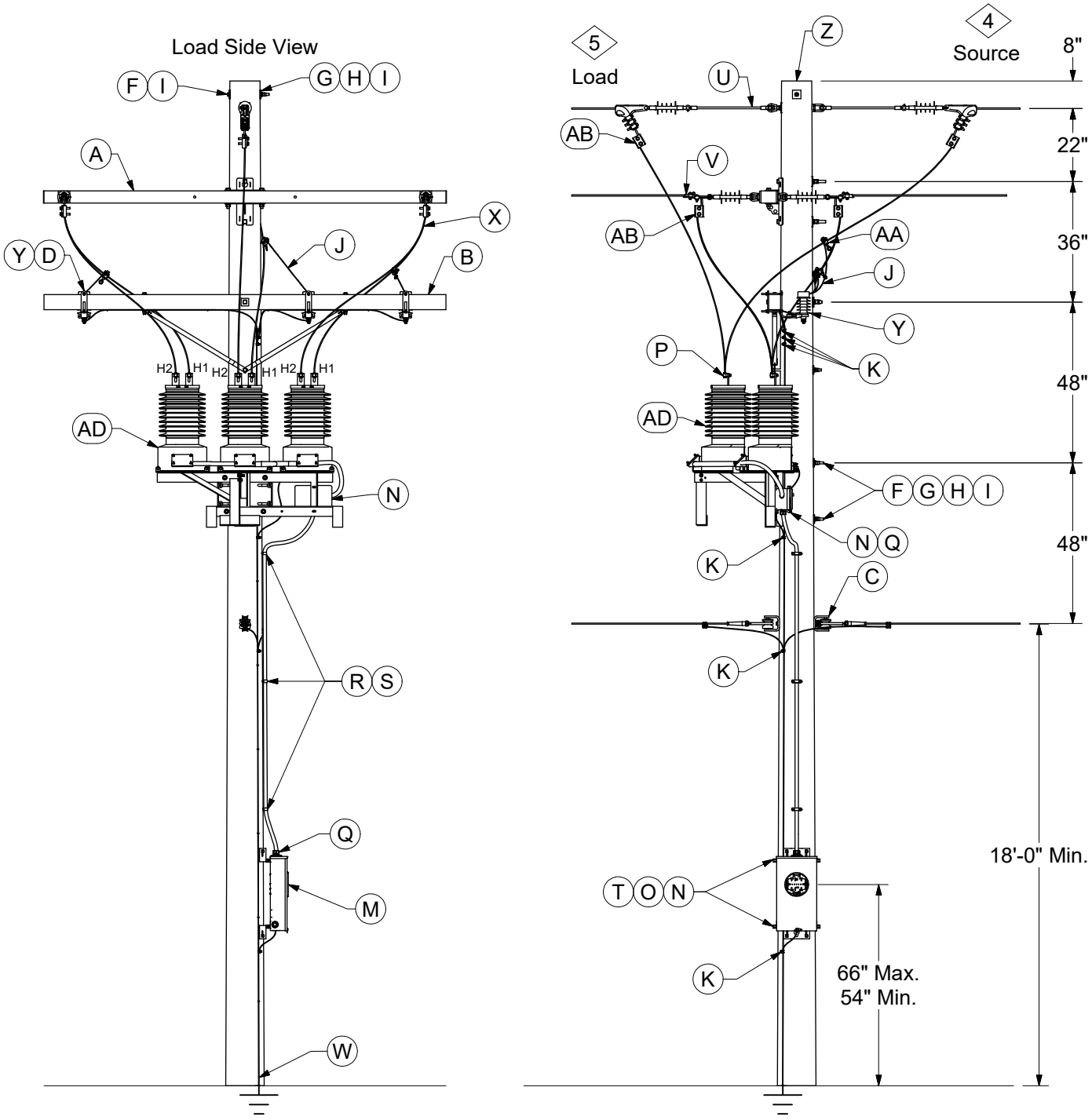
1. Grounding all instrument transformers, arrestors, and mounting assembly to the grounding unit.
2. Install barriers for protection against vehicular traffic where necessary.
3. Maintain a minimum of 40" between the energized conductors and the pole on climbing side of the pole as per DCS **29 00 18 01**; maintain a minimum of 19" between the energized lateral and vertical conductors and the pole on non-climbing side of the pole as per DCS **29 00 17 12**.
4. If disconnect switches are required, the switch may be installed on adjacent poles.
5. For wire color coding on PT and CT secondaries, refer to system metering drawings.
6. If metering structure is located within a substation, the metering and arrestors ground wires must be connected to the substation ground mat.
7. To enhance the protection of the metering equipment ensure that the tap for the phase conductor to the arrestor is as short as possible in distance. Install arrestors to load side on the adjacent pole if multiple span exposure on the load side exists and arrestors may be installed on adjacent poles.

ILLINOIS ONLY

	ITEM	STK / DCS #	DESCRIPTION - Ameren Provides and Installs Material 25 12 15 **	01	02
	A	**04 00 42 03 @**	Crossarm - Deadend, F/G 10'	1	1
	B	**04 00 20 03 @**	Crossarm - Wood, 10'	1	1
	C	**06 01 01 02**	Double Clevis	1	1
	D	23 62 128	Adapter Pin for Vice Top Insulator	1	1
	E	25 05 143	Insulator, Vice Top, 12kV	1	1
	F	17 58 054	Bracket, Arrester/Cutout Mounting	3	3
	G	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	2	2
	H	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	4	4
	I	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	2	2
	J	23 66 207	Washer, Curved, Square, 5/8"	6	6
	K	23 66 134	Lock Washer - 5/8" Double Coil	6	6
	L	23 65 043	Lock Nut - 5/8" Square	6	6
	M	23 53 003	Bolt, DA, 5/8" x 18" w/ 4 square nuts	3	3
	N	18 51 021	Wire, #6, Cu, S.D., Covered (ft.)	35	35
	O	17 54 004	Connector - Split Bolt, #4 Sol CU thru #8 Sol CU	4	4
	P	23 17 294	Mounting - Primary Metering Unit	1	1
	Q	40 01 120	Box - Secondary Connection	1	1
	R	40 54 378	Meter Socket - 600V 8 Terminal	1	1
	S	62 51 563	Bracket - Meter Socket Hanging	2	2
	T	23 60 007	Lag Screw - 1/2" x 4"	4	4
	U	40 53 612	Conduit - Connector 1" Steel	10	10
	V	21 66 039	Screw, Hex Head Cap, 3/8"x2"	4	4
	W	**06 12 30 03 @**	Double Deadend on Pole with FG Extension	1	1
	X	**06 12 35 02 @**	Double Deadend on FG Crossarm	2	2
	Y	69 58 296	Guard, Wildlife, PT (H1) Bushing	2	2
@	Z	**12 00 10 ****	Grounding Unit	1	1
@	AA	18 51 018	Wire, #2 Cu, 5kV, Covered, S.D. (ft.)	60	-
		18 51 019	Wire, #2 Cu, Covered, S.D. (ft.)	-	60
@	AB	**12 00 01 01 @**	Arrester, Lightning	3	3
@	AC	**07 00 80 00 @**	Lead Wire, PH (ft.)	#	#
@	AD	**02 00 02 01**	Pole	1	1
@	AE	**07 00 21 00 @**	Hot Line Clamp	6	6
@	AF	**07 00 25 00 @**	Clamp, Parallel Groove	6	6
@	AG	Meter Shop	Current Transformer, 7.2kV	2	2
@	AH	Meter Shop	Potential Transformer, 7.2kV	2	2
@	AI	Meter Shop	Wire Pack, Color Coded, 10-#12 (ft.)	5	5
@	AJ	Meter Shop	Wire, #2 Cu, S.D., Covered (ft.)	20	20
@	AK	12 51 303	Conduit, Flex, 1" Non-Metalic (ft.)	#	#
		286	Op Code, Install Primary Metering	1	1

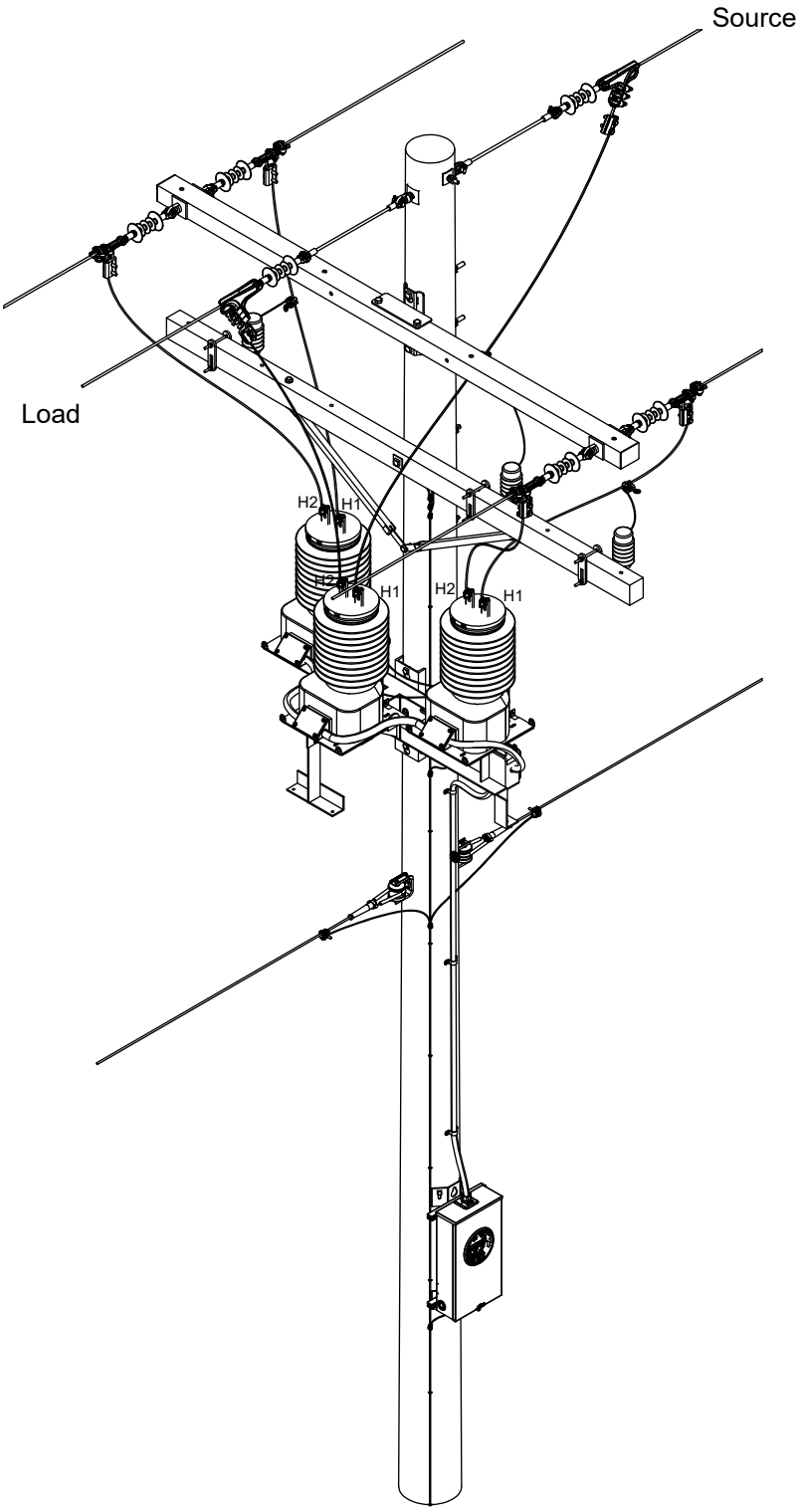
REV	DATE	ENG	DESCRIPTION
0	01/01/24	WYW	New - Moved from DCS 25 12 12 **

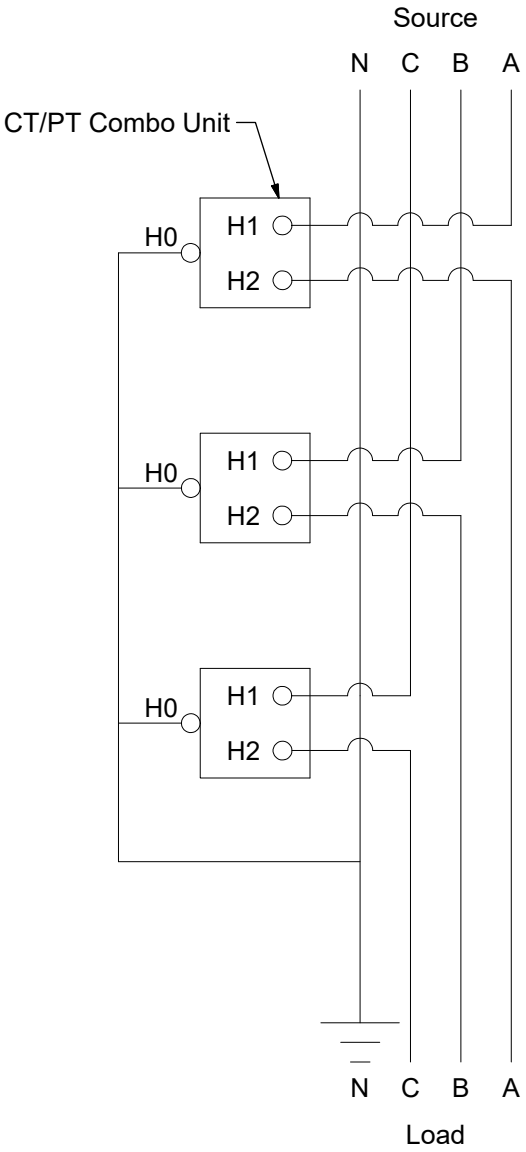
ILLINOIS ONLY



REV	DATE	ENG	DESCRIPTION
2	01/01/24	WYW	Converted to new format
1	10/01/20	WYW	

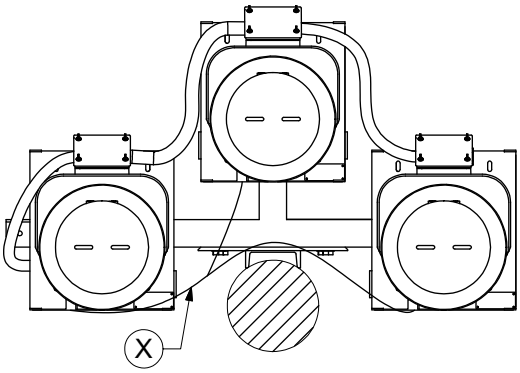
ILLINOIS ONLY

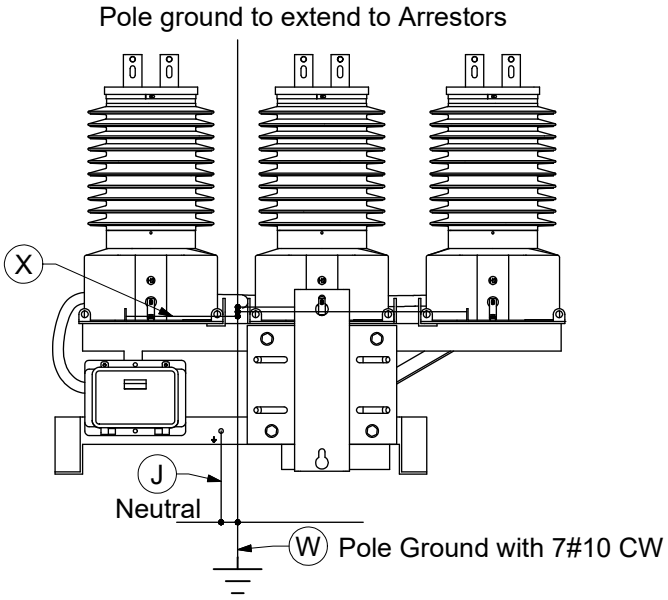




3-Phase 4 Wire

ILLINOIS ONLY





CONSTRUCTION NOTE(s):

1. Ground each CT/PT combo instrument, arrestors, and mounting assembly to the pole ground.

2. If meter structure is located within a substation, the pole ground riser must be connected to the substation ground grid.

3. Maintain a minimum of 40" between the energized conductors and the pole on climbing side of the pole as per DCS **29 00 18 01**; maintain a minimum of 19" between the energized lateral and vertical conductors and the pole on non-climbing side of the pole as per DCS **29 00 17 12**.

4. Install 2-bolted deadend, DCS 03 01 01 13 if slack span.

ILLINOIS ONLY

	ITEM	STK / DCS #	DESCRIPTION - Ameren Provides and Installs Material 25 12 20 **	01
	A	**04 00 42 03 @**	Crossarm - Deadend, F/G, 10'	1
	B	**04 00 20 03 @**	Crossarm - Wood, 10'	1
4,@	C	**06 01 01 02**	Double Clevis	1
	D	17 58 054	Bracket, Arrester/Cutout Mounting	3
	E	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	1
	F	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	2
	G	23 66 207	Washer, Curved, Square, 5/8"	3
	H	23 66 134	Lock Washer - 5/8" Double Coil	2
	I	23 65 043	Lock Nut - 5/8" Square	2
	J	18 51 025	Wire, #6, Cu, S.D., Covered (ft.)	35
	K	17 54 004	Connector - Split Bolt, #4 Sol CU thru #8 Sol CU	6
	L	40 01 120	Enclosure, Secondary Connection	1
	M	40 54 353	Socket, Meter, Instrument Rated, Pre-Wired, 13-Terminal	1
	N	62 51 563	Bracket - Meter Socket Hanging	2
	O	23 60 007	Lag Screw - 1/2" x 4"	4
	P	17 51 114	Connector - One Bolt #8 to 2/0	6
	Q	40 53 612	Conduit - Connector 1" Steel	2
	R	40 83 093	Clamp - Conduit 1" Two Hole Steel Strap	3
	S	23 60 032	Lag Screw - 1/4" x 1 1/2"	6
	T	21 66 039	Screw, Hex Head Cap, 3/8”x2”	4
	U	**06 12 30 03 @**	Deadend on Pole, FG Extension	1
	V	**06 12 35 02 @**	Double Deadend on FG Crossarm	2
@	W	**12 00 10 ****	Grounding Unit	2
@	X	18 51 019	Wire, #2, Cu, S.D., Covered (ft.)	60
		18 51 018	Wire, #2, Cu, S.D., 5kV, Covered (ft.)	60
@	Y	10 01 144	Arrester, Lightning, 10kV	3
		10 01 008	Arrester, Lightning, 3kV	3
@	Z	**02 00 02 01**	Pole	1
@	AA	**07 00 21 00 @**	Clamp, Hot Line	3
@	AB	**07 00 25 00 @**	Clamp, Parallel Groove	3
@	AC	12 51 303	Conduit, Flex, 1", Non-Metallic	#
@	AD	Meter Shop	CT/PT Combo 15kV - Contact Metering Dept.	1
		286	Op Code, Install Primary Metering	1

REV	DATE	ENG	DESCRIPTION
2	01/01/24	WYW	Converted to new format
1	10/01/20	WYW	

ILLINOIS ONLY

DESIGN NOTE(s):

4. Ameren overcurrent protection is required on source side, preferable on adjacent upstream pole.

5. A customer-owned group-operated disconnect switch shall be installed on an adjacent structure on the customer side of the meter structure. The switch or subsequent breaker shall be capable of breaking the maximum current expected on the line. (Refer to DCS **25 12 30 00** and DCS **25 12 30 01** for typical customer owned primary group operated switch and overcurrent protection)

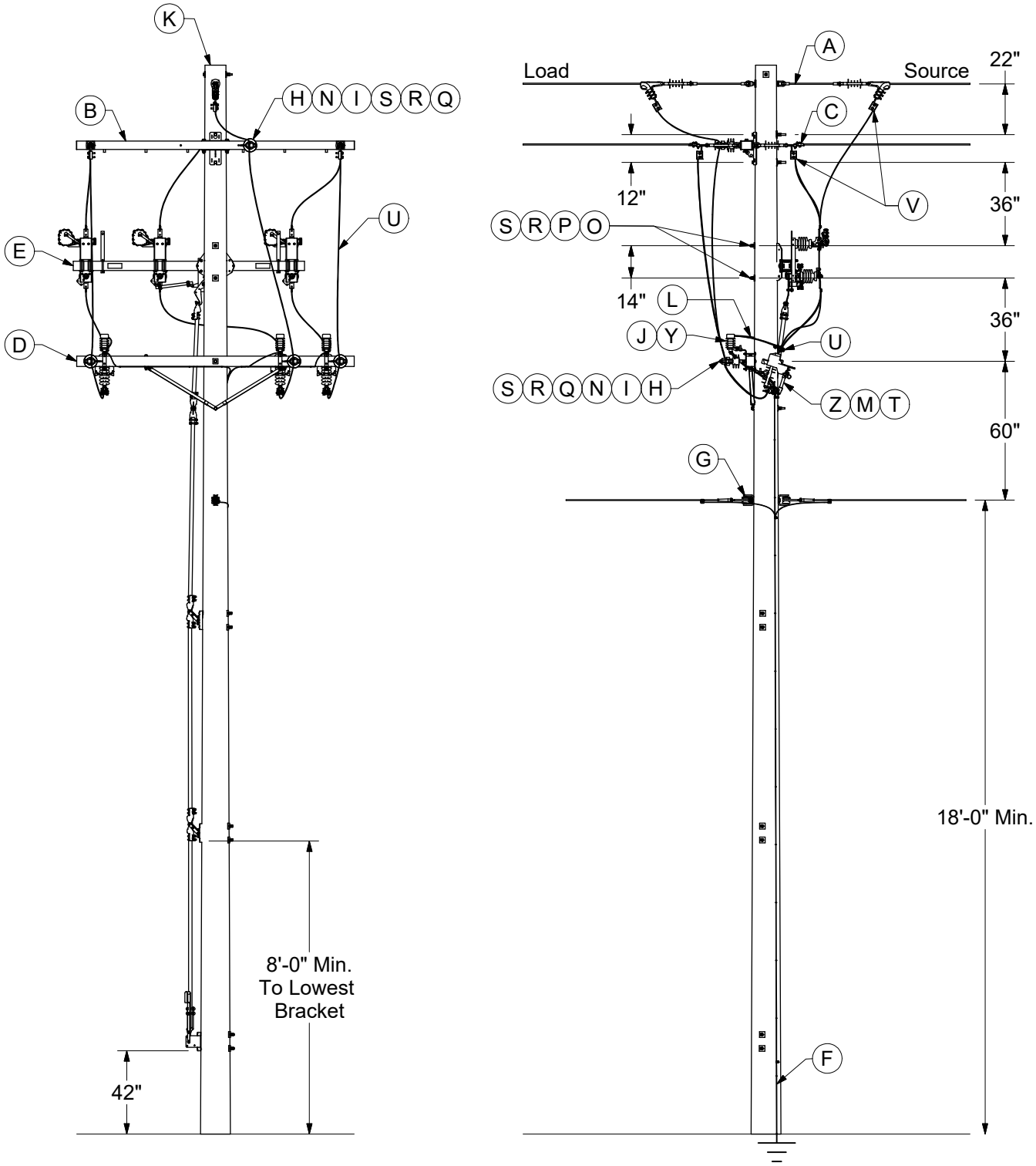
6. Lightning arrestor selection:
   4kV grounded system - Stock #10 01 133
   12.47 and 13.2kV grounded systems - Stock #10 01 144
   13.8kV grounded system - Stock #10 01 008
   (Refer to DCS **12 00 01 01** for other system ratings)

7. Install barriers for protection of the pole from vehicular traffic where necessary.

8. For wire color coding on PT and CT secondaries, contact System Metering.

9. If the meter pole is located within a substation or immediate outside fence, the 7 #10 ground riser needs to be upgraded to #2 copper for high fault currents and tied to substation grid. (Refer to DCS **12 00 10 04**)

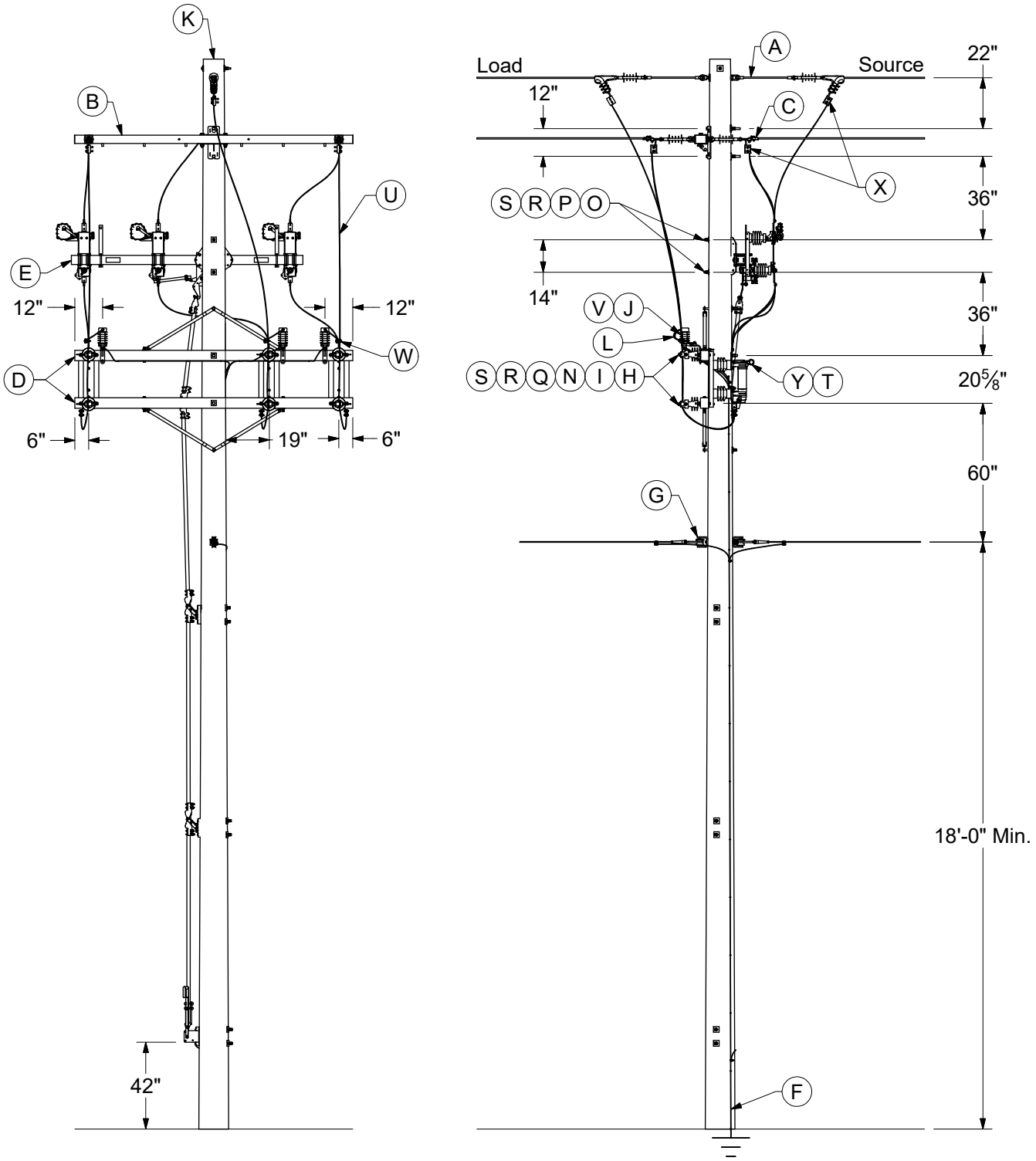
ILLINOIS ONLY 11



25 12 30 01
200 Amp Fused Switch

REV	DATE	ENG	DESCRIPTION
1	01/01/24	WYW	Converted to new format
0	07/01/20	WYW	

ILLINOIS ONLY



25 12 30 02
SM-5 Fuse and Fuse Mounting

REV	DATE	ENG	DESCRIPTION
1	01/01/24	WYW	Converted to new format
0	07/01/20	WYW	

ILLINOIS ONLY

CONSTRUCTION NOTE(s):

1. A 15kV group operated switch rated 600 amp and associated overcurrent protection are required immediately after the Ameren meter pole.
2. Customer may choose to install lightning arrestors and overcurrent protection on structure immediately following the group operated switch structure.
3. For location fused at 200 amp or less, open type cutout, polymer insulator with load break hook is required.
4. SM5 fuse device is used on 4kV system requiring 201 to 400 amp overcurrent protection.
5. If lightning arrestors are installed on the group operated switch structure, a ground mat is required.
6. If the pole ground riser is attached to the system neutral, a ground mat is required.
7. If group operated switch structure does not have overcurrent or lightning protection on structure, and there is vertical pipe insulation, a driven ground rod needs to be installed and bonded to the switch handle. If there is no pole ground riser extended to the neutral, ground mat is not required.
8. Customer's group operated switch may be operated with hook stick, no handle is located at the ground line. In this case, no ground mat is required.
9. Lightning arrestor selection:
   4kV grounded system - 3kV/2.55kV MCOV
   12.47kV and 13.2kV grounded systems - 10kV/8.4kV MCOV
   13.8kV grounded system - 12kV/10.2kV MCOV
10. 45ft. pole height with proposed framing ensures minimum NEC/NESC clearances are maintained.

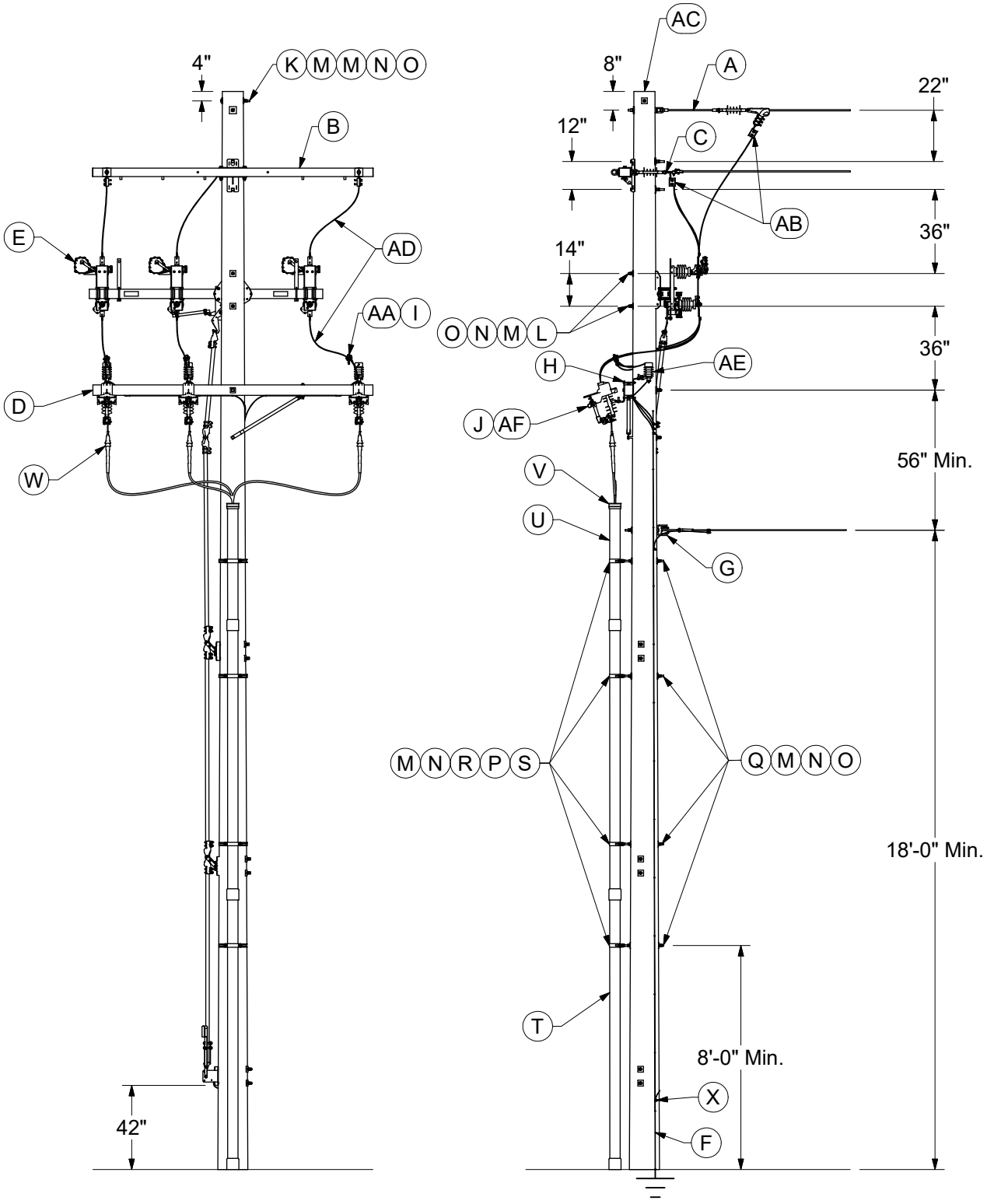
<11> For DER consult with IL Meter Engineering.

ILLINOIS ONLY

	ITEM	DESCRIPTION - Customer Provides and Installs Material 25 12 30 **	01	02
	A	Double Deadend on Pole w/ FG Extension	1	1
	B	Crossarm - Deadend, FG, 10'	1	1
	C	Double Deadend on FG Crossarm w/o FG Extension	2	2
	D	Single 10' Wood Arm w/ Braces	1	2
	E	Switch - 15kV, Group Operated	1	1
	F	Grounding Unit	1	1
	G	Double Clevis, Secondary	1	1
	H	Insulator, Vice Top, 12kV	4	4
	I	Adapter Pin for Vice Top Insulator	4	4
	J	Bracket, Crossarm, Double Sided NEMA	3	3
	K	Pole (45ft and Class 3 Min.)	1	1
	L	Wire, Cu, #6, S.D., Covered (ft.)	30	30
	M	Wildlife Guard - Cover Cutout	3	3
	N	Bolt, Mach., 5/8" x 6" w/ square nut	4	6
	O	Bolt, Mach., 5/8" x 12" w/ square nut	2	2
	P	Washer, Curved, Square, 5/8"	2	2
	Q	Washer, Flat, Square 5/8"	8	12
	R	Lock Washer - 5/8" Double Coil	6	8
	S	Lock Nut - 5/8" Square	6	8
	T	Fuse (Sized by Engineer)	3	3
	U	Clamp, Hot Line	3	3
	V	Clamp, Parallel Groove	6	6
	W	Cable, 15kV, Size per Load	#	#
@	X	Wire, Cu, #2, S.D., Covered (ft.)	50	-
		Wire, Cu, 4/0, S.D., Covered (ft.)	-	50
	Y	Arrester, Lightning, 12kV	3	3
@		Arrester, Lightning, 3kV	3	3
		Arrester, Lightning, 10kV	3	3
@	Z	Switch, Fused, 200A, 15kV	3	-
		Switch, Fused, SM5	-	3

REV	DATE	ENG	DESCRIPTION
1	01/01/24	WYW	Converted to new format
0	07/01/20	WYW	

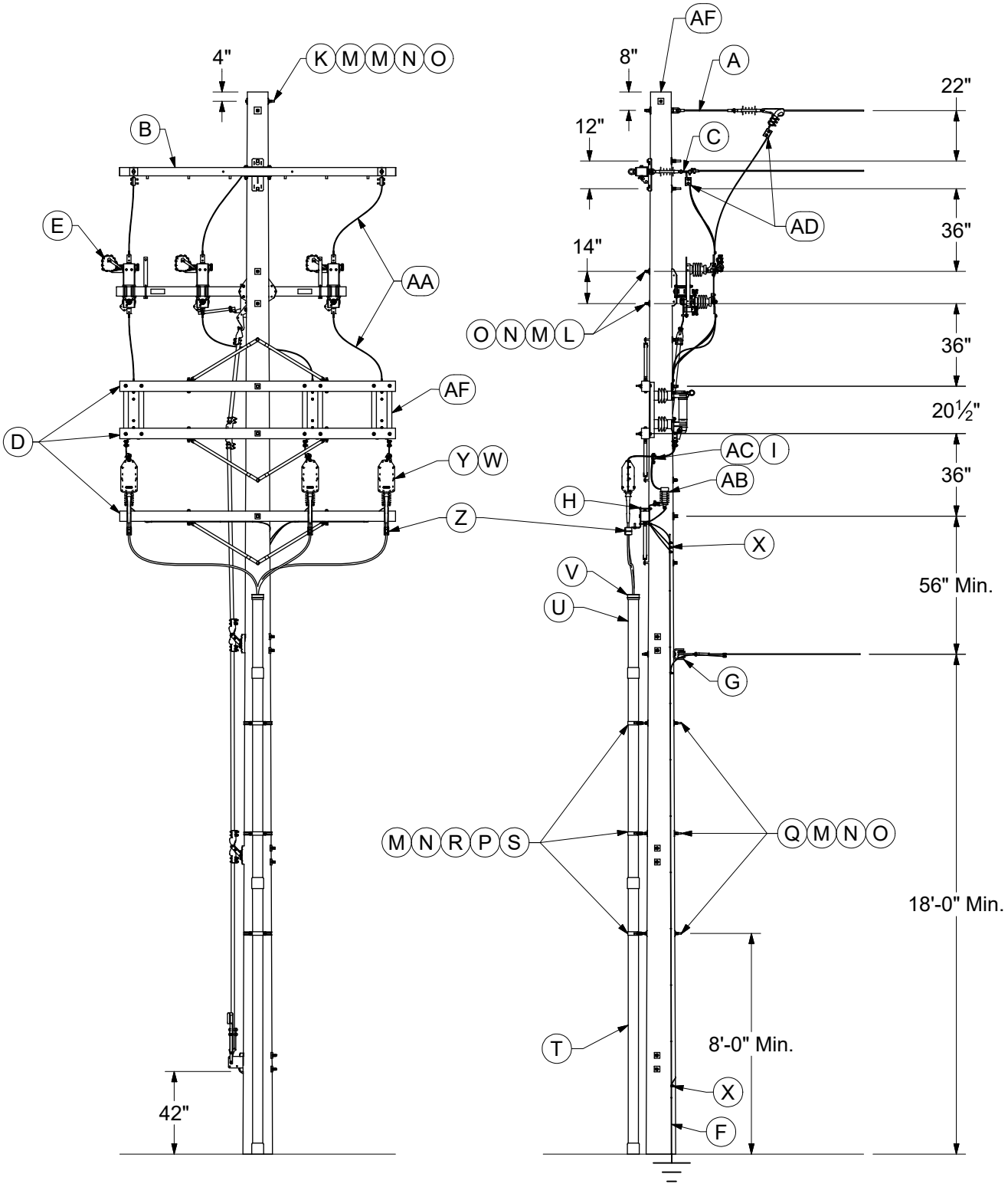
ILLINOIS ONLY 12



25 12 31 01
200 Amp Fused Switch

REV	DATE	ENG	DESCRIPTION
0	01/01/24	WYW	New - Renumbered from DCS 25 12 30 01

ILLINOIS ONLY



25 12 31 02
SM-5 Fuse and Fuse Mounting

REV	DATE	ENG	DESCRIPTION
0	01/01/24	WYW	New - Renumbered from DCS 25 12 30 01

ILLINOIS ONLY

CONSTRUCTION NOTE(s):

1. A 15kV group operated switch rated 600 amp and associated overcurrent protection are required immediately after the Ameren meter pole.

2. Customer may choose to install lightning arrestors and overcurrent protection, and UG riser on structure immediately following the group operated switch structure.

3. For location fused at 200 amp or less, open type cutout, polymer insulator with load break hook is required.

4. SM5 fuse device is used on 4kV system requiring 201 to 400 amp overcurrent protection.

5. If lightning arrestors are installed on the group operated switch structure, a ground mat is required.

6. If the pole ground riser is attached to the system neutral, a ground mat is required.

7. If group operated switch structure does not have overcurrent or lightning protection on structure, and there is vertical pipe insulation, a driven ground rod needs to be installed and bonded to the switch handle. If there is no pole ground riser extended to the neutral, ground mat is not required.

8. Customer's group operated switch may be operated with hook stick, no handle is located at the ground line, In this case, no ground mat is required.

9. Lightning arrestor selection:
   4kV grounded system - 3kV/2.55kV MCOV
   12.47 and 13.2kV grounded systems - 10kV/8.4kV MCOV
   13.8kV grounded system - 12kV/10.2kV MCOV

10. 45ft. pole height (0-200 Amp fuses) and 50ft. pole height (201-400 Amp fuses) with proposed framing ensures minimum NEC/NESC clearances are maintained at termination pole.

11. Another option is for customer to install underground termination pole immediately after Ameren meter pole. Customer provided group operated switch and overcurrent protection could be located in customer's padmount switchgear provided distance between termination pole and switchgear is less than 50ft.

For DER consult with IL Meter Engineering.

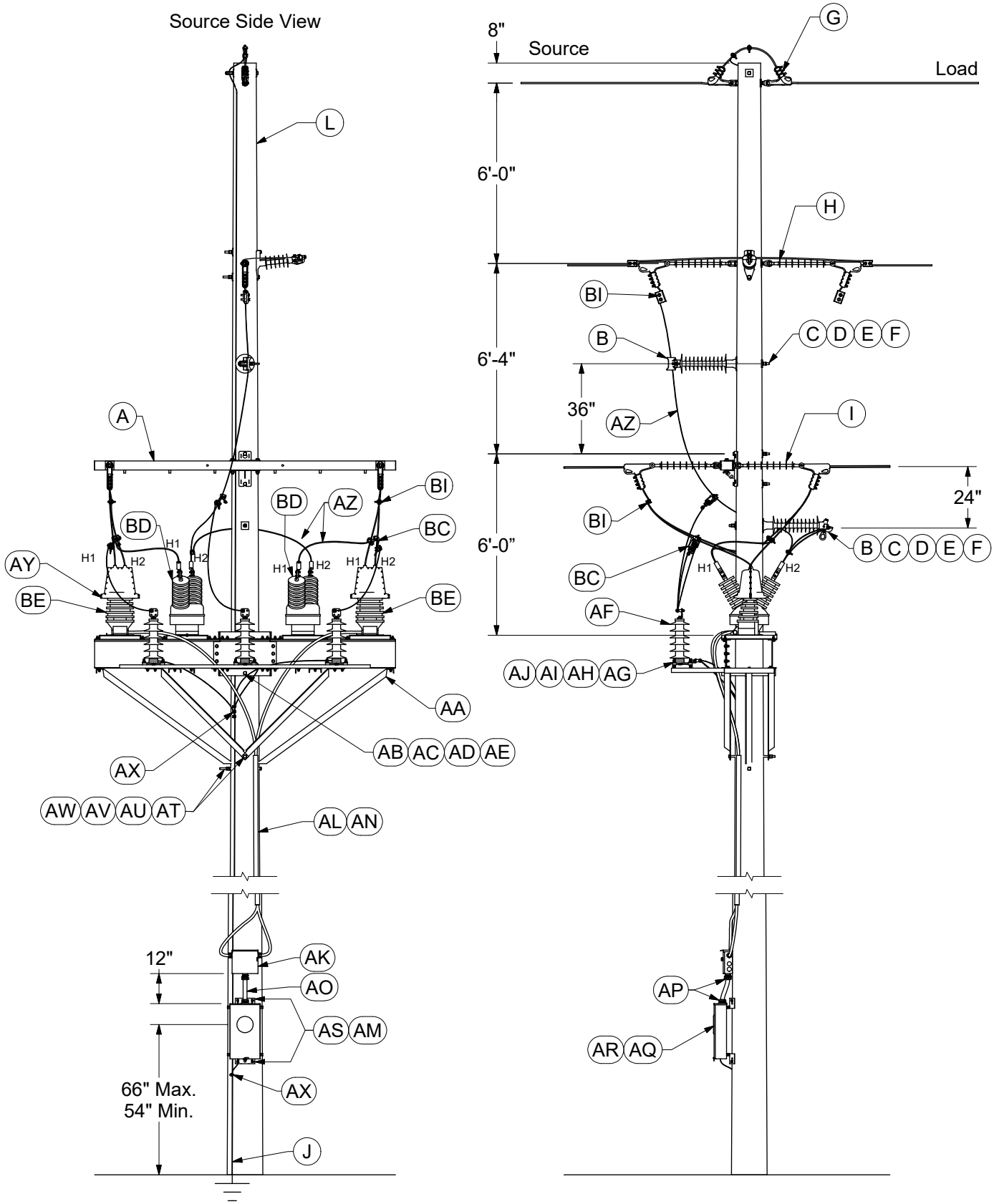
REV	DATE	ENG	DESCRIPTION
0	01/01/24	WYW	New - Renumbered from DCS 25 12 30 01

ILLINOIS ONLY

	ITEM	DESCRIPTION - Customer Provides and Installs Material 25 12 31 **	01	02
	A	Straight Deadend on Pole w/ FG Extension	1	1
	B	Crossarm, FG, Deadend, 10'	1	1
	C	Single Deadend on FG Crossarm w/o FG Extension	2	2
	D	Crossarm, Wood, 10'	1	3
	E	Switch - 15kV, Group Operated	1	1
	F	Grounding Unit	1	1
	G	Single Clevis	1	1
	H	Bracket, Crossarm, Double Sided NEMA	3	3
	I	Wire, Cu, #6 S.D. Covered (ft.)	30	30
	J	Wildlife Guard - Cover Cutout	3	-
	K	Bolt, Mach., 5/8" x 12" w/ square nut	1	1
	L	Bolt, Mach., 5/8" x 14" w/ square nut	2	2
	M	Washer, Curved, Square, 5/8"	11	11
	N	Lock Washer - 5/8" Double Coil	11	11
	O	Lock Nut - 5/8" Square	7	7
	P	Bracket - Standoff, 12"	4	4
	Q	Bolt, DA, 5/8" Dia x 18" w/ 4 square nuts	4	4
	R	Nut - 5/8" Jam	4	4
	S	Strap - Conduit 4" w/2" Bolts	4	4
	T	Conduit - 4" Schedule 80 (ft.)	10	10
	U	Conduit - 4" Schedule 40 (ft.)	20	20
	V	Conduit - Coupling 4" Bell End	1	1
	W	Termination Cable - 15kV #2 - 4/0	3	3
	X	Connector - Split Bolt, #4 Sol CU thru #8 Sol CU	5	5
	Y	Guard - Wildlife, Cover, Termination, #1 to 750 kcmil	-	3
	Z	Bracket - Cable Support	-	1
	AA	Clamp, Hot Line	3	3
	AB	Clamp, Parallel Groove	6	6
	AC	Pole (45ft and Class 3 Min.)	1	1
@	AD	Wire, Cu, #2, S.D., Covered (ft.)	50	-
		Wire, Cu, 4/0, S.D., Covered (ft.)	-	50
	AE	Arrester - Lightning, 3kV/2.55kV MCOV	3	3
@		Arrester - Lightning, 10kV/8.4kV MCOV	3	3
		Arrester - Lgntning, 12kV/10.2kV MCOV	3	3
@	AF	Switch, Fused, 200A, 15kV	3	-
		Switch, SM-5 Fuse, 400A, 15kV	-	3
@	AG	Cable, 15kV, Size per Load	#	#

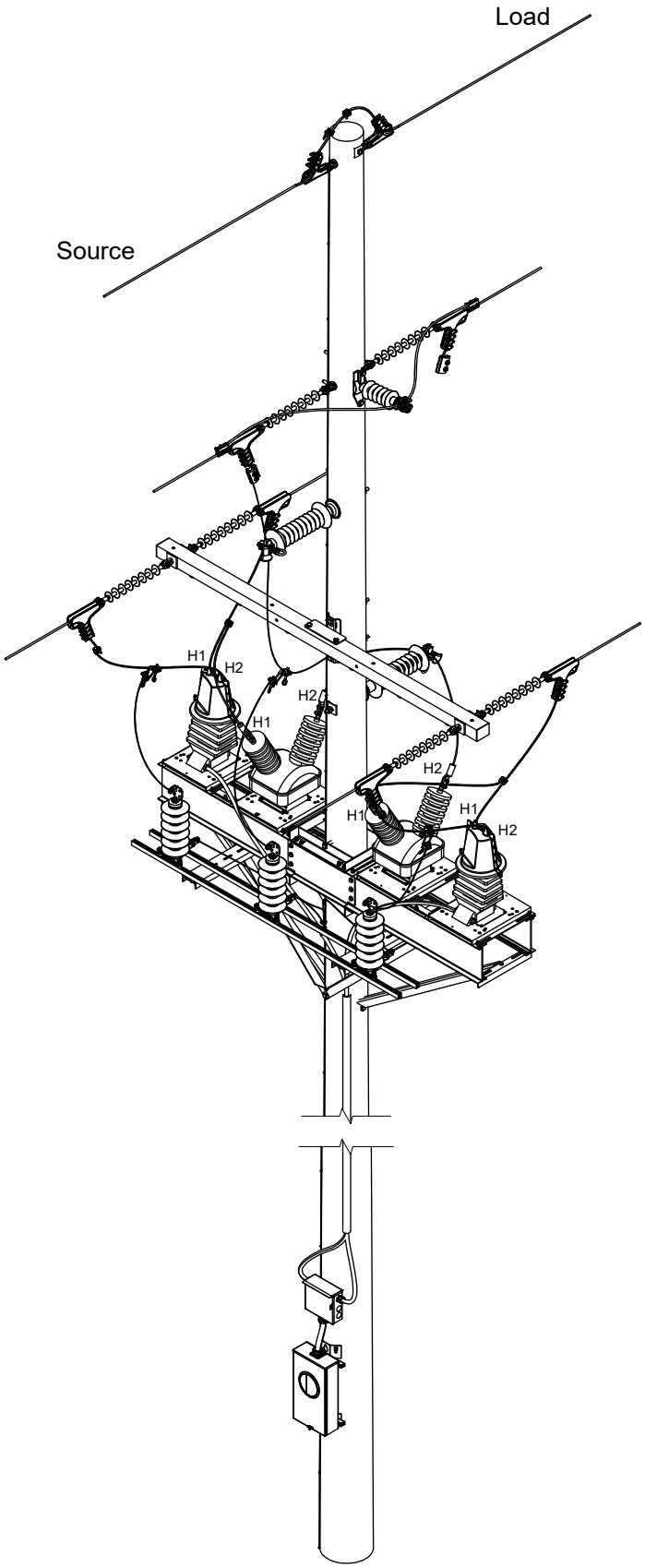
REV	DATE	ENG	DESCRIPTION
0	01/01/24	WYW	New - Renumbered from DCS 25 12 30 01

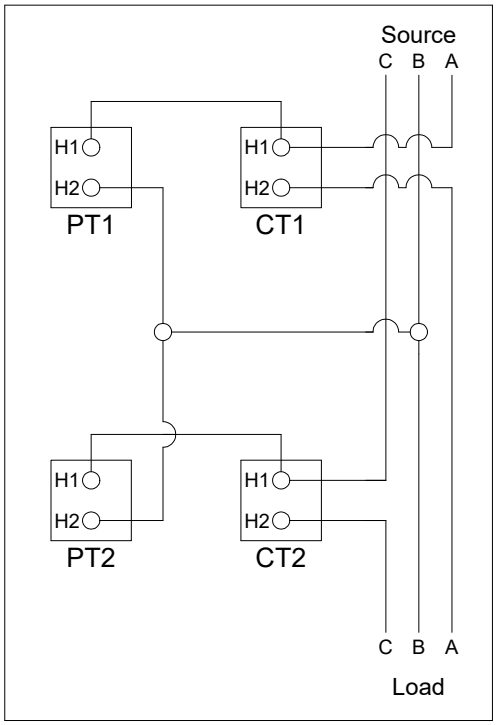
MISSOURI ONLY



REV	DATE	ENG	DESCRIPTION
2	01/01/24	WYW	Converted to new format
1	11/07/16	WYW	

MISSOURI ONLY





3 Wire

MISSOURI ONLY

CONSTRUCTION NOTE(s):

1. Ground all instrument transformers, arrestors, and mounting assembly to the grounding unit.
2. Install barriers for protection against vehicular traffic where necessary.
3. Maintain a minimum of 23" clearance between 34kV phases or phase to ground.
4. Maintain minimum of 6'-0" clearance between the aluminum mounting platform and the crossarm.
5. Maintain a minimum of 40” between the energized conductors and the pole on climbing side of the pole as per DCS **29 00 18 01**; maintain a minimum of 30” between the energized lateral and vertical conductors and the pole on non-climbing side of the pole as per DCS **29 00 17 12**.
6. Maintain a minimum of 40" between any part of the aluminum mounting platform and conductors of 4 or 12kV underbuilds.
7. If disconnect switches are required, the switches may be installed on adjacent poles.
8. For wire color coding on PT and CT secondary's, refer to system meter drawings.
9. If metering structure is located within a substation, the metering and LA ground wires must be connected to the substation ground grid.
10. To enhance the protection of the metering equipment, ensure that the tap for the phase conductor to the arrestor is as short as possible. Install arrestors to load side on the adjacent pole if multiple span exposure on the load side exists.
11. Intermediate class arrestor comes with isolator disconnect and hot line clamp (bronze, up to 2/0) assembly. For lead wire if greater than 2/0 copper and all aluminum, must select a proper size of stirrup.

	ITEM	STK / DCS #	DESCRIPTION - Customer Provides and Installs Material 25 34 01 **	00
	A	**04 00 42 03 @**	Crossarm - Deadend, F/G, 10'	1
	B	25 05 219	Insulator, Vertical L.P., 69kV, Universal Clamptop	2
	C	23 53 058	Bolt, DA, 3/4" Dia x 16" w/ 4 square nuts	2
	D	23 66 031	Washer, Curved, Square, 3/4"	1
	E	23 66 135	Lock Washer - 3/4" Double Coil	1
	F	23 65 042	Lock Nut - 3/4" Square	1
	G	**06 00 11 06 @**	Static Deadend Tangent w/ Pole Ground	1
	H	**06 34 60 25 @**	35kV Double Deadend Loop	1
	I	**06 34 68 08 @**	35kV Double Deadend on Arm	2
@	J	**12 00 10 ****	Grounding Unit	1
@	K	**02 00 02 01**	Pole	1

REV	DATE	ENG	DESCRIPTION
2	01/01/24	WYW	Converted to new format
1	11/07/16	WYW	

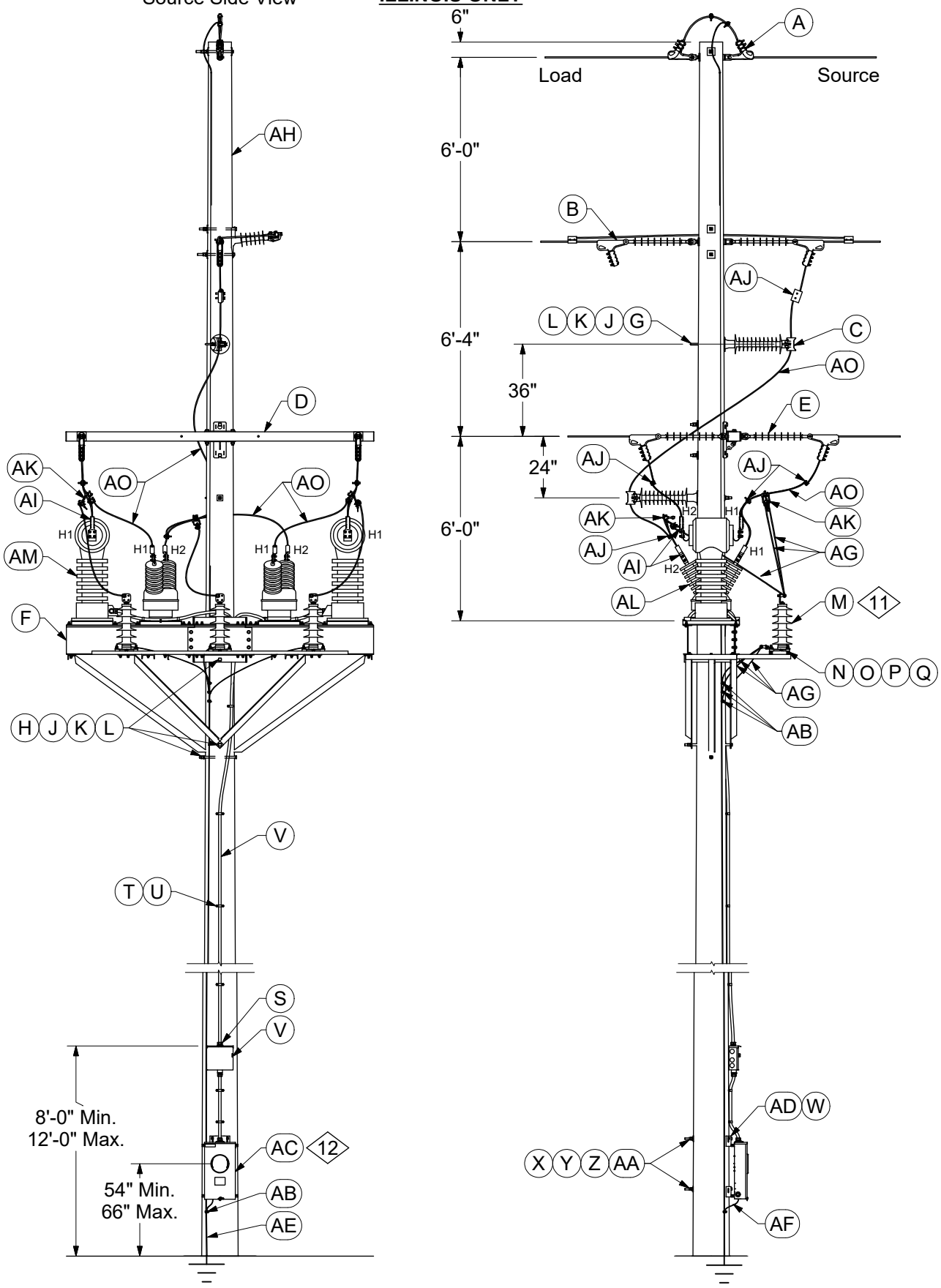
MISSOURI ONLY

	ITEM	STK / DCS #	DESCRIPTION - Ameren Provides and Installs Material 25 34 01 **	00
	AA	23 17 349	Mounting Assembly, 2CT's & 2PT's	1
	AB	23 52 103	Bolt, Mach., 3/4" x 18" w/ square nut	4
	AC	23 66 031	Washer, Curved, Square, 3/4"	4
	AD	23 66 135	Lock Washer - 3/4" Double Coil	4
	AE	23 65 042	Lock Nut - 3/4" Square	4
	AF	10 01 242	Arrester, 29kV MCOV, 36kV Duty Cycle, Intermediate, Base Mount	3
	AG	23 52 427	Bolt, Mach., 1/2" x 2-1/2" w/ square nut	9
	AH	23 66 017	Washer - Round 1/2"	9
	AI	23 66 133	Lock Washer - Double Coil 1/2"	9
	AJ	23 65 056	Lock Nut - 1/2" Square	9
	AK	40 01 120	Box - Secondary Connection	1
	AL	12 51 217	Conduit - 2" Split, SCH 40, .2" X 10'	1
	AM	23 60 007	Lag Screw - 1/2" x 4"	4
	AN	27 60 035	Iron Hanger, Galv., 3/4" Wide (ft.)	3
	AO	40 52 468	Conduit, Flex, 1-1/2", Non-Metallic (ft.)	1
	AP	40 52 072	Conduit Fitting, Liquid-tight, Flex, 1-1/2”	2
	AQ	40 04 246	Socket, Meter, Instrument Rated, 8-Terminal	1
	AR	21 66 039	Screw, Hex Head Cap, 3/8”x2”	4
	AS	62 51 563	Bracket - Meter Socket Hanging	2
	AT	23 52 068	Bolt, Mach., 5/8" x 16" w/ square nut	2
	AU	23 66 134	Lock Washer - Double Coil 5/8"	2
	AV	23 66 207	Washer, Curved, Square, 5/8"	2
	AW	23 65 043	Lock Nut - 5/8" Square	2
	AX	17 54 005	Connector - Split Bolt, #2 Solid to #6 Solid	5
	AY	69 56 039	Wildlife Cover for Ritz 34kV CT	2
@	AZ	18 51 019	Wire, #2 Cu, S.D., Covered (ft.)	#
@	BA	18 51 021	Wire, #6 Cu, S.D., Covered (ft.)	#
@	BB	18 11 065	Cord, Hrd Srv, 2-#14 Cu, 600V	#
@	BC	**07 00 21 00 @**	Clamp, Stirrup	3
@	BD	Meter Shop	Potential Transformer	2
@	BE	Meter Shop	Current Transformer	2
@	BF	Meter Shop	Wire Pack, Color Coded, 10-#12 (ft.)	#
@	BG	**07 00 30 00 @**	Lug, Connector, 2-Hole/4-Hole Pad	8
@	BH	**07 00 80 00 @**	Lead Wire, PH (ft.)	#
@	BI	**07 00 25 00 @**	Clamp, Parallel Groove, PG*	7
		286	Op Code, Install Primary Metering	1

REV	DATE	ENG	DESCRIPTION
2	01/01/24	WYW	Converted to new format
1	11/07/16	WYW	

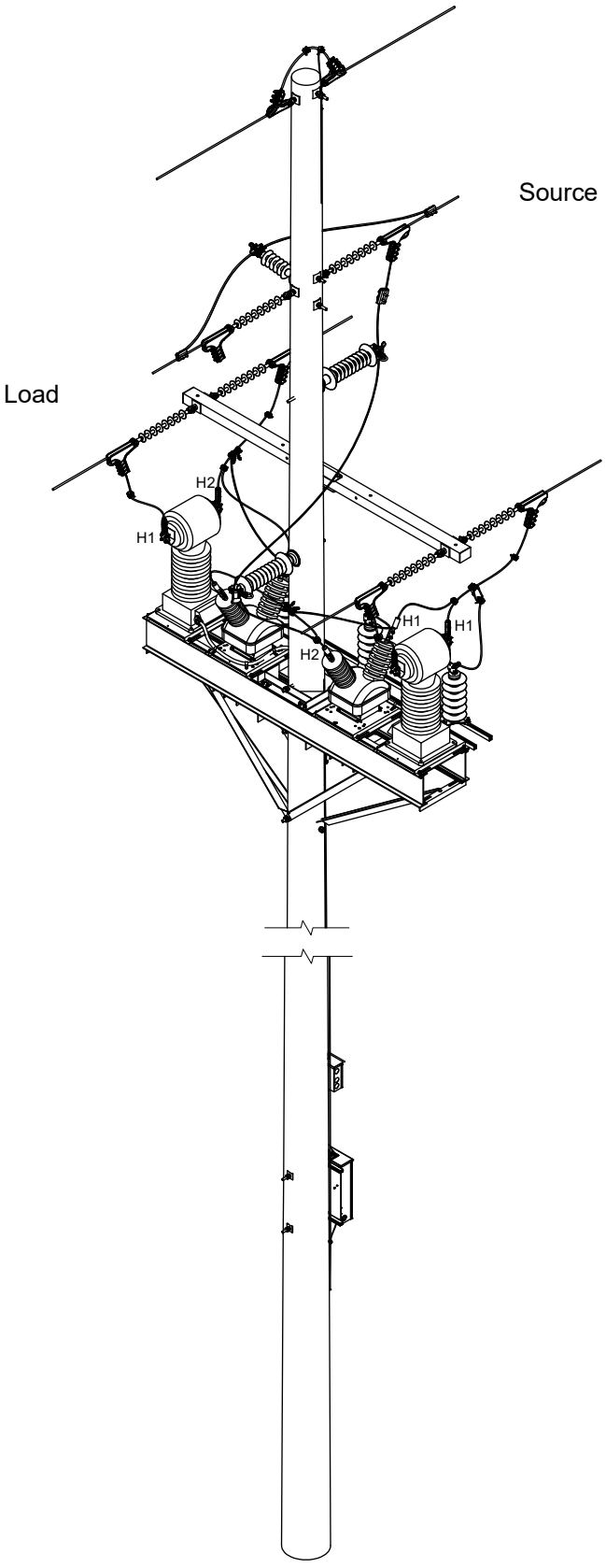
Source Side View

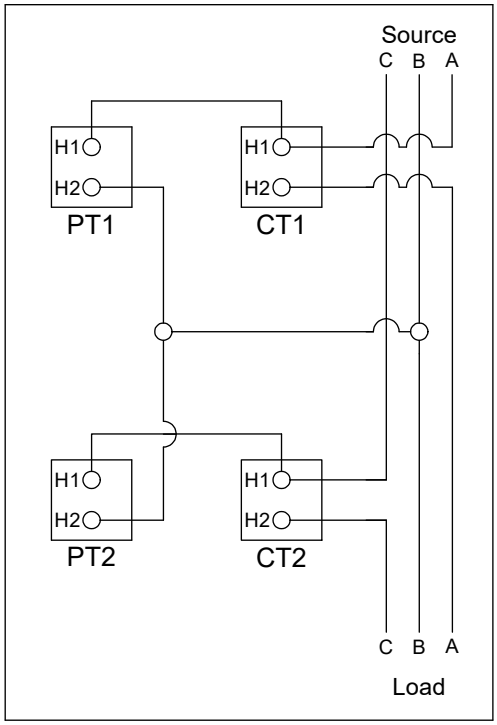
ILLINOIS ONLY



REV	DATE	ENG	DESCRIPTION
1	01/01/24	WYW	Converted to new format
0	08/14/14	WYW	

ILLINOIS ONLY





3 Wire

ILLINOIS ONLY

CONSTRUCTION NOTE(s):

1. Ground all instrument transformers, arrestors, and mounting assembly to the grounding unit.

2. Install barriers for protection against vehicular traffic where necessary.

3. Maintain a minimum of 23" clearance between 35kV phases or phase to ground.

4. Maintain a minimum of 6'-0" clearance between the aluminum mounting platform and the crossarm.

5. Maintain a minimum of 40” between the energized conductors and the pole on climbing side of the pole as per DCS **29 00 18 01**. Maintain a minimum of 30” between the energized lateral and vertical conductors and the pole on non-climbing side of the pole as per DCS **29 00 17 12**.

6. Maintain a minimum of 40" between any part of the aluminum mounting platform and conductors of 4 or 12kV underbuilt.

7. A customer-owned group-operated disconnect switch shall be installed on an adjacent structure on the customer side of the meter structure. The switch or subsequent breaker shall be capable of breaking the maximum current expected on the line.

8. For wire color coding on PT and CT secondaries, refer to System Meter drawings.

9. If metering structure is located within a substation, the metering and LA ground wires must be connected to the substation ground mat.

10. To enhance the protection of the metering equipment ensure that the tap for the phase conductor to the arrestor is as short as possible in distance. Install arrestors to load side on the adjacent pole if multiple span exposure on the load side exists and arrestors may be installed on adjacent poles.

Intermediate class arrestor comes with isolator disconnect & hot line clamp(Bronze, up to 2/0) assembly. For lead wire, if greater than 2/0 copper and all aluminum, must select a proper size of stirrup.

IL Meter Engineering specifies the Meter Enclosure used for the project and IL field poly-phase technicians order the meter enclosure and pole mounting bracket through the MDF. Most retail projects require a standard AMI meterbase (Stock #40 54 378) and pole mounting bracket (Stock #62 51 563). DER, Wholesale, and special retail projects (e.g. customer needs instantaneous data for load shedding scheme) require a two door cabinet (Stock #69 04 611) and other components supplied by IL Metering to house a high-end meter. Various two door cabinet manufacturers supply the MDF. Thus the required pole mounting bracket for the two door cabinet varies based on the supplier. Check the Stock #69 04 611 description in EMPRV for pole mounting bracket options.

ILLINOIS ONLY

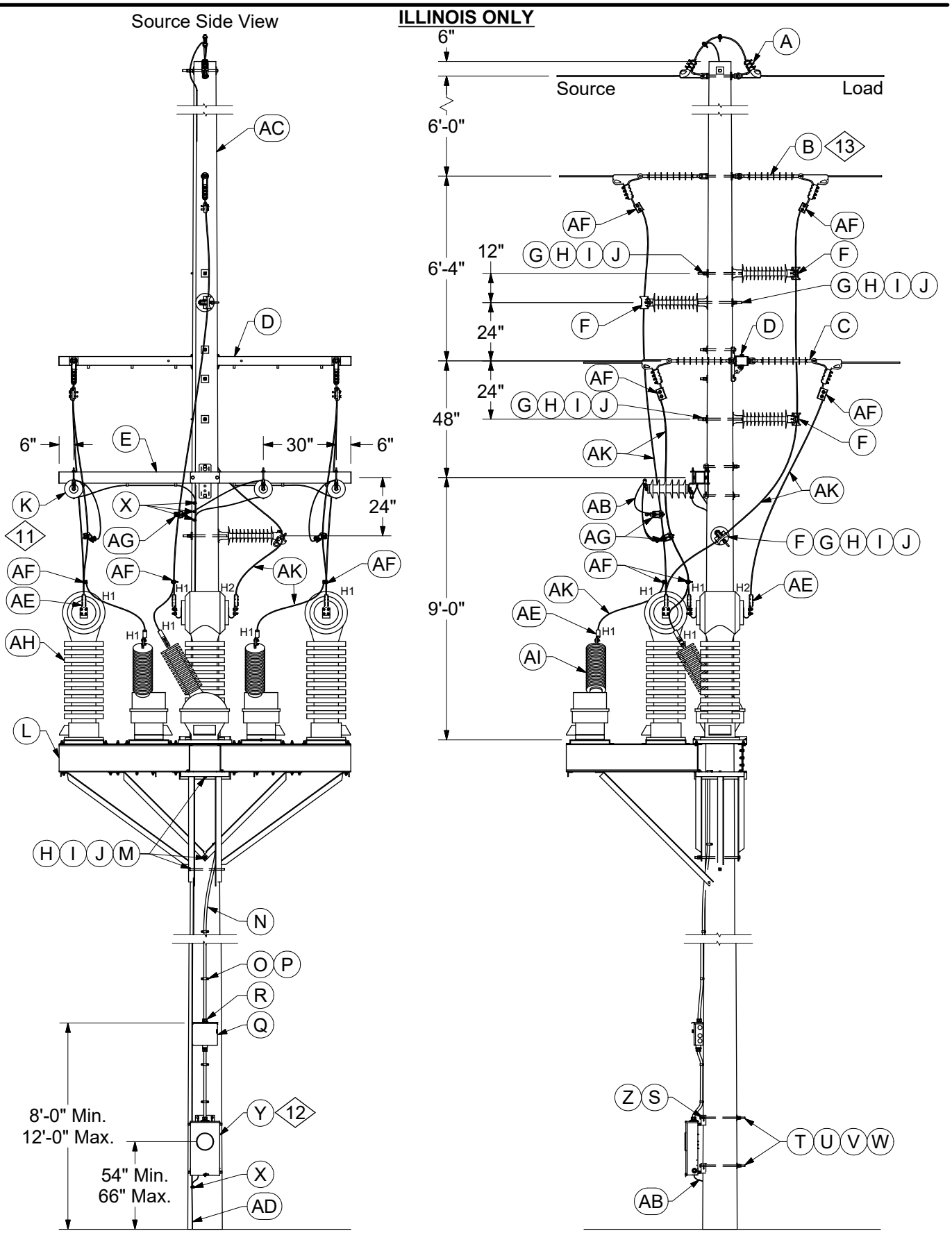
	ITEM	STK / DCS #	DESCRIPTION - Ameren Provides and Installs Material 25 34 02 **	00
	A	**06 00 11 06 @**	Static Deadend Tangent w/ Pole Ground	1
	B	**06 34 60 25 @**	35kV Double Deadend Loop	1
	C	25 05 219	Insulator, Vertical L.P., 69kV, Universal Clamptop	2
	D	**04 00 42 03 @**	Crossarm - Deadend, F/G 10'	1
	E	**06 34 68 11 @**	34kV Single Deadend on Arm	4
	F	23 17 349	Mounting Assembly, 2CT's & 2PT's	1
	G	23 53 059	Bolt, DA, 3/4" Dia x 18" w/ 4 square nuts	2
	H	23 52 103	Bolt, Mach., 3/4" x 18" w/ square nut	3
	I	23 66 031	Washer, Curved, Square, 3/4"	2
	J	23 66 131	Washer, Square, 3/4"	2
	K	23 66 135	Lock Washer - 3/4" Double Coil	4
	L	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	4
11	M	10 01 242	Arrester, 29kV MCOV, 36kV Duty Cycle, Intermediate, Base Mount	3
	N	23 52 427	Bolt, Mach., 1/2" x 2-1/2" w/ square nut	9
	O	23 66 017	Washer - Round 1/2"	9
	P	23 66 133	Lock Washer - Double Coil 1/2"	9
	Q	23 65 056	Lock Nut, 1/2"	9
	R	12 51 303	Conduit, Flex, 1" Non-Metalic (ft.)	20
	S	40 53 612	Conduit - Connector 1" Steel	2
	T	40 83 093	Clamp - Conduit 1" Two-Hole Steel Strap	15
	U	23 60 033	Lag Screw - 1/4" x 2" Hex Head	30
	V	40 01 120	Box - Secondary Connection	1
	W	23 60 007	Lag Screw - 1/2" x 4"	2
	X	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	2
	Y	23 66 027	Washer, Flat, Square 5/8"	2
	Z	23 66 134	Lock Washer - 5/8" Double Coil	2
	AA	23 65 043	Lock Nut - 5/8" Square	2
	AB	17 54 005	Connector - Split Bolt, #2 Solid to #6 Solid	4
12,@	AC	40 54 378	Meter, Enclosure, Instrument Rated, 8-Terminal	1
12,@	AD	62 51 563	Bracket - Meter Socket Hanging	2
@	AE	**12 00 10 ****	Grounding Unit	1
@	AF	18 51 019	Wire #2 Cu Covered (ft.)	#
@	AG	18 51 021	Wire #6 Cu Covered (ft.)	#
@	AH	**02 00 02 01**	Pole	1
@	AI	**07 00 30 00 @**	Lug, Connector w/ 2-Hole/4-Hole Pad	8
@	AJ	**07 00 25 00 @**	Clamp, Parallel Groove	7
@	AK	**07 00 21 00 @**	Clamp, Stirrup & Hotline	3
@	AL	Meter Shop	Potential Transformer	2
@	AM	Meter Shop	Current Transformer	2
@	AN	Meter Shop	Pack of 8C #12 Cu Wires of Individual Colors - Contact Metering Dept.	#
@	AO	**07 00 80 00 @**	Lead Wire, PH (ft.)	#
		286	OP Code, Install Primary Metering	1

REV	DATE	ENG	DESCRIPTION
1	01/01/24	WYW	Converted to new format
0	08/14/14	WYW	

METER INSTALLATIONS

Primary Meter Structure
Overhaed 3-PH 4W

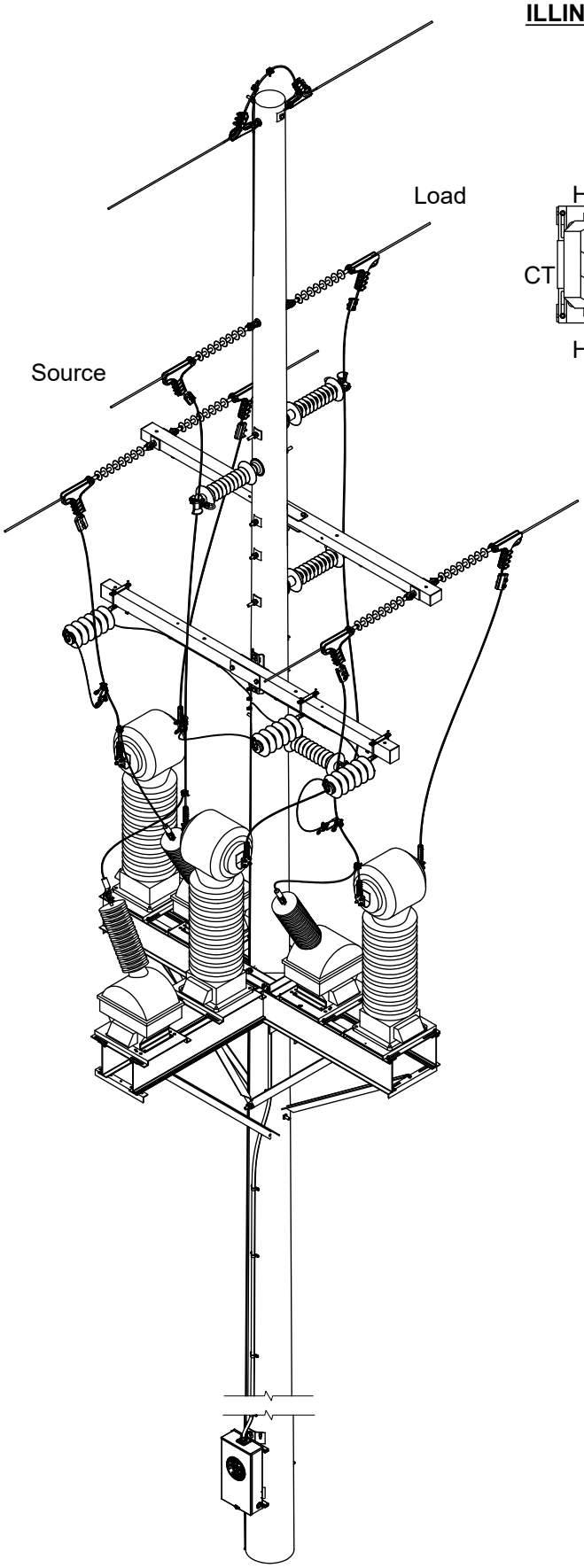
25 34 02 01
35kV
1 of 4

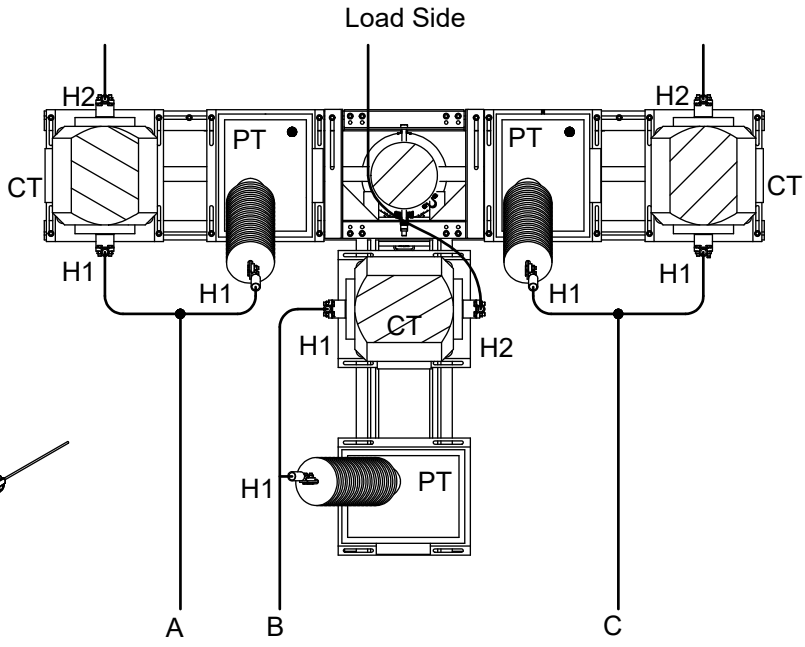


DISTRIBUTION CONSTRUCTION STANDARDS

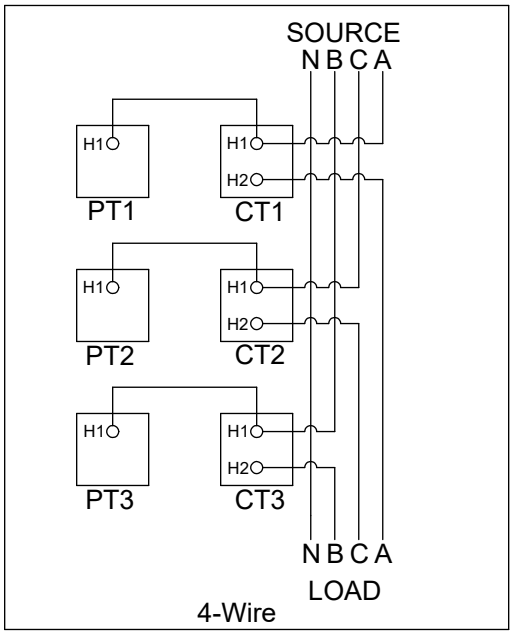
REV	DATE	ENG	DESCRIPTION
1	01/01/24	WYW	Converted to new format
0	04/01/21	WYW	First Issue

ILLINOIS ONLY





Metering Transformer
Primary Connections



REV	DATE	ENG	DESCRIPTION
1	01/01/24	WYW	Converted to new format
0	04/01/21	WYW	First Issue

ILLINOIS ONLY

CONSTRUCTION NOTE(s):

1. Ground all instrument transformers, arrestors, and mounting assembly to the grounding unit.
2. Install barriers for protection against vehicular traffic where necessary.
3. Maintain a minimum of 23" clearance between 35kV phases or phase to ground.
4. Maintain minimum of 6'-0" clearance between the aluminum mounting platform and the crossarm.
5. Maintain a minimum of 40” between the energized conductors and the pole on climbing side of the pole as per DCS **29 00 18 01.** Maintain a minimum of 19” between the energized lateral and vertical conductors and the pole on non climbing side of the pole as per DCS **29 00 17 12**.
6. Maintain a minimum of 40" between any part of the aluminum mounting platform and conductors of 4 or 12kV underbuild.
7. A customer-owned group-operated disconnect switch shall be installed on an adjacent structure on the customer side of the meter structure. The switch or subsequent breaker shall be capable of breaking the maximum current expected on the line.
8. For wire color coding on PT and CT secondaries, refer to System Meter drawings.
9. If metering structure is located within a substation, the metering LA ground wires must be connected to the substation ground mat.
10. To enhance the protection of the metering equipment ensure that the tap for the phase conductor to the arrestor is as short as possible in distance. Install arrestors to load side on the adjacent pole if multiple span exposure on the load side exists and arrestors may be installed on adjacent poles.

<11> Intermediate class arrestor comes with isolator disconnect & hot line clamp (bronze, up to 2/0) assembly. For lead wire if greater than 2/0 copper and all aluminum, must select a proper size of stirrup.

<12> IL Meter Engineering specifies the Meter Enclosure used for the project and IL field poly-phase technicians order the meter enclosure and pole mounting bracket through the MDF. Most retail projects require a standard AMI meterbase (Stock #40 54 378) and pole mounting bracket (Stock #62 51 563). DER, Wholesale, and special retail projects (e.g. customer needs instantaneous data for load shedding scheme) require a two door cabinet (Stock #69 04 611) and other components supplied by IL Metering to house a high-end meter. Various two door cabinet manufacturers supply the MDF. Thus the required pole mounting bracket for the two door cabinet varies based on the supplier. Check the Stock #69 04 611 description in EMPRV for pole mounting bracket options.

<13> Looparound is not required for 3PH 4W metering.

ILLINOIS ONLY

	ITEM	STK / DCS #	DESCRIPTION - Ameren Provides and Installs Material 25 34 02 **	01
	A	**06 00 11 06 @**	Static Wire Deadend 69kV	1
13	B	**06 34 60 25 @**	Double Deadend 34kV Top Phase	1
	C	**06 34 68 08 @**	Double Deadend 34kV on Fiberglass Arm	2
	D	**04 00 41 04 @**	Crossarm - Deadend, F/G 10'	1
	E	**04 00 41 16 @**	Crossarm - Tangent, F/G 10'	1
	F	25 05 219	Insulator, Vertical L.P., 69kV, Universal Clamptop	4
	G	23 53 059	Bolt, DA, 3/4" Dia x 18" w/ 4 square nuts	4
	H	23 66 031	Washer, Curved, Square, 3/4"	4
	I	23 66 135	Lock Washer - 3/4" Double Coil	8
	J	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	8
11	K	10 01 243	Arrester, 29kV MCOV, 36kV Duty Cycle, NEMA Bracket	3
	L	23 17 419	Mounting Assembly, 3CT's & 3PT's	1
	M	23 52 103	Bolt, Mach., 3/4" x 18" w/ square nut	4
	N	12 51 303	Conduit, Flex, 1" Non-Metallic (ft.)	20
	O	40 83 093	Clamp - Conduit 1" Two Hole Steel Strap	12
	P	23 60 033	Lag Screw - 1/4" x 2" Hex Head	24
	Q	40 01 120	Box - Secondary Connection	1
	R	40 53 612	Conduit - Connector 1" Steel	3
	S	23 60 007	Lag Screw - 1/2" x 4"	2
	T	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	2
	U	23 66 027	Washer, Flat, Square 5/8"	2
	V	23 66 134	Lock Washer - 5/8" Double Coil	2
	W	23 65 043	Lock Nut - 5/8" Square	2
	X	17 54 005	Connector - Split Bolt, #2 Solid to #6 Solid	4
12,@	Y	40 54 353	Meter Enclosure - 600V 13 Terminal	1
12,@	Z	62 51 563	Bracket - Meter Socket Hanging	2
@	AA	18 51 019	Wire #2 Cu Covered (ft.)	#
@	AB	18 51 021	Wire #6 Cu Covered (ft.)	#
@	AC	**02 00 02 01**	Pole	1
@	AD	**12 00 10 ****	Grounding Unit New Pole	1
@	AE	**07 00 30 00 @**	Lug, Connector w/ 2-Hole/4-Hole Pad	9
@	AF	**07 00 25 00 @**	Clamp, Parallel Groove	11
@	AG	**07 00 21 00 @**	Clamp, Stirrup & Hot Line	3
@	AH	Meter Shop	Current Transformer	3
@	AI	Meter Shop	Potential Transformer	3
@	AJ	Meter Shop	Pack of 8C #12 Cu Wires of Individual Colors - Contact Metering Dept.	#
@	AK	**07 00 80 00 @**	Lead Wire, PH (ft.)	#
		286	OP Code, Install Primary Metering	1

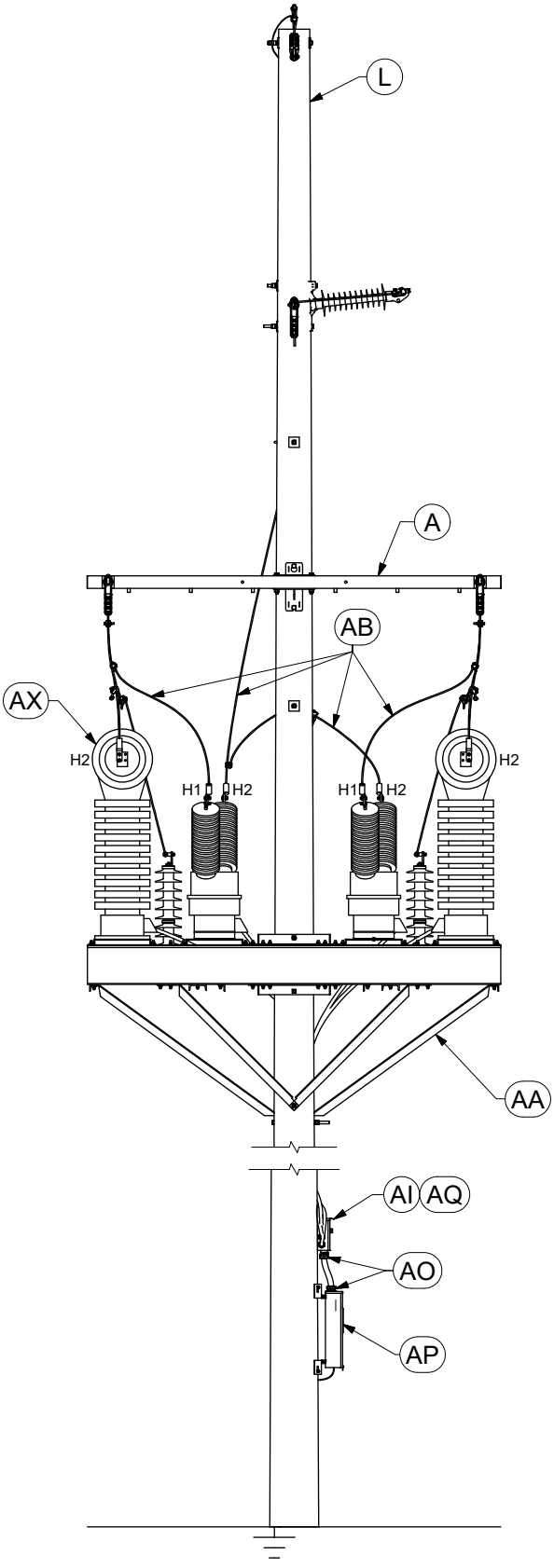
REV	DATE	ENG	DESCRIPTION
1	01/01/24	WYW	Converted to new format
0	04/01/21	WYW	First Issue

METER INSTALLATIONS

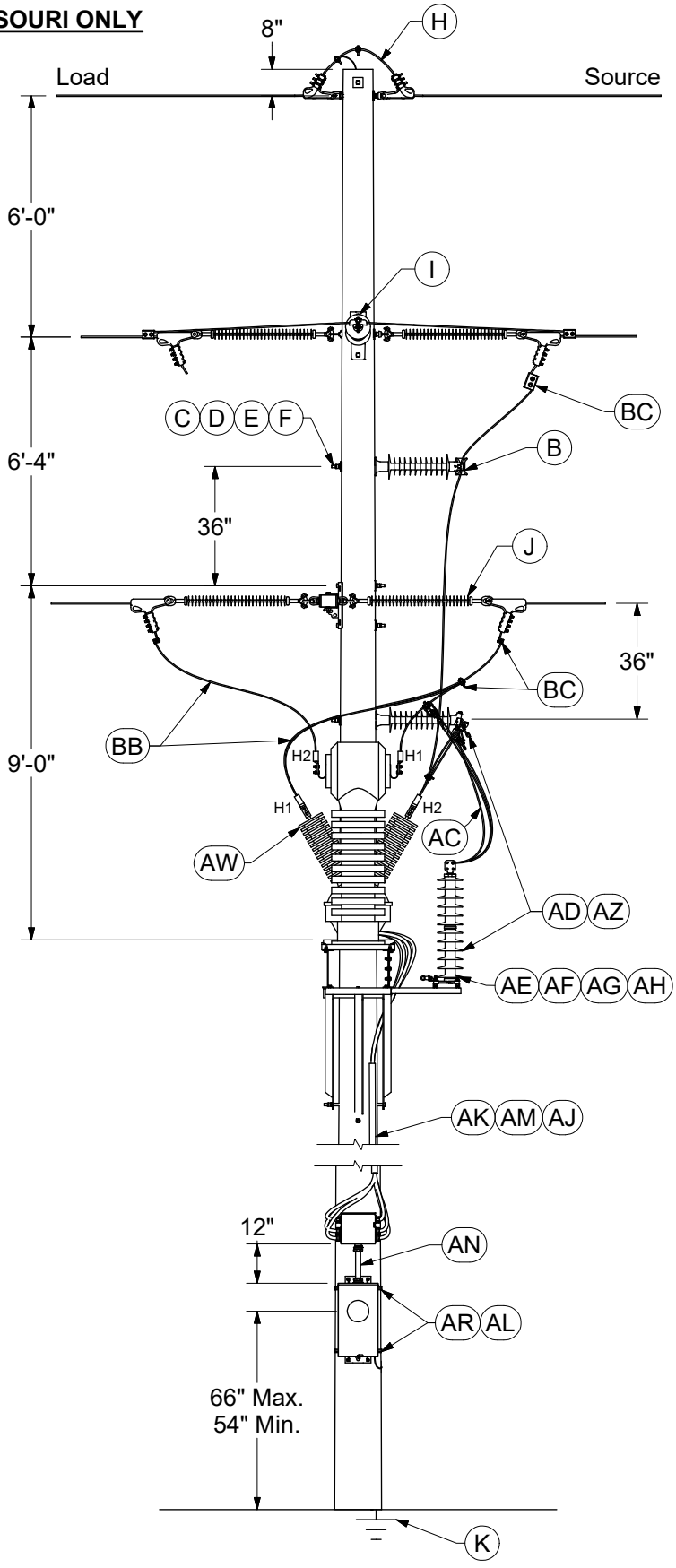
Primary Meter Structure
3-Phase Overhead 3W

25 69 01 00
69kV
1 of 4

Load Side View



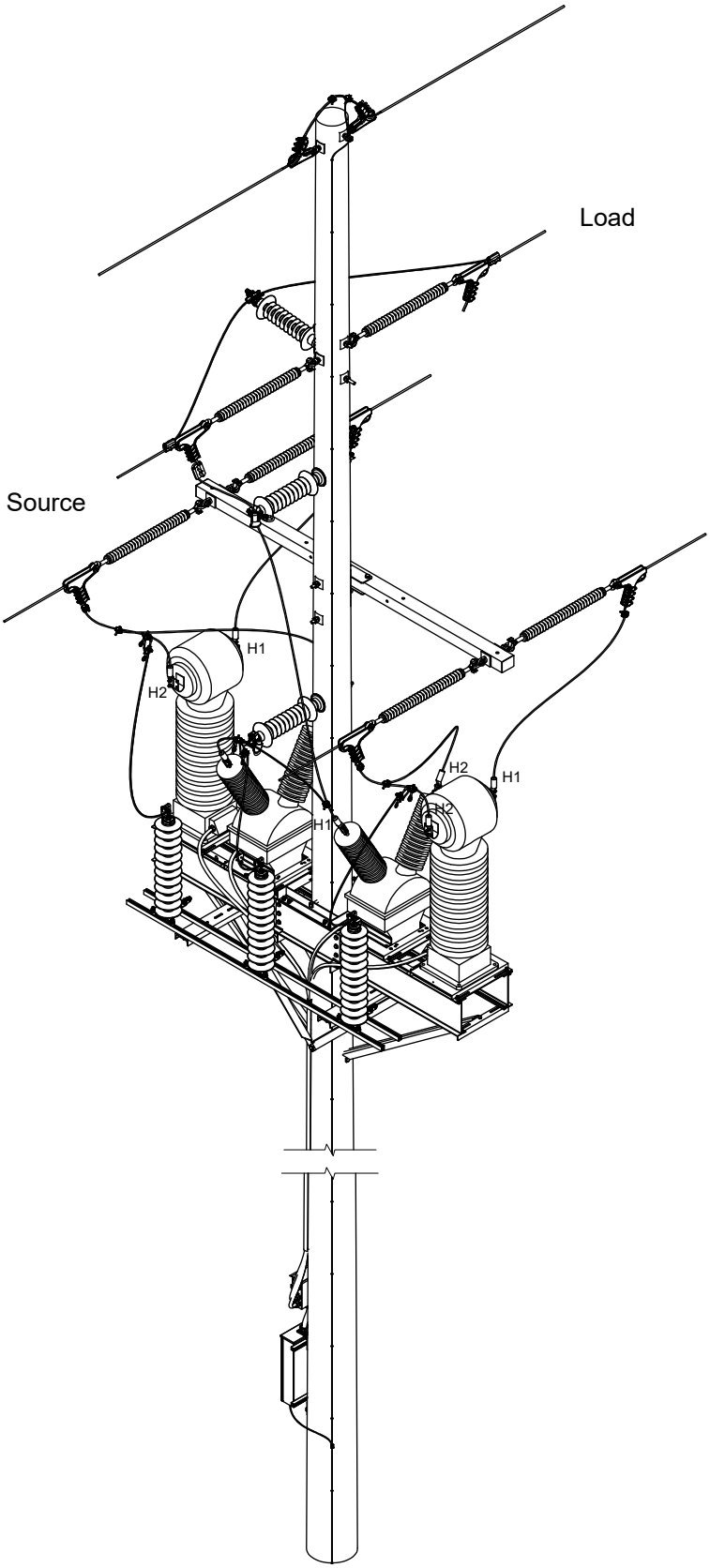
MISSOURI ONLY

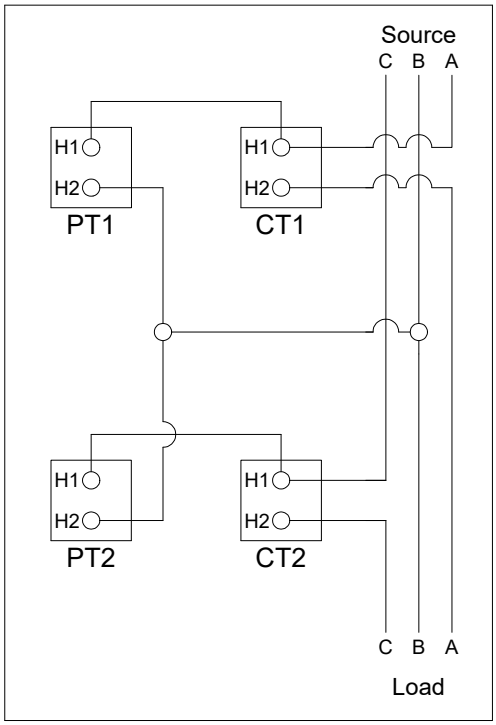


DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
1	01/01/24	WYW	Converted to new format
0	08/14/14	WYW	

MISSOURI ONLY





3 Wire

REV	DATE	ENG	DESCRIPTION
1	01/01/24	WYW	Converted to new format
0	08/14/14	WYW	

MISSOURI ONLY

CONSTRUCTION NOTE(s):

1. Ground all instrument transformers, arresters, and mounting assembly to the grounding unit.
2. Install barriers for protection against vehicular traffic where necessary.
3. Maintain a minimum of 38" clearance between 69kV phases or phase to ground.
4. Maintain a minimum of 9'-0" clearance between the aluminum mounting platform and the crossarm.
5. Maintain a minimum of 54" between the energized conductors and the pole on climbing side of the pole as per DCS **29 00 18 01**; maintain a minimum of 30" between the energized conductors and the pole on non-climbing side of the pole as per DCS **29 00 17 12**.
6. Maintain a minimum of 40" between any part of the aluminum mounting platform and conductors of 4 or 12kV underbuild.
7. If disconnect switches are required, the switches may be installed on adjacent poles.
8. For wire color coding on PT and CT secondary's, refer to System Meter drawings.
9. If metering structure is located with a substation, the metering and LA ground wires must be connected to the substation ground mat.
10. To enhance the protection of the metering equipment, ensure that the tap for the phase conductor to the arrester is as short as possible. Install arrestors to load side on the adjacent pole if multiple span exposure on the load side exists.
11. Intermediate class arrester comes with isolator disconnect & hot line clamp (bronze, up to 2/0) assembly. For lead wire if greater than 2/0 copper and all aluminum, must select a proper size of stirrup.

	ITEM	STK / DCS #	DESCRIPTION - Customer Provides and Installs Material 25 69 01 **	00
	A	**04 00 42 03 @**	Crossarm - Deadend, FG, 10'	1
	B	25 05 219	Insulator, Vertical L.P., 69kV, Universal Clamptop	2
	C	23 53 058	Bolt, DA, 3/4" Dia x 16" w/ 4 square nuts	2
	D	23 66 031	Washer, Curved, Square, 3/4"	2
	E	23 66 135	Lock Washer - 3/4" Double Coil	2
	F	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	2
	G	17 54 005	Connector - Split Bolt, #2 Solid to #6 Solid	4
	H	**06 00 11 06 @**	Static Deadend Tangent w/ Pole Ground	1
	I	**06 34 60 01 @**	69kV Double Deadend Loop	1
	J	**06 34 68 10 @**	Double Deadend 69kV on FG Arm	2
@	K	**12 00 10 ****	Grounding Unit	1
@	L	**02 00 02 01**	Pole	1

REV	DATE	ENG	DESCRIPTION
1	01/01/24	WYW	Converted to new format
0	08/14/14	WYW	

MISSOURI ONLY

	ITEM	STK / DCS #	DESCRIPTION - Ameren Provides and Installs Material 25 69 01 **	00
	AA	23 17 349	Mounting Assembly, 2CT's & 2PT's	1
	AB	18 51 019	Wire, #2 CU, S.D., Covered (ft.)	50
	AC	18 51 021	Wire, #6 CU, S.D., Covered (ft.)	30
	AD	10 01 269	Arrester - 57kV MCOV, 72kV Duty Cycle	3
	AE	23 52 427	Bolt, Mach., 1/2" x 2-1/2" w/ square nut	9
	AF	23 66 017	Washer - Round 1/2"	9
	AG	23 66 133	Lock Washer - Double Coil 1/2"	9
	AH	23 65 056	Lock Nut -1/2" Square	9
	AI	40 01 120	Box - Secondary Connection	1
	AJ	18 11 065	Cord, Hrd Srv, 2-#14 Cu, 600V	180
	AK	12 51 217	Conduit - 2" Split SCH 40	1
	AL	23 60 007	Lag Screw - 1/2" x 4"	4
	AM	27 60 035	Iron Hanger, Galv., 3/4" Wide (ft.)	2
	AN	40 52 468	Conduit, Flex, 1-1/2", Non-Metallic (ft.)	1
	AO	40 52 072	Conduit Fitting, Liquid-tight, Flex, 1-1/2”	2
	AP	40 04 246	Socket, Meter, Instrument Rated, Pre-Wired, Test Switches, 8-Terminal	1
	AQ	21 66 039	Screw, Cap, Hex Head, Steel, 3/8" - 16 TPI x 2"	2
	AR	62 51 563	Bracket - Meter Socket Hanging	2
	AS	23 52 069	Bolt, Mach.,5/8" x 18" w/ square nut	2
	AT	23 66 207	Washer, Curved, Square, 5/8"	2
	AU	23 66 134	Lock Washer, - 5/8" Double Coil	2
	AV	23 65 043	Lock Nut - 5/8" Square	2
@	AW	Meter Shop	Potential Transformer	2
@	AX	Meter Shop	Current Transformer	2
@	AY	Meter Shop	Wire Pack, Color Coded, 10-#12 (ft.)	5
@	AZ	**07 00 21 00 @**	Clamp, Stirrup	3
@	BA	**07 00 30 00 @**	Lug, Connector 4-Hole	4
@	BB	**07 00 80 00 @**	Lead Wire, PH (ft.)	#
@	BC	**07 00 25 00 @**	Clamp, Parallel Groove, PG*W	5
		286	Op Code, Install Primary Metering	1

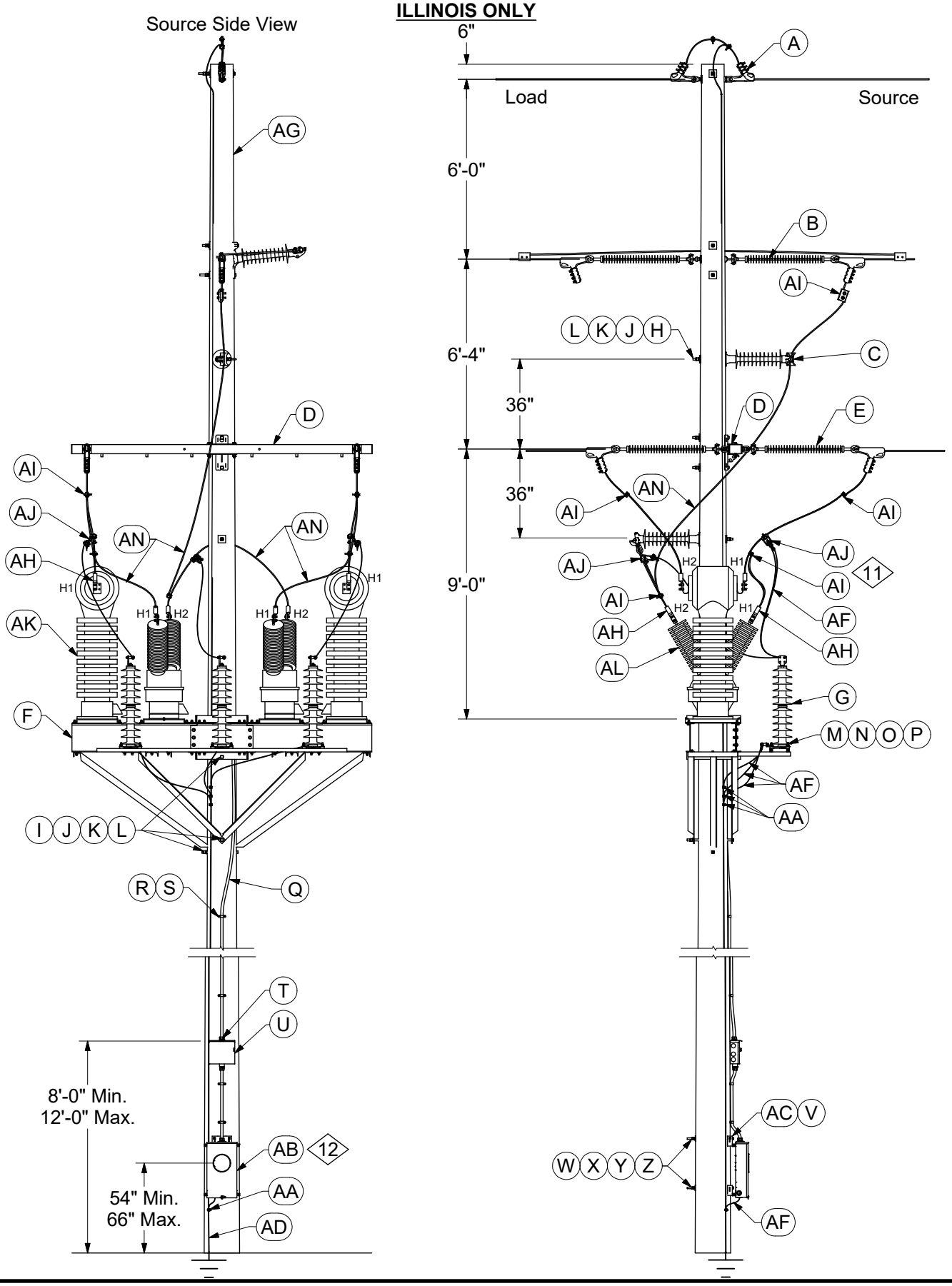
REV	DATE	ENG	DESCRIPTION
1	01/01/24	WYW	Converted to new format
0	08/14/14	WYW	

METER INSTALLATIONS

Primary Metering
3 Phase, 3 Wire

25 69 02 00
69kV
1 of 4

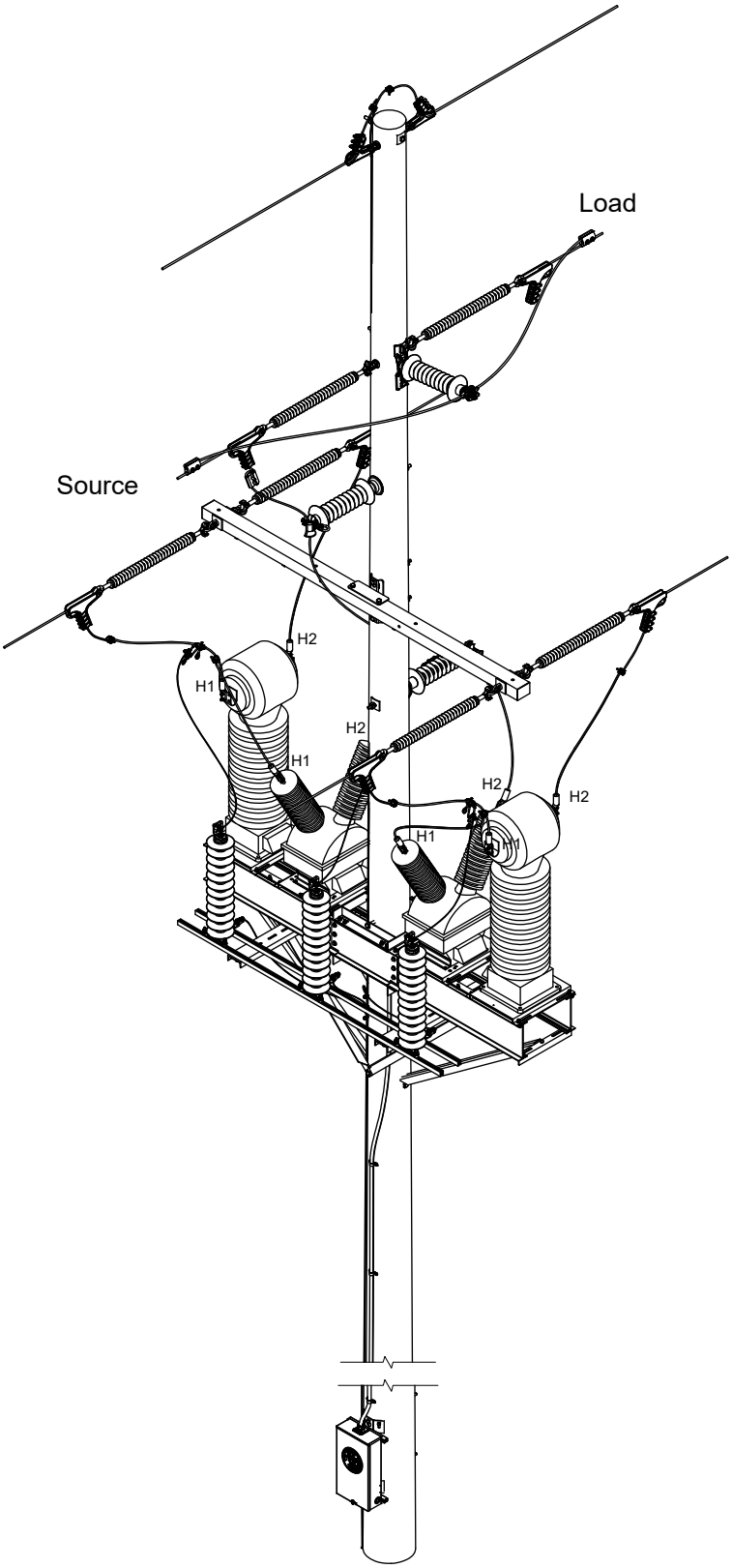
ILLINOIS ONLY

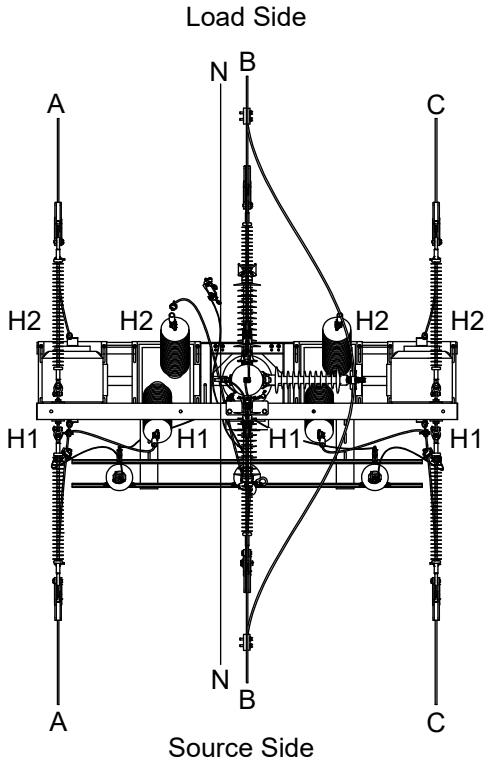


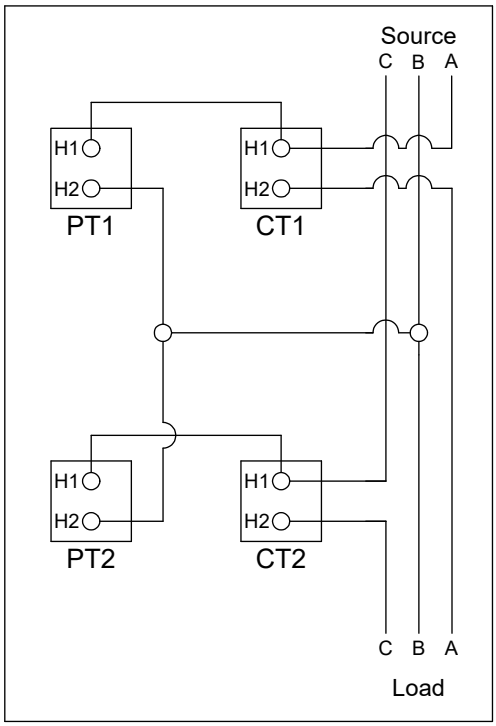
DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
3	01/01/24	WYW	Converted to new format
2	09/29/17	WYW	

ILLINOIS ONLY







3 Wire

ILLINOIS ONLY

CONSTRUCTION NOTE(s):

1. Ground all instrument transformers, arrestors, and mounting assembly to the grounding unit.
2. Install barriers for protection against vehicular traffic where necessary.
3. Maintain a minimum of 38" clearance between 69kV phases or phase to ground.
4. Maintain a minimum of 9'-0" clearance between the aluminum mounting platform and the crossarm.
5. Maintain a minimum of 54” between the energized conductors and the pole on climbing side of the pole as per DCS **29 00 18 01**. Maintain a minimum of 30” between the energized lateral and vertical conductors and the pole on non-climbing side of the pole as per DCS **29 00 17 12**.
6. Maintain a minimum of 40" between any part of the aluminum mounting platform and conductors of 4 or 12kV underbuilt.
7. A customer-owned group-operated disconnect switch shall be installed on an adjacent structure on the customer side of the meter structure. The switch or subsequent breaker shall be capable of breaking the maximum current expected on the line.
8. For wire color coding on PT and CT secondaries, refer to System Meter drawings.
9. Due to variations in 69kV configurations, each primary metering installation should be individually designed, but this standard will serve as a general guide.
10. To enhance the protection of the metering equipment ensure that the tap for the phase conductor to the arrestor is as short as possible in distance. Install arrestors to load side on the adjacent pole if multiple span exposure on the load side exists and arrestors may be installed on adjacent poles.

<11> Intermediate class arrestor comes with isolator disconnect & hot line clamp(Bronze, up to 2/0) assembly. For lead wire, if greater than 2/0 copper and all aluminum, must select a proper size of stirrup.

<12> IL Meter Engineering specifies the Meter Enclosure used for the project and IL field poly-phase technicians order the meter enclosure and pole mounting bracket through the MDF. Most retail projects require a standard AMI meterbase (Stock #40 54 378) and pole mounting bracket (Stock #62 51 563). DER, Wholesale, and special retail projects (e.g. customer needs instantaneous data for load shedding scheme) require a two door cabinet (Stock #69 04 611) and other components supplied by IL Metering to house a high-end meter. Various two door cabinet manufacturers supply the MDF. Thus the required pole mounting bracket for the two door cabinet varies based on the supplier. Check the Stock #69 04 611 description in EMPRV for pole mounting bracket options.

ILLINOIS ONLY

	ITEM	STK / DCS #	DESCRIPTION - Ameren Provides and Installs Material 25 69 02 **	00
	A	**06 00 11 06 @**	69kV Static Wire Deadend	1
	B	**06 34 60 01 @**	69kV Double Deadend Loop	1
	C	25 05 219	Insulator, Vertical L.P., 69kV, Universal Clamptop	2
	D	**04 00 42 03 @**	Crossarm, Deadend, F/G 10'	1
	E	**06 34 68 10 @**	69kV Double Deadend on F/G Crossarm	2
	F	23 17 349	Mounting Assembly, 2CT's & 2PT's	1
11	G	10 01 269	Arrester - 57kV MCOV, 72kV Duty Cycle, Interim	3
	H	23 53 058	Bolt, DA, 3/4" Dia x 16" w/ 4 square nuts	2
	I	23 52 103	Bolt, Mach., 3/4" x 18" w/ square nut	3
	J	23 66 031	Washer, Curved, Square, 3/4"	4
	K	23 66 135	Lock Washer - 3/4" Double Coil	4
	L	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	4
	M	23 52 427	Bolt, Mach., 1/2" x 2-1/2" w/ square nut	9
	N	23 66 017	Washer - Round 1/2"	9
	O	23 66 133	Lock Washer - Double Coil 1/2"	9
	P	23 65 056	Lock Nut, 1/2"	9
	Q	12 51 303	Conduit, Flex, 1" Non-Metalic (ft.)	20
	R	40 83 093	Clamp - Conduit 1" Two Hole Steel Strap	10
	S	23 60 033	Lag Screw - 1/4" x 2" Hex Head	20
	T	40 53 612	Conduit - Connector 1" Steel	3
	U	40 01 120	Box - Secondary Connection	1
	V	23 60 007	Lag Screw - 1/2" x 4"	2
	W	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	2
	X	23 66 027	Washer, Flat, Square 5/8"	2
	Y	23 66 134	Lock Washer - 5/8" Double Coil	2
	Z	23 65 043	Lock Nut - 5/8" Square	2
	AA	17 54 005	Connector - Split Bolt, #2 Solid to #6 Solid	4
12,@	AB	40 54 378	Meter, Socket, Instrument Rated, 8-Terminal	1
12,@	AC	62 51 563	Bracket - Meter Socket Hanging	2
@	AD	**12 00 10 ****	Grounding Unit	1
@	AE	18 51 019	Wire #2 Cu Covered (ft.)	#
@	AF	18 51 021	Wire #6 Cu Covered (ft.)	#
@	AG	**02 00 02 01**	Pole	1
@	AH	**07 00 30 00 @**	Lug, Connector w/ 2-Hole/4-Hole Pad	8
@	AI	**07 00 25 00 @**	Clamp, Parallel Groove	7
@	AJ	**07 00 21 00 @**	Clamp, Stirrup & Hot Line	3
@	AK	Meter Shop	Current Transformer	2
@	AL	Meter Shop	Potential Transformer	2
@	AM	Meter Shop	Pack of 8C #12 Cu Wires of Individual Colors - Contact Metering Dept.	#
@	AN	**07 00 80 00 @**	Lead Wire, PH (ft.)	#
		286	OP Code, Install Primary Metering	1

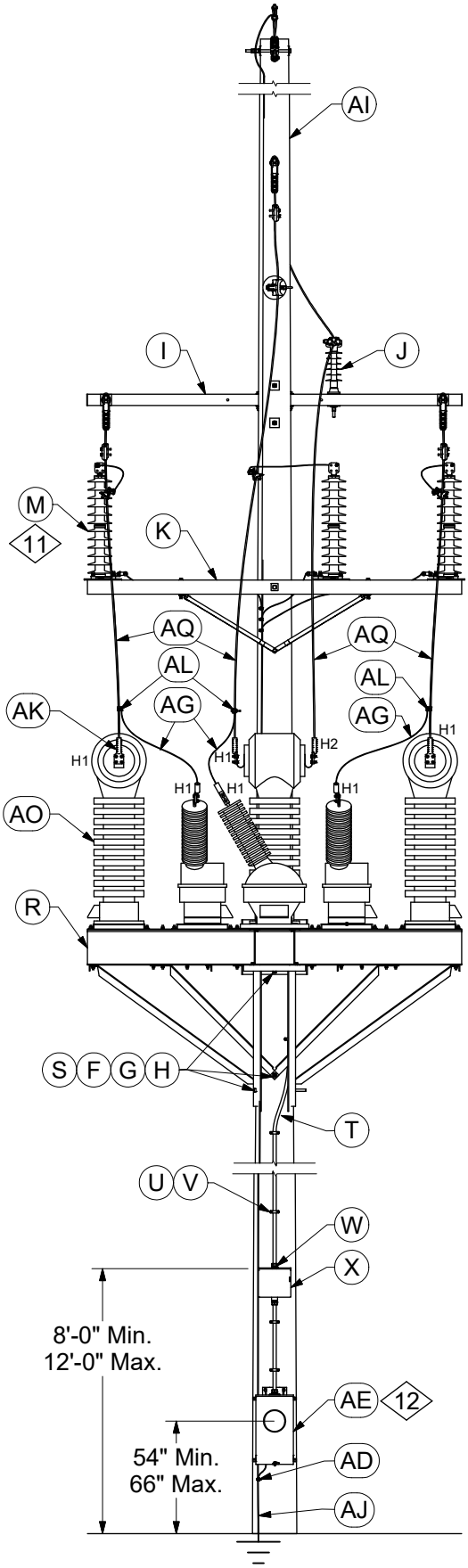
REV	DATE	ENG	DESCRIPTION
3	01/01/24	WYW	Converted to new format
2	09/29/17	WYW	

METER INSTALLATIONS

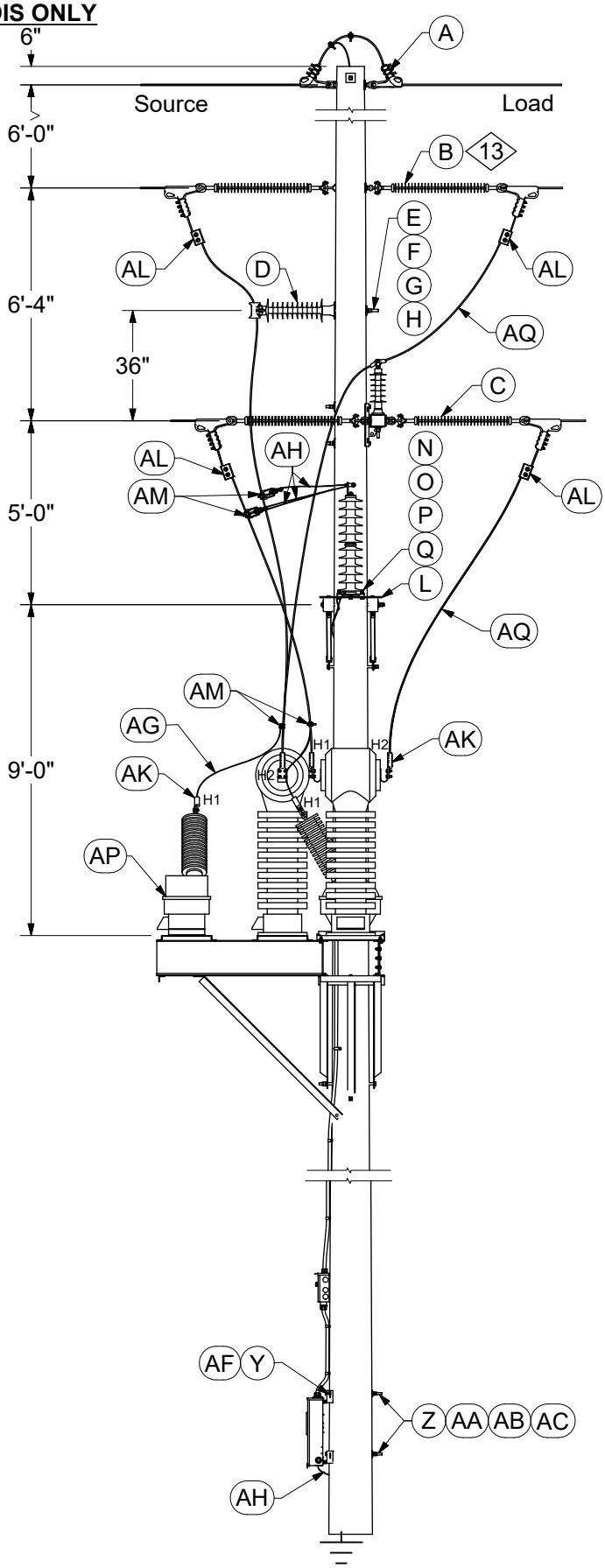
Primary Metering
3 Phase, 4 Wire

25 69 02 01
69kV
1 of 4

Source Side View



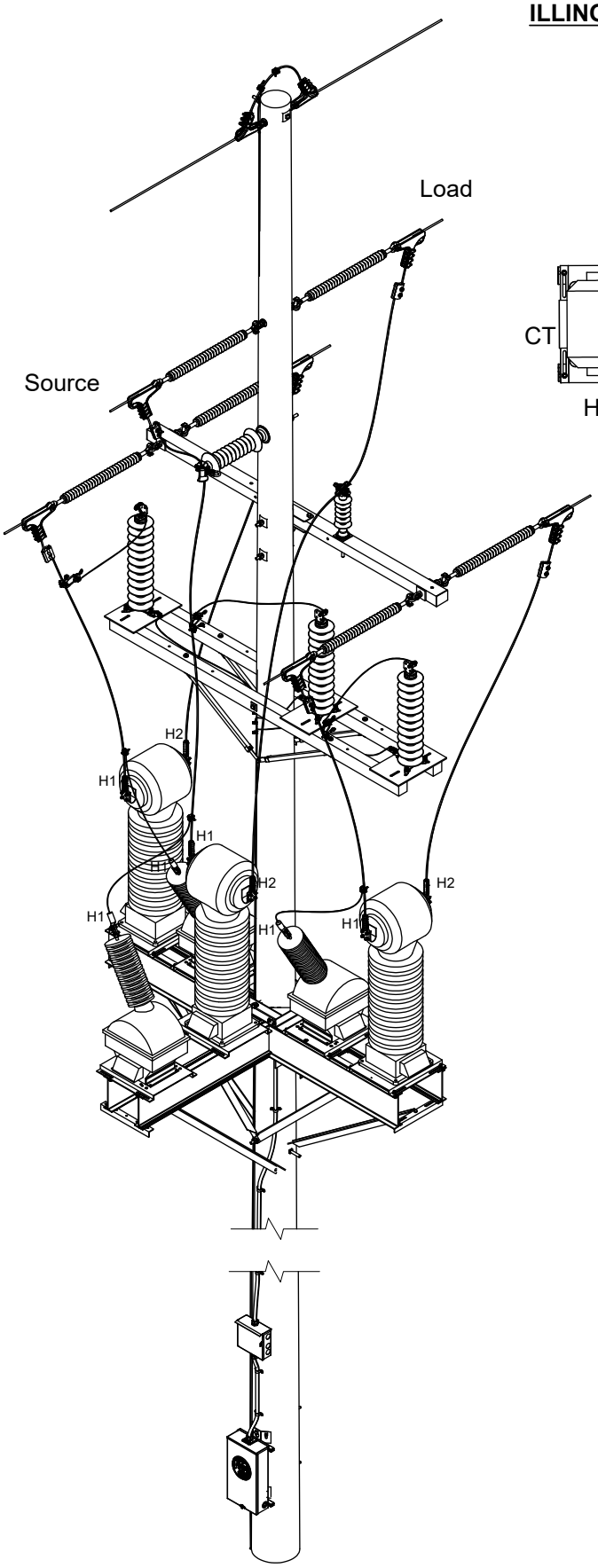
ILLINOIS ONLY

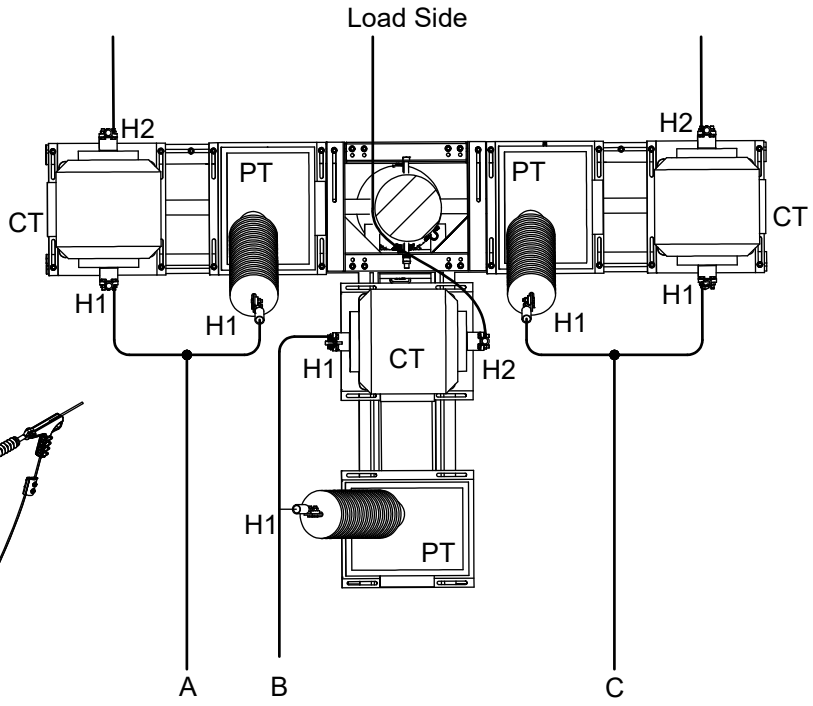


DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
1	01/01/24	WYW	Converted to new format

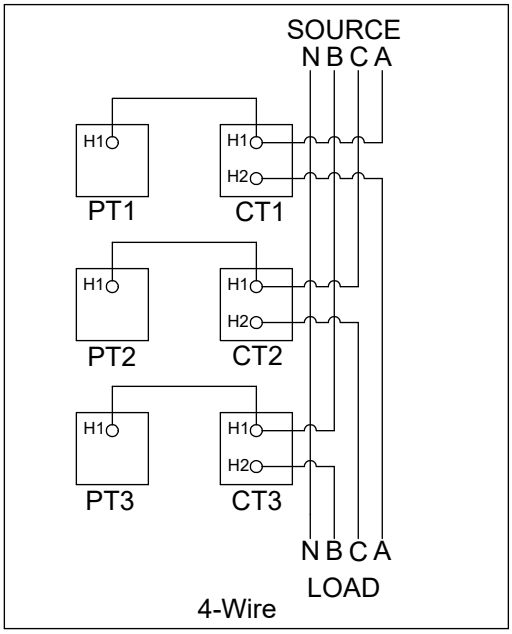
ILLINOIS ONLY





Source Side

Metering Transformer
Primary Connections



REV	DATE	ENG	DESCRIPTION
1	01/01/24	WYW	Converted to new format

ILLINOIS ONLY

CONSTRUCTION NOTE(s):

1. Ground all instrument transformers, arrestors, and mounting assembly to the grounding unit.
2. Install barriers for protection against vehicular traffic where necessary.
3. Maintain a minimum of 38" clearance between 69kV phases or phase to ground.
4. Maintain a minimum of 9'-0" clearance between the aluminum mounting platform and the crossarm.
5. Maintain a minimum of 54” between the energized conductors and the pole on climbing side of the pole as per DCS **29 00 18 01**. Maintain a minimum of 30” between the energized lateral and vertical conductors and the pole on non-climbing side of the pole as per DCS **29 00 17 12**.
6. Maintain a minimum of 40" between any part of the aluminum mounting platform and conductors of 4 or 12kV underbuilt.
7. A customer-owned group-operated disconnect switch shall be installed on an adjacent structure on the customer side of the meter structure. The switch or subsequent breaker shall be capable of breaking the maximum current expected on the line.
8. For wire color coding on PT and CT secondaries, refer to System Meter drawings.
9. Due to variations in 69kV configurations, each primary metering installation should be individually designed, but this standard will serve as a general guide.
10. To enhance the protection of the metering equipment ensure that the tap for the phase conductor to the arrestor is as short as possible in distance. Install arrestors to load side on the adjacent pole if multiple span exposure on the load side exists and arrestors may be installed on adjacent poles.

<11> Intermediate class arrestor comes with isolator disconnect & hot line clamp(Bronze, up to 2/0) assembly. For lead wire, if greater than 2/0 copper and all aluminum, must select a proper size of stirrup.

<12> IL Meter Engineering specifies the Meter Enclosure used for the project and IL field poly-phase technicians order the meter enclosure and pole mounting bracket through the MDF. Most retail projects require a standard AMI meterbase (Stock #40 54 378) and pole mounting bracket (Stock #62 51 563). DER, Wholesale, and special retail projects (e.g. customer needs instantaneous data for load shedding scheme) require a two door cabinet (Stock #69 04 611) and other components supplied by IL Metering to house a high-end meter. Various two door cabinet manufacturers supply the MDF. Thus the required pole mounting bracket for the two door cabinet varies based on the supplier. Check the Stock #69 04 611 description in EMPRV for pole mounting bracket options.

<13> Looparound is not required for 3PH 4W metering.

ILLINOIS ONLY

	ITEM	STK / DCS #	DESCRIPTION - Ameren Provides and Installs Material 25 69 02 **	01
	A	**06 00 11 06 @**	Deadend, Static, with Clamp	1
13	B	**06 34 60 01 @**	69kV Double Deadend Top Phase	1
	C	**06 34 68 10 @**	69kV Double Deadend on Fiberglass Arm	2
	D	25 05 219	Insulator, Vertical L.P., 69kV, Universal Clamptop	1
	E	23 53 059	Bolt, DA, 3/4" Dia x 18" w/ 4 square nuts	1
	F	23 66 031	Washer, Curved, Square, 3/4"	1
	G	23 66 135	Lock Washer - 3/4" Double Coil	4
	H	23 65 042	Nut, Locking, Square, Galvanized, 3/4"	4
	I	**04 00 42 03 @**	Crossarm - Deadend, F/G 10'	1
	J	**06 69 01 02 @**	Line Post Insulator 69kV Clamp-top	1
	K	**04 00 20 03**	Crossarm, Wood with Brace, 10'	2
	L	27 06 355	Plate for DBL Arm w/Mounting Hardware on the Crossarm	3
11	M	10 01 269	Arrester - 57kV MCOV, 72kV Duty Cycle, Interim	3
	N	23 52 427	Bolt, Mach., 1/2" x 2-1/2" w/ square nut	9
	O	23 66 017	Washer - Round 1/2"	9
	P	23 66 133	Lock Washer - Double Coil 1/2"	9
	Q	23 65 056	Lock Nut - 1/2" Square	9
	R	23 17 419	Mounting Assembly, 3CT's & 3PT's	1
	S	23 52 103	Bolt, Mach., 3/4" x 18" w/ square nut	3
	T	12 51 303	Conduit, Flex, 1" Non-Metallic (ft.)	20
	U	40 83 093	Clamp - Conduit 1" Two Hole Steel Strap	1
	V	23 60 033	Lag Screw - 1/4" x 2" Hex Head	20
	W	40 53 612	Conduit - Connector 1" Steel	3
	X	40 01 120	Box - Secondary Connection	1
	Y	23 60 007	Lag Screw - 1/2" x 4"	4
	Z	23 52 069	Bolt, Mach., 5/8" x 18" w/ square nut	2
	AA	23 66 027	Washer, Flat, Square 5/8"	2
	AB	23 66 134	Lock Washer - 5/8" Double Coil	2
	AC	23 65 043	Lock Nut - 5/8" Square	2
	AD	17 54 005	Connector - Split Bolt, #2 Solid to #6 Solid	4
12,@	AE	40 54 353	Meter Socket - 600V 13 Terminal	1
12,@	AF	62 51 563	Bracket - Meter Socket Hanging	2
@	AG	**12 00 10 ****	Grounding Unit	1
@	AH	18 51 019	Wire #2 Cu Covered (ft.)	#
@	AI	18 51 021	Wire #6 Cu Covered (ft.)	#
@	AJ	**02 00 02 01**	Pole	1
@	AK	**07 00 30 00 @**	Lug, Connector w/ 2-Hole/4-Hole Pad	7
@	AL	**07 00 25 00 @**	Clamp, Parallel Groove	11
@	AM	**07 00 21 00 @**	Clamp, Hot Line	3
@	AN	Meter Shop	Pack of 8C #12 Cu Wires of Individual Colors - Contact Metering Dept.	#
@	AO	Meter Shop	Current Transformer	3
@	AP	Meter Shop	Potential Transformer	3
@	AQ	**07 00 80 00 @**	Lead Wire, PH (ft.)	#
@		286	OP Code, Install Primary Metering	1

REV	DATE	ENG	DESCRIPTION
1	01/01/24	WYW	Converted to new format

1. Antennas & AMI/AMR Devices Located in the Supply Space

A. Communication antennas located in the supply space shall be installed and maintained only by personnel authorized and qualified to work in the supply space. These are typically antennas on routers and collectors installed for Ameren's Advanced Metering Infrastructure (AMI) system, or Micro Cell Controllers (MCCs) installed for Ameren's Automated Meter Reading (AMR).

B. Vertical and lateral AMI/AMR device power conductors and cables attached to a communication antenna vertical and lateral device power conductors or antenna cables should be attached to the surface of the structure enclosed in non-metallic conduit or U-guard. They shall be located so that they do not obstruct climbing spaces or lateral working spaces between line conductors at different levels or interfere with the safe use of pole steps.

C. Communication Equipment and Antennas
The radial clearance between a communication antenna and its associated conductive mounting hardware and a supply line conductor shall be not less than the values given in the following table.

Clearance of Line Conductor From: ◇1	**0 to 600V**	**>600V to 69kV**
Antenna ◇2 ◇3 ◇5	12 in.	48 in.
Equipment case that supports or is adjacent to a communication antenna	6 in.	48 in.

DESIGN NOTE(s):

◇1. These Ameren required clearances exceed the NESC, 2017 Edition, Rule 235 I allowed minimum clearance.

◇2. Wide Area Network (WAN) antennas or located on the top of the AMI or AMR devices.

◇3. Local Area Network (LAN) antennas located on the bottom of the AMI or AMR devices shall have at least 40 inches vertical clearance to communication conductors.

4. Additional requirements for AMI or AMR devices:

a. The bottom of an ungrounded AMI or AMR device case shall have at least 40 inches vertical clearance to communication conductors. If the AMI or AMR device case is grounded and there is no downward oriented antenna, the vertical clearance to communication conductors may be reduced to 30 inches.

b. The top and bottom of the AMI or AMR device should be maintained a minimum of 4 inches from bolted connection points on the pole that are in the same place as the AMI or AMR device. This is to allow access by Ameren personnel to the bolted connection.

c. AMI or AMR device cases shall be at least 6 inches from conductors 0 to 600V. AMI or AMR devices may be installed at any angle from secondary rack or clevis necessary to achieve required clearance.

d. Ameren requires a minimum of 30 inches from center of cross-arm to top of the AMI or AMR device or its antenna whichever is closer. Greater separation may be required to achieve required clearance from line conductors.

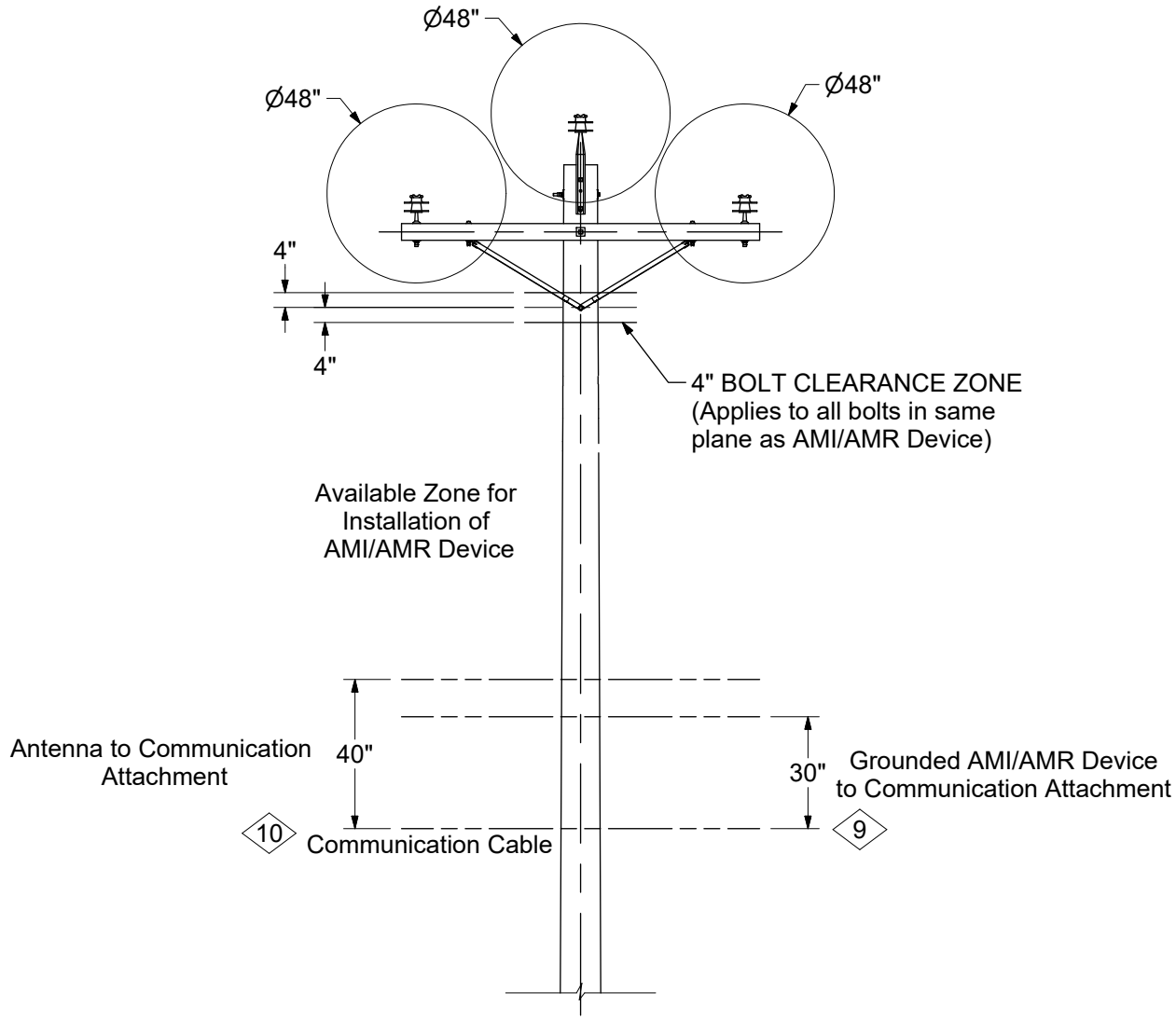
◇5. This DCS is applicable to antennas operated at a radio frequency of 3 kHz to 300 GHz.

6. Collectors (AMI) / Gateway (AMI) / Routers (AMI) shall be effectively grounded.

7. AMI devices may be installed on transformer poles where there are no communication (telephone or CATV) attachments, and where clearance requirements to communications (if present) can be met.

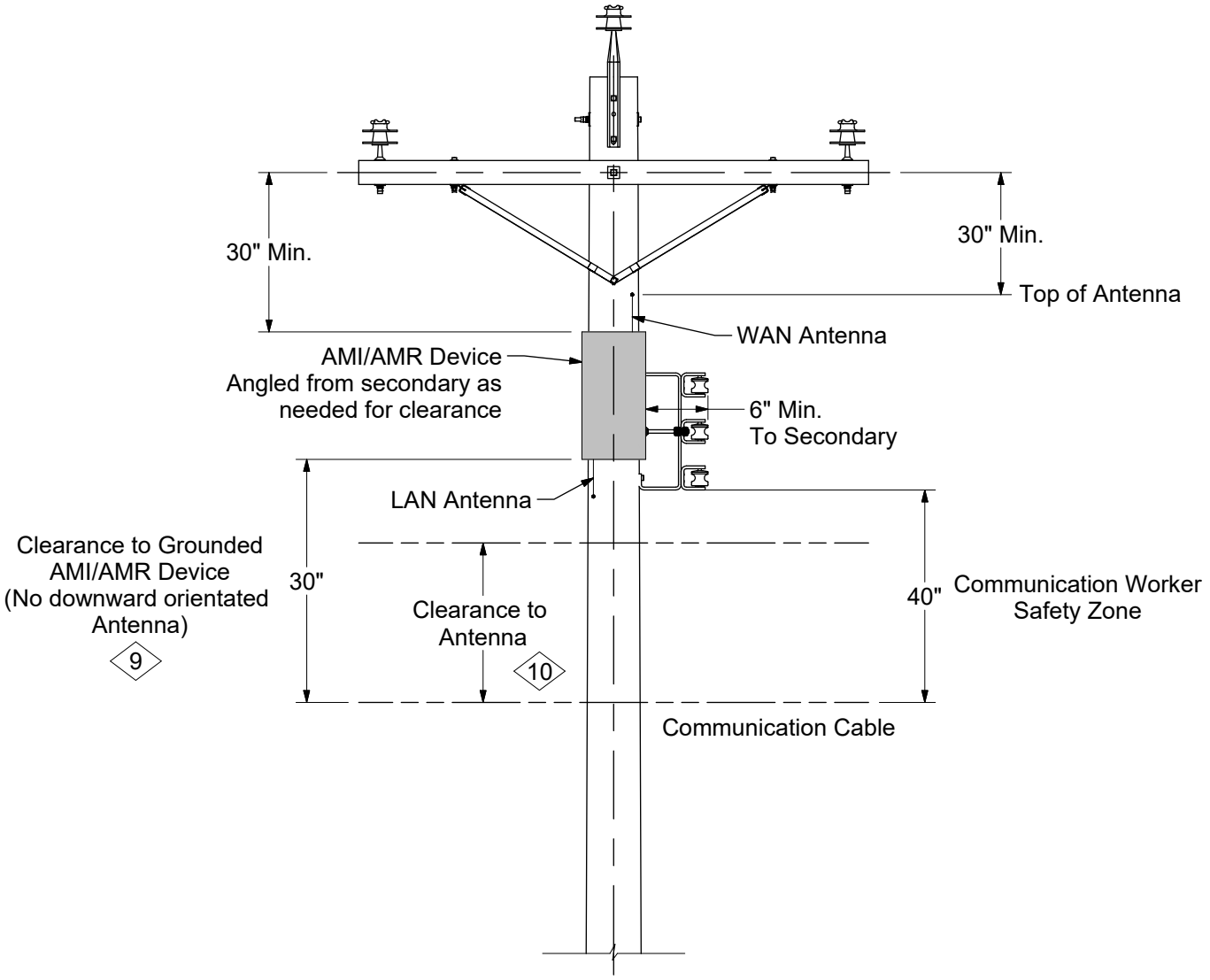
8. AMI or AMR devices should not be installed on terminal poles, gang operated switch poles, capacitor poles, or voltage regulator poles. They may be installed on solid blade or fused switch poles as long as the AMI or AMR device does not interfere with safe operation of the switches.

REV	DATE	ENG	DESCRIPTION
2	01/01/24	WYW	Converted to new format
1	05/12/21	DG	



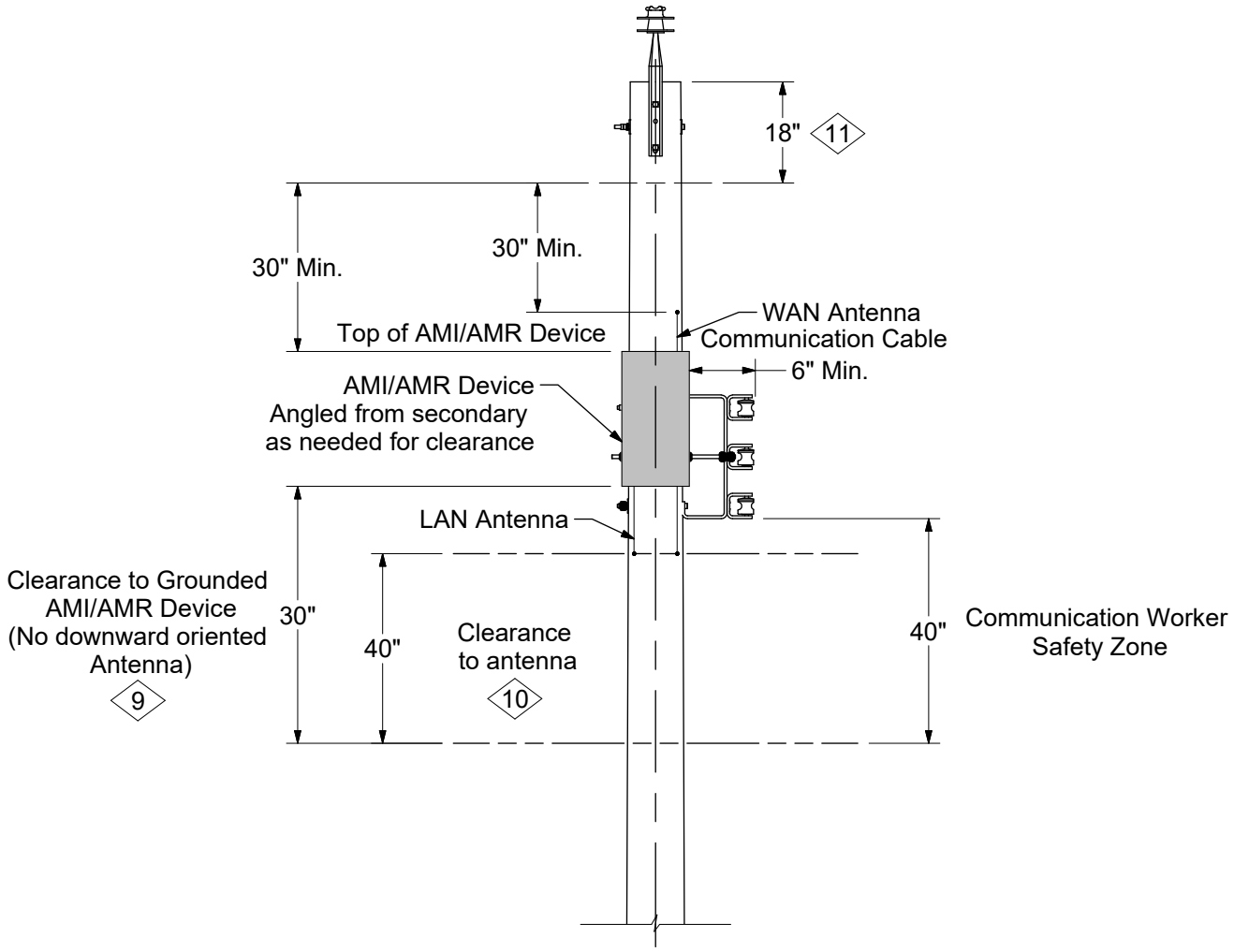
Antenna & AMI/AMR Device Supply Space Installation/Clearance Zone

REV	DATE	ENG	DESCRIPTION
2	01/01/24	WYW	Converted to new format
1	05/12/21	DG	



Antenna & AMI/AMR Device Clearances in 3 Phase Supply Space

REV	DATE	ENG	DESCRIPTION
2	01/01/24	WYW	Converted to new format
1	05/12/21	DG	



Antenna & AMI/AMR Device Clearances in 1 Phase Supply Space

CONSTRUCTION NOTE(s):

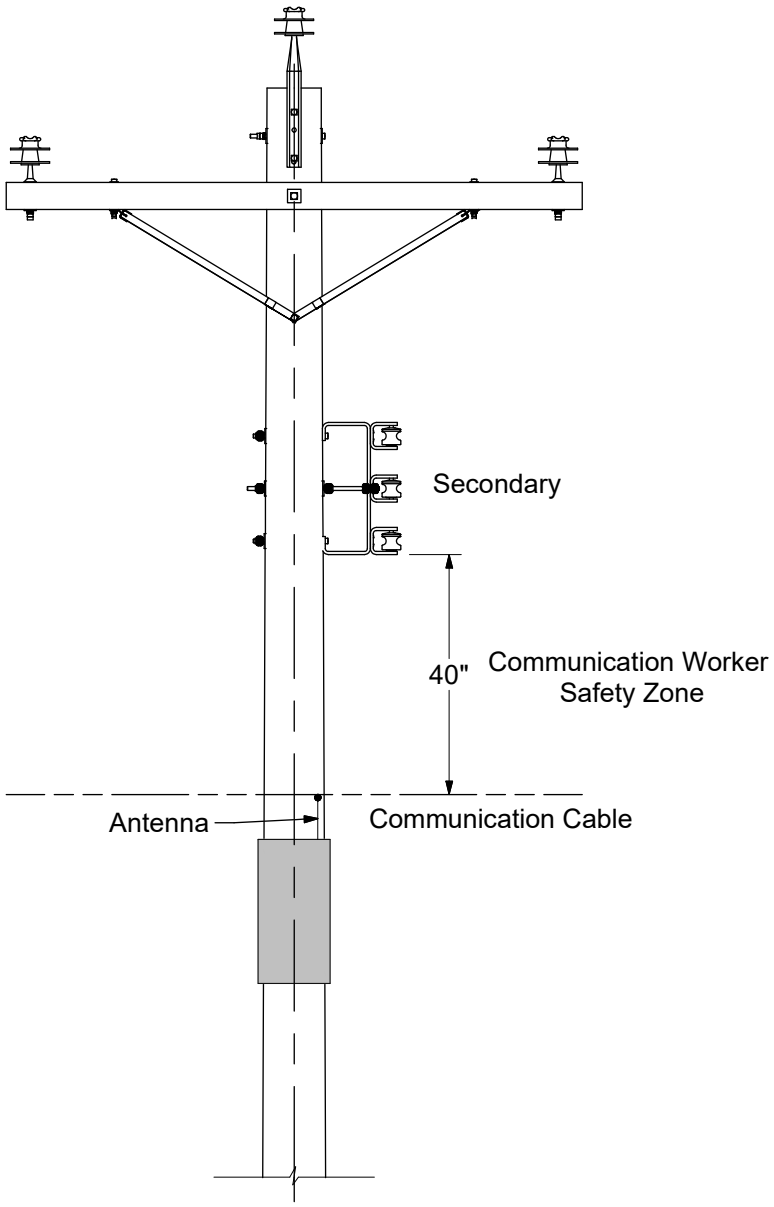
9. If the AMI/AMR device case is not grounded, 40" minimum clearance to communication cable is required.

10. Antennas located on the bottom of the AMI/AMR device shall have at least 40" vertical clearance to communication conductors.

11. On single phase pole lines where future addition of crossarm for adding additional phases is not reasonably expected, this dimension can be reduced to 6" (i.e., total of 36" from the pole top to the top of the antenna).

2. Antennas Located in the Communication Space

   Antennas located in the communication space shall be considered equipment for the purpose of determining minimum clearance requirements. Also see DCS **29 00 17 11**.

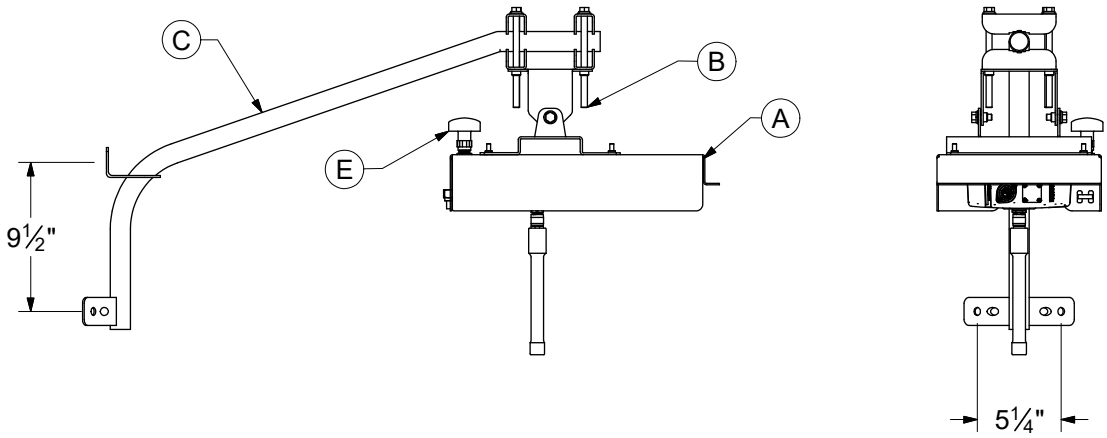


Antenna Clearance in Communication Space

CONSTRUCTION NOTE(s):

12. Reference: NESC, 2017 Edition, Rule 238

REV	DATE	ENG	DESCRIPTION
2	01/01/24	WYW	Converted to new format
1	05/12/21	DG	

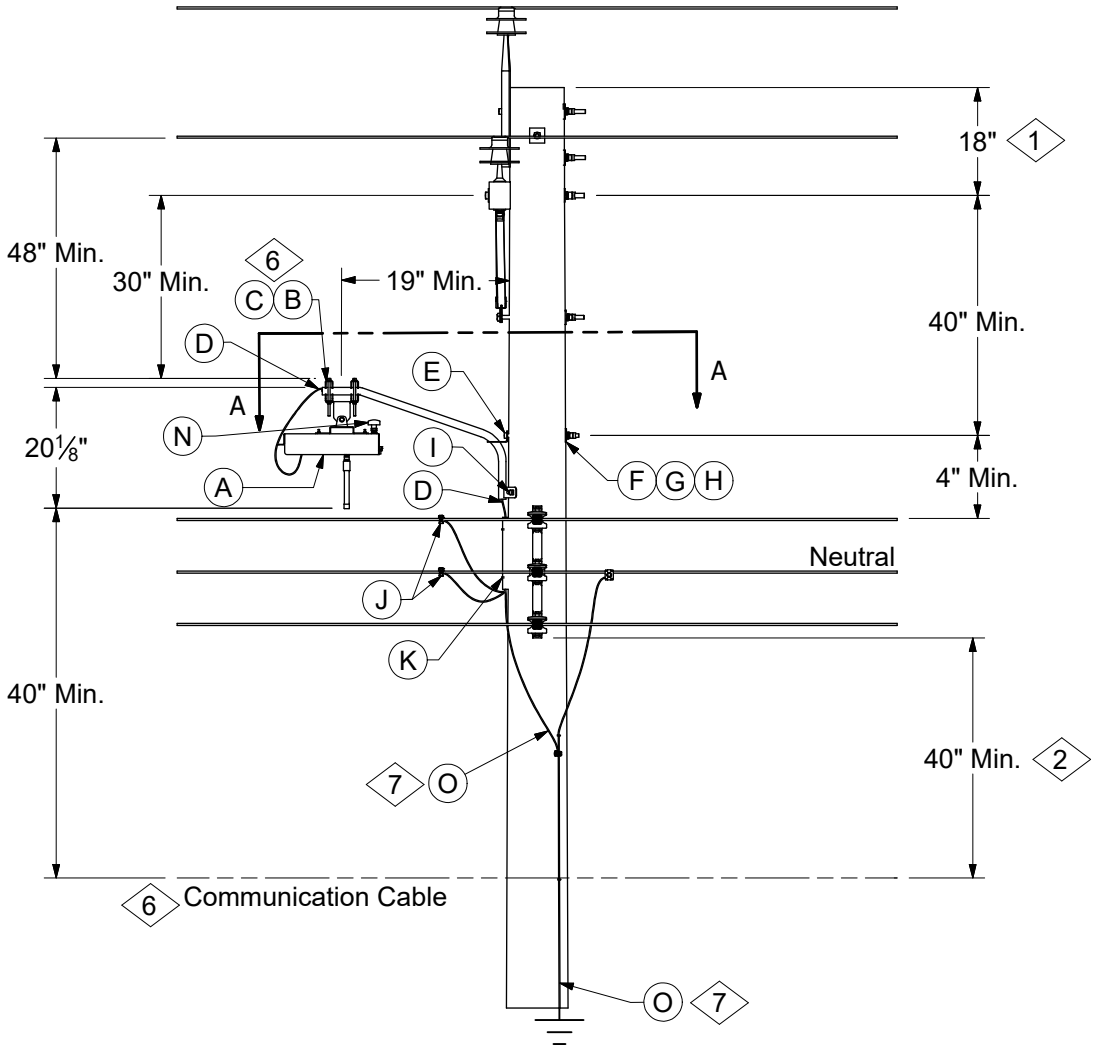


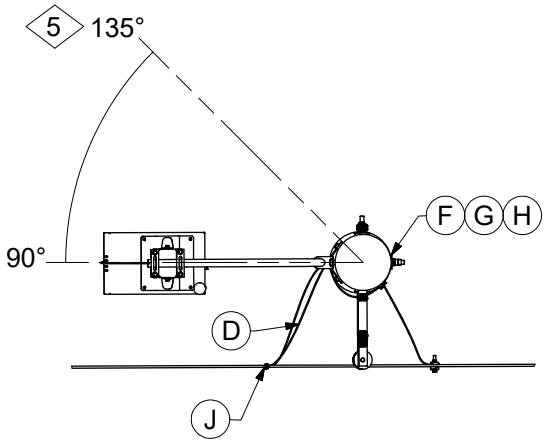
CONSTRUCTION NOTE(s):

1. Initial deployment will be done using L&G Router Mounting Kit M1217. This mounting kit includes the power cable assembly and hardware for mounting the router to the wood pole bracket. The antenna is provided with the router.
2. The router mounting kit may be preassembled for ease of installation on the wood pole bracket.
3. Assembly Instructions:
   a. Slide a lock washer and a flat washer onto each of the two 3/8"-16 bolts and attach the swivel bracket to the mounting plate by threading these bolts into press nuts on the mounting plate.
   b. Slide a lock washer and a flat washer onto each of the four 7" x 3/8"-16 bolts and thread these bolts through the clamps that go around the wood pole bracket mast. NOTE: To install the swivel bracket to the mast, open one side of the bracket to permit mast entry.
   c. Hang the router mount assembly off the mast and re-install the mast clamp bolts, taking care to keep the flat washer and lock washer on the mast clamp bolts with the lock washer closer to the head of the bolt.
   d. Install the antenna. Connect the terminated end of the power cable assembly to the router. The un-terminated end of the power cable assembly is connected directly to the 120 Volt secondary.
   e. As the mast clamps are tightened, align the router so that the antenna does not exceed 5 degrees off perpendicular to the ground.
   f. Secure the power supply cable to the wood pole bracket using UV resistant cable ties and trim the excess length for a clean installation.
4. Antenna Stock #16 16 105 is for maintenance replacement if the antenna provided with the router is damaged.

	ITEM	STK / DCS #	DESCRIPTION 25 91 10 **	00
	A	16 16 319	Enhanced Mesh Router Series 5	1
1	B	23 67 509	Mounting Kit - Router Wood Pole Bracket	1
1	C	38 01 417	Streetlight Bracket - 30" x 1-1/4"	1
4	D	16 16 105	Antenna - Dipole, 9"	1
	E	16 16 395	Antenna, GPS, 2.56GHz/1.57GHz/1.6GHz	1

REV	DATE	ENG	DESCRIPTION
1	01/01/23	WYW	Replaced router, converted to new format
0	11/09/15	DG	





SECTION A-A

REV	DATE	ENG	DESCRIPTION
2	01/01/23	WYW	Replaced router, converted to new format
1	04/01/19	DG	

CONSTRUCTION NOTE(s):

1. On single-phase pole lines where future addition of crossarm for adding additional phases is not reasonably expected, this dimension can be reduced to 6" (i.e., total of 44" from the pole top to the top mounting bracket bolt).

2. The 40" minimum applies to the secondary bracket or the router cable drip loops whichever is lowest.

3. Initial deployment will be done using L&G router mounting kit M1217. This mounting kit includes the power cable assembly and hardware for mounting the router to the wood pole bracket. The antenna is provided with the router.

4. Antenna Stock #16 16 105 is for maintenance replacement if the antenna provided with the router is damaged.

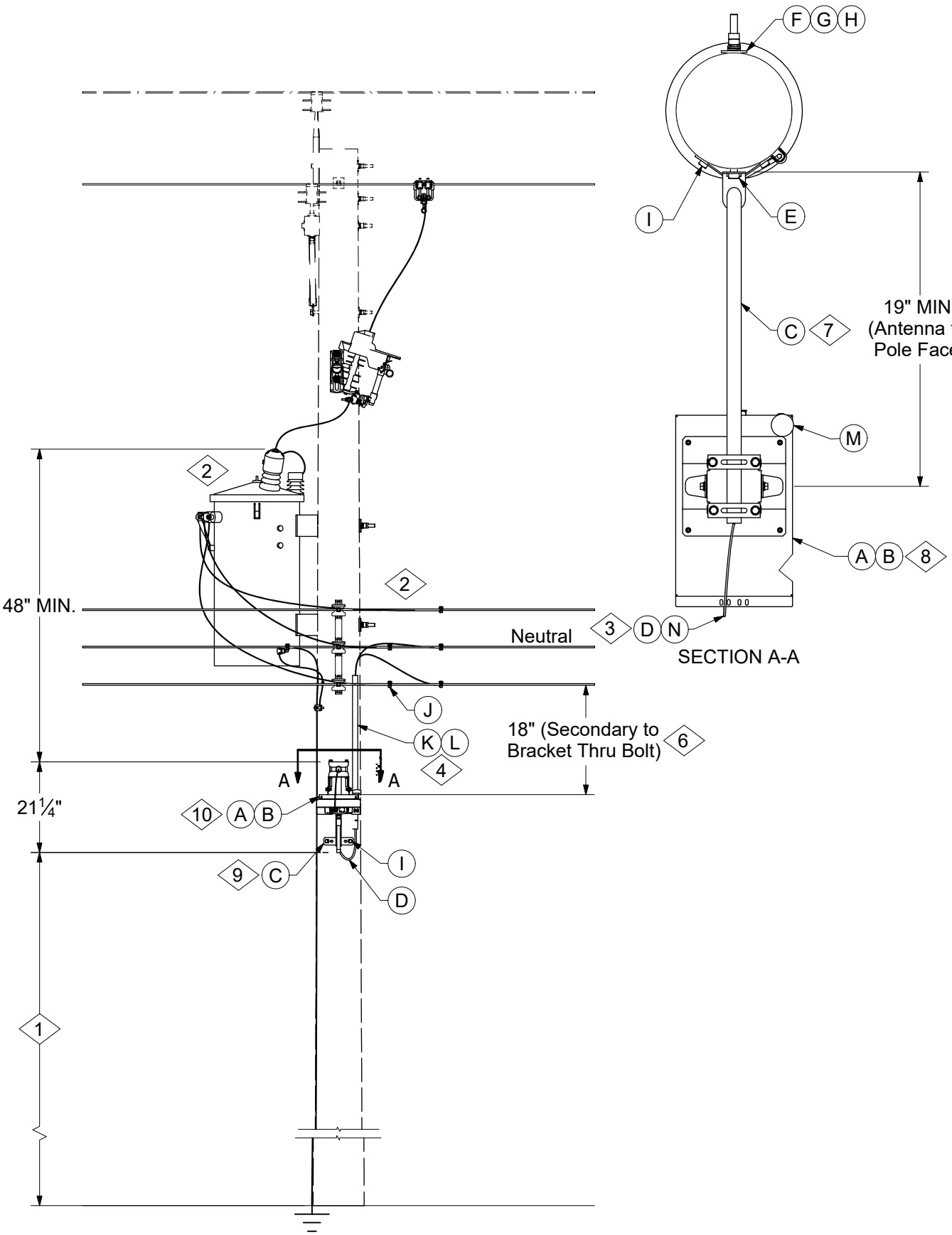
5. Mounting bracket is shown at 135 degrees from secondary rack but may be installed at any angle necessary to achieve required clearances as per DCS **25 90 00 00**.

6. If there are no communications attachments on the pole, the mounting bracket may be installed below the secondary provided clearance requirements of DCS **25 90 00 00** and DCS **29 00 17 03** are met.

7. Router must be grounded. The primary method is to bond the router's ground wire to the pole ground wire. If existing pole ground wire is damaged, it must be repaired. If pole ground wire is not present on the pole, one should be installed. EXCEPTION: The device may be grounded by attaching to the neutral if there is a good pole ground not more than two spans away.

	ITEM	STK / DCS #	DESCRIPTION 25 91 10 **	01
	A	16 16 319	Enhanced Mesh Router Series 5	1
3	B	23 67 509	Mounting Kit - Router Wood Pole Bracket	1
3	C	38 01 417	Streetlight Bracket - 30" x 1-1/4"	1
	D	25 54 074	Guard, Cable, 1/2" Poly (ft)	5
	E	23 52 065	Bolt, Mach., 5/8" x 12" w/ square nut	1
	F	23 66 027	Washer, Flat, Square 5/8"	1
	G	23 66 134	Lock Washer - 5/8" Double Coil	1
	H	23 65 043	Lock Nut - 5/8" Square	1
	I	23 60 007	Lag Screw - 1/2" x 4"	2
	J	17 54 005	Split Bolt, #2 Solid to #6 Solid	3
	K	23 64 028	Staple - Coated Steel 29/32" x 2-1/2"	7
4	L	16 16 105	Antenna - Dipole, 9"	1
	M	16 16 395	Antenna, GPS, 2.56GHz,1.57GHz,1.6GHz	1
	N	40 89 493	Tie, Wire	1
	O	**12 00 10 ** **	Grounding Unit	1

REV	DATE	ENG	DESCRIPTION
2	01/01/23	WYW	Replaced router, converted to new format
1	04/01/19	DG	



REV	DATE	ENG	DESCRIPTION
2	01/01/24	WYW	Added Notes 8,9, 10 and 11
1	08/20/21	WYW	Converted to new format

CONSTRUCTION NOTE(s):

1. See DCS **29 00 17 02** for minimum required ground clearance to bottom of antenna. Use clearances for 'Secondary & Service Conductors 0 to 750 Volts'.

2. If transformer is installed just to serve the router and no secondary exists, the router bracket can be mounted higher provided that a minimum of 48" radial clearance to any part of the router (including antenna) is maintained from the transformer primary bushings and all other primary conductors.

3. Initial deployment will be done using L&G Router Mounting Kit M1217. This mounting kit includes the power cable assembly and hardware for mounting the router to wood pole bracket. The antenna is provided with the router.

4. Cut router cable molding to required length.

5. Antenna Stock #16 16 105 is for maintenance replacement if the antenna provided with the Router is damaged.

6. 18" is recommended but may be varied provided that the 6" minimum clearance from the secondary to the router mounting bracket is met and minimum ground clearance per note 1 is met.

7. Mounting bracket is shown at 0 degrees from the secondary rack but may be installed at any angle necessary provided clearances in DCS **25 90 00 00** are met.

8. Routers may be installed on transformer poles where there are no communication (telephone or CATV) attachments, and where clearance requirements to communications (if present) can be met.

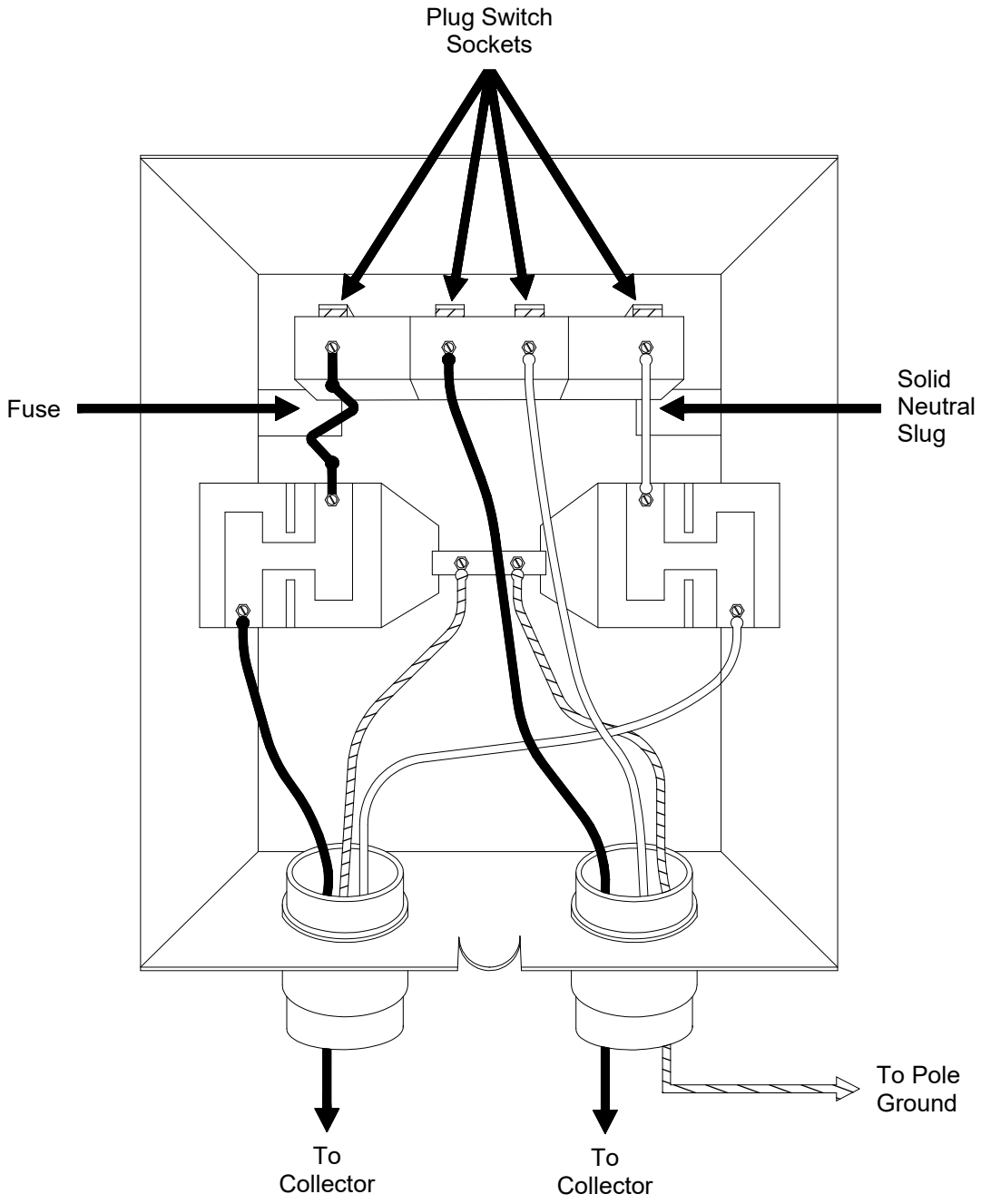
9. The 40" minimum applies to the secondary bracket or the router cable drip loops, whichever is lowest.

10. If there are no communications attachments on the pole, the mounting bracket may be installed below the secondary, provided clearance requirements of DCS **25 90 00 00** and DCS **29 00 17 03** are met.

11. Router must be grounded. The primary method is to bond the router's ground wire to the pole ground wire. If existing pole ground wire is damaged, it must be repaired. If pole ground wire is not present on the pole, a new pole ground wire shall be installed.
EXCEPTION: The device may be grounded by attaching to the system neutral, if there is an acceptable pole ground less than two spans away.

	ITEM	STK / DCS #	DESCRIPTION 25 91 10 **	02
	A	16 16 319	Enhanced Mesh Router Series 5	1
3	B	23 67 509	Mounting Kit - Router Wood Pole Bracket	1
3	C	38 01 417	Streetlight Bracket - 30" x 1-1/4"	1
3	D	18 57 111	Cable Assy., Router Power, Three Wire, 10 ft.	1
	E	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	1
	F	23 66 027	Washer, Flat, Square 5/8"	1
	G	23 66 134	Lock Washer - 5/8" Double Coil	1
	H	23 65 043	Lock Nut - 5/8" Square	1
	I	23 60 007	Lag Screw - 1/2" x 4"	2
	J	17 54 005	Split Bolt, #2 Solid to #6 Solid	6
4	K	41 56 041	Molding - 3/4"	1
	L	23 64 028	Staple - Coated Steel 29/32" x 2-1/2"	7
	M	16 16 395	Antenna - GPS, 2.56GHz/1.57GHz/1.6GHz	1
	N	25 54 074	Guard, Cable, 1/2" Poly (ft.)	5
5,@	O	16 16 105	Antenna - Dipole, 9"	1

REV	DATE	ENG	DESCRIPTION
2	01/01/24	WYW	Added Notes 8,9, 10 and 11
1	08/20/21	WYW	Converted to new format

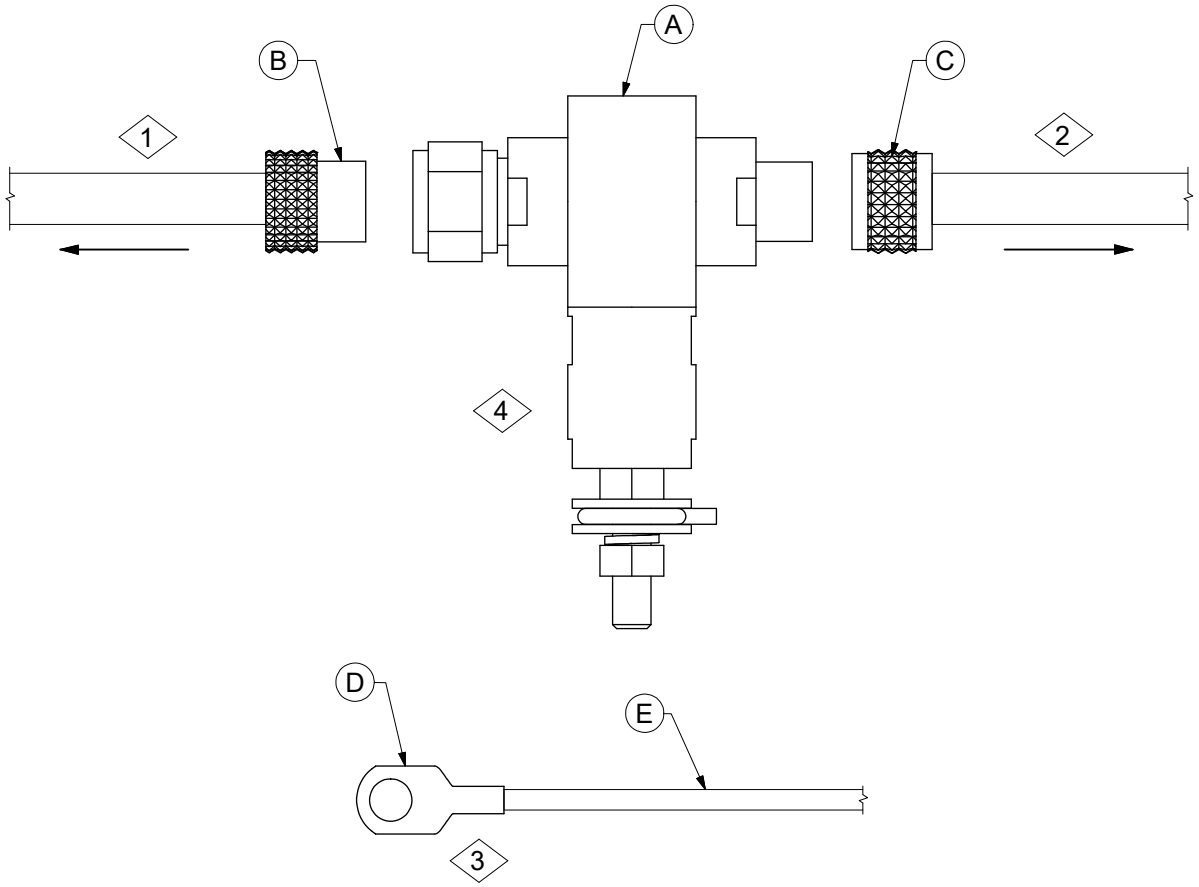


Switch, 30A, Fused, Plug Type - C6500/C7500 Collector Wiring
Switch Stock #40 78 038

CONSTRUCTION NOTE(s):

1. Use #6 SD CU (Stock #18 51 021) to bond safety switch box to pole ground. There must be a pole ground on poles where collectors are installed.

2. Collector and secondary wire entrances can be reversed as needed for best wire/conduit arrangement on the pole.



CONSTRUCTION NOTE(s):

1. This end of the coax cable goes to the collector where it is terminated on that end with a male N connector stock #16 16 015. If 12'-0" coax cable assembly stock #16 16 119 is used, connectors are pre-installed on both ends.

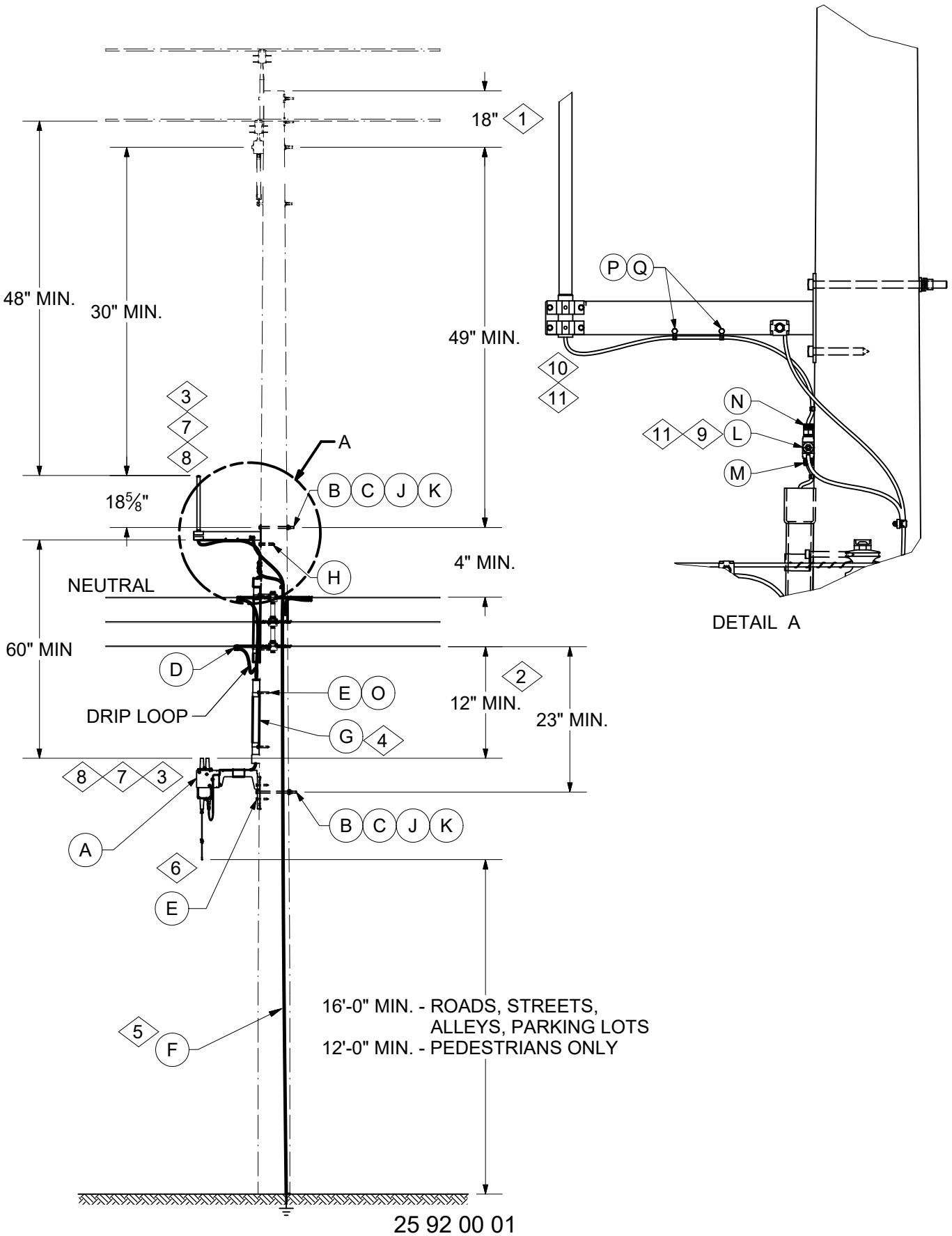
2. This end of the coax cable goes to the pole-top antenna where it is terminated on that end with a male N connector stock #16 16 015. If 25'-0" coax cable assembly stock #16 16 120 is used, connectors are pre-installed on both ends.

3. Arrester ground wire connects to the pole ground. There must be a pole ground on poles where collectors are installed.

4. Cover the arrester and arrester connections with moisture proofing tape stock #25 54 053 with overwrapping of electrical tape stock #25 53 055.

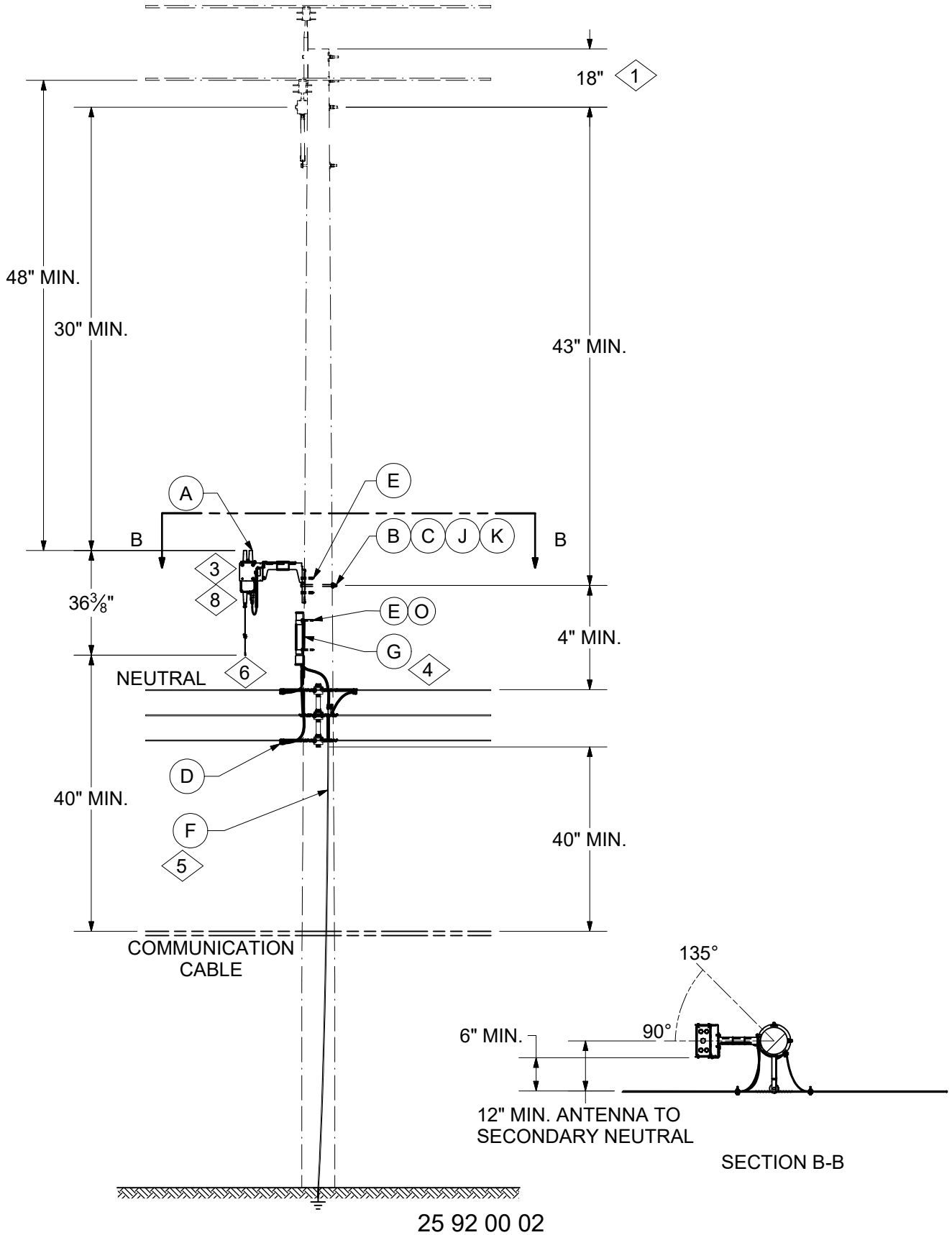
ITEM	STK / DCS #	DESCRIPTION 25 91 50 **	03
A	10 01 250	Arrestor - Antenna Coax Cable	1
B	16 16 110	Connector - Coax Cable N Female	1
C	16 16 015	Connector - Coax Cable N Male	1
D	17 55 834	Lug - #10 AWG 1 Hole, Flat	1
E	18 66 375	Wire, #10 STR CU, THHN White	#

REV	DATE	ENG	DESCRIPTION
1	01/01/24	WYW	Converted to new format
0	10/28/15	DG	



25 92 00 01

REV	DATE	ENG	DESCRIPTION
3	01/01/23	WYW	Item E and item I changed, construction note changes.
2	10/01/20	WYW	Conduit Size Change



25 92 00 02

REV	DATE	ENG	DESCRIPTION
3	01/01/23	WYW	Item E and item I changed, construction note changes.
2	10/01/20	WYW	Conduit Size Change

CONSTRUCTION NOTE(s):

1. On single-phase pole lines where future addition of crossarm for adding additional phases is not reasonably expected, this dimension can be reduced to 6” (e.g., total of 55” from the pole top to the top antenna mounting bracket bolt for DCS **25 92 00 01**).

2. The 12” minimum is from the secondary conductor to the top of the Gateway device.

3. Initial deployment will be done using L&G Gateway Mounting Kit. This mounting kit includes the power cable assembly, Gateway device, wood pole bracket, and hardware for mounting the Gateway device to the wood pole bracket. It also includes the antenna, antenna cable, and antenna mounting bracket.

4. Cut Gateway device and antenna cable molding to required length.

5. Use DCS **12 00 10 01** for ground coil application on new pole installation. Use DCS **12 00 10 02** for ground rod application on existing pole installation.

6. Antenna stock #16 16 105 is for maintenance replacement if the whip antenna provided with the Gateway device is damaged.

7. Mounting bracket may be installed at any angle necessary to achieve required clearances as per DCS **25 90 00 00**. For multiple antenna installation, keep all antennas aligned vertically greater than 5ft. separation and in the same plane within ± 5 inches.

8. Every antennae and Gateway needs to be installed at the minimum height as specified by the AMI designer for that location. Install replacement at as found height.

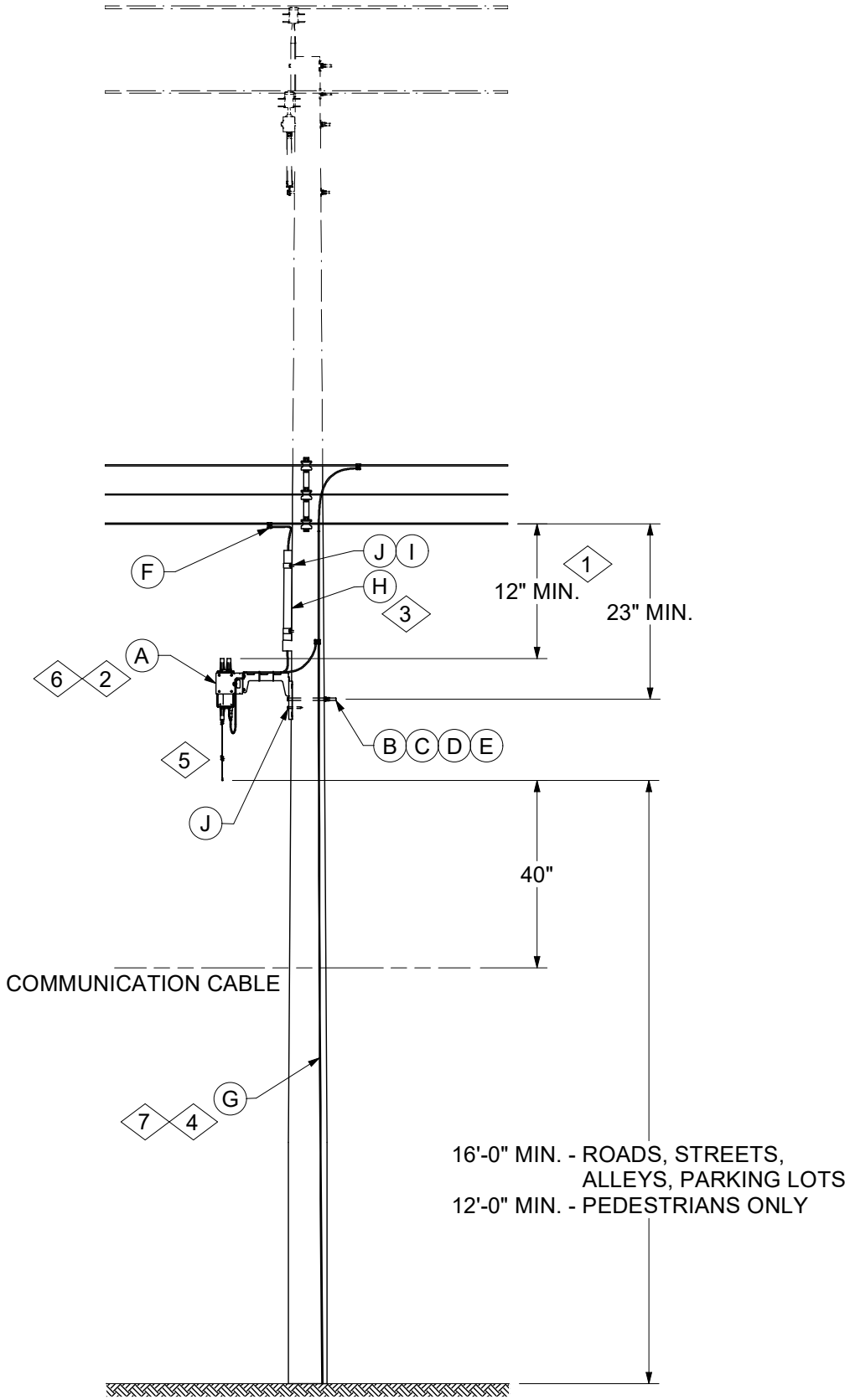
9. Gateway Device must be grounded. The primary method to ground the remote or sector antennae is through the lightning arrestor (place a 12" radius on the bend of the ground loop on lightning arrestor going to the device) which will be attached to the ground wire. If existing pole ground wire is damaged, it must be repaired. If pole ground wire is not present on the pole, one should be installed. EXCEPTION: The device may be grounded by attaching to the neutral if there is a good pole ground not more than two spans away.

10. Fasten drip loop with minimum 12" radius below antenna mount.

11. Weather proof coaxial connection between cable assembly, lighting arrestor, and antenna using weatherproof kit (Sealer: Stock #25 54 053 and Electrical Tape: Stock #25 53 055).

ITEM	STK / DCS #	DESCRIPTION 25 92 00 **	01	02
A	16 16 317	Network Gateway - Utility Pole Mount	1	1
B	23 52 068	Bolt - 5/8" Square 16"	2	1
C	23 66 046	Washer - 5/8" Round	2	1
D	17 51 032	Clamp, Parallel Groove, for 1/0 (7) AAAC Static	5	5
E	23 60 007	Lag Screw - 1/2" x 4"	10	6
F	**12 00 10 ****	Grounding Unit	1	1
G	12 01 280	Conduit - 2" Schedule 40 (ft.)	2	2
H	23 60 011	Lag Screw - 5/8" x 5"	1	-
I	23 64 027	Staple, 5/8" x 2"	2	2
J	23 65 043	Lock Nut - 5/8" Square	2	1
K	23 66 134	Lock Washer - 5/8" Double Coil	2	1
L	10 01 250	Arrestor - Antenna Coax Cable	1	-
M	16 16 015	Connector - Coax Cable N Male	1	-
N	16 16 110	Connector - Coax Cable N Female	1	-
O	23 67 190	Strap - Conduit 2" w/2" Bolts	4	2
P	23 67 510	Cleat - Cable Clamp 3/8"	2	-
Q	21 53 001	Bolt - 1/4" Hex 3/4"	2	-

REV	DATE	ENG	DESCRIPTION
3	01/01/23	WYW	Item E and item I changed, construction note changes.
2	10/01/20	WYW	Conduit Size Change



REV	DATE	ENG	DESCRIPTION
0	01/01/23	WYW	New Issued Standard

CONSTRUCTION NOTE(s):

1. The 12” minimum is from the secondary conductor to the top of the Gateway device.

2. Initial deployment will be done using L&G Gateway Mounting Kit. This mounting kit includes the power cable assembly, Gateway device, wood pole bracket, and hardware for mounting the Gateway device to the wood pole bracket.

3. Cut conduit to required length.

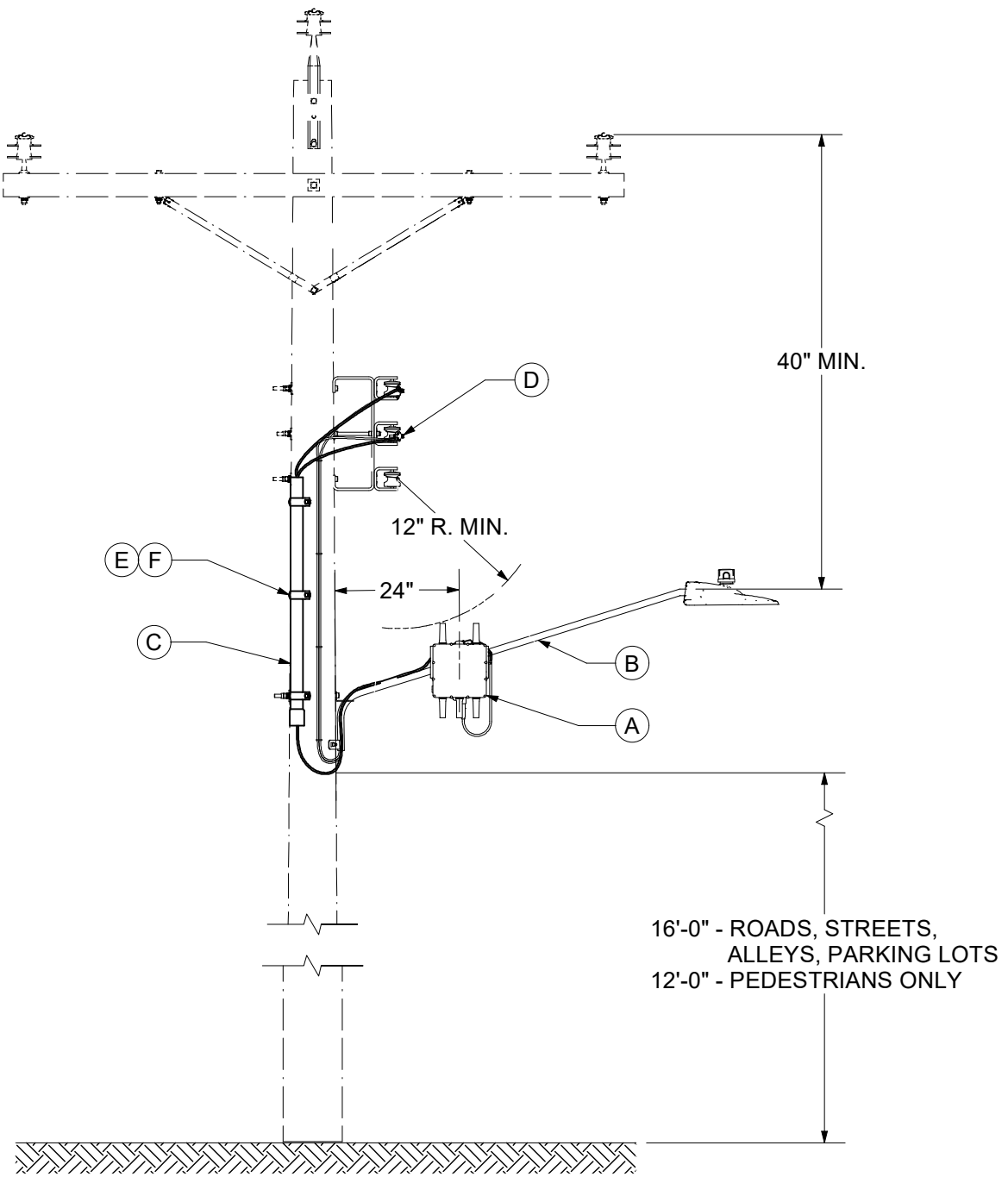
4. Use DCS **12 00 10 01** for ground coil application on new pole installation. Use DCS **12 00 10 02** for ground rod application on existing pole installation.

5. Antenna stock #16 16 105 is for maintenance replacement if the whip antenna provided with the Gateway device is damaged.

6. Every antennae and Gateway needs to be installed at the minimum height as specified by the AMI designer for that location. Install replacement at as found height.

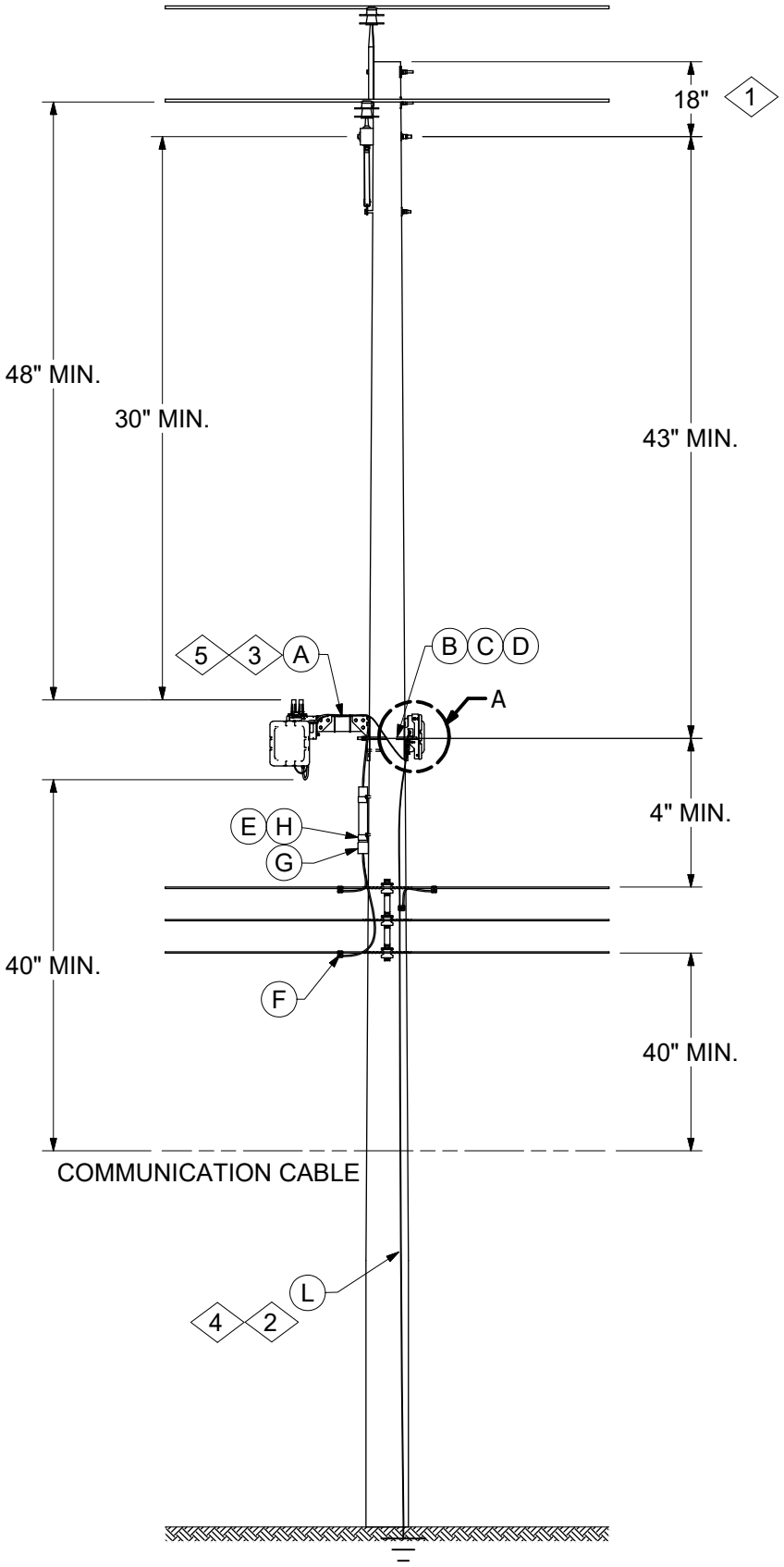
7. Gateway Device must be grounded. If existing pole ground wire is damaged, it must be repaired.
If pole ground wire is not present on the pole, one should be installed. EXCEPTION: The device may be grounded by attaching to the neutral if there is good pole ground not more than two spans away.

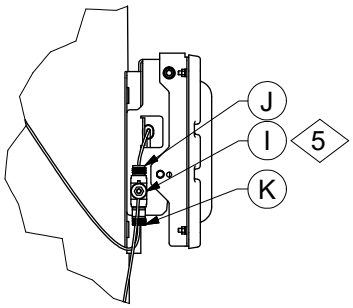
ITEM	STK / DCS #	DESCRIPTION 25 92 01 **	00
A	16 16 317	Network Gateway - Utility Pole Mount	1
B	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	1
C	23 66 046	Washer - 5/8" Round	1
D	23 66 134	Lock Washer - 5/8" Double Coil	1
E	23 65 043	Lock Nut - 5/8" Square	1
F	17 51 032	Clamp, Parallel Groove, for 1/0 (7) AAAC Static	2
G	12 00 10 **	Grounding Unit	1
H	12 01 280	Conduit - 2" Schedule 40 (ft.)	1
I	23 67 190	Strap - Conduit 2" w/2" Bolts	2
J	23 60 007	Lag Screw - 1/2" x 4"	6



ITEM	STK / DCS #	DESCRIPTION 25 92 01 **	01
A	16 16 318	Network Gateway - Streetlight Mount	1
B	38 01 249	Streetlight Bracket - 6' x 1-1/4"	-
C	12 01 280	Conduit - 2" Schedule 40 (ft.)	1
D	17 51 032	Clamp, Parallel Groove, for 1/0 (7) AAAC Static	4
E	23 67 190	Strap - Conduit 2" w/2" Bolts	3
F	23 60 007	Lag Screw - 1/2" x 4"	6

REV	DATE	ENG	DESCRIPTION
3	*01/01/23*	WYW	Changed title - removed "Smart"
2	10/01/20	WYW	Changed Conduit Size to 2"





DETAIL A

REV	DATE	ENG	DESCRIPTION
0	01/01/23	WYW	New Issued Standard

CONSTRUCTION NOTE(s):

1. On single-phase pole lines where future addition of crossarm for adding additional phases is not reasonably expected, this dimension can be reduced to 6” (e.g., total of 55” from the pole top to the top antenna mounting bracket bolt for DCS **25 92 00 01**).

2. Use DCS **12 00 10 01** for ground coil application on new pole installation. Use DCS **12 00 10 02** for ground rod application on existing pole installation.

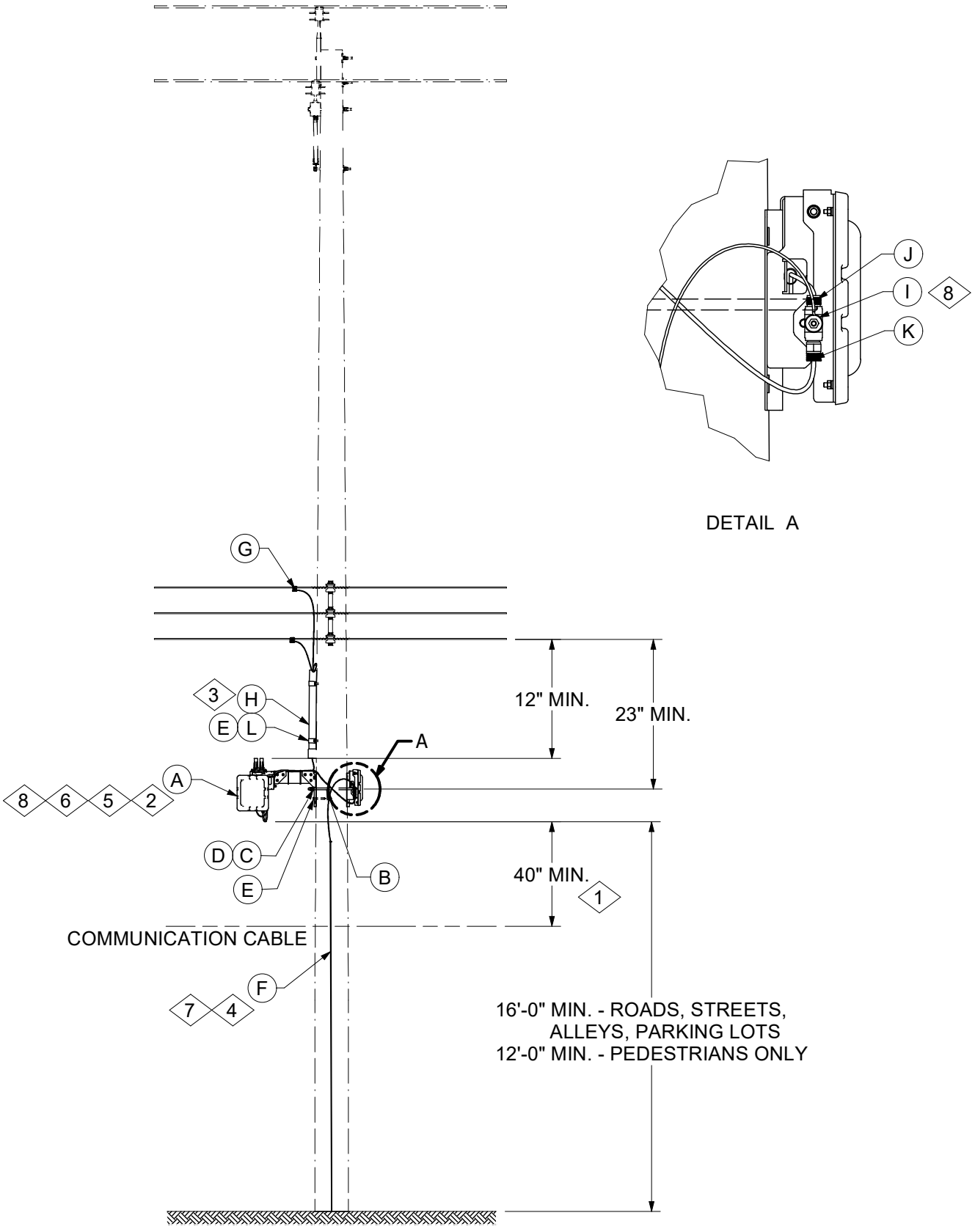
3. Mounting bracket may be installed at any angle necessary to achieve required clearances as per DCS **25 90 00 00**.

4. Gateway Device must be grounded. The primary method to ground the remote or sector antennae is through the lightning arrestor (place a 12" radius on the bend of the ground loop on lightning arrestor going to the device) which will be attached to the ground wire. If existing pole ground wire is damaged, it must be repaired. If pole ground wire is not present on the pole, one should be installed. EXCEPTION: The device may be grounded by attaching to the neutral if there is a good pole ground not more than two spans away.

5. Weather proof coaxial connection between cable assembly, lighting arrestor, and antenna using weatherproof kit (Sealer: Stock #25 54 053 and Electrical Tape: Stock #25 53 055).

ITEM	STK / DCS #	DESCRIPTION 25 92 02 **	00
A	16 13 893	Network Gateway with Sector Antenna	1
B	23 53 002	Bolt, DA, 5/8" Dia x 16" w/ 4 square nuts	1
C	23 66 134	Lock Washer - 5/8" Double Coil	2
D	23 65 043	Lock Nut - 5/8" Square	2
E	23 60 007	Lag Screw - 1/2" x 4"	6
F	17 51 032	Clamp, Parallel Groove, for 1/0 (7) AAAC Static	4
G	12 01 280	Conduit - 2" Schedule 40 (ft.)	1
H	23 67 190	Strap - Conduit 2" w/2" Bolts	2
I	10 01 250	Arrestor - Antenna Coax Cable	1
J	16 16 015	Connector - Coax Cable N Male	1
K	16 16 110	Connector - Coax Cable N Female	1
L	12 00 10 **	Grounding Unit	1

REV	DATE	ENG	DESCRIPTION
0	01/01/23	WYW	New Issued Standard



REV	DATE	ENG	DESCRIPTION
0	*01/01/23*	WYW	New Issued Standard

CONSTRUCTION NOTE(s):

1. The 40” minimum applies to the secondary bracket or the Gateway cable drip loops whichever is lowest to the communication

2. Initial deployment will be done using L&G Gateway Mounting Kit. This mounting kit includes the power cable assembly, Gateway device, wood pole bracket, and hardware for mounting the Gateway device to the wood pole bracket. It also includes the antenna, antenna cable, and antenna mounting bracket.

3. Cut conduit to required length.

4. Use DCS **12 00 10 01** for ground coil application on new pole installation. Use DCS **12 00 10 02** for ground rod application on existing pole installation.

5. Mounting bracket may be installed at any angle necessary to achieve required clearances as per DCS **25 90 00 00**.

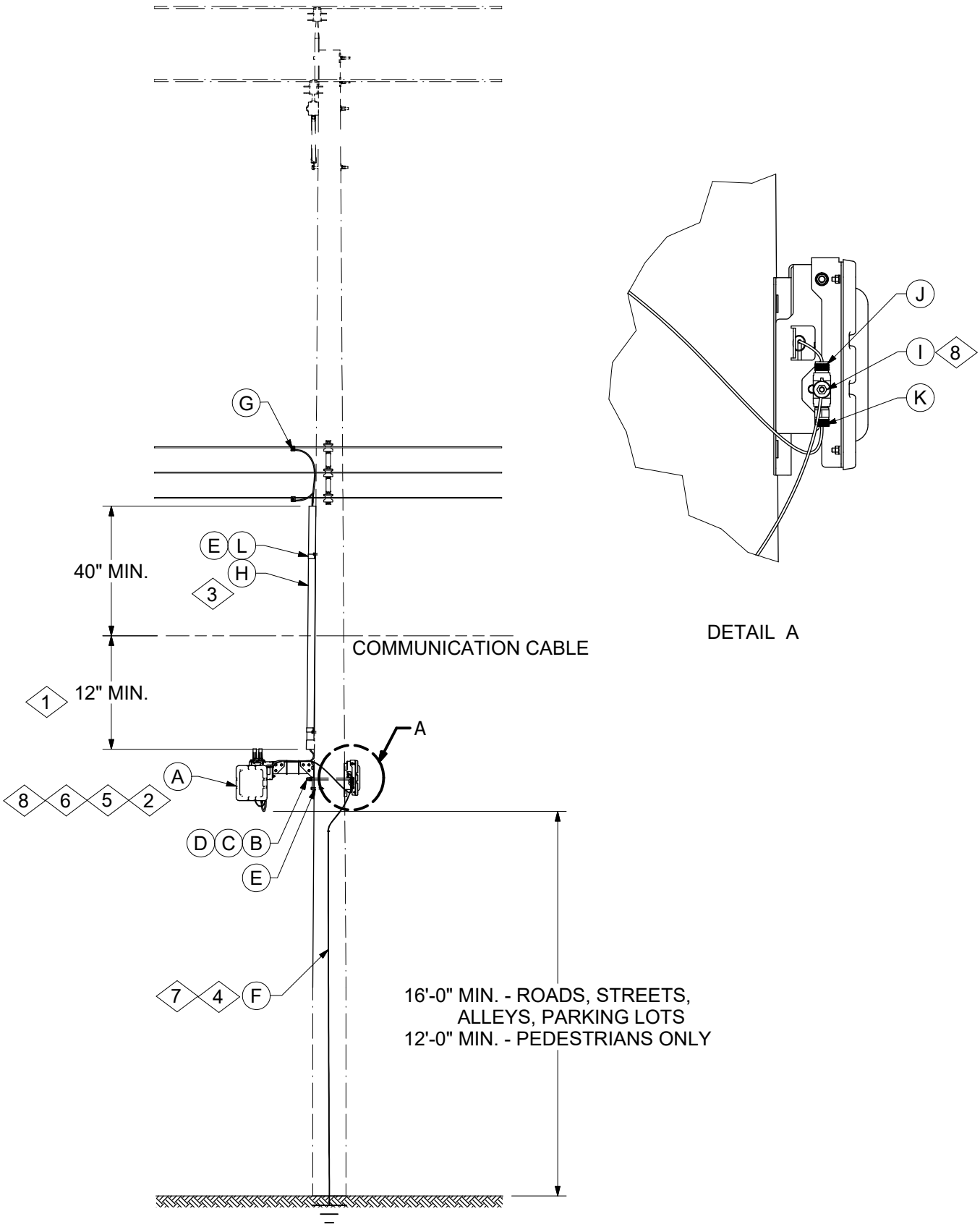
6. Every antennae and Gateway needs to be installed at the minimum height as specified by the AMI designer for that location. Install replacement at as found height.

7. Gateway Device must be grounded. The primary method to ground the remote antennae is through the lightning arrestor which will be attached to the ground wire. If existing pole ground is damaged, it must be repaired. If pole ground wire is not present on the pole, one should be installed. EXCEPTION: The device may be grounded by attaching to the neutral if there is a good pole ground not more than two spans away.

8. Weather proof coaxial connection between cable assembly, lighting arrestor, and antenna using weatherproof kit (Sealer: Stock #25 54 053 and Electrical Tape: Stock #25 53 055).

ITEM	STK / DCS #	DESCRIPTION 25 92 02 **	01
A	16 13 893	Network Gateway with Sector Antenna	1
B	23 53 002	Bolt, DA, 5/8" Dia x 16" w/ 4 square nuts	1
C	23 66 134	Lock Washer - 5/8" Double Coil	10
D	23 65 043	Lock Nut - 5/8" Square	8
E	23 60 007	Lag Screw - 1/2" x 4"	6
F	12 00 10 **	Grounding Unit	1
G	17 51 032	Clamp, Parallel Groove, for 1/0 (7) AAAC Static	2
H	12 01 280	Conduit - 2" Schedule 40 (ft.)	1
I	10 01 250	Arrestor - Antenna Coax Cable	1
J	16 16 015	Connector - Coax Cable N Male	1
K	16 16 110	Connector - Coax Cable N Female	1
L	23 67 190	Strap - Conduit 2" w/2" Bolts	2

REV	DATE	ENG	DESCRIPTION
0	*01/01/23*	WYW	New Issued Standard



REV	DATE	ENG	DESCRIPTION
0	01/01/23	WYW	New Issued Standard

CONSTRUCTION NOTE(s):

1. The 40” minimum is from the highest part of the gateway device to the communication attachment. The 40" minimum also applies from the end of the conduit to the communication attachment.

2. Initial deployment will be done using L&G Gateway Mounting Kit. This mounting kit includes the power cable assembly, Gateway device, wood pole bracket, and hardware for mounting the Gateway device to the wood pole bracket. It also includes the antenna, antenna cable, and antenna mounting bracket.

3. Cut conduit to required length.

4. Use DCS **12 00 10 01** for ground coil application on new pole installation. Use DCS **12 00 10 02** for ground rod application on existing pole installation.

5. Mounting bracket may be installed at any angle necessary to achieve required clearances as per DCS **25 90 00 00**.

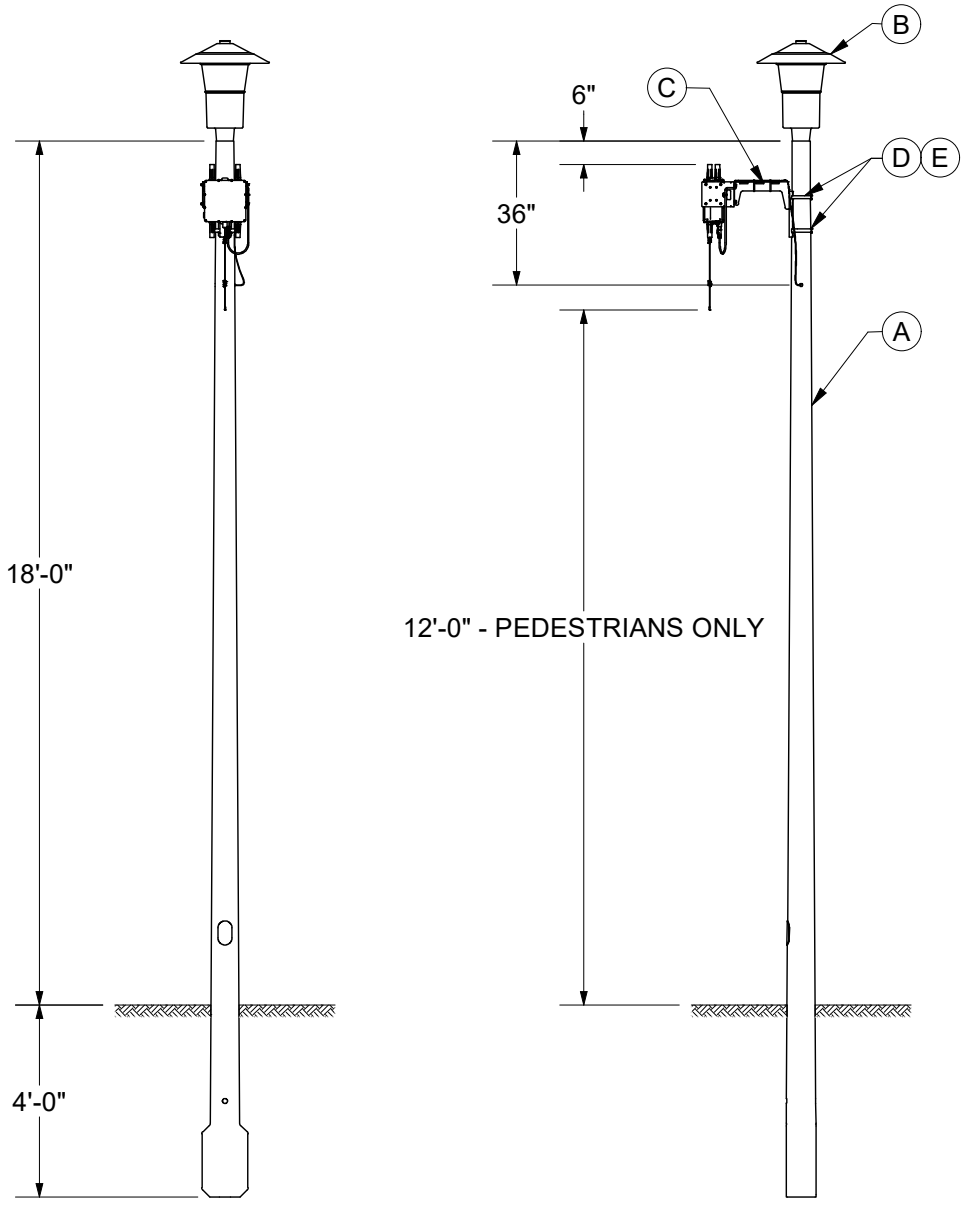
6. Every antennae and Gateway needs to be installed at the minimum height as specified by the AMI designer for that location. Install replacement at as found height.

7. Gateway Device must be grounded. The primary method to ground the remote antennae is through the lightning arrestor (place a 12" radius on the bend of the ground loop on lightning arrestor going to the device) which will be attached to the ground wire. If existing pole ground is damaged, it must be repaired. If pole ground wire is not present on the pole, one should be installed. EXCEPTION: The device may be grounded by attaching to the neutral if there is a good pole ground not more than two spans away.

8. Weather proof coaxial connection between cable assembly, lighting arrestor, and antenna using weatherproof kit (Sealer: Stock #25 54 053 and Electrical Tape: Stock #25 53 055).

ITEM	STK / DCS #	DESCRIPTION 25 92 03 **	01
A	16 13 893	Network Gateway with Sector Antenna	1
B	23 53 002	Bolt, DA, 5/8" Dia x 16" w/ 4 square nuts	1
C	23 66 134	Lock Washer - 5/8" Double Coil	2
D	23 65 043	Lock Nut - 5/8" Square	2
E	23 60 007	Lag Screw - 1/2" x 4"	6
F	12 00 10 **	Grounding Unit	1
G	17 51 032	Clamp, Parallel Groove, for 1/0 (7) AAAC Static	2
H	12 01 280	Conduit - 2" Schedule 40 (ft.)	1
I	10 01 250	Arrestor - Antenna Coax Cable	1
J	16 16 015	Connector - Coax Cable N Male	1
K	16 16 110	Connector - Coax Cable N Female	1
L	23 67 190	Strap - Conduit 2" w/2" Bolts	2

REV	DATE	ENG	DESCRIPTION
0	01/01/23	WYW	New Issued Standard

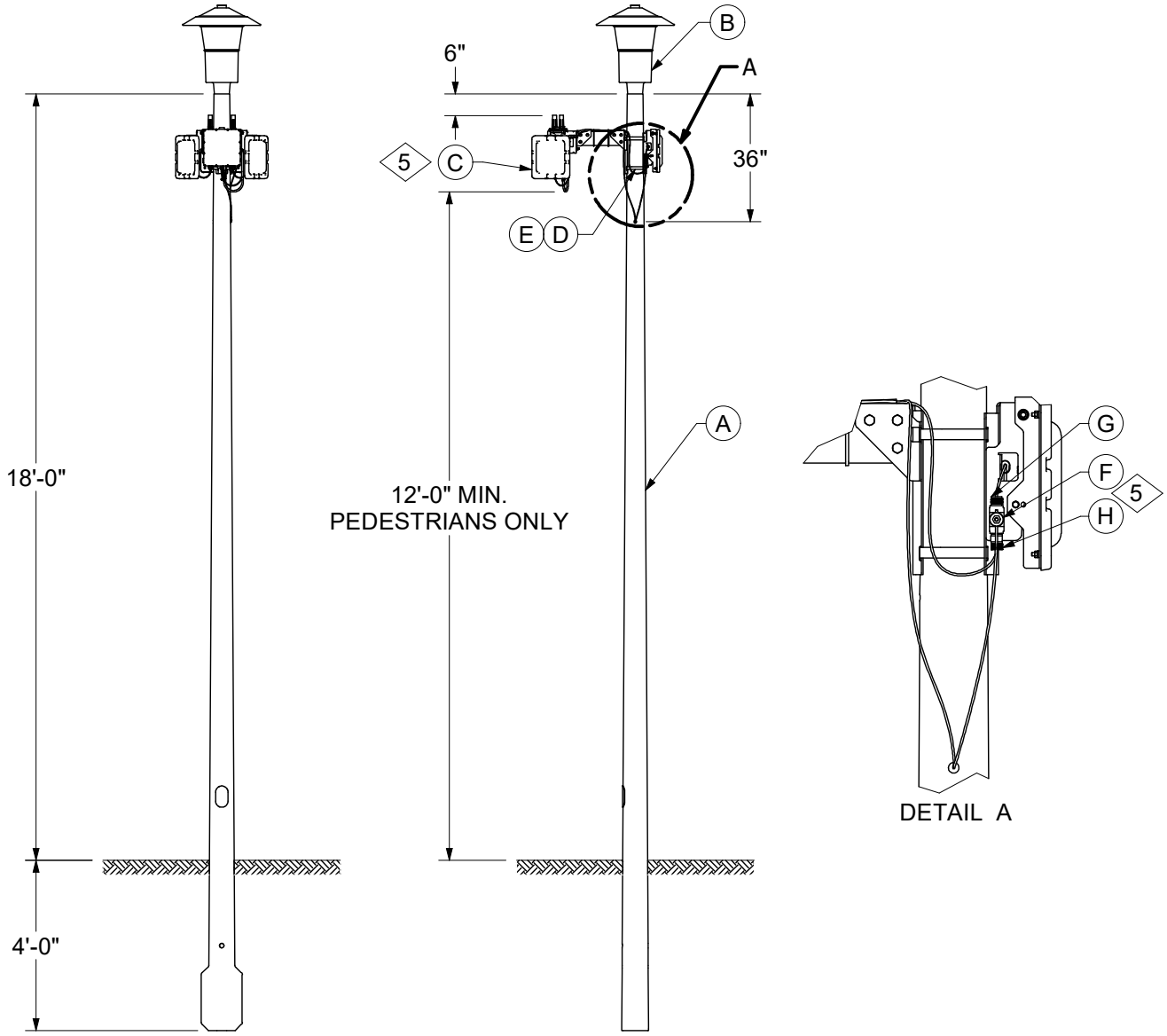


ITEM	STK / DCS #	DESCRIPTION 25 92 10 **	00
A	38 51 677	Pole - FG 22' OH 18' MH	1
B	15 76 01 **	Luminaire	1
C	16 16 317	Network Gateway - Utility Pole Mount	1
D	23 67 528	Band - 3/4in	2
E	23 67 529	Band Buckle - 3/4in	2

Construction Note(s):

1. Native soil back fill must be tamped to provide solid compaction around the pole.
2. Generally only one street light tag per street light shall be installed. The tag should be installed visibly from the ground level but not reachable by the public. Refer to DCS **15 90 01 01**.
3. In Missouri; residential developments, the contractor will install 1-1/2" conduit to within 18" of the pole. Ameren will install the pole and the cable.
4. See DCS **29 00 17 02** for minimum required ground clearance to bottom of antenna. Use clearances for "Secondary & Service Conductors 0 to 750 Volts".

REV	DATE	ENG	DESCRIPTION
1	*01/01/23*	WYW	Moved Gateway 6" below bottom of tenon
0	07/01/20	WYW	New Issue



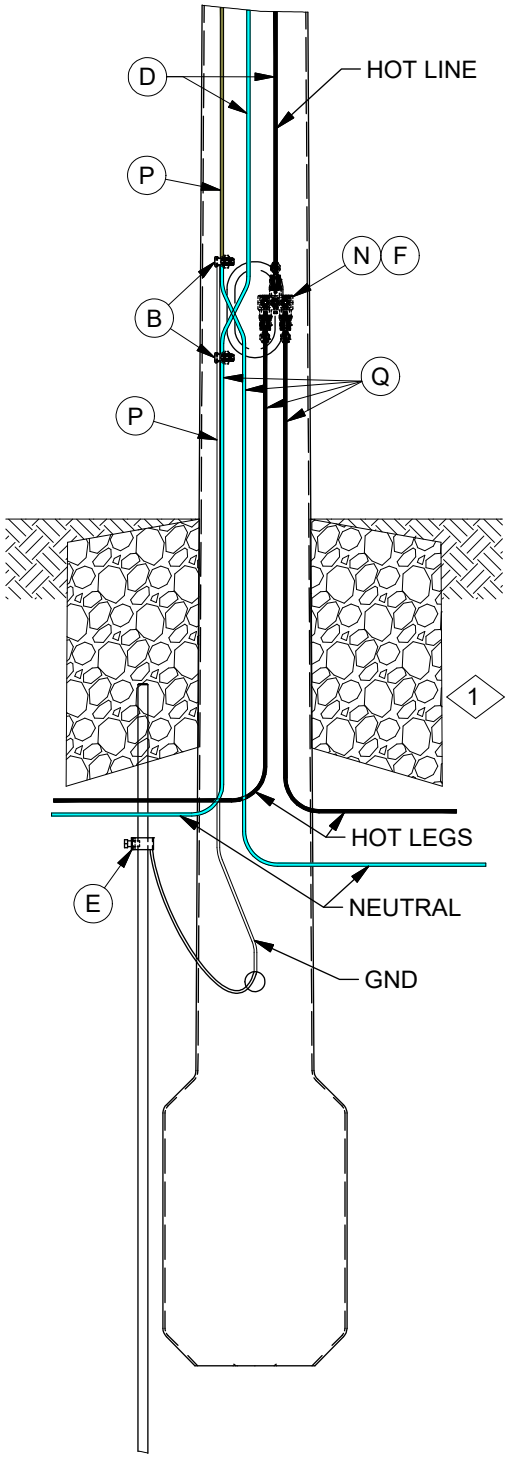
CONSTRUCTION NOTE(s):

1. Native soil back fill must be tamped to provide solid compaction around the pole.
2. Generally only one street light tag per street light shall be installed. The tag should be installed visibly from the ground level but not reachable by the public. Refer to DCS **15 90 01 01**.
3. In Missouri; residential developments, the contractor will install 1-1/2" conduit to within 18" of the pole. Ameren will install the pole and the cable.
4. See DCS **29 00 17 02** for minimum required ground clearance to bottom of antenna. Use clearances for "Secondary & Service Conductors 0 to 750 Volts".
5. Weather proof coaxial connection between cable assembly, lighting arrestor, and antenna using weatherproof kit (Sealer: Stock #25 54 053 and Electrical Tape: Stock #25 53 055).

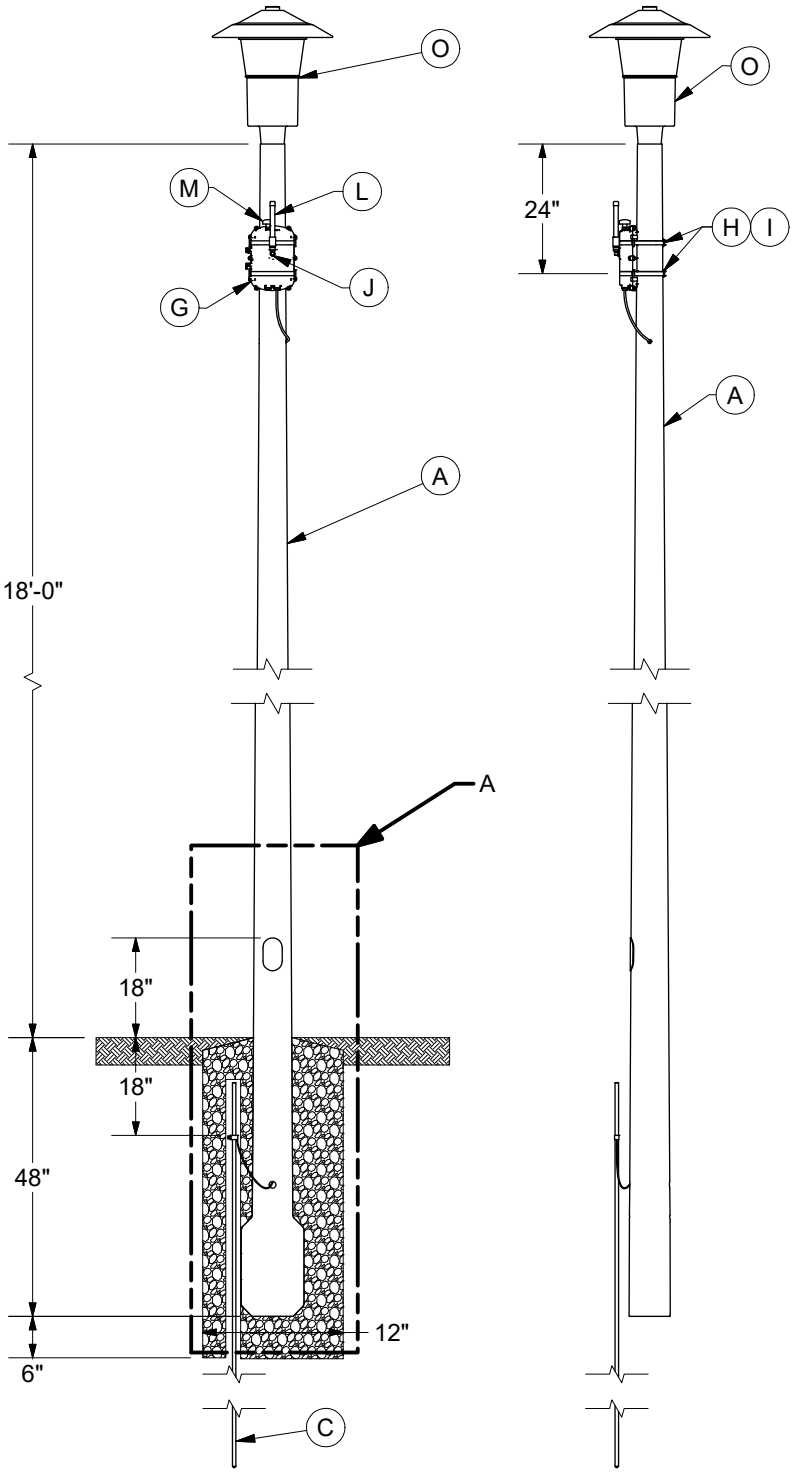
REV	DATE	ENG	DESCRIPTION
0	*01/01/23*	WYW	New Issued Standard

ITEM	STK / DCS #	DESCRIPTION 25 92 10 **	02
A	38 51 677	Pole - FG 22' OH 18' MH	1
B	38 51 631	Colonial, LED 100W equivalent, 120V-277V, Type V, 3000K	1
C	16 13 893	Network Gateway with Sector Antenna	1
D	23 67 528	Band - 3/4in	2
E	23 67 529	Band Buckle - 3/4in	2
F	10 01 250	Arrestor - Antenna Coax Cable	1
G	16 16 015	Connector - Coax Cable N Male	1
H	16 16 110	Connector - Coax Cable N Female	1

REV	DATE	ENG	DESCRIPTION
0	*01/01/23*	WYW	New Issued Standard

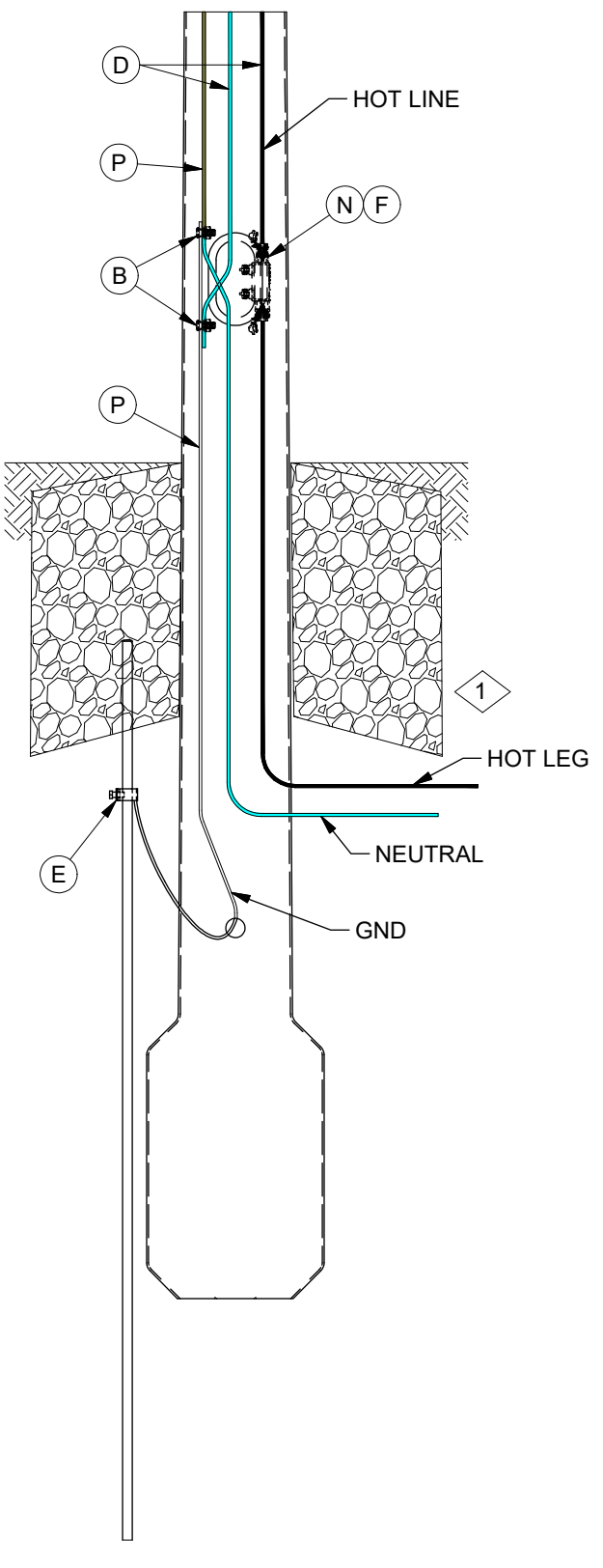


Detail A

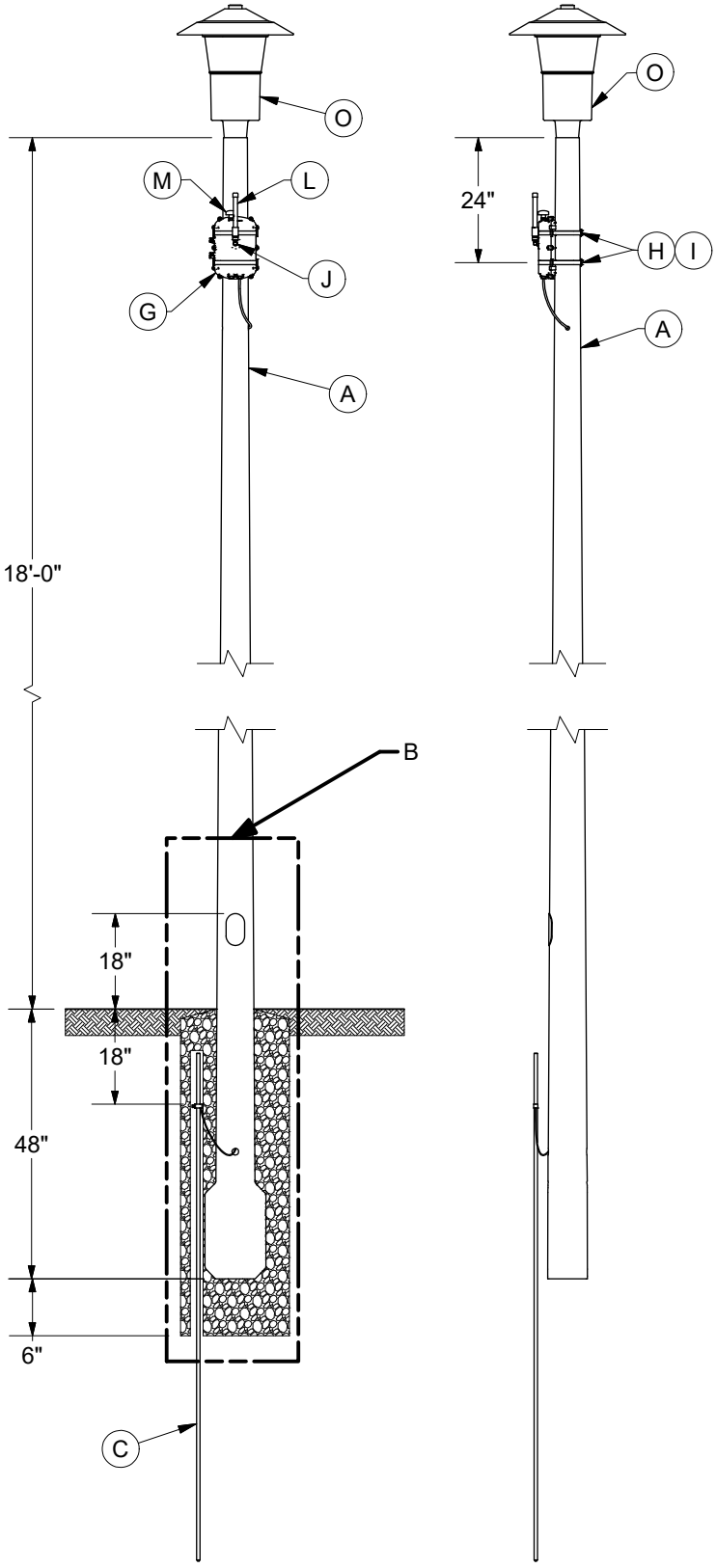


25 92 11 02

REV	DATE	ENG	DESCRIPTION
0	01/01/24	WYW	New Standard



Detail B



25 92 11 01

REV	DATE	ENG	DESCRIPTION
0	01/01/24	WYW	New Standard

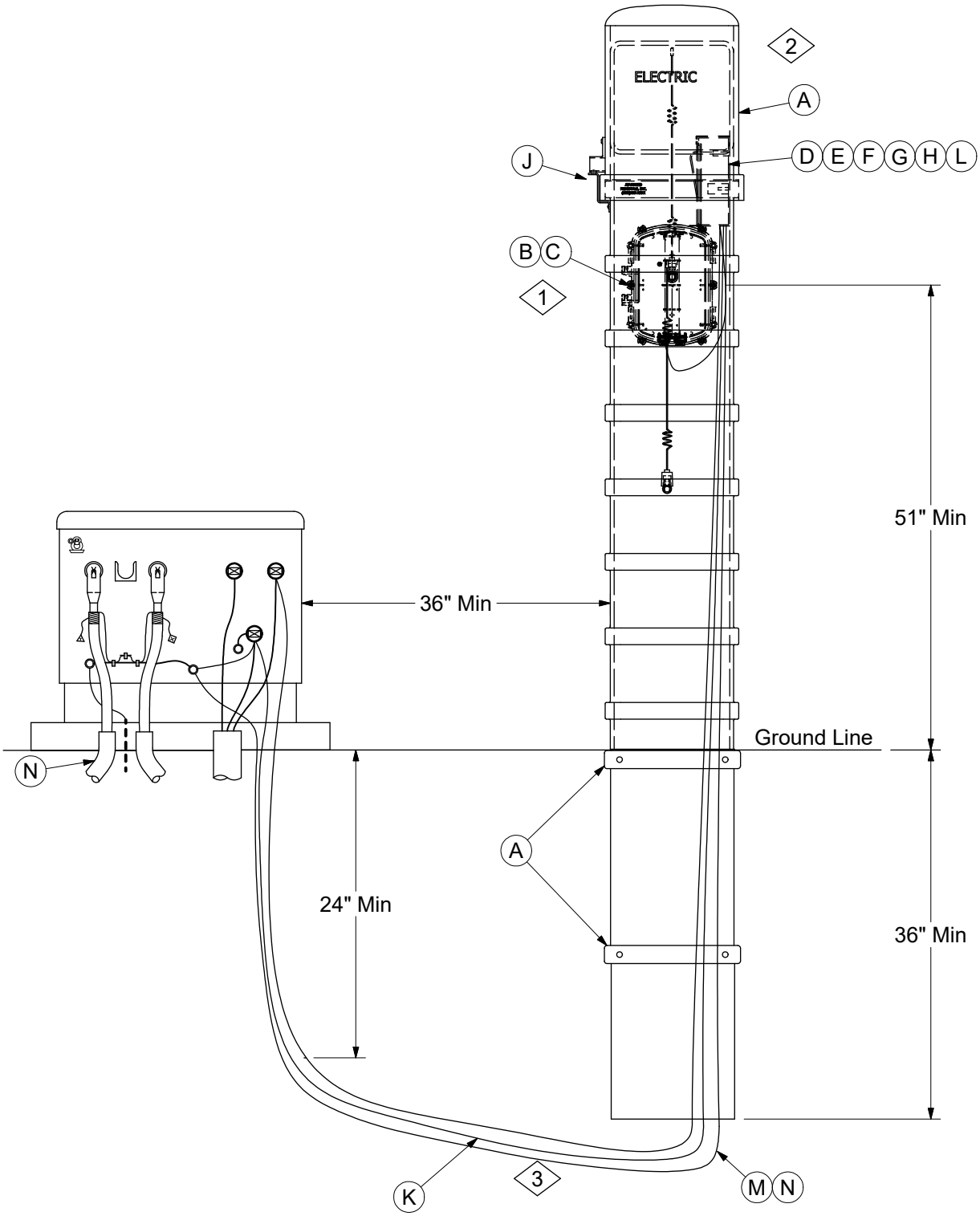
CONSTRUCTION NOTE(s):

1. Rock or native soil must be tamped to provide solid compaction around the pole. Refer to DCS **02 20 05 ****** for more detail.
2. Generally only one tag per street light shall be installed. If more than one street light installed on the same pole, one tag per street light is required, and each tag should be installed on the same quadrant of the light. The tag should be installed visibly from the ground level but not reachable from public. Refer to DCS **15 90 01 01** for more details.
3. In Missouri residential developments, the contractor will install 1-1/2 inch conduit to the pole site. Ameren will install the pole and the cable. In Illinois residential developments, Ameren will install direct burial unless the customer provides a complete conduit system.
4. For fuse underground streetlight cable at pad mount transformer or pedestal, Refer to DCS **52 00 01 ****. In Illinois residential developments, Ameren will install direct burial unless the customer provides a complete conduit system.
5. See DCS **29 00 17 02** for minimum required ground clearance to bottom of antenna. Use clearance "Secondary & Service Conductors 0 to 750 Volts".
6. Native soil back fill must be tamped to provide solid compaction around the pole.
7. In Missouri residential developments, the contractor will install 1-1/2" conduit to within 18" of the pole. Ameren will install the pole and the cable. In Illinois residential developments, Ameren will install direct burial unless the customer provides a complete conduit system.
8. See DCS **29 00 17 02** for minimum required ground clearance to bottom of antenna. Use clearances for "Secondary & Service Conductors 0 to 750 Volts".

DCS #	DESCRIPTION
25 92 11 01	Single Light
25 92 11 02	Multi-Lights

	ITEM	STK / DCS #	DESCRIPTION 25 92 11 **	01	02
	A	38 51 677	Pole - FG 22' OH 18' MH	1	1
	B	17 54 004	Connector - Split Bolt, #4 Sol CU thru #8 Sol CU	2	2
	C	23 13 069	5/8" Ground Rod 8ft	1	1
	D	18 57 104	Cable, 2#10, Cu, Poly, ft	17	17
	E	17 52 032	Clamp, Ground Rod 5/8	1	1
	F	20 51 007	Fuse, 10 Amp	1	2
	G	16 16 119	Enhanced Mesh Router Series 5	1	1
	H	23 67 528	Band - 3/4"	2	2
	I	23 67 529	Band Buckle - 3/4"	2	2
	J	16 16 020	Adapter - Coax Right Angle N Male to N Female	1	1
	K	18 57 111	Cable Assy, Power Cable, Three Wire, 10 ft	1	1
	L	16 16 105	Antenna, Dipole, 9"	1	1
@	M	16 16 395	Antenna GPS	1	1
	N	20 56 543	Connector, #14 thru 1/0 Wire, One to One Fusible Link	1	-
	N	20 56 544	Connector, #14 thru 1/0 Wire, One to Two Way Fusible Link	-	1
@	O	**15 70 15 ** **	Luminaire, Post Top	1	1
@	P	18 52 019	Wire, S.D. #6 Cu, Bare, ft	#	#
@	Q	18 07 252	Cable - Duplex #6 Al.	#	#

REV	DATE	ENG	DESCRIPTION
0	01/01/24	WYW	New Standard



REV	DATE	ENG	DESCRIPTION
0	01/01/24	WYW	New Standard

CONSTRUCTION NOTE(s):

1. Fasten the router with a Lanyard with a double locking carabiner (Stock #85 26 162) to ensure the router does not fall inside the pedestal during maintenance operation.

2. Install a sticker "Property of Ameren" on the router and outside of the pedestal cover.

3. Installing cable in conduit is optional.

	ITEM	STK / DCS #	DESCRIPTION 25 92 20 **	00
	A	40 89 774	Pedestal, API PFAM1011XLST001	1
	B	16 16 117	Router - AMI, L&G Series R6500	1
	C	16 16 020	Adapter - Coax Right Angle N Male to N Female	1
	D	40 78 038	Switch, 30A, Fused, Plug Type	1
	E	16 08 301	Connector, Strain Relief, (for #10), 3 Wire	1
	F	16 08 303	Connector, Strain Relief, (for Collector Cable)	1
	G	20 51 012	Fuse, 250V, 30A, Cartridge Type	1
	H	40 59 039	Cartridge, Solid Neutral Fuse Slug, 30A, 250V	1
	J	22 13 197	Lock, Pad, Combination, 5/16" Diam x 1" W x 2-1/4" Tall	1
	K	18 07 252	Cable 2-#6 Al	#
	L	23 52 567	Hardware - Bolt, 1/4" x 1", Nut and Washer	20
3,@	M	12 01 230	Conduit, PVC, Schedule 40, 1-1/2" x 10'	#
3,@	N	19 18 572	Bend, Conduit, 1-1/2"	2

REV	DATE	ENG	DESCRIPTION
0	01/01/24	WYW	New Standard

OVERHEAD INSTRUCTIONS 29

JOINT CONSTRUCTION..... 29 00 01 01

CLEARANCE OF SUPPORTING STRUCTURES FROM OTHER OBJECTS..... 29 00 17 01

VERTICAL CLEARANCE OF WIRES ABOVE GROUND, RAIL, OR WATER..... 29 00 17 02

VERTICAL CLEARANCE TO EQUIPMENT MOUNTED ON STRUCTURES..... 29 00 17 03

CLEARANCE OF WIRES FROM BUILDINGS AND OTHER INSTALLATIONS.....29 00 17 04

CLEARANCE OF WIRES FROM RAIL CARS..... 29 00 17 05

CLEARANCE OF WIRES TO GRAIN BINS..... 29 00 17 06

CLEARANCE OF WIRES TO BRIDGES.....29 00 17 07

CLEARANCE OVER SWIMMING AREAS..... 29 00 17 08

CLEARANCE FOR WIRES CARRIED ON THE SAME SUPPORTING STRUCTURE..... 29 00 17 09

VERTICAL CLEARANCE BETWEEN CONDUCTORS AND NON-CURRENT-CARRYING METAL PARTS OF EQUIPMENT..... 29 00 17 11

CLEARANCE OF VERTICAL AND LATERAL CONDUCTORS FROM OTHER WIRES AND SURFACES ON THE STRUCTURE..... 29 00 17 12

CLEARANCE BETWEEN CONDUCTORS AND CABLES CARRIED ON DIFFERENT SUPPORT STRUCTURES.....29 00 17 13

CLIMBING AND WORKING SPACE.....29 00 18 01

ENERGIZED ZONE RISK REDUCTION (EZRR) CORRECTIVE ACTION WORK..... 29 12 00 **

Wherever practicable it is intended that poles be jointly used with other utilities. To effectively do this, some of the more important provisions in the National Electric Safety Code (NESC) pertaining to Joint Use are outlined below.

1. Scope

Communication company (Communication Co.) circuits in this DCS include Telephone, Telegraph, CATV, Railroad Signal, Messenger Call, Clock, Control, Fire and Police, and other alarm circuits.

2. NESC Requirements

The National Electric Safety Code forms the basis for construction specifications under our joint use agreements. All new construction shall conform to the NESC in effect at the time of construction. Where conductors or equipment are added, altered, or replaced on an existing structure, the installation should be brought into conformance with the NESC in effect at that time except as mutually agreed not to do so. This mutual agreement is allowed provided that the resulting installation will be in compliance with either (a) the NESC rules in effect at original installation, or (b) NESC rules in effect in a subsequent edition to which the structure has been previously brought into compliance. Exception: On these existing structures, clearances between luminaire brackets and communications equipment must comply with the NESC rules in effect at the time the structure is replaced. These provisions shall not be so applied as to require any then existing cables carried on one side of a joint pole to be rearranged to occupy the other side of the pole.

A. Setting Depth of Poles

Ameren poles shall be set in accordance with DCS 02 20 03 01. Variations in depth setting for self--sustaining shall be considered in arriving at the height of pole required for joint use.

B. Minimum ”Clearance Space to Ground” Requirements

The ”Clearance Space to Ground” for a conductor is the NESC minimum clearance between ground or rail and the conductor. For equipment such as transformers hung low on a pole it is the minimum clearance between ground and the bottom of the transformer case or hanger.

In Table 1 are listed the clearances for Communications Co. conductors (usually the lowest on the pole).

TABLE 1 - Clearance to Ground or Rail of Communications Co. Cables or Conductors

Nature of Object Crossed Over or Along	Clearance Above Ground or Rail (ft.) ◇1
Communications Co. Cables or Conductors Crossing Over:	
Track rails of railroads	23.5
Public streets or roads	15.5
Public alleys	15.5
Driveways to residence garages (No vehicles greater than 8 ft. anticipated)	11.5
Spaces or ways accessible to pedestrians only	9.5
Communications Co. Cables Running Along and Within Limits of:	
Public streets, roads or alleys	15.5
Where no part of line overhangs any part of the highway and where it is unlikely loaded vehicles will cross under the line	13.5
Spaces or ways accessible to pedestrians only	9.5

CONSTRUCTION NOTE(s):

◇1. The clearances given are for the lowest point in the span. The point of attachment on the pole must, therefore, be higher to compensate for conductor sag or ground irregularities. Clearances are per the 2017 NESC.

REV	DATE	ENG	DESCRIPTION
10	04/01/22	DG	Converted to new format
9	03/23/18	DG	

C. Communication Worker Saftey Zone

The communication worker safety zone shall be an equipment free vertical space (except as noted below) between Ameren attachments and equipment and Communications Co. attachments and equipment. It shall measure not less than 40” for Ameren attachments and equipment of circuits up to 600 volts to ground and 72” for circuits exceeding 600 volts to ground.

Exceptions:

a. Where non-current carrying parts of equipment are effectively grounded consistently throughout well--defined areas,and where communications circuits are at lower levels, the neutral space may be reduced to 30”.

b. For street light span wires and brackets, see Section 2E,and for vertical runs, see Section 2F.

D. Ground Connections

On all structures where a pole ground is installed by either Ameren or the Communication Co., the electric supply neutral and communication metallic messengers shall be bonded together with a minimum #6 covered copper or equivalent bond wire.

The same grounding wire or artificial ground may be used for Ameren and Communications Co. attachments, where mutually agreed upon. If separate Ameren and communication grounds are installed on the same pole, they must be bonded together with a minimum #6 covered copper or equivalent bond wire to the same ground rod or at the base of the pole, and at the Communication Co. attachment level.

E. Minimum Clearances between Street Light Equipment and Communications Equipment

Table 2 gives the minimum clearances that shall be maintained between Ameren and Communications Co. facilities under various conditions.

TABLE 2 - Vertical Clearance of Luminaire Brackets and Span Wires to Communication Lines	
Location of Luminaire Bracket or Span Wire Supporting Luminaire	Minimum Vertical Clearance (in)
Above communication support arms (not allowed by Ameren)	40 ◇2
Below communication support arms (not allowed by Ameren)	40 ◇3
Above messengers carrying communication cables	40 ◇4
Below messengers carrying communication cables	40 ◇4
From terminal box of communication cable	40 ◇4
From communication brackets, bridle wire rings, or drive hooks	40 ◇4

CONSTRUCTION NOTE(s):

Ref. 2017 NESC Section 23 Table 238-2

◇2. This may be reduced to 20" for grounded luminaire brackets, or 12" for either span wires or metal parts of brackets at points 40" or more from the pole surface.

◇3. This may be reduced to 24" for grounded luminaire brackets.

◇4. This may be reduced to 20" for grounded luminaire brackets. (Note that this is greater than the NESC allowed 4”.)

REV	DATE	ENG	DESCRIPTION
10	04/01/22	DG	Converted to new format
9	03/23/18	DG	

F. Vertical Runs on Pole Surface

In general, Ameren and Communications Co. vertical runs shall not be placed on the same pole if it is practicable to place them on separate poles.

If vertical runs of both companies must be placed on the same pole, the runs shall be placed in adjacent quadrants, or on standoff brackets if more than half the pole surface is needed.

a. Clearance Between Vertical Runs and Pole Equipment

Vertical runs, risers, ground wires and hardware supporting such runs belonging to Ameren shall have a clearance of 1/8 the pole circumference but in no case less than 2” from communications equipment.

Vertical runs, risers, ground wires and hardware supporting such runs shall be so located that they do not interfere with the free use of pole steps.

b. Coverings for Vertical Runs on Poles

Ameren ground wires fastened directly to the pole need not be covered with plastic molding except where required within 8' of the ground.

Ameren non-leaded cables shall be covered with plastic conduit from the ground to a point not less than 40 inches above the highest Communications Co. attachments.

c. Vertical Runs Supported Between Crossarms

Lamp leads for street lights may be run from an Ameren crossarm directly to the lamp bracket provided the luminaire bracket is 40" or more above all communication attachments.

G. Other Attachments

a. Longitudinal Cable

All attachments in the communication space by a third party shall be bolted directly to the pole. In order to maintain climbing space, extension arms for means of attaching are prohibited.

b. Aerial Supply Service Cables

The point where such cables leave the pole shall be not less than 40" above the highest or 40" below the lowest Communication Co. attachments.

c. Requirements for Joint Use/Third Party Power Supply Equipment on Ameren Poles

All power supply equipment and associated facilities attachments (including but not limited to wires, conduits, brackets, and ground wires) are subject to Ameren approval.

Climbing space on any Ameren pole will be maintained at all times. This requires one side of the pole (180 degrees of the same face of the pole) to be open from the ground to the top of the communication space. Any power supplies or similar facilities shall be mounted on the same side of the pole as any risers and cables. Under no circumstances is power supply equipment allowed above the communications space.

Risers and cables shall be installed in accordance with DCS **14 00 01 02**. No exceptions allowed.

Ameren’s wireless antenna location policy addresses the proper placement of any risers and cables above the communications space.

If climbing space cannot be maintained, the cabinet equipment shall be installed on the ground and shall be a minimum of 5’ horizontally, in any direction, from the base of the pole.

H. Guys & Anchors

In Tables 3 and 4 are listed minimum clearances that shall be maintained between guys of either Ameren or the Communications Co. to the equipment listed and under the particular circumstances shown.

Anchors shall have a minimum of 5' separation from the pole face and to other anchors. Communication guys shall not be attached to Ameren anchors (see DCS **29 00 01 01** sheet 10).

TABLE 3 - Clearance to Grounded Guys when Crossing Over or Under Cables, Conductors or Guys of Another Line

Equipment Guy Crosses Over or Under	Clearance Required (ft.)
Communications Co. cable or conductors	2
Ameren triplex or quad cables	2
Ameren open conductors up to 750 volts	2 ◇7
Ameren open conductors above 750 volts	2 ◇8 ◇6
Other guys or street light span wires	2 ◇5

CONSTRUCTION NOTE(s):

Ref. 2017 NESC, Section 23, Table 233-1

◇5. This clearance may be reduced where both guys are electrically interconnected.

◇6. For voltages above 22 kV consult the Standards Group.

◇7. 4' is required to communication guy.

◇8. 5' is required to communication guy.

TABLE 4 - Clearance in Any Direction between Guys and Line Conductors or Cables Attached to the Same Structure

Equipment Guy Shall Clear	Parallel to Line (in.)	Not Parallel to Line (in.)
Communications Co. cables or conductors	6 ◇9	6 ◇9
Ameren conductors up to 8.7 kV phase to phase	12 ◇9	6
Ameren conductors (7.2/12.47 kV to14.4 kV)	15	9
Ameren 34.5 kV conductors	30	30

CONSTRUCTION NOTE(s):

Ref. 2017 NESC, Section 23, Table 235-6

◇9. If guy passes within 12" of Ameren conductors and also passes within 12" of communication cables, the guy must be insulated with a strain insulator at a point below the lowest supply conductor and above the highest communication cable.

REV	DATE	ENG	DESCRIPTION
10	04/01/22	DG	Converted to new format
9	03/23/18	DG	

I. Miscellaneous Requirements

Street lamp span wires shall not encircle the pole but shall be attached by means of a through bolt.

Street lamp brackets and their metal parts shall be confined to the half of the pole circumference nearest the lamp, except that where attachment by means of lag screws is impracticable the metal parts may be secured with through bolts. Lamp leads supported along a span wire or lamp bracket shall be so attached that insulation will not be injured.

Span wires shall have at least one strain insulator.

J. Communication Co. Antennas

Communication Co. antennas shall not be installed on any jointly used poles until reviewed by and approval is granted by Ameren. Communication Co. antennas shall not be installed on Ameren transformer poles, terminal poles, switch poles, capacitor poles, voltage regulator poles, recloser poles, deadend poles, or corner poles.

Exception: An installation on a transformer pole may be considered by Ameren to provide power to antenna where secondary does not exist.

Sections 2C, 2D, 2E, 2F, and 2G of this DCS shall also apply to Communication Co. antennas except where the clearances in this Section are more stringent.

a. Communication Co. Antennas Located in the Communication Space

Communication Co. antennas located in the communication space are considered equipment for the purpose of determining minimum clearance requirements.

Clearance from Communication Co. antennas to Ameren secondary shall be 40” (see DCS **29 00 01 01** sheet 14). See Section 2C of this DCS for minimum required clearance to higher voltage conductors when Ameren secondary is not present.

b. Communication Co. Antennas Located in the Supply Space

Communication Co. antennas located in the supply space shall be installed on the pole top only, and maintained only by personnel authorized and qualified to work in the supply space. Pole-top antennas shall only be allowed on poles that are truck accessible.

Minimum required clearances for Communication Co. antennas installed in the supply space above Ameren conductors shall be as shown in DCS **29 00 01 01** sheet 15.

Pole top extensions are not permitted for providing antenna clearance above Ameren conductors.

All exposed Communication Co. cable or wiring shall be covered or insulated. Antenna brackets shall be non-metallic or ungrounded.

Communication Co. antenna cable must extend down the pole in non-metallic conduit or U-guard from the antenna to below the communication worker safety zone. The non-metallic conduit or U-guard shall be located so that it does not obstruct climbing spaces or lateral working spaces between line conductors at different levels, or interfere with the safe use of pole steps.

c. Antenna Disconnect

Communication Co. shall provide a disconnect switch accessible to Ameren so that the antenna can be de-energized to prevent exposure to radiation at any time work is required in or near the space (Supply or Communication) where the antenna is installed.

K. Overhead Aerial Construction

DCS **29 00 01 01** sheets 7 thru 13 include drawings for compliance to NESC joint construction requirements.
DCS **29 00 01 01** sheets 14 thru 16 include drawings showing Ameren requirements for location of communication antennas.

3. Communication Attachments to Poles

A. Wood Poles

Holes for through-bolts shall be no closer than 4” apart to avoid compromising pole strength.

B. Composite Poles

All communication attachments to Ameren composite poles shall be made using pole-band attachment hardware. Drilling holes in Ameren composite poles shall not be allowed for any communication facilities attachment. All attachment hardware shall be free of any cleats or protrusions that will compress into the pole. Ameren has approved the use of an Aluma-Form pole-band kit rated for 3,000lbs of vertical load for this purpose. This kit consists of a 60” stainless steel pole-band, a mounting block for the Communication Co. attachment, and fastening hardware for tensioning the band. The Aluma-Form part number is 3-CSO-3HB. Any alternate hardware must be approved by Ameren prior to use.

REV	DATE	ENG	DESCRIPTION
10	04/01/22	DG	Converted to new format
9	03/23/18	DG	

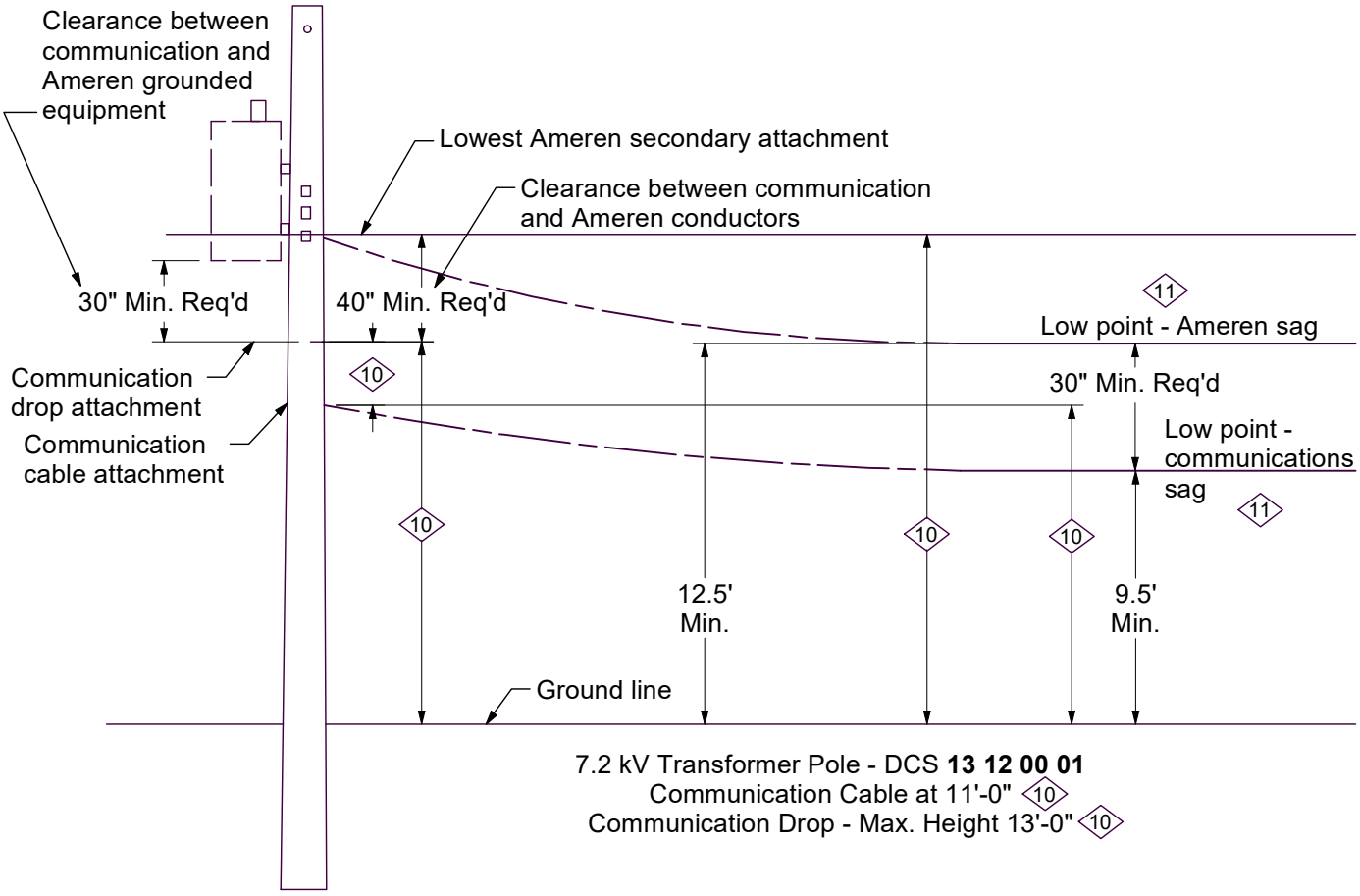


Figure 1 - Typical Pole Set on Private Property

CONSTRUCTION NOTE(s):

10. These mounting heights will vary in individual cases according to span lengths, conductor size, terrain and mounting height of customer drop attachment.

11. These minimum ground clearances are applicable in spaces or ways accessible to pedestrians only.

REV	DATE	ENG	DESCRIPTION
10	04/01/22	DG	Converted to new format
9	03/23/18	DG	

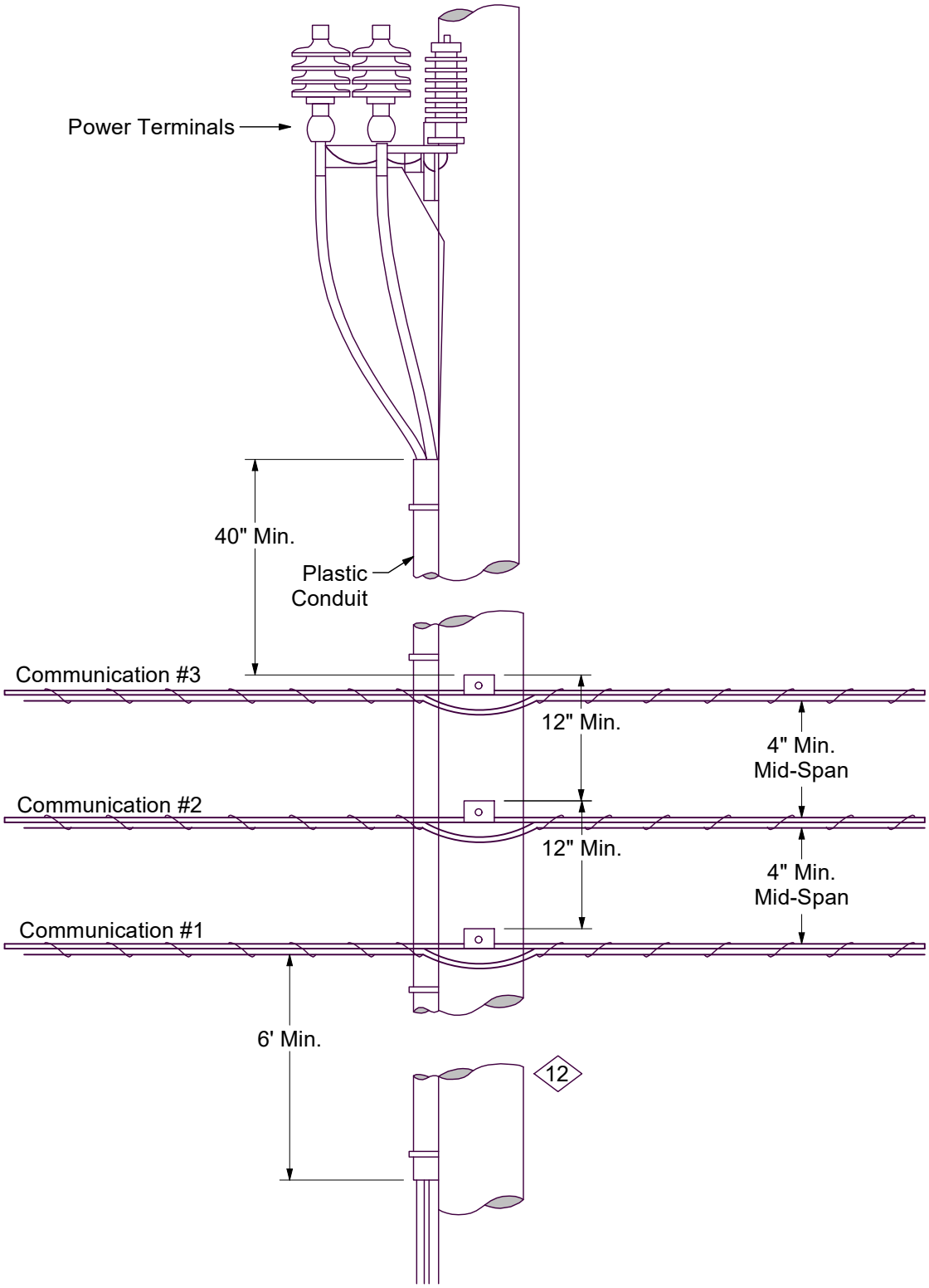


Figure 2 - Vertical Clearance to Power Lines

CONSTRUCTION NOTE(s):

12. Communication exposed through bolts and other exposed metal objects shall be no closer than 2” from power company riser

REV	DATE	ENG	DESCRIPTION
10	04/01/22	DG	Converted to new format
9	03/23/18	DG	

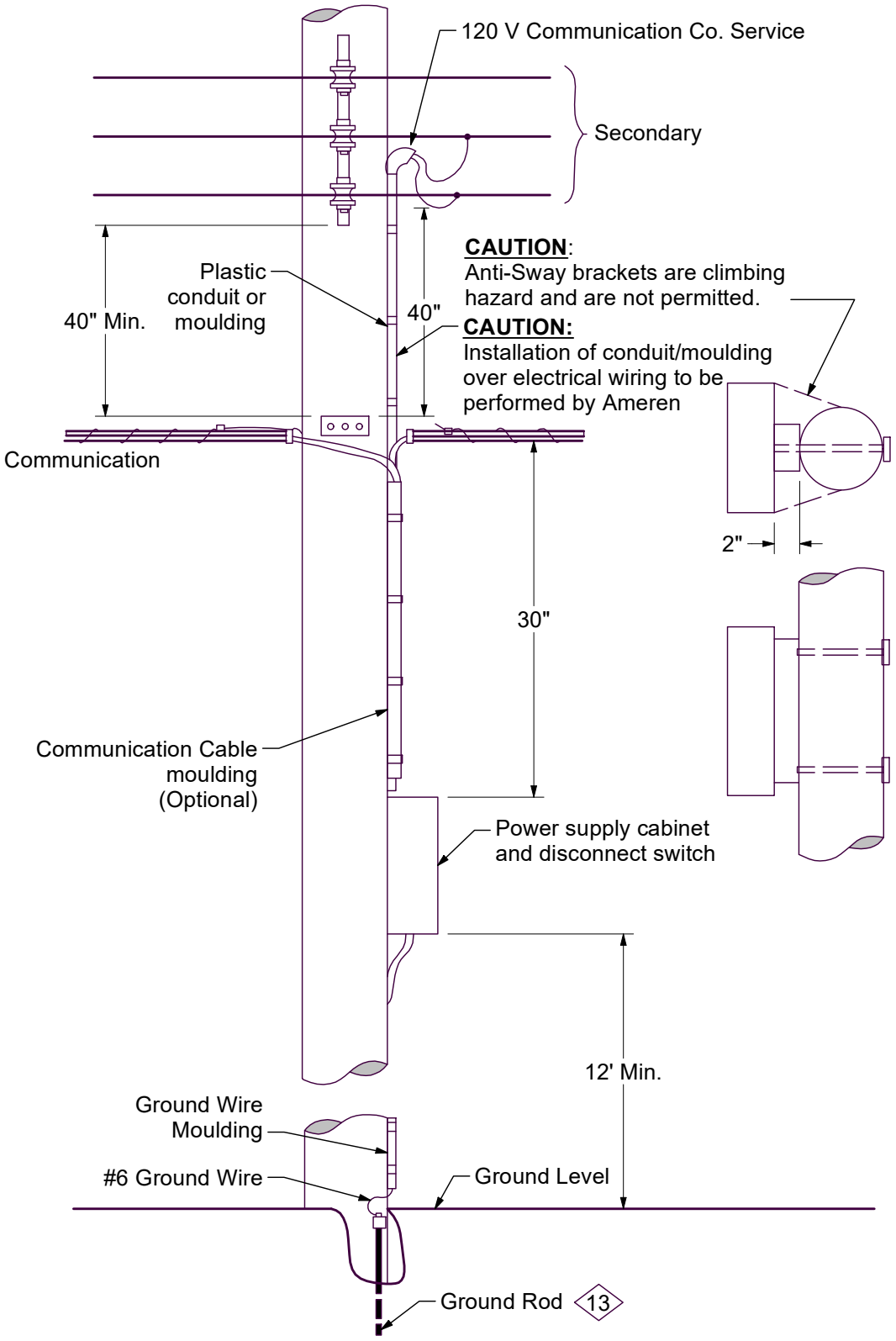


Figure 3 - Communication Co. Power Supplies

CONSTRUCTION NOTE(s):

13. If an Ameren vertical ground wire exists, Communication Co. must bond to the Ameren ground.

REV	DATE	ENG	DESCRIPTION
10	04/01/22	DG	Converted to new format
9	03/23/18	DG	

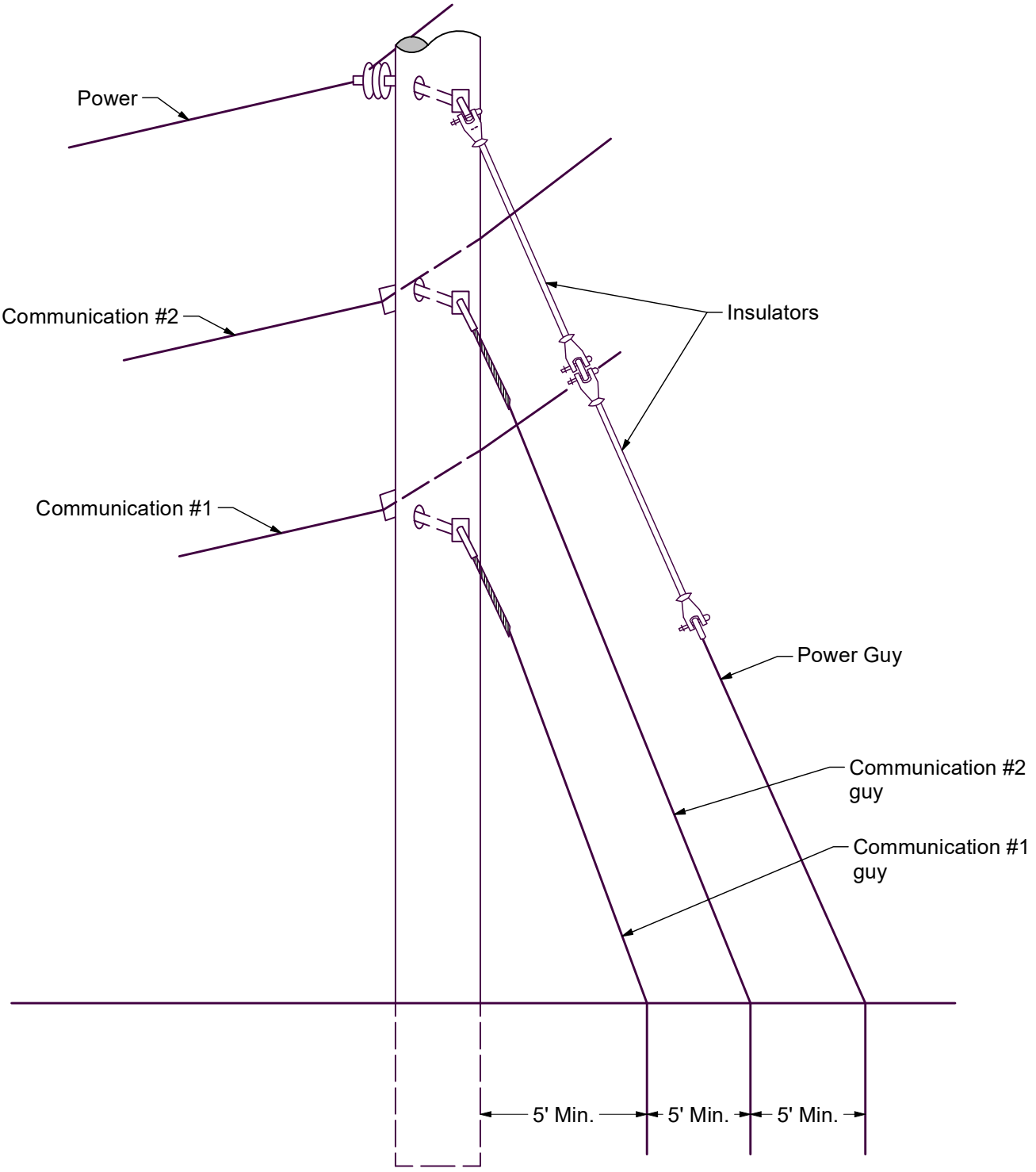


Figure 4 - Guy Anchor Clearance

CONSTRUCTION NOTE(s):

14. This guide is applicable to new guys only.
15. This guide is only to show minimum anchor separation at the ground.
16. Communication guys shall not be attached to Power (Ameren) anchors.

REV	DATE	ENG	DESCRIPTION
10	04/01/22	DG	Converted to new format
9	03/23/18	DG	

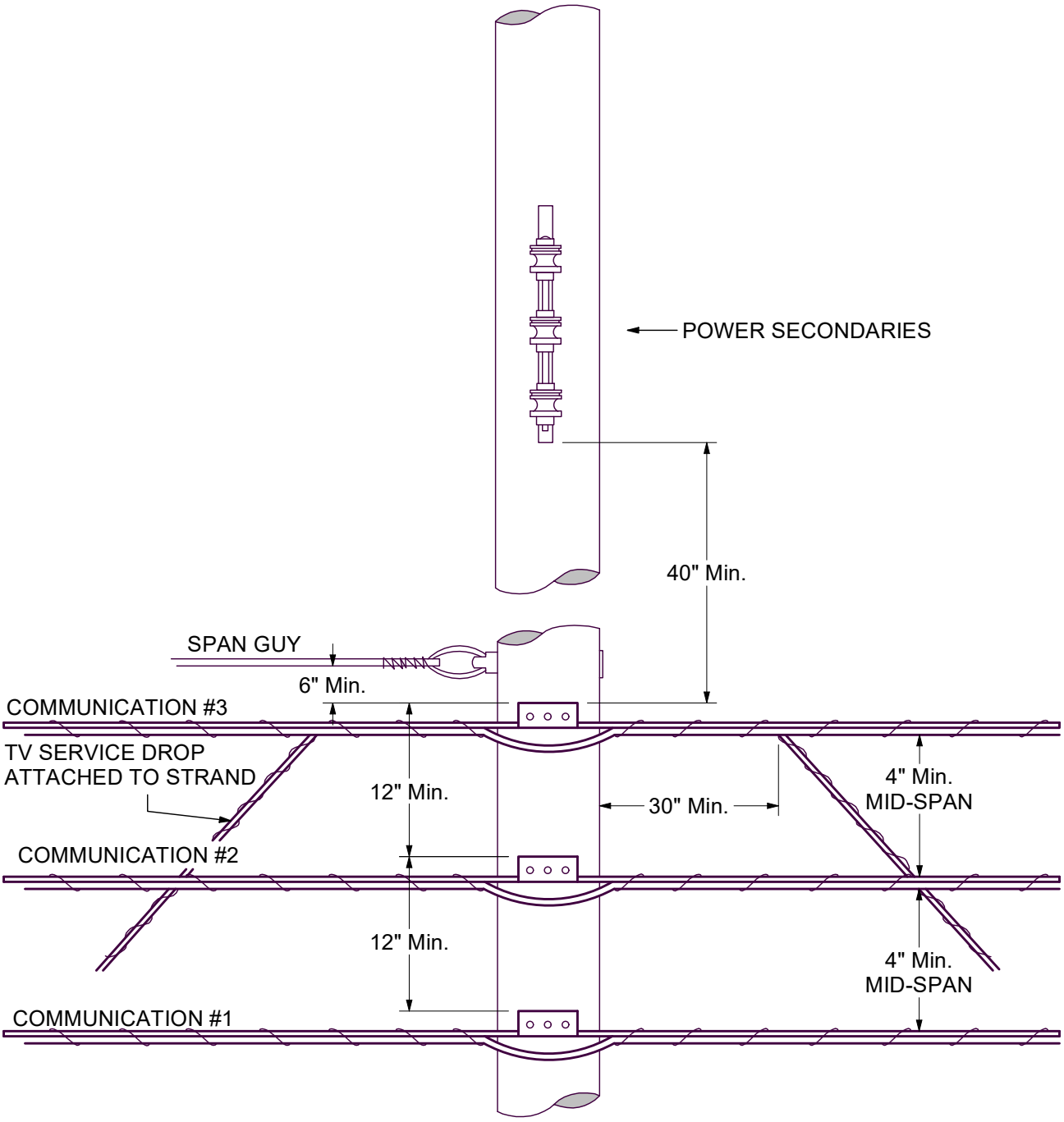


Figure 5 - Vertical Clearance at the Pole

CONSTRUCTION NOTE(s):

17. Any additional licensee's must adhere to clearances shown.

18. Spacing between attachment licensees and joint users must consider equipment which may be below strand and cable. Separation is defined by NESC and operating requirements.

REV	DATE	ENG	DESCRIPTION
10	04/01/22	DG	Converted to new format
9	03/23/18	DG	

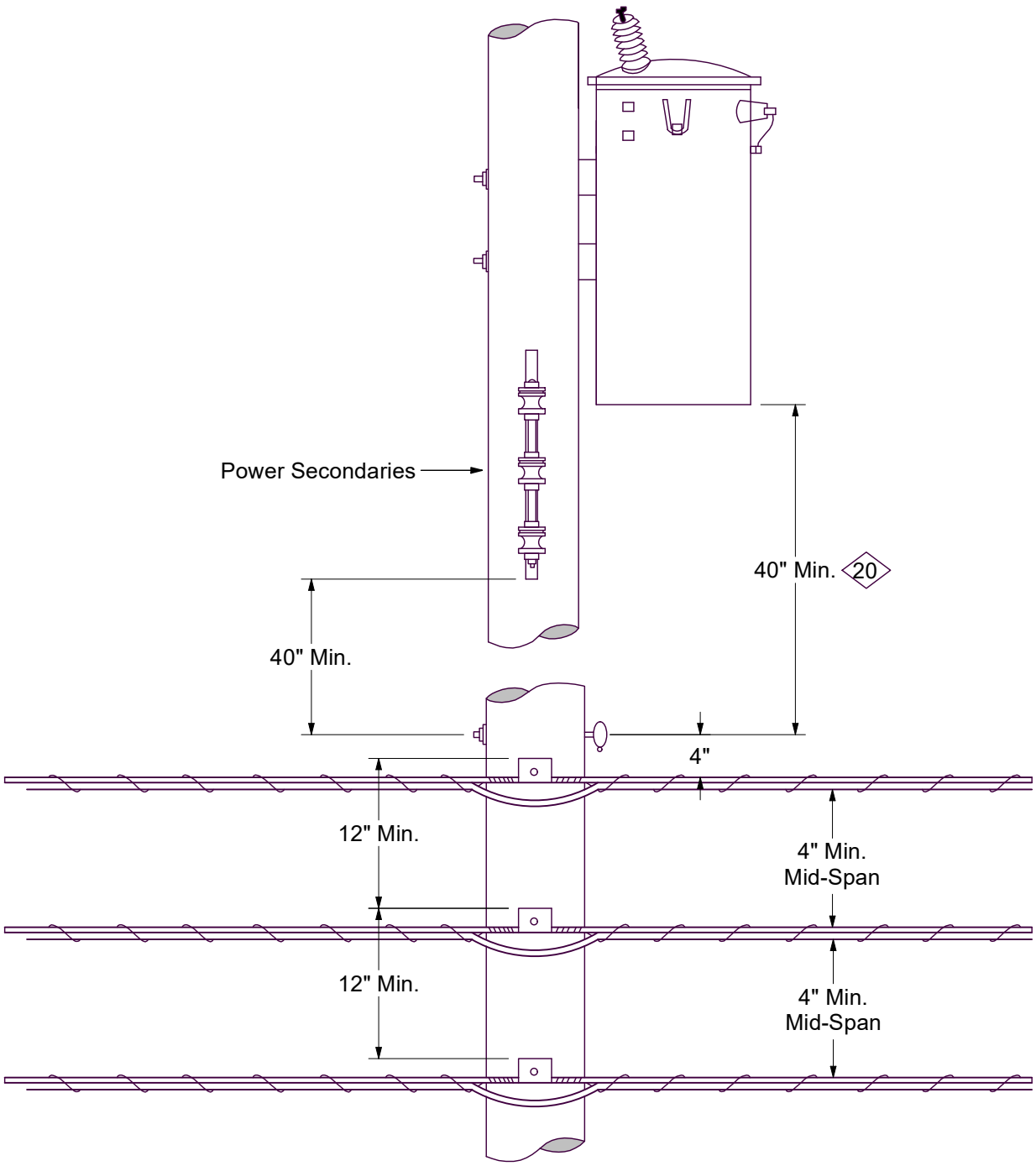


Figure 6 - Vertical Clearance to Power Equipment

CONSTRUCTION NOTE(s):

19. No communication equipment in cabinet shall be installed on a transformer pole.

20. May be 30" if case is effectively grounded.

REV	DATE	ENG	DESCRIPTION
10	04/01/22	DG	Converted to new format
9	03/23/18	DG	

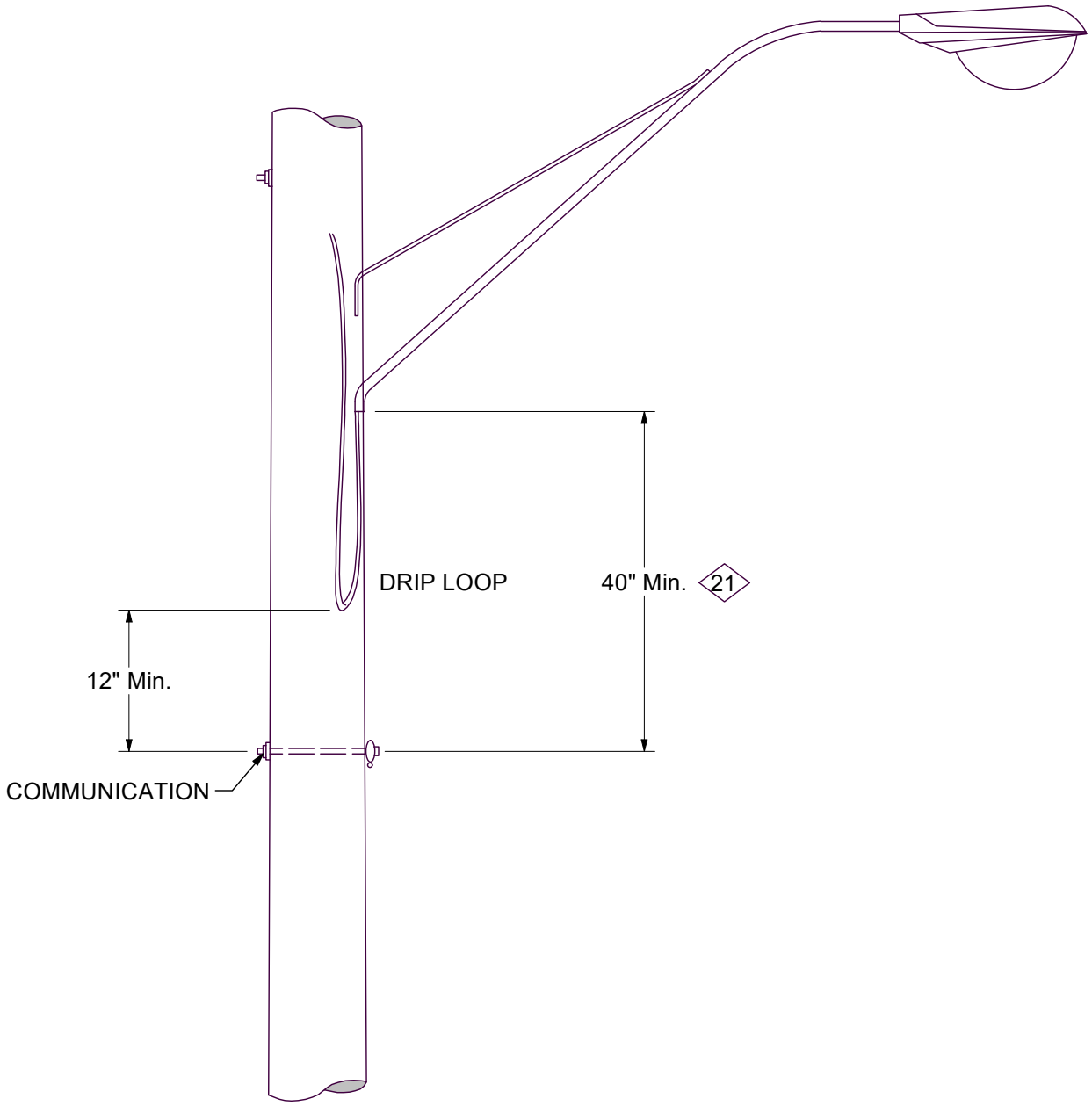


Figure 7 - Vertical Clearance to Streetlights

CONSTRUCTION NOTE(s):

21. 40" Minimum from bottom of ungrounded bracket
20" Minimum from bottom of grounded bracket

REV	DATE	ENG	DESCRIPTION
10	04/01/22	DG	Converted to new format
9	03/23/18	DG	

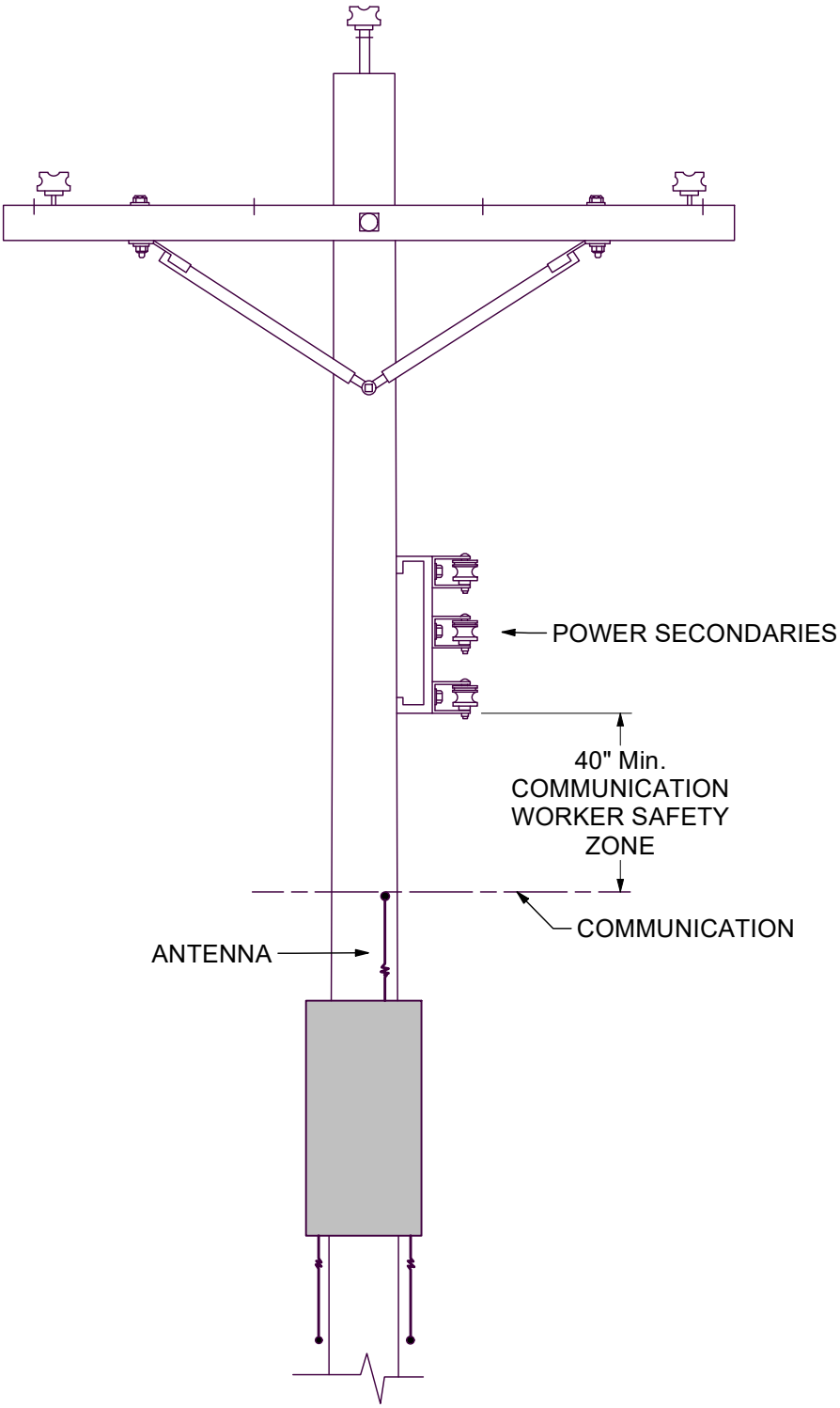


Figure 8 - Antenna Clearance in Communication Space

CONSTRUCTION NOTE(s):

22. Refer to sections 2G, 2J, 2Ja, 2Jc, and 3 for specific requirements.

REV	DATE	ENG	DESCRIPTION
10	04/01/22	DG	Converted to new format
9	03/23/18	DG	

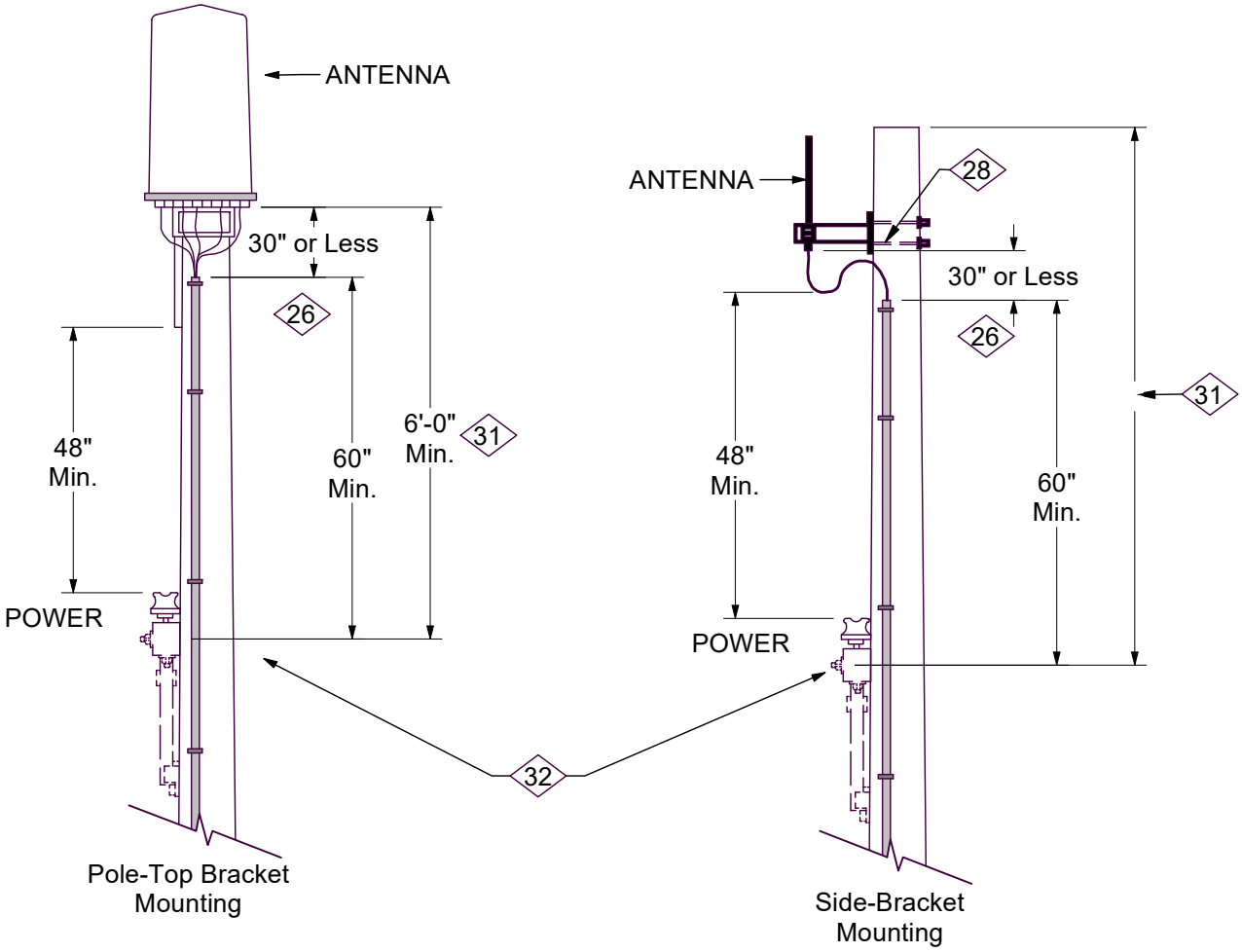


Figure 9 - Antenna Clearance Above Ameren Conductors

CONSTRUCTION NOTE(s):

23. Pole-top antennas shall only be allowed on poles that are truck accessible. Refer to sections 2G, 2J, 2Jb, 2Jc, and 3 for other specific requirements.

24. Communication Co. antenna and antenna cable must be installed and maintained by Ameren approved persons qualified to work in the electric supply space.

25. Pole top extensions are not permitted for providing antenna clearance above Ameren conductors.

26. Communication Co. antenna cable must extend down the pole in non-metallic conduit or U-guard from the antenna to below the communication worker safety zone. Length of antenna cable from the antenna to top of conduit or U-guard opening, must be 30” or less.

27. All Communication Co. wiring must be covered or insulated.

28. Antenna brackets must be non-metallic or ungrounded.

29. Ameren configuration changes required to accommodate the Communication Co. antenna must meet Ameren avian design standard requirements. Conductor cover must be installed on center phase.

30. Ameren configuration changes required to accommodate the Communication Co. antenna may require modification to adjacent poles to prevent conductor contact during galloping conditions.

REV	DATE	ENG	DESCRIPTION
10	04/01/22	DG	Converted to new format
9	03/23/18	DG	

31. 6'-0" minimum from the crossarm mounting bolt (or center of the crossarm) to the top of the pole is required for antennas mounted on the pole top. For antennas mounted on side-brackets as shown in this drawing, the top of the pole must extend above the top of the antenna.

32. Tangent cross-arm construction is shown. For other single- or three-phase configurations, a minimum of 48” must be maintained from the lowest portion of the Communication Co. antenna mounting bracket or antenna cable drip-loop to the highest Ameren power conductor.

This standard and the Clearance Standards that follow cover minimum clearances to be used in the design and construction of overhead lines on the Ameren System. The clearances specified meet or exceed the NESC requirements as required by the amended 83 IL. Admin. Code 305 and the MO 4CSR 240-18.010 Safety Standards. These clearances also meet the requirements of the 2017 Edition of the NESC.

1. Horizontal Clearances of Supporting Structures

Supporting structures, support arms, anchor guys, and attached equipment shall have the following minimum clearances, measured between the nearest parts of the objects concerned:

Clearances of Supporting Structures from Other Objects (feet)		
OBJECTS	MINIMUM	RECOMMENDED
A. Fire Hydrants	3 ◇3◇	4
B. Streets, Roads, & Highways ◇4◇ 1. With street curbs (clearance measured from street side of the curb).	Horizontal Clearance for First 15 Ft. Above Ground ◇5◇	
	◇1◇◇4◇	2 ◇1◇◇4◇
2. With no curbs	-	As close as practical to R.O.W. Line ◇4◇
C. All Railroad Tracks	Horizontal Clearance for First 22 Feet Above the Nearest Track Rail	
	12 ◇2◇	12

DESIGN NOTE(s):

Reference: 2017 NESC, Rule 231.

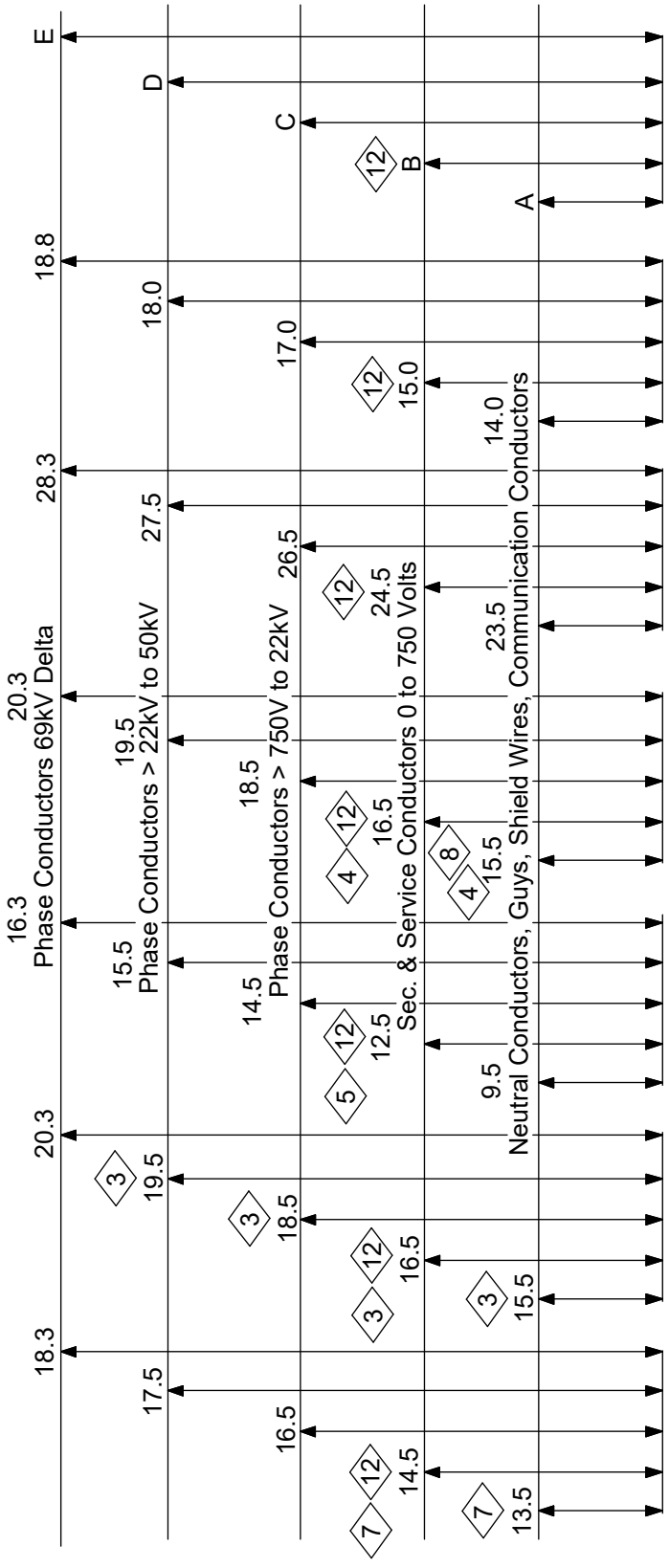
◇1◇ Supporting structures should be placed as far as practical behind the curb within the road right-of-way and shall be located a sufficient distance behind the curb to avoid contact by ordinary vehicles using and located on the traveled way. Some ordinary trucks and delivery vehicles overhang the curb by more than 6 in. Superelevated curves and heavily crowned roads further increase this overhang.

◇2◇ This may be reduced to 7 feet where the supporting structure is not the controlling obstruction, provided sufficient space for a driveway is left where the cars are loaded and unloaded.

◇3◇ 3 feet is allowed only if conditions do not allow 4 feet clearance.

◇4◇ For Illinois and Missouri State and Federal highways, location of structures shall be as required by each individual permit. In Illinois, 92 IL Admin. Code 530 provides requirements for location of support structures. In Missouri, MO 7CSR 10-3.010 provides requirements for location of support structures.

◇5◇ Specified clearance is to the support structure or the closest support arm, anchor guy, or attached equipment on that structure up to 15 feet above the road surface.



Reference Height 10	A	B 12	C	D	E
less than 20 acres	17.5	18.5	20.5	21.5	22.3
20 to 200 acres	25.5	26.5	28.5	29.5	30.3
200 to 2000 acres	31.5	32.5	34.5	35.5	36.3
over 2000 acres	37.5	38.5	40.5	41.5	42.3

9 10 11 14 Water Areas

All Distance in Feet

REV	DATE	ENG	DESCRIPTION
7	04/01/22	DG	Converted to new format
6	04/03/18	DG	

DESIGN NOTE(s):

Reference: 2017 NESC, Rule 232, Table 232-1

1. All voltages are phase-to-ground unless otherwise indicated.

2. The vertical clearances apply under the following conductor temperature and loading conditions, whichever produces the largest final sag.

    a. 120°F (50°C), no wind displacement.

    b. The maximum conductor temperature for which the line is designed to operate, if greater than 120°F (50°C), with no wind displacement.

    c. 32°F (0°C), no wind displacement with 1/2 in of ice.

◇3. Where this construction crosses over state and federal commercial highways, this clearance shall be no less than 18 ft. per MO Title 7 CSR 10-3.010 and 92 Il. Admin. Code 530. For Illinois limited access highway crossings, this clearance shall be no less than 20 ft.

◇4. Where vehicles exceeding 8 ft in height are not normally encountered nor reasonably anticipated, service drop(s) clearances over residential driveways only may be reduced to the following:

a. Insulated supply service drops limited to 300 V to ground	12.5 ft
b. Insulated drip loops of supply service drops limited to 300 V to ground	10.5 ft
c. Triplex supply service drops limited to 150 V to ground	12.0 ft
d. Drip loops only of triplex service drops limited to 150 V to ground	10.0 ft
e. Insulated communication service drops	11.5 ft

◇5. Clearance values for service drops to residential buildings only may be reduced to the following:

a. Insulated supply service drops limited to 300 V to ground	10.5 ft
b. Insulated drip loops of supply service drops limited to 300 V to ground	10.5 ft
c. Triplex supply service drops limited to 150 V to ground	10.0 ft
d. Drip loops only of triplex supply service drops limited to 150 V to ground	10.0 ft

◇6. Spaces and ways subject to pedestrians or restricted traffic only are those areas where riders on horseback or other large animals, vehicles, or other mobile units exceeding 8 ft in height, are prohibited by regulation or permanent terrain configurations or are otherwise not normally encountered nor reasonably anticipated.

◇7. Where a line along a road is located relative to fences, ditches, embankments, etc. so that the ground under the line would not be expected to be traveled except by pedestrians, this clearance may be reduced to the following values:

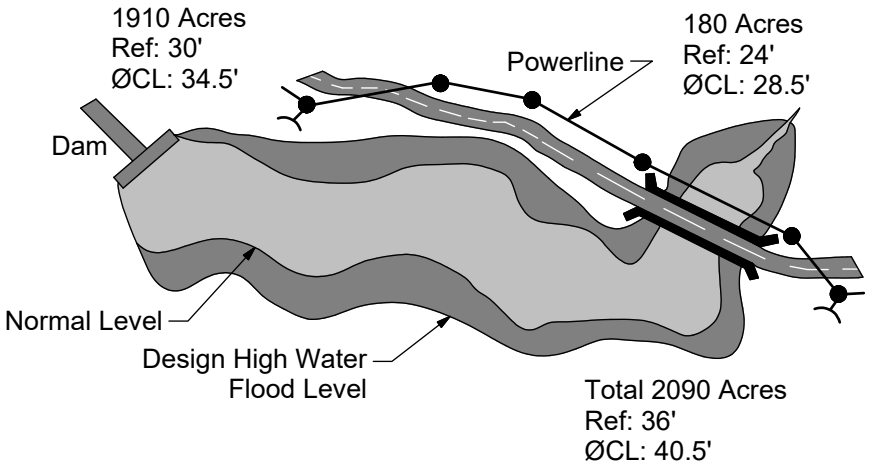
a. Triplex and quadruplex 120 V to ground	10.0 ft
b. Insulated conductors 0 to 300 V to ground	12.5 ft
c. Guys, neutrals, insulated communication cables	9.5 ft

8. Where this construction crosses over and runs along alleys, driveways, or parking lots not subject to truck traffic, this clearance may be reduced to 15 ft.

9. The surface area and corresponding clearance shall be based upon the normal flood level or, for controlled impoundments, upon the design high water level. The clearance over rivers, streams, and canals shall be based upon the largest surface of any onemile long segment which includes the crossing. The clearance over a canal or similar waterway providing access for sailboats to a larger body of water shall be the same as that required for the larger body of water.

10. Where an over water obstruction restricts vessel height, the required clearance may be reduced by the difference between the Reference Height from the 'Water Areas' table above (for the overall area of the body of water that the line crosses), and the over water obstruction height. Exception: The reduced clearance shall not be less than that required for the water surface area on the line crossing side of the obstruction.

Example: A 12.47 kV line will cross over a portion of a 2090 acre lake adjacent to a bridge. For this size lake, the normally required clearance for a 12.47 kV line is 40.5 ft (the Reference Height = 36 ft). The area of the lake on one side of the bridge is 1910 acres. For a 1910 acre lake, the normally required clearance for a 12.47 kV line is 34.5 ft The area of the lake on the other side of the bridge is 180 acres. For a 180 acre lake, the normally required clearance for a 12.47 kV line is 28.5 ft. The height of the bridge above the water is 25 ft. The Reference Height for the overall area of the lake minus the bridge height is 11 ft (36 ft - 25 ft).



If the 12.47 kV line is installed on the 1910 acre side of the bridge, an 11 ft reduction in the clearance over the 2090 acre lake would be 29.5 ft (40.5 ft − 11 ft). However, 29.5 ft is less than the 34.5 ft required for a 12.47 kV line over a 1910 acre lake. Therefore, if the 12.47 kV line crossing is done over the 1910 acre side of the bridge, the full 34.5 ft clearance of the 12.47 kV line over the lake must be maintained.

If the 12.47 kV line is installed on the 180 acre side of the bridge, an 11 ft reduction in the clearance over the 2090 acre lake would be 29.5 ft (40.5 ft − 11 ft). 29.5 ft is more than the 28.5 ft required for a 12.47 kV line over a 180 acre lake. Therefore, if the 12.47 kV line crossing is done over the 180 acre side of the bridge, the clearance of the 12.47 kV line over the lake can be reduced to 29.5 ft.

11. Where the US Army Corps of Engineers, or the State, or surrogate thereof has issued a crossing permit, clearances of that permit shall govern.

12. Clearance can be reduced by 6 in for triplex and quadruplex conductor.

13. When designing to accommodate oversized vehicles, these clearance values shall be increased by the difference in the known height of the oversized vehicle and 14 ft.

14. Add 5 ft to the water area clearance values for ground clearance at established boat ramp and rigging areas, or areas posted with sign(s) for rigging or launching sail boats.

REV	DATE	ENG	DESCRIPTION
7	04/01/22	DG	Converted to new format
6	04/03/18	DG	

These vertical clearances above ground are for unguarded rigid live parts such as potheads, transformer bushings, lightning arresters, short lengths of connecting supply conductors which are not subject to variations in sag, and effectively grounded equipment cases.

Minimum Vertical Clearance in Feet (All voltages are phase-to-ground unless otherwise indicated)					
Nature of Surface Below Live Parts	Effectively Grounded Cases	0 to 750 Volts	Over 750V to 22kV	Over 22kV to 50kV	69kV Delta
1. Where live parts overhang:	-	-	-	-	-
a. Roads, streets, alleys; nonresidential driveways; parking lots and other areas subject to truck traffic ◇3◇	15.0	16.0	18.0	19.0	19.8
b. Residential driveways; commercial areas not subject to truck traffic.	15.0	16.0 ◇1◇	18.0	19.0	19.8
c. Other land traversed by oversized vehicles such as cultivated land, grazing land, forest, orchard, industrial commercial etc. ◇7◇	15.0 ◇5◇	16.0	18.0	19.0	19.8
d. Spaces and ways accessible to pedestrians only. ◇4◇	9.0 ◇5◇	12.0 ◇1b◇	14.0	15.0	15.8
2. Where live parts are along and within the limits of highways or other road rights−of−way but do not overhang the roadway:	-	-	-	-	-
a. Roads, streets, and alleys.	15.0 ◇5◇	16.0	18.0	19.0	19.8
b. Roads where it is unlikely that vehicles will be crossing under the line.	13.0 ◇5◇	14.0 ◇2◇	16.0	17.0	17.8
3. Water areas not suitable for sailboating or where sailboating is prohibited. ◇6◇	13.5	14.5	16.5	17.5	18.3
4. Water areas suitable for sailboating including lakes, ponds, reservoirs, tidal waters, rivers, streams, and canals with an unobstructed surface area.	Use clearances over Water Areas in DCS 29 00 17 02 reduced by 6 inches.				

Reference: NESC, 2017 Edition, Rule 232, Table 232-2

DESIGN NOTE(s):

◇1◇ This clearance may be reduced to the following values (feet):

a. Insulated live parts limited to 300 V to ground 12 ft

b. Insulated live parts limited to 150 V to ground 10 ft

◇2◇ Where a supply line along a road is limited to 300V to ground and is located relative to fences, ditches, embankments, etc., so that the ground under the line would not be expected to be traveled except by pedestrians, this clearance may be reduced to 12 ft.

◇3◇ For the purpose of this rule, trucks are defined as any vehicle exceeding 8 ft in height. Areas not subject to truck traffic are areas where truck traffic is not normally encountered nor reasonably anticipated.

◇4◇ Spaces and ways subject to pedestrians or restricted traffic only are those areas where riders on horseback, vehicles, or other mobile units exceeding 8 ft in height, are prohibited by regulation, or permanent terrain configurations, or are otherwise not normally encountered nor reasonably anticipated.

REV	DATE	ENG	DESCRIPTION
5	04/01/22	DG	Converted to new format
4	04/05/18	DG	

5. Effectively grounded switch handles and supply or communication equipment cases (such as fire alarm boxes, control boxes, communication terminals, meters, or similar equipment cases) may be mounted at a lower level for accessibility, provided such cases do not unduly obstruct a walkway.

6. Where the US Army Corps of Engineers, or the State, or surrogate thereof has issued a crossing permit, clearances of that permit shall govern.

7. These clearances shall be increased by the difference between the known height of the oversized vehicle and 14 ft.

REV	DATE	ENG	DESCRIPTION
5	04/01/22	DG	Converted to new format
4	04/05/18	DG	

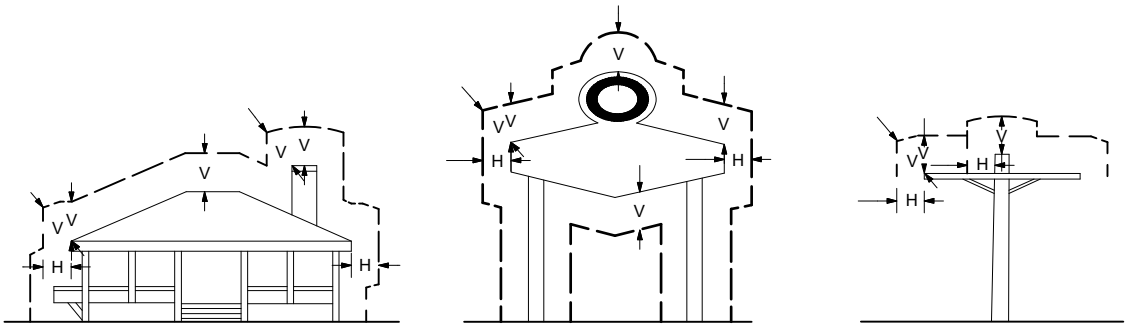


Table 1 - Clearances of Wires from Buildings and Other Installations [1]

STRUCTURES	SHIELD WIRES; NEUTRAL CONDUCTORS; GUYS [10]	TRIPLEX OR QUAD CABLES	UNGUARDED RIGID LIVE PARTS 0 TO 750V	PHASE CONDUCTORS 0 TO 750V; SHIELDED & NON- SHIELDED CABLES W/ MESSENGER OVER 750V [18]	UNGUARDED RIGID LIVE PARTS OVER 750VTO 22kV	PHASE CONDUCTORS AT XX kV (PHASE TO PHASE)			
						2.4 12	34	69Y	69Δ
Buildings [2] [3] [19]	-	-	-	-	-	-	-	-	-
1. Horizontal Clearances, with wind [20]	-	-	-	3.5	-	4.5	5.0	5.2	6.2
2. Horizontal Clearances, no wind [20]	-	-	-	-	-	-	-	-	-
a. To walls, projections and guarded windows	4.5 [5] [11]	5.0 [5]	5.0 [5]	5.5 [5]	7.0 [5]	7.5 [5]	8.0 [5]	8.2	9.2
b. To unguarded windows [13]	4.5	5.0	5.0	5.5	7.0	7.5	8.0	8.2	9.2
c. To balconies and areas accessible to pedestrians [7]	4.5	5.0	5.0	5.5	7.0	7.5	8.0	8.2	9.2
3. Vertical Clearances [8]	-	-	-	-	-	-	-	-	-
a. Above or below roofs or projections NOT accessible to pedestrians	3.0	3.5 [12]	10.0	10.5 [12]	12.0	12.5	13.0	13.2	14.2
b. Above or below balconies or roofs accessible to pedestrians [7]	10.5	11.0 [12]	11.0	11.5 [12]	13.0	13.5	14.0	14.2	15.2
c. Above roofs accessible to vehicles but NOT subject to truck traffic [16]	10.5	11.0	11.0	11.5	13.0	13.5	14.0	14.2	15.2
d. Above roofs accessible to truck traffic [16]	15.5	16.0	16.0	16.5	18.0	18.5	19.0	19.2	20.2
Signs, chimneys, radio and T.V. antennas, tanks and other installations NOT classified as buildings or bridges [6] [9] [19]	-	-	-	-	-	-	-	-	-
1. Horizontal clearances, with wind [20]	-	-	-	3.5	-	4.5	5.0	5.2	6.2
2. Horizontal clearances, no wind [20]	-	-	-	-	-	-	-	-	-
a. To portions that are NOT readily accessible to pedestrians	3.0	3.5	5.0 [5]	5.5 [5]	7.0 [5]	7.5 [5]	8.0	8.2	9.2
b. To portions that ARE readily accessible to pedestrians [7]	4.5	5.0	5.0 [5]	5.5	7.0 [5]	7.5	8.0	8.2	9.2
3. Vertical Clearances	-	-	-	-	-	-	-	-	-
a. Over or under catwalks and other surfaces upon which personnel walk	10.5	11.0	11.0	11.5	13.0	13.5	14.0	14.2	15.2
b. Over or under other portions of such installations	3.0	3.5	5.5	6.0	7.5	8.0	8.5	8.7	9.7
Support Structures [14] [19]	Guys, messengers, neutrals, triplex 0- 300V	-	-	Phase conductors & cables 0- 750V	-	-	-	-	-
1. Horizontal clearances, with wind [20]	-	-	-	3.5	-	4.5	5.0	5.2	6.2
2. Horizontal clearances, no wind [20]	3.0	3.0	-	5.0	-	5.0	5.5	5.7	6.7
3. Vertical Clearances [15]	2.0	2.0	-	4.5	-	4.5	5.0	5.2	6.2
Crane, derricks, etc. [17]	-	-	-	-	-	-	-	-	-
1. Vertical Clearances	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	15.0
Storage facilities for hazardous materials (oxygen, hydrogen, gasoline, etc.)	Contact the Electric Distribution Standards group before locating any electric line within 50 feet of such a storage facility (Reference is OSHA, 1910 Subpart H)								

REV	DATE	ENG	DESCRIPTION
11	04/01/22	DG	Converted to new format
10	05/29/18	DG	

DESIGN NOTE(s):

Reference: NESC, 2017 Edition, Rules 234 A,B,C, and G.

1. Clearances are in feet. Voltages are phase-to-ground unless otherwise indicated.

2. The construction of electric distribution primary lines over buildings is to be avoided whenever possible. When avoidance is not practical, these clearances shall be provided.

3. Where buildings or other installations exceed three stories (or 50 feet) in height, overhead lines should be arranged, where practical, so that a clear space or zone at least 6 feet wide will be left either adjacent to the building or beginning not over 8 feet from the building, to facilitate the raising of ladders where necessary for fire fighting.

4. Not used in this revision.

5. Where available space will not permit this value, it may be reduced by 2 feet if the conductors, including splices and taps, have covering which provides sufficient insulation to prevent a short circuit in case of a momentary contact with a structure or building.

6. Clearance to flags and banners shall assume no deflection of the flag pole but maximum displacement of the flag or banner towards the at rest (no displacement) utility facility.

7. A roof, balcony, or similar structure is considered readily accessible to pedestrians if it can be casually accessed through a doorway, window, ramp, stairway, or permanently mounted ladder by a person on foot who neither exerts extra ordinary physical effort nor employs tools or devices to gain entry. A permanently mounted ladder is not considered a means of access if its bottom rung is 8 feet or more from the ground or other permanently installed accessible surface, or is otherwise equipped with barriers to inhibit climbing by unauthorized persons.

8. For clearances above railings, walls, or parapets around balconies, decks, or roofs, use the clearances required for roofs not accessible to pedestrians.

9. The required clearance shall be increased to allow for the movement of motorized signs and other moveable attachments to any installation covered by this table.

10. Ungrounded guys and ungrounded portion of guys between guy insulators shall have clearances based on the highest voltage to which they may be exposed to a slack conductor or guy.

11. This clearance may be reduced to 3 inches for the effectively grounded portion of guys.

12. Service Conductors Attached to Installation for Service Entrance:

    a. Service drop conductors including drip loops not in excess of 750 volts, shall have a clearance of not less than 10 feet from the highest point of roofs over which they pass with the following exceptions.

        Exception 1: Where the voltage between open- wire conductors does not exceed 300 volts or the voltage between triplex or quadruplex conductors does not exceed 750 volts and the roof or balcony is not readily accessible, the clearance may be not less than 3 feet.

        Exception 2: Where service-drop conductors of 0 to 300 volts, or triplex or quadruplex cable 0 to 750 volts pass over a roof or a balcony that is not readily accessible to terminate at a (through the roof) raceway or approved support located not more than 4 feet horizontally from the nearest edge of the roof, it may be maintained at a minimum of 18 inches for a horizontal distance of 6 feet from the raceway or support, and may be maintained at a minimum of 3 feet for the remainder of the horizontal distance that the conductor or cable passes over the roof.

    b. Service drop conductors not in excess of 750 volts shall have a clearance of not less than 3 feet in any direction from windows designed to open.

REV	DATE	ENG	DESCRIPTION
11	04/01/22	DG	Converted to new format
10	05/29/18	DG	

Exception 1: This does not apply to triplex or quadruplex conductors above the top level of a window.

c. Service drop conductors of 300 volts or less may be run along side the installation provided the clearance from the surface of the installation is not less than 3 inches.

d. Service drop conductors not in excess of 750 volts shall have a clearance of not less than 5 feet horizontally from porches, decks, fire escapes, or other similarly attached structures.

e. Service drop conductors not in excess of 750 volts shall have a clearance of not less than 3 feet vertically below porches, decks, fire escapes, or other similarly attached structures.

13. Windows not designed to open may have the clearance permitted for walls and projections.

14. Support structures include those to which the conductor is not attached, such as a lighting support, a traffic signal support, and a supporting structure of another line.

15. These clearances may be reduced by 2 feet (with 2 feet as minimum) if both of the following conditions are met:

a. The wires, conductors, or cables above and the supporting structure of another line below are operated and maintained by the same utility.

b. Employees do not work above the top of the supporting structure unless:

1. The upper circuit is de-energized and grounded, or temporarily insulated or repositioned, or

2. Other equivalent measures are taken.

16. For purpose of these clearances, trucks are defined as any vehicle exceeding 8.0 feet in height. When designing for oversized vehicles, increase clearances by the difference between the known height of the oversized vehicle and 14 feet

17. The clearances specified in the table are minimum clearances allowed between any part of the equipment, load line, or load and the energized conductors if the 20 feet zone of clearance cannot be maintained. THE CRANE, DERRICK, ETC. OPERATOR MUST COMPLY WITH OSHA 1926.1408 WHICH SPECIFIES SAFETY REQUIREMENTS IF ANY PART OF THE EQUIPMENT, LOAD LINE, OR LOAD COULD GET CLOSER THAN 20 FEET TO A POWER LINE.

18. “Shielded & Non- Shielded Cables w/Messenger Over 750 V” does NOT include spacer type cable. Spacer cable clearances are the same as open phase conductors in this DCS.

19. The clearances specified in the table are NESC minimum clearances. If workers must access these structures for installation or maintenance when the conductors are energized, then minimum approach distances (MAD) for unqualified workers as specified by OSHA in section 1910.333 (c) (3) (i) must be maintained (10 feet for 69 kVY and below and 11 feet for 69 kV△). These MADs are to the longest conductive tool or object the worker may contact.

20. The following Table 2 lists NESC wind displacement for some of Ameren’s higher use conductors. These values are added to the ’Horizontal Clearances with wind’ values in the clearance table. If this sum is greater than the ’no wind’ clearance, the ’no wind’ clearance must be increased to this value.

Example: 12kV, 1/0 AAAC Long Span - Wind displacement is 3.9 feet The ’with wind’ value from clearance table is 4.5 feet The sum of the two is 8.4 feet The ’no wind’ value from clearance table is 7.5 feet which is less than the ’with wind’ sum. Therefore, the ’no wind’ clearance must be increased to 8.4 feet

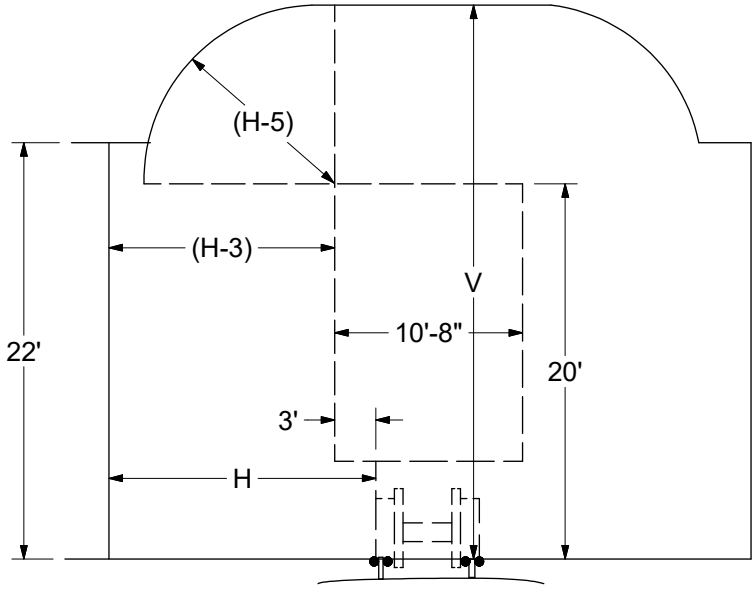
CAUTION - Table 2 is based on the DCS **07 00 07 03** Ruling Spans. Longer spans within the span category have greater sags and therefore the wind displacement must be claculated. Example: 1/0 AAAC Long Span Ruling Span sag is 46 inches. The sag of a 300 foot span in this category is 67 inches and the calculated wind displacement is 4.8 feet. Therefore the 'no wind' clearance would need to be increased to 9.3 feet.

REV	DATE	ENG	DESCRIPTION
11	04/01/22	DG	Converted to new format
10	05/29/18	DG	

Table 2 - Horizontal Line Displacement (Sag Table)*				
Conductor	Short Span	Medium Span	Long Span	Extra Long Span
1/0 AAAC	2.2	3.2	3.9	4.8
110.8 (12/7) ACSR	2.5	3.0	3.3	3.5
336.4 (18/1) ACSR	2.9	3.7	4.5	5.0
556.5 (19) AAC	2.7	3.2	4.2	5.1
954 (45/7) ACSR	3.1	4.1	5.0	5.9
1272 (45/7) ACSR	3.5	4.3	5.0	5.8
4/0 (6/1) ACSR T2	3.2	3.6	4.0	4.1
336.4 (18/1) ACSR T2	2.8	3.5	4.1	4.6
556.5 (19) AAC T2	2.8	3.8	4.8	5.7
954 (45/7) ACSR T2	3.6	4.7	5.8	6.6

*60F, 6psf of WIND, FINAL SAG (In Feet)
*Per NESC Rule 234 A2

REV	DATE	ENG	DESCRIPTION
11	04/01/22	DG	Converted to new format
10	05/29/18	DG	



Clearance of Wires from Rail Cars (feet) 1		
Overhead Wires, Conductors, or Cables	V	H
Phase Conductors 69 kV 2	28.3 4	13.3 3
Phase Conductors > 22 kV to 50 kV	27.5	12.5
Phase Conductors 751 V to 22 kV	26.5	11.5
Phase Conductors 0- 750 V, Unshielded Cables with messenger over 750 V	24.5	9.5
Triplex, Quad, Unshielded Cable with Messenger 0- 750 V	24.0	9.0
Grounded Guys, Neutrals, Shielded Cables With Messenger	23.5	8.5

DESIGN NOTE(s):

Reference: NESC, 2017 Edition, Rules 234A and I.

1. Clearances shown are NESC minimums. Where the railroad authority issues a crossing permit, clearances of that permit shall govern.

2. This voltage is phase-to-phase. All others are phase-to-ground.

3. Where conductors run along mine, logging, and similar railways that handle only cars smaller than standard freight cars, the value of H may be reduced by one-half the difference between the width of a standard rail car (10 ft 8 in) and the width of the narrower car.

4. The vertical clearance V is per DCS **29 00 17 02** (NESC Rule 232).

REV	DATE	ENG	DESCRIPTION
5	04/01/22	DG	Converted to new format
4	10/01/18	DG	

P = Probe clearance (18 ft) [1]
H = Horizontal clearance (15 ft) [1]
T = Transition clearance
V1 = Vertical clearance above a building, see DCS **29 00 17 04**
V2 = Vertical clearance above land, see DCS **29 00 17 02**

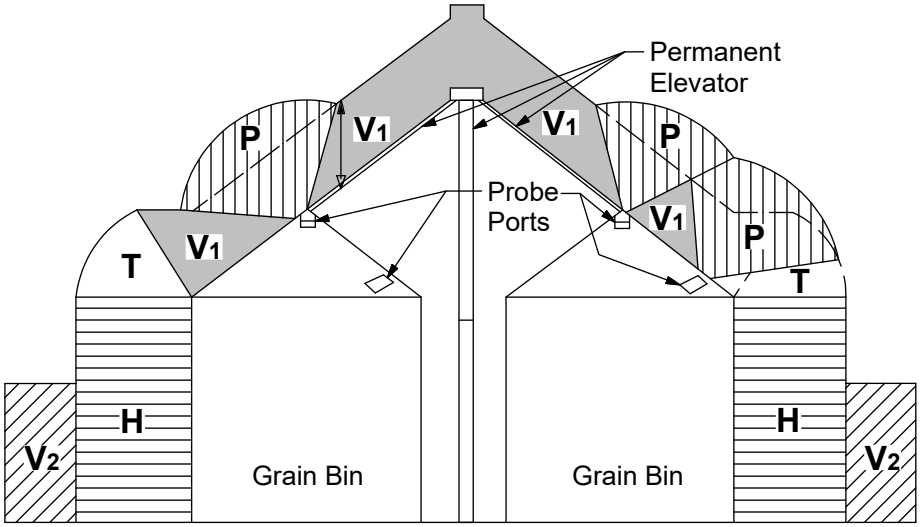
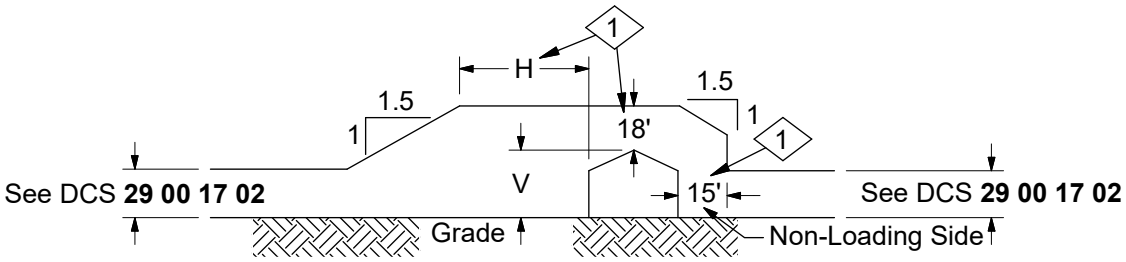


Figure 1 - Clearance Envelope for Grain Bins Filled by Permanently Installed Augers, Conveyors or Elevators



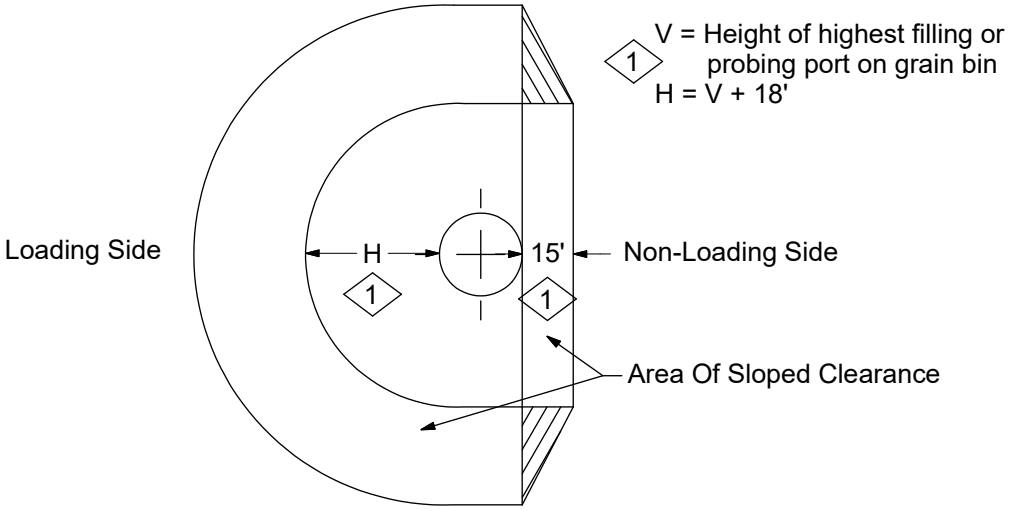


Figure 2 - Clearance Envelope for Grain Bins Filled by Portable Augers, Conveyors, or Elevators

REV	DATE	ENG	DESCRIPTION
8	04/01/22	DG	
7	10/01/18	DG	

DESIGN NOTE(s):

References: NESC 2017 Edition, Rules 234A, F, and G.

1. The clearances on this page are the minimums permitted for up to 34.5 kV-Y. Increase dimensions by 6 inches for 34.5 kV-Delta, 9 inches for 69 kV-Y, and 21 inches for 69 kV-Delta.

2. All portions of grain bins that are expected to be loaded by use of a permanently installed auger, conveyer, or elevator system shall be considered as a building or other installation for the purpose of determining clearances, except that for voltages of 0 to 34.5 kV-Y a radial clearance above the bin of not less than 18 feet shall be maintained above each port and a horizontal clearance of not less than 15 feet shall be maintained between an open supply conductor and a grain bin.

3. The clearance on the non-loading side of grain bins may be reduced to those required for buildings (see DCS **29 00 17 04**) if the cable or equipment is in one of the following categories:

   (a) Support arms and effectively grounded equipment cases
   (b) Messengers, guys, neutrals, and shielded cables
   (c) Triplex and quadruplex unshielded cable with messenger 0-750 volts

4. Any side of a grain bin is considered to be a non-loading side if it is so designated, or if it is so closely abutting another structure or obstruction, or so close to a public road or other right of way that a portable auger, conveyer, or elevator is not reasonably anticipated to be used over that side or portion to fill the grain bin.

5. Where an agreement excludes the use of portable augers, conveyers, or elevators from a designated portion of a grain bin, such portion is considered to be a non-loading side.

Clearance of Wires to Bridges ◇1◇							
	Unguarded rigid live parts and ungrounded equipment cases 0-750V, triplex, quad, shielded & non-shielded cables with messenger 0-750V; ungrounded guys	Unshielded Cable with Messenger Over 750V Phase Conductors 0-750V	Unguarded rigid live parts and ungrounded equipment cases over 750V to 22kV	Phase Conductors at XX kV (Phase-to-Phase)			
				2.4 12	34	69Y	69Δ
1. Over Bridges ◇3◇◇5◇	-	-	-	-	-	-	-
a. Attached ◇4◇	3.0	3.5	5.0	5.5	6.0	6.2	7.2
b. Not attached	10.0	10.5	12.0	12.5	13.0	13.2	14.2
2. Clearance beside, under or within bridge structure ◇5◇	-	-	-	-	-	-	-
a. Readily accessible portions of any bridge including wing wall and bridge attachments ◇3◇	-	-	-	-	-	-	-
1. Attached ◇4◇	3.0	3.5	5.0	5.5	6.0	6.2	7.2
2. Not attached, no wind	5.0	5.5	7.0	7.5	8.0	8.2	9.2
3. Not attached, with wind ◇8◇	--	3.5	--	4.5	5.0	5.2	6.2
b. Ordinarily inaccessible portions of bridges (other than brick, concrete or masonry) and from abuments ◇6◇	-	-	-	-	-	-	-
1. Attached ◇4◇◇7◇	3.0	3.5	5.0	5.5	6.0	6.2	7.2
2. Not attached, no wind ◇7◇◇9◇	4.0	4.5	6.0	6.5	7.0	7.2	8.2
3. Not attached, with wind ◇7◇◇8◇◇9◇	--	3.5	--	4.5	5.0	5.2	6.2

DESIGN NOTE(s):

Reference: NESC 2017 Edition, Rules 234A, D, and G.

◇1.◇ Clearances are in feet. Voltages are phase-to-ground unless otherwise indicated.

2. The clearances on this page are the minimums permitted. No clearances are specified for effectively grounded neutral conductors.

◇3.◇ Where over traveled ways on or near bridges, the clearances specified in DCS **29 00 17 02** also apply.

◇4.◇ Clearances from supply conductors to supporting arms and brackets attached to bridges shall be the same as specified in DCS **29 00 17 09** if the supporting arms and brackets are owned, operated, or maintained by the same utility.

◇5.◇ Where the bridge has moving parts, such as a lift bridge, the required clearances shall be maintained throughout the full range of movement of the bridge or its attachments.

REV	DATE	ENG	DESCRIPTION
5	04/01/22	DG	
4	10/01/18	DG	

6. Bridge seats of steel bridges carried on masonry, brick, or concrete abutments that require frequent access for inspection shall be considered as readily accessible portions.

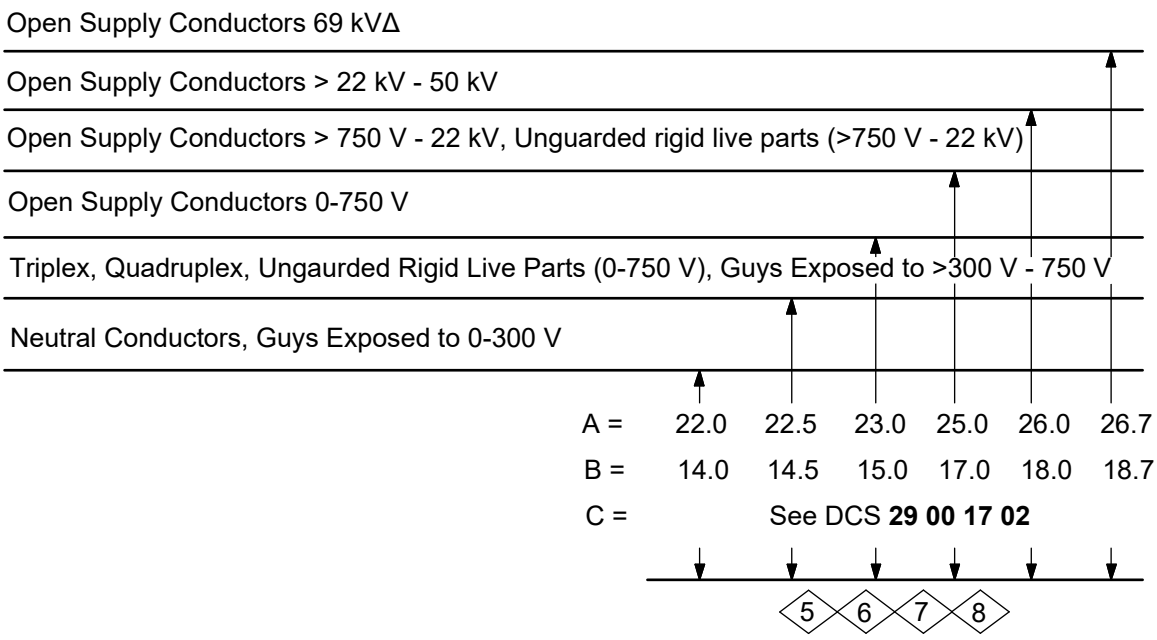
7. Where conductors passing under bridges are adequately guarded against contact by unauthorized persons and can be de-energized and grounded for maintenance of the bridge, clearances of the conductor from the bridge at any point may have clearances specified in DCS **29 00 17 09** for clearances from surfaces of support arms plus one-half the final sag at 60 degrees F no wind of the conductor at that point.

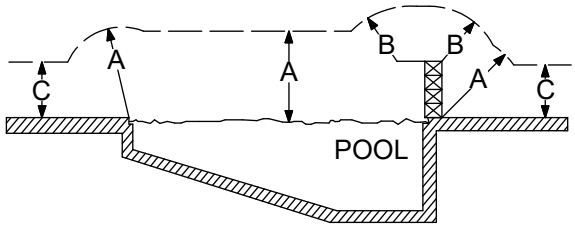
8. Clearances with wind shall be determined with the conductor or cable displaced by a 6 lb per sq ft wind at final sag at 60 degrees F. The wind may be reduced to 4 lbs per sq ft in areas sheltered by buildings, terrain or other obstacles. The displacement shall include the deflection of suspension insulators and flexible structures.

9. Ungrounded guys and ungrounded portions of guys between guy insulators shall have clearances based on the highest voltage to which they may be exposed due to a slack conductor or guy.

10. Where permitted by the bridge owner, supply cables may be run in rigid conduit attached directly to the bridge.

Clearance Over Swimming Pools 2 3 And Waterways Restricted to Swimming 2 4 1



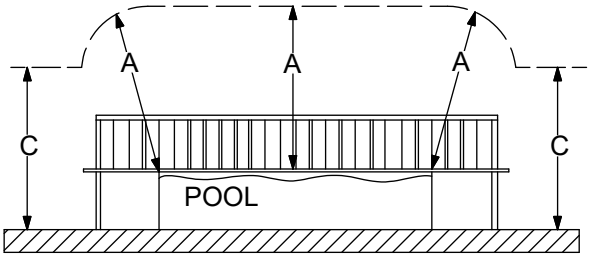


In-Ground Swimming Pool

A = Clearance in any direction to the water level, edge of water surface, base of diving platform or permanently anchored raft.

B = Clearance in any direction to the diving platform, tower, slide, or other fixed pool structure.

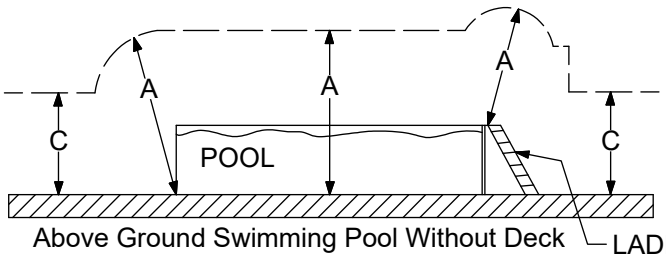
C = Vertical clearance over adjacent land as specified by DCS **29 00 17 02.**



Above Ground Swimming Pool

A = Clearance in any direction from the highest point of the installation upon which people can stand (typically the pool deck).

C = Vertical clearance over adjacent land as specified by DCS **29 00 17 02.**



Above Ground Swimming Pool Without Deck

A = Clearance in any direction from the highest point of the installation upon which people can stand.

C = Vertical clearance over adjacent land as specified by DCS **29 00 17 02**.

DESIGN NOTE(s):

Reference: NESC, 2017 Edition, Rule 234A, E, and G.

1. Clearances are in feet. Voltages are phase-to-ground unless otherwise indicated.

2. Although the NESC allows conductors to be installed over swimming areas, this practice is discouraged and should only be done if there is no other practical alternative.

3. Where wires conductors or cables cross over a swimming pool or the surrounding area, the clearances in any direction shall be as shown in the diagrams above. This rule does not apply to a pool fully enclosed by a solid or screened permanent structure.

4. If rescue poles are not used by lifeguards in supervised swimming beaches, the clearances specified in DCS **29 00 17 02** for the appropriate water body shall be used.

5. Vertical clearances are determined with conductor at final sag, maximum design operating temperature, no wind.

6. This rule does not apply to neutrals, guys, triplex, and quadruplex (0 to 750 V) when these are 10 feet or more horizontally from the edge of the pool, diving platform, diving tower, slide, or other fixed pool related structures.

7. For hot-tubs, jacuzzis, spas, etc. not suitable for swimming, vertical clearance is from the highest point of the installation upon which a person can stand. See DCS **29 00 17 04** for this clearance.

8. For wading pools, see DCS **29 00 17 02**, “space or ways accessible to pedestrians only”.

1. Minimum Vertical Clearance Between Line Conductors

Table 1 - Minimum Vertical Clearance Between Line Conductors (Inches) ◇1
(All voltages are phase-to-ground unless otherwise indicated)

Conductors Usually at Upper Levels / Conductors Usually at Lower Levels	Neutral Conductors; Triplex & Quadruplex		Open Supply Line Conductors							
			0 to 8.7 kV		> 8.7 to 22 kV		>22 to 50 kV		69 kV Δ	
	At Pole	Mid Span	At Pole	Mid Span	At Pole	Mid Span	At Pole	Mid Span	At Pole	Mid Span
Communication Condutors	40◇6	30	40	30	46	35	57	43	66	52
Neutral Conductors; Phase Conductors 0- 750 Volts; Triplex & Quadruplex	16◇7	12◇7	16◇4 ◇9	12◇4 ◇9	22◇8	17◇8	33◇8	25◇8	42◇8	34◇8
> 750 V to 8.7 kV	-	-	16◇4	12◇4	25◇8	19◇8	36◇8	27◇8	45◇8	37◇8
> 8.7 to 22 kV	-	-	-	-	31◇8	24◇8	42◇8	32◇8	51◇8	43◇8
> 22 to 50 kV	-	-	-	-	-	-	53◇8	53◇8	62◇8	54◇8

DESIGN NOTE(s):

Reference: NESC, 2017 Edition, Rule 235 A, C, and G

◇1. **In Illinois, where conductors are mounted on crossarms, IL Adm Code 305 Table A takes precedent (See Table 2 of this DCS).**

2. The minimum vertical clearance at any point in the span shall be not less than the mid-span values in the table above with the upper conductor at its maximum design operating temperature or 32°F with 1/2 inch of ice (whichever produces the greatest final sag) and the lower conductor at its final sag at the same ambient temperature. The clearance "At Pole" means the clearance at the support on the supporting structure.

3. Communication service drops, crossing under neutral conductors on a common crossing structure, may have a minimum clearance of 4 inches to the neutral conductor.

◇4. Where conductors are operated by different utilities, the minimum vertical clearance of 40 inches at the pole and 30 inches mid-span are recommended.

5. Triplex and quadruplex cables, 0-480 volts, running above and parallel to communication service drops, may have a minimum spacing of 12 inches at any point in the span, including at their attachment to a building, provided that a clearance of 40 inches is maintained between the two services at the pole.

◇6. May be reduced to 30 inches for effectively grounded supply neutrals where the communication messenger is bonded to the neutral.

◇7. No clearance is required between neutral conductors and triplex or quadruplex cables if owned by the same utility.

◇8. Where conductors are operated by different utilities, add 24 inches to the "At Pole" clearance. The new "Mid Span" clearance is then 75% of this new “At Pole” clearance.

◇9. Secondary conductors (0-750 volts) on vertical racks are allowed to have only 8 inches separation at the pole for span lengths up to 250 feet and 12 inches separation up to 300 feet.

REV	DATE	ENG	DESCRIPTION
3	04/01/22	DG	Converted to new format
2	10/01/18	DG	

2. Vertical Separation Between Crossarms - **Applicable only to Ameren Illinois**

Table 2 - Vertical Separation Between Crossarms (Inches)
(All voltages are nominal circuit voltages)

Conductors Usually at Upper Levels / Conductors Usually at Lower Levels	Neutral Conductors; Phase Conductors 0 to 480 Volts; Shielded & Non-Shielded Cables With Messenger	Phase Conductors				
		2.4 to 4 Kv	7.2 to 13.8 kV	14.4 to 34 kV	69 kV Y	69 kV Δ
Communication Conductors	48	48	48	72	72	81
Communication Conductors Used in Operation of Power Lines	24	24	24	48 (10)	48 (10)	57 (10)
Neutral Conductors; Phase Conductors 0 to 480 Volts; Shielded & Non-Shielded Cables with Messenger	24	24 (10)	24 (10)	48 (10)	48 (10)	57 (10)
Phase Conductors	-	-	-	-	-	-
2.4 to 4 kV	-	24 (10)	24 (10)	48 (10)	48 (10)	57 (10)
7.2 to 13.8 kV	-	-	24 (10)	48 (10)	48 (10)	57 (10)
14.4 to 34 kV	-	-	-	48 (10)(11)	48 (10)(11)	57 (10)(11)
69 kV Y	-	-	-	-	48 (10)(11)	62 (10)(11)(12)
69 kV Δ	-	-	-	-	-	71 (10)(11)(12)

DESIGN NOTE(s):

Reference: 83 Il. Adm. Code 305 Table A

(10) Where conductors are operated by different utilities, the minimum vertical clearance shall be increased by 24 inches.

(11) These values do not apply to adjacent crossarms carrying phases of the same circuit or circuits.

(12) These values are calculated from the NESC. They exceed the 83 IL. Adm. Code 305 Table A values.

3. Horizontal Clearance Between Line Conductors

Line conductors attached to fixed supports shall have horizontal clearances from each other not less than the larger value required by Table 3 or as calculated based on the sag of the conductors. **For long spans, horizontal clearance requirements will in most cases be driven by the conductor sag calculation method.**

Horizontal clearance based on conductor sag is calculated as follows:

A. For line conductors smaller than #2 -
Clearance (inches) = 0.3 x kV + 4.04 x sq rt (S-24)

B. For #2 or larger line conductors -
Clearance (inches) = 0.3 x kV + 8 x sq rt (S/12)

S = the sag in inches of the conductor having the greater sag (60 degree F, final sag, no wind)

kV = the voltage between the conductors

Example: 69 kV, 954 ACSR, 260 foot spans.
S = 64 inches per DCS **07 00 07 03**
kV = 69 x 1.05 = 72.45 kV
(Switching surge factor of 1.05 is applied because above 50 kV, the maximum possible operating voltage must be used instead of the nominal voltage)

Clearance = 0.3 x 72.45 + 8 x sq rt (64/12)
= 41 inches

Therefore; for this example, 41 inches of horizontal spacing at the support is required instead of the 38 inches as indicated in Table 3.

Table 3 - Horizontal Clearance Between Line Conductors
(Voltage is between the two conductors for which the clearance is being determined)

Class of Circuit	Clearance (inches) 13 14 15					
	0 to 8.7 kV	> 8.7 to 14.4 kV	> 14.4 to 22 kV	> 22 to 34.5 kV	> 34.5 to 50 kV	69 kV 16
Supply Conductors of the Same or Different Circuit	12	15	18	23	29	38

DESIGN NOTE(s):

References: NESC, 2017 Edition, Rule 235 A and B

13. The pin spacing on buck-arm construction may be reduced to 7.25 inches for conductors 15 kV line-to-line and below provided that the span lengths do not exceed 150 feet; the 60 degree F sag does not exceed 15 inches (#2 or larger), or 30 inches (smaller than #2); each conductor on the end of every arm is tied to the same side of its insulator; and spacing on the next pole is not less than 14.5 inches.

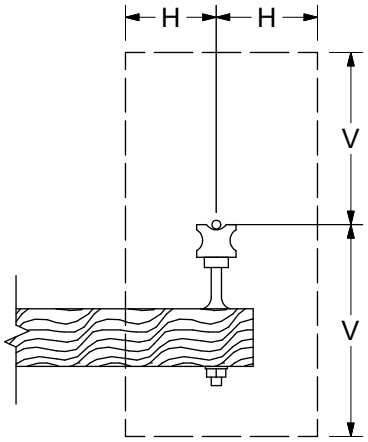
14. These clearances do not apply to covered or insulated cables.

15. Where suspension insulators are used and not restrained from movement, the horizontal spacing shall be increased so that the clearances above will be maintained with one string of insulators at maximum swing angle with 6 lb/sq ft wind at 60 degree F final sag. This may be reduced to 4 lb/sq ft wind in sheltered areas.

16. For 69 kV conductors of the same circuit, no horizontal clearance is specified in the NESC.

4. Diagonal Clearance Between Line Wires, Conductors, and Cables Located at Different Levels on the Same Supporting Structure

No wire, conductor, or cable may be closer to any other wire, conductor, or cable than defined by the dashed line in the figure below. V is determined by section 1 of this DCS and H is determined by section 3 of this DCS.



V = Vertical Clearance
H = Horizontal Clearance

5. Clearances in Any Direction From Line Conductors to Supports, and to Vertical or Lateral Conductors, Span or Guy Wires Attached to Same Support

A. Fixed Supports
Clearances shall not be less than those in Table 4.

B. Suspension Insulators
Where suspension insulators are used and are not restrained from movement, the clearance shall be increased so that the clearances in Table 4 are maintained with the string of insulators at maximum design swing angle with 6 lb/sq ft wind at 60 degree F final sag. This may be reduced to a 4 lb/sq ft wind in sheltered areas. The displacement of wires, conductors, and cables shall include deflections of flexible structures and fittings where such deflection would reduce the clearances.

Table 4 - Clearances in any Direction from Line Conductors to Supports, and to Vertical or Lateral Conductors, Span or Guy Wires Attached to Same Support
(Clearances are in inches, All voltages are phase-to-phase)

Clearance of Line Conductors From ◇17	0 to 4.16 kV	> 4.16 kV - 14.4 kV	>14.4 kV - 34.5 kV	69 kV
Vertical and lateral conductors: ◇18 ◇19	-	-	-	-
Of the same ckt.	3	5	10	19
Of other ckts. ◇27	6 ◇23	9	17	32
Span or guy wires attached to same structure: ◇25	-	-	-	-
Span guy parallel to line	12 ◇21 ◇24	15	30 ◇26	38
All other	6 ◇21	9 ◇21	30 ◇26	32
Surface of support arms	3 ◇20 ◇22	5	9	16
Surface of structures	5 ◇20 ◇22	7	11	18

REV	DATE	ENG	DESCRIPTION
3	04/01/22	DG	Converted to new format
2	10/01/18	DG	

DESIGN NOTE(s):

Reference: NESC, 2017 Edition, Rule 235E

17. A line conductor is a wire or cable intended to carry electric currents between structures along the route of the line.

18. A lateral conductor is a wire or cable entirely supported on one structure and extending in a general horizontal, vertical, or diagonal direction to make connections to line conductors, service drops, equipment, or other facilities on the same structure. Lateral conductors may be attached directly to the structure or supported away from the structure.

19. A vertical conductor is either a wire or cable riser (not in non-metallic conduit or u-guard) attached to a pole, or the vertical portion of a lateral conductor.

20. A neutral conductor which is effectively grounded throughout its length and associated with circuits 0 to 22 kV to ground may be attached directly to the structure surface.

21. If a guy passes within 12 inches of Ameren's conductors and also passes within 12 inches of communication cables, the guy must be insulated with a strain insulator at a point below the lowest supply conductor and above the highest communication cable.

22. For supply circuits of 0 to 750 V, this clearance may be reduced to 1 inch.

23. For neutrals and supply circuits of 0 to 750 V, this clearance may be reduced to 3 inches.

24. For neutrals, this clearance may be reduced to 6 inches.

25. "Parallel" means in the same general direction as the line conductors. "All other" includes down guys and span guys that cross over or under line conductors. See DCS **11 00 02 03** for reduced clearances allowed to guy insulators.

26. 30" is based on Ameren's use of 500 kV BIL and is greater than NESC requirements.

27. These dimensions are based on the voltage of the vertical or lateral conductor being 8.7 kV or less. If voltage of vertical or lateral conductor is greater than 8.7 kV, then these dimensions need to be increased based on assumption that line and vertical or lateral conductor voltages are 180° out of phase.

Equipment here means non-current-carrying metal parts of equipment mounted on the same structure. Non-current-carrying metal parts of equipment include metal supports for cables or conductors, metal support braces which are attached to metal supports or are less than 1 inch from transformer cases or hangers which are not effectively grounded, and metal or non-metallic supports or braces associated with communication cables or conductors. Antennas, solar panels, power supplies, etc., are considered equipment for applying these clearances.

Vertical Clearance Between Communications and Supply Facilities Located on the Same Structure (All voltages are phase-to-ground unless otherwise indicated)				
Vertical Clearance of Conductors to Non-Current-Carrying Metal Parts of Equipment ◇1◇		Vertical Clearance of Span Wires and Luminaire Brackets from Communication Lines		
Supply Voltage	Vertical Clearance (in)	Location of Span Wires and Luminaire Brackets	Not Effectively Grounded (in)	Effectively Grounded (in)
Grounded conductor and messenger hardware and supports	30	Above communication support arms	40	20 ◇2◇
0 to 8.7 kV	40	Above messengers carrying communication cables	40	4
>8.7 to 22 kV	46	From terminal box of communication cable	40	4
>22 to 50 kV	57	From communication brackets, bridle wire rings, or drive hooks	40 ◇3◇	4 ◇3◇
69 kV DELTA	66	Drip loop of conductor entering luminaire bracket above communication cable, throughbolt, or other equipment	12	12

DESIGN NOTE(s):

Reference: NESC, 2017 Edition, Rule 238

◇1.◇ For vertical clearances which are between supply conductors and communication equipment, communication conductors and supply equipment, and supply and communication equipment.

◇2.◇ Clearance may be reduced to 12 inches for span wires or metal parts of brackets which are 40 inches or more from the structure surface.

◇3.◇ May be reduced to 3 inches if the loop is covered by a suitable non-metallic covering that extends at least 2 inches beyond the loop.

REV	DATE	ENG	DESCRIPTION
2	xx/xx/xx	DG	
1	05/28/18	DG	

Table 1 - Clearances of Open Vertical and Lateral Conductors (in) ◇1◇ ◇2◇			
Phase-to-Phase Voltages (kV)	From Surfaces of Supports ◇4◇	From Span Guy and Messenger Wires	Anchor Guys
0 to 8.7 kV	3 ◇3◇	6 ◇7◇	6 ◇7◇
>8.7 to 22 kV	6	12	10
>22 to 50 kV	12	23	17
69 kV Δ	16	32	29

Table 2 - Clearances Between Open Vertical Conductors and Pole Surface (Fig.1,2) ◇4◇		
Phase-to-Ground Voltage Unless Otherwise Indicated	A. Zones Above and Below Conductor Where Clearances Apply (ft) ◇5◇	B. Min. Clearance Between Vertical Cond. & Pole Surface (in)
0 to 22 kV	6	19
>22 to 30 kV	6	22
>30 to 50 kV	6	30
69 kV Δ	◇6◇	◇6◇

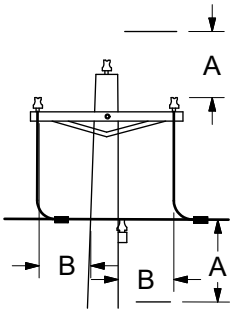


FIG. 1

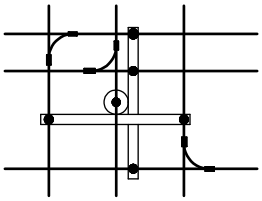


FIG. 2

DESIGN NOTE(s):

Reference: NESC, 2017 Edition, Rule 239E.

◇1◇ A lateral conductor is a wire or cable entirely supported on one structure and extending in a general horizontal, vertical, or diagonal direction to make connections to line conductors, service drops, equipment, or other facilities on the same structure. Lateral conductors may be attached directly to the structure or supported away from the structure.

◇2◇ A vertical conductor is either a wire or cable riser (not in non-metallic conduit or u-guard) attached to a pole, or the vertical portion of a lateral conductor.

◇3◇ Clearance may be reduced to 1 inch for supply circuits of 0 to 750 V. A neutral conductor may be attached directly to the structure surface.

◇4◇ If open wire conductors are within 4 feet of the pole, vertical conductors must conform to the zones and clearances in Table 2.

◇5◇ Within this zone above and below open supply conductors, vertical and lateral conductors may be enclosed in non-metallic conduit or protected by a non-metallic covering and may be run on the pole surface.

◇6◇ These distances are not specified in the NESC for voltages above 50 kV phase-to-ground.

◇7◇ For effectively grounded neutrals, this clearance can be reduced to 3 inches.

REV	DATE	ENG	DESCRIPTION
2	04/01/22	DG	Converted to new format
1	10/01/18	DG	

Additional Requirements (per NESC, 2017 Edition, Rule 239)

1. CONDUCTORS ATTACHED DIRECTLY TO SUPPORTING STRUCTURES.
   Grounding and neutral conductors or conductors physically protected by conduit may be run directly on the support.

2. CLIMBING SPACE
   Location of vertical or lateral conductors shall not obstruct climbing spaces or lateral working spaces between line conductors at different levels.

3. CONDUCTORS NOT IN CONDUIT
   All conductors which are not enclosed in a conduit must maintain the same clearances from conduits as from other structure surfaces.

4. MECHANICAL PROTECTION NEAR GROUND
   All vertical conductors, cables, and grounding wires shall have a suitable mechanical protective covering when within 8 feet of the ground. This protective covering may be omitted from grounding conductors used to ground multi-grounded circuits.

5. SUPPLY GROUNDING CONDUCTORS
   Supply grounding conductors may be run bare through communication spaces provided no supply equipment is located between the ground rod and the neutral and the grounding conductor is bonded to grounded communication facilities at that structure. All other grounding conductors must be protected by a non-metallic covering for a distance of 40 inches above the highest communication attachment and 6 feet below the lowest communication attachment.

6. CLEARANCE FROM METAL PARTS
   Vertical runs of supply cables must have a clearance of at least 2 inches from through bolts or other metal parts associated with communication line equipment. Exception: Vertical runs of effectively grounded supply conductors may have a clearance of 1 inch.

Crossings should be made on a common supporting structure, where practical. When this is not practical, the clearance between any two crossing or adjacent wires, conductors, or cables carried on different supporting structures shall be not less than that required in this DCS.

1. Conductor Movement Envelope

The relevent positions of the conductors or cables on or within their respective conductor movement envelopes must be considered. The conductor movement envelope for each must be determined under the following general conditions, See Figure 1.

A. Both are simultaneously subjected to the same ambient air temperature and wind loading conditions, and

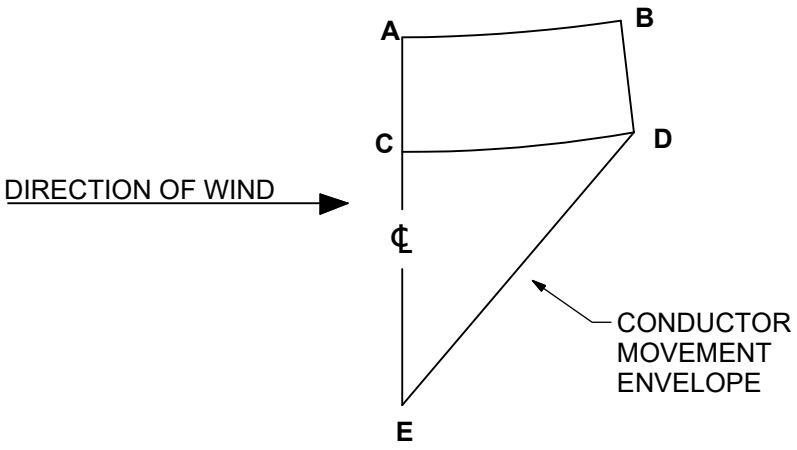
B. Each is subjected individually to the full range of its icing conditions and applicable design electrical loading.

2. Conductor Clearance Envelope

The vertical Table 1 and horizontal Table 2 clearances are used to define a clearance envelope as shown in Figure 2. The clearance envelope defines the minimum required clearance to any other conductor or cable.

3. Use of the Conductor Clearance and Conductor Movement Envelopes

The “conductor 1” clearance envelope is drawn with its center located at any point on the “conductor 1” movement envelope. At any point on its movement envelope, the “conductor 1” clearance envelope shall not contact “conductor 2” within its movement envelope with the same horizontal displacement. See Figure 3.



Point	Conductor Temperature	Sag	Ice Loading	Wind Displacment ◇1
A	60° F ◇3	Initial	None	None
B	60° F ◇3	Initial	None	6 psf
C	60° F ◇3	Final	None	None
D	60° F ◇3	Final	None	6 psf
E1 ◇2	The greater of 120° F or maximum operating temperature	Final	None	None
E2 ◇2	32° F	Final	1/2 in	None

Figure 1 - Conductor Movement Envelope

REV	DATE	ENG	DESCRIPTION
2	04/01/22	DG	Converted to New Format
1	10/01/18	DG	

DESIGN NOTE(s):

1. The direction of the wind shall be that which produces the minimum distance between conductors including the deflection of suspension insulators and flexible structures.

2. Point E shall be determined by whichever of the conditions described under E1 and E2 produces the greater sag.

3. When one conductor movement envelope is lower than that of the other conductor, the lower conductor envelope shall be developed with points A, B, C, and D at a conductor temperature equal to the ambient temperature used in determining E of the upper conductor movement envelope.

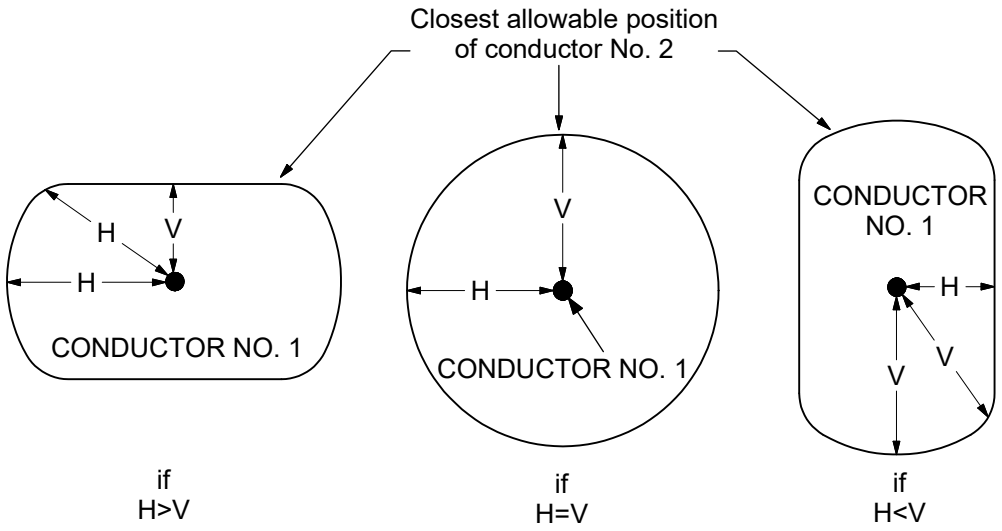


Figure 2 - Conductor Clearance Envelope

Table 1 - Vertical Clearances for Clearance Envelope V in Feet
(All voltages are phase-to-ground unless otherwise indicated)

Conductors at Upper Levels / Conductors at Lower Levels	Shield/Static Wire, Neutral, Guys (6)	Shielded Cables with Messenger; Triplex & Quadruplex	Phase Conductors			
			0 to 750 V	>750 V to 22 kV	>22 kV to 50 kV	69 kVΔ
Shield/Static Wire, Neutral, Guys (6)	2.0 (4)	2.0	2.0	2.0	3.0	3.7
Communication Conductors	2.0	2.0	4.0 (7)	5.0 (5)	6.0	6.7
Shielded Cables with Messenger; Triplex & Quadruplex	2.0	2.0	2.0	2.0	3.0	3.7
Phase Conductors 0 to 750 V	2.0	2.0	2.0	2.0	3.0	3.7
Phase Conductors > 750 V to 22 kV	2.0	-	-	3.0	3.7	5.0
Phase conductors > 22 kV to 50 kV	3.0	-	-	-	4.6	5.4
Phase Conductors 69 kV Δ	4.0	-	-	-	-	6.1

REV	DATE	ENG	DESCRIPTION
2	04/01/22	DG	Converted to New Format
1	10/01/18	DG	

Table 2 - Horizontal Clearance H Used for Drawing the Clearance Envelope	
Vector Difference Between Voltage of Wires ◇8◇	Horizontal Clearance H (ft)
0 to 22 kV	5.0 ◇9◇
Over 22 kV	5.0 plus 0.4 inches / kV over 22 kV

DESIGN NOTE(s):

Reference: NESC, 2017 Edition, Rule 233

◇4.◇ No clearance is specified between guys or span wires that are electrically interconnected.

◇5.◇ This clearance may be reduced to 4 feet where supply conductors of 750 V to 8.7 kV cross a communication line more than 6 feet horizontally from a communication structure.

◇6.◇ These clearances may be reduced by not more than 25% to a guy insulator, provided that full clearance is maintained to its metallic end fittings and the guy wires. The clearance to an insulated section of a guy between two insulators may be reduced by not more than 25% provided that full clearance is maintained to the uninsulated portion of the guy.

◇7.◇ This clearance may be reduced to 2 feet for supply service drops.

◇8.◇ Vector Difference Between Voltage of Wires is equal to:
1.05 X (kV phase-to-phase (Line1)) /sq rt of 3 + 1.05 X (kV phase-to-phase (Line 2)) /sq rt of 3
The Factor of 1.05 is only applied if the kV phase-to-phase is greater than 50kV.

◇9.◇ The horizontal clearance H between anchor guys of different supporting structures may be reduced to 6 inches and may be reduced to 2 feet between other guys and neutral conductors.

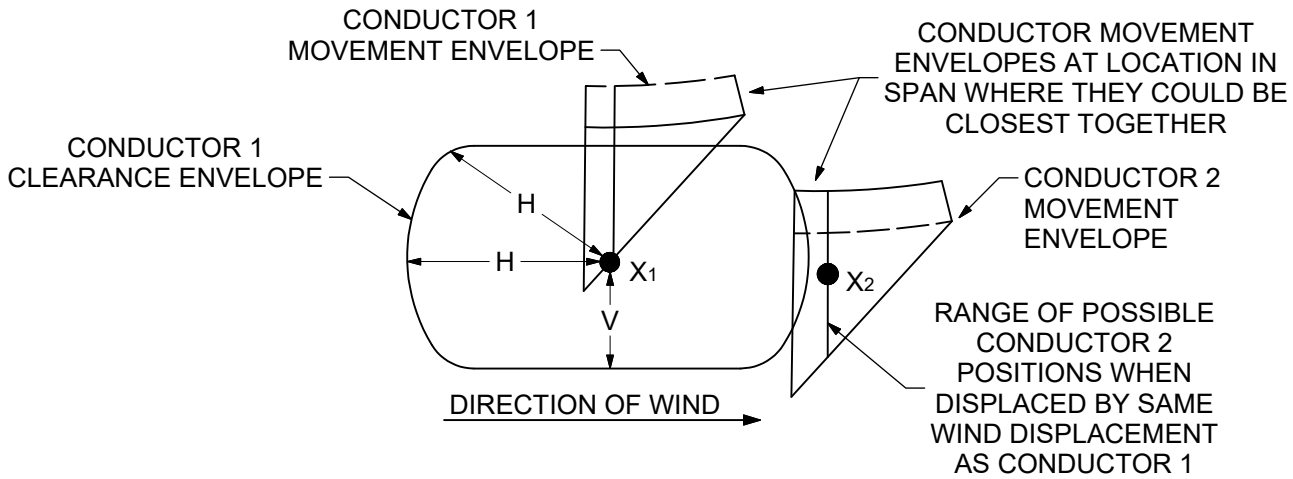


Figure 3 - Use of Conductor Movement and Clearance Envelopes

DESIGN NOTE(s):

10. In this illustration, Conductor 2 is closest at position X2 to Conductor 1 when Conductor 1 is at position X1.

11. Vertical lines intersecting X1 and X2 represent the equivalent horizontal wind displacements.

REV	DATE	ENG	DESCRIPTION
2	04/01/22	DG	Converted to New Format
1	10/01/18	DG	

Climbing space shall be provided on poles past any conductors, crossarms, equipment or other parts. In addition, working space shall be provided on the climbing face of the pole at each side of the climbing space.

1. Climbing Space − Location and Dimensions (Reference NESC, 2017 Edition, Rule 236)

The climbing space need only be provided on one side or corner of the pole and shall extend vertically not less than 40 inches above or below the limiting conductors or other part, but may otherwise be shifted from any side or corner of the pole to any other side or corner per Figure 1.

Table 1 - Minimum Horizontal Dimensions of Climbing Space
(All voltages are phase-to-phase)

Type of Conductors Adjacent to Climbing Space	Horizontal Dimension of Climbing Space
Communications Conductors	30” x 30”
Ameren Circuits	40” x 40” preferred generally but in no case less than 30” x 30” for 4.16 kV; in no case less than 36” x 36” for 15 kV; in no case less than 40” x 40” for 34.5 kV; and in no case less than 54” x 54” for 69 kV

A. Portions of Pole and Equipment in Climbing space

Portions of the pole or structure, including crossarms, when included in one side or corner of the climbing space, are not considered to obstruct the climbing space.

Longitudinal runs, such as secondaries on racks or brackets, are not considered as obstructing the climbing space if all wires concerned are covered by rubber protective equipment or otherwise guarded.

Where longitudinal runs such as secondaries on racks or brackets are not covered up, the climbing space shall be measured from the longitudinal run concerned and shall extend 40 inches above and below the limiting conductors. The normal method of meeting this requirement where there is less than 40 inches between limiting conductors and conductors are carried on arms, is to eliminate the conductor from the pole pin on the opposite side of the pole to which the longitudinal run is attached. This also includes buckarm construction.

Vertical runs encased in suitable conduit or other protective covering and securely attached to the pole surface are not considered to obstruct the climbing space.

With pole top pin construction, the climbing space shall be provided above the top crossarm to the pole top pin conductor but need not be carried past it.

Supply and communication apparatus including but not limited to transformers, regulators, capacitors, cable terminals (potheads), lightning arresters, antennas, and switches when located below conductors or other attachments shall be mounted outside the climbing space.

2. Working Space − Dimensions (Reference NESC, 2017 Edition, Rule 237)

The working space shall extend along the crossarm on each side of the climbing space to the outmost pin position on the crossarm.

At right angles to the crossarm, the working space shall preferably extend 40 inches but in no case less than the distances shown in Table 1 when measured from the face of the crossarm.

Vertically the working space shall have a height not less than shown in Table 2.

The working space shall not be obstructed by vertical or lateral conductors. Such conductors shall be located on the opposite side of the pole from the climbing side or on the climbing side of the pole at a distance from the crossarms at least as great as the width of the climbing space required for the highest voltage conductor concerned. See Table 1.

Table 2 - Minimum Vertical Height of Working Space Between Conductors on Different Levels on The Same Pole or Structure in inches

Voltage of Wire, Cable, or Conductor Concerned	Other Wire, Cable, or Conductor Concerned		
	A	B	C
	Secondaries 0−750 V Between Phases and Multi−Grounded Neutral	2.4 kV to 4.16 kV Circuits	7.2 kV to 34.5 kV Circuits
Secondaries 0−750 V Between Phases and Multi−Grounded Neutral	16 ◇1	24 ◇2	60 ◇2
2.4 kV to 4.16 kV Circuits	-	24 ◇2	60 ◇2
7.2 kV to 34.5 kV Circuits	-	-	60 ◇2

DESIGN NOTE(s):

◇1. This applies to secondaries on crossarms. The clearance between secondary conductors on racks or clevises are allowed to have 8 inches separation for span lengths up to 250 feet and 12 inches up to 300 feet.

◇2. These clearances exceed NESC required minimums. For reduced clearances refer to NESC Table 235-5.

REV	DATE	ENG	DESCRIPTION
5	04/01/22	DG	Converted to new format
4	10/01/18	DG	

Climbing space shaft may be shifted from one side or corner of pole to another side or corner as required but shall in such instances provide the minimum vertical overlap shown by dimension ”B”.

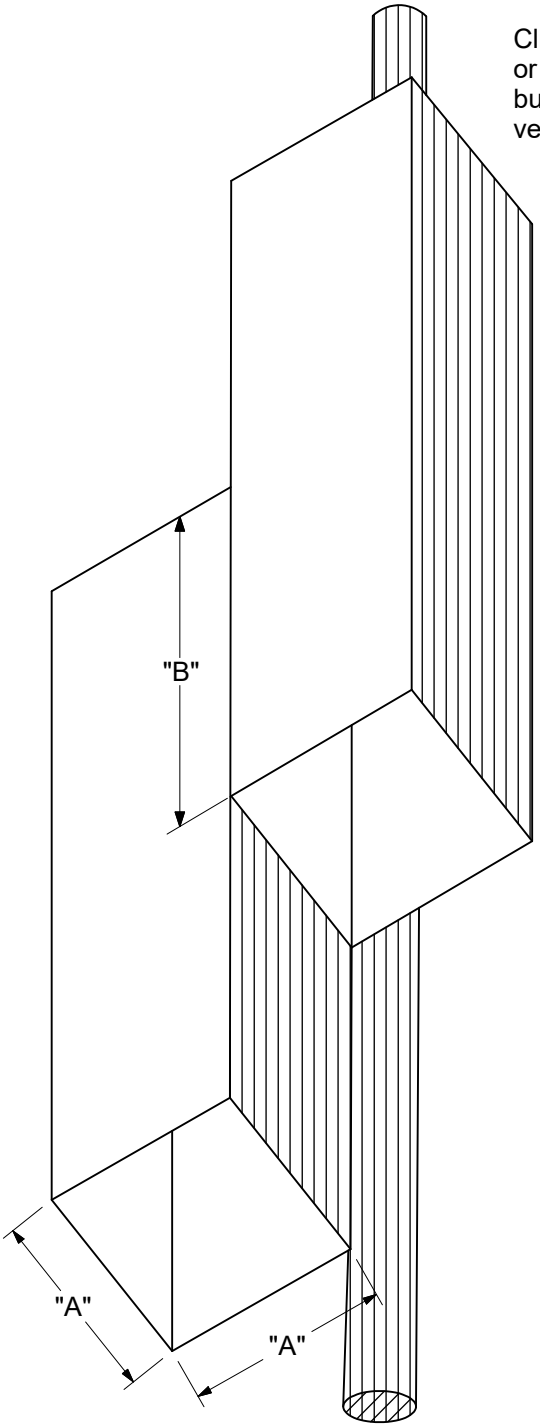


Figure 1 - Climbing Space

Table 3 - Climbing Space Dimensions (inches)

	Dimension ”A”					Dimension "B"
	Ameren Ciruit Voltage					
	0 to 600V	2.4 kV to 4.16 kV	7.2 kV to 14.4 kV	25 kV to 34.5kV	69kV	
Min. Climbing Space	30	30	36	40	54	40

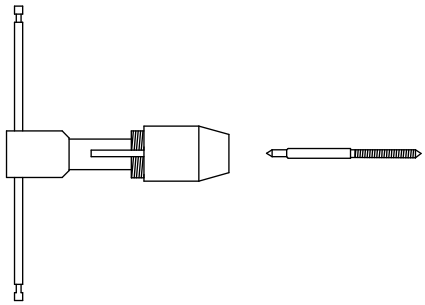
REV	DATE	ENG	DESCRIPTION
5	04/01/22	DG	Converted to new format
4	10/01/18	DG	

ILLINOIS ONLY

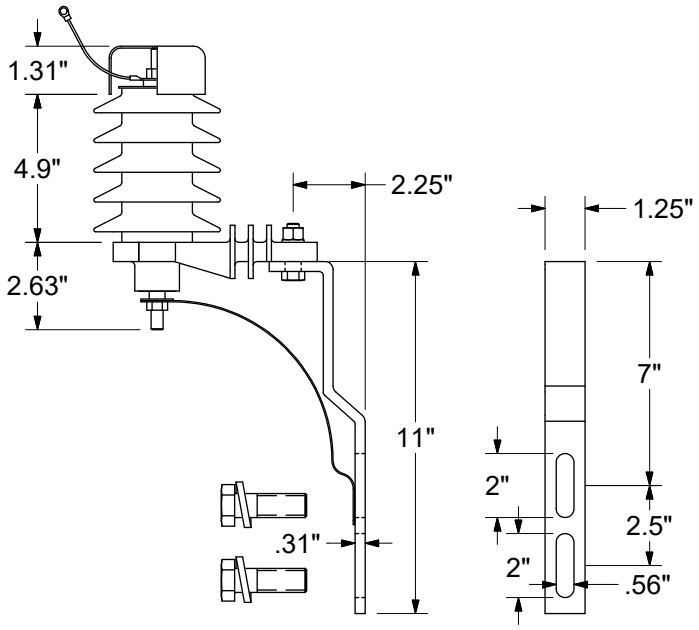
This DCS is for use by Ameren Illinois for EZRR corrective action projects. This DCS provides materials for:
1) Moving the arrester from the energized zone above the transformer to the transformer tank
2) Replacing porcelain cutout with polymer cutout
3) Lowering cutout from phase conductor crossarm to FG cutout bracket (refer to DCS **13 12 00 01**)
4) Conforming the transformer H2 grounding to current Ameren Standards (refer to DCS **13 00 06 02**)

INSTRUCTIONS - IF TRANSFORMER HAS EXISTING LUGS FOR MOUNTING ARRESTER ADJACENT TO THE H1 BUSHINGS:

1. **Clean the threads in the arrester mounting lugs.** Thread Tap (Stock #85 37 166) with T-Wrench (Stock #85 41 336) can be used to 'chase' the threads.



2. **Install arrester on transformer tank.**
   A. If transformer is rated 7.2 kV thru 7.97 kV use DCS **29 12 00 01.**
   Use arrester kit Stock #10 01 145. This kit includes a 10 kV arrester with cap, 600 V insulated arrester lead-wire, L-shaped mounting bracket, copper ground strap, and two 1/2" bolts for mounting to the transformer tank.

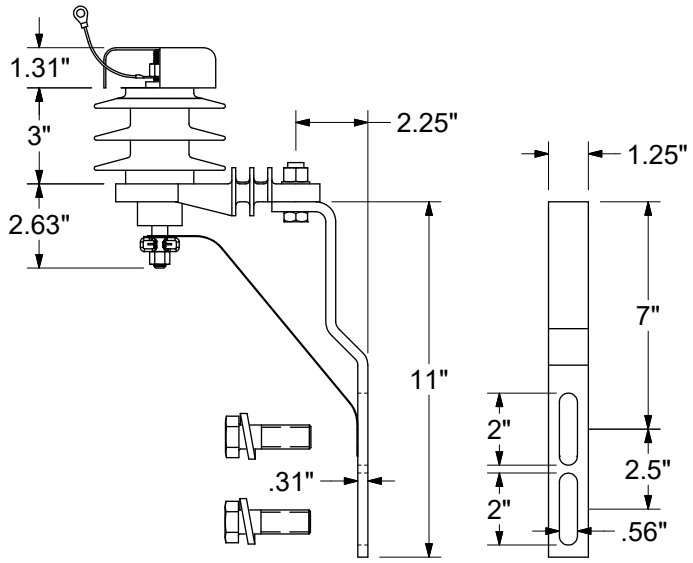


29 12 00 01

REV	DATE	ENG	DESCRIPTION
1	04/01/22	DG	Converted to new format
0	05/21/18	DG	

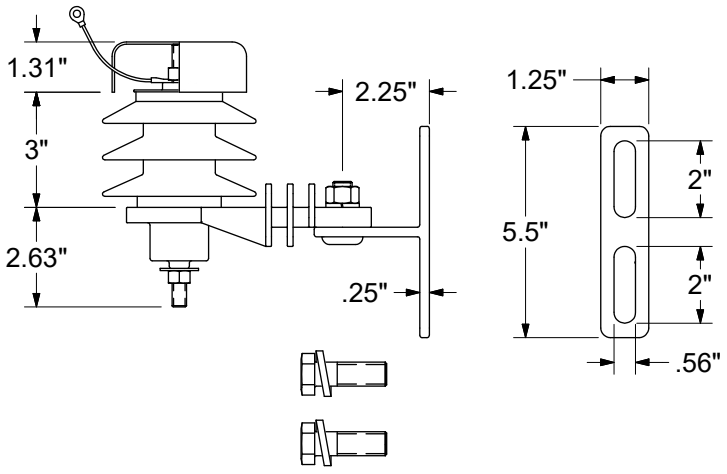
ILLINOIS ONLY

B. If transformer is rated 2.4 kV with cover mounted bushings use DCS **29 12 00 02.**
Use arrester kit Stock #10 01 256. This kit includes a 3 kV arrester with cap, 600 V insulated arrester lead-wire, L-shaped mounting bracket, copper ground strap, and two 1/2” bolts for mounting to the transformer tank.



29 12 00 02

C. If transformer is rated 2.4 kV with side-wall mounted primary bushings use DCS **29 12 00 03.**
Use arrester kit Stock #10 01 122. This kit includes a 3 kV arrester with cap, 600 V insulated arrester lead-wire, T-shaped mounting bracket, copper ground strap, and two 1/2" bolts for mounting to the transformer tank.



29 12 00 03

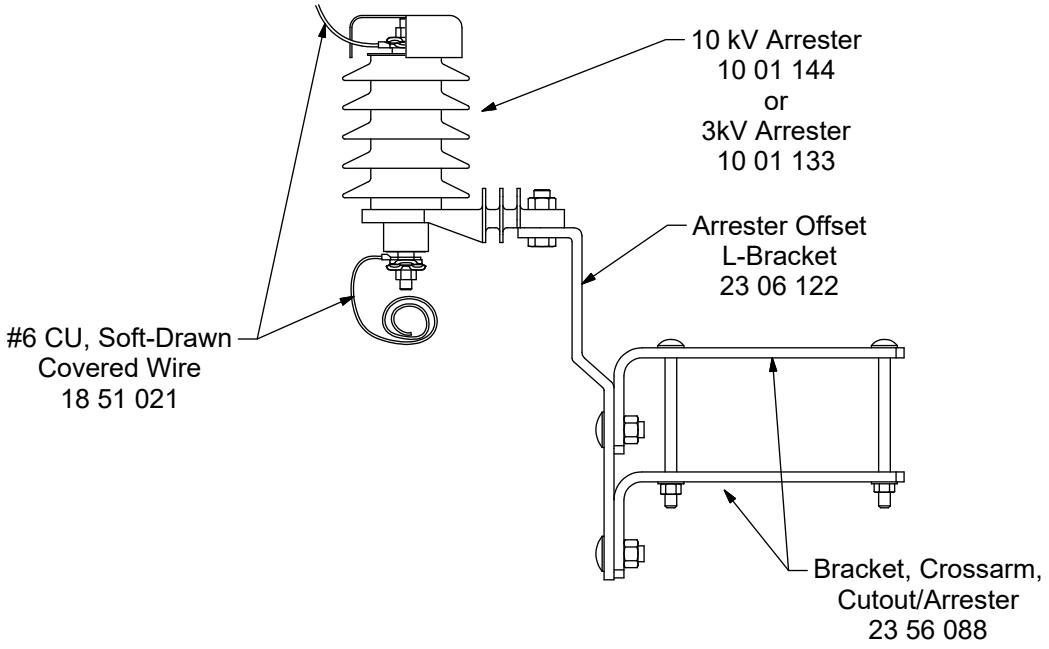
REV	DATE	ENG	DESCRIPTION
1	04/01/22	DG	Converted to new format
0	05/21/18	DG	

ILLINOIS ONLY

INSTRUCTIONS - IF TRANSFORMER DOES NOT HAVE EXISTING LUGS FOR MOUNTING ARRESTER TO THE H1 BUSHING:

1. **Transformer with Cover Mounted Primary Bushings -**

   Mount hardware and arrester to upper transformer hanger bracket as per DCS **12 12 05 ****. DCS **12 12 05 ** contains the following materials needed for a transformer with cover mounted primary bushings:



29 12 00 04

29 12 00 05

2. **2.4 kV Transformer with Side-Wall Mounted Primary Bushings -**
   Replace with new transformer that is pre-kitted with tank mounted arrester.

ILLINOIS ONLY

DCS #	DESCRIPTION
29 12 00 01	Tank Mounting of Arrester, 7.2 kV thru 7.97 kV Transformer
29 12 00 02	Tank Mounting of Arrester, 2.4 kV Transformer w/ Cover Mounted Primary Bushings
29 12 00 03	Tank Mounting of Arrester, 2.4 kV Transformer w/ Side-Wall Mounted Primary Bushings
29 12 00 04	Hanger Bracket Mounting of Arrester, 7.2 kV thru 7.97 kV Transformer
29 12 00 05	Hanger Bracket Mounting of Arrester, 2.4 kV Transformer w/ Cover Mounted Primary Bushings

	ITEM	STK / DCS #	DESCRIPTION 29 12 00 **	01	02	03	04	05
	A	23 06 127	Bracket, Cutout	1	1	1	1	1
	B	23 52 065	Bolt, Mach, 5/8” x 12”	2	2	2	2	2
	C	23 66 027	Washer, Square, 5/8”	2	2	2	2	2
	D	54 07 208	Switch, Fused, Open Type	1	1	1	1	1
	E	18 51 025	Wire, Trans. Riser, #4, S.D. Poly covered (FT.)	15	15	15	15	15
	F	23 17 411	Cover-Cutout	1	1	1	1	1
	G	10 01 145	Arrester Kit, 10kV, w/ “L” Transformer Mtg. Brkt.	1	-	-	-	-
		10 01 256	Arrester Kit, 3kV, w/ “L” Transformer Mtg. Brkt.	-	1	-	-	-
		10 01 122	Arrester Kit, 3kV, w/ “T” Transformer Mtg. Brkt.	-	-	1	-	-
	H	12 12 05 01	Arrester, 10kV	-	-	-	1	-
		12 12 05 02	Arrester, 3kV	-	-	-	-	1
	I	23 64 001	Staple, Ground Wire, Serrated, CU Clad	-	-	-	3	3
	J	17 51 032	Clamp, PG. #6-1/0	1	1	1	2	2
	K	69 58 296	Guard, Wildlife, Clam-Shell, Short	1	1	1	1	1
	L	69 58 121	Ground, Transformer Tank, #8 Sol. To #2 Str. Cu.	1	1	1	1	1
	M	23 66 134	Washer, Dble Coil, 5/8"	2	2	2	2	2
	N	23 65 043	Nut, Lock, 5/8"	2	2	2	2	2
@	O	10 00 01 01	Link, Fuse	1	1	1	1	1

REV	DATE	ENG	DESCRIPTION
1	04/01/22	DG	Converted to new format
0	05/21/18	DG	

DUCT SYSTEMS 31

STANDARD DUCT CONSTRUCTION..... 31 10 01 **

4 DUCT TRANSPOSITION STANDARD TO FLAT POSITION.....31 10 03 00

6 DUCT TRANSPOSITION STANDARD TO HORIZONTAL POSITION.....31 10 04 00

6 DUCT TRANSPOSITION STANDARD TO FLAT POSITION.....31 10 05 00

8 DUCT TRANSPOSITION STANDARD TO HORIZONTAL POSITION.....31 10 06 00

8 DUCT TRANSPOSITION STANDARD TO FLAT POSITION.....31 10 07 00

10 DUCT TRANSPOSITION STANDARD TO HORZIONTAL POSITION.....31 10 08 00

3 FT. AVERAGE TRENCH DEPTH NO PAVING BASE.....31 11 03 **

4 FT. AVERAGE TRENCH DEPTH NO PAVING BASE.....31 11 04 **

5 FT. AVERAGE TRENCH DEPTH NO PAVING BASE.....31 11 05 **

6 FT. AVERAGE TRENCH DEPTH NO PAVING BASE.....31 11 06 **

7 FT. AVERAGE TRENCH DEPTH NO PAVING BASE.....31 11 07 **

8 FT. AVERAGE TRENCH DEPTH NO PAVING BASE.....31 11 08 **

3 FT. AVERAGE TRENCH DEPTH WITH PAVING BASE (9” CONCRETE).....31 12 03 **

4 FT. AVERAGE TRENCH DEPTH WITH PAVING BASE (9” CONCRETE).....31 12 04 **

5 FT. AVERAGE TRENCH DEPTH WITH PAVING BASE (9” CONCRETE).....31 12 05 **

6 FT. AVERAGE TRENCH DEPTH WITH PAVING BASE (9” CONCRETE).....31 12 06 **

7 FT. AVERAGE TRENCH DEPTH WITH PAVING BASE (9” CONCRETE).....31 12 07 **

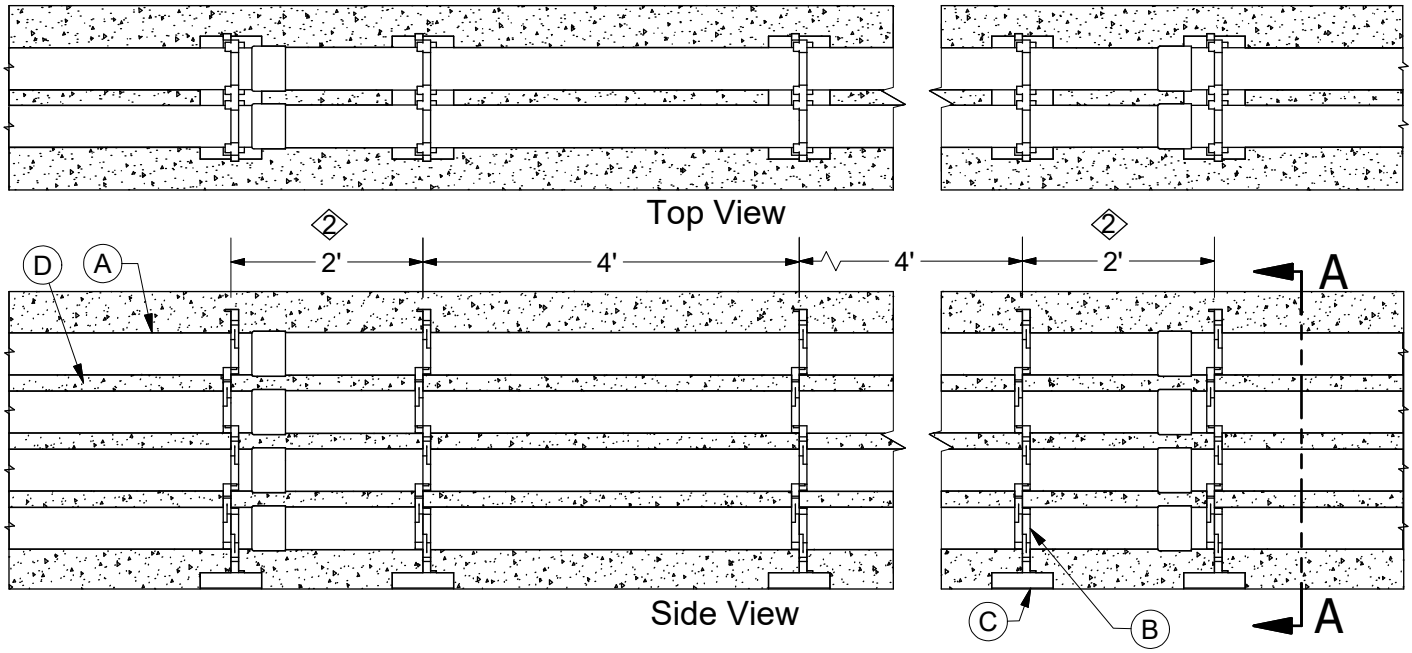
8 FT. AVERAGE TRENCH DEPTH WITH PAVING BASE (9” CONCRETE).....31 12 08 **

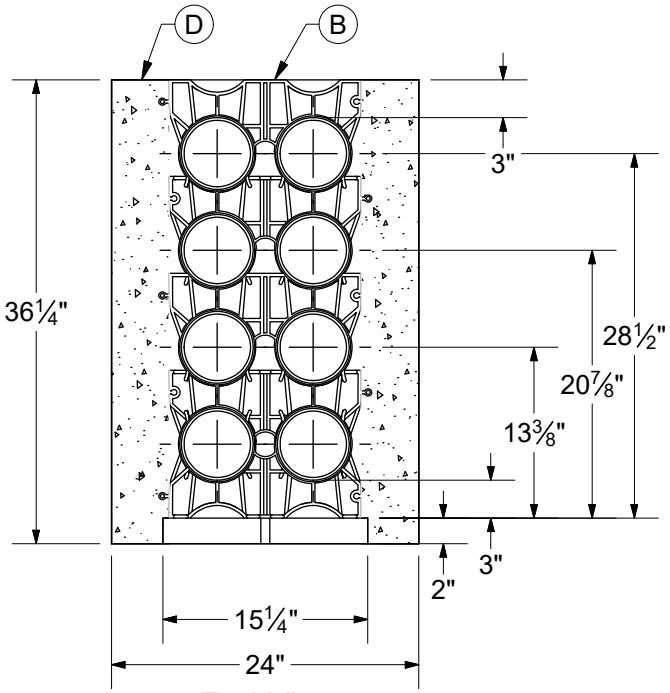
ENCASED CONDUIT FORMATIONS 5" EB CONDUIT.....31 13 01 **

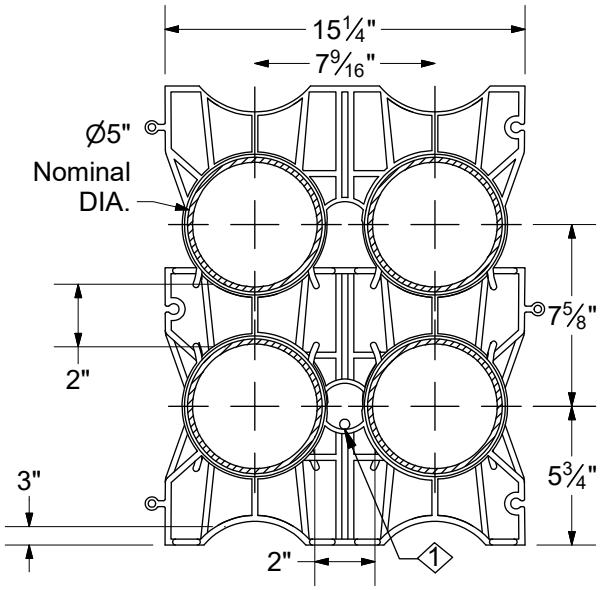
ENCASED CONDUIT FORMATIONS 4" EB CONDUIT.....31 13 02 **

U.G. BEND RESTRAINT PVC CONDUIT.....31 47 01 **

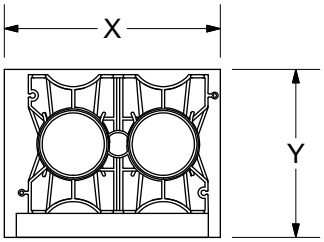
DRAINAGE PIT FOR DIRECT BURIED CONDUIT.....31 47 02 **



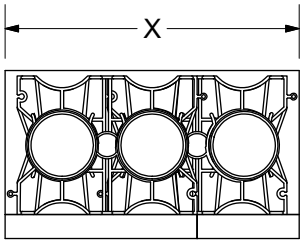




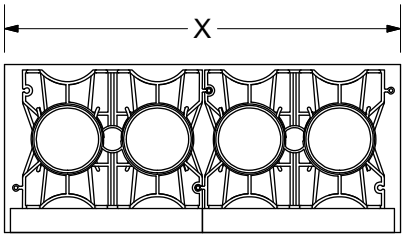
REV	DATE	ENG	DESCRIPTION
8	01/01/23	JMW	Converted to new format
7	07/04/15	EJB	



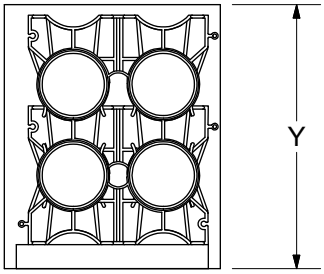
31 10 01 01
2-Ducts



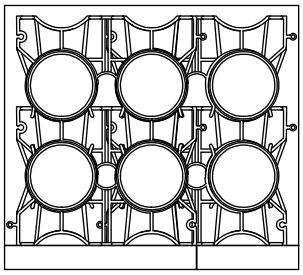
31 10 01 02
3-Ducts



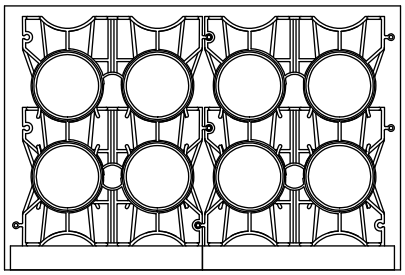
31 10 01 03
4-Ducts



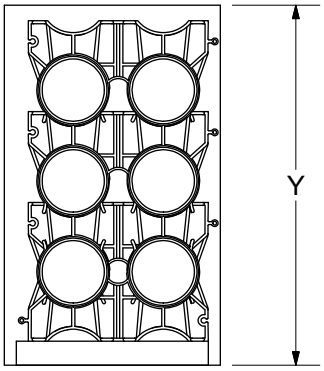
31 10 01 04
4-Ducts



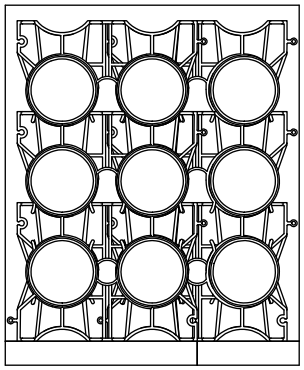
31 10 01 05
6-Ducts



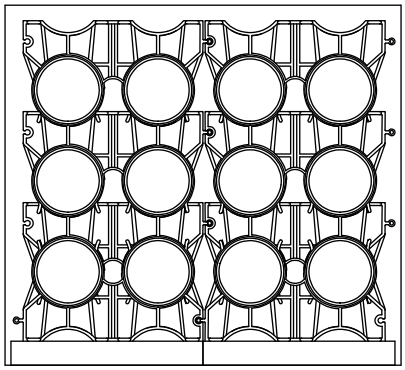
31 10 01 06
8-Ducts



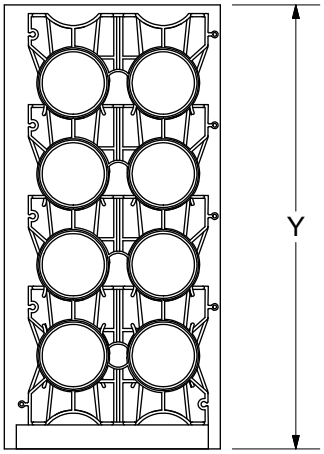
31 10 01 07
6-Ducts



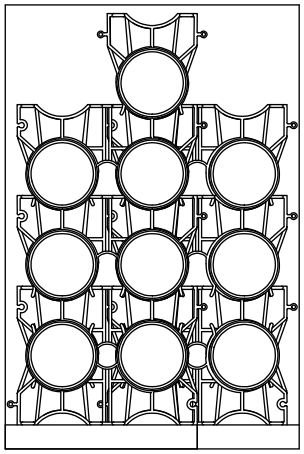
31 10 01 08
9-Ducts



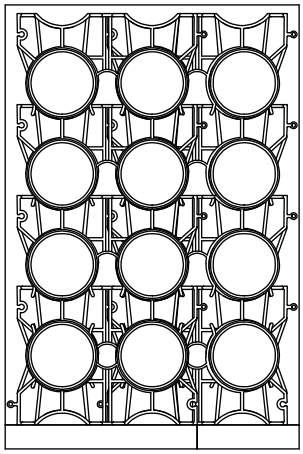
31 10 01 09
12-Ducts



31 10 01 10
8-Ducts



31 10 01 11
10-Ducts



31 10 01 12
12-Ducts

REV	DATE	ENG	DESCRIPTION
8	01/01/23	JMW	Converted to new format
7	07/04/15	EJB	

DCS #	Number of Ducts	Dimensions		
		X Min.	X*	Y
31 10 01 01	2	18"	24"	24"
31 10 01 02	3	25"	30"	30"
31 10 01 03	4	33"	36"	36"
31 10 01 04	4	18"	24"	24"
31 10 01 05	6	25"	30"	30"
31 10 01 06	8	33"	36"	36"
31 10 01 07	6	18"	24"	24"
31 10 01 08	9	25"	30"	30"
31 10 01 09	12	33"	36"	36"
31 10 01 10	8	18"	24"	24"
31 10 01 11	10	25"	30"	30"
31 10 01 12	12	33"	30"	36"

* Based on standard 24" or 36" bucket size used to dig trench.

CONSTRUCTION NOTE(s):

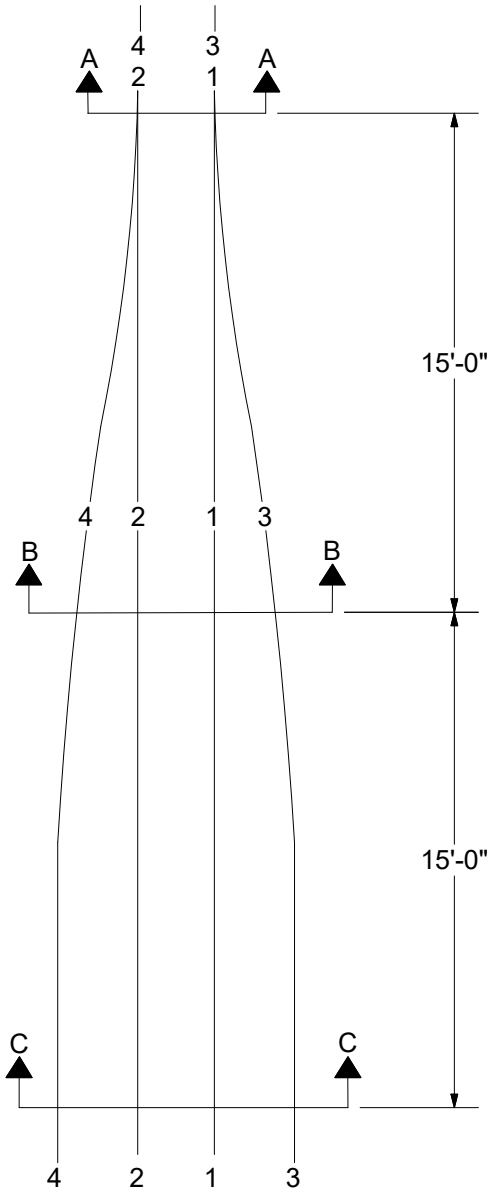
1. 4/0 copper bond wire shall be placed in the center of the spacer.
2. Spacers should be installed every 4 ft. for straight runs. If 10 ft. long ducts are used, reduce the 2 ft distance from spacer to ends to 1 ft. and maintain 4 ft. distance between other spacers.
3. Use extra spacers to use on large sweeps in a duct run. Sweeps need more spacers placed closer together.
4. If floatation is a concern, install restraint as necessary per installers' direction. Wood is not an acceptable material for restraint.
5. For duct banks stacked higher than 4 conduits, multiple concrete pours may be necessary to prevent ducts from collapsing.
6. Upon completion of duct bank, the integrity of each duct must be verified by pulling a mandrel through each duct.
7. In situations where the duct bank crosses an unsupported area or large sewer pipe, reinforcing the duct bank will be required per Ameren's direction.

ITEM	DCS/STOCK #	DESCRIPTION 31 10 01 **	01	02	03	04	05	06	07	08	09	10	11	12
A	12 01 335	Conduit - PVC, 5" x 20' EB 35	40	60	80	80	120	160	120	180	240	160	200	240
B	12 56 120	Spacer - Conduit 5"	10	20	20	15	30	30	20	40	40	25	45	50
C	11 54 128	Cement Block - Patio 2" x 8" x 16"	5	10	10	5	10	10	5	10	10	5	10	10
D	98 00 007	Concrete (Cu. Yd.)	1	2	2	2	3	3	3	4	4	3	5	5

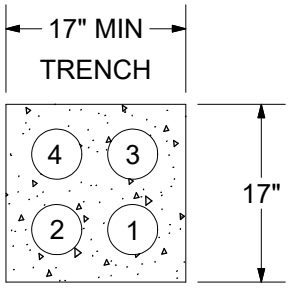
DESIGN NOTE(s):

1. Each DCS includes material for a 20 ft. duct formation.
2. This DCS illustrates the method and materials to be use in duct systems. Design and estimate actual material with DCS 31 11 03 ** to 31 12 03 **.

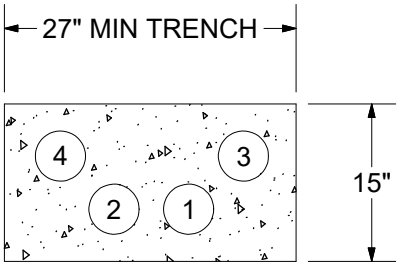
REV	DATE	ENG	DESCRIPTION
8	01/01/23	JMW	Converted to new format
7	07/04/15	EJB	



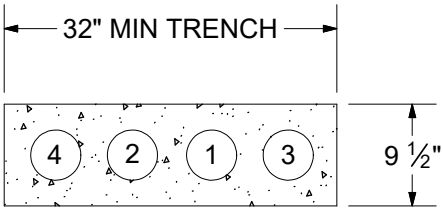
TOP VIEW



SECTION A-A



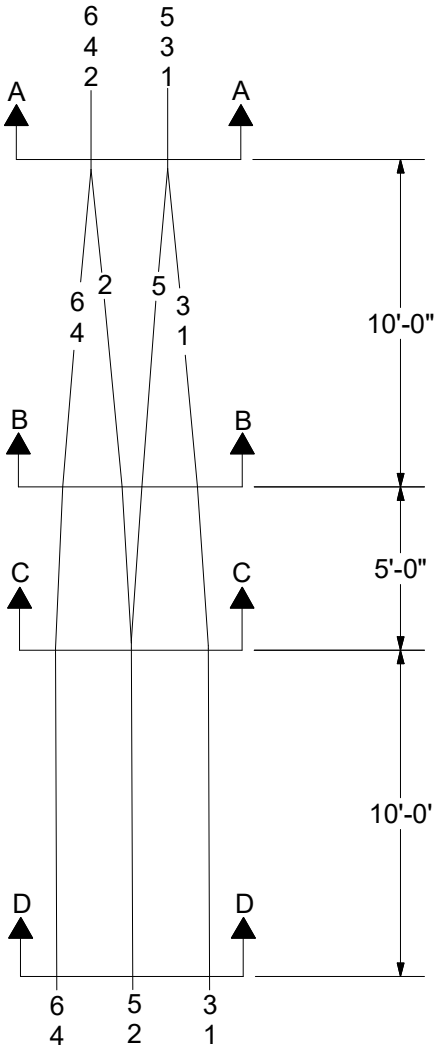
SECTION B-B



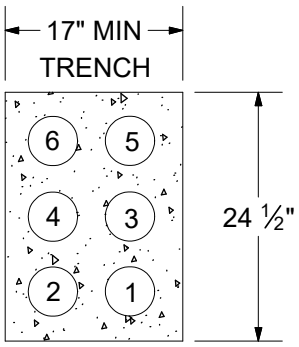
SECTION C-C

CONSTRUCTION NOTE(s):

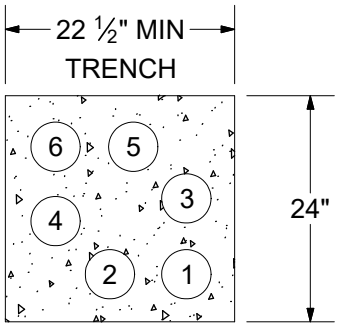
1. Dimensions based on 5" conduit.
2. Spacer blocks shall be used to maintain conduit spacing during transposition.



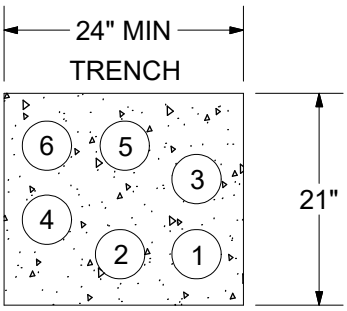
TOP VIEW



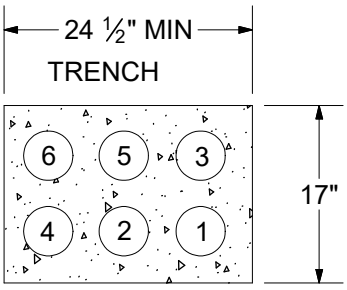
SECTION A-A



SECTION B-B



SECTION C-C

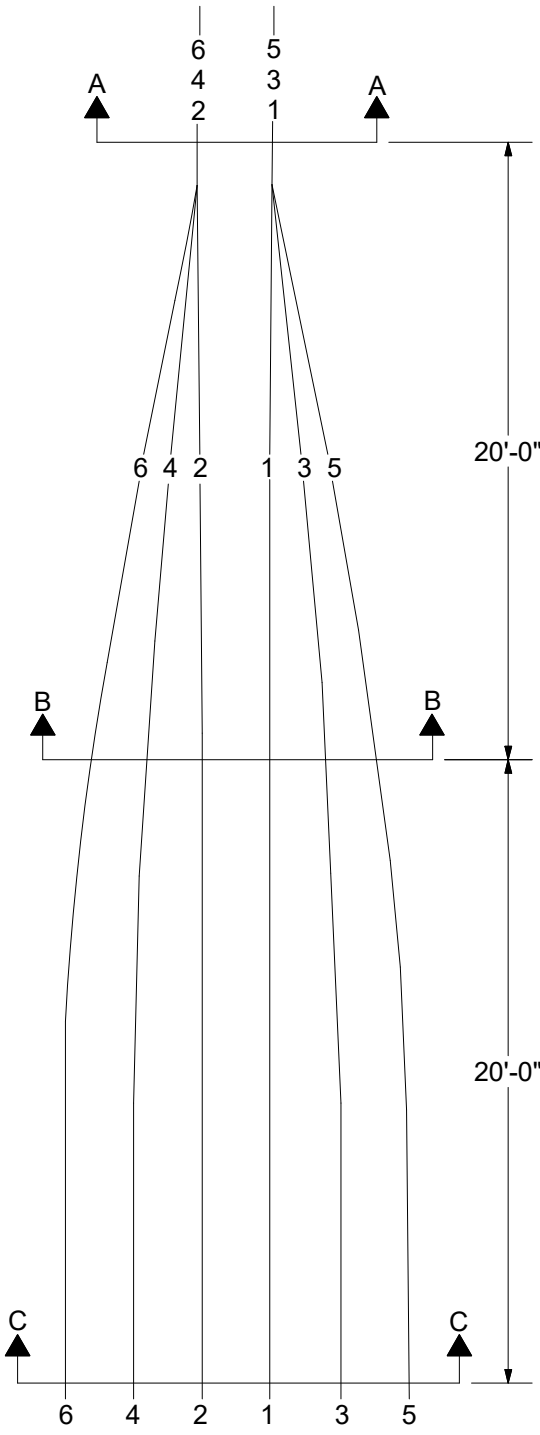


SECTION D-D
END VIEW

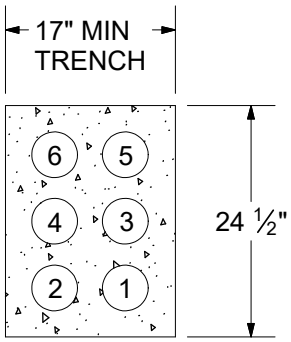
CONSTRUCTION NOTE(s):

1. Dimensions based on 5" conduit.
2. Spacer blocks shall be used to maintain conduit spacing during tansposition.

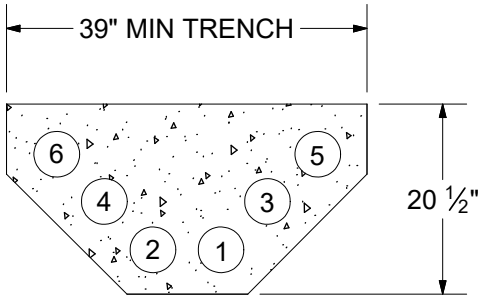
REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format
0	05/03/94	DDG	



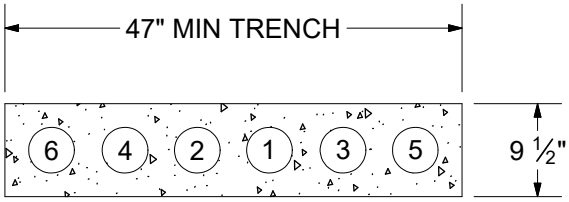
TOP VIEW



SECTION A-A



SECTION B-B

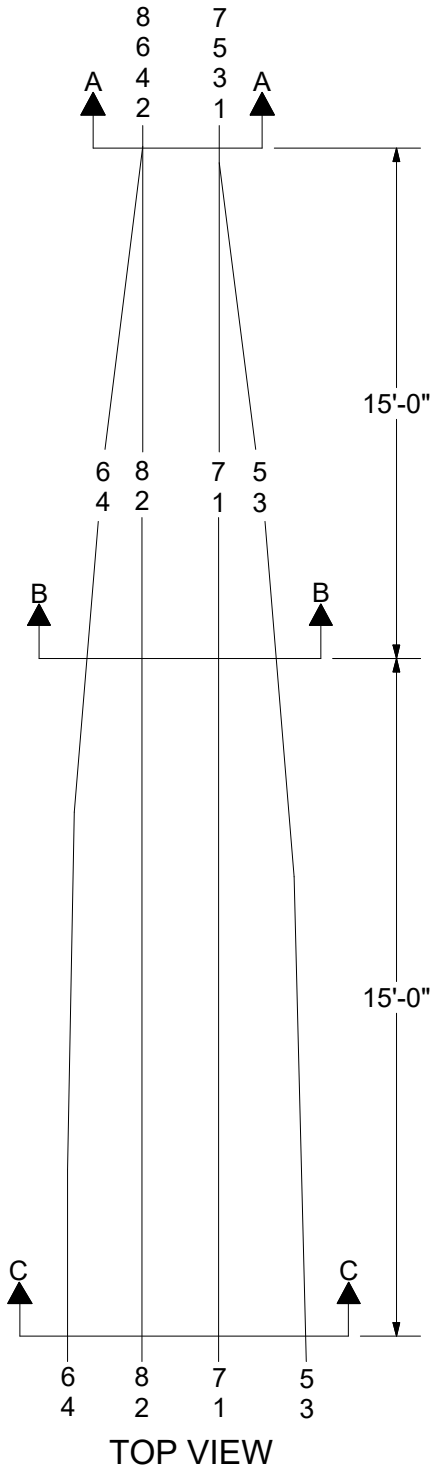


SECTION C-C

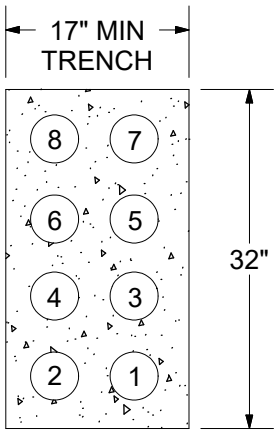
CONSTRUCTION NOTE(s):

1. Dimensions based on 5" conduit.
2. Spacer blocks shall be used to maintain conduit spacing during transposition.

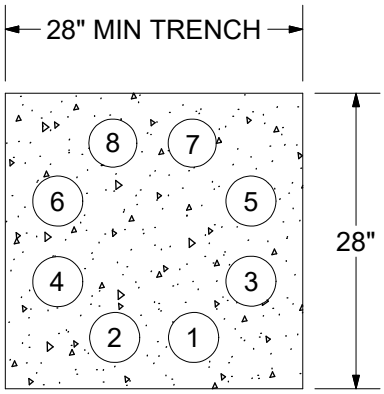
REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format
0	05/03/94	DDG	



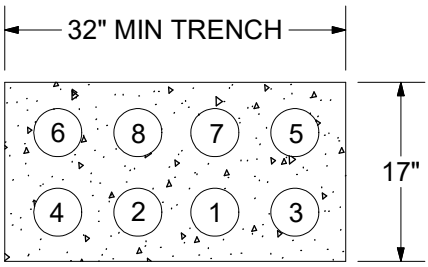
TOP VIEW



SECTION A-A



SECTION B-B

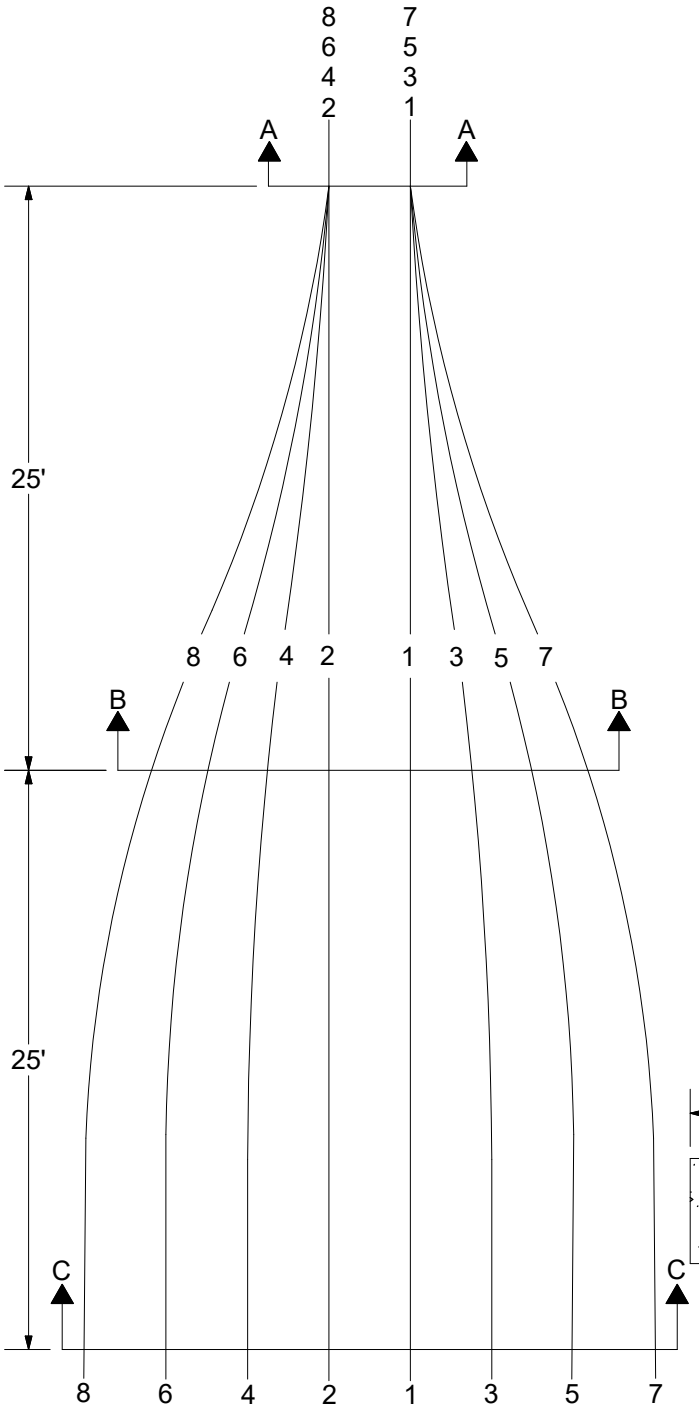


SECTION C-C

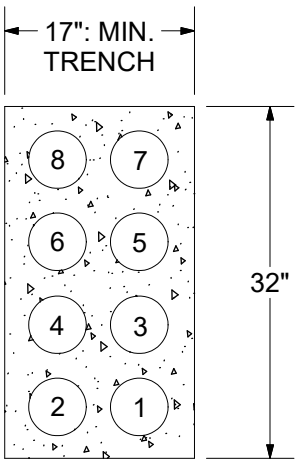
CONSTRUCTION NOTE(s):

1. Dimensions based on 5" conduit.
2. Spacer blocks shall be used to maintain conduit spacing during transposition.

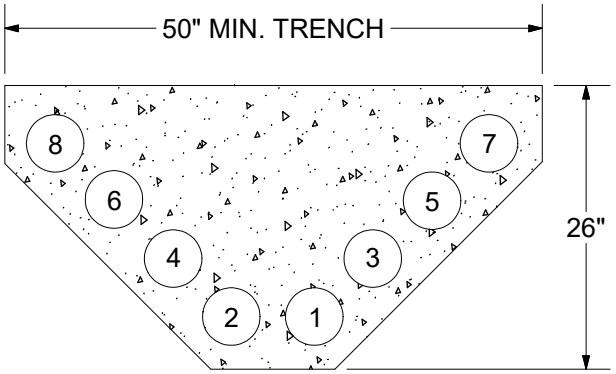
REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format
0	05/03/94	DDG	



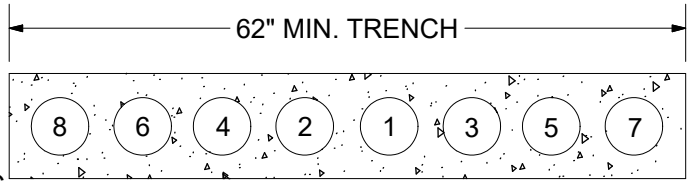
TOP VIEW



SECTION A-A



SECTION B-B

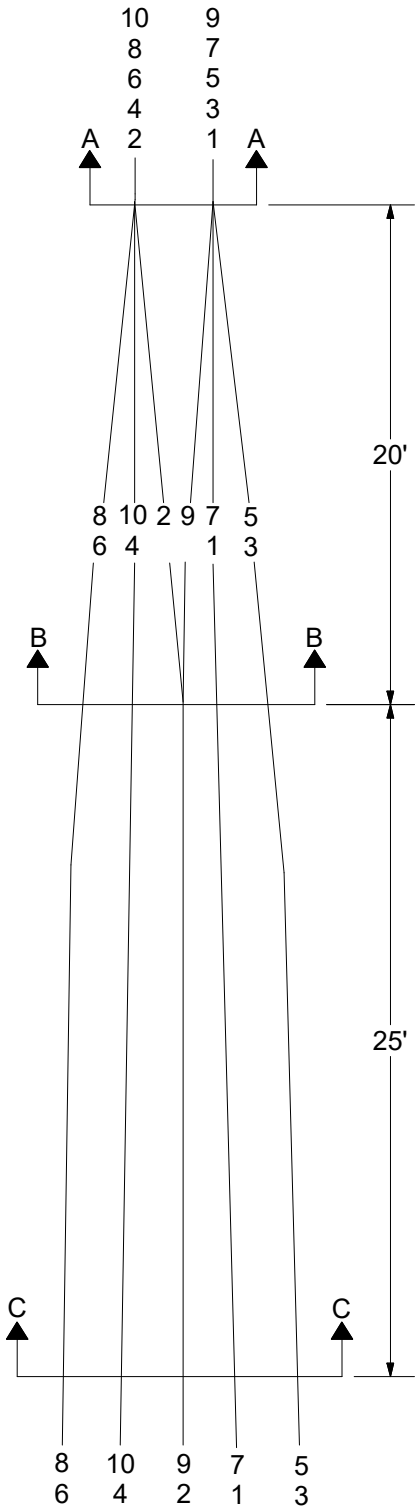


SECTION C-C

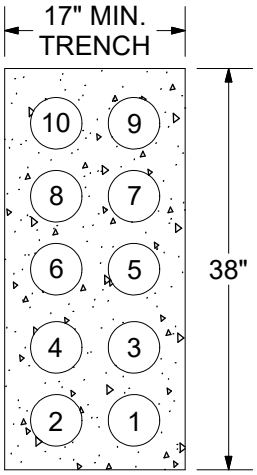
CONSTRUCTION NOTE(s)

1. Dimensions base on 5" conduit.
2. Spacer blocks shall be used to maintain conduit spacing during transposition.

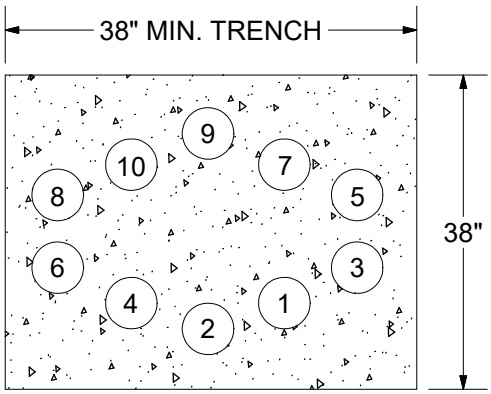
REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format
0	01/09/13	DDG	



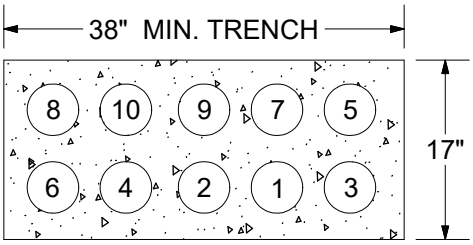
TOP VIEW



SECTION A-A



SECTION B-B



SECTION C-C

CONSTRUCTION NOTE(s):

1. Dimensions based on 5" conduit.
2. Spacer blocks shall be used to maintain conduit spacing during transposition.

REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format
0	05/03/94	DDG	

Quantity Per 100' Duct Run

	ITEM	STK / DCS #	DESCRIPTION 31 11 03 **	11	12	13	14
	A	12 01 335	Conduit - PVC, 5" x 20', EB 35	100	200	400	600
	B	11 54 128	Block - Concrete Patio	25	50	50	50
	C	12 56 120	Plastic Spacer - Conduit 5"	50	50	75	100
	D	98 00 014	Crushed Limestone	16	33	24	14
	E	98 00 007	Concrete - Conduit (C.Y.)	3	4	6	9
	F	18 52 030	Wire, 4/0 Cu S.D. (Ft.)	100	100	100	100
		RFIN	Op Code Rough Finish Concrete (S.F.)	100	160	160	160
@			Op Code Surface Removal (S.F.)	200	260	260	260
		36 CBTRN	Op Code Backhoe Trenching (L.F.)	100	100	100	100
		835	Op Code Hauling Spoil	2	4	4	4
		ATMP	Op Code Tamping (S.F.)	200	320	320	320
@			Op Code Surface Replacement (S.F.)	200	260	260	260
		831	Op Code Rodding (Duct Feet)	100	200	400	600

DESIGN NOTE(s):

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.

REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format
0	01/09/13	DDG	

Quantity Per 100' Duct Run

	ITEM	STK / DCS #	DESCRIPTION 31 11 04 **	11	12	13	14	15	16
	A	12 01 335	Conduit - PVC, 5" x 20', EB 35	100	200	400	600	800	1000
	B	11 54 128	Block - Concrete Patio	25	50	50	50	50	50
	C	12 56 120	Plastic Spacer - Conduit 5"	50	50	75	100	125	150
	D	98 00 014	Crushed Limestone	24	48	38	28	19	10
	E	98 00 007	Concrete - Conduit (C.Y.)	3	4	6	9	11	14
	F	18 52 030	Wire, 4/0 Cu S.D. (Ft.)	100	100	100	100	100	100
		RFIN	Op Code Rough Finish Concrete (S.F.)	100	160	160	160	160	160
@			Op Code Surface Removal (S.F.)	200	260	260	260	260	260
		48 CBTRN	Op Code Backhoe Trenching (L.F.)	100	100	100	100	100	100
		835	Op Code Hauling Spoil	3	6	6	6	6	6
		ATMP	Op Code Tamping (S.F.)	200	320	320	320	320	320
@			Op Code Surface Replacement (S.F.)	200	260	260	260	260	260
		831	Op Code Rodding (Duct Feet)	100	200	400	600	800	1000

DESIGN NOTE(s):

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.

Quantity Per 100' Duct Run

	ITEM	STK / DCS #	DESCRIPTION 31 11 05 **	11	12	13	14	15	16
	A	12 01 335	Conduit - PVC, 5" x 20', EB 35	100	200	400	600	800	1000
	B	11 54 128	Block - Concrete Patio	25	50	50	50	50	50
	C	12 56 120	Plastic Spacer - Conduit 5"	50	50	75	100	125	150
	D	98 00 014	Crushed Limestone	31	62	52	43	33	24
	E	98 00 007	Concrete - Conduit (C.Y.)	3	5	8	11	14	17
	F	18 52 030	Wire, 4/0 Cu S.D. (Ft.)	100	100	100	100	100	100
		RFIN	Op Code Rough Finish Concrete (S.F.)	100	185	185	185	185	185
@			Op Code Surface Removal (S.F.)	200	285	285	285	285	285
		60 CBTRN	Op Code Backhoe Trenching (L.F.)	100	100	100	100	100	100
		835	Op Code Hauling Spoil	4	7	7	7	7	7
		ATMP	Op Code Tamping (S.F.)	200	370	370	370	370	370
@			Op Code Surface Replacement (S.F.)	200	285	285	285	285	285
		831	Op Code Rodding (Duct Feet)	100	200	400	600	800	1000

DESIGN NOTE(s):

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.

REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format
0	01/09/13	DDG	

Quantity Per 100' Duct Run

	ITEM	STK / DCS #	DESCRIPTION 31 11 06 **	11	12	13	14	15	16
	A	12 01 335	Conduit - Plastic, 5" x 20', EB 35	100	200	400	600	800	1000
	B	11 54 128	Block - Concrete Patio	25	50	50	50	50	50
	C	12 56 120	Plastic Spacer - Conduit 5"	50	50	75	100	125	150
	D	98 00 014	Crushed Limestone	38	76	66	56	47	38
	E	98 00 007	Concrete - Conduit (C.Y.)	3	5	8	11	14	17
	F	18 52 030	Wire, 4/0 Cu S.D. (Ft.)	100	100	100	100	100	100
		RFIN	Op Code Rough Finish Concrete (S.F.)	100	185	185	185	185	185
@			Op Code Surface Removal (S.F.)	200	285	285	285	285	285
		72 CBTRN	Op Code Backhoe Trenching (L.F.)	100	100	100	100	100	100
		835	Op Code Hauling Spoil	5	9	9	9	9	9
		ATMP	Op Code Tamping (S.F.)	200	370	370	370	370	370
@			Op Code Surface Replacement (S.F.)	200	285	285	285	285	285
		831	Op Code Rodding (Duct Feet)	100	200	400	600	800	1000

NOTE(s):

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.

REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format
0	01/09/13	DDG	

Quantity Per 100' Duct Run

	ITEM	STK / DCS #	DESCRIPTION 31 11 07 **	11	12	13	14	15	16
	A	12 01 335	Conduit - PVC, 5" x 20', EB 35	100	200	400	600	800	1000
	B	11 54 128	Block - Concrete Patio	25	50	50	50	50	50
	C	12 56 120	Plastic Spacer - Conduit 5"	50	50	75	100	125	150
	D	98 00 014	Crushed Limestone	45	90	81	71	62	52
	E	98 00 007	Concrete - Conduit (C.Y.)	3	5	8	11	14	17
	F	18 52 030	Wire, 4/0 Cu S.D. (Ft.)	100	100	100	100	100	100
		RFIN	Op Code Rough Finish Concrete (S.F.)	100	185	185	185	185	185
@			Op Code Surface Removal (S.F.)	200	285	285	285	285	285
		84 CBTRN	Op Code Backhoe Trenching (L.F.)	100	100	100	100	100	100
		835	Op Code Hauling Spoil	5	10	10	10	10	10
		ATMP	Op Code Tamping (S.F.)	200	370	370	370	370	370
@			Op Code Surface Replacement (S.F.)	200	285	285	285	285	285
		831	Op Code Rodding (Duct Feet)	100	200	400	600	800	1000

DESIGN NOTE(s):

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.

REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format
0	01/09/13	DDG	

Quantity Per 100' Duct Run

	ITEM	STK / DCS #	DESCRIPTION 31 11 08 **	11	12	13	14	15	16
	A	12 01 335	Conduit - Plastic, 5" x 20', EB 35	100	200	400	600	800	1000
	B	11 54 128	Block - Concrete Patio	25	50	50	50	50	50
	C	12 56 120	Plastic Spacer - Conduit 5"	50	50	75	100	125	150
	D	98 00 014	Crushed Limestone	52	105	95	86	76	67
	E	98 00 007	Concrete - Conduit (C.Y.)	3	5	8	11	14	17
	F	18 52 030	Wire, 4/0 Cu S.D. (Ft.)	100	100	100	100	100	100
		RFIN	Op Code Rough Finish Concrete (S.F.)	100	185	185	185	185	185
@			Op Code Surface Removal (S.F.)	200	285	285	285	285	285
		96 CBTRN	Op Code Backhoe Trenching (L.F.)	100	100	100	100	100	100
		835	Op Code Hauling Spoil	6	12	12	12	12	12
		ATMP	Op Code Tamping (S.F.)	200	370	370	370	370	370
@			Op Code Surface Replacement (S.F.)	200	285	285	285	285	285
		831	Op Code Rodding (Duct Feet)	100	200	400	600	800	1000

DESIGN NOTE(s):

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.

REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format
0	01/09/13	DDG	

Quantity Per 100' Duct Run

	ITEM	STK / DCS #	DESCRIPTION 31 12 03 **	11	12	13
	A	12 01 335	Conduit - PVC, 5" x 20', EB 35	100	200	400
	B	11 54 128	Block - Concrete Patio	25	50	50
	C	12 56 120	Plastic Spacer - Conduit 5"	50	50	75
	D	98 00 014	Crushed Limestone	10	19	10
	E	98 00 007	Concrete - Conduit (C.Y.)	3	4	6
	G	98 00 001	Concrete Paving Base	3	5	5
	F	18 52 030	Wire, 4/0 Cu S.D. (Ft.)	100	100	100
		RFIN	Op Code Rough Finish Concrete (S.F.)	200	320	320
@			Op Code Surface Removal (S.F.)	200	260	260
		36 CBTRN	Op Code Backhoe Trenching (L.F.)	100	100	100
		835	Op Code Hauling Spoil	2	4	4
		ATMP	Op Code Tamping (S.F.)	200	320	320
@			Op Code Surface Replacement (S.F.)	200	260	260
		831	Op Code Rodding (Duct Feet)	100	200	400

DESIGN NOTE(s):

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.

REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format
0	01/09/13	DDG	

Quantity Per 100' Duct Run

	ITEM	STK / DCS #	DESCRIPTION 31 12 04 **	11	12	13	14	15
	A	12 01 335	Conduit - PVC, 5" x 20', EB 35	100	200	400	600	800
	B	11 54 128	Block - Concrete Patio	25	50	50	50	50
	C	12 56 120	Plastic Spacer - Conduit 5"	50	50	75	100	125
		98 00 014	Crushed Limestone	17	33	24	14	4
	D	98 00 007	Concrete - Conduit (C.Y.)	3	4	6	9	11
	E	98 00 001	Concrete - Paving Base	3	5	5	5	5
	F	18 52 030	Wire, 4/0 Cu S.D. (Ft.)	100	100	100	100	100
		RFIN	Op Code Rough Finish Concrete (S.F.)	200	320	320	320	320
@			Op Code Surface Removal (S.F.)	100	260	260	260	260
		48 CBTRN	Op Code Backhoe Trenching (L.F.)	100	100	100	100	100
		835	Op Code Hauling Spoil	3	6	6	6	6
		ATMP	Op Code Tamping (S.F.)	200	320	320	320	320
@			Op Code Surface Replacement (S.F.)	200	260	260	260	260
		831	Op Code Rodding (Duct Feet)	100	200	400	600	800

DESIGN NOTE(s):

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.

REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format
0	01/09/13	DDG	

Quantity Per 100' Duct Run

	ITEM	STK / DCS #	DESCRIPTION 31 12 05 **	11	12	13	14	15	16
	A	12 01 335	Conduit - PVC, 5" x 20', EB 35	100	200	400	600	800	1000
	B	11 54 128	Block - Concrete Patio	25	50	50	50	50	50
	C	12 56 120	Plastic Spacer - Conduit 5"	50	50	75	100	125	150
	D	98 00 014	Crushed Limestone	24	48	38	29	19	10
	E	98 00 007	Concrete - Conduit (C.Y.)	3	5	8	11	14	17
	F	98 00 001	Concrete - Paving Base	3	6	6	6	6	6
	G	18 52 030	Wire - 4/0 Cu S.D. (Ft.)	100	100	100	100	100	100
		RFIN	Op Code Rough Finish Concrete (S.F.)	200	370	370	370	370	370
@			Op Code Surface Removal (S.F.)	100	285	285	285	285	285
		60 CBTRN	Op Code Backhoe Trenching (L.F.)	100	100	100	100	100	100
		835	Op Code Hauling Spoil	4	7	7	7	7	7
		ATMP	Op Code Tamping (S.F.)	200	370	370	370	370	370
@			Op Code Surface Replacement (S.F.)	200	285	285	285	285	285
		831	Op Code Rodding (Duct Feet)	100	200	400	600	800	1000

DESIGN NOTE(s):

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.

REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format
0	01/19/13	DDG	

Quantity Per 100' Duct Run

	ITEM	STK / DCS #	DESCRIPTION 31 12 06 **	11	12	13	14	15	16
	A	12 01 335	Conduit - PVC, 5" x 20', EB 35	100	200	400	600	800	1000
	B	11 54 128	Block - Concrete Patio	25	50	50	50	50	50
	C	12 56 120	Plastic Spacer - Conduit 5"	50	50	75	100	125	150
	D	98 00 014	Crushed Limestone	31	62	52	43	33	24
	E	98 00 007	Concrete - Conduit (C.Y.)	3	5	8	11	14	17
	F	98 00 001	Concrete - Paving Base	3	6	6	6	6	6
	G	18 52 030	Wire, 4/0 Cu S.D. (Ft.)	100	100	100	100	100	100
		RFIN	Op Code Rough Finish Concrete (S.F.)	200	370	370	370	370	370
@			Op Code Surface Removal (S.F.)	100	285	285	285	285	285
		72 CBTRN	Op Code Backhoe Trenching (L.F.)	100	100	100	100	100	100
		835	Op Code Hauling Spoil	5	9	9	9	9	9
		ATMP	Op Code Tamping (S.F.)	200	370	370	370	370	370
@			Op Code Surface Replacement (S.F.)	200	285	285	285	285	285
		831	Op Code Rodding (Duct Feet)	100	200	400	600	800	1000

DESIGN NOTE(s):

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.

Quantity Per 100' Duct Run

	ITEM	STK / DCS #	DESCRIPTION 31 12 07 **	11	12	13	14	15	16
	A	12 01 335	Conduit - PVC, 5" x 20', EB 35	100	200	400	600	800	1000
	B	11 54 128	Block - Concrete Patio	25	50	50	50	50	50
	C	12 56 120	Plastic Spacer - Conduit 5"	50	50	75	100	125	150
	D	98 00 014	Crushed Limestone	38	76	67	57	48	38
	E	98 00 007	Concrete - Conduit (C.Y.)	3	5	8	11	14	17
	F	98 00 001	Concrete - Paving Base	3	6	6	6	6	6
	G	18 52 030	Wire - 4/0 Cu S.D. (Ft.)	100	100	100	100	100	100
		RFIN	Op Code Rough Finish Concrete (S.F.)	200	370	370	370	370	370
@			Op Code Surface Removal (S.F.)	100	285	285	285	285	285
		84 CBTRN	Op Code Backhoe Trenching (L.F.)	100	100	100	100	100	100
		835	Op Code Hauling Spoil	5	10	10	10	10	10
		ATMP	Op Code Tamping (S.F.)	200	370	370	370	370	370
@			Op Code Surface Replacement (S.F.)	200	285	285	285	285	285
		831	Op Code Rodding (Duct Feet)	100	200	400	600	800	1000

DESIGN NOTE(s):

1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.

REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format
0	01/09/13	DDG	

Quantity Per 100' Duct Run

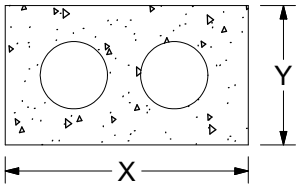
	ITEM	STK / DCS #	DESCRIPTION 31 12 08 **	11	12	13	14	15	16
	A	12 01 335	Conduit - PVC, 5" x 20', EB 35	100	200	400	600	800	1000
	B	11 54 128	Block - Concrete Patio	25	50	50	50	50	50
	C	12 56 120	Plastic Spacer - Conduit 5"	50	50	75	100	125	150
	D	98 00 014	Crushed Limestone	46	90	81	72	60	52
	E	98 00 007	Concrete - Conduit (C.Y.)	3	5	8	11	14	17
	F	98 00 001	Concrete - Paving Base	3	6	6	6	6	6
	G	18 52 030	Wire, 4/0 Cu S.D. (Ft.)	100	100	100	100	100	100
		RFIN	Op Code Rough Finish Concrete (s.f.)	200	370	370	370	370	370
@			Op Code Surface Removal (S.F.)	100	285	285	285	285	285
		96 CBTRN	Op Code Backhoe Trenching (L.F.)	100	100	100	100	100	100
		835	Op Code Hauling Spoil	6	12	12	12	12	12
		ATMP	Op Code Tamping (S.F.)	200	370	370	370	370	370
@			Op Code Surface Replacement (S.F.)	200	285	285	285	285	285
		831	Op Code Rodding (Duct Feet)	100	200	400	600	800	1000

DESIGN NOTE(s):

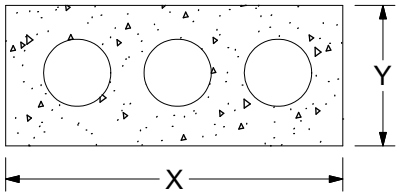
1. Estimator to show duct construction in units of "Feet", i.e., 180 Ft. duct run, should be shown as 180 in quan. column. Computer will interpret 180 as 180% and multiply units listed above by 1.8 to obtain desired results.
2. The quantity shown in the adder item is for a duct run of 100'. For a duct run other than 100', the quantity of the adder item (@) must be adjusted by the estimator.

REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format

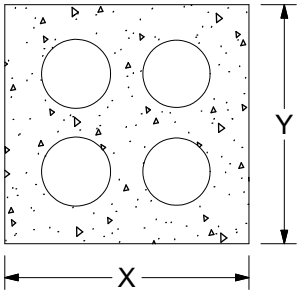
ILLINOIS ONLY



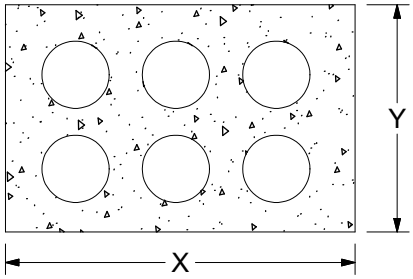
31 13 01 02
2-DUCTS



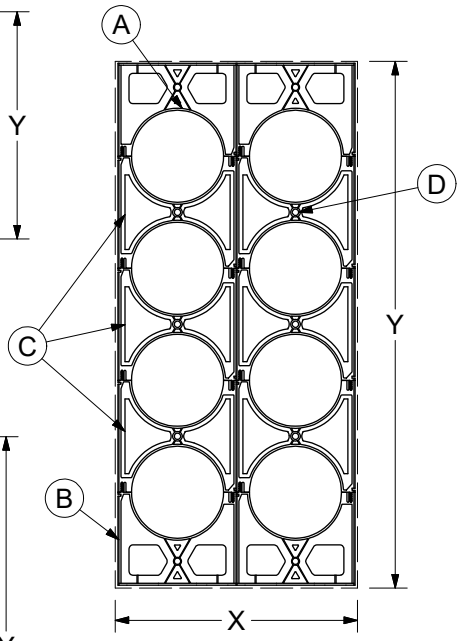
31 13 01 03
3-DUCTS



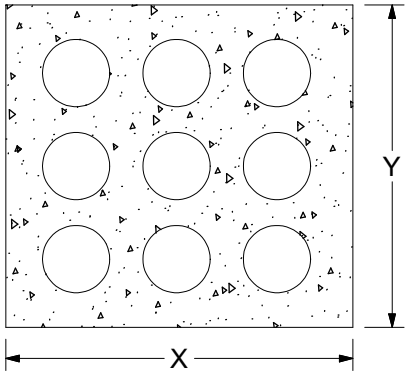
31 13 01 04
4-DUCTS



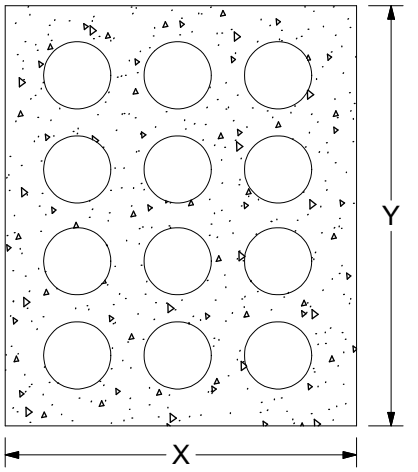
31 13 01 06
6-DUCTS



31 13 01 08
8-DUCTS



31 13 01 09
9-DUCTS



31 13 01 12
12-DUCTS

REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format
0	01/11/13	DDG	

ILLINOIS ONLY

CONSTRUCTION NOTE(s):

1. Spacers should be installed every 10 Ft. for straight runs.
2. Use extra spacers on large sweeps in a duct run. Sweeps need more spacers placed closer together.
3. To keep conduits from floating when when the concrete is poured, attach the duct bank to rebar stakes with rebar tie wire. Contractors usually supply the rebar and tie wire.

DCS #	NUMBER OF DUCTS	DEMINSIONS	
		X	Y
31 13 01 02	2	17-3/4"	10-3/4"
31 13 01 03	3	24-3/4"	10-3/4"
31 13 01 04	4	17-1/4"	17-3/4"
31 13 01 06	6	24-3/4"	17-3/4"
31 13 01 08	8	17-1/4"	31-3/4"
31 13 01 09	9	24-3/4"	24-3/4"
31 13 01 12	12	24-3/4"	31-3/4"

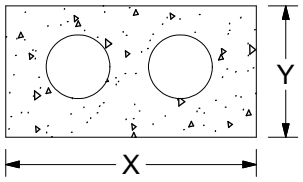
ITEM	STK / DCS #	DESCRIPTION 31 13 01 **	02	03	04	06	08	09	12
A	12 01 335	Conduit - PVC, 5" x 20', EB 35	40	60	80	120	160	180	240
B	40 83 015	Spacer - Conduit, 5", Base	4	6	4	6	4	6	6
C	40 83 016	Spacer - Conduit, 5", Intermediate	-	-	4	6	12	12	18
D	98 00 007	Concrete - Conduit (Cu. Yd.)	0.74	1.01	1.10	1.53	1.85	2.05	2.58

DESIGN NOTE(s):

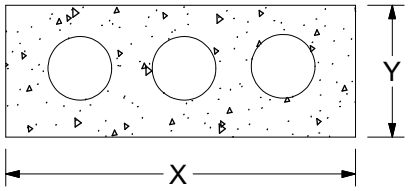
4. Each DCS includes material for a 20 Ft. duct formation.

REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format
0	01/11/13	DDG	

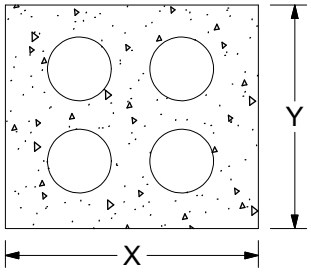
ILLINOIS ONLY



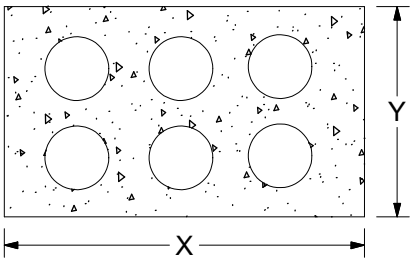
31 13 02 02
2-DUCTS



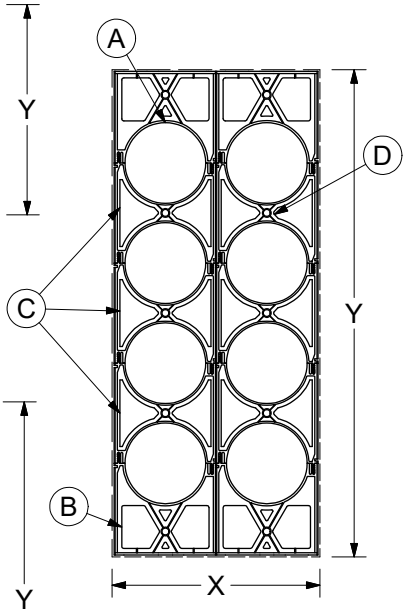
31 13 02 03
3-DUCTS



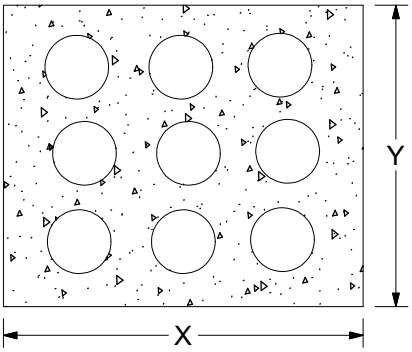
31 13 02 04
4-DUCTS



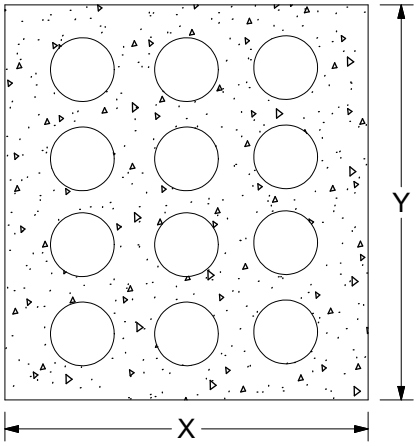
31 13 02 06
6-DUCTS



31 13 02 08
8-DUCTS



31 13 02 09
9-DUCTS



31 13 02 12
12-DUCTS

REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format
0	01/11/13	DDG	

ILLINOIS ONLY

CONSTRUCTION NOTE(s):

1. Spacers should be installed every 10 ft. for straight runs.
2. Use extra spacers on large sweeps in a duct run. Sweeps need more spacers placed closer together.
3. To keep conduits from floating when when the concrete is poured, attach the duct bank to rebar stakes with rebar tie wire. Contractors usually supply the rebar and tie wire.

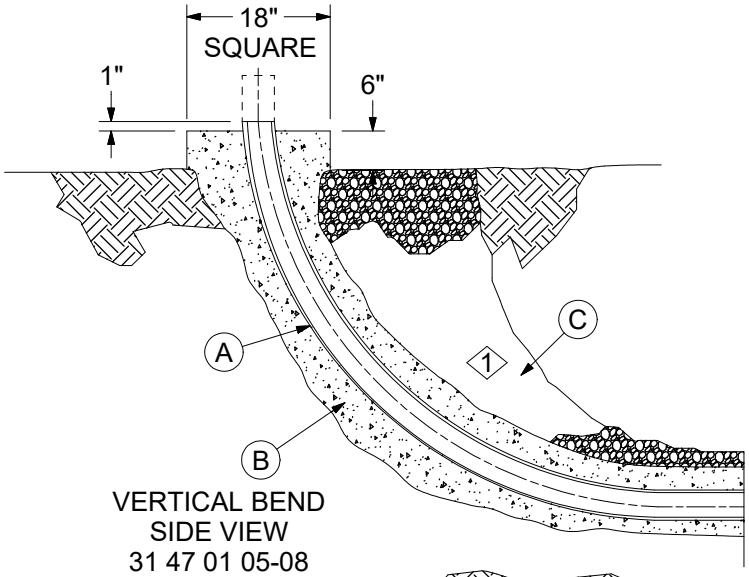
DCS #	NUMBER OF DUCTS	DIMENSIONS	
		X	Y
31 13 02 02	2	15"	9-1/2"
31 13 02 03	3	21-1/2"	9-1/2"
31 13 02 04	4	15"	15-1/2"
31 13 02 06	6	21-1/2"	15-1/2"
31 13 02 08	8	15"	27-1/2"
31 13 02 09	9	21-1/2"	21-1/2"
31 13 02 12	12	21-1/2"	27-1/2"

ITEM	STK/DCS #	DESCRIPTION 31 13 02 **	02	03	04	06	08	09	12
A	12 01 337	Conduit - PVC, 4" x 20', EB 35	40	60	80	120	160	180	240
B	40 83 014	Spacer- Conduit , 4", Base	4	6	4	6	4	6	6
C	40 83 013	Spacer- Conduit , 4", Intermediate	-	-	4	6	12	12	18
D	98 00 007	Concrete - Conduit (Cu. Yd.)	0.57	0.81	0.87	1.22	1.47	1.65	2.08

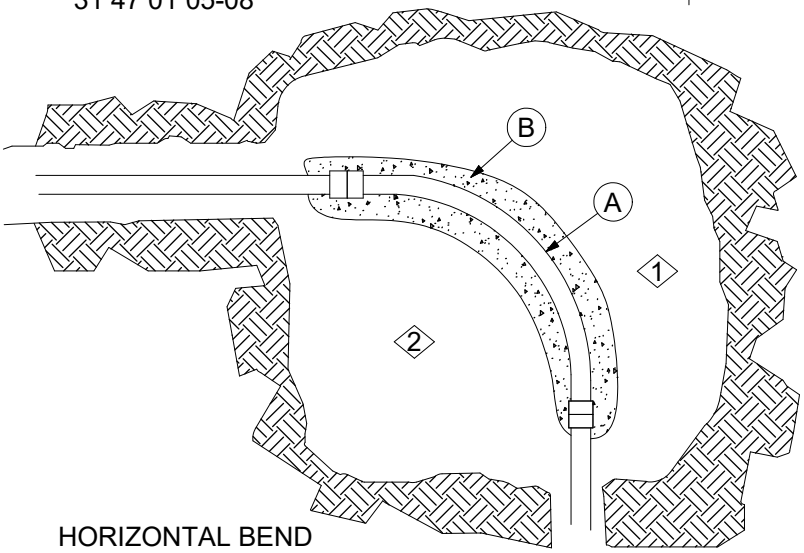
DESIGN NOTE(s):

4. Each DCS includes material for a 20 ft. duct formation.

REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format
0	01/11/13	DDG	



VERTICAL BEND
SIDE VIEW
31 47 01 05-08



HORIZONTAL BEND
TOP VIEW
31 47 01 01-04

CONSTRUCTION NOTE(s):

1. Normal encasement is approximately 5". Minimum encasements is 3".

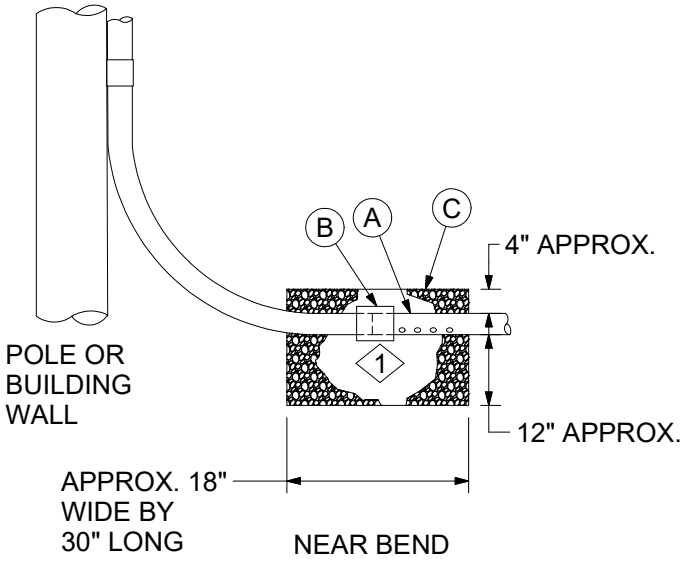
2. Compact soil around bend and concrete.

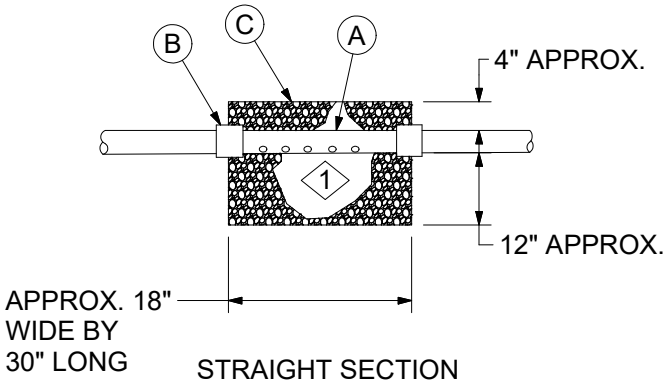
	ITEM	STK / DCS #	DESCRIPTION 31 47 01 **	01	02	03	04	05	06	07	08
	A	12 51 180	Bend 2" x 36" Rad.	1	-	-	-	1	-	-	-
		12 51 173	Bend 3" x 36" Rad.	-	1	-	-	-	1	-	-
		12 51 176	Bend 4" x 36" Rad.	-	-	1	-	-	-	1	-
		12 51 206	Bend 5" x 36" Rad.	-	-	-	1	-	-	-	1
	B	11 04 105	Concrete or Flowable fill (C.Y.)	4	5	6	7	6	7	8	9
	C	98 00 014	Crushed Rock C.Y.	-	-	-	-	1/2	1/2	1/2	1/2
@		36 CBTRN	Op Code Backhoe Trench (L.F.)	4	4	4	4	4	4	4	4

DESIGN NOTES(s):

3. For use with conduit bends to terminal poles and switchgear.

REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format
0	02/08/95	DDG	





CONSTRUCTION NOTE(s):

1. Drill six 1/2" diameter holes on 4" centers.

	ITEM	STK / DCS #	DESCRIPTION 31 47 02 **	01	02	03	04
	A	12 01 280	Conduit - PVC, 2" x 10', Sch. 40	1	-	-	-
		12 01 279	Conduit - PVC, 3" x 10', Sch. 40	-	1	-	-
		12 01 278	Conduit - PVC, 4" x 10', Sch. 40	-	-	1	-
		12 01 330	Conduit - PVC, 5" x 10', Sch. 40	-	-	-	1
	B	12 51 181	Coupling 2"	2	-	-	-
		12 51 158	Coupling 3"	-	2	-	-
		12 51 157	Coupling 4"	-	-	2	-
		12 51 156	Coupling 5"	-	-	-	2
@	C	98 00 014	Rock, Crushed, Clean	#	#	#	#

REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format
0	02/08/95	DDG	

MANHOLES AND VAULTS 32

PRECAST MANHOLE - 6’-0” X 17’-6” X 7'-0".....32 21 01 **

PRECAST MANHOLE - 4'-0” X 10’-0” X 6'-0".....32 21 02 **

PRECAST MANHOLE - 6'-0" X 14'-0" X 7'-0".....32 21 03 **

PRECAST MANHOLE - 6'-0" X 12'-0" X 7'-0" (TYPE 38Y - ROOF A).....IL ONLY.....32 21 04 **

PRECAST MANHOLE - 6'-0" X 12'-0" X 7'-0" (TYPE 38Y - J4 ROOF A).....IL ONLY.....32 21 05 **

PRECAST MANHOLE - 6'-0" X 12'-0" (TYPE 38Y- J4 ROOF D).....IL ONLY.....32 21 06 **

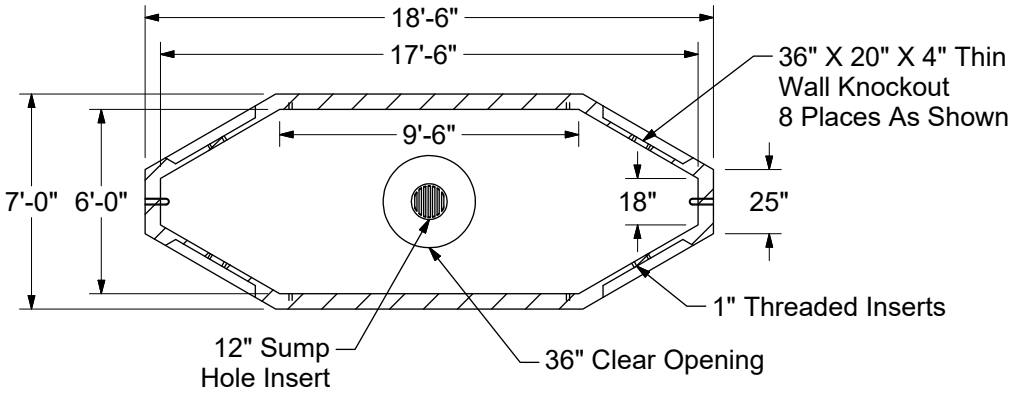
PRECAST MANHOLE - 3 WAY - 9'-0" X 17'-7".....32 22 01 **

PRECAST VAULT - 3' X 5' X 3.5' DEPTH .....32 24 01 **

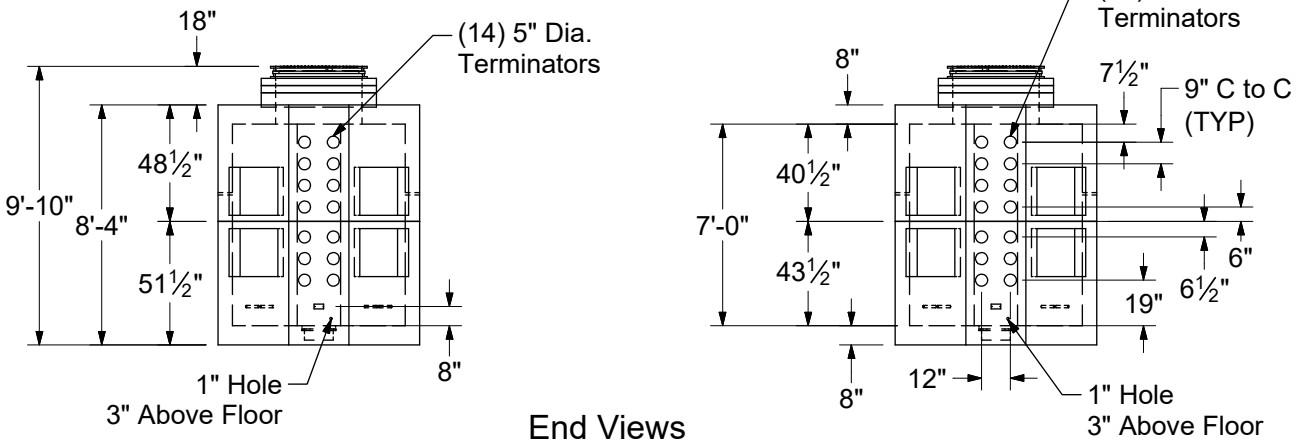
PRECAST VAULT - 4' X 8' X 4' DEPTH.....32 24 02 **

FIBERCRETE OR POLYETHYLENE VAULT - 3' X 5' X 3.5' DEPTH.....32 24 03 **

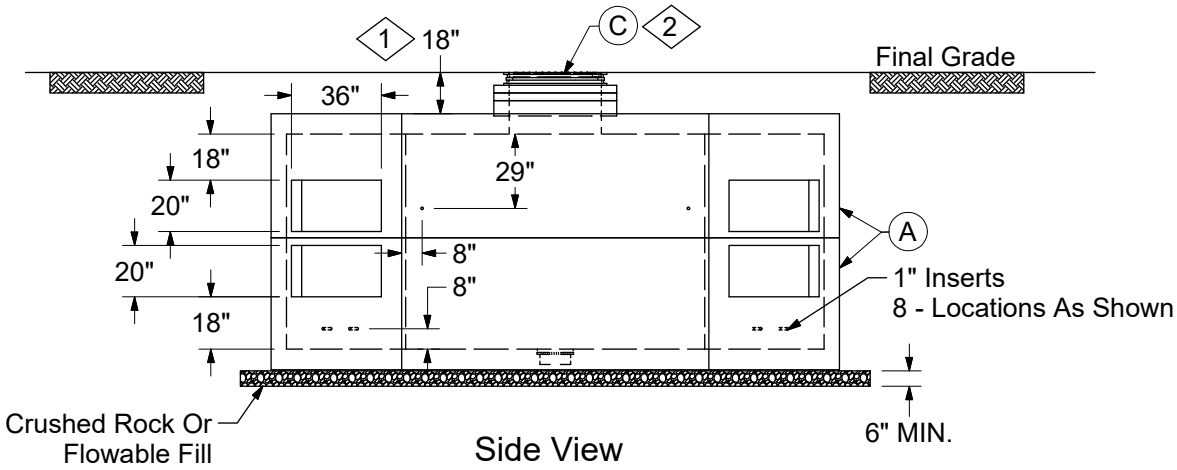
POLYETHYLENE SPLICE BOX - 2' X 4' X 2' DEPTH.....32 24 04 01



Top View



End Views



Side View

REV	DATE	ENG	DESCRIPTION
13	01/01/24	JMW	Converted to new format
12	04/23/14	EJB	

CONSTRUCTION NOTE(s):

1. Preferred setting depth is 18" as shown. Minimum setting depth is 12" and maximum is 60".

2. Preferred collar configuration is one 6" and two 3" for 12" thickness. The 3" necks are required on all manholes and shall be the top two collars. Add the required necks so that frame and cover are at final grade. 3" thick collar is Stock #12 06 062 and 6" thick collar is Stock #12 06 063.

3. Weights are as follows: Top Section - 20,980 lbs., Base Section - 21,559 lbs., Total - 42,579 lbs.

DCS #	DESCIPTION
32 21 01 01	18" Setting Depth
32 21 01 02	60" Setting Depth

	ITEM	STK / DCS #	DESCRIPTION 32 21 01 **	01	02
	A	12 06 235	Manhole - Top, Precast Concrete	1	1
		12 06 236	Manhole - Bottom, Precast Concrete	1	1
	B	98 00 006	Concrete - 2 Sack (c.y.)	8	8
	C	**33 12 01 01**	Frame and Cover 36" Dia. x 18" Deep	1	-
		32 12 01 02	Frame and Cover 36" Dia. x 60" Deep	-	1
	D	19 04 327	Grate - 14"	1	1
	E	**33 11 ** ****	Wingwall Bays	#	#
	F	98 00 014	Crushed Rock (c.y.)	1.33	1.33
	G	12 53 017	Shield, Duct, Cable	12	12
6	H	12 56 113	Cable Mounting Arm - 14"	#	#
6	I	12 56 112	Cable Mounting Arm - 18"	#	#
6	J	12 56 114	Cable Mounting Arm - 7-1/2"	#	#
6	K	12 56 125	J Hook - 5"	#	#
	L	**33 20 02 03**	Grounding System, 6' x 17' Manhole	1	1
@			Op Code, Excavation (Mach.) (c.y.)	50	70
@			Op Code, Backfilling (Mach.) (c.y.)	12	31
@			Op Code, Tamping (s.f)	130	130
@			Op Code, Surface Removal (s.f.)	130	130
@			Op Code, Surface Replacement (s.f.)	130	130
@			Op Code, Loading Out (c.y.)	#	#

DESIGN NOTE(s):

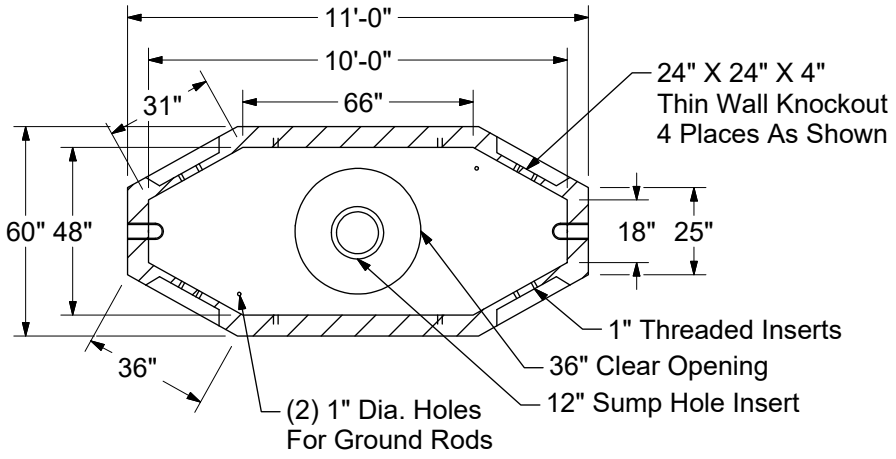
4. 5.32 Cubic yards of dirt removed per foot of excavation.

5. Add the required number of 6" concrete (Stock #12 06 063) and 3" concrete (Stock #12 06 062) necks so that the frame and cover are at final grade.

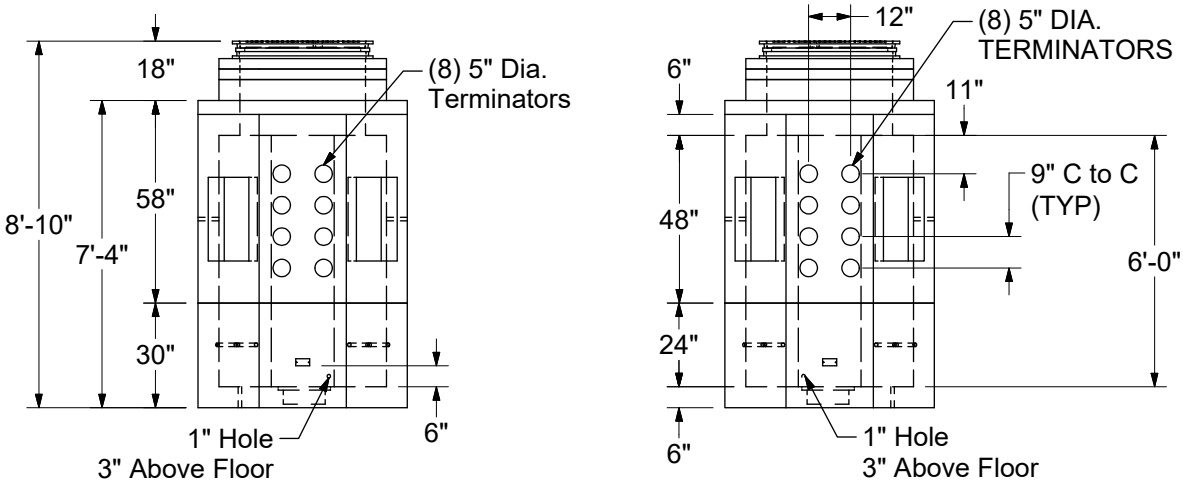
6. Manhole are equipped with the cable mounting racks. Add the required number of cable mounting arms to suspend the installed cables.

7. Traffic Rated Design - H-20 16,000 pounds wheel load.

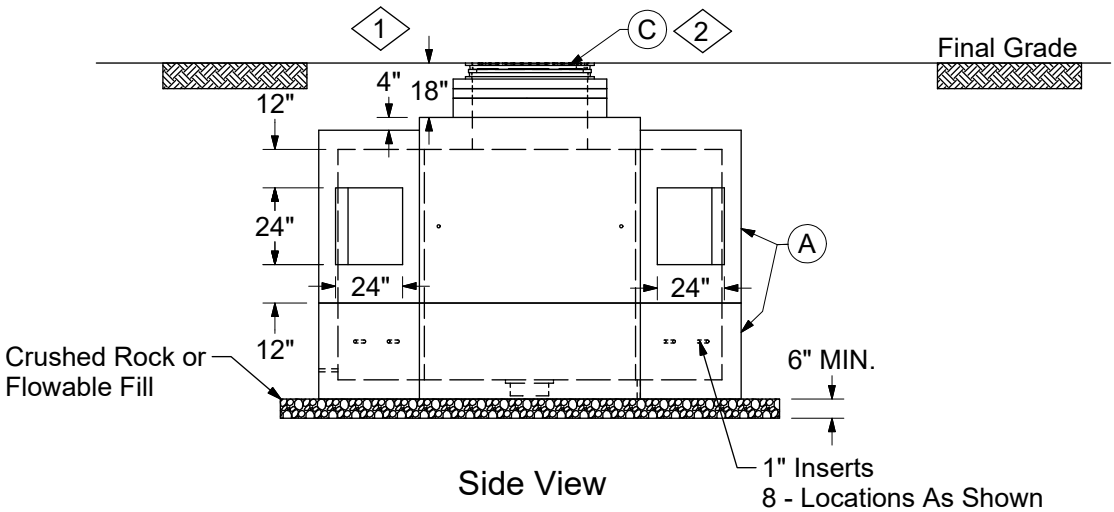
REV	DATE	ENG	DESCRIPTION
13	01/01/24	JMW	Converted to new format
12	04/23/14	EJB	



Top View



End Views



Side View

REV	DATE	ENG	DESCRIPTION
8	01/01/24	JMW	Converted to new format
7	12/12/12	DDG	

CONSTRUCTION NOTE(s):

1. Preferred setting depth is 18" as shown. Minimum setting depth is 12" and maximum is 60".

2. Preferred collar configuration is one 6" and two 3" for 12" thickness. The 3" necks are required on all manholes and shall be the top two collars. Add the required necks so that frame and cover are at final grade. 3" thick collar is Stock #12 06 062 and 6" thick collar is Stock #12 06 063.

3. Weights are as follows: Top Section - 13,200 lbs., Base Section - 7,350 lbs., Total - 20,550 lbs.

DCS #	DESCRIPTION
32 21 02 01	18" Setting Depth
32 21 02 02	60" Setting Depth

	ITEM	STK / DCS #	DESCRIPTION 32 21 02 **	01	02
	A	12 06 231	Manhole - Top, Precast Concrete	1	1
		12 06 232	Manhole - Bottom, Precast Concrete	1	1
	B	98 00 006	Concrete - 2 Sack (c.y.)	4	4
	C	**33 12 01 01**	Frame and Cover 36" Dia. x 18" Deep	1	-
		33 12 01 02	Frame and Cover 36" Dia. x 60" Deep	-	1
	D	19 04 327	Grate - 14"	1	1
	E	**33 11 ** ****	Wingwall Bays	#	#
	F	98 00 014	Crushed Rock (c.y.)	2/3	2/3
	G	12 53 017	Shield, Duct, 3" thru 6"	4	4
6	H	12 56 113	Cable Mounting Arm - 14"	#	#
6	I	12 56 112	Cable Mounting Arm - 18"	#	#
6	J	12 56 114	Cable Mounting Arm - 7-1/2"	#	#
6	K	12 56 125	J Hook - 5"	#	#
	L	**32 20 02 01**	Grounding System, 4' x 10' Manhole	1	1
@			Op Code, Excavation (Mach.) (c.y.)	18	27
@			Op Code, Backfilling (Mach.) (c.y.)	4	11
@			Op Code, Tamping (s.f.)	70	70
@			Op Code, Surface Removal (s.f.)	70	70
@			Op Code, Surface Replacement (s.f.)	70	70
@			Op Code, Loading Out (c.y.)	#	#

DESIGN NOTE(s):

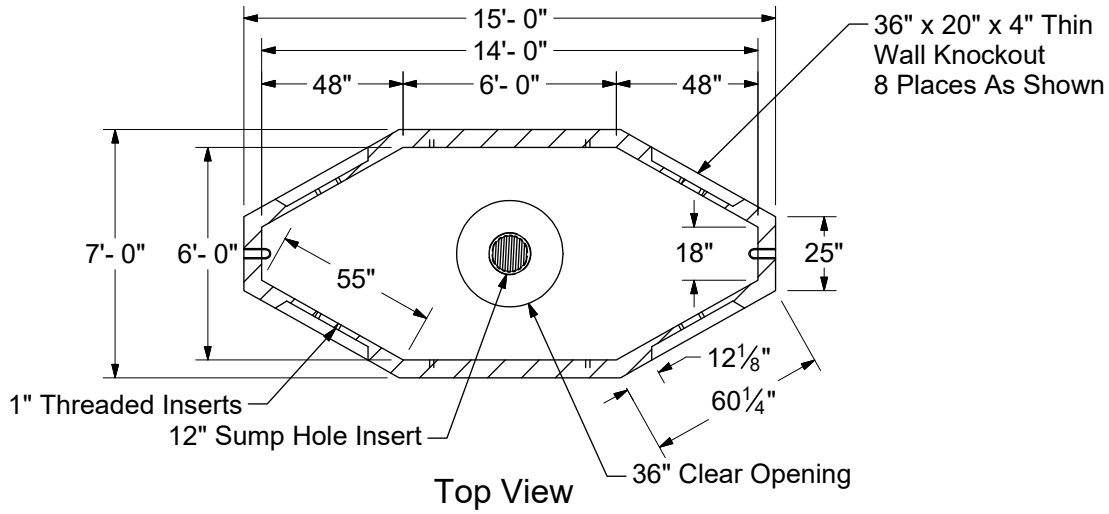
4. 2.45 Cubic yards of dirt removed per foot of excavation.

5. Add the required number of 6" concrete (Stock #12 06 063) and 3" concrete (Stock #12 06 062) necks so that the frame and cover are at final grade.

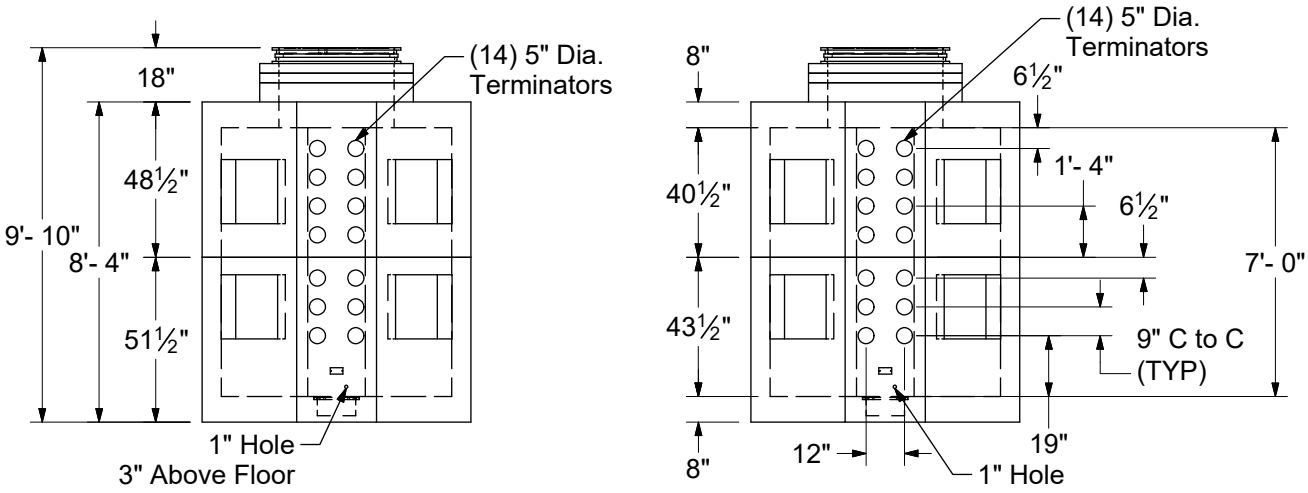
6. Manholes are equipped with the cable mounting racks. Add the required number of cable mounting arms to suspend the installed cables.

7. Traffic Rated Design - H-20 16,000 pounds wheel load.

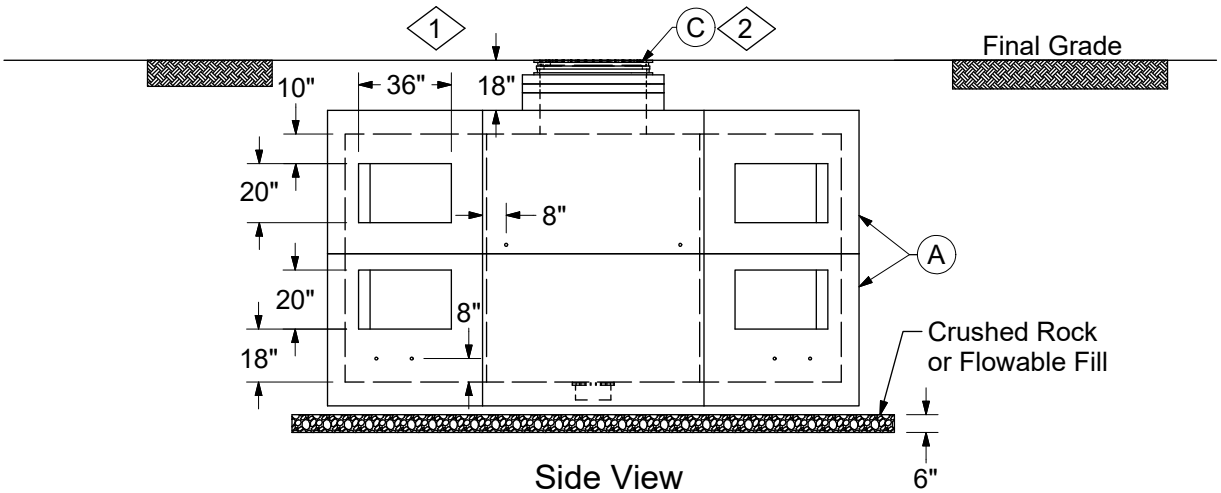
REV	DATE	ENG	DESCRIPTION
8	01/01/24	JMW	Converted to new format
7	12/12/12	DDG	



Top View



End Views



Side View

REV	DATE	ENG	DESCRIPTION
11	01/01/24	JMW	Converted to new format
10	04/23/14	EJB	

CONSTRUCTION NOTE(s):

1. Preferred setting depth is 18" as shown. Minimum setting depth is 12" and maximum is 60".

2. Preferred collar configuration is one 6" and two 3" for 12" thickness. The 3" necks are required on all manholes and shall be the top two collars. Add the required necks so that frame and cover are at final grade. 3" thick collar is Stock #12 06 062 and 6" thick collar is Stock #12 06 063.

3. Weights are as follows: Top Section - 19,798 lbs., Base Section - 20,526 lbs., Total - 40,324 lbs.

DCS #	DESCRIPTION
32 21 03 01	18" Setting Depth
32 21 03 02	60" Setting Depth

	ITEM	STK / DCS #	DESCRIPTION 32 21 03 **	01	02
	A	12 06 233	Manhole - Top, Precast Concrete	1	1
		12 06 234	Manhole - Bottom, Precast Concrete	1	1
	B	98 00 006	Concrete - 2 Sack (c.y.)	8	8
	C	**33 12 01 01**	Frame and Cover 36" Dia. x 18" Deep	1	-
		33 12 01 02	Frame and Cover 36" Dia. x 60" Deep	-	1
	D	19 04 327	Grate - 14"	1	1
	E	**33 11 ** ****	Wingwall Bays	#	#
	F	98 00 014	Crushed Rock (c.y.)	1	1
	G	12 53 017	Shield, Duct, Cable	12	12
6	H	12 56 112	Cable Mounting Arm - 18"	#	#
6	I	12 56 113	Cable Mounting Arm - 14"	#	#
6	J	12 56 114	Cable Mounting Arm - 7-1/2"	#	#
6	K	12 56 125	J Hook - 5"	#	#
	L	**33 20 02 02**	Grounding System, 6' x 14'	1	1
@			Op Code, Excavation (Mach.) (c.y.)	40	53
@			Op Code, Backfilling (Mach.) (c.y.)	9	24
@			Op Code, Tamping (s.f.)	99	99
@			Op Code, Surface Removal (s.f.)	99	99
@			Op Code, Surface Replacement (s.f.)	99	99
@			Op Code, Loading Out (c.y.)	#	#

DESIGN NOTE(s):

4. 5.32 Cubic yards of dirt removed per foot of excavation.

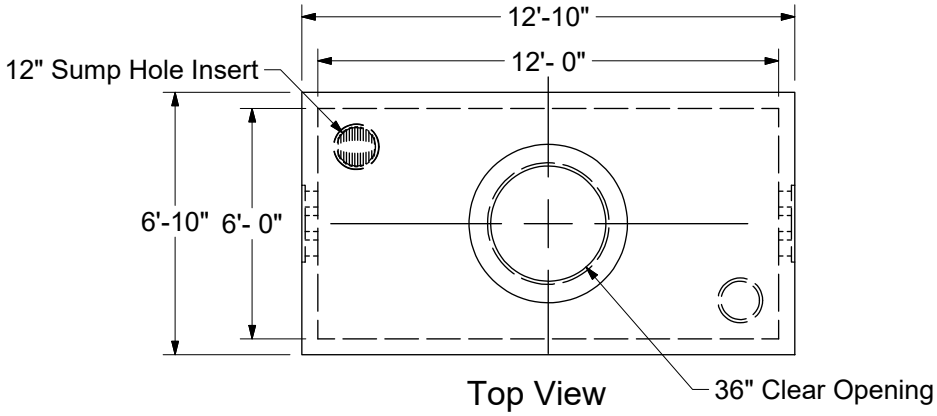
5. Add the required number of 6" concrete (Stock #12 06 063) and 3" concrete (Stock #12 06 062) necks so that the frame and cover are at final grade.

6. Manholes are equipped with the cable mounting racks. Add the required number of cable mounting arms to suspend the installed cables.

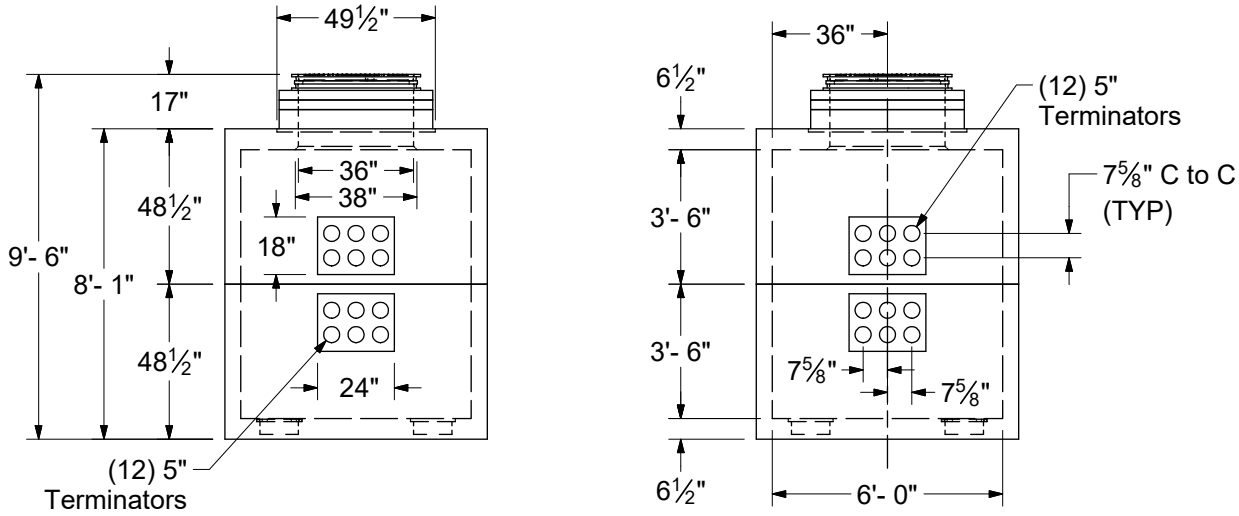
7. Traffic Rated Design - H-20 16,000 pounds wheel load.

REV	DATE	ENG	DESCRIPTION
11	01/01/24	JMW	Converted to new format
10	04/23/14	EJB	

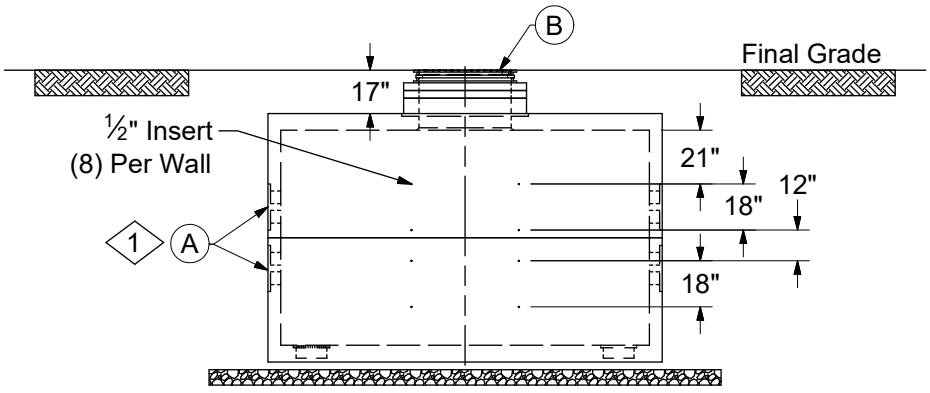
ILLINOIS ONLY



Top View



End Views



Side View

REV	DATE	ENG	DESCRIPTION
3	01/01/24	JMW	Converted to new format
2	12/12/12	DDG	

CONSTRUCTION NOTE(s):

1. Weights are as follows: Top Section - 14,375 lbs., Bottom Section - 15,075 lbs., Total 29,450 lbs.

DCS #	DESCRIPTION
32 21 04 01	5-5/8" Setting Depth
32 21 04 02	10" Setting Depth

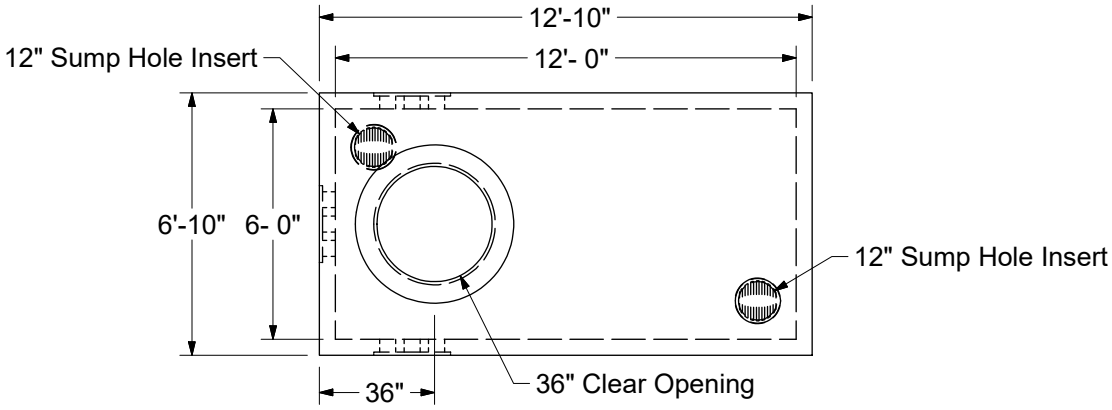
	ITEM	STK / DCS #	DESCRIPTION 32 21 04 **	01	02
1	A	12 06 223	Manhole - Top, Precast Concrete (Type 38Y- Roof A)	1	1
		12 06 224	Manhole - Bottom, Precast Concrete (Type 38Y- Roof A)	1	1
	B	**33 12 02 01**	Manhole Frame and Cover - 32" Dia. x 5-5/8" Deep	1	-
		33 12 02 02	Manhole Frame and Cover - 32" Dia. x 10" Deep	-	1

DESIGN NOTE(s):

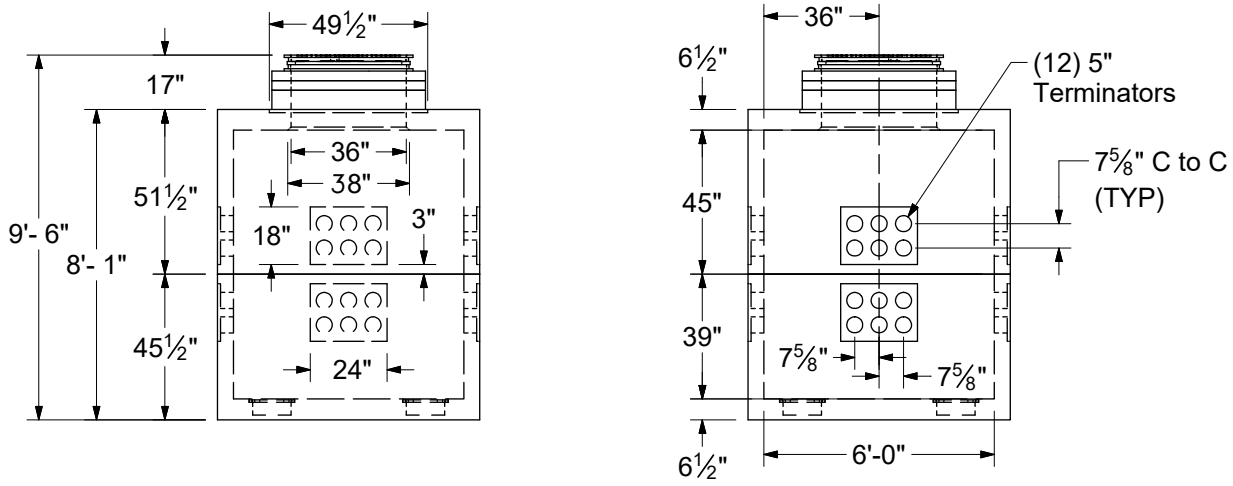
2. Traffic Rated Design - H-20 16,000 pounds wheel load.

REV	DATE	ENG	DESCRIPTION
3	01/01/24	JMW	Converted to new format
2	12/12/12	DDG	

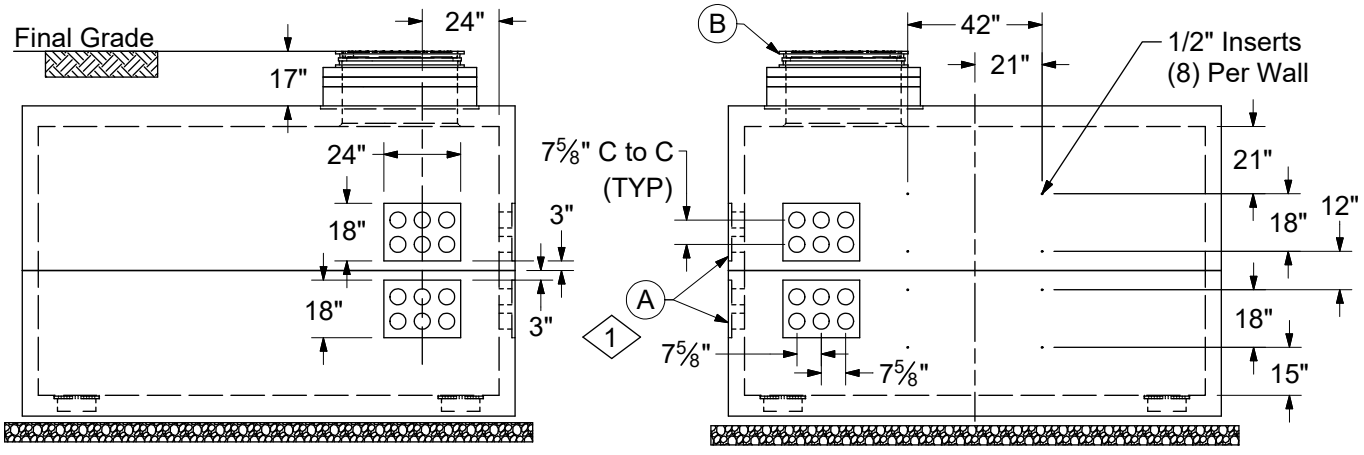
ILLINOIS ONLY



Top View



End Views



Side Views

REV	DATE	ENG	DESCRIPTION
3	01/01/24	JMW	Converted to new format
2	12/12/12	DDG	

CONSTRUCTION NOTE(s):

1. Weights are as follows: Top Section - 14,375 lbs., Bottom Section - 15,075 lbs., Total - 29,450 lbs.

DCS #	DESCRIPTION
32 21 05 01	5-5/8" Setting Depth
32 21 05 02	10" Setting Depth

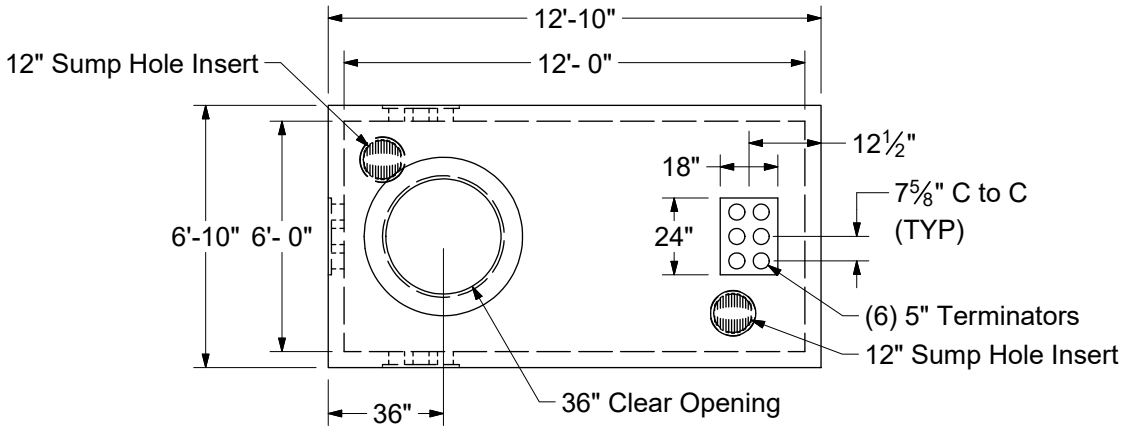
	ITEM	STK / DCS #	DESCRIPTION 32 21 05 **	01	02
1	A	12 06 225	Manhole - Top, Precast Concrete (Type 38Y- J4 Roof A)	1	1
		12 06 226	Manhole - Bottom, Precast Concrete (Type 38Y- J4 Roof A)	1	1
	B	**33 12 02 01**	Manhole Frame and Cover - 32" Dia. x 5-5/8" Deep	1	-
		33 12 02 02	Manhole Frame and Cover - 32" Dia. x 10" Deep	-	1

DESIGN NOTE(s):

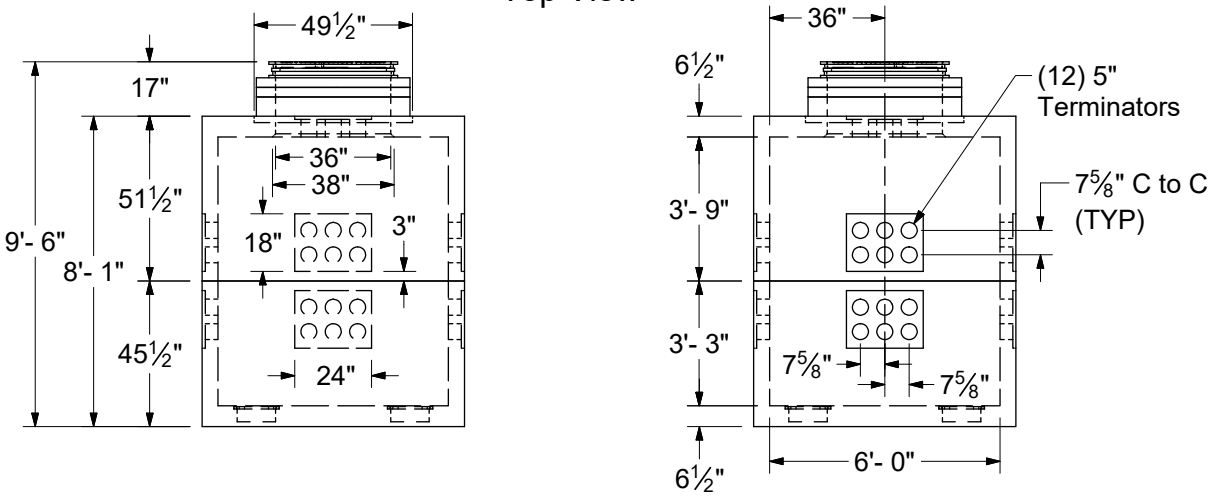
2. Traffic Rated Design - H-20 16,000 pounds wheel load.

REV	DATE	ENG	DESCRIPTION
3	01/01/24	JMW	Converted to new format
2	12/12/12	DDG	

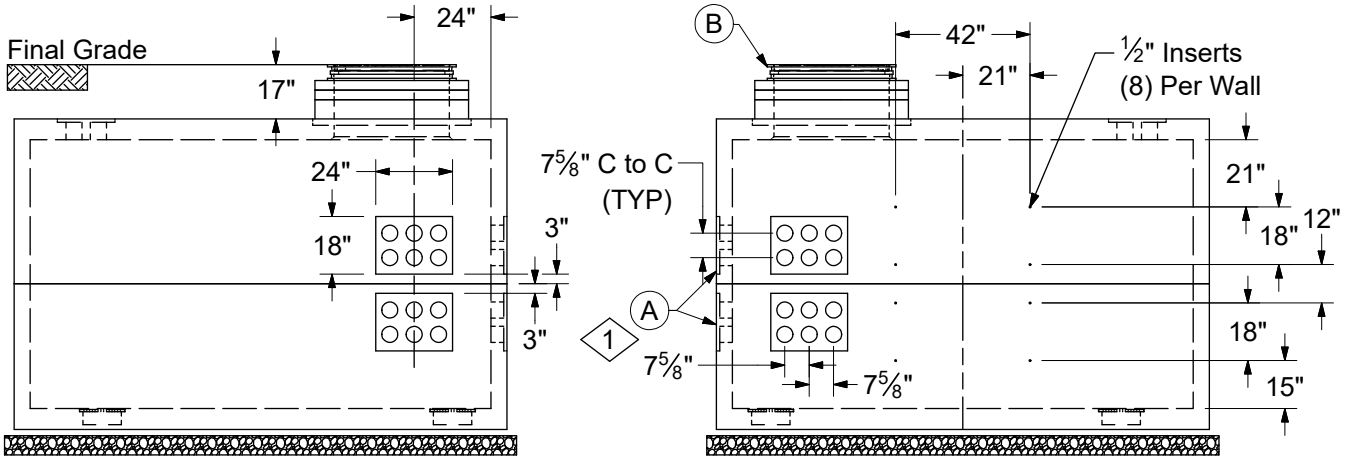
ILLINOIS ONLY



Top View



End Views



Side Views

REV	DATE	ENG	DESCRIPTION
3	01/01/24	JMW	Converted to new format
2	12/12/12	DDG	

CONSTRUCTION NOTE(s):

1. Weights are as follows: Top Section - 14,375 lbs., Bottom Section - 15,075 lbs., Total - 29,450 lbs.

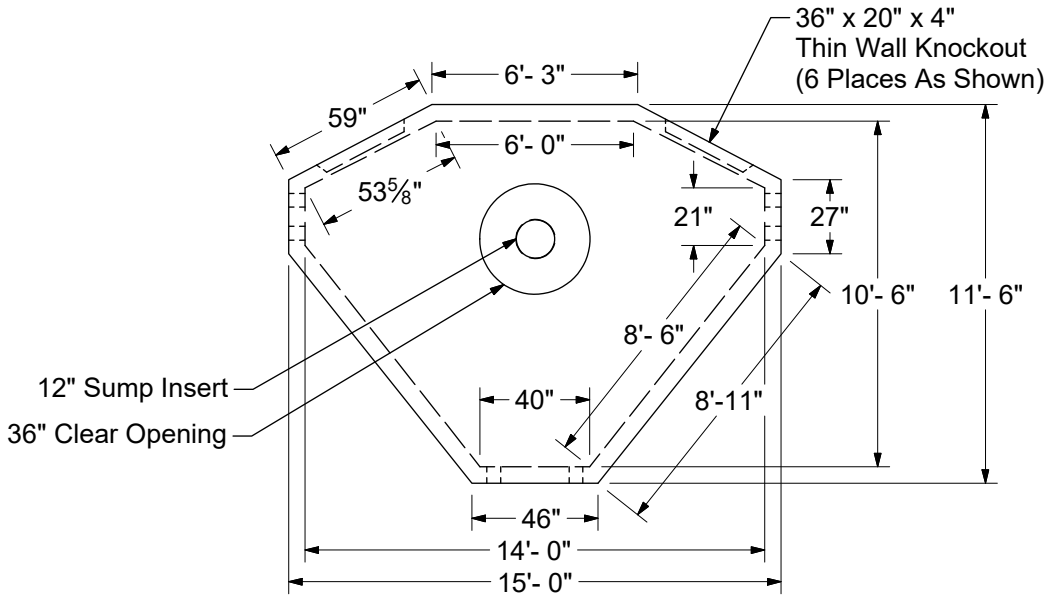
DCS #	DESCRIPTION
32 21 06 01	5-5/8" Setting Depth
32 21 06 02	10" Setting Depth

	ITEM	STK / DCS #	DESCRIPTION 32 21 06 **	01	02
1	A	12 06 227	Manhole - Top, Precast Concrete (Type 38Y- J4 Roof D)	1	1
		12 06 228	Manhole - Bottom, Precast Concrete (Type 38Y- J4 Roof D)	1	1
	B	**33 12 02 01**	Manhole Frame and Cover - 32" Dia. x 5-5/8" Deep	1	-
		33 12 02 02	Manhole Frame and Cover - 32" Dia. x 10" Deep	-	1

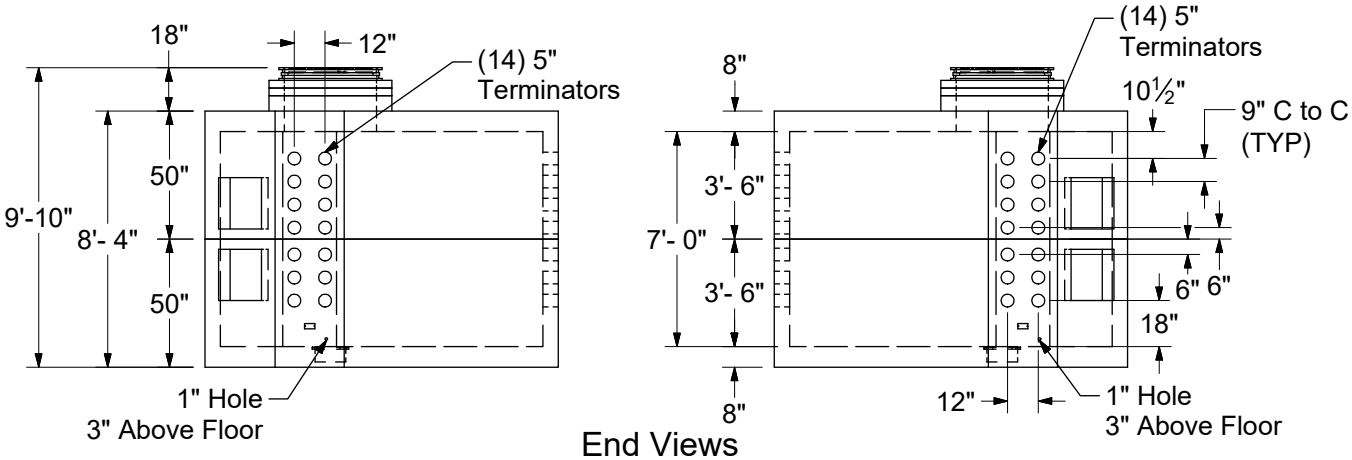
DESIGN NOTE(s):

2. Traffic Rated Design - H-20 16,000 pounds wheel load.

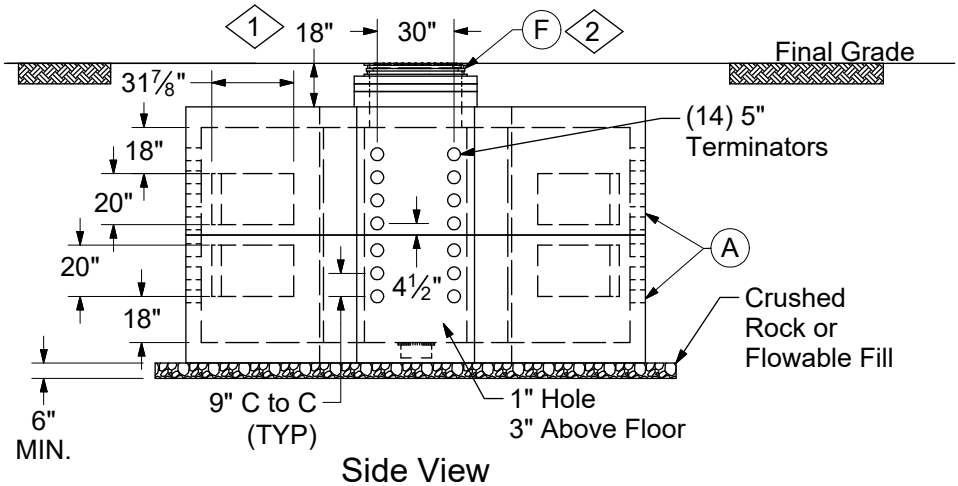
REV	DATE	ENG	DESCRIPTION
3	01/01/24	JMW	Converted to new format
2	12/12/12	DDG	



Top View



End Views



Side View

DISTRIBUTION
CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
10	01/01/24	JMW	Converted to new format
9	04/23/14	EJB	

CONSTRUCTION NOTE(s):

1. Preferred setting depth is 18" as shown. Minimum setting depth is 12" and maximum is 60".

2. Preferred collar configuration is one 6" and two 3" for 12" thickness. The 3" necks are required on all manholes and shall be the top two collars. Add the required necks so that frame and cover are at final grade. 3" thick collar is Stock #12 06 062 and 6" thick collar is Stock #12 06 063.

3. Weights are as follows: Top Section - 21,609 lbs., Bottom Section - 22,305 lbs., Total - 43,914 lbs.

DCS #	DESCRIPTION
32 22 01 01	18" Setting Depth
32 22 01 02	60" Setting Depth

	ITEM	STK / DCS #	DESCRIPTION 32 22 01 **	01	02
	A	12 06 237	Manhole - Top, Precast Concrete	1	1
		12 06 238	Manhole - Bottom, Precast Concrete	1	1
	B	98 00 006	Concrete - 2 Sack (C.Y.)	14	14
	C	12 51 156	Coupling - Conduit, 5" Plastic (AVG.)	26	26
	D	19 04 327	Grate - 14"	1	1
	E	**33 11 ** ****	Wingwall Bays	1	1
	F	**33 12 01 01**	Frame and Cover 36" Dia. x 18" Deep	1	-
		33 12 01 02	Frame and Cover 36" Dia. x 60" Deep	-	1
	G	98 00 014	Crushed Rock (C.Y.)	2	2
	H	12 53 017	Shield - Duct, 3" thru 6"	1	1
6	I	12 56 113	Cable Mounting Arm - 14"	#	#
6	J	12 56 112	Cable Mounting Arm - 18"	#	#
6	K	12 56 114	Cable Mounting Arm - 7-1/2"	#	#
@	L	12 56 125	J Hook - 5"	#	#
@	M	**33 20 03 01**	Grounding System, 3-Way Manhole	1	1
@			Op Code, Excavation (Mach.) (C.Y.)	46	65
@			Op Code, Backfilling (Mach.) (C.Y.)	12	28
@			Op Code, Tamping (S.F.)	124	124
@			Op Code, Surface Removal (S.F.)	124	124
@			Op Code, Surface Replacement (S.F.)	124	124
@			Op Code, Loading Out (C.Y.)	#	#

DESIGN NOTE(s):

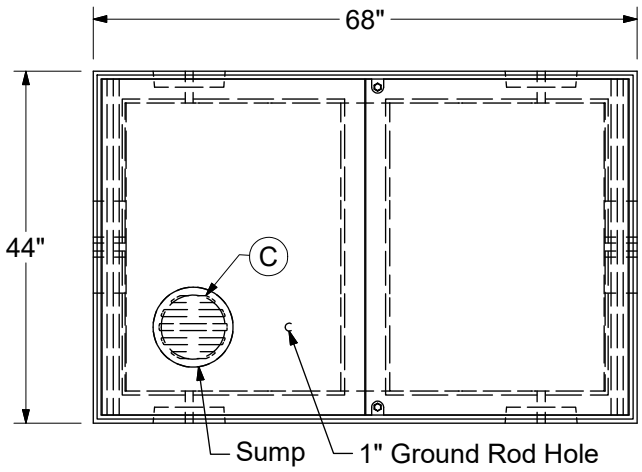
4. 4.586 Cubic yards of dirt removed per foot of excavation.

5. Add the required number of 6" concrete (Stock #12 06 063) and 3" concrete (Stock #12 06 062) necks so that the frame and cover are at final grade.

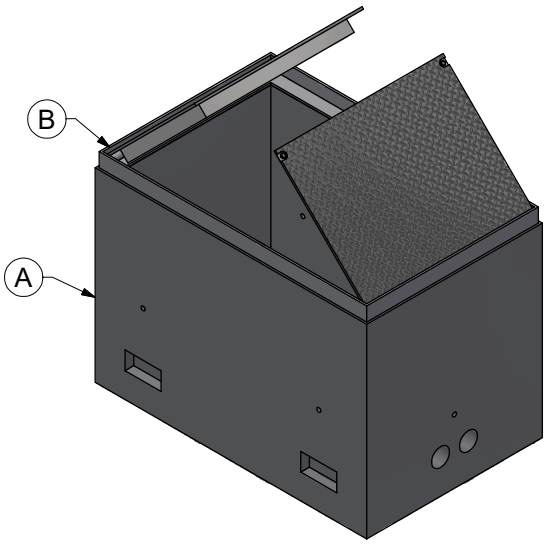
6. Manhole are equipped with the cable mounting racks. Add the required number of cable mounting arms to suspend the installed cables.

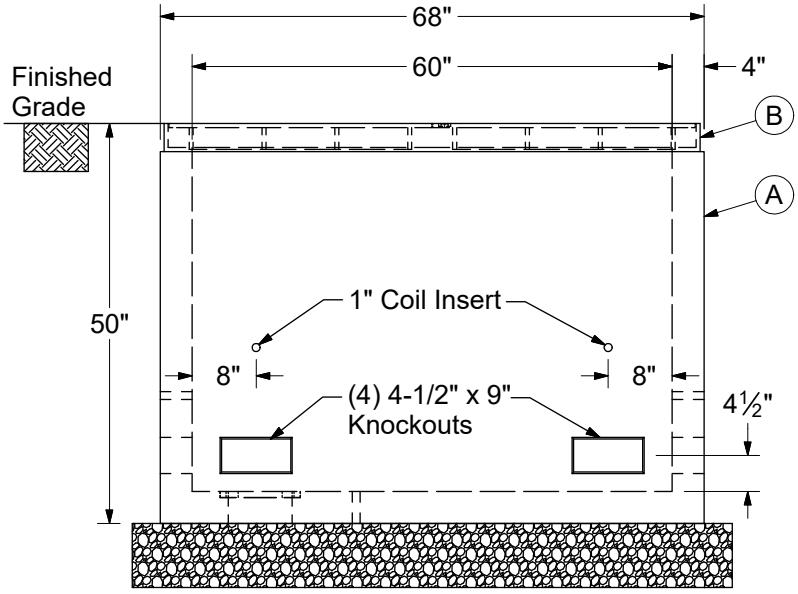
7. Traffic Rated Design - H-20 16,000 pounds wheel load.

REV	DATE	ENG	DESCRIPTION
10	01/01/24	JMW	Converted to new format
9	04/23/14	EJB	

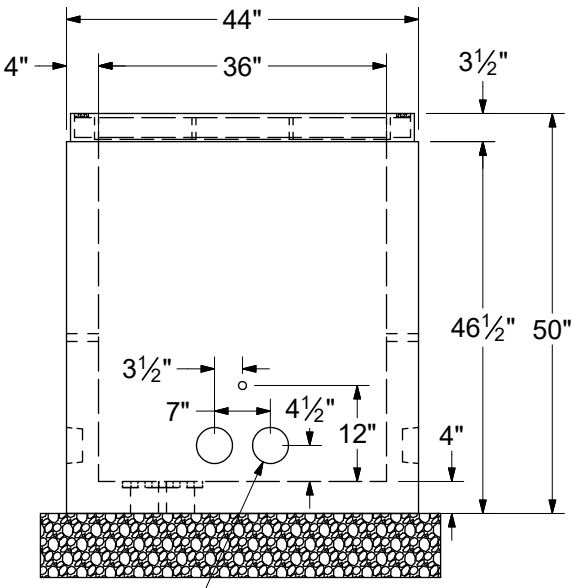


Top View





Side View



End View

CONSTRUCTION NOTE(S):

1. Grade adjustments shall be made using the riser to meet the existing slope. The vault floor shall always be installed level.

2. Excavate a pit approximately 5' W x 7' L and 4-½' D.
   Note: 6" riser (Stock #12 06 192) may be use if vault is set deeper.

3. Fill with crushed rock leveling the rock and tamping to firm wherever the earth has been distrubed.

4. Use swivel plates mounted to the threaded inserts with lag bolts to firmly fasten the plate against the wall.

REV	DATE	ENG	DESCRIPTION
11	01/01/24	JMW	Converted to new format
10	01/12/16	EJB	

CONSTRUCTION NOTE(S): (CONT.)

5. Place conduits into ducts or knockouts as required. Grout or mortar around ducts entering thru knockouts.

6. Replace and stabilize the earth around the vault and riser tamping to compaction.

7. Brick and mortar between riser and keyway in manhole to accommodate the grade slope. Seal the cover frame to riser with aquaseal. Install pulling eyes firmly into wall above conduits.

8. Weights are as follows: vault - 4,200 lbs., riser - 665 lbs., cover - 500 lbs.

9. Sod or resurface grade as necessary.

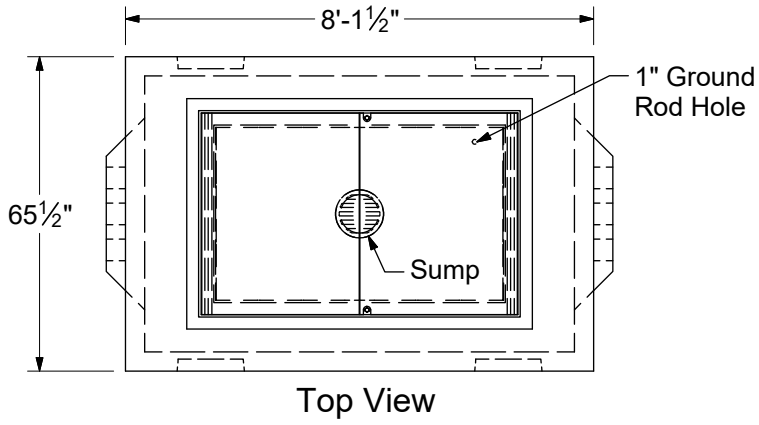
10. In Missouri residential developments, the contractor will install the vault conduit, See DCS **32 24 01 03**.

	ITEM	STK / DCS #	DESCRIPTION 32 24 01 **	01	03
	A	12 06 097	Vault - Precast 3' x 5'	1	-
	B	12 02 100	Cover - Vault Galv. Stl. 42" x 66"	1	-
	C	19 04 352	Grate - Sewer 10" Round	1	1
	D	98 00 014	Rock - Crushed (c.y.)	1	-
	E	23 59 076	Eye - Pulling (ea.)	2	2
	F	25 54 053	Compound - Sealer Aqua	1	-
	G	12 53 017	Shield - Duct, 3" thru 6"	#	#
@			Op Code, Mechanical Excavation (c.y.)	11	-
@			Op Code, Mechanical Backfill (c.y.)	2	-
@			Op Code, Air Tamping (s.f.)	32	-
@			Op Code, Install Conduit (m.h.)	50	-
@			Op Code, Knockout - Conduit Preparation	#	#
@			Op Code, Resurfacing	#	#

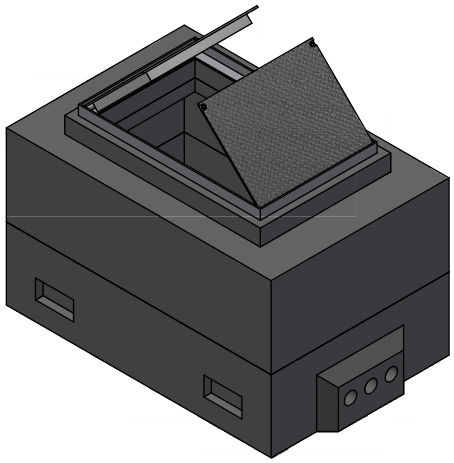
DESIGN NOTE(s):

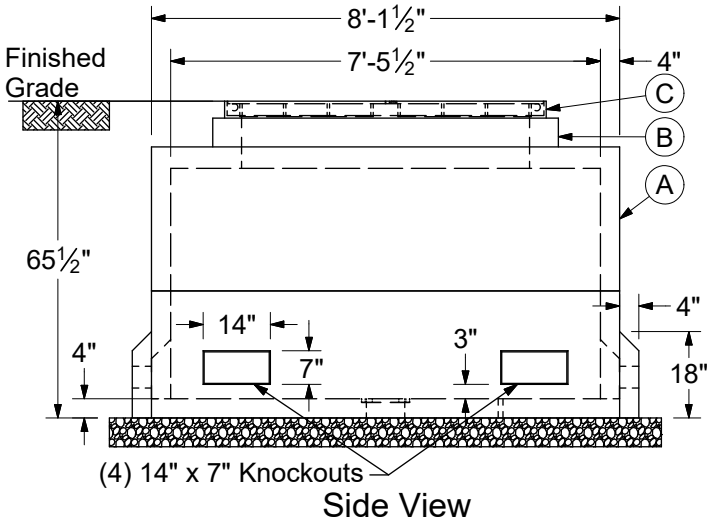
11. Vault has (2) 4" PVC couplings at each end. Use with #2 and 4/0 cable. Vault can accommodate up to 6 splices.

12. This vault can withstand occasional vehicular traffic loading and can be placed in between the street and sidewalk, in parking lots, and driveways. Rated H-15 12,000 pounds wheel load.

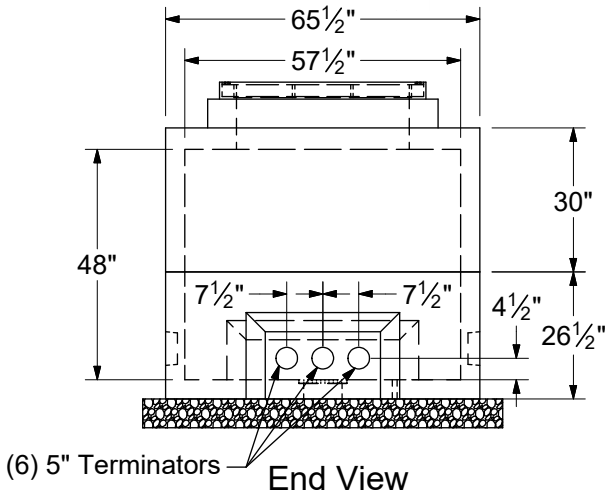


Top View





Side View



End View

CONSTRUCTION NOTE(s):

1. Grade adjustments shall be made using the riser to meet the existing slope. The vault floor shall always be installed level.
2. Excavate a pit approximately 6' W x 11' L and 6' D.
   Note: The 6" riser must be used on this vault.
3. Fill any overdig with crushed rock leveling the rock and tamping to firm whatever the earth has been distrubed.
4. Use swivel plates mounted to the threaded inserts with lag bolts to firmly fasten the plate against the wall.
5. Place conduits into ducts or knockouts as required. Grout or motar around ducts entering thru knockouts.
6. Replace and stabilize the earth around the vault and riser tamping to compaction.
7. Brick and motar between riser and keyway in manhole to accommodate the grade slope. Seal the cover frame to the riser with aquaseal. Install pulling eyes firmly into wall above conduits.
8. Weights are as follows: bottom - 4,560 lbs., top - 4,420 lbs., riser - 365 lbs., cover - 500 lbs.
9. Sod or resurface grade as neccessary.
10. In Missouri residential developments, the contractor will install the vault and conduits. See DSC # **32 24 02 03**.

	ITEM	STK / DCS #	DESCRIPTION 32 24 02 **	01	03
	A	12 06 096	Vault - Precast 4' x 8'	1	-
	B	12 06 192	Riser - Neck 6" Extension	1	-
	C	12 02 100	Cover - Vault Galv. Stl. 42" x 66"	1	-
	D	19 04 352	Grate - Sewer 10" Round	1	-
	E	98 00 014	Rock - Crushed (c.y.)	2	-
	F	23 59 076	Eye - Pulling	2	2
	G	25 54 053	Compound - Sealer Aqua	1	-
	H	12 53 017	Shield - Duct, 3: thru 6"	#	#
@			Op Code, Mechanical Excavation (c.y.)	20	-
@			Op Code, Mechanical Backfill (s.f.)	1	-
@			Op Code, Air Tamping (m.h.)	50	-
@			Op Code, Install Conduit	50	-
@			Op Code, Knockout - Conduit Preparation	#	#
@			Op Code, Resurfacing	#	#

DESIGN NOTE(s):

11. Vault has (3) 5" PVC couplings at each end. Use with 350 through 750 cable.

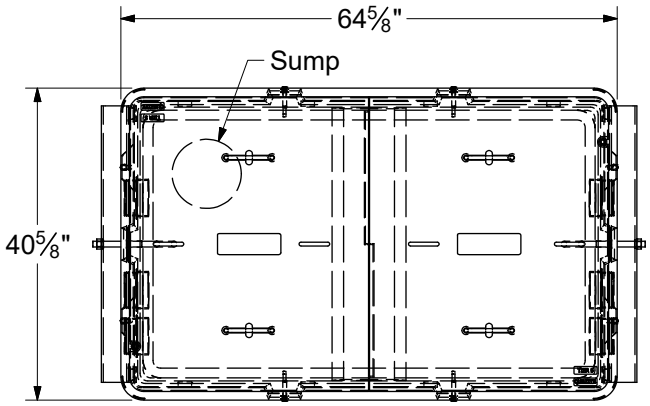
12. This vault can withstand occasional vehicular loading and can be placed in between the street and sidewalk, in parking lots, and driveways. Rated H-15 12,000 pounds wheel load.

REV	DATE	ENG	DESCRIPTION
10	01/01/24	JMW	Converted to new format
9	01/26/11	DDG	

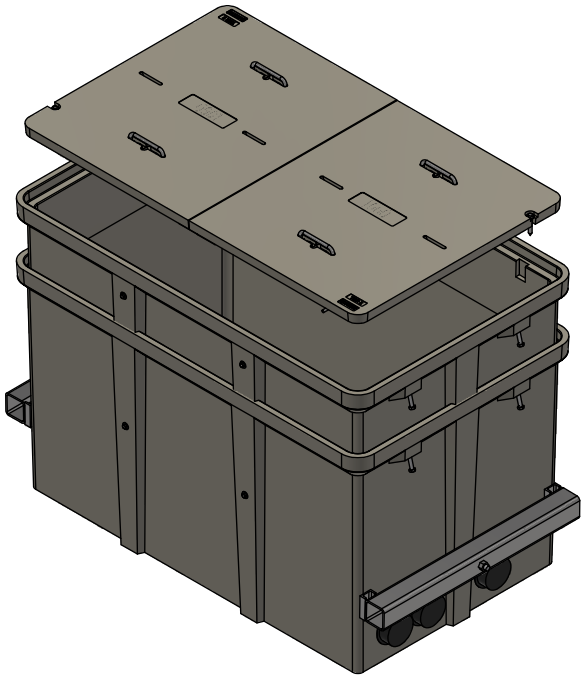
UNDERGROUND STRUCTURES

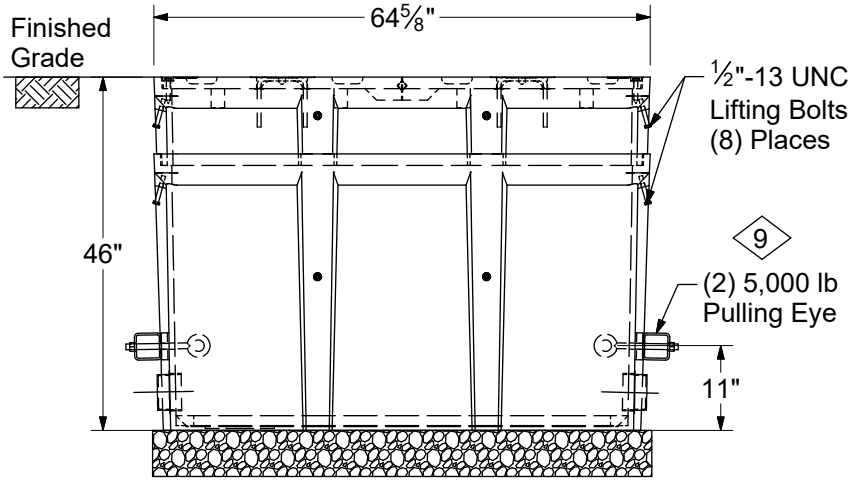
Fibercrete or Polyethylene Vault
3' x 5' x 3.5' Depth

32 24 03 **
15kV
1 of 2

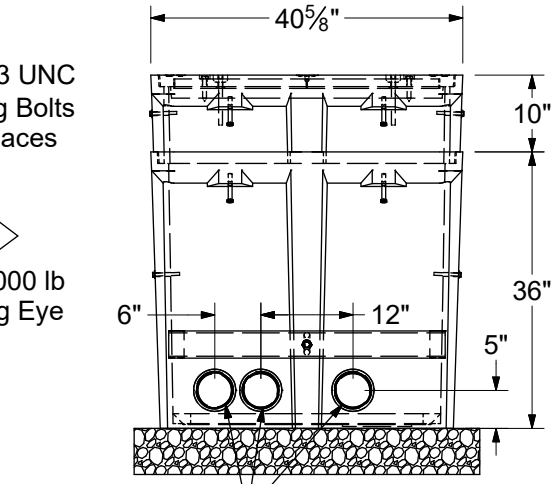


Top View





Side View



End View

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
5	01/01/24	JMW	Converted to new format
4	06/26/18	JMW	

CONSTRUCTION NOTE(s):

1. Drawing illustrates Fibercrete vault. Polyethylene vault dimensions vary slightly.
2. Excavate and install vault at standard conduit depths on 10" base of 1" gravel.
3. Fill any overdig with crushed rock leveling the rock and tamping firm.
4. Install conduits in couplings or drill holes in desired conduit locations.
5. Replace and stabilize the earth around the vault tamping to compaction
6. Sod or resurface grade as necessary.

	ITEM	STK / DCS #	DESCRIPTION 32 24 03 **	01	02
	A	12 06 122	Vault - 3' x 5' - Fibercrete	1	-
9	B	12 06 259	Vault - 3' x 5' - Polyethylene	-	1
	C	98 00 14	Rock - Crushed (cy.)	1	1
	D	19 04 352	Grate - Sewer 10" Round	1	1
	E	12 53 017	Shield - Duct, 3" thru 6"	#	#
@			Op Code, Mechanical Excavation (cy.)	11	11
@			Op Code, Mechanical Backfill (cy.)	2	2
@			Op Code, Air Tamping (s.f.)	32	32
@			Op Code, Install Conduit (MH/10)	50	50
@		701	Op Code, Drill Hole in Vault	#	#
@			Op Code, Resurfacing	#	#

DESIGN NOTE(s):

7. Vault has (3) 4" couplings at each end. Use with #2 and 4/0 cable. Vault can accommodate up to 9 splices.

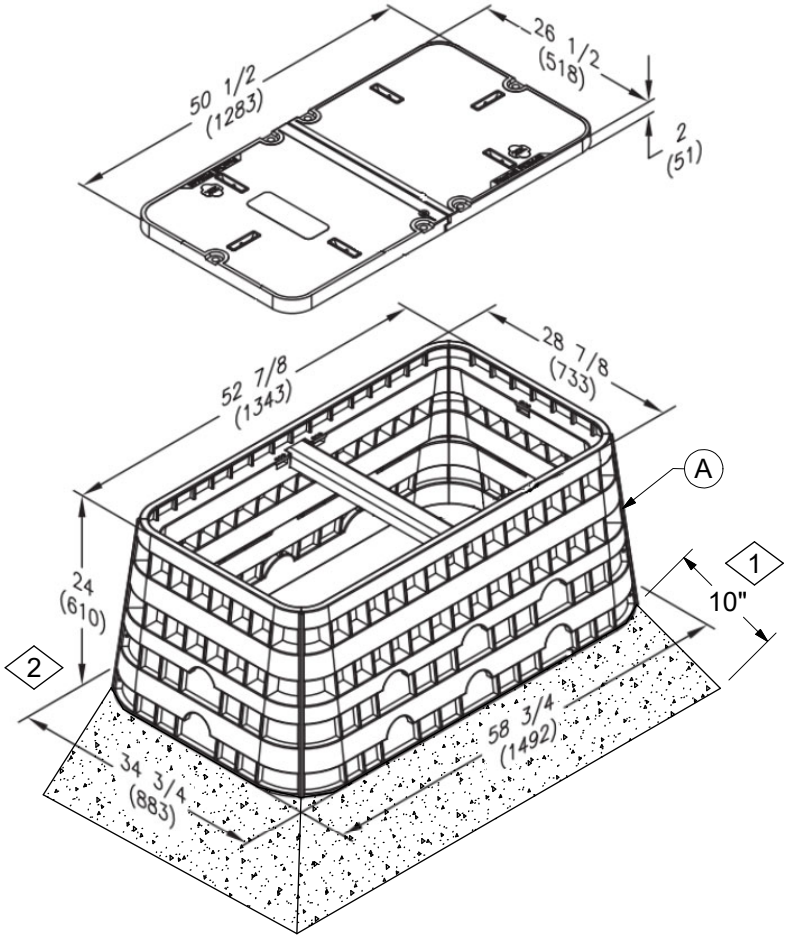
8. These vaults are intended for yards, terraces sidewalks, and other areas not subject to vehicular traffic. Non-Traffic Rated 5,000 pounds over 10" x 10" area.

◇9◇ Weight of Fibercrete vault is 1,136 lbs. Weight of polyethylene vault is 420 lbs. Use Polyethylene vault only when Fibercrete is too heavy to transport - such as on private property.

UNDERGROUND STRUCTURES

Polyethylene Splice Box
2' x 4' x 2' Depth

32 24 04 **
15kV
1 of 1



CONSTRUCTION NOTES(s):

1. Excavate and install box at standard conduit depths on 10 inch base of 1 inch gravel. Box lid located approx. 18" below grade.

2. Install conduits thru knockouts, or bore holes in the box. Seal conduits at box interface.

3. After installing cable, place lid on box, partially backfill and tamp soil.

4. Place electronic marker at the center inside of the box and complete backfill. IMPORTANT: Marker must be laid flat.

5. In Missouri residential developments, the contractor will install the splice box and conduit.

6. Conduit end to end inside box 45" min.

	ITEM	STK / DCS #	DESCRIPTION 32 24 04 **	01
	A	12 06 105	Box, Cable, 2' x 4' x 2' Deep	1
	B	49 05 519	Marker, Electronic	1
	C	98 00 014	Rock Crushed	-
@		701	Op Code, Drill Hole In Box	#

DESIGN NOTES(s):

7. Splice box is intended to be buried. It can be installed at grade. Non-traffic Rated 5,000 lbs.

8. Splice box has (2) 4" cutouts in each end and (6) in each side. Use with single phase #2 and 4/0 cable. Splice box can accommodate up to 2 splices.

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
1	01/01/24	JMW	Converted to new format
0	01/11/13	DDG	

NOTES

MANHOLES ACCESSORIES 33

12” RECESS CONSTRUCTION - FOR CAST IN PLACE MANHOLES..... 33 11 01 **

BAY CONSTRUCTION - FOR PRECAST OR CAST IN PLACE MANHOLES..... 33 11 03 **

24” RECESS CONSTRUCTION - FOR CAST IN PLACE MANHOLES..... 33 11 04 **

36” RECESS CONSTRUCTION - FOR CAST IN PLACE MANHOLES..... 33 11 05 **

MANHOLE NECK - WITH SWIVELOCK FRAME AND COVER.....33 12 01 **

MANHOLE NECK - WITH FRAME AND COVER - ILLINOIS ONLY..... 33 12 02 **

UNISTRUT CABLE RACK - ILLINOIS ONLY..... 33 20 01 **

GROUNDING SYSTEM - FOR PRECAST MANHOLE - STRAIGHT..... 33 20 02 **

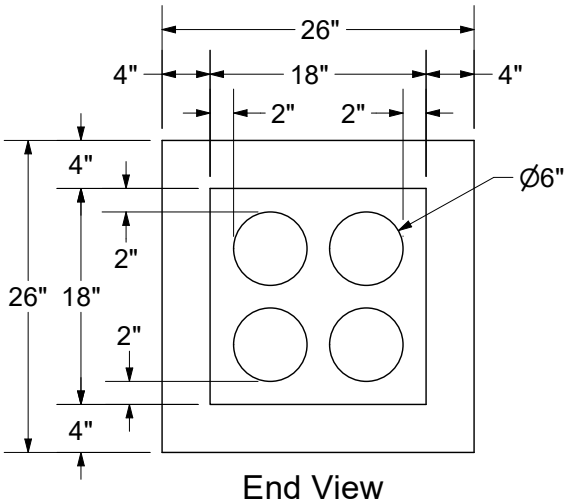
GROUNDING SYSTEM - FOR PRECAST MANHOLE - 3 WAY..... 33 20 03 01

CABLE TRAINING - FOR PRECAST MANHOLE - STRAIGHT..... 33 20 04 01

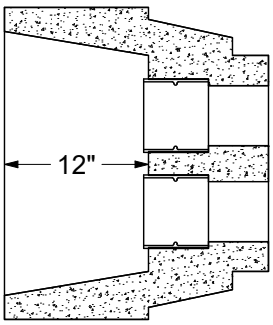
CABLE TRAINING - FOR PRECAST MANHOLE - 3 WAY 33 20 04 02

CABLE RACKING - FOR PRECAST MANHOLE - STRAIGHT..... 33 20 05 **

GROUNDING SYSTEM - FOR CAST IN PLACE NETWORK VAULT..... 33 20 06 01

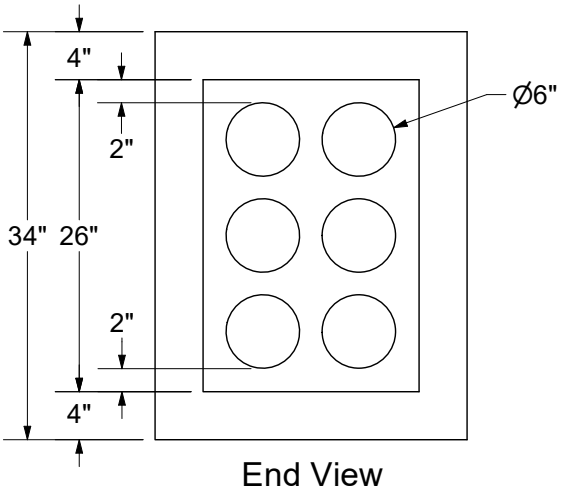


End View

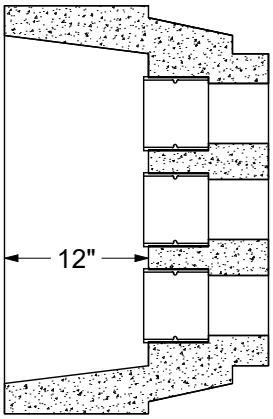


Side View

33 11 01 01

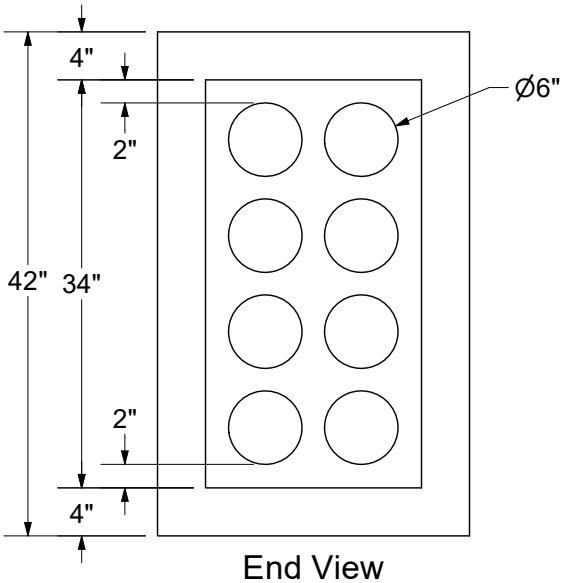


End View

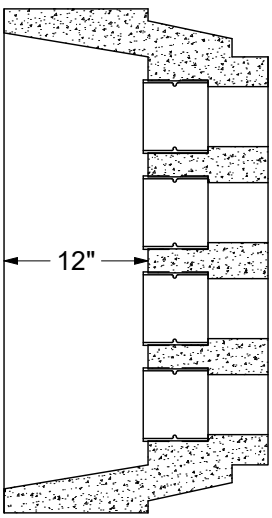


Side View

33 11 01 02



End View



Side View

33 11 01 03

REV	DATE	ENG	DESCRIPTION
4	01/01/24	JMW	Converted to new format
3	03/16/09	DDG	

DCS #	DESCRIPTION
33 11 01 01	4 Duct Recess
33 11 01 02	6 Duct Recess
33 11 01 03	8 Duct Recess

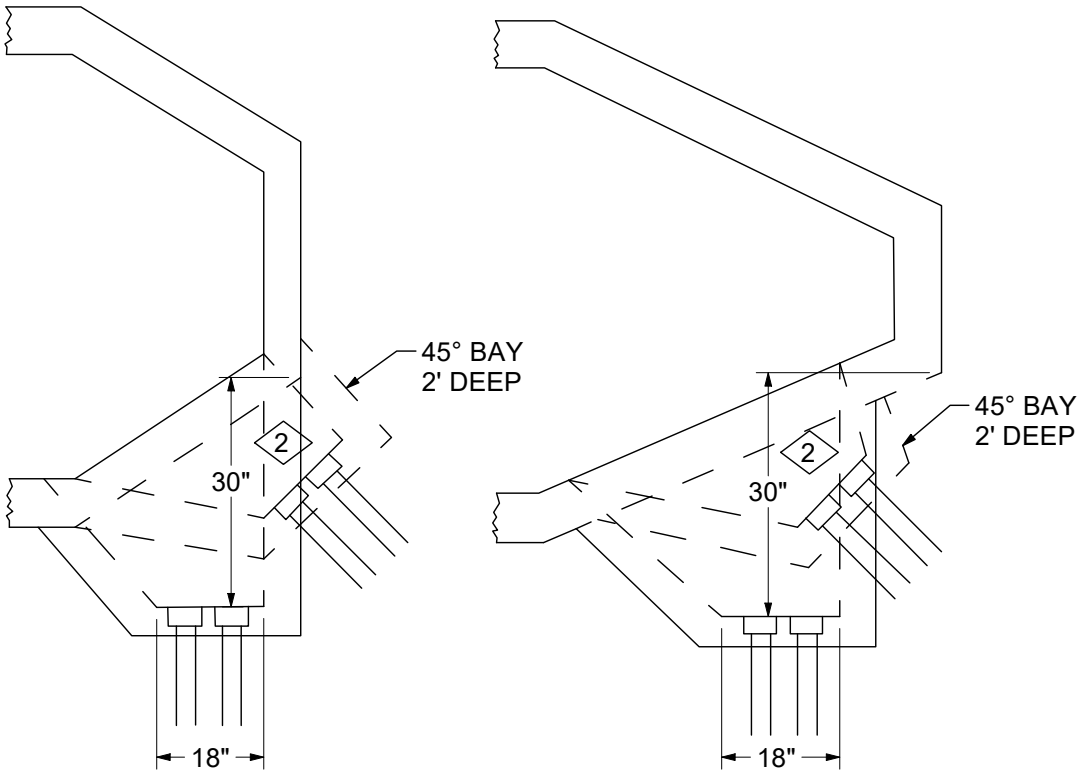
CONSTRUCTION NOTE(s):

1. Two or more ducts may be omitted if not required.

2. May use 3 hole duct terminator (Stock #12 56 126) in place of couplings when appropriate.

	ITEM	STOCK #	DESCRIPTION 33 11 01 **	01	02	03
	A	98 00 005	Concrete - M.H. (c.y.)	1	1	1
2	B	12 51 156	Coupling, PVC, 5" SCH 40	4	6	8
@			Op Code, Excavation (Mach.) (c.y.)	3	3	3
@			Op Code, Installing and Removing Forms (s.f.)	11	13	14
@			Op Code, Backfilling (Mach.) (c.y.)	1	1	1
@			Op Code, Tamping (s.f.)	7	7	8
@			Op Code, Surface Removal (s.f.)	7	7	8
@			Op Code, Surface Replacement (s.f.)	7	7	8

REV	DATE	ENG	DESCRIPTION
4	01/01/24	JMW	Converted to new format
3	03/16/09	DDG	



DCS #	DESCRIPTION
33 11 03 01	45° - 90° Wingwall Bay for 10'-0" & 14'-0" Long Manholes
33 11 03 02	45° - 90° Wingwall Bay for 17'-6" Long Manholes

CONSTRUCTION NOTE(s):

1. Use plywood to frame walls approximately 6" thick.

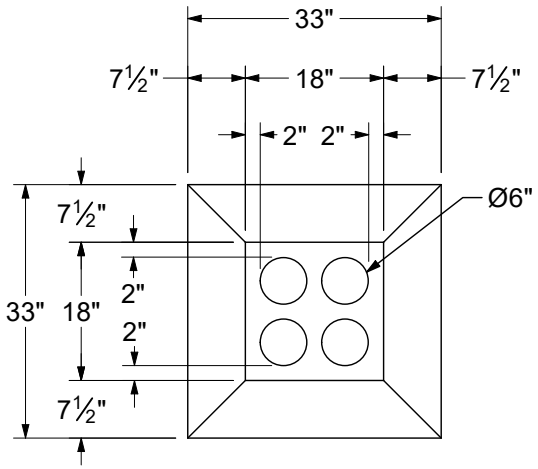
<2.> 30" may be reduced to 24" if necessary.

	ITEM	STK / DCS #	DESCRIPTION 33 11 03 **	01	02
	A	98 00 005	Concrete - M.H. (c.y)	1	1
@			Op Code, Excavation (Mach.) (c.y.)	8	8
@			Op Code, Installing and Removing Forms (S.F.)	43	43
@			Op Code, Backfilling (Mach.) (c.y.)	1	1
@			Op Code, Tamping (s.f)	22	22
@			Op Code, Surface Removal (s.f.)	22	22
@			Op Code, Surface Replacement (s.f.)	22	22

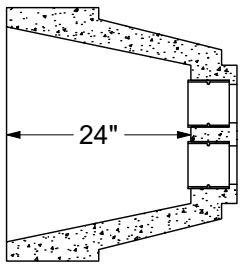
DESIGN NOTE(s):

3. Bay to be used on pre-cast manholes when conduit run direction requires this or when end openings are all used.

REV	DATE	ENG	DESCRIPTION
5	01/01/24	JMW	Converted to new format
4	03/16/09	DDG	

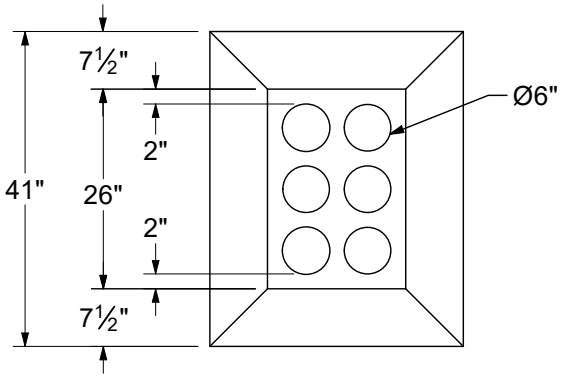


End View

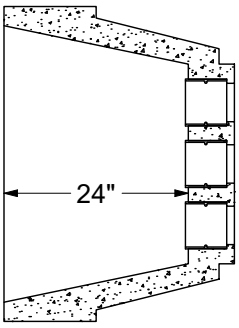


Side View

33 11 04 01

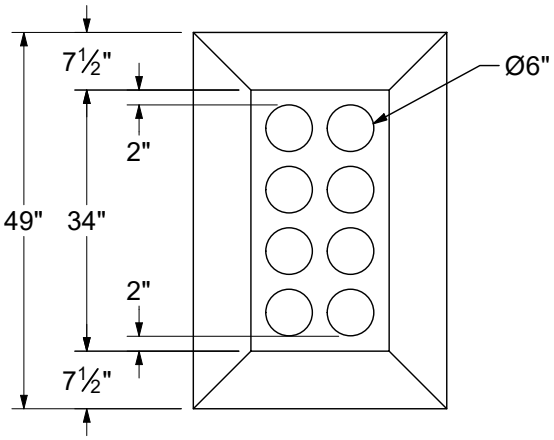


End View

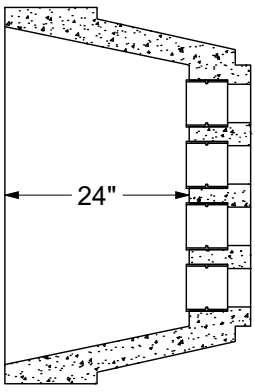


Side View

33 11 04 02



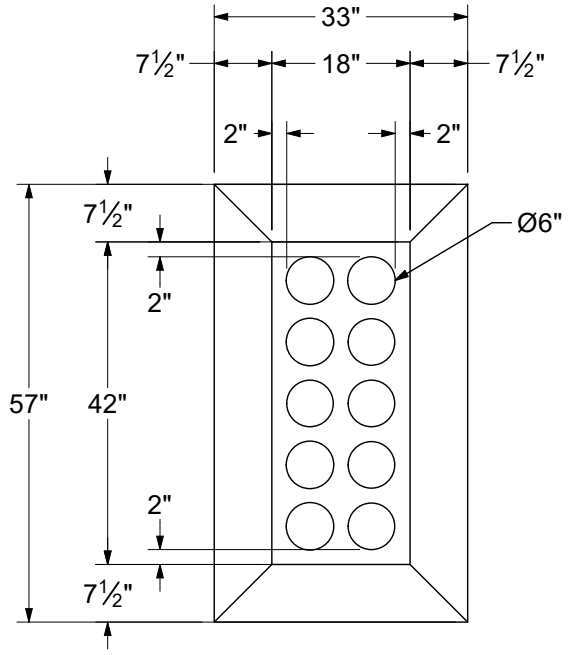
End View



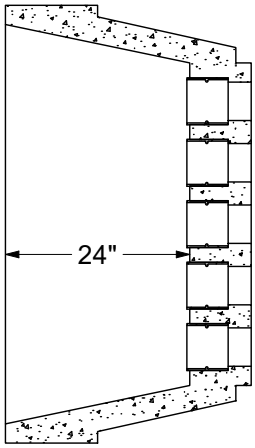
Side View

33 11 04 03

REV	DATE	ENG	DESCRIPTION
4	01/01/24	JMW	Converted to new format
3	01/16/03	DDG	



End View



Side View

33 11 04 04

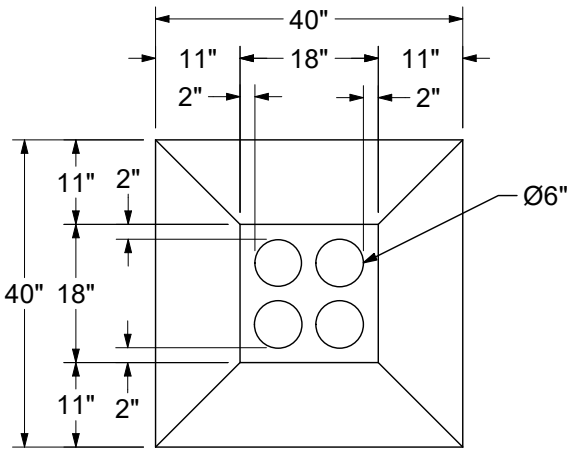
DCS #	DESCRIPTION
33 11 04 01	4 Duct Recess
33 11 04 02	6 Duct Recess
33 11 04 03	8 Duct Recess
33 11 04 04	10 Duct Recess

CONSTRUCTION NOTE(s):

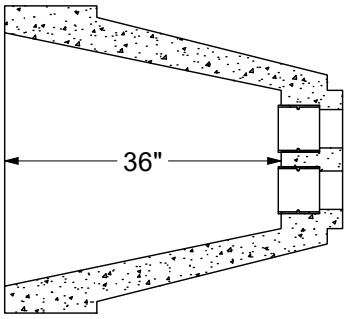
1. May use 3 hole duct terminator (Stock #12 56 126) in place of couplings when appropriate.

	ITEM	STK / DCS #	DESCRIPTION 33 11 04 **	01	02	03	04
	A	98 00 005	Concrete - M.H. (c.y.)	1	1	2	2
1	B	12 51 156	Coupling, PVC, 5" SCH 40	4	6	8	10
@			Op Code, Excavation (Mach.) (c.y.)	4	4	4	14
@			Op Code, Installing and Removing Forms (s.f.)	20	23	26	29
@			Op Code, Backfilling (c.y.)	1	1	1	1
@			Op Code, Tamping (s.f.)	12	12	12	12
@			Op Code, Surface Removal (s.f.)	12	12	12	12
@			Op Code, Surface Replacement (s.f.)	12	12	12	12
@			Op Code, Demolition (s.f.)	7	8	10	11

REV	DATE	ENG	DESCRIPTION
4	01/01/24	JMW	Converted to new format
3	01/16/03	DDG	

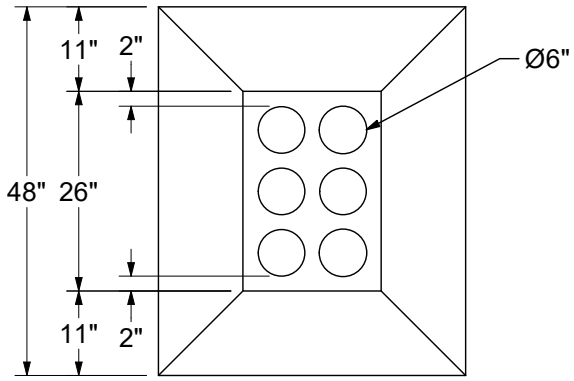


End View

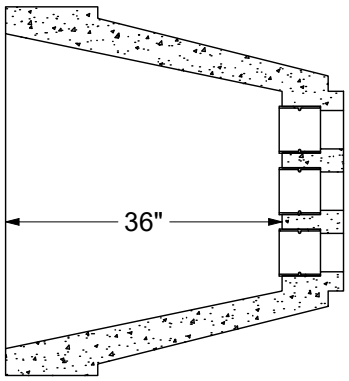


Side View

33 11 05 01

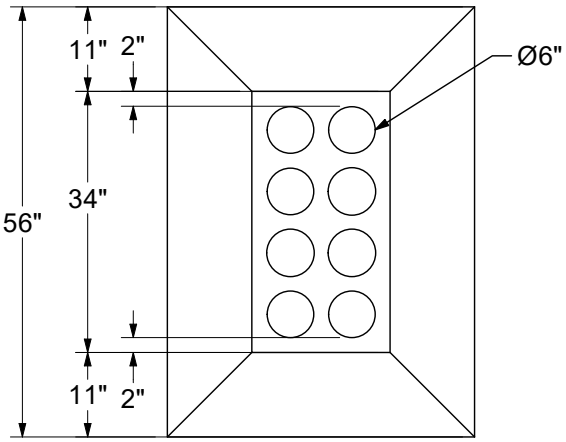


End View

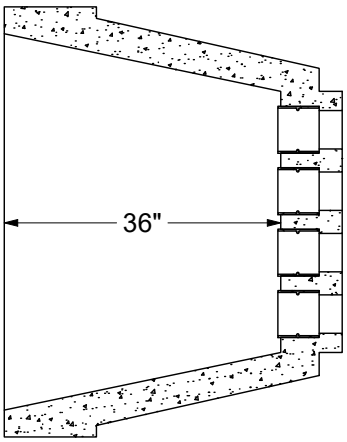


Side View

33 11 05 02



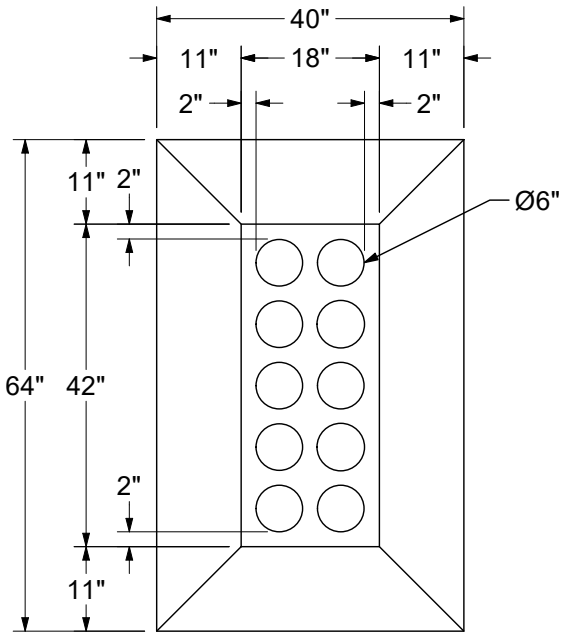
End View



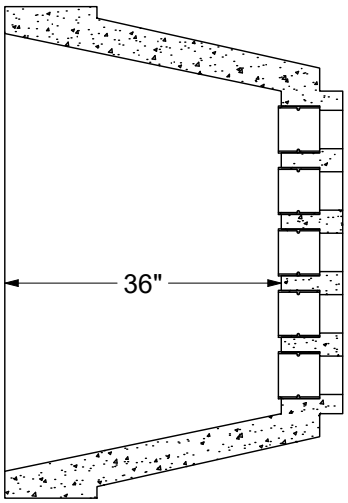
Side View

33 11 05 03

REV	DATE	ENG	DESCRIPTION
4	01/01/24	JMW	Converted to new format
3	03/16/03	DDG	



End View



Side View

33 11 05 04

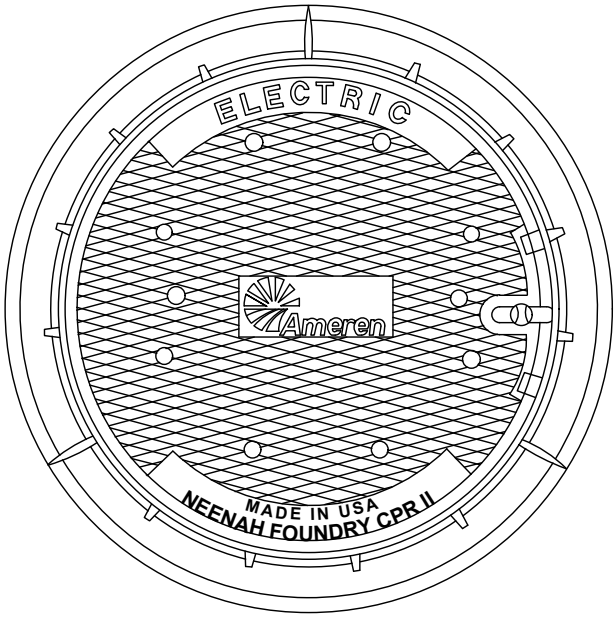
DCS #	Description
33 11 05 01	4 Duct Recess
33 11 05 02	6 Duct Recess
33 11 05 03	8 Duct Recess
33 11 05 04	10 Duct Recess

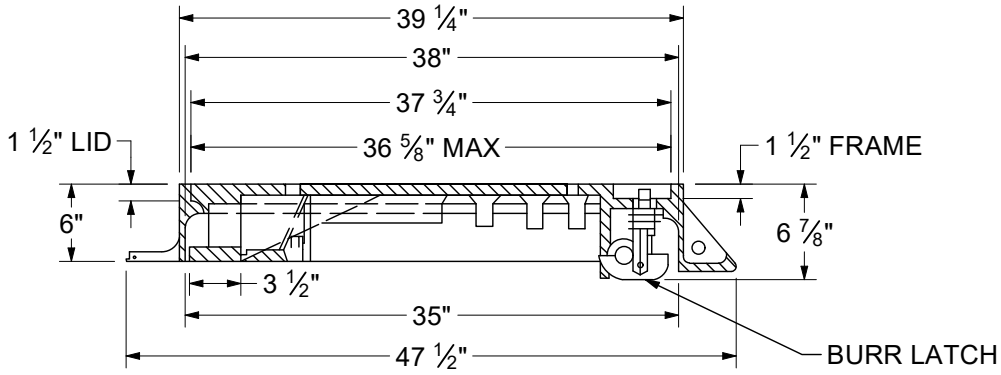
CONSTRUCTION NOTE(s):

1. May use 3 hole duct terminator (Stock #12 56 126) in place of couplings when appropriate.

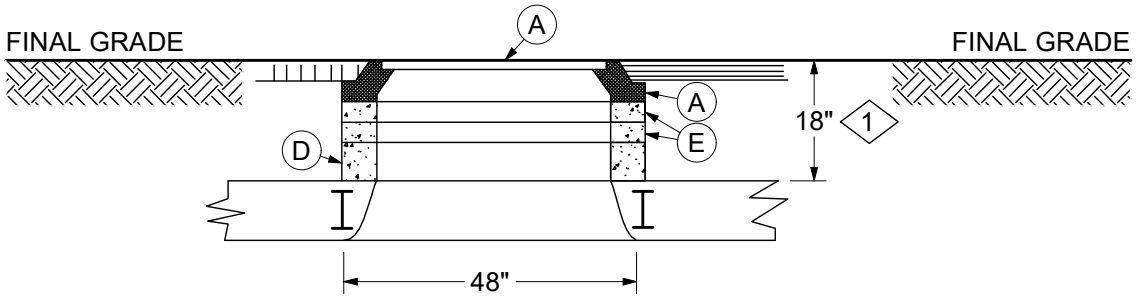
	ITEM	STK / DCS #	DESCRIPTION 33 11 05 **	01	02	03	04
	A	98 00 005	Concrete - M.H. (c.y.)	2	2	3	3
	B	12 51 156	Coupling, PVC, 5" SCH 40	4	6	8	10
@			Op Code, Excavation (Mach.) (c.y.)	5	5	5	5
@			Op Code, Installing and Removing Forms	36	39	42	45
@			Op Code, Backfilling (c.y.)	2	2	2	2
@			Op Code, Tamping (s.f.)	18	18	18	18
@			Op Code, Surface Removal (s.f.)	18	18	18	18
@			Op Code, Surface Replacement (s.f.)	18	18	18	18
@			Op Code, Demolition (s.f.)	8	10	11	12

REV	DATE	ENG	DESCRIPTION
4	01/01/24	JMW	Converted to new format
3	03/16/03	DDG	



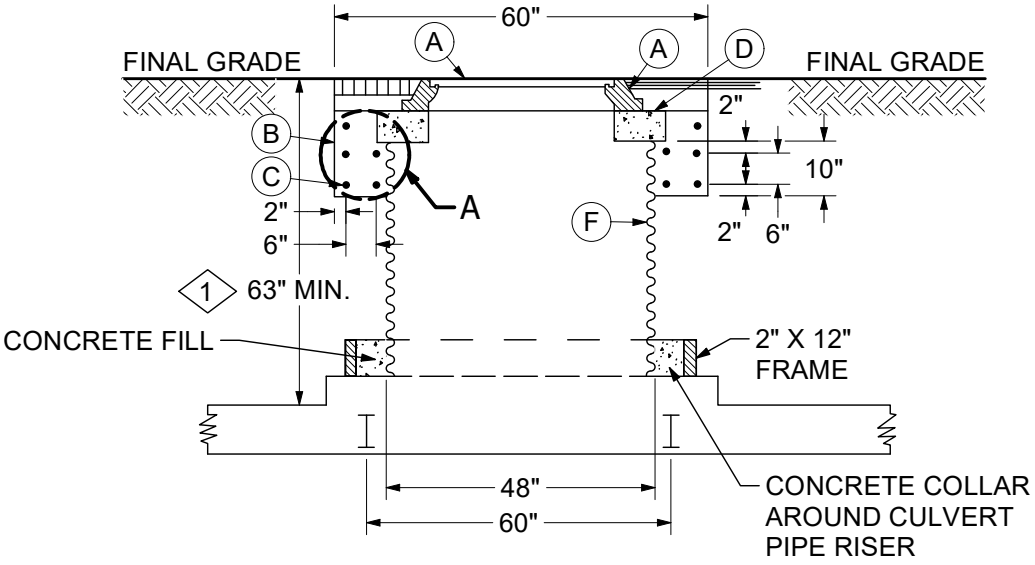


Frame and Cover
Swiveloc Type 3

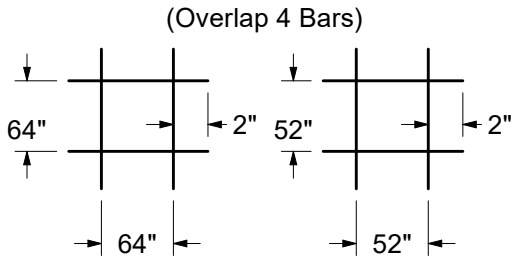


33 12 01 01
Normal Depth

REV	DATE	ENG	DESCRIPTION
6	01/01/24	JMW	Converted to new format
5	12/05/17	EJB	



33 12 01 02
Extra Deep



Detail A
#3 Reinforcing Bars

CONSTRUCTION NOTE(s):

1. Normal depth is 18" with 2 - 3" collars on top of 1 - 6" collar. Extra deep is 63" minimum.

2. Extension rings can be used to raise the non-locking style cover. 1.75" rise - Stock #12 52 003 and 2.25" rise - Stock #12 52 004.

	ITEM	STK / DCS #	DESCRIPTION 33 12 01 **	01	02
3	A	12 02 108	Frame and Cover - SwiveLoc Type, 36" Dia.	1	1
	B	98 00 005	Concrete, 4000 PSI Cu Yards	-	1
	C	27 02 062	Bar, Reinforcing, #3, 16 ft	-	6
	D	12 06 063	Neck - Section, 6" Thick Concrete	1	1
	E	12 06 062	Neck - Section, 3" Thick Concrete	2	-
@	F	12 02 076	Culvert Pipe - 48" x 5'-0"	-	1
		12 02 077	Culvert Pipe - 48" x 4'-0"	-	-
@	G	12 02 107	Cover Only - Explosion Mitigation Type	-	-

DESIGN NOTE(s):

3. Non-locking manhole frame and cover (Stock #12 02 085) is available for restricted use only.

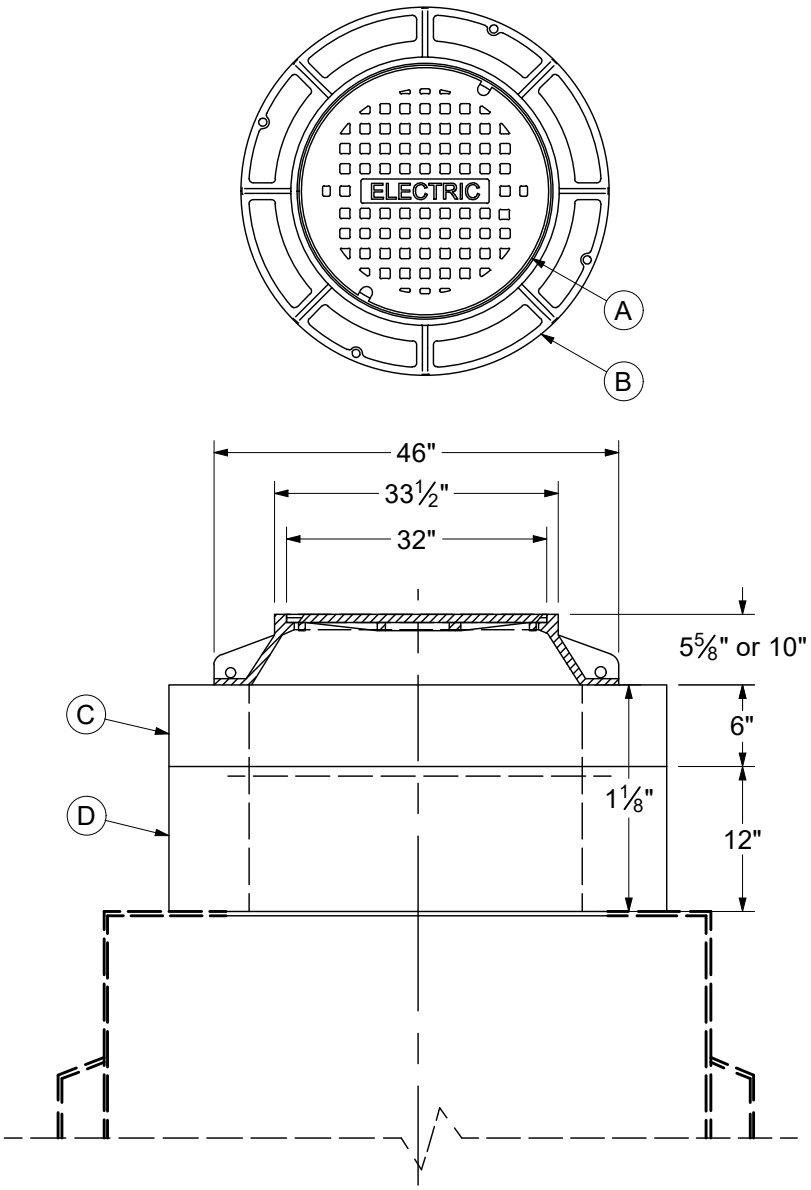
REV	DATE	ENG	DESCRIPTION
6	01/01/24	JMW	Converted to new format
5	12/05/17	EJB	

MANHOLE ACCESSORIES

Manhole Neck
with Frame and Cover

33 12 02 **
1 of 1

ILLINOIS ONLY



DCS #	DESCRIPTION
33 12 02 01	5-5/8" Frame Depth - Alternate
33 12 02 02	10" Frame Depth - Preferred

CONSTRUCTION NOTE(s):

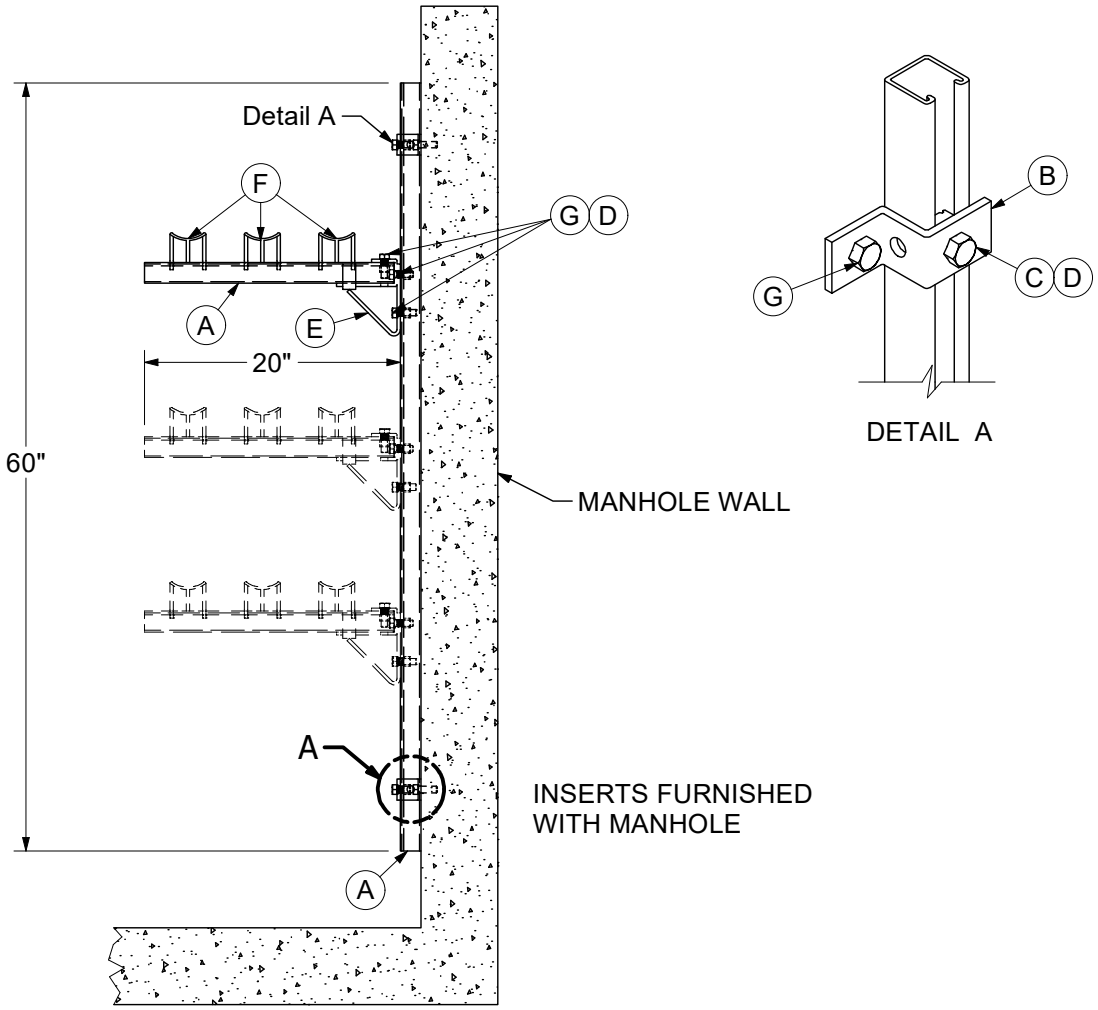
1. Extension rings can be used to raise the cover. 2" rise - Stock #12 52 089 and 3" rise - Stock #12 52 091.

	ITEM	STK / DCS #	DESCRIPTION 33 12 02 **	01	02
	A	12 02 088	Cover - Manhole, 32" Dia.	1	1
	B	12 06 143	Frame - Manhole, 5-5/8" Deep	1	-
		12 06 144	Frame - Manhole, 10" Deep	-	1
@	C	12 56 085	Collar - 6" Precast Concrete	-	-
@	D	12 56 086	Collar - 12" Precast Concrete	-	-

DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
2	01/01/24	JMW	Converted to new format
1	03/25/09	DDG	

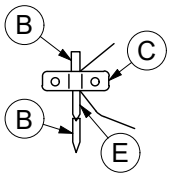
ILLINOIS ONLY



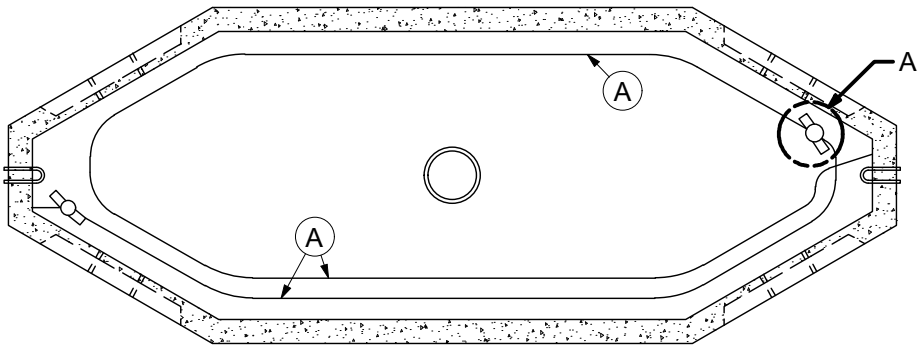
DCS #	DESCRIPTION
33 20 01 01	Cable Rack - 1 Circuit
33 20 01 02	Cable Rack - 2 Circuits
33 20 01 03	Cable Rack - 3 Circuits
33 20 01 04	Cable Rack - Add (1) Circuit

	ITEM	STK / DCS #	DESCRIPTION 33 20 01 **	01	02	03	04
	A	40 79 781	Channel - Single, Galv, 1-5/8" x 1-5/8" x 10', (Ft.)	7	9	10	2
	B	40 79 764	Support - Zee Unistrut	2	2	2	-
	C	23 52 436	Screw - 1/2" x 1" Hex	2	2	2	-
	D	40 09 231	Nut - Channel, 1/2"	5	8	11	3
	E	40 79 759	Brace - Bracket, Unistrut	1	2	3	1
	F	40 79 761	Insulator - Cable Rack	3	6	9	3
	G	40 79 763	Screw - Cap, 1/2" x 1-1/2" Hex	5	8	11	3

REV	DATE	ENG	DESCRIPTION
2	01/01/24	JMW	Converted to new format
1	03/25/09	DDG	



DETAIL A



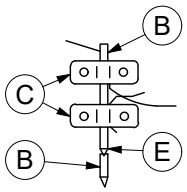
DCS #	DESCRIPTION
33 20 02 01	4' x 10' Manhole
33 20 02 02	6' x 14' Manhole
33 20 02 03	6' x 17' Manhole

CONSTRUCTION NOTE(s):

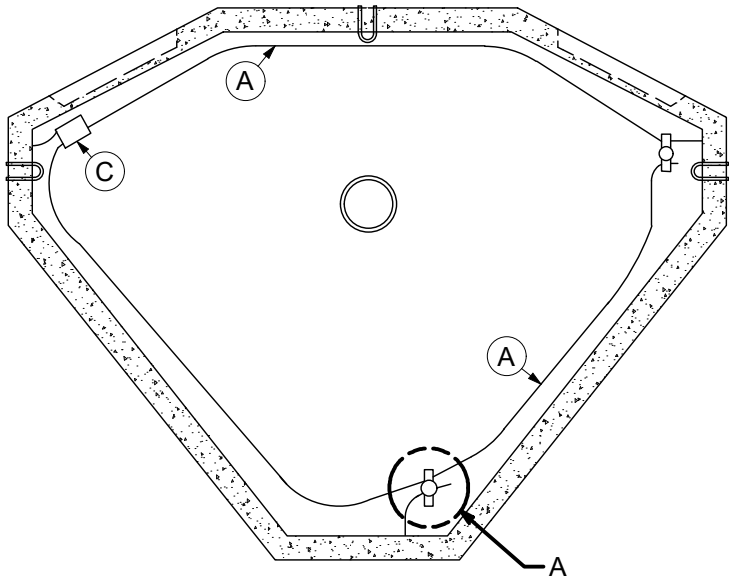
1. All splice ground and drain wires are connected to the grounding system using a two bolt connector.
2. The bond wire is to be fastened 6 inches above the manhole floor using plastic hooks (D) attached to the cable mounting brackets.
3. If the manhole is the first one in the substation do not drive the ground rods. Connect the end of the bond wire at two points to the substation ground grid.
4. When making grounding attachments to the bond wire, clean the bond wire at the attachment point.
5. Join two ground rods together with a coupling.

	ITEM	STK / DCS #	DESCRIPTION 33 20 02 **	01	02	03
	A	18 52 024	Wire-4/0 AWG, Copper, Bare, Soft Drawn	43	54	65
3	B	23 63 143	5/8" Ground Rod 4ft	4	4	4
	C	17 54 132	Connector-Wire, 8-350 kcmil, CU	2	2	2
2	D	12 56 123	Cable Hook - Bond Wire Support	10	10	10
5	E	23 12 070	Coupling - CU Alloy, 5/8", Threaded	2	2	2
			Op Code, Install ground system	1	1	1

REV	DATE	ENG	DESCRIPTION
3	01/01/24	JMW	Converted to new format
2	04/05/17	EJB	



DETAIL A

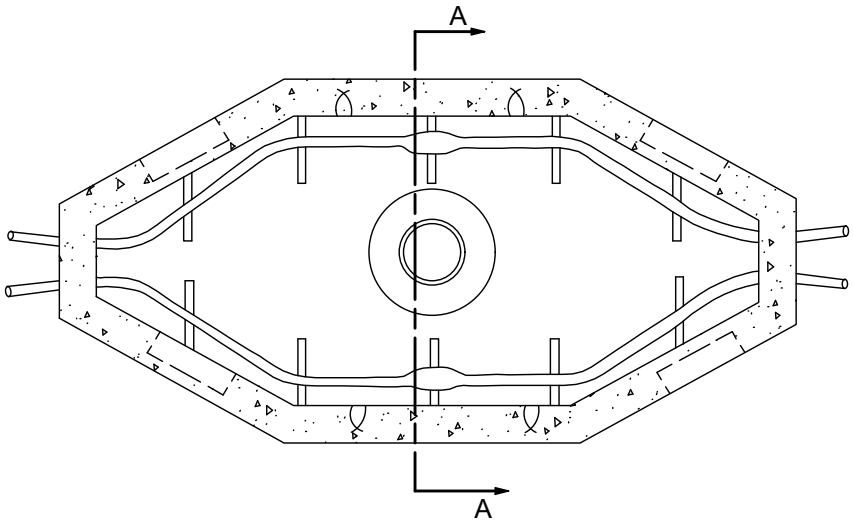


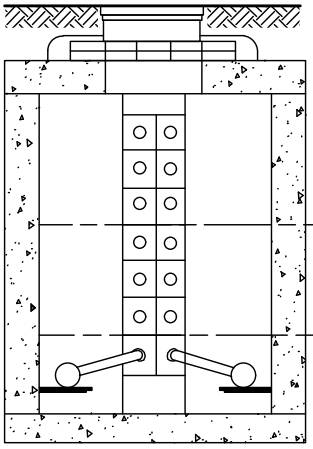
CONSTRUCTION NOTE(s):

1. All splice ground and drain wires are connected to the grounding system using a two bolt connector.
2. The bond wire is to be fastened 6 inches above the manhole floor using plastic hooks (D) attached to the cable mounting brackets.
3. If the manhole is the first one in the substation do not drive the ground rods. Connect the end of the bond wire at two points to the substation ground grid.
4. When making rounding attachments to the bond wire, clean the bond wire at the attachment point.
5. Join two ground rods together with a coupling.

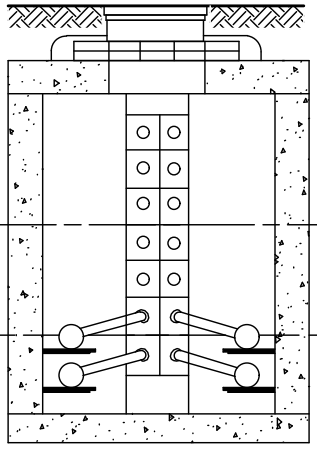
	ITEM	STK / DCS #	DESCRIPTION 33 20 03 **	01
	A	18 52 024	Wire - 4/0 AWG, Copper, Bare, Soft Drawn	50
3	B	23 63 143	5/8" Ground Rod 4ft	4
	C	17 54 132	Connector - Wire, 8-350 kcmil, CU	5
2	D	12 56 123	Cable Hook - Bond Wire Support	8
5	E	23 13 070	Coupling - CU Alloy, 5/8", Threaded	2
			Op Code, Install Ground System	1

REV	DATE	ENG	DESCRIPTION
3	01/01/24	JMW	Converted to new format
2	04/05/17	EJB	

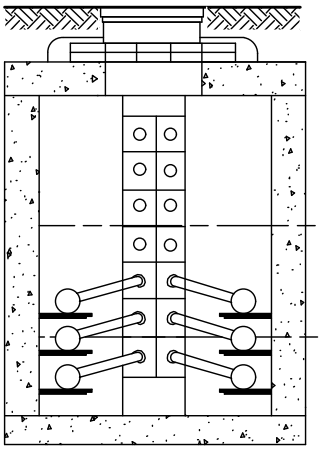




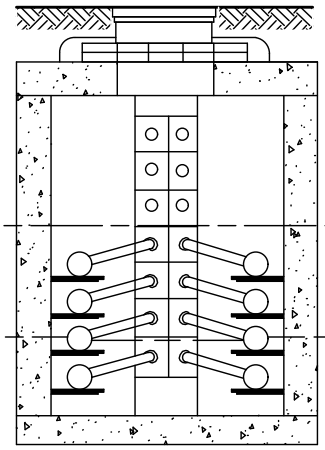
Section A-A
Two Ducts



Section A-A
Four Ducts

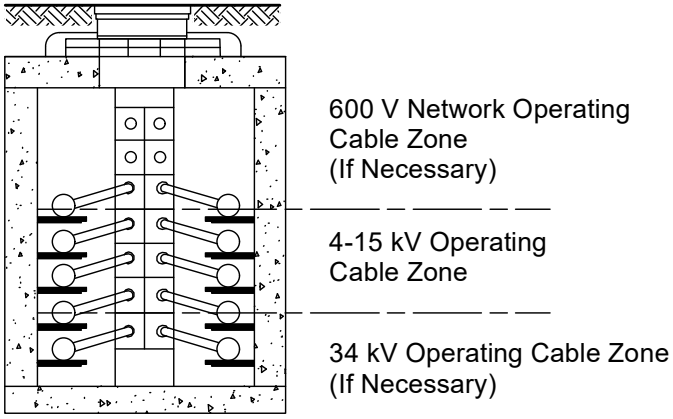


Section A-A
Six Ducts

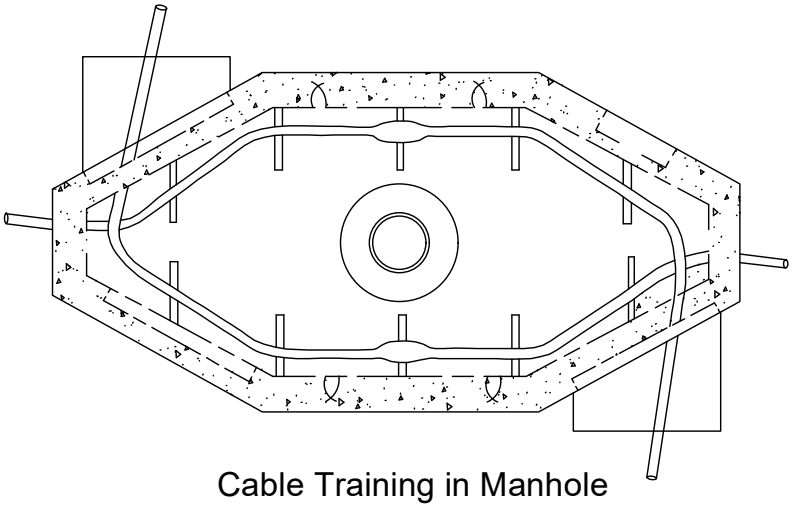


Section A-A
Eight Ducts

REV	DATE	ENG	DESCRIPTION
2	01/01/24	JMW	Converted to new format
1	10/03/16	EJB	



Section A-A
Ten Ducts

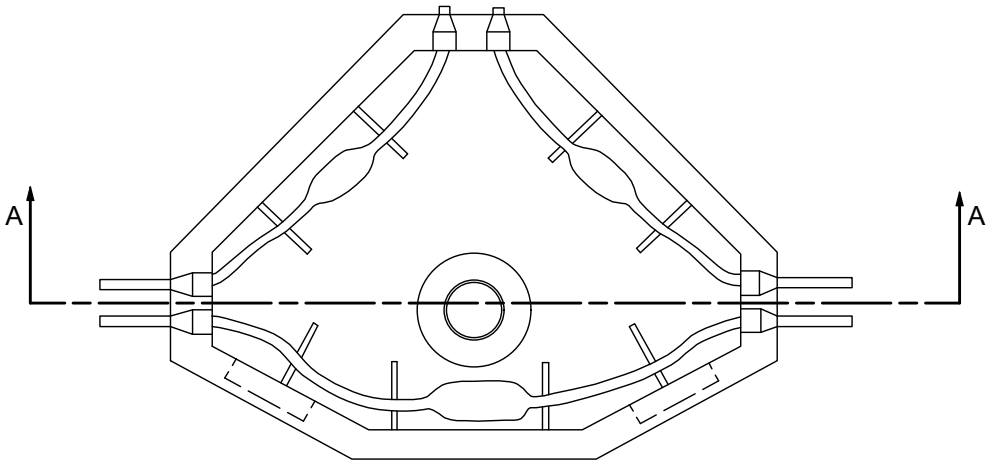


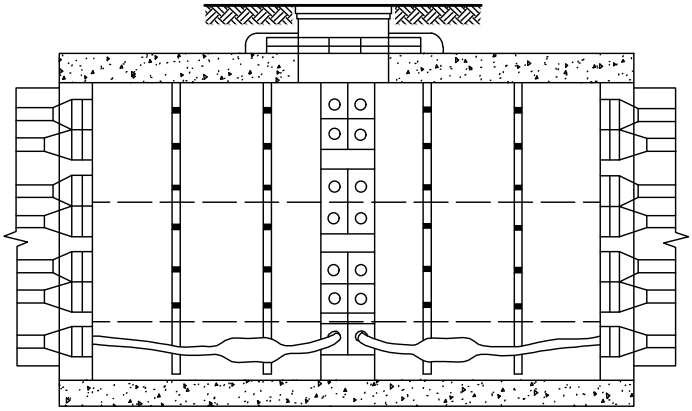
Cable Training in Manhole
With Wingwall

CONSTRUCTION NOTE(s):

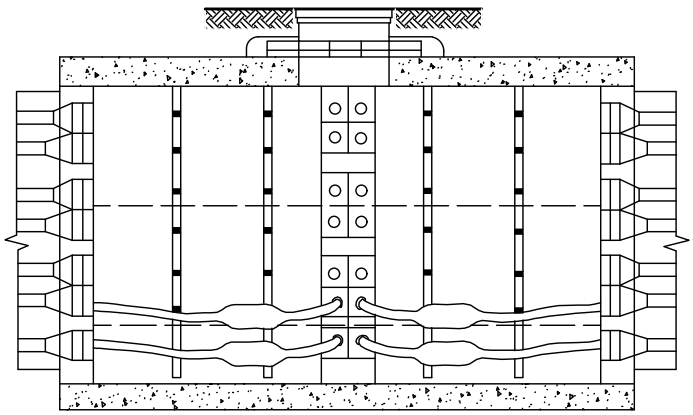
1. Cable and splice positions reflect three single solid dielectric cable splices or one three conductor PILC cable joint.

2. The maximum number of ducts occupied by energized power cables shall be ten.

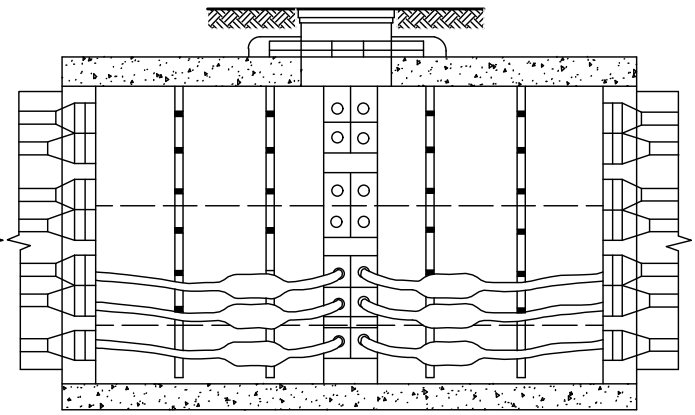




Section A-A
Two Ducts

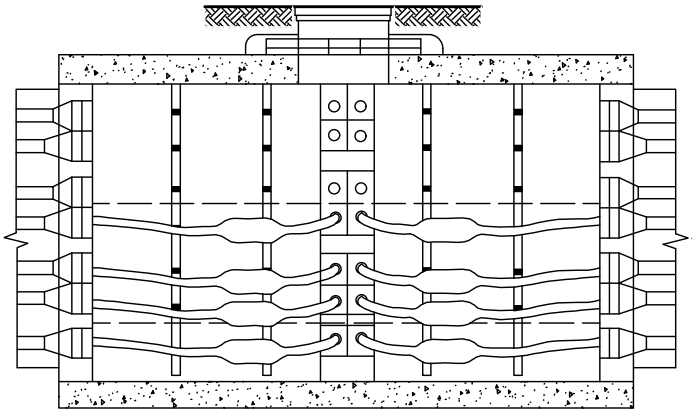


Section A-A
Four Ducts

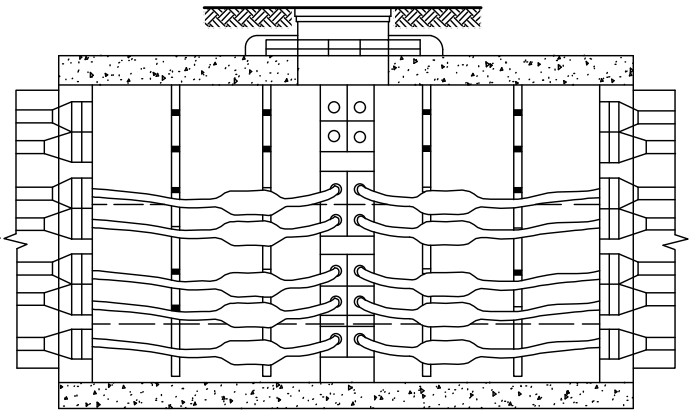


Section A-A
Six Ducts

REV	DATE	ENG	DESCRIPTION
1	01/01/24	JMW	Converted to new format
0	07/03/13	EJB	



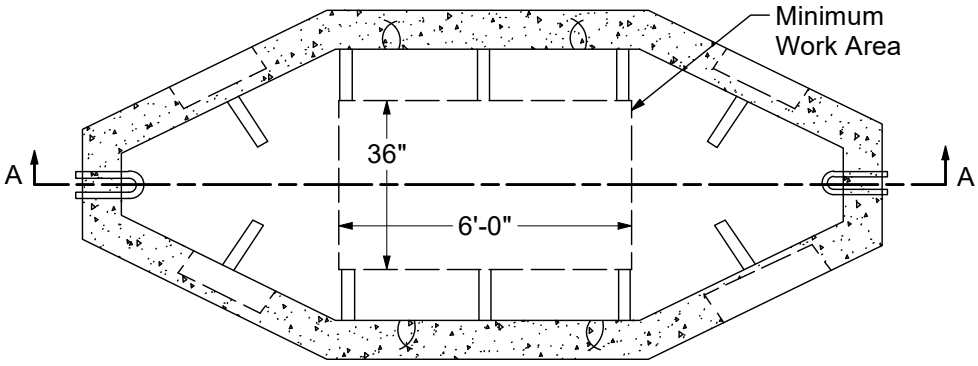
Section A-A
Eight Ducts



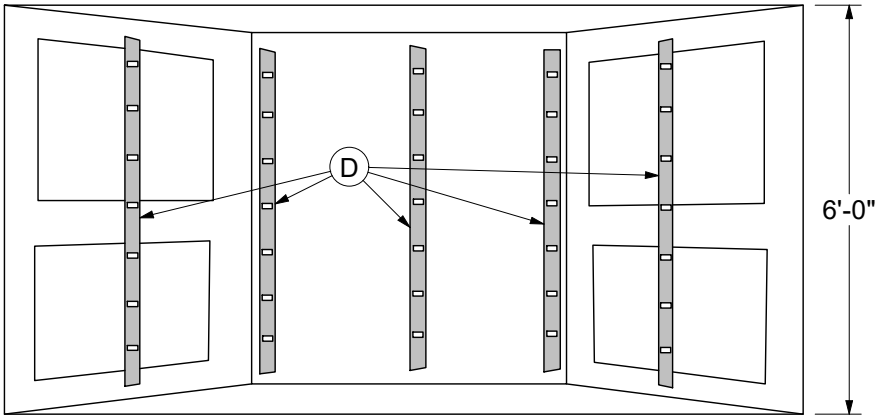
Section A-A
Ten Ducts

CONSTRUCTION NOTE(s):

1. Cable and splice positions reflect three single dielectric cable splices or one three conductor PILC cable joint.
2. The maximum number of ducts occupied by energized power cables shall be ten.



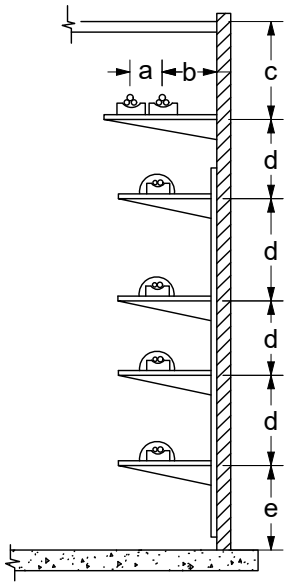
Cable Rack Spacing in Manhole



SECTION A-A

Side View of Cable Racks in Manhole

Cable Bracket Spacing



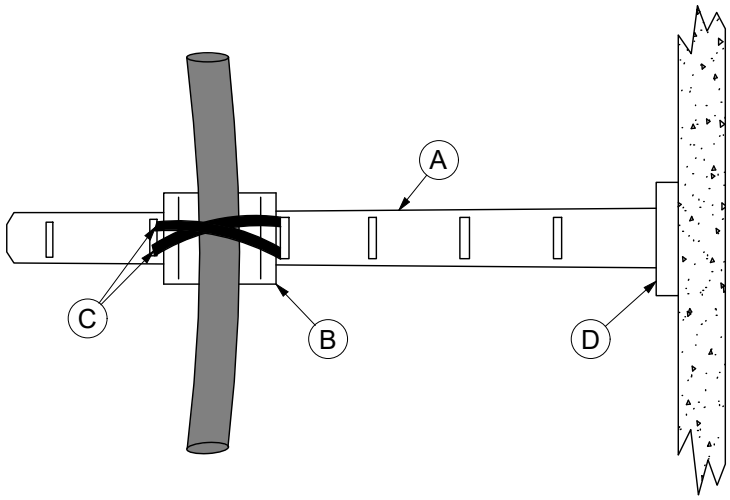
Dimension in Table

Standard Manhole (1 to 10 Ducts Used)
Maximum of 10 Network Cables on One Side
Maximum of 5 Primary Cables on Each Side
7 Brackets Maximum on Each Cable Rack

SPACING REQUIREMENTS FOR CABLE BRACKETS
Standard Precast Manhole

	a	b	c	d	e
Network & 600V	6"	6"	12"	12"	12"
5 & 15 kV	-	6"	12"	12"	12"
35 kV	-	6"	12"	12"	15"

REV	DATE	ENG	DESCRIPTION
1	01/01/24	JMW	Converted to new format
0	03/14/13	EJB	



Cable / Splice Cross Tie Down Detail

CONSTRUCTION NOTE(s):

1. In combined Network & Primary manholes the Network cables should be located on the top 1-4 brackets and the Primary cables should be located on the next 1-3 brackets below the Network cables. The Sub-transmission cables (if needed) should be located below the Primary cables on the bottom bracket(s).

2. Use the Cable Training DCS 33 20 04 01 to determine the duct position of new cable installations. When training and racking cables avoid situations whenever possible where cables will cross each other.

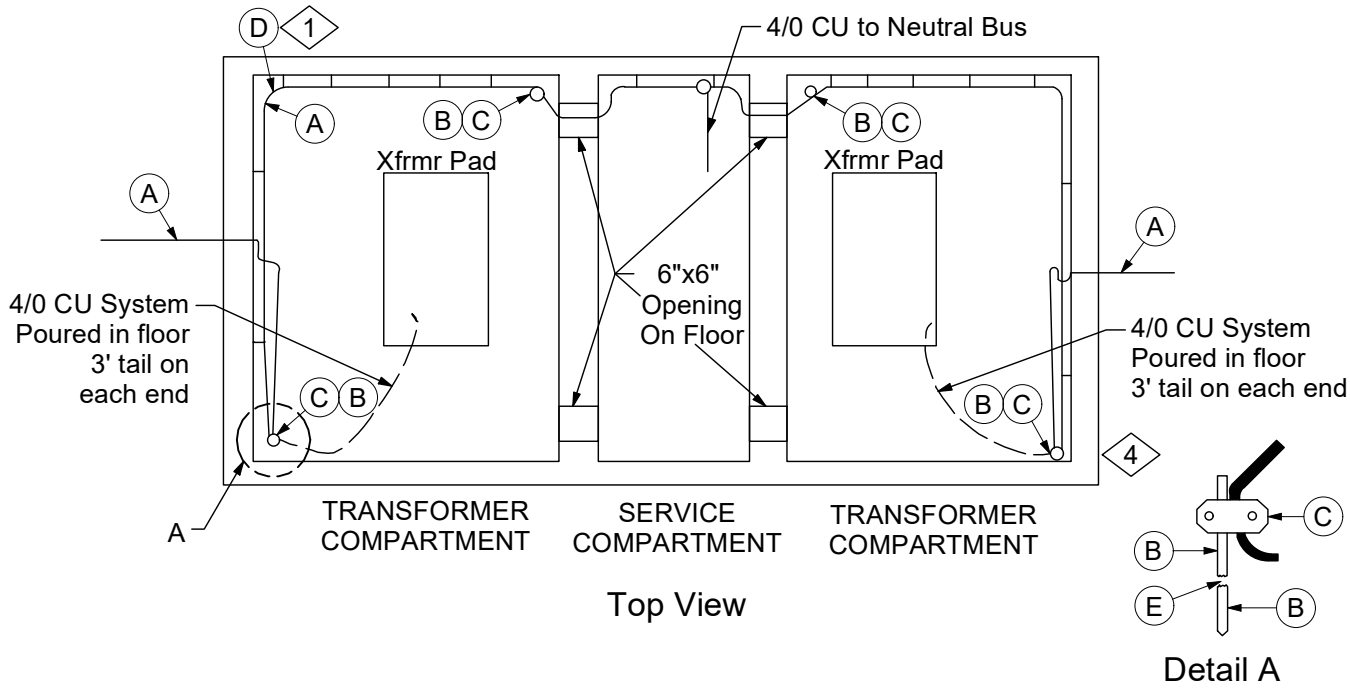
3. At each cable mounting arm, tie the cable/splice down to the porcelain insulator pad and mounting arm using two cable ties in a cross pattern (see Detail above).

4. New precast manholes will be supplied with the cable racks already installed in them.

DCS #	DESCRIPTION
33 20 05 01	Single Installation of 5 kV or 15 kV Primary Cable and Splice or a 35 kV Sub−transmission Cable and a Splice
33 20 05 02	Installation of One or Two 600 V Network Cables and Straight Splices or 2−3 Network Cables and a 3−way Crab Connector
33 20 05 03	4−7 600 V Network Cables and Either a 5 or 7 way Crab Connector

	ITEM	STK / DCS #	DESCRIPTION 33 20 05 **	01	02	03
	A	12 56 121	Arm − Cable Mounting 10”	5	-	-
		12 56 113	Arm − Cable Mounting 14”	-	20	-
		12 56 112	Arm − Cable Mounting 18”	-	-	20
	B	12 56 122	Insulator − Porcelain Pad	#	#	#
3	C	40 59 196	Tie − Cable, Black, 13 ½” Dia.	10	40	200
4@	D	12 56 115	Rack − Cable, Galv. Steel, 30” Long, 18 Holes	#	#	#
		12 56 116	Rack − Cable, Galv. Steel, 55” Long, 37 Holes	#	#	#

REV	DATE	ENG	DESCRIPTION
1	01/01/24	JMW	Converted to new format
0	03/14/13	EJB	



CONSTRUCTION NOTE(s):

1. The Bond Wire (A) is to be fastened with cable ties (D) 6 inches above the manhole floor after the vault is poured. The Bond wire will be tied to 1/2" minimum diameter mounting eyes which are to be cast into the vault walls at intervals of 3 ft. maximum. The 4/0 AWG bond wire will run from the primary duct banks in to the vaults.

2. Each transformer component will have a 4/0 AWG copper wire extension from the wall to the transformer pad. The extension is to be poured into the vault floor and have two 3 foot tails exposed at each end. One end will connect to the bond wire system while the other end connects to the transformer ground. Connect the extension with two bolt connections (C).

3. The service compartment will have a 4/0 AWG bond wire, clean the bond wire extension from the bond wire system to the neutral bus bar. Connect the extension with two bolt connectors (C).

4. Ground rods (B) are to be driven in 6 feet prior to pouring the floor of the vault. Rods shall be placed 6" from corners and walls.

5. When making grounding attachments to the bond wire, clean the bond wire at the attachment point.

6. Join two ground rods together with a coupling.

7. All access ladders are to be individually connected to the grounding system.

	ITEM	STK / DCS #	DESCRIPTION 33 20 06 **	01
1	A	18 52 024	Wire - 4/0 AWG, Copper, Bare, Soft Drawn	95
4	B	23 63 143	5/8" Ground Rod 4ft	8
	C	17 54 132	Connector - Wire, 8-350 kcmil, CU	11
1	D	40 59 196	Tie - Cable, Black, 13-1/2" Dia.	20
6	E	23 13 070	Coupling - CU Alloy, 5/8", Threaded	4

REV	DATE	ENG	DESCRIPTION
2	01/01/24	JMW	Converted to new format
1	04/05/17	EJB	

PADS AND TRANSFORMER ACCESSORIES 34

THREE PHASE TRANSFORMER PADS - POURED-IN-PLACE - 35kV 34 11 00 00

SINGLE PHASE FIBERGLASS BOX VAULT PAD - 5kV, 15kV, 35kV ..... 34 21 04 **

THREE PHASE TRANSFORMER PADS WITH COMPOSITE BOX VAULT - 5kV, 15kV 34 21 04 05

SINGLE AND THREE PHASE COMPOSITE FLAT PADS - 5kV, 15kV ..... 34 21 05 **

RETAINING WALL SET FOR SINGLE PHASE PADMOUNT TRANSFORMERS - 5kV, 15kV, 35kV ..... 34 21 06 **

BOX PAD FOR AIRBREAK SWITCHGEAR MANUAL AND MOTOR OPERATED..... 34 21 10 01

BOX PAD FOR VACUUM, S&C VISTA SWITCHGEAR MANUAL OR REMOTE SUPV CONTROL..... 34 21 11 **

BUMPER POST - POWER INSTALLED - FOR PADMOUNT EQUIPMENT PROTECTION..... 34 22 01 00

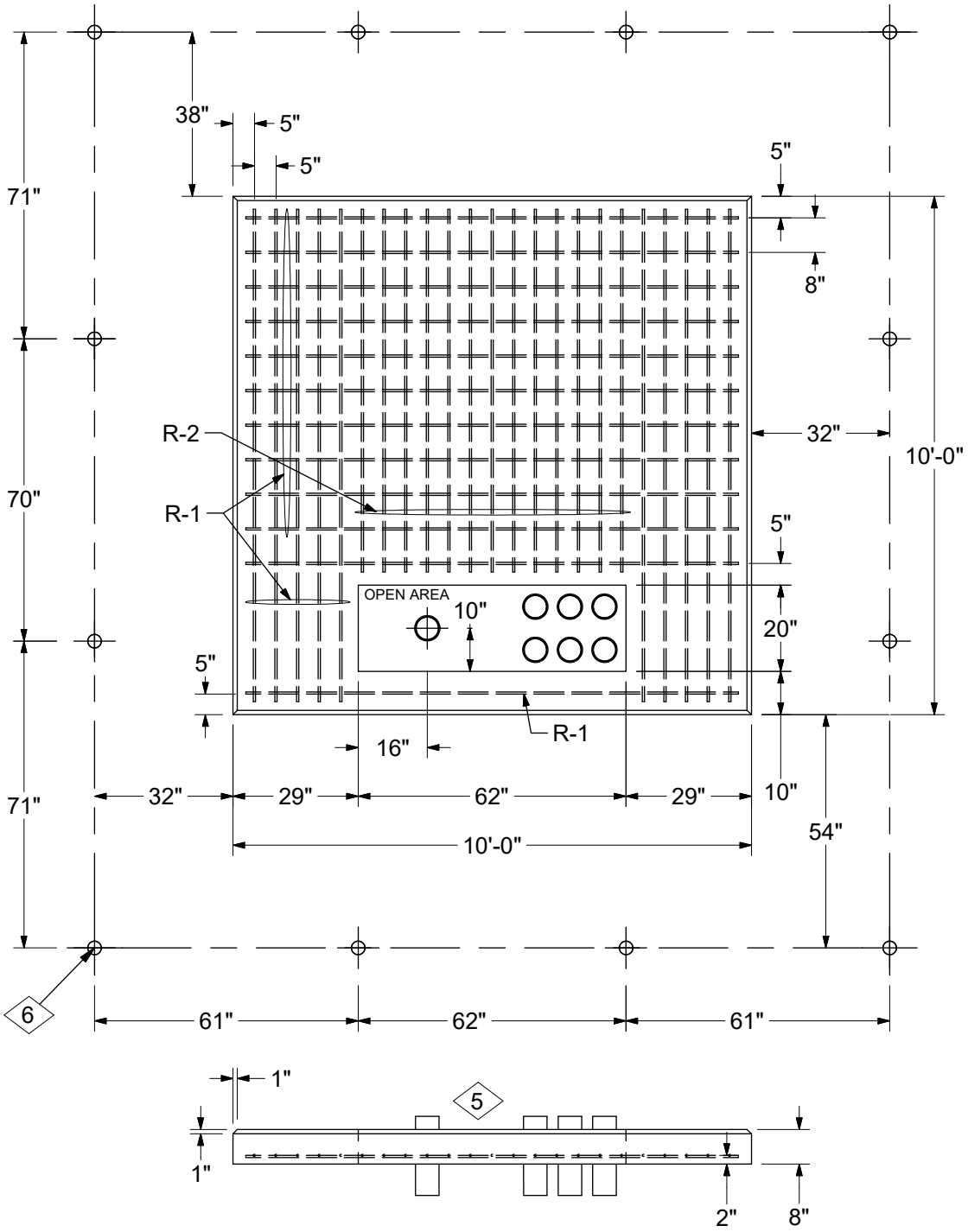


Table 1 - Radial-Feed Pad Reinforcing Schedule			
Rebar	NO Req'd	Size	Length
R-1	22	#4	114"
R-2	13	#4	84"

Radial-Feed Pad
1500 kVA Thru 3000 kVA

REV	DATE	ENG	DESCRIPTION
4	01/01/22	DG	Converted to new format

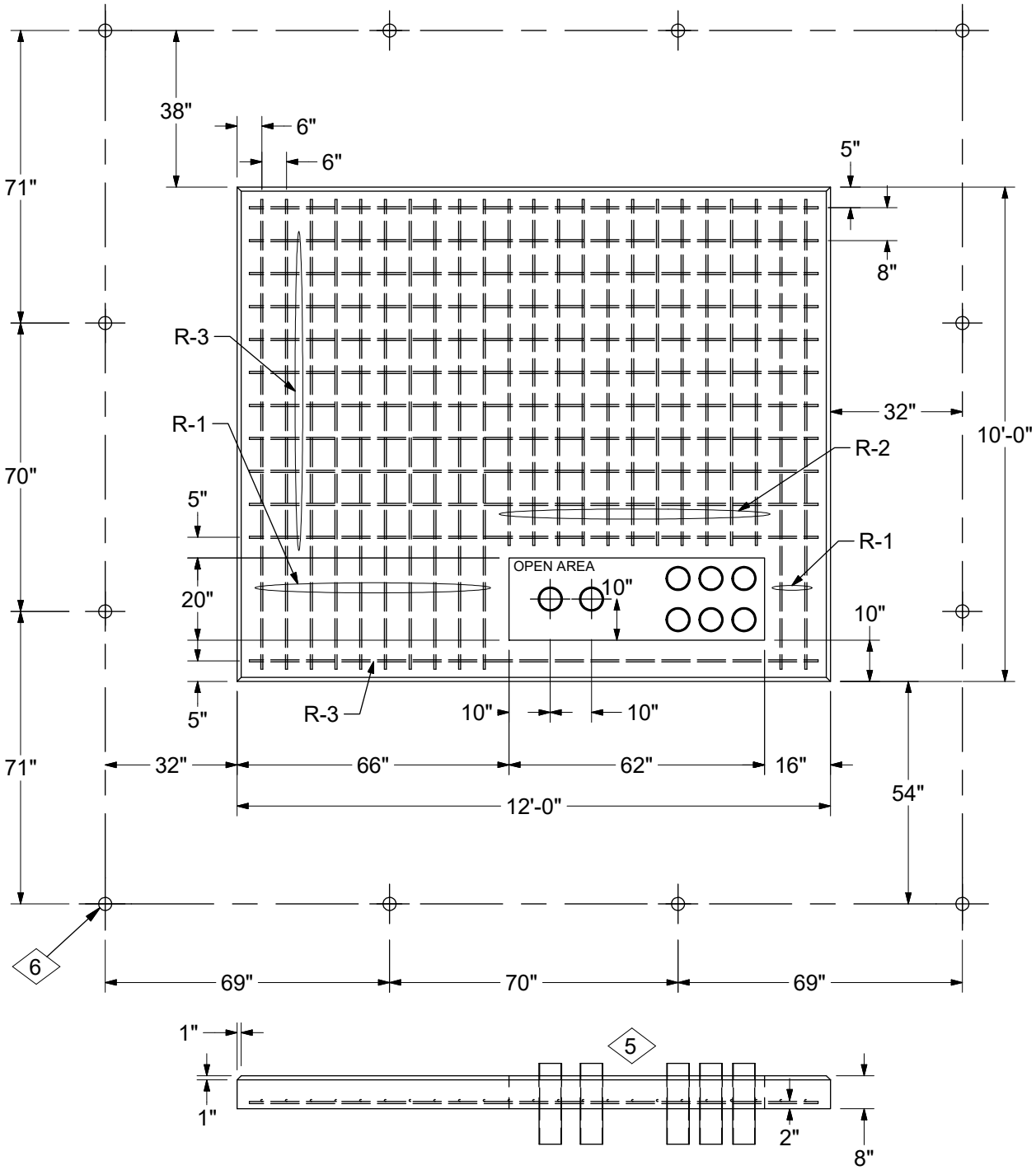


Table 2 - Loop-Feed Pad Reinforcing Schedule			
Rebar	NO Req'd	Size	Length
R-1	12	#4	114"
R-2	11	#4	84"
R-3	12	#4	138"

LOOP-FEED PAD
500 kVA THRU 2500 kVA

REV	DATE	ENG	DESCRIPTION
4	01/01/22	DG	Converted to new format

CONSTRUCTION NOTE(s):

1. Concrete mix shall be either Type I or Type III portland. Mix concrete in accordance with ASTM C94. Water shall be clear and drinkable. Ultimate strength at 28 days shall be 4,000 psi, 6 sacks minimum of cement per cubic yard. Maximum slump 4”. Water to cement ratio shall not exceed 5.0 by weight, including free moisture on aggregate. Aggregate shall be white limestone rock, maximum size 3/4”. Use air entraining admixture (3% to 6% air by volume.) **The use of calcium chloride is prohibited.**

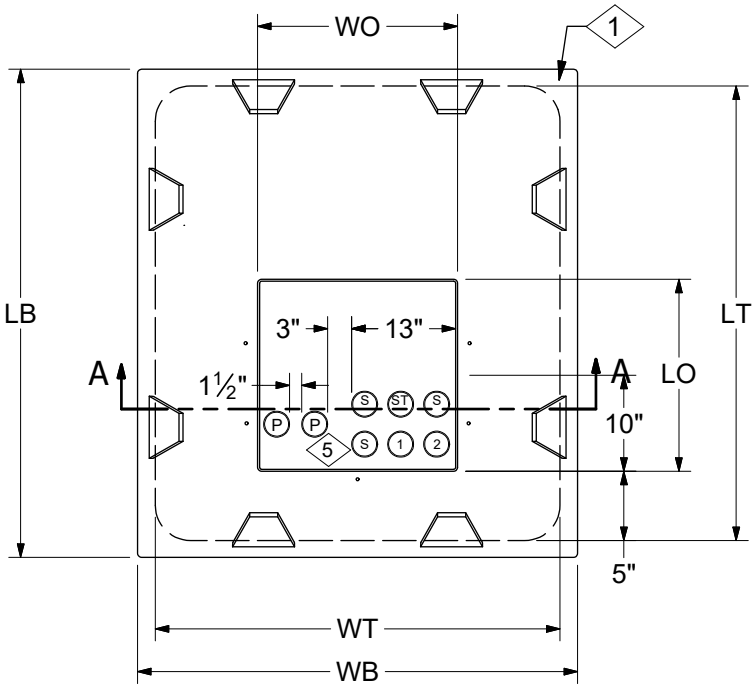
2. All concrete shall be well vibrated, dense and smooth. No honeycombs, fins or cold joints shall be present. Placement and vibration of concrete shall not disturb the reinforcement.

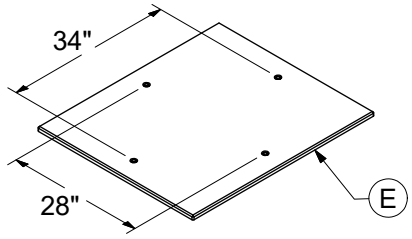
3. Reinforcement shall consist of #4 reinforcing bars meeting the requirements of ASTM A615, minimum grade 40. All reinforcing bars shall be tied to prevent displacement during concrete placement.

4. Dimensions shall be in accordance with the drawings shown in this standard. The top surface shall be true and free of mounds or depressions. A four foot level shall be placed at any location on the top surface and at no location may a #14 (American Wire Gauge) bare wire fit between the level and the surface. The finished pad shall be free of voids and crumbling edges. No protrusion or flashing shall exceed 1/4” in length from the finished surface. **Pads not conforming to any dimension or specification contained herein will not be accepted.**

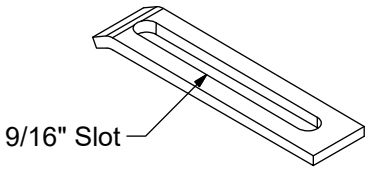
◇5. Secondary conduits shall be symmetrically located within a 20" x 24" area. Primary conduit shall be positioned as shown.

◇6. All materials and labor for protective barrier posts shall be provided by the customer.
a. Barrier posts on sides not accessible to vehicles may be omitted.
b. Installation of barrier posts must be coordinated with the conduit installation to avoid mutual interference.
c. Barrier posts to be 4" steel pipe, 8'-6" long, buried 56" deep.
d. Drill holes for barrier posts with 8" auger.
e. Fill the holes around the barrier posts with concrete to the top of grade.
f. Fill the barrier posts with concrete.
g. Paint barrier posts with yellow laquer.

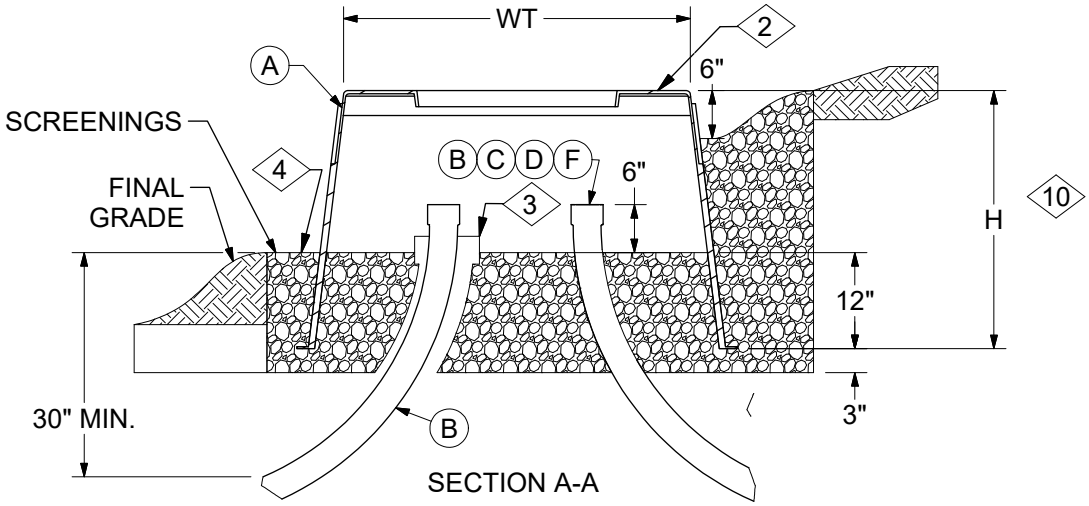




OPTIONAL BOX VAULT COVER
W/Four 3/8" SS Penta Head Bolts



HOLD DOWN BRACKET DETAIL
2 Brackets Provided w/Pad



CONSTRUCTION NOTE(s):

1. Base of vault.
2. Load bearing surface of vault.
3. Restrain conduit bends per DCS **31 47 01 ** ** for pulling long cable lengths.
4. 12" minimum cover over flange of box on downhill side of box.
5. P=Primary, S=Secondary, ST=Streetlight, 1&2=Services
6. In Missouri residential developments, the contractor will install the vault and bends.
7. Secondary conduit shall be symmetrically located within a 13” x 10” area as shown above.

8. For Missouri residential contractor jobs, 3” conduits shall be installed on the primary side. Otherwise 2” conduit may be installed on the primary side.

9. Conduit ends to be sealed with duct tape and the tape marked with permanent marker as follows: S=Secondary, ST=Streetlight, and service conduits marked with lot number.

Box Vault Dimensions & Weight										
	STK #	Description	Dimensions (Inches)							Approx. Weight (lbs.)
			Top		Height	Opening		Base		
			WT	LT	H	WO	LO	WB	LB	
10	12 06 215	42"Wx48"Lx32"H	42	48	32	25	24	54	60	144
11	12 06 163	42"Wx48"Lx18"H	42	48	18	25	24	50.5	56.5	90
12	12 06 218	37"Wx48"Lx18"H	37	43	18	22	23.5	47.5	54.5	80

	ITEM	STK / DCS #	DESCRIPTION 34 21 04 **	01	02	03
	A	12 06 215	Vault - Transformer 42" x 48" x 32" Fiberglass	1	-	-
		12 06 163	Vault - Transformer 42" x 48" x 18" Fiberglass	-	1	-
		12 06 218	Vault - Transformer 37" x 43" x 18" Fiberglass	-	-	1
@	B	12 51 173	Conduit - Bend 3" , 36" Rad	#	#	#
@	C	12 51 331	Conduit - Bend 1-1/2", 24" Rad	#	#	#
@	D	12 51 264	Conduit - Bend 2-1/2", 24" Rad	#	#	#
@	E	12 06 085	Cover - Vault, Fiberglass	1	1	1
	F	40 83 492	Conduit - Coupling 1-1/2" Bell End	#	#	#
@		12 51 398	Conduit - Coupling 2-1/2" Bell End	#	#	#
		12 51 008	Conduit - Coupling 3", Bell End	2	2	2

DESIGN NOTE(s):

10. The 32” tall box vault pad stock #12 06 215 is for use on slopped grades.

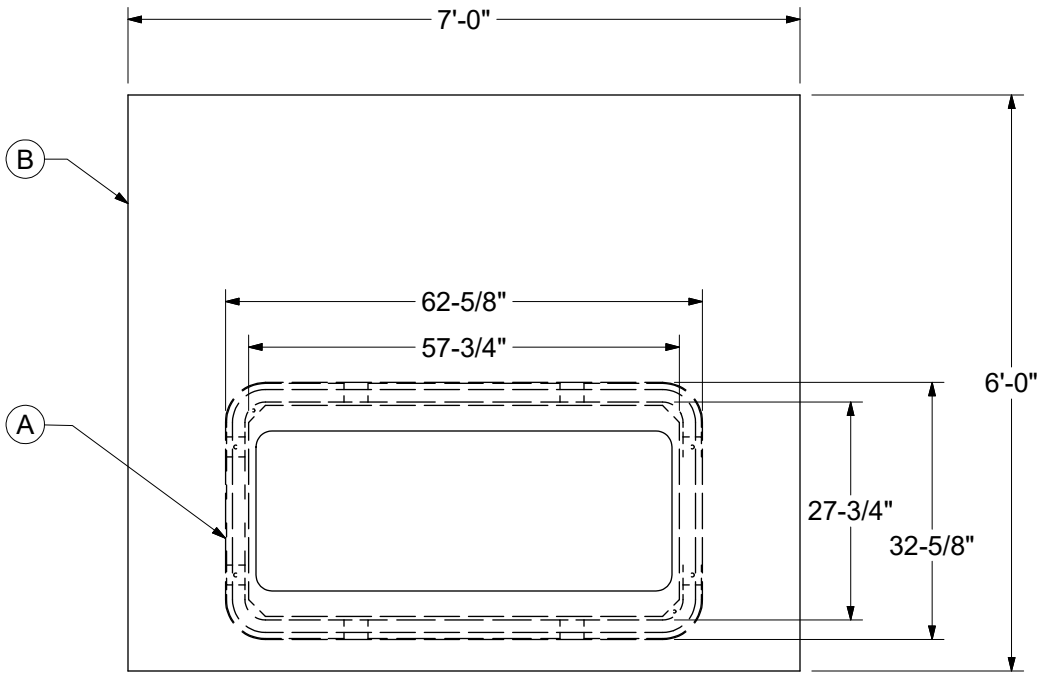
11. The 18” tall box vault pad stock #12 06 163 is intended for use on flat grades for commercial applications with two or more runs of 750 kcmil secondary/service cables or where primary cable is larger than #2, and transformer is 167 or 250kVA. It is also used for 34.5kV Grdy/19.92kV singlephase padmount transformers.

12. The 18" tall box vault pad stock #12 06 218 is intended for use on flat grades for commercial applications with two or more runs of 750 kcmil secondary/service cables or where primary cable is larger than #2, and transformer is 100kVA or smaller.

REV	DATE	ENG	DESCRIPTION
5	01/01/22	DG	Converted to new format

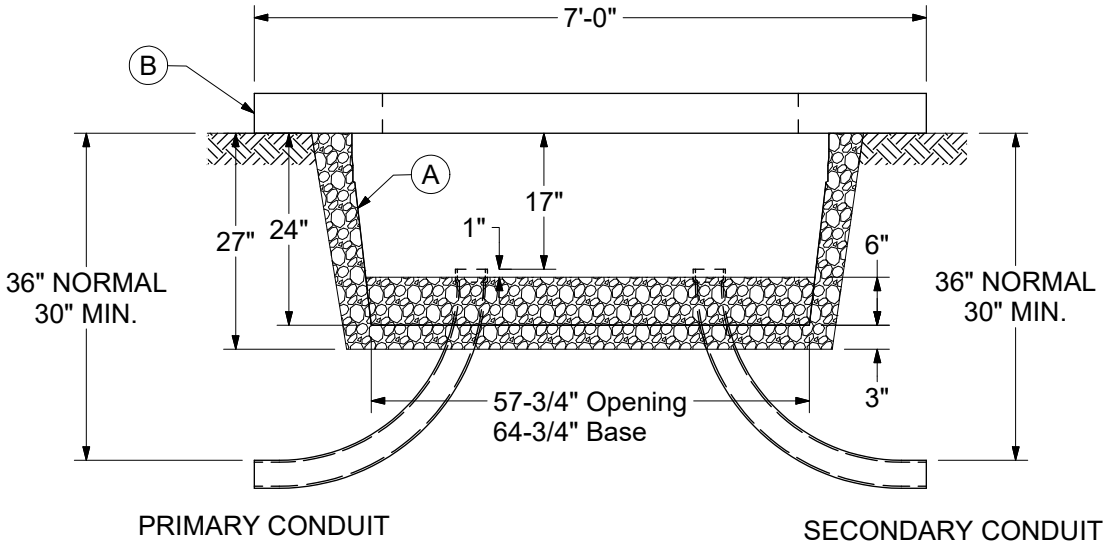
This transformer box vault (Stock #12 06 241) is for use with composite pad Stock #12 06 124 (or equivalent sized poured in place concrete pad) for the following applications:

1. If primary cable is larger than 1/0,
2. If secondary output requirement from the transformer is greater than 2000 Amps:
   A. Loop-feed 750 kVA and larger transformer at 208Y/120 Volts
   B. Radial-feed 1500 kVA and larger transformer at 480Y/277 Volts

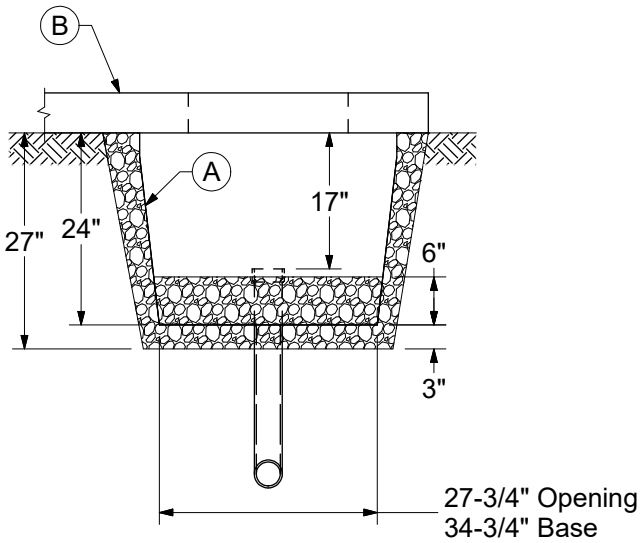


Top View

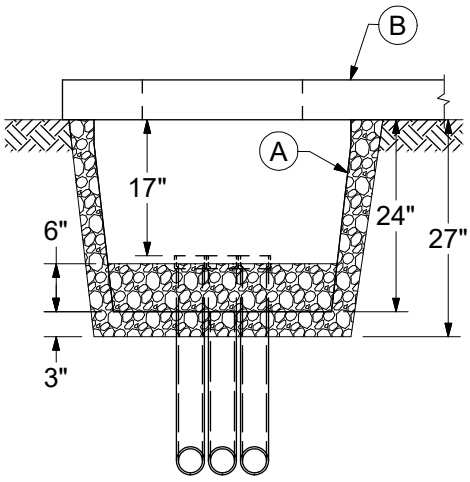
REV	DATE	ENG	DESCRIPTION
1	01/01/22	DG	Converted to new format



Front View



Primary Conduit
Side View



Secondary Conduit
Side View

REV	DATE	ENG	DESCRIPTION
1	01/01/22	DG	Converted to new format

CONSTRUCTION NOTE(s):

1. The areas of excavation that bear the box vault and the flat pad shall be tamped and leveled. Proper compaction prior to setting the box vault and the flat pad is important to prevent settling. See DCS **34 21 05 **** for pad backfill requirements.

2. An initial depth of 27” shall be excavated for the box vault.

3. To install the 36” radius bends, an increase in the initial excavation depth is required. After the bends have been installed, crushed stone screenings shall be placed and tamped to the level shown in the drawings.

4. The primary and secondary conduits may enter the box vault from the sides (as shown in drawings), from the front, or from the back.

5. All conduits shall be rigid PVC Schedule 40 or approved PVC flexible conduit. If bends are cut off, apply a bell end coupling over the end of each conduit.

6. See DCS **34 21 05 ****, sheet 4 of 4, for conduit layout in the primary and secondary compartment areas of the pad vault.

7. Stabilize the box vault over the conduits before backfilling so that there will be no shifting. To further stabilize the conduit bends, place additional screenings inside the pad vault and hand tamp in place. Conduit openings should be 17” below the load bearing surface (top) of the box vault. See drawings.

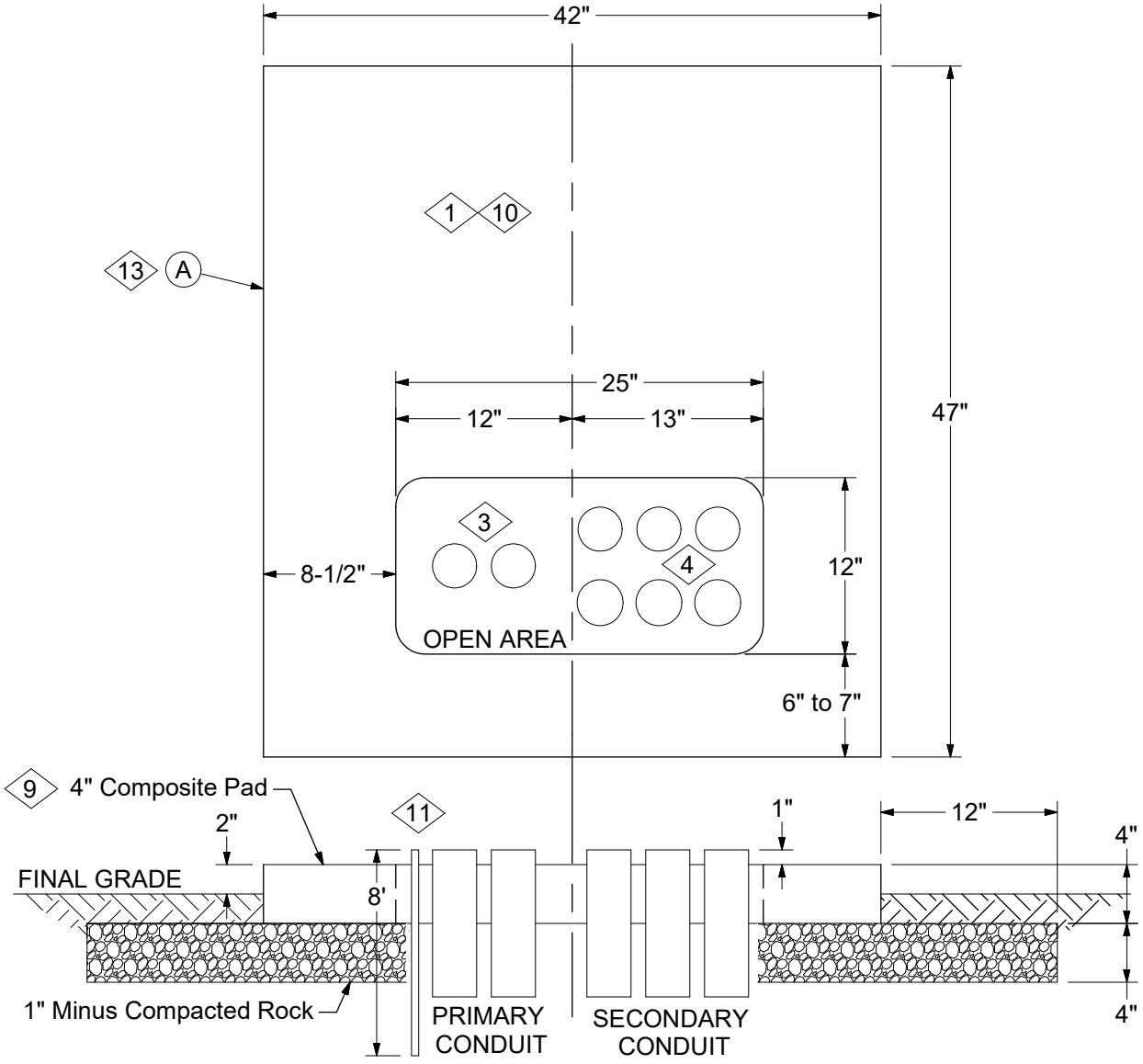
8. The opening of the flat pad should be centered over the box vault. Note that the box vault opening is 57-3/4” x 27-3/4” and the flat pad opening is slightly smaller at 52” x 20”.

9. If pulling tension through the conduit elbows will exceed 400 lbs., restrain the bends as per DCS **31 47 01 ****.

10. Box vault cover Stock #12 06 245 can be used on this vault box to temporarily cover the opening. Note however, this cover cannot be installed or removed with the flat pad in place over the box vault.

ITEM	STK / DCS #	DESCRIPTION 34 21 04 **	05
A	12 06 241	Box Vault - Composite 60" x 30" x 24"	1
B	12 06 124	Pad - Transformer, Composite 3 Phase 84" x 72"	1

REV	DATE	ENG	DESCRIPTION
1	01/01/22	DG	Converted to new format



34 21 05 01 - Lightweight Pad

34 21 05 02 - Heavy Pad 13

25 kVA thru 250 kVA Single Phase Loop Feed

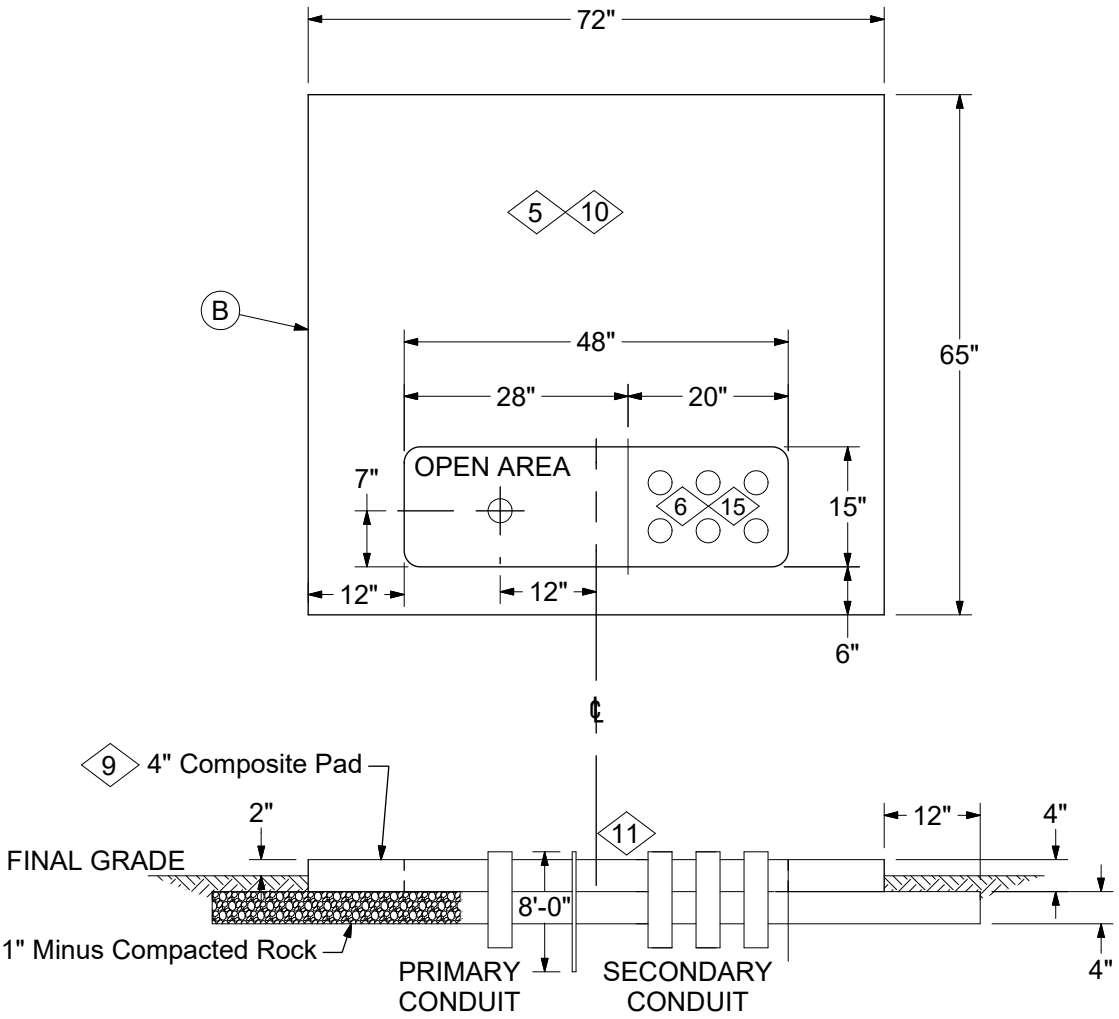
CONSTRUCTION NOTE(s):

1. Approximate weight of single-phase pads: Lightweight - 50 lbs., Heavy - 300 lbs.

2. In Missouri residential developments, the contractor will install the pad and conduits.

3. Two conduits shall be installed on the primary side - minimum size 2".

4. Secondary conduit shall be symmetrically located within 12" x 13" area. The maximum number of conduits is 6 - 3" for the secondary. The number of secondary cables shall not exceed 8 per phase.

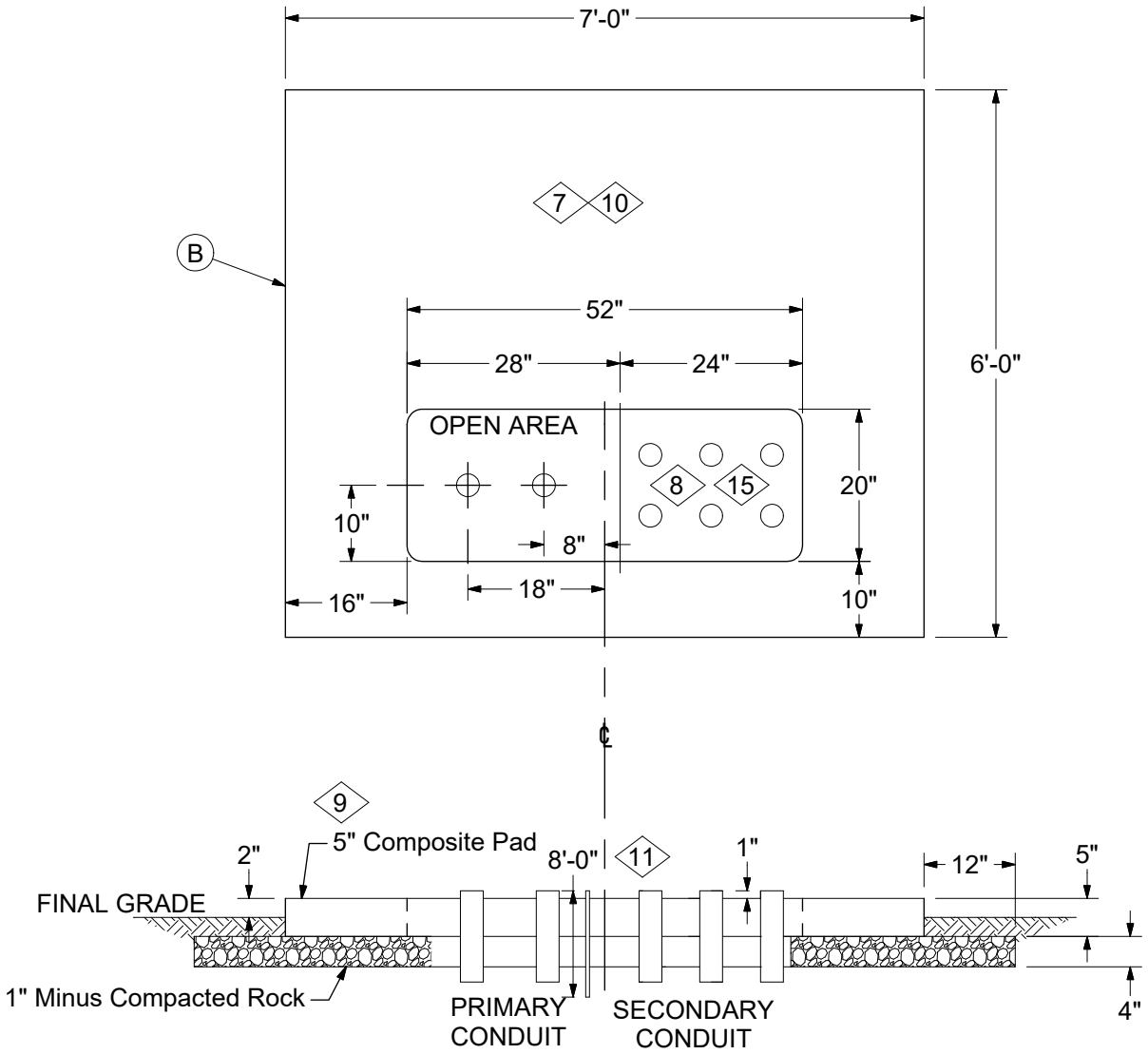


34 21 05 04

750 kVA and Smaller Three Phase Radial Feed

CONSTRUCTION NOTE(s):

5. Approximate weight of this three-phase pad is 600 lbs.
6. Secondary conduit shall be symmetrically located within a 15" x 20" area as shown above.



34 21 05 05

75 kVA thru 1000 kVA Three Phase Loop Feed

1000 kVA thru 2500 kVA Three Phase Radial Feed

CONSTRUCTION NOTE(s):

7. Approximate weight of this three-phase pad is 800 lbs.
8. Secondary conduits shall be symmetrically located within a 20" x 24" area as shown above.

CONSTRUCTION NOTE(s):

9. Pad shall be installed on 4" level, well compacted, 1" minus rock extending 12" outside the pad. Dirt under rock must first be compacted. Avoid filling opening before cable or conduit is installed. Unless situated in a paved area, the rest of the exterior shall be backfilled with the excavated material and foot tamped.

10. When possible, do not install cable under this portion of the pad.

11. The 5/8" x 8' ground rod can be located where most convenient in the pad opening to avoid the incoming and outgoing conduit elbows.

	ITEM	STK / DCS #	DESCRIPTION 34 21 05 **	01	02	04	05
13	A	12 06 164	Pad - Transformer, Composite 1 Phase Lightweight	1	-	-	-
		12 06 198	Pad - Transformer, Composite 1 Phase Heavy	-	1	-	-
	B	12 06 123	Pad - Transformer, Composite 3 Phase 72" x 65"	-	-	1	-
		12 06 124	Pad - Transformer, Composite 3 Phase 84" x 72"	-	-	-	1

DESIGN NOTE(s):

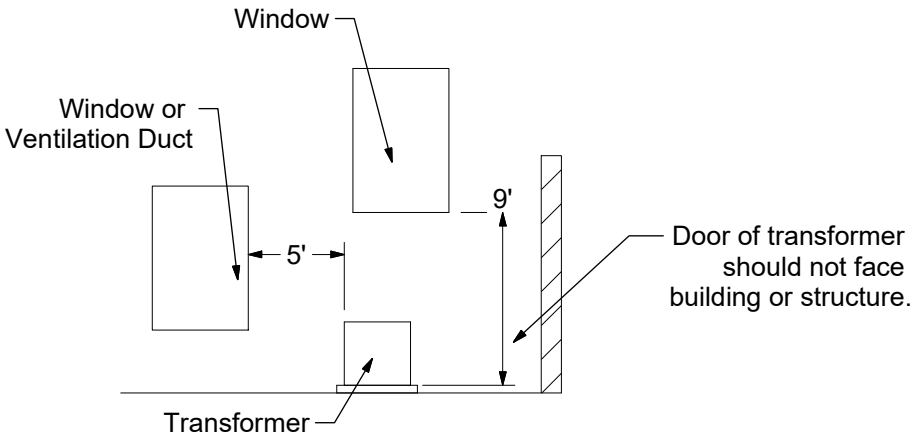
12. Ameren Engineering to determine final location and orientation of transformer pad.

13. Heavy single-phase pad is for conduit systems where pad is installed by customer contractor and for “dummy” transformers (DCS **51 11 02 ****). Lightweight single-phase pad is for installations where pad is installed by Ameren personnel.

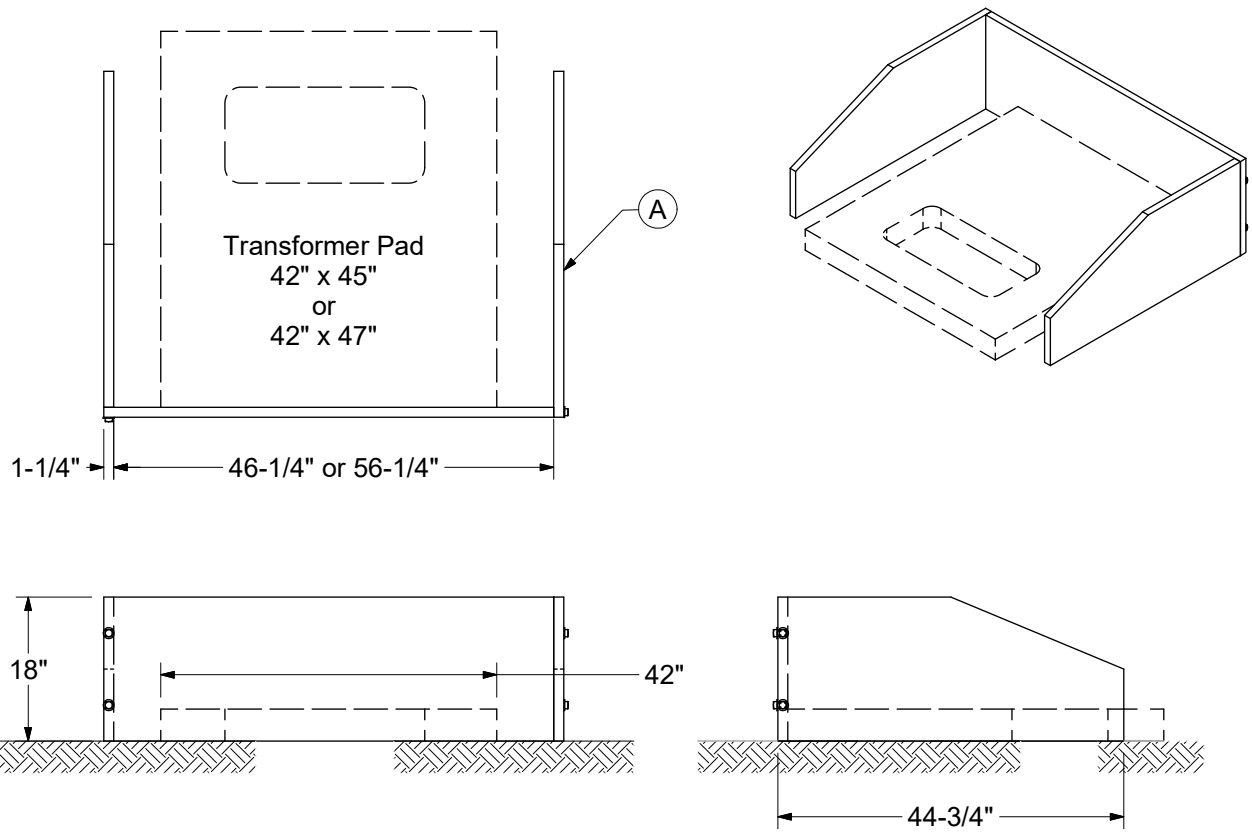
14. All conduit shall be rigid PVC Schedule 40 or approved PVC flexible conduit.

15. The number of primary and secondary conduits may vary. The number of secondary cables shall not exceed 12 per phase. Ameren Engineering will determine if the number of conduits is acceptable or if a vault will be required.

16. Typical Minimum Clearances -



REV	DATE	ENG	DESCRIPTION
11	01/01/22	DG	Converted to new format



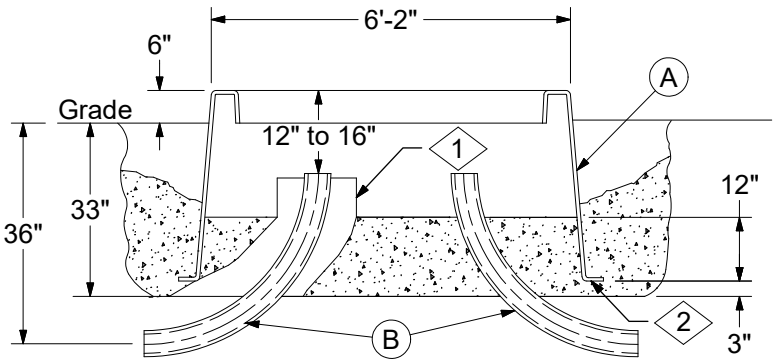
DESIGN NOTE(s):

1. Use where grade has changed and transformer or pedestal has been partially buried. Can also be used in new installations where slight grade exists and erosion or landscaping is reasonably expected.

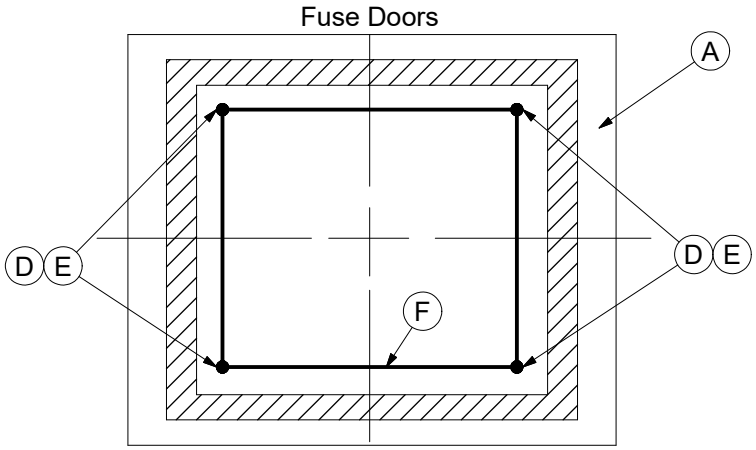
2. Retaining wall set includes 1 - Back Wall, 1 - Right (short) Wall, 1 - Left (long) Wall, and 4 - galvanized steel bolts with washers and nuts.

ITEM	STK / DCS #	DESCRIPTION 34 21 06 **	01	02
A	12 06 208	Retaining Wall - 44-3/4" x 58-3/4" x 18" x 1-1/4"	1	-
	12 06 209	Retaining Wall - 44-3/4" x 48-3/4" x 18" x 1-1/4"	-	1

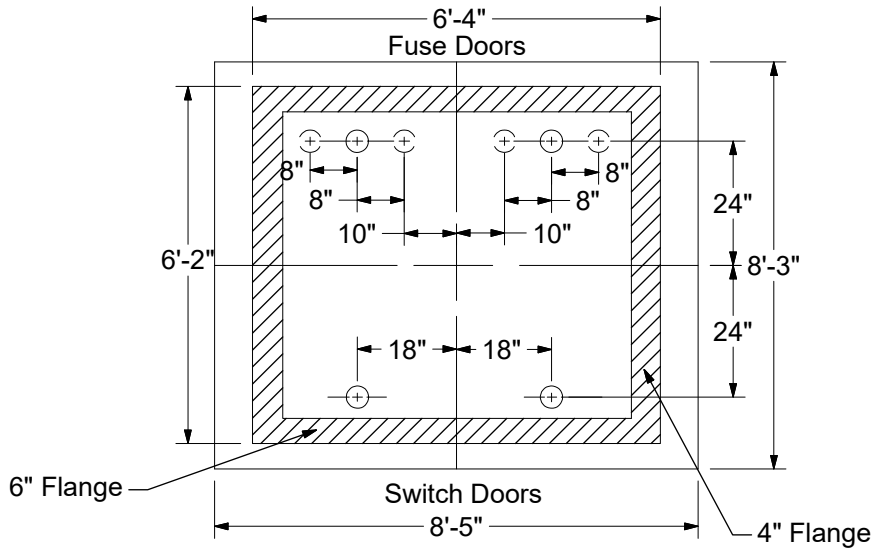
REV	DATE	ENG	DESCRIPTION
2	01/01/22	DG	Converted to new format



Side View



Switch Doors



Type 9 Switchgear

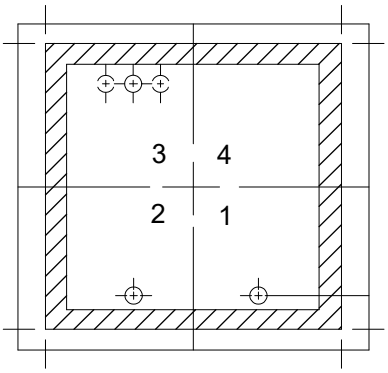
◠ Single Phase Lateral Conduit Location

◯ Three Phase Lateral Conduit Location

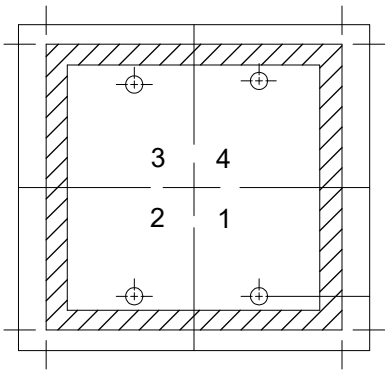
REV	DATE	ENG	DESCRIPTION
0	04/01/2023	JMW	New, moved from 53 11 05 **, updated format

For the following switchgear conduit layouts, use the appropriate dimensions from the Type 9 conduit layout drawing above.

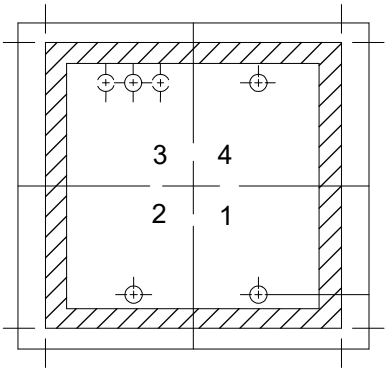
Type 6 Switchgear



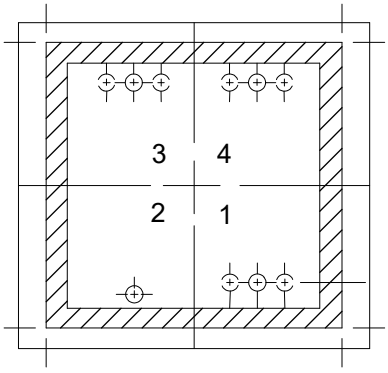
Type 10 Switchgear



Type 11 Switchgear



Type 12 Switchgear



CONSTRUCTION NOTE(s):

1. Conduit bends should be installed in locations per the type of switchgear used. Note: the bends will not withstand pulling long cable lengths without stabilization. Install restraining bends per DCS **31 47 01 **** as needed. Recommended for 750 kcmil cables more than 250'.

2. After bends have been installed, crushed stone or screening shall be placed, leveled, and tamped to a depth of 3"

3. Set and level the box pad place 1-2" of soil on the flange to keep the box pad in place. Then backfill to final depth allowing of box pad allowing top surface to be 6" below final grade.

4. To further stabilize the box pad, place additional screening inside the ground pad and hand tamp in place.

5. Conduit bends should be placed or cut off such that the tops are below the box pad mounting flange. 4" conduit shall be a minimum 12" below the top, and 5" conduit shall be a minimum of 16" below the flange. Install bell end couplings on cut conduit or use duct shields to avoid damage to cable.

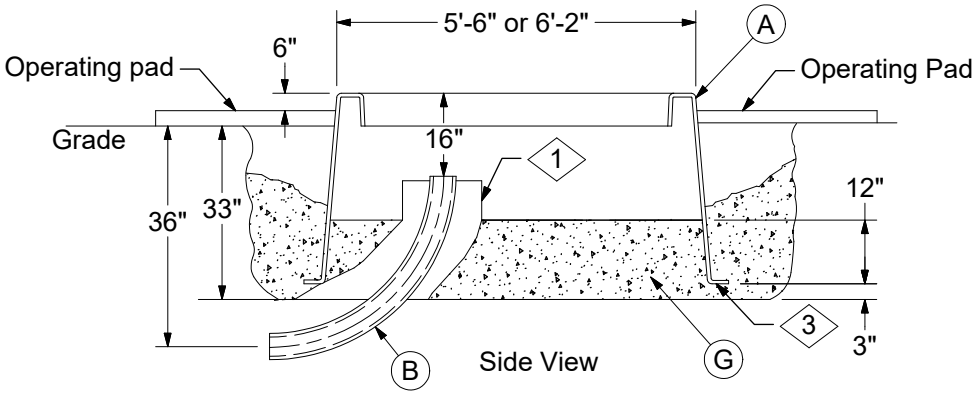
6. Place ground rods at corners as shown. Loop #2 bare copper wire around the pad and connect to the rods with ground rod clamps.

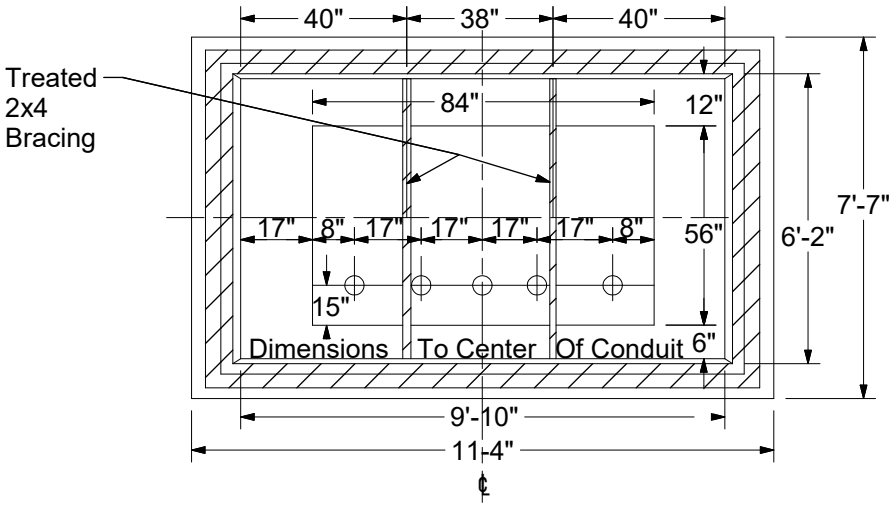
7. Connect the copper ground wire to the switchgear ground connectors as shown in swtchgear DCS.

REV	DATE	ENG	DESCRIPTION
0	04/01/2023	JMW	New, moved from 53 11 05 **, updated format

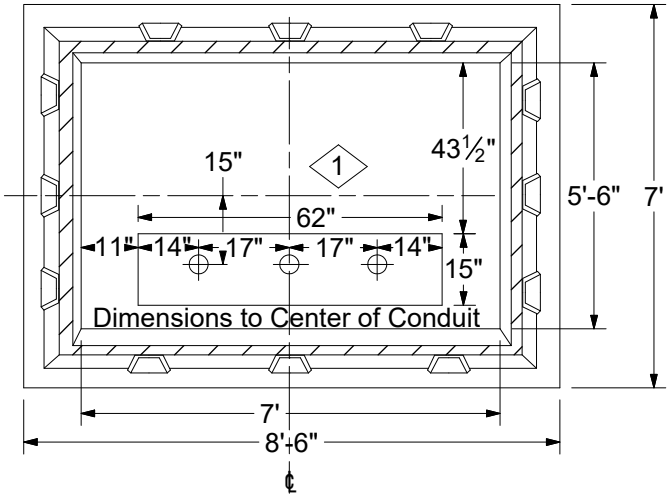
	ITEM	STK / DCS #	DESCRIPTION 34 21 10 **	01
	A	12 06 165	Box Pad - Composite, 74" x 76" x 36"	1
	B	12 51 173	Bend, PVC, 3", 36" Rad.	-
@		12 51 176	Bend, PVC, 4", 36" Rad	-
		12 51 206	Bend, PVC, 5", 36" Rad	-
	C	12 51 008	Coupling - Conduit, PVC, Bell End, 3"	-
@		12 51 254	Coupling - Conduit, PVC, Bell End, 4"	-
		12 51 233	Coupling - Conduit, PVC, Bell End, 5"	-
	D	23 13 069	Rod - Ground, 5/8" x 8'	4
	E	17 52 032	Clamp - Ground Rod, 5/8" for #8 - 1/0	4
	F	18 52 025	Wire - Cu, #2 S.D. (Ft.)	36
@	G		Screenings	-

REV	DATE	ENG	DESCRIPTION
0	04/01/2023	JMW	New, moved from 53 11 05 **, updated format



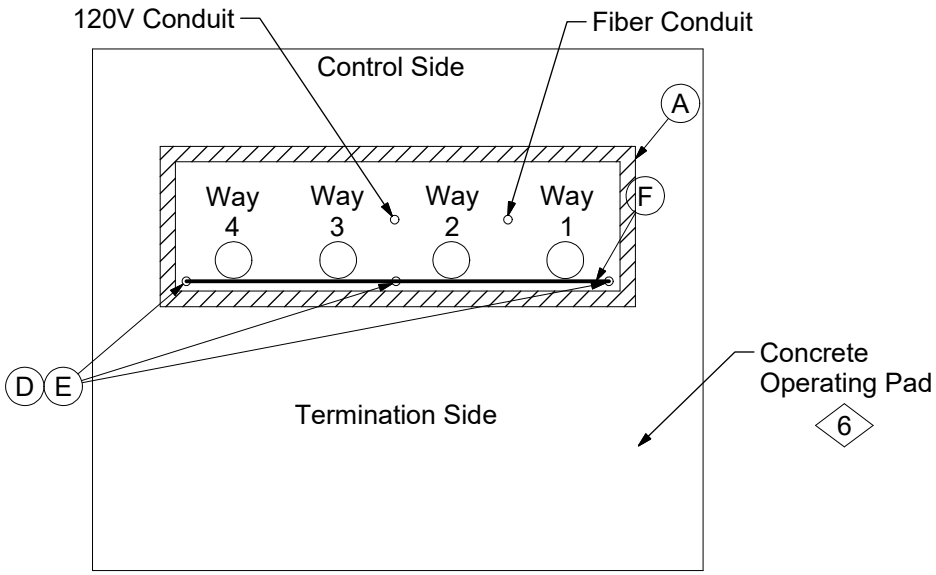


5 Way Box Pad
32 21 11 01



2, 3, & 4 Way Box Pad
32 21 11 02

REV	DATE	ENG	DESCRIPTION
0	04/01/2023	JMW	New, moved from 53 11 05 **, updated format



Designation of Conduit Position

CONSTRUCTION NOTE(s):

1. The number of bends will equal the number of ways. Adjust the spacing between bends such that they are evenly spaced and directly below each way (position). Note: the bends will not withstand pulling long cable lengths without stabilization. Install restraining bends per DCS **31 47 01 ****** as needed. Recommended for 750 kcmil cables more than 250'.

2. When required, installed bend for 120V power between way 2 and 3. install fiber bend between way 1 and 2.

3. After bends have been installed, crushed stone or screenings shall be placed, leveled, and tamped to a depth of 3"

4. Set and level the box pad and place 1-2" of soil on the flange to keep the box pad in place. Then backfill to final depth of box pad allowing top of surface to be 6" below final grade.

5. To further stabilize the box pad, place additional screening inside the ground pad and hand tamp in place.

6. The termination side of vacuum switchgear requires significant room for operation. See DCS **59 81 51 11** for required clearances and pour concrete pad when appropriate.

7. Conduit bends should be placed or cut off such that the tops are 16" below the box pad mounting flange. Install bell end coupling on cut conduit or use duct shields to avoid damage to cable.

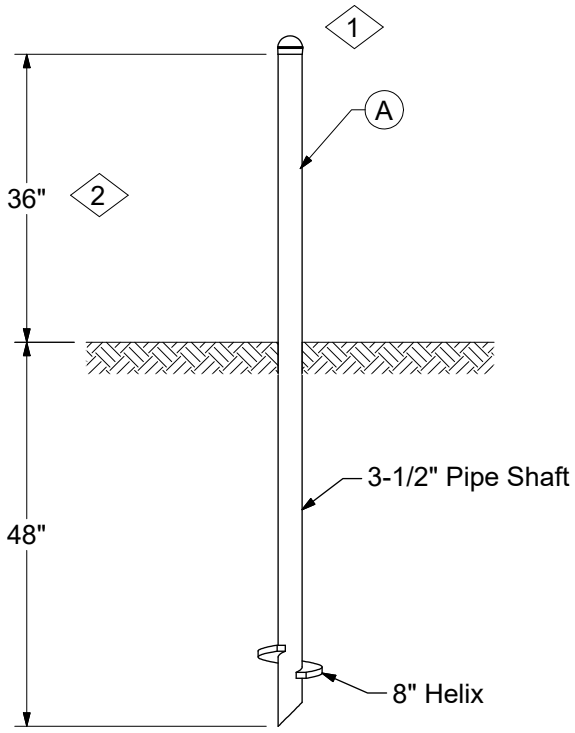
8. Place ground rods at corners as shown. Loop #2 bare copper wire around the pad and connect to the rods with ground rod clamps. Connect #2 copper wire to solid copper ground provided with switchgear at each end.

9. Connect the copper ground wire to the switchgear ground connectors as shown in switchgear DCS.

REV	DATE	ENG	DESCRIPTION
0	04/01/2023	JMW	New, moved from 53 11 05 **, updated format

	ITEM	STK / DCS #	DESCRIPTION 34 21 11 **	01	02
	A	12 06 154	Box Pad - Composite, 74" x 118" x 36"	1	-
		12 06 155	Box Pad - Composite, 66" x 84" x 36"	-	1
	B	12 51 173	Bend, PVC, 3", 36" Rad.	-	-
@		12 51 176	Bend, PVC, 4", 36" Rad.	-	-
		12 51 206	Bend, PVC, 5", 36" Rad.	-	-
	C	12 51 008	Coupling - Conduit, PVC, Bell End, 3"	-	-
@		12 51 254	Coupling - Conduit, PVC, Bell End, 4"	-	-
		12 51 233	Coupling - Conduit, PVC, Bell End, 5"	-	-
	D	23 13 069	Rod - Ground, 5/8" x 8'	3	3
	E	17 52 032	Clamp - Ground Rod, 5/8" for #8 - 1/0	3	3
	F	18 52 025	Wire - Cu, #2 S.D. (Ft.)	30	30
@	G		Screenings	-	-

REV	DATE	ENG	DESCRIPTION
0	04/01/2023	JMW	New, moved from 53 11 05 **, updated format



CONSTRUCTION NOTE(s):

1. Cap should be driven on after bumper post is installed.

2. Install the base 48" into the ground in order to leave 36" projecting above the ground line.

3. See DCS **59 81 51 10** for placement positions of bumper posts around padmounted transformers and switchgear.

ITEM	STK / DCS #	DESCRIPTION 34 22 01 00	QTY
A	21 51 127	Bumper - Screw Type 3-1/2" x 84"	1
	203	Operation Code - Inst Bumper Post	1

REV	DATE	ENG	DESCRIPTION
4	01/01/22	DG	Converted to new format

UNDERGROUND CABLE SPLICE 41

SINGLE CONDUCTOR RUBBER OR XLP JACKETED OR NON JACKETED, 600 V..... 41 14 31 **

SINGLE CONDUCTOR GEL WRAP SLEEVE, RUBBER OR XLP, 600 V..... 41 14 36 **

SINGLE CONDUCTOR 1/0, 3/0, 4/0, 350, & 500 kcmil INLINE SET SCREW CONNECTOR INSULATED WITH GEL WRAP SLEEVE, 600 V..... 41 14 37 **

STREETLIGHT STRAIGHT OR Y GEL WRAP SLEEVE - #6 CU/AL - #6 CU/AL OR #6 CU/AL - #10 CU, 600 V..... 41 15 31 00

SINGLE CONDUCTOR LONG REPAIR SPLICE #6 - 350 AL/CU, 600 V..... 41 15 32 01

1/0 - 750 CU NON-SHIELDED COLD-SHRINKABLE RUBBER SPLICE, 5 kV..... 41 24 30 **

TRIFURCATING: 3/C PILC TO 3 - 1/C EXTRUDED SOLID DIELECTRIC HEAT-SHRINKABLE, 5 kV..... 41 33 22 **

PREMOLDED #2 AL AND 1/0 AL CNX/CNR, 15 kV..... 41 34 34 **

PREMOLDED 4/0 AL CNX/CNR, 15 kV..... 41 34 35 **

PREMOLDED LONG REPAIR - 4/0 AL, CNX/CNR, 15 kV..... 41 34 36 **

PREMOLDED #2 AL TO 4/0 AL CNX/CNR, 15 kV..... 41 34 40 **

PREMOLDED SEPERARABLE #2 AL THROUGH 750 KCMIL CU OR AL, 15 kV, 35 kV..... 41 35 31 **

HOT TEST CAP 1/0 THRU 800 KCMIL 3 COND LEAD CABLE (BELTED OR SHIELDED), 5 kV, 15 kV..... 41 36 11 **

TRIFURCATING: 3/C PILC TO 3 - 1/C SOLID DIELECTRIC HEAT SHRINKABLE, 35 kV..... 41 43 22 **

1C PILC TO EXTRUDED SOLID DIELECTRIC HEAT SHRINKABLE, 35kV..... 41 44 21 **

PREMOLDED 1/0 AL, CNR, P, 35 kV..... 41 44 30 03

HOT TEST CAP 350 KCMIL OR 500 KCMIL 3 COND LEAD CABLE (BELTED OR SHIELDED), 35 kV..... 41 46 11 **

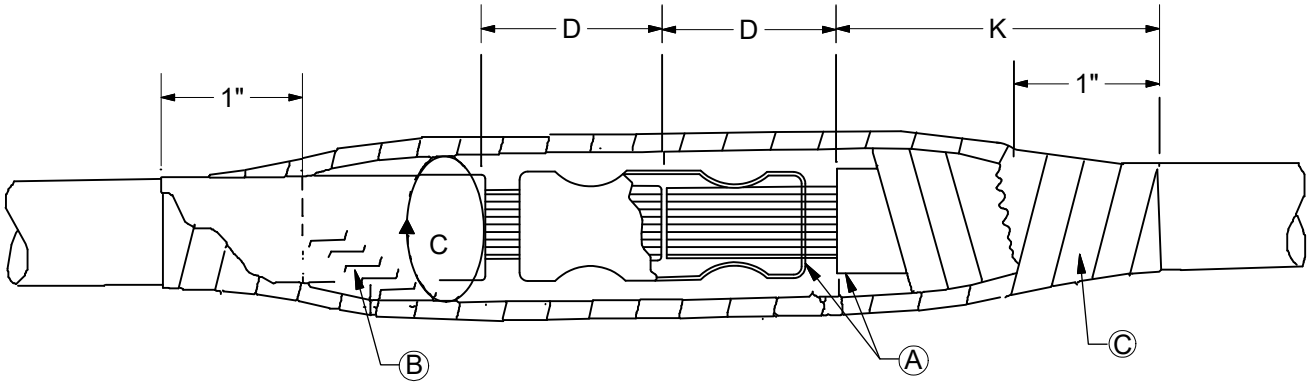
HEAT SHRINKABLE 69kV 500−750 AL KCMIL, 69 kV..... 41 54 30 **

COLD SHRINKABLE 350−750 KCMIL, 15 kV, 35 kV..... 41 64 30 00

UNDERGROUND CABLE SPLICE

Single Conductor Rubber or XLP
Jacketed or Non-Jacketed

41 14 31 **
600 V
1 of 2



INSTRUCTIONS:

1. Jackets over the insulation are considered a part of the insulation and are not to be removed.

2. Remove insulation back the required length (D) and install crimp sleeve and, if necessary, reducers.

3. Apply rubber tape half lapped to circ. (C) taping gradual slopes at each end. Stretch tape to only 3/4" of its original width. CAUTION: When splicing aluminum cable, wipe off all excess inhibitor.

4. Apply two half-lapped layers of plastic tape extending one inch beyone the original taping and length (K) from from the insulation cut off.

CONSTRUCTION NOTE(s):

1. A #2 AWG copper splicing sleeve (Stock #17 60 273) may be substituted for this sleeve.

Copper Cables					
		Dimensions (In)			Ins. (mils)
DCS#	Size	D	K	C	
01	#2	1.5	3	2.7	180
02	1/0	2	3	3.6	180
03	4/0	2	3	3.6	180
04	500	2.5	4	4.2	180

Aluminum Cables					
		Dimensions (In)			Ins. (mils)
DCS#	Size	D	K	C	
05	1/0	1.25	3	2.7	180
06	3/0	1.75	3	3.2	180
07	350	2	4	4.2	180
–	–	–	–	–	–

REV	DATE	ENG	DESCRIPTION
3	01/01/23	EJB	Converted to New Format
2	12/08/09	EJB	

					COPPER				ALUM.		
	ITEM	**STK / DCS #**	**DESCRIPTION** **41 14 31 ** **	**01**	**02**	**03**	**04**	**05**	**06**	**07**
1	A	17 63 127	Sleeve−Compression, #2, Cu.	1	-	-	-	-	-	-
		17 54 219	Reducer−#4/0 to #1/0	-	2	-	-	-	-	-
		17 63 030	Sleeve−Compression, 4/0 Cu.	-	1	1	-	-	-	-
		17 63 032	Sleeve−Compression, 500 kcmil, Cu.	-	-	-	1	-	-	-
		17 63 133	Sleeve−Compression, 1/0, Al	-	-	-	-	1	-	-
		17 63 125	Sleeve−Compression, 3/0, Al	-	-	-	-	-	1	-
		17 63 124	Sleeve−Compression, 350 kcmil, Al	-	-	-	-	-	-	1
	B	25 53 080	Tape−Rubber, 3/4”	1	1	1	1	1	1	1
	C	25 53 055	Tape−Plastic	1	1	1	1	1	1	1
		413	Op Code Splice Up to 1000 V	1	1	1	1	1	1	1

REV	DATE	ENG	DESCRIPTION
3	01/01/23	EJB	Converted to New Format
2	12/08/09	EJB	

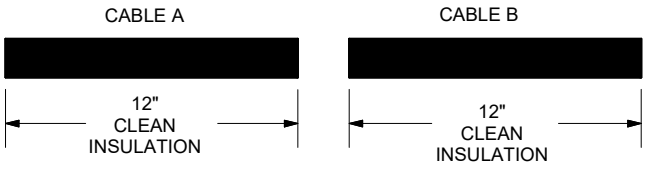


Figure 1

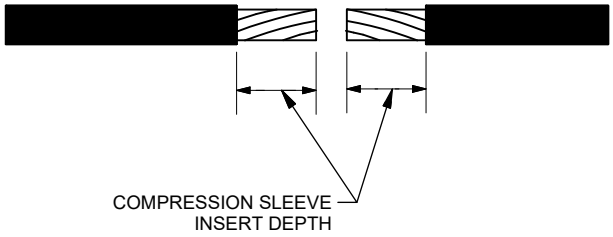


Figure 2

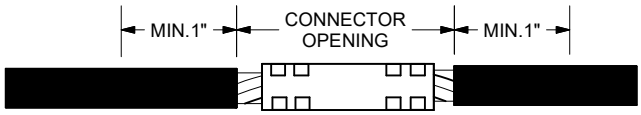


Figure 3

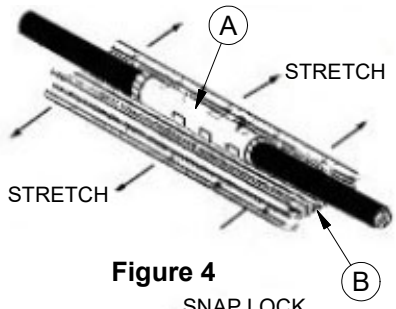
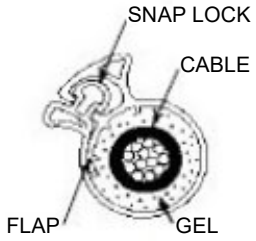


Figure 4



CUTAWAY VIEW

Figure 5

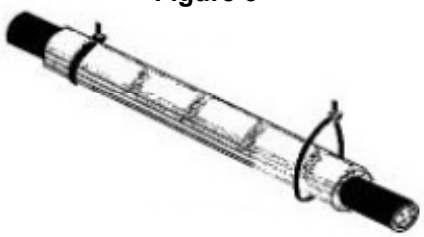


Figure 6

INSTRUCTIONS:

1. Throughly clean the cable insulation. Clean 12" of Insulation on Cable "A" and 12" of insulation on Cable "B". See Figure 1.

2. Check the insert depth of the compression sleeve being used. Remove the length of cable insulation on each cable that corresponds to the insert depth of the compression sleeve. See Figure 2.

3. Install the compression sleeve. Make as many crimps as possible without overlap. Use the dies shown in the table. Remove the excess flash and inhibitor. See Figure 3.

4. Prestretch gel wrap sleeve as shown in Figure 4. Warming the sleeve will make it easier to install in cold weather.

5. Center the connector in the sleeve, then wrap the sleeve around the cable and connector. Start at one end, compress the snap locks over the entire length of the sleeve. Ensure that flaps seat under snap locks as shown in Figure 5.

6. Install cable ties at outer most notches of the snap locks. Splice is complete and ready for use. See Figure 6.

INSTRUCTIONS - #8 CNP TO #8 CNP:

1. Follow the instructions on sheet 1.
2. Unwind the concentric neutral wire from each cable. Remove enough cable to provide a sufficient length of concentric neutral wire for connecting across a splice.
3. Clean the cables.
4. Check the insert depth of the compression sleeve being used. Remove the installation from each cable that corresponds to the insert depth of the compression sleeve.
5. Install the compression sleeve using the "J" groove on the Nicopress 53-XPJ tool. Apply three crimps per end.
6. Install gel wrap sleeve as shown on sheet 1.
7. Connect concentric neutral wires together across the splice with a split bolt.

INSTRUCTIONS - #8 CNP TO #6 AL/CU:

1. Follow instructions on sheet 1.
2. Install the #8 to #6 compression sleeve (Stock #17 60 363).
3. Attach the concentric neutral wires to the #6 Al/Cu neutral cables as follows:
   a. Unwind concentric neutral from the end of the #8 cable and twist the ends of the concentric together. Obtain a 18" piece of #8 cable with concentrics removed. Strip approximately 2" of insulation from one end of the short piece of #8 cable.
   b. Using Stock #17 54 003, join the concentrics to the short piece of #8 cable. After covering this connection with two layers of 1/2" lapped rubber tape, apply three layers of 1/2" lapped plastic tape.
   c. Attach the other end of the short piece of #8 cable to the #6 neutral cable. This connection shall be made according to the instructions shown above. The #6 neutral will be identified by yellow insulation, yellow stripes, or ribs. See Figure 7.

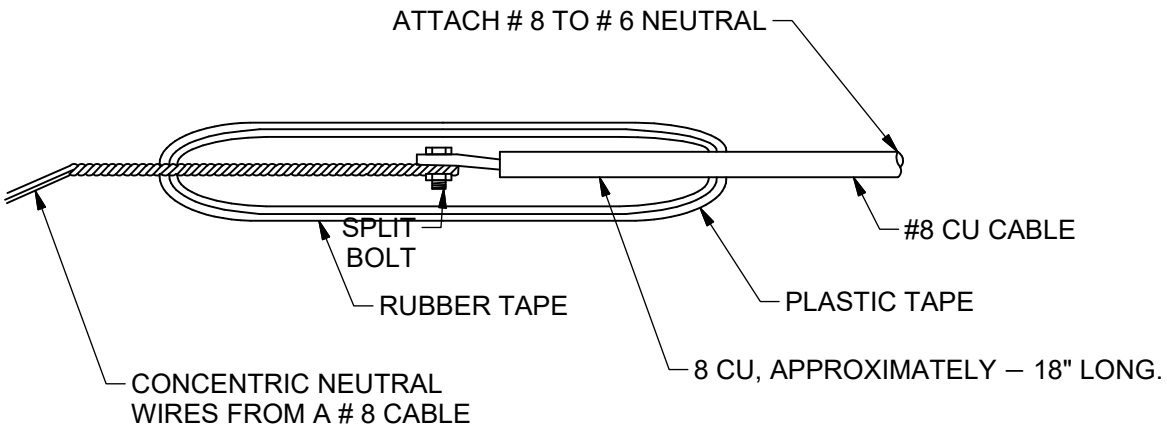


FIGURE 7

ITEM	STK # /DCS	DESCRIPTION 41 14 36 **	01	02	03	04	05	06	07	08	09	10	11	12	13	14
A	17 63 133	Sleeve–Compression, 1/0 Al.	1	–	–	–	–	–	–	–	–	–	–	–	–	–
	17 63 138	Sleeve–Compression, 1/0 to 3/0 Al.	–	1	–	–	–	–	–	–	–	–	–	–	–	–
	17 63 125	Sleeve–Compression, 3/0 Al.	–	–	1	–	–	–	–	–	–	–	–	–	–	–
	17 63 124	Sleeve–Compression, 350 Al.	–	–	–	1	–	–	–	–	–	–	–	–	–	–
	17 63 144	Sleeve–Compression, 4/0 Al.	–	–	–	–	1	–	–	–	–	–	–	–	–	–
	17 63 143	Sleeve–Compression, 1/0 to 4/0 Al.	–	–	–	–	–	1	–	–	–	–	–	–	–	–
	17 63 145	Sleeve–Compression, 3/0 to 4/0 Al	–	–	–	–	–	–	1	–	–	–	–	–	–	–
	17 63 141	Sleeve–Compression, 3/0 to 350 Al.	–	–	–	–	–	–	–	1	–	–	–	–	–	–
	17 60 362	Sleeve–Compression, 6 Al./Cu.	–	–	–	–	–	–	–	–	1	–	–	–	–	–
	17 63 142	Sleeve–Compression, 750 kcm il Al	–	–	–	–	–	–	–	–	–	1	–	–	–	–
	17 63 032	Sleeve–Compression, 500 kcmil Cu	–	–	–	–	–	–	–	–	–	–	1	–	–	–
	17 60 360	Sleeve–Compression, 750 kcmil Cu	–	–	–	–	–	–	–	–	–	–	–	1	–	–
	17 60 102	Sleeve–Compression, #8 Cu	–	–	–	–	–	–	–	–	–	–	–	–	1	–
	17 60 363	Sleeve–Compression, #8 Cu to #6 Al/Cu	–	–	–	–	–	–	–	–	–	–	–	–	–	2
	17 54 003	Connector–Split Bolt	–	–	–	–	–	–	–	–	–	–	–	–	1	1
B	17 62 215	Wrap – Gel, 10” Long	1	1	1	1	1	1	1	1	–	–	–	–	–	–
	17 62 217	Wrap – Gel, 8” Long	–	–	–	–	–	–	–	–	1	–	–	–	1	1
	17 62 282	Wrap – Gel, 12” Long	–	–	–	–	–	–	–	–	–	1	1	1	–	–
	405	OP Code Splice 1/0 to 350 AL	1	1	1	1	1	1	1	1	1	–	–	–	–	–
	406	OP Code Splice 1000 Str.	–	–	–	–	–	–	–	–	–	1	1	1	1	1

REV	DATE	ENG	DESCRIPTION
7	01/01/23	EJB	Converted to New Format
6	08/08/08	HLH	

UNDERGROUND CABLE SPLICE

Inline Set Screw Connector Insulated with Gel Wrap Sleeve
Single Conductor 1/0, 3/0, 4/0, 350, & 500 kcmil

41 14 37 **
600 V
1 of 1

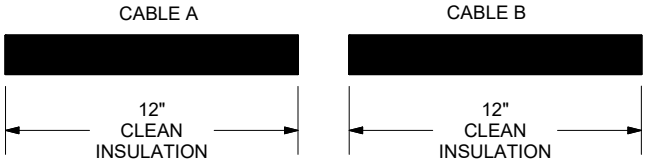


Figure 1

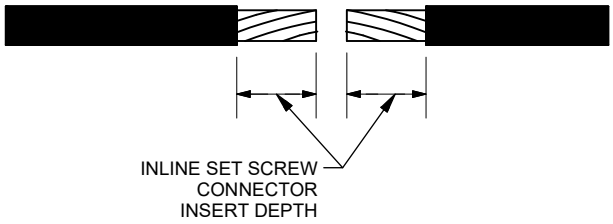


Figure 2

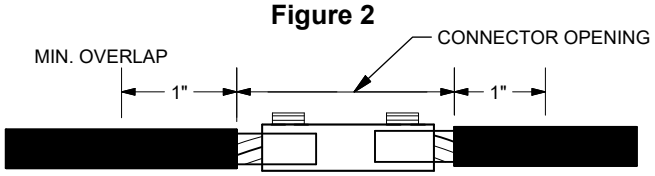


Figure 3

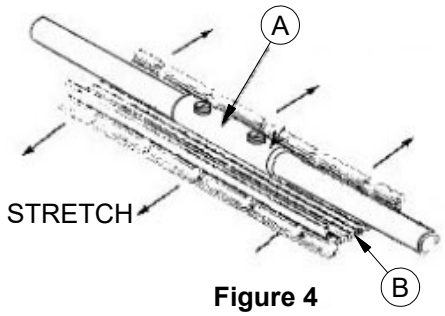
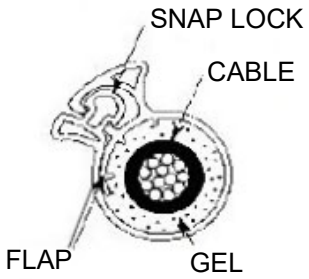


Figure 4



CUTAWAY VIEW
Figure 5

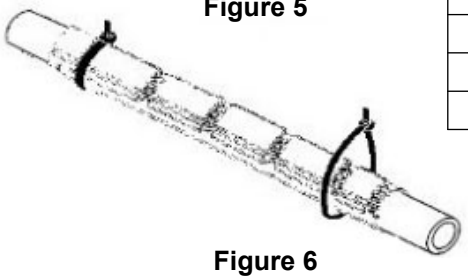


Figure 6

INSTRUCTIONS:

1. Thoroughly clean the cable insulation. Clean 12" of insulation on Cable "A" and 12" of insulation on Cable "B". See Figure 1.

2. Check the insert depth of the inline set screw connector. Remove the length of cable insulation on each cable that corresponds to the insert depth of the connector. See Figure 2. Remove surface oxides from the exposed conductors with a wire brush. Coat the cleaned conductors with oxide inhibitor (Stock #31 59 058).

3. Insert cables into the connector. Tighten the set screws using a 5/16" allen wrench. To obtain sufficient torque it may be necessary to hold the connector with a large crescent wrench. See Figure 3.

4. Prestretch the Gel Wrap sleeve will make it easier to install in cold weather. See Figure 4.

5. Center the connector in the sleeve then wrap the sleeve around the cable and connector. Start at one end. Compress the snap locks over the entire length of the sleeve. Ensure that flaps seat under snap locks as shown in Figure 5.

6. Install cable ties at outermost notches of snap locks. Splice is complete and ready for use. See Figure 6.

CONSTRUCTION NOTE(s):

1. Warming the sleeve will make it easier to install in cold weather.

ITEM	STK / DCS #	DESCRIPTION 41 14 37 **	01	02
A	17 64 204	Connector - Inline Set Screw 1/0 - 350 kcmil	1	-
	17 54 972	Connector – Inline Set Screw 3/0 - 500 kcmil	-	1
B	17 62 215	Wrap – Gel, 10" Long	1	-
	17 62 282	Wrap - Gel, 12" Long	-	1
	405	Op Code Splice 1/0 to 350 AL	1	1

REV	DATE	ENG	DESCRIPTION
2	01/01/23	EJB	Conversion to new format
1	08/08/08	HLH	

UNDERGROUND CABLE SPLICE

Streetlight Straight or "Y" Gel Wrap Sleeve
#6 Cu/Al - #6 Cu/Al or #6 Cu/Al - #10 Cu

41 15 31 00
600 V
1 of 1

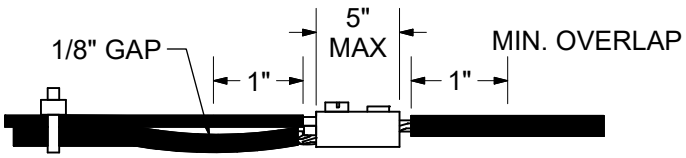


Figure 1

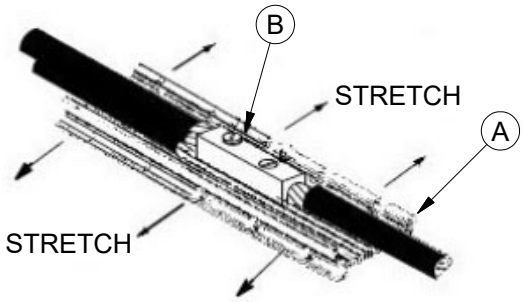


Figure 2

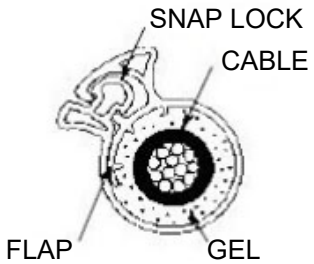


Figure 3

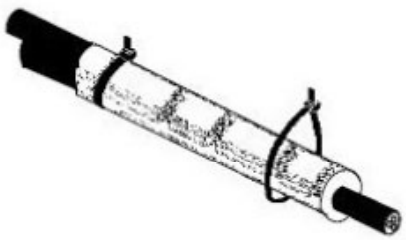


FIGURE 4

INSTRUCTIONS:

1. Remove 1" of insulation from each of the cables. Clean the conductors.
2. Install the connector and wipe off any excess inhibitor.
3. Clean the cables as required, and apply a small piece of gel pad around one of the cables of the "Y". Omit this step if making a straight splice.
4. Position a wire tie around the two cables as shown in Figure 1. Omit this step if making a straight splice.
5. Pre stretch the gel wrap sleeve and position it around the cables with the connector centered. See Figure 2.
6. Starting at one end of the gel wrap sleeve compress the snap locks over the entire length of the sleeve. Ensure that flaps seat under snap locks as shown in Figure 3.
7. Install the two wire ties in the notches of the snap locks. Splice is complete and ready for use. See Figure 4.

CONSTRUCTION NOTE(s):

1. Warming the gel wrap sleeve will make it easier to install in cold weather

	ITEM	STK / DCS #	DESCRIPTION 41 15 31 **	00
	A	17 62 217	Wrap - Gel, 8" Long	1
	B	17 51 233	Connector - Wire St. Lt	1
@	C	17 62 216	Gel Wrap Pad - 2" x 8"	1
		405	Op Code Splice 1/0 to 350 AL	1

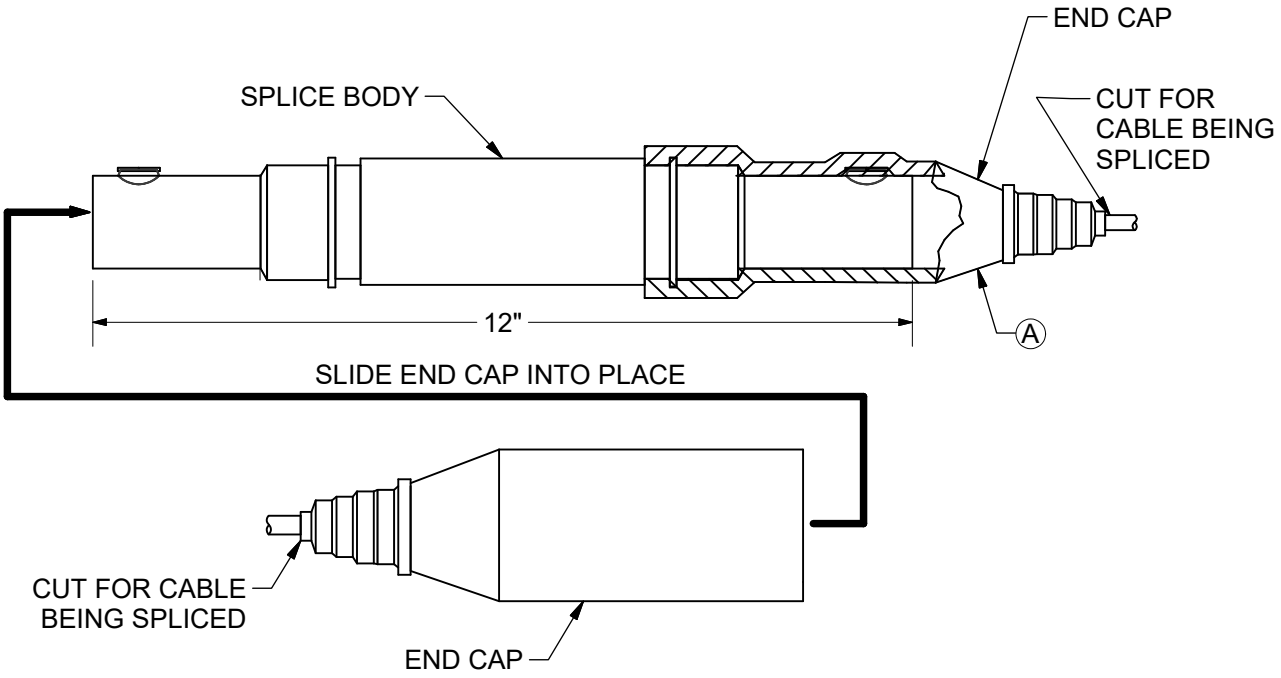
DISTRIBUTION CONSTRUCTION STANDARDS

REV	DATE	ENG	DESCRIPTION
004	01/01/23	EJB	Converted to New Format
003	08/08/08	HLH	

UNDERGROUND CABLE SPLICE

Single Conductor Long Repair Splice
#6-350 Al/Cu

41 15 32 01
600 V
1 of 1



INSTRUCTIONS:

1. Check insert depth of connector and remove required cable insulation. DO NOT KNICK THE CONDUCTOR.
2. Cut appropriate steps on the end caps to match the conductor size.
3. Install silicone grease on the cables and slide the end caps onto the cables.
4. Remove surface oxides from the exposed conductors with a wire brush.
5. Coat the exposed conductors with oxide inhibitor (Stock #31 59 058).
6. Insert cables into the connector ports until they hit the stops.
7. Tighten the set screw using a 5/16" allen wrench.
8. Complete the splice by sliding the splice end caps onto the splice body.

	ITEM	STK / DCS #	DESCRIPTION 41 15 32 **	01
	A	17 62 193	Splice - Repair, #6 - 350 kcmil AL. or CU.	1
		405	Op Code Splice 1/0 to 350 AL	1

REV	DATE	ENG	DESCRIPTION
2	01/01/23	EJB	Converted to New Format
1	01/07/05	HLH	

UNDERGROUND CABLE SPLICE

Cold-Shrinkable Rubber Splice
1/0-750 Cu, Non-Shielded

41 24 30 **
5 kV
1 of 1

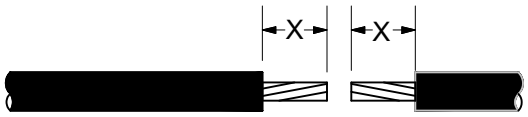


Figure 1

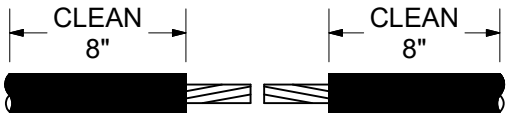


Figure 2

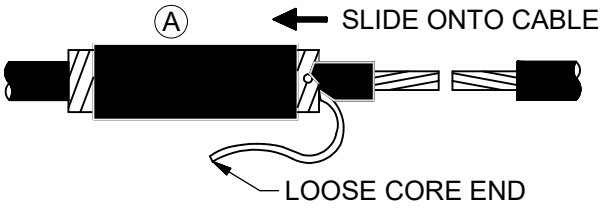


Figure 3

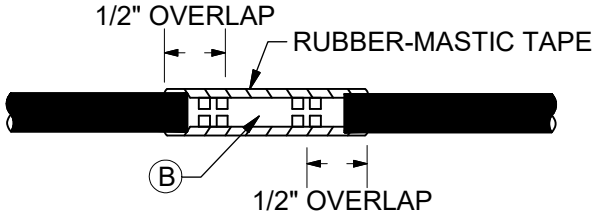


Figure 4

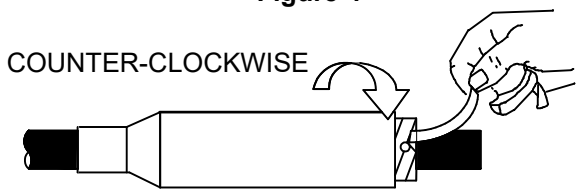


Figure 5

INSTRUCTIONS:

1. Remove the insulation/jacket as shown in Figure 1. "X" dimension is the insert depth of the connector being used.The connectors, used on 350 kcmil and 750 kcmil cables, shall not exceed a length of 6-1/4". The connector, used on 1/0 cable, shall not exceed a length of 4-1/2".

2. Clean the cable insulation/jacket with the cleaning pads provided. See Figure 2.

3. Slide cold shrink splice onto one of the cables. See Figure 3.

4. Install compression sleeve.

5. Overwrap the installed connector with the rubber mastic tape provided. Apply the tape with the mastic side in towards the connector. Use the tape to build up the thickness to the level of the cable insulation then overlap the tape 1/2" onto the insulation. DO NOT apply an excess amount of the rubber mastic tape. See Figure 4. The rubber mastic tape should be stretched during installation, so that its width is reduced to approximately 1-1/2" or less.

6. Center the splice over the connector area. Remove the core by unwinding counter-clockwise, starting with the loose core end. An occasional tug of the core strand while unwinding will aid in core removal. Splice is complete after the core is removed. See Figure 5.

ITEM	STK / DCS #	DESCRIPTION 41 24 30 **	01	02	03
A	17 55 301	Splice, Straight, 5 kV, #2−300 kcmil	1	-	-
	17 55 300	Splice, Straight, 5 kV, 350 kcmil−750 kcmil	-	1	1
B	17 60 357	Sleeve, Compression, 1/0	3	-	-
	17 60 359	Sleeve, Compression, 350 kcmil	-	3	-
	17 60 360	Sleeve, Compression, 750 kcmil	-	-	3
	402	Op Code Cable Set-Up	3	3	3

DESIGN NOTE(s):

1. Quantities shown are for making three joints

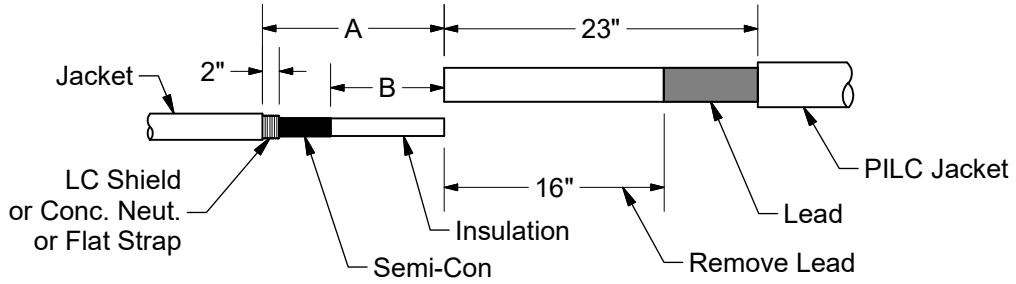
REV	DATE	ENG	DESCRIPTION
2	01/01/23	EJB	Converted to New Format
1	06/27/94	EJB	

INSTRUCTIONS

1. HEAT SHRINK BASICS

   A. Adjust the flame so that it is an overall 12" bushy flame.
   B. Apply outer 3" to 4" tip of the flame to heat-shrinkable material with a rapid brushing motion.
   C. Unless otherwise instructed start shrinking tubes at the center working the flame around all sides of the tubes to apply uniform heat.
   D. Concentrate on heating the back of the tubes as well as the front of the tubes.
   E. If if is necessary to interrupt the shrinking process and the tubes cool, you must reheat prior to shrinking the next tube.
   F. Inspect all installed tubes. Reheat any flat spots or wrinkles, paying particular attention to the back of the splice.

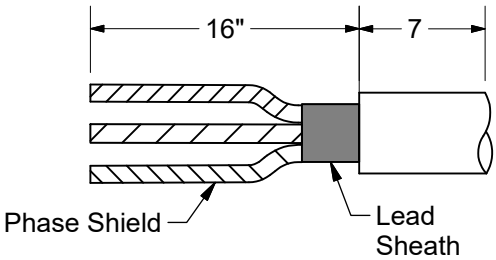
2. PREPARE CABLES
   Secure end of flat strip, concentric neutral, or LC shield with a length of copper foil tape or minimal width of plastic tape.



IF THE LEAD IS UNJACKETED, MARK THE PILC CABLE AS SHOWN

CABLE SIZE	A (IN)	B (IN)
1/0[3]– 4/0[3]PILC TO 3–#2, 3–1/0 OR 3-4/0	10	5
350[3]PILC TO 3-350, OR 3-4/0	12	5-1/2
800[3]PILC TO 3-750	12	5-1/2

3. PREPARE AND REMOVE LEAD SHEATH
   A. Remove lead oxide from the lead sheath and clean with an approved solvent. Remove the lead sheath as shown.

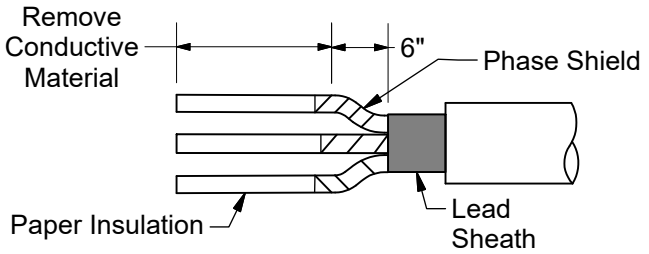


   B. Phase Holding:
   If an existing 3/C PILC cable is being cut and spliced to three new single conductor cables, "Phase Holding" may be required. After opening the lead sheath to expose the shielded phase conductors, place several wraps of colored tape around each phase before cutting the conductors. Use "white" to signify the "Held Phase A", blue to signify the "Held Phase B" and "red" to signify the "Held Phase C". The phase colors do not identify the actual phases but they represent the "Held Phase" of the system.

   Due to the covering of the phases during the preparation of the splice, it will be necessary to move the markers several times throughout the splicing process. Each time the "Phase Holding" tape is to be moved to a new location, "Phase Holding" will be noted in the installation instructions.

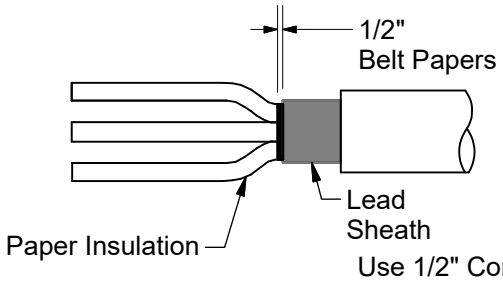
   If "Phase Holding" is not a requirement for this splice, then the "Phase Holding" comments should be ignored.

4. REMOVE SHIELD
   A. Cut back any bedding and/or shield tapes over all three phases to three phases to the lead sheath cutback.
   B. Cut back phase shields and remove any conductive material from paper insulation as shown.



Tape phase shields at edge to prevent unwrapping. DO NOT use string. Use one wrap of colored "phase holding" tape or plastic tape.

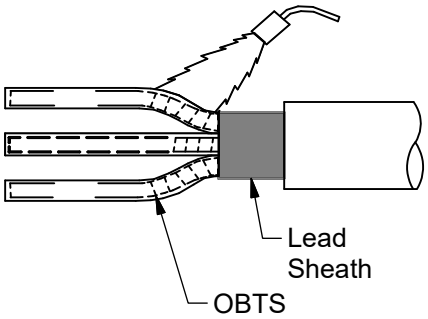
If Belted PILC Cable
Remove Belt Papers as Shown



Use 1/2" Constant Tension Clamp to Obtain Clean Tear at Lead Sheath Cutback.

5. POSITION AND SHRINK OIL BARRIER TUBES (OBT)
   A. Place an oil barrier tube over each phase, butted to the lead sheath cutback.
   B. Shrink the OBT's in the crotch area first. After the crotch is done, shrink one tube at a time.
   C. Inspect the installed OBT's. The OBT's should have a smooth, wrinkle-free surface after shrinking. Reheat to smooth any wrinkled areas.

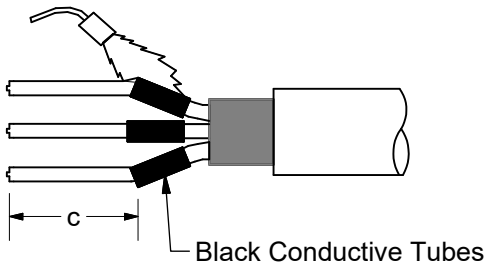
   a. OBT may shrink 1/4" - 1/2" away from lead sheath cutback. This is okay.
   b. To achieve a smooth wrinkle-free installation, use a reduced flame to install the thin-walled OBT's.



Phase Holding: Wrap a layer of "Phase Holding" tape to the connection end of the OBT before positioning and shrinking the Black Conductive Tubes.

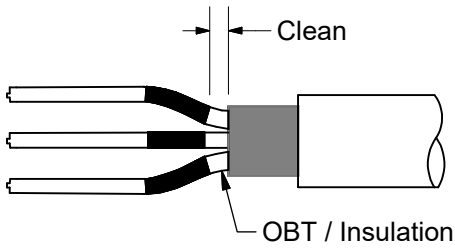
6. POSITION AND SHRINK BLACK CONDUCTIVE TUBES
   A. Place a black conductive tube over each phase and position as shown.
   B. Shrink the tubes in place starting at the end nearest to the center of the splice.

CABLE SIZES	C (IN)
1/0 ^{3} and 4/0 ^{3} PILC	6
350 ^{3} and 800 ^{3} PILC	6-1/2

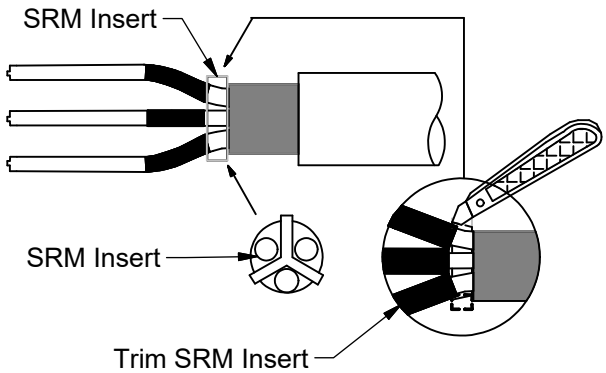


REV	DATE	ENG	DESCRIPTION
4	01/01/23	EJB	Converted to New Format
3	08/09/10	EJB	

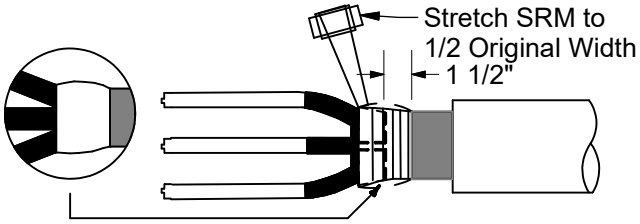
7. CLEAN OBTS AND INSTALL SRM INSERT
   A. Using an approved solvent, clean the OBT/insulation, as shown.



   B. Assemble SRM insert per box instructions.
   C. Spread the phases and position the SRM insert as shown.The SRM insert is packaged inside the conductive breakout.
   D. Trim SRM insert to extend 1/8" beyond each phase.
   E. Reclean the lead sheath using an approved solvent.

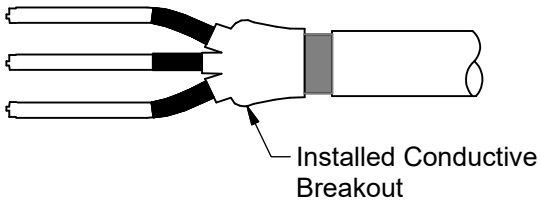


8. INSTALL OIL SEAL
   A. Mark the lead sheath 1-1/2" from the end.
   B. Remove the backing from one side of a long strip of SRM. Roll the SRM and remaining backing strip into a convenient size.
   C. While removing the remaining backing strip, tightly wrap the SRM from the mark on the lead sheath to the outer edge of the SRM insert.
   D. Four to six strips of SRM should be used to build the SRM to the shape down.



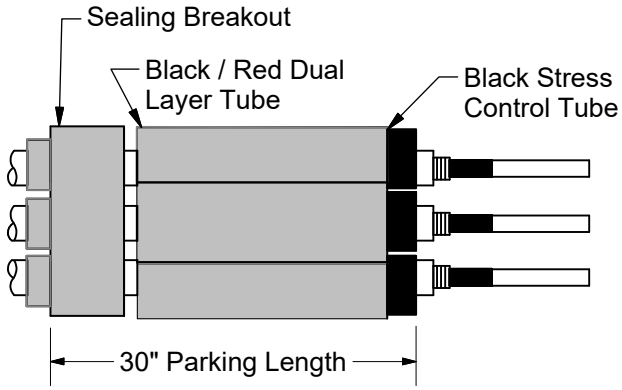
      a. The SRM will stick better if the lead sheath is preheated.
      b. <u>DO NOT</u> over apply SRM, the finished diameter must not exceed that of the breakout boot.

9. POSITION AND SHRINK CONDUCTIVE BREAKOUT
   A. Position the conductive breakout over the SRM so that the inside butts up hard against the SRM.
   B. Shrink the conductive breakout in place starting at the fingers and working toward the other end.
   C. After the breakout has shrunk, continue to apply heat until the breakout has a smooth, uniform surface.

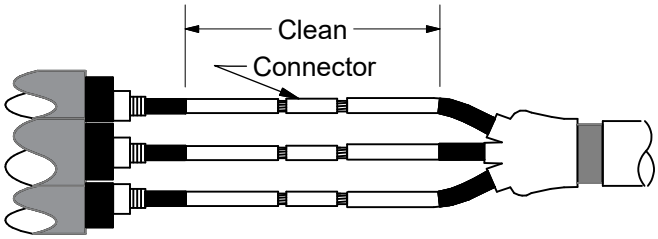


Phase Holding: After breakout is cool, apply "Phase Holding" tape to the fingers of the cable breakout (last and final loaction for "Phase Holding" tape).

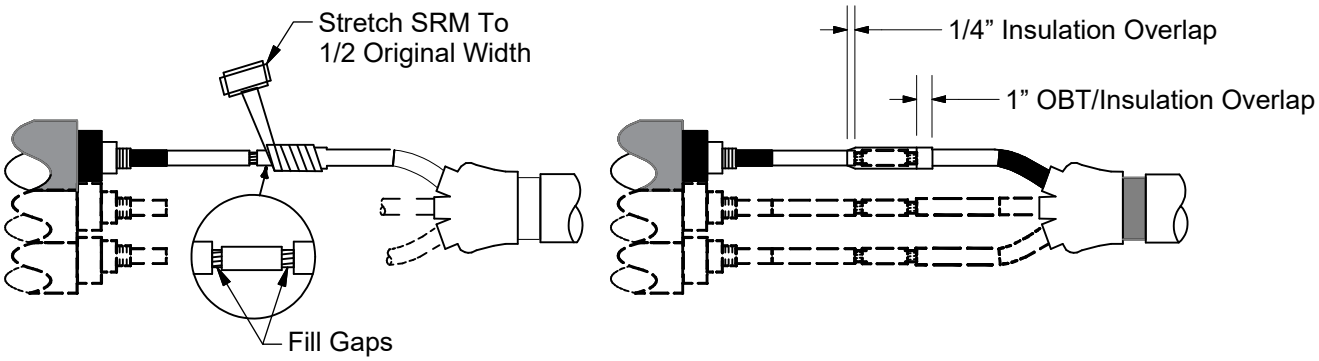
10. POSITION SPLICE COMPONENTS ON SOLID DIELECTRIC CABLES
    A. Clean 30" of cable jacket.
    B. Place sealing breakout over the cables with the fingers pointing away from the splice center.
    B. Place one set of nested tubes over each clean cable.



11. REMOVE INSULATION AND INSTALL CONNECTORS
    A. Determine the insert depth of the connector.
    B. The insulation cutback should equal the connector insert depth plus 1/4".
    C. Install the connectors. Protect the OBT's, if using soldered connector by wrapping them with cotten or glass fiber tape.
    D. Make sure connections are smooth.
    E. Using an approved solvent, clean the insulation as shown. Pay particular attention to the OBT/insulation surface.

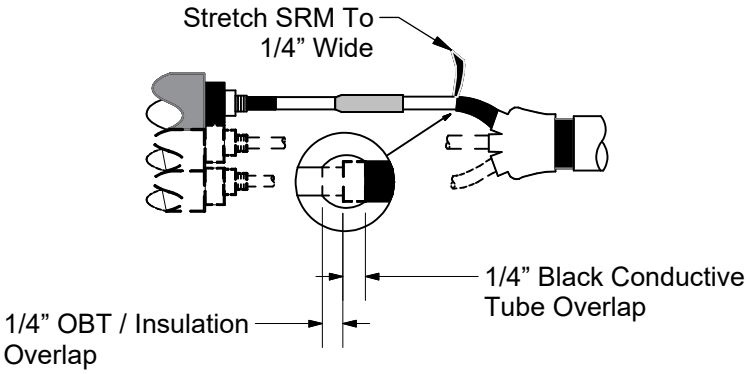


12. APPLY SRM OVER CONNECTOR
    (Complete steps 12 and 13 working on one phase at a time.)
    A. Remove backing from one side of a long strip of SRM, roll the SRM and remaining backing strip into a convenient size.
    B. While removing the remaining backing strip, tightly wrap the SRM around the connector and exposed conductor. Be sure to fill the gaps and low spots around the connector.
    C. Continue to wrap the SRM onto the insulation as shown.
    D. If the connector diameter is larger than the insulation diameter, apply two half-lapped layers of SRM over the entire connection.

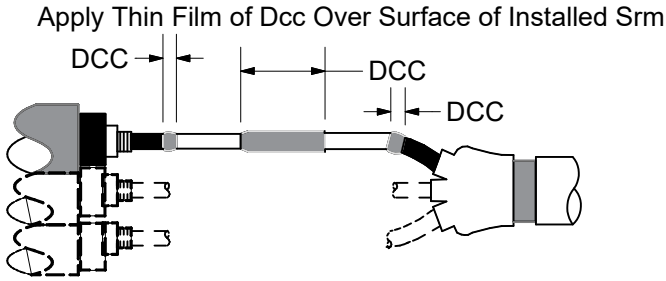


13. APPLY SRM AT BLACK CONDUCTIVE TUBE AND SEMI-CON STEPS, APPLY DISCHARGE CONTROL COMPOUND, AND THEN POSITION BLACK STRESS CONTROL TUBE.

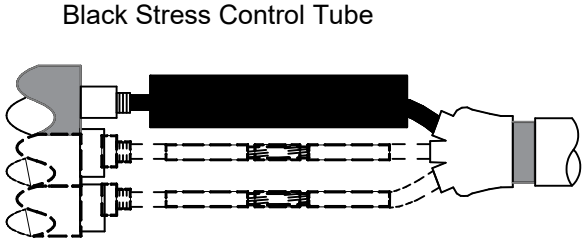
A. Remove the backing from the short angle-cut piece of SRM. Place the tip of SRM at the black conductive tube step and tightly wrap to fill the step. Overlap black conductive tube and OBT/insulation and taper as shown.
B. Repeat the above procedure for the semi-con step.



C. Snip open the end of the DCC tube and apply a thin film of compound on the SRM over the connector and semi-con steps.

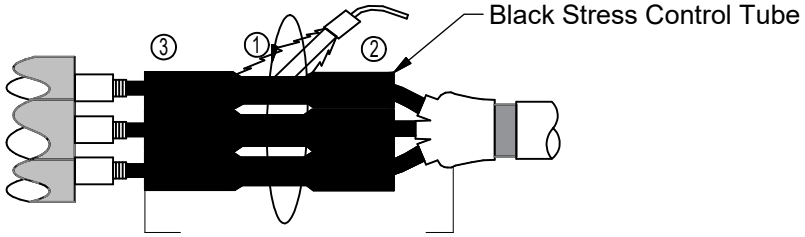


D. Center the black stress control tube over the completed connector area. Be sure to equally overlap the semi-con and the black conductive tube.



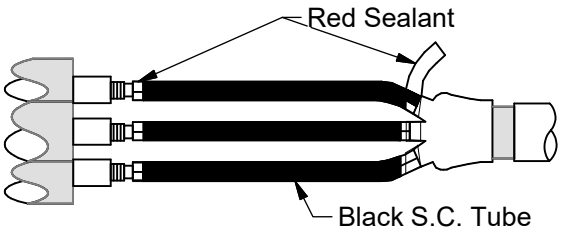
COMPLETE STEPS 12 AND 13 FOR THE REMAINING TWO PHASES BEFORE PROCEEDING TO STEP 14.

14. SHRINK BLACK STRESS CONTROL TUBES
   A. Make sure that each tube is centered over the connection area, equally overlapping the semi-con and black conductive tube.
   B. Shrink all three tubes in place at the same time.
   C. Begin shrinking at center of tubes (1), working torch with a smooth brushing motion around the tubes.
   D. After center portions shrink, work torch toward one end (2), then to opposite end (3). Post heat all tubes.
   E. Apply sufficient heat to ensure softening of the SRM, indicated by a smooth surface profile.

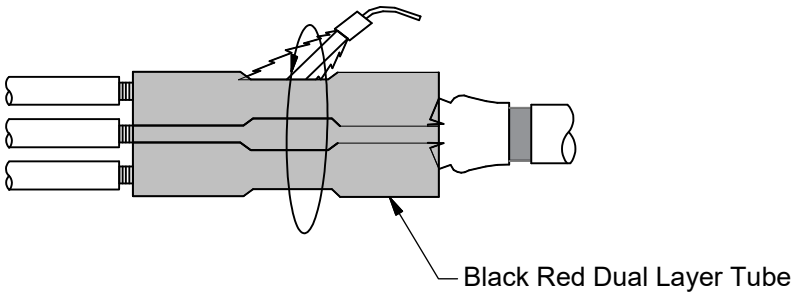


Center Tube Over Connection Area

15. APPLY RED SEALANT
   A. Remove backing from red sealant.
   B. Using light tension, wrap sealant over the cable and butt against the black stress control tube as shown.
   C. Build the sealant to the level of the black stress control tube.



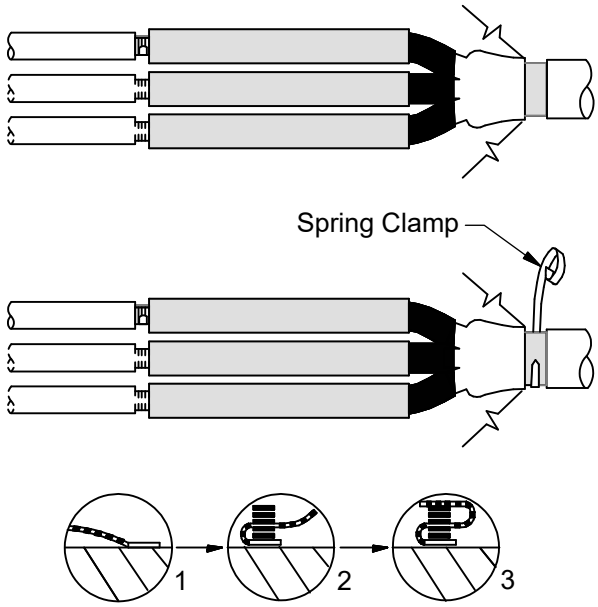
16. POSITION AND SHRINK BLACK/RED DUAL LAYER TUBES
   A. Center the tubes over the black stress control tubes.
   B. Shrink in place using the method described in 14 except stop shrinking 5" from each end. Then shrink each end.
   C. After initial shrinking, heat the entire tubes for approximately 1 minute. The raised ridges should disappear. Absence of ridges can be observed by visual inspection and feeling the surface with gloved hand.



17. INSTALL GROUND LEADS TO PILC CABLE

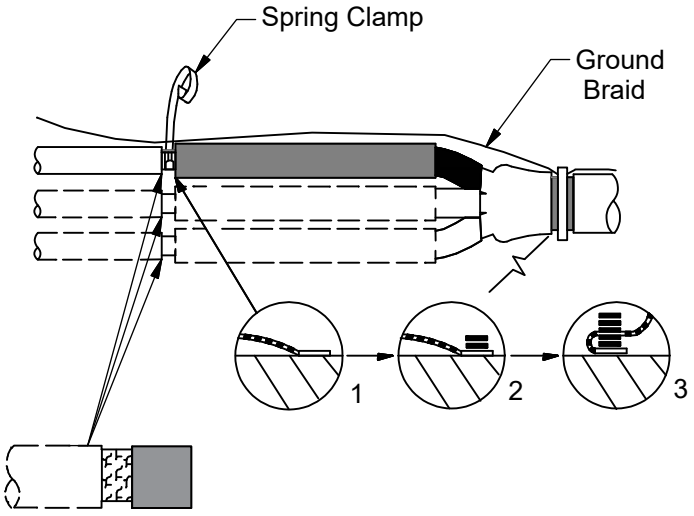
There are three long braids provided with this kit. One end of the braid has a short length of heat shrink tube installed next to a 2" wide solder block. This is the end of the braid which will be positioned over the jacket for external grounding.

A. Wrap three layers of 2" wide copper mesh around the cleaned lead sheath on the 3/C PILC side of the joint. Tie off with half hitch or equivalent knot.
B. Lay three braids across the joint evenly spaced around the joint circumfrence so that the braids overlap the mesh and the solder block is positioned over the jacket and aligned with the cable jacket cutback. Temporarily tape the braids into position.
C. (1) Wrap two turns of the large spring clamp over the three braids and mesh. (2) Fold the long end of the braid back over the spring clamp and wrap two additional turns. (3) Fold long end one more time the spring clamp and complete wrapping the spring clamp over the braid. (The long end of the braid should be going across the splice at this time.)



18. INSTALL GROUND LEADS TO METALLIC SHIELDS

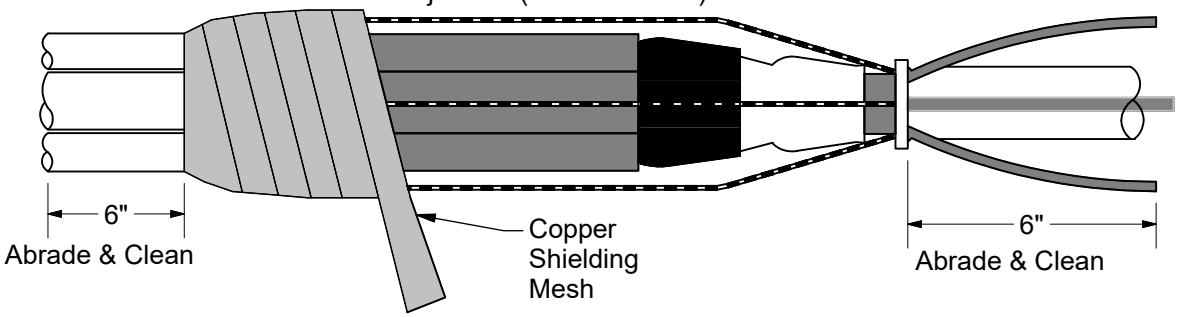
A. Wrap three layers of 2" wide copper mesh around the metallic shields of the solid dielectric cable and tie off with a half hitch or equivalent knot. (Wrap around flat strap, concentric wires or LC Shield.)
B. (1) Lay braid directly over the mesh. (2) Wrap two turns of the small spring clamp over the braid and mesh. (3) Fold back the braid over the spring clamp and complete wrapping the spring clamp over the braid. (Excess braid should be going across the splice at this time.) Excess braid may be cut off or left over the splice.
C. Repeat this step for remaining phases until all three phases are completed.



REV	DATE	ENG	DESCRIPTION
4	01/01/23	EJB	Converted to New Format
3	08/09/10	EJB	

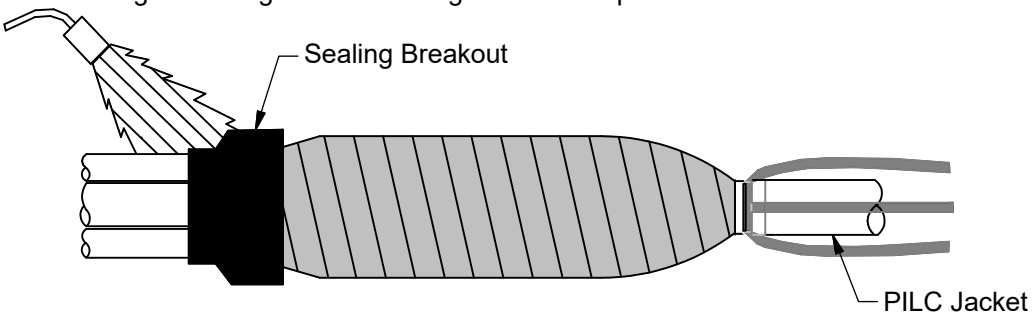
19. APPLY SHIELDING MESH

A. Starting over the ground connections on the extruded solid dielectric cable side of the splice, wrap one half-lapped layer of 2" wide shielding mesh across the splice and tie off to the PILC cable lead sheath.
B. Abrade and solvent clean the cable jackets (or lead sheath) as shown.



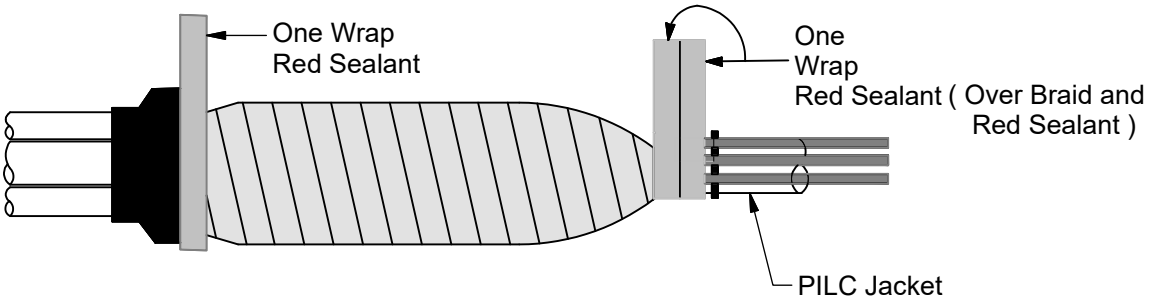
20. POSITION AND SHRINK NON-CONDUCTIVE SEALING BREAKOUT

A. Slide the breakout into position. Make sure that the full length of the fingers of the breakout are over the cable jackets and the body is extending over the splice.
B. Shrink in place starting at the fingers and working toward the splice center.



21. APPLY RED SEALANT

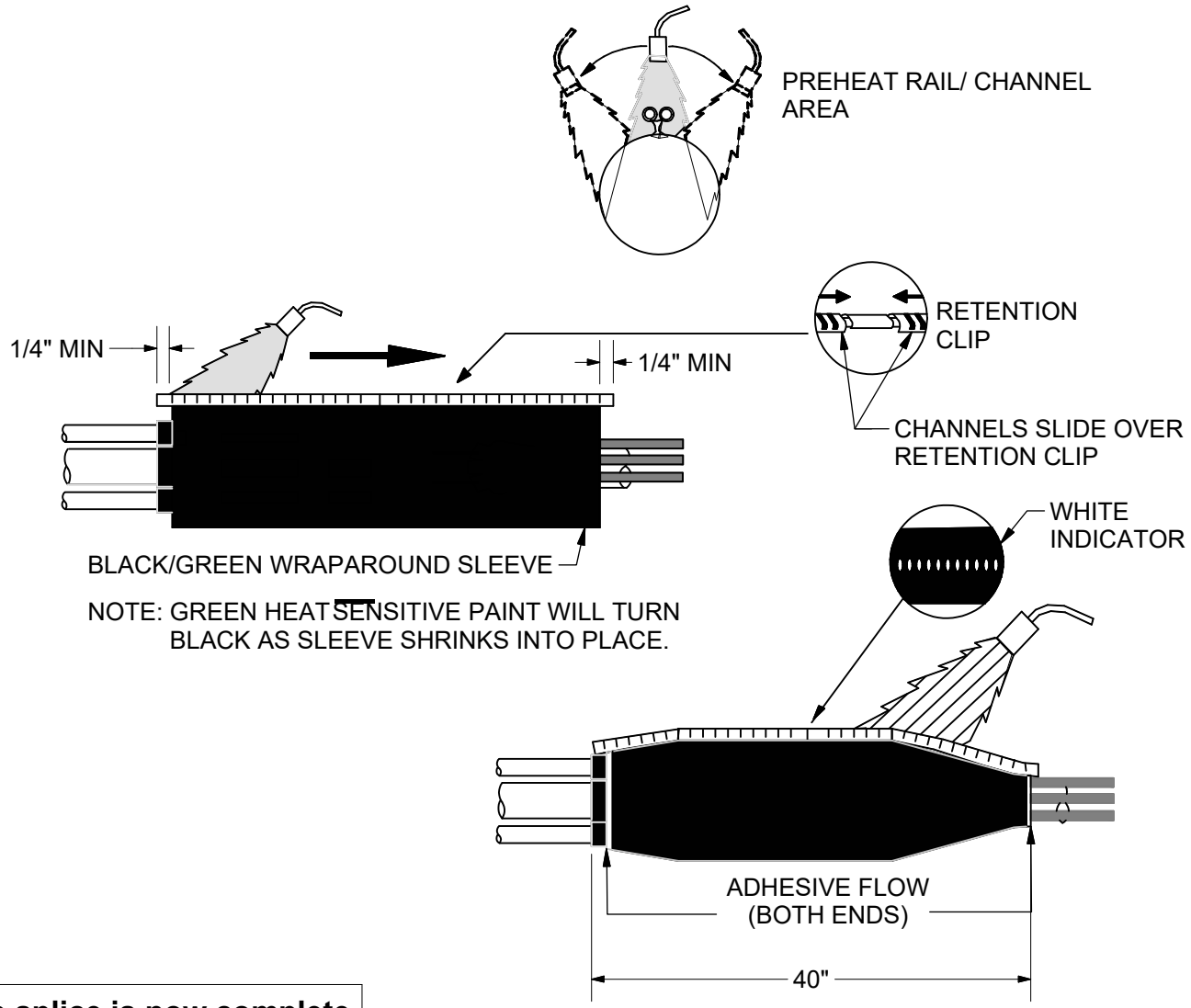
A. Allow the breakout to cool sufficiently to touch before proceeding.
B. Apply two single wraps of red sealant under the ground braids on the PILC cable side. Wraps should be side by side and butted up to the cable jacket cutback.
C. Lay the braids down and press the solder blocked portion and the end of the heat shrink tubing into the red sealant.
D. Apply two additional single wraps of red sealant over the braids and the first layer of red sealant.
E. Apply one wrap of red sealant over the body of the breakout as shown.



REV	DATE	ENG	DESCRIPTION
4	01/01/23	EJB	Converted to New Format
3	08/09/10	EJB	

22. POSITION AND SHRINK WRAPAROUND SLEEVE

A. Remove or tape over all sharp points to prevent puncture of wraparound sleeve.
B. Remove the backing from the wraparound sleeve and center sleeve over splice.
C. Slide the metal retention clip onto the butted rails. Connect the channels by overlapping the retention clip as shown below.
D. Channel(s) must overlap sleeve edges by 1/4" minimum.
E. Preheat evenly along both sides of the rail/channel area until this area begins to shrink. (Critical Step)
F. Begin shrinking at the center of the sleeve and work all the way around the sleeve and toward each end.
G. Apply heat until the sleeve is completely shrunk and the green paint is completely converted to black.
H. Post heat the entire length, concentrating on the metal channel area. The post heat should be for 30 seconds after the sleeve is completely shrunk. A white line should be visible in the channel gaps indicating sufficient heating.
I. Look for adhesive flow at both ends of the sleeve.
J. Allow the sleeve to cool before moving or placing in service.



The splice is now complete

REV	DATE	ENG	DESCRIPTION
4	01/01/23	EJB	Converted to New Format
3	08/09/10	EJB	

Heat Shrink Splice Standards For Common Cable Splices

DCS	PILC CABLE TO	SOLID DIELECTRIC CABLE
41 33 22 01	$1/0^3$	3 - 1/0 CNRP
41 33 22 02	$1/0^3$	3 - #2 ALCNRP
41 33 22 03	$1/0^3$	3 - 4/0 ALCNRP
41 33 22 04	$4/0^3$	3 - 4/0 ALCNRP
41 33 22 05	350^3	3 - 4/0 ALCNRP
41 33 22 06	350^3	3 - 350 CNRP
41 33 22 06	350^3	3 - 350 FSRP, RW
41 33 22 07	800^3	3 -750 LCRP
41 33 22 07	800^3	3 - 750 FSRP, RW
41 33 22 07*	800^3	3 - 1000 TSRP

* 800 kcmil to 1000 kcmil compression sleeve is not included in the standard.

	ITEM	STK / DCS #	DESCRIPTION 41 33 22 **	01	02	03	04	05	06	07
	A	17 05 308	Splice−Cond., Trif., H.S., 1/0−4/0 AWG	1	1	1	1	-	-	-
		17 05 307	Splice−Cond., Trif., H.S., 350 kcmil	-	-	-	-	1	1	-
		17 05 306	Splice−Cond., Trif., H.S., 750−800 kcmil	-	-	-	-	-	-	1
	B	17 60 357	Sleeve−Cmpsn., 1/0 Cu	3	-	-	-	-	-	-
		17 60 344	Sleeve−Cmpsn., 1/0 − #2 Al.	-	3	-	-	-	-	-
		17 63 143	Sleeve−Cmpsn., 1/0 − 4/0 Al.	-	-	3	-	-	-	-
		17 60 317	Sleeve−Cmpsn., 4/0 Al.	-	-	-	3	-	-	-
		17 63 201	Sleeve−Cmpsn., 350 − 4/0 Al.	-	-	-	-	3	-	-
		17 60 359	Sleeve−Cmpsn., 350 kcmil Cu.	-	-	-	-	-	3	-
		17 60 504	Sleeve−Cmpsn., 800 kcmil to 750 kcmil Cu.	-	-	-	-	-	-	3
	C	25 53 055	Tape−Plastic (RL)	1	1	1	1	1	1	1
		729	Op Code Splice 15 kV Heat Shrink	1	1	1	1	1	1	1

REV	DATE	ENG	DESCRIPTION
4	01/01/23	EJB	Converted to New Format
3	08/09/10	EJB	

INSTRUCTIONS - 3M STANDARD SPLICE:

Read the cautionary statement on Sheet 9 before starting.

1. There must be an 8" overlap of the cables, Figure 1. Wipe clean 24" each side.

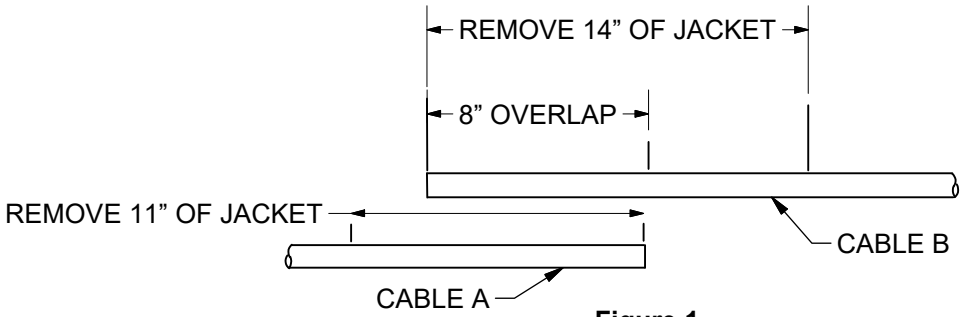


Figure 1

2. Place the shinkable sleeve on either cable.
3. Remove 14" of jacket Cable B, 11" of jacket Cable A.
4. For single phase cables train the concentric wires in two bundles each side, five wires per bundle. See Figure 2. For three phase cables train concentric wires in one six wire bundle.

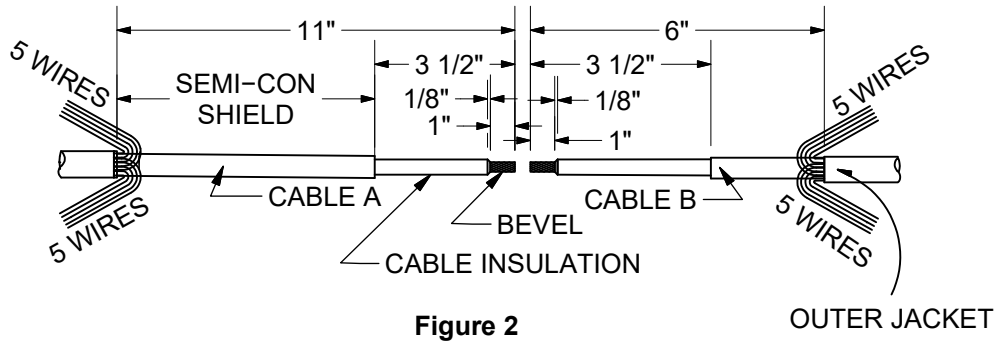


Figure 2

5. Cut 8" off Cable B. Cut cables with a hack saw so that the cable ends butt together at the splice center.
6. Strip cables for splicing per Figure 2, clean cables - <u>DO NOT USE SILICONE SPRAY ON CABLES OR SPLICE BODY.</u>
7. Prior to installing the connector, clean the exposed conductor with a stainless steel wire brush. Some splice kits may contain a small disposable stainless steel wire brush, if so, it should be used. If ther is no wire brush in the kit, use one of the stocked stainless steel wire brushes.
8. Lubricate insulation and semi-con shield of Cable A with silicone grease. Install splice body onto Cable A, leaving conductor exposed for the connector. Lubricate bore with silicone grease to aid installation.
9. Install the connector, Make as many crimps per end as possible without overlap. File flashing down. Remove excess inhibitor.
10. Lubricate insulation and semi-con shield of Cable B with silicone grease. Slide splice body onto Cable B and into final positon over the connector. Use the bumps formed on the splice ends as guides for centering. See Figure 3.

11. Connect concentrics with two sleeves on Side A. For single phase cables, place five wires per side into each sleeve. For three phase cables, place all six wires into one sleeve. Crimp the sleeves. Snug sleeves and wires tightly against splice and cable. See Figure 3.

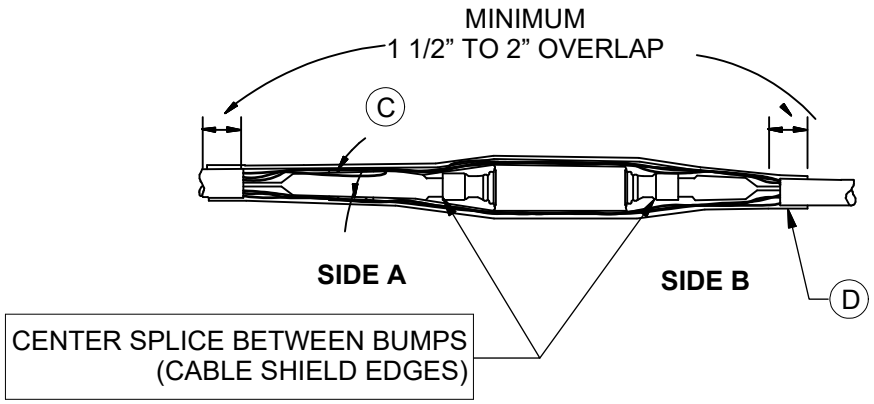


Figure 3

12. Slide shrinkable sleeve over the splice and shink it down. To install cold-shinkable sleeves, follow the manufactures' instructions.

CONSTRUCTION NOTE(s):

1. When a cold-shrinkable sleeve or no sleeve is used, connect one or two concentric wires on each end to the ground eyes.
2. When splicing a nonjacketed cable to a long length of jacketed cable seal the jacketed side per DCS # **59 40 90 14**.

INSTRUCTIONS - ELASTIMOLD STANDARD SPLICE:

Read the cautionary statement on Sheet 9 before starting.

1. There must be an 8" overlap of the cables, Figure 1. Wipe clean 24" each side.

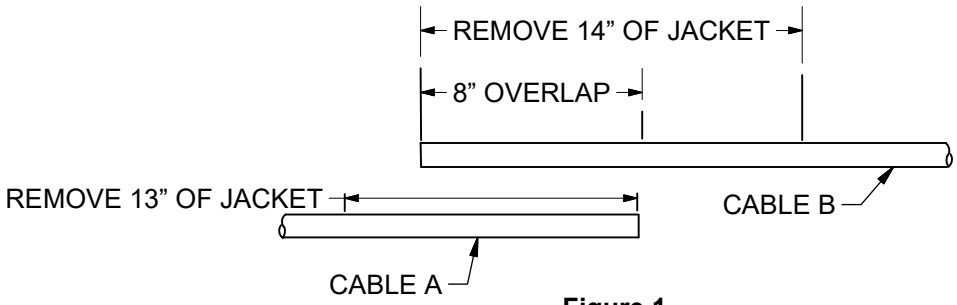


Figure 1

2. Place the shrinkable sleeve on either side.
3. Remove 14" of jacket Cable B, 13" of jacket Cable A.
4. For single phase cabels, train the concentric wires in two bundles each side, five wires per bundle. See Figure 2. For three phase cables, train the concentric wires in one six wire bundle.
5. Cut 8" off Cable B. Cut cables with a hacksaw so that the cable end butt together at the splice center.
6. Strip cables for splicing per Figure 2, clean cables - <u>DO NOT USE SILICONE SPRAY ON CABLES OR SPLCE BODY.</u>

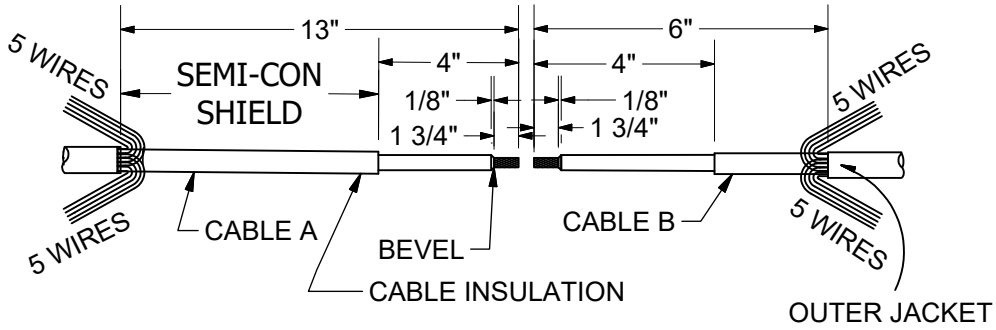


Figure 2

7. Prior to installing the connector, clean the exposed conductor with a stainless steel wire brush. Some splice kits may contain a small disposable stainless steel wire brush, if so, it should be used. If there is no wire brush in the kit, use one of the stocked stainless steel wire brushes.
8. Lubricate insulation and semi-con shield of Cable A with silicone grease. Install splice body onto Cable A, leaving conductor exposed for the connector. Lubricate bore with silicone grease to aid installation.
9. Install the connector. Make as many crimps per end as possible without overlap. File flashing down. Remove excess inhibitor.
10. Lubricate insulation and semi-co shield of Cable B with silicone grease. Slide body onto Cable B and into final position over the connector. Use the bumps formed on the splice ends as guides for centering. See Figure 3.
11. Connect concentrics with two sleeves on Side A. For single phase cables place five wires per side into each sleeve. For three phase cables place all six wires into one sleeve. Crimp the sleeve. Snug sleeves and wires tightly against splice and cable. See Figure 3.

12. Slide shrinkable sleeve over the splice and shrink it down. To install cold-shrinkable sleeves, follow the manufacturers' instructions.

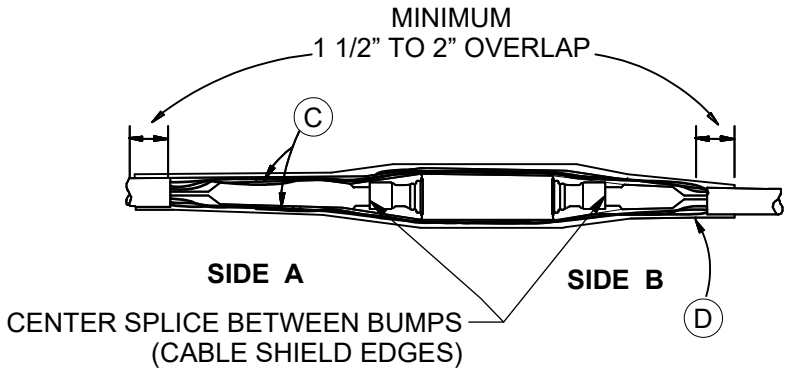


Figure 3

CONSTRUCTION NOTE(s):
1. When a cold-shrinkable sleeve or no sleeve is used, connect one or two concentric wires on each end to the grounding eyes.
2. When splicing a nonjacketed cable to a long length of jacketed cable seal the jacketed side per DCS # **59 40 90 14**.

INSTRUCTIONS - COOPER STANDARD SPLICE:

Read the cautionary statement on Sheet 9 before starting.

1. There must be an 8" overlap of the cables, Figure 1. Wipe clean 24" each side.

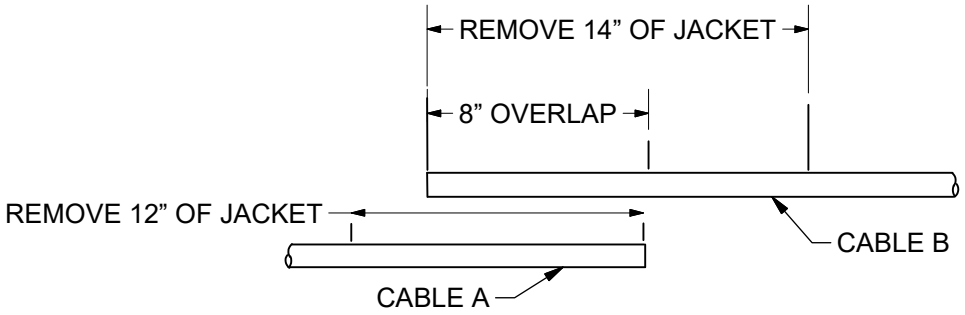


Figure 1

2. Place the shrinkable sleeve on either cable.
3. Remove 14" of jacket Cable B, 12" of jacket Cable A.
4. For single phase cables train the concentric wires in two bundles each side, five wires per bundle. See Figure 2. For three phase cables train concentric wires in one six wire bundle.
5. Cut 8" off Cable B. Cut cables with a hack saw so that the cable ends butt together at the splice center.
6. Strip cables for splicing per Figure 2, clean cables - DO NOT USE SILICONE SPRAY ON CABLES OR SPLICE BODY. Prior to installing the conector, clean the exposed conductor with a stainless steel wire brush. Some splice kits may contain a small disposable stainless steel wire brush, if so, it should be used. If there is no wire brush in the kit, use one of the stocked stainless steel brushes.

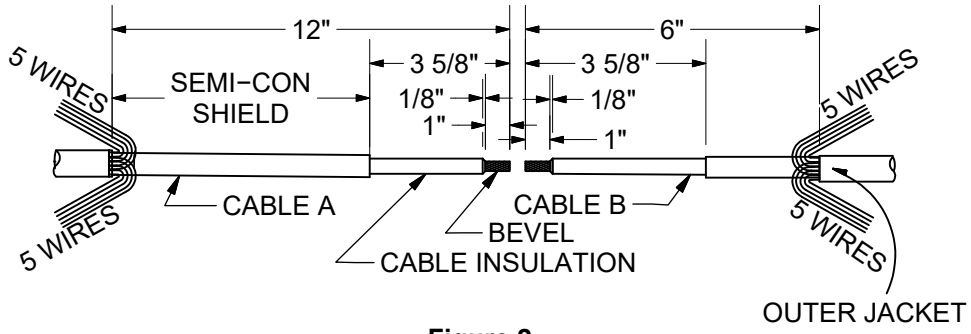


Figure 2

7. Lubricate insulation and semi-con shield of Cable A with silicone grease. Apply one wrap of tape to the end of the conductor on Cable A. Install splice body onto Cable A, leaving conductor exposed for the connector. Lubricate bore with silicone grease to aid installation.
8. Remove tape from the conductor on Cable A. Clean bare conductors with a wire brush prior to installing the connector.
9. Install the connector. Make as many crimps per end as possible without overlap. Leave the center 1/4" of the connector uncrimped. File flashing down. Remove excess inhibitor.
10. Lubricate insulation and semi-con shield of Cable B with silicone grease. Slide splice body onto Cable B and into final position over the connector. Use the bumps formed on the splice ends as guides for centering. See Figure 3.

11. Connect concentrics with two sleeves on Side A. Place five wires per side into each sleeve. Crimp the sleeves. Snug sleeves and wires tightly against splice and cable. See Figure 3.

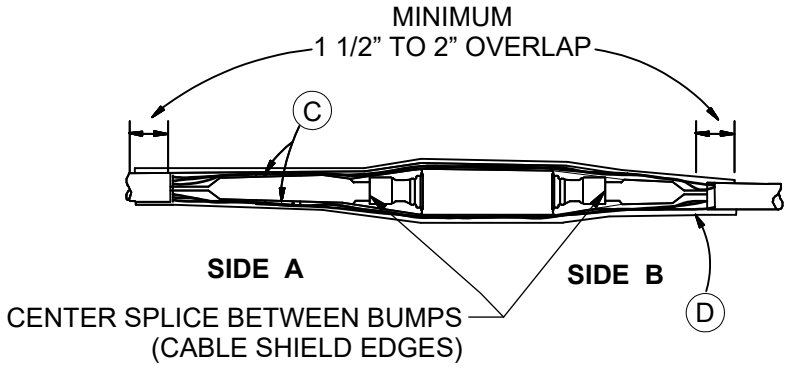


Figure 3

12. Slide shrinkable sleeve over the splice and shrink it down. To install cold-shrinkable sleeves, follow the manufacturers' instructions.

CONSTRUCTION NOTE(s):
1. When a cold-shrinkable sleeve or no sleeve is used, connect one or two concentric wires on each end to the grounding eyes.
2. When splicing a nonjacketed cable to a long length of jacketed cable, seal the jacketed side per DCS # **59 40 90 14**.

INSTRUCTIONS -3M LONG REPAIR SPLICE:

1. Cut out damaged cable section, do not exceed 6". Retain neutral wires from damaged section. Use a hack saw to get clean cuts.
2. Prepare cables as shown in Figure 1. If cable is jacketed, remove jacket to expose neutral wires. For single phase cables train the concentric wires in two bundles each. For three phase cables train the concentric wires in one six wire bundle. Place the shrinkable sleeve on one of the cables.

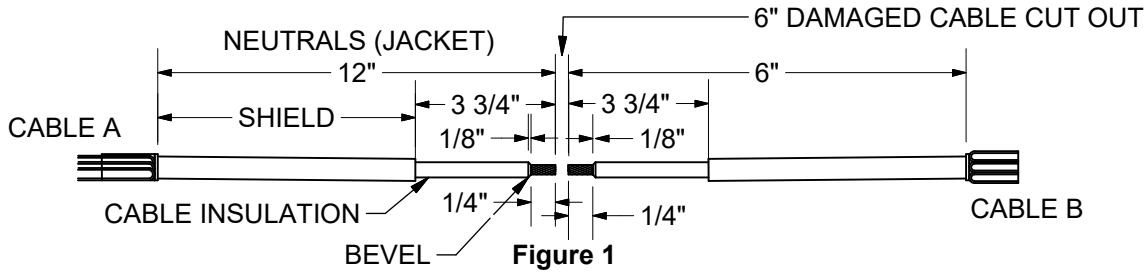


Figure 1

3. Fold neutrals back and clean dirt off of the semi-con shield and the insulation. Use a dry cloth. Prior to installing the connector, clean the exposed conductor with a stainless steel wire brush. Some splice kits may contain a small disposable stainless steel wire brush, if so, it should be used. If there is no wire brush in the kit use one of the stocked stainless steel brushes.
4. Install the connector on Cable A only and crimp. Wipe off excess inhibitor and file flashing down.

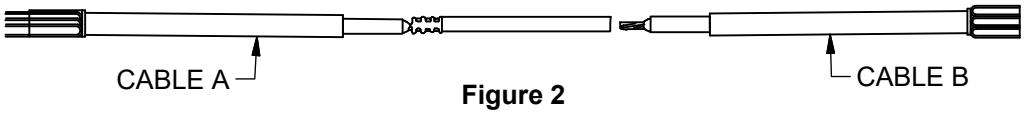


Figure 2

5. Lubricate connector, insulation, semi-con, and splice bore with silicone grease. Install splice body onto connector and Cable A until uncrimped connector end is exposed approximately 2". DO NOT USE SPRAY SILICONE.
6. Install Cable B into connector and crimp. Clean off excess inhibitor and file flashing down.
7. Lubricate insulation and semi-con of Cable B and the exposed connector and bore area of the splice body with silicone grease. Slide splice body only onto Cable B. Use bumps formed on splice ends as guides for centering.
8. Tape down concentric strands at ends of splice.
9. Attach one concentric from cable through its splice grounding eye and back to the concentric neutral wires. (Cold-shrinkable sleeve and Non-jacketed cables only.)
10. Twist the strands together and jumper across the splice using cable neutral wires and retained neutral wires. For single phase cables connect each bundle using two sleeves. See Figure 3. For three phase cables connect the bundle using one sleeve. Make sure that the neutral wires are against the splice body.

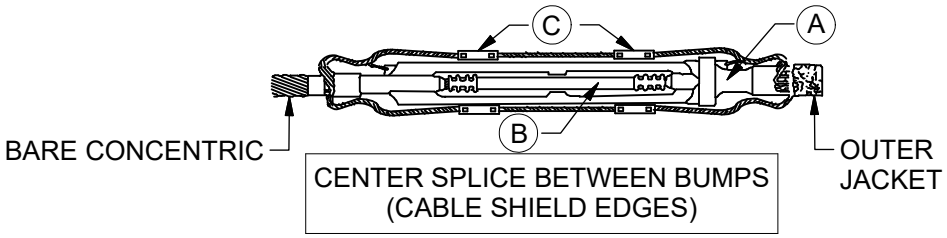


Figure 3

CONSTRUCTION NOTE(s):
1. Slide shrinkable sleeve over splice and shrink down.
2. When splicing a non jacketed cable to a long length of jacketed cable, seal the jacketed side per DCS # **59 40 90 14**.

DCS #	DESCRIPTION
41 34 34 05	1/0 Al Stranded
41 34 34 07	#2 Al Solid
41 34 34 08	Transition #2 Solid to 1/0 Stranded AL
41 34 34 09	Transition #2 Stranded to 1/0 Stranded AL
41 34 34 10	Transition #2 Stranded to #2 Solid Al, or #4 Stranded Cu
41 34 34 11	#2 Al Stranded
41 34 34 14	Long Repair #2 Al, Solid or #4 Stranded Cu
41 34 34 15	Long Repair #1/0 Stranded
41 34 34 16	Long Repair #2 Al, Stranded

ITEM	STK / DCS #	DESCRIPTION 41 34 34 **	05	07	08	09	10	11	14	15	16
A	17 55 283	Splice − #2 Al Str. 15kV	1	1	1	1	1	1	-	-	-
	17 55 288	Splice − Long Repair, #2 Al. Str. 15kV	-	-	-	-	-	-	1	-	1
	17 62 250	Splice − Long Repair, 1/0 Al Str. 15kV	-	-	-	-	-	-	-	1	-
B	17 60 506	Sleeve − #2 Solid Al	-	1	-	-	-	-	-	-	-
	17 60 505	Sleeve − 1/0 Str. Al	1	-	-	-	-	-	-	-	-
	17 60 501	Sleeve − Transition #2 Str. to #2 Solid Al,or #4Cu Str	-	-	-	-	1	-	-	-	-
	17 60 502	Sleeve − Transition #2 Str. to 1/0 Str. Al	-	-	-	1	-	-	-	-	-
	17 60 408	Sleeve − Transition #2 Solid to 1/0 Str. Al	-	-	1	-	-	-	-	-	-
	17 60 409	Sleeve − Long Repair,#2 Al, Solid, or #4 Str. Cu, 15kV	-	-	-	-	-	-	1	-	-
C	17 60 103	Sleeve − #4 Str. Cu.	2	2	2	2	2	2	4	4	4
D	17 55 371	Sleeve Cold−Shrinkable	1	1	1	1	1	1	1	1	1
	404	Op Code Splice #2 AL. Str. 15 kV	1	1	1	1	1	1	1	1	1

REV	DATE	ENG	DESCRIPTION
10	01/01/23	EJB	Converted to new format
9	02/10/14	EJB	

CAUTIONARY STATEMENT

The standard splice (Stock. #17 55 283) is for #2 stranded aluminum cables (Stock. #18 07 238 and Stock. #18 07 237). If any cables other than the standard #2 stranded aluminum cables are to be spliced together, the compression sleeve in the standard splice must be discarded and replaced by one of the compression sleeves shown in the materials list.

DO NOT CHANGE THE CABLE PREPARATION DIMENSIONS SHOWN FOR EACH APPROVED SUPPLIER'S SPLICE WHEN SUBSTITUTING A COMPRESSION SLEEVE FOR THE STANDARD #2 COMPRESSION SLEEVE. THIS IS ESPECIALLY IMPORTANT WHEN SUBSTITUTING A 2" LONG COMPRESSION SLEEVE FOR THE 3" LONG COMPRESSION SLEEVE IN THE ELASTIMOLD SPLICE. IF THE DIMENSIONAL REQUIREMENTS SHOWN ARE NOT MAINTAINED - THE SPLICE WILL FAIL.

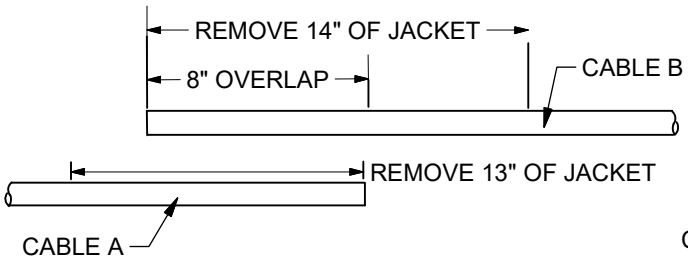


Figure 1

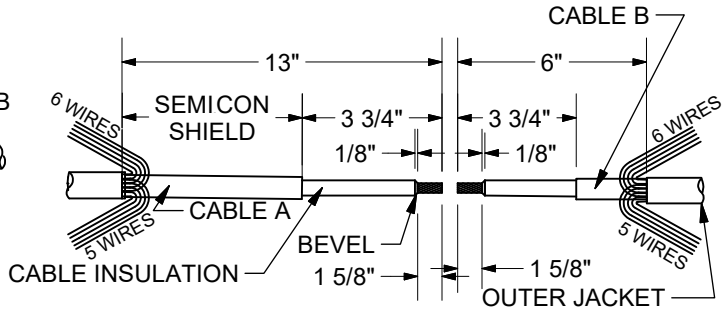


Figure 2

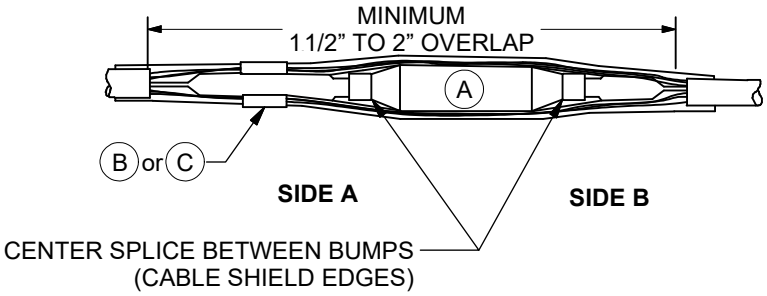


Figure 3

INSTRUCTIONS - 3M CABLE SPLICE:

1. There must be an 8" overlap of the cables. See Figure 1. Wipe clean 24" on each side.
2. Remove 14" of jacket from Cable B, 13" of jacket from Cable A.
3. Place the shrinkable sleeve(s) on either side.
4. Train the concentric wires in two bundles each side, five and six wires per bundle. See Figure 2.
5. Cut 8" off Cable B. Cut cables with a hawksaw so that the cable ends butt together at the splice center.
6. Strip cables for splicing per Figure 2, clean cables - DO NOT USE SILICONE SPRAY ON CABLE OR JOINT.
7. Clean the bare conductors with a stainless steel wire brush prior to installing the connector. Some splice kits may contain a small disposable stainless steel wire brush, if so, it should be used. If there is no wire brush in the kit, use one of the stocked stainless steel wire brushes.
8. Lubricate insulation and semi-con shield of Cable A with silicone grease. Install splice body onto Cable A, leaving conductor exposed for the connector. Lubricate bore with silicone grease to aid installation.
9. Install the connector. File the flashing down.
10. Lubricate insulation and semi-con shield of Cable B with silicone grease. Slide splice body onto Cable B and into final position over the connector. Use the bumps formed on the splice ends as guides for centering. See Figure 3.
11. Connect concentric with two sleeves on Side A. Place five and six wire bundles into connectors. Crimp the sleeves. Snug sleeves and wires tightly against splice and cable. See Figure 3. The 4/0 single phase cable with twenty #12 concentrics requires three wire bundles and three #2 sleeves.
12. For the cold shrink sleeve, place a layer of mastic around the end of each cable jacket. Slide the first cold shrink sleeve over the splice with the end of the sleeve overlapping the opposite cable jacket cut off (or mastic strip) by 2". Shrink the sleeve down. Wrap one layer of mastic tape at the inner end of the shrunken sleeve. Slide the second sleeve over the splice and overlap the first sleeve by 2". Shrink the second sleeve down.

CONSTRUCTION NOTE(s):

1. For cold shrink sleeves or no rejacketing sleeves, connect one or two concentric wires on each end to the grounding eyes.
2. When splicing a nonjacketed cable to a long length of jacketed cable seal the jacketed side per DCS **59 40 90 14**.
3. When splicing in manholes an external ground connection is required - see sheet 3 for instructions.

REV	DATE	ENG	DESCRIPTION
11	01/01/23	EJB	Converted to new format
10	06/02/14	EJB	

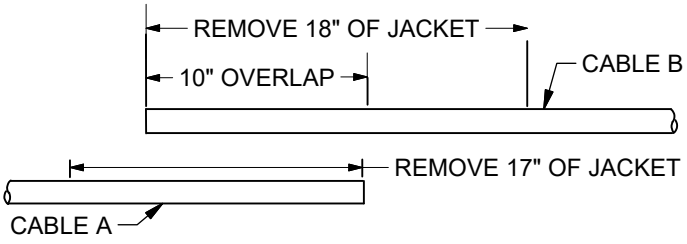


Figure 1

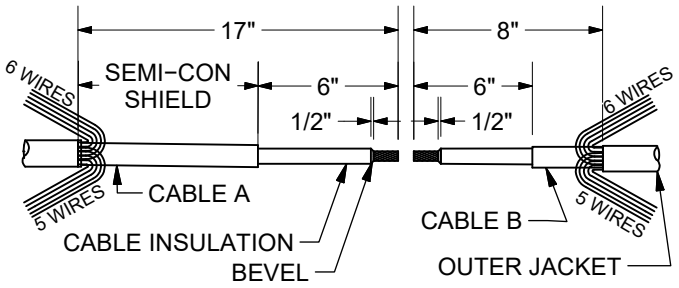


Figure 2

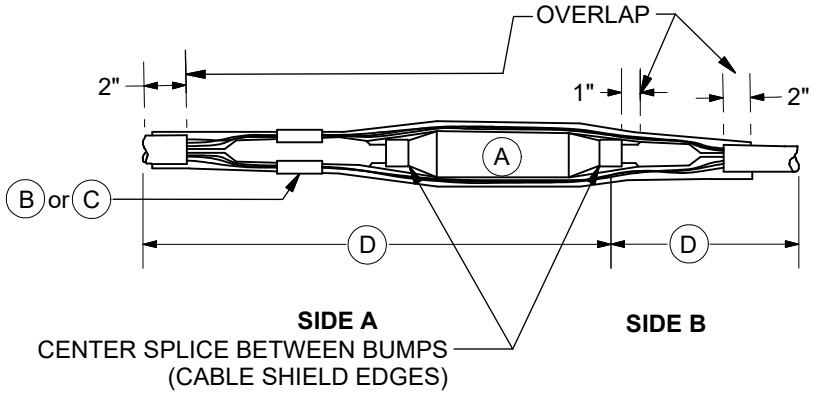


Figure 3

INSTRUCTIONS - ELASTIMOLD CABLE SPLICE:

1. There must be an 10" overlap of the cables. Figure 1. Wipe clean 24" on each side.
2. Remove 18" of jacket from Cable B, 17" of jacket from Cable A.
3. Place the shrinkable sleeves on either side of the cable.
4. Train the concentric wires in two bundles each side, five and six wires per bundle. See Figure 2.
5. Cut 10" off Cable B. Cut cables with a hawksaw so that the cable ends butt together at the splice center.
6. Strip cables for splicing per Figure 2, clean cables - DO NOT USE SILICONE SPRAY ON CABLE OR JOINT.
7. Clean the bare conductors with a stainless steel wire brush prior to installing the connector. Some splice kits may contain a small disposable stainless steel wire brush, if so, it should be used. If there is no wire brush in the kit, use one of the stocked stainless steel wire brushes.
8. Lubricate insulation and semi-con shield of Cable A with silicone grease. Install splice body onto Cable A, leaving conductor exposed for the connector. Lubricate bore with silicone grease to aid installation.
9. Install the connector. File the flashing down.
10. Lubricate insulation and semi-con shield of Cable B with silicone grease. Slide splice body onto Cable B and into final position over the connector. Use the bumps formed on the splice ends as guides for centering. See Figure 3.
11. Connect concentric with two sleeves on Side A. Place five and six wire bundles into connectors. Crimp the sleeves. Snug sleeves and wires tightly against splice and cable. See Figure 3. The 4/0 single phase cable with twenty #12 concentrics requires three wire bundles and three #2 sleeves.
12. For the cold shrink sleeve, place a layer of mastic around the end of each cable jacket. Slide the first cold shrink sleeve over the splice with the end of the sleeve overlapping the opposite cable jacket cut off (or mastic strip) by 2". Shrink the sleeve down.
    Wrap one layer of mastic tape at the inner end of the shrunken sleeve. Slide the second sleeve over the splice and overlap the first sleeve by 2". Shrink the second sleeve down.

CONSTRUCTION NOTE(s):

1. For cold shrink sleeves or no rejacketing sleeves, connect one or two concentric wires on each end to the grounding eyes.
2. When splicing a nonjacketed cable to a long length of jacketed cable seal the jacketed side per DCS **59 40 90 14.**
3. When splicing in manholes an external ground connection is required - see sheet 3 for instructions.

INSTRUCTIONS - GROUND CONNECTION FOR SPLICES INSTALLED IN MANHOLES (DCS 41 34 35 08 & 41 34 35 09):

1. Prior to installing the cold shrink sleeves, wrap six layers of shielding.
2. Attach a ground braid and a constant force spring over the shielding braid on Cable A. Install the ground braid and spring per DCS **59 40 93 44**. Wrap two layers of plastic tape over the spring connector (no sealer is needed as shown in the standard). Position the tails of the ground braid away from the splice body.
3. Apply two mastic strips from the cold shrink jacket kit at the end of the cable jacket cutoffs on each cable. Wrap one layer of mastic at each cutoff. Apply the mastic over the ground braid on Cable A.
4. Slide the first cold shrink sleeve over the splice with the end of the sleeve overlapping the opposite cable jacket cutoff (or mastic strip) by 2". Shrink the sleeve down.
5. Wrap one layer of mastic at the inner end of the shrunken sleeve.
6. Slide the second sleeve over the splice and overlap the first cold shrink sleeve by 1/2" minimum. Shrink the second sleeve down.
7. Attach the ground braid tails to a piece of #2 Cu bond wire using a two bolt clamp (Stock #17 54 140). Seal the two bolt connector, the bond wire, and the ground braid connections using sealer compound (Stock #31 53 055) and two layers of plastic tape (Stock #25 53 055) wrapped over the outside. Connect the #2 Cu bond wire to the 4/0 Cu bond wire in the manhole (system ground) using a two bolt clamp.

DCS #	Description
41 34 35 03	4/0, 3 Phase
41 34 35 05	4/0, 1 Phase
41 34 35 06	3/0 to 4/0 AL, 3 Phase
41 34 35 07	3/0 to 4/0, 1 Phase
41 34 35 08	4/0 AL, 3 Phase with External Ground (Manholes)
41 34 35 09	4/0 AL, 1 Phase with External Ground (Manholes)

	ITEM	STK / DCS #	DESCRIPTION 41 34 35 **	03	05	06	07	08	09
	A	17 55 285	Splice, Straight, 4/0 Al., 15 kV	1	1	1	1	1	1
	B	17 63 127	Sleeve, Compression, # 2 Copper	-	3	-	3	-	3
	C	17 60 103	Sleeve, Compression, # 4 Copper	2	-	2	-	2	-
	D	17 55 443	Sleeve, Cold Shrinkable	1	1	1	1	1	1
	E	17 60 720	Sleeve, Transition, 3/0 to 4/0 Al.	-	-	1	1	-	-
	F	17 54 306	Connector − Cable Ground w/ Constant Force Spring	-	-	-	-	1	1
	G	18 66 101	Braid − Copper, 1” x 15’	-	-	-	-	1	1
	H	17 54 140	Connector − Wire, #8−4/0 Cu, 2 Bolt	-	-	-	-	2	2
		415	Op Code Splice 4/0 AL or CU Str. 15 kV	1	1	1	1	1	1

CAUTIONARY STATEMENT FOR 3/0 TO 4/0 SPLICING

The standard splice (Stk. #17 55 285) is for 4/0 stranded aluminum cables (Stk. #18 07 240 and Stk. #18 07 239). If any cables other than the standard 4/0 stranded aluminum cables are to be spliced together, the compression sleeve in the strandard splice must be discarded and replaced by the transition sleeve shown in the materials list.

DO NOT CHANGE THE CABLE PERPARATION DIMENSIONS SHOWN FOR EACH APPROVED SUPPLIER'S SPLICE WHEN SUBSTITUTING A COMPRESSION SLEEVE FOR THE STANDARD 4/0 COMPRESSION SLEEVE. THIS IS ESPECIALLY IMPORTANT WHEN SUBSTITUTING A 2" LONG COMPRESSION SLEEVE FOR THE 3" LONG COMPRESSION SLEEVE IN THE ELASTIMOLD SPLICE. IF THE DIMENSIONAL REQUIREMENTS SHOWN ARE NOT MAINTAINED - THE SPLICE WILL FAIL.

REV	DATE	ENG	DESCRIPTION
11	01/01/23	EJB	Converted to new format
10	06/02/14	EJB	

INSTRUCTIONS:

1. Cut out the damaged section of cable, but do not exceed 6". Retain the neutral wires from the damaged section. Use a hacksaw to get a clean square cut.

2. Prepare the cables as shown in Figure 1. If the cable is non-jacketed, bind the neutrals with wire or vinyl tape at the jacket cut back dimensions shown in Figure 1. Check the dimensions using templates provided.

3. Prior to installing the connector, clean the exposed conductor with a stainless steel wire brush. Some splice kits may contain a small disposable stainless steel wire brush, if so, it should be used. If there is no wire brush in the kit, use one of the stocked stainless steel wire brushes.

4. Install the connector onto the "X" cable only. Wipe off excess inhibitor and file sharp flashing.

5. Lubricate the connector, cable "X", and both ends of splice body with the silicone grease provided or Stock #31 51 050.

6. Slide the splice body onto connector and cable "X" until the uncrimped connector end is exposed. See Figure 2.

7. If jacketed cable is being repaired, store the cold-shrinkable sleeves on the cables at this time.

8. Connect the exposed connector end to cable "Y". Wipe off excess inhibitor and file sharp flashing.

9. Place a tape marker on cable "Y" semi-con, 1/2" from the end of the cable semi-con. See Figure 3.

10. Lubricate the expose connector and cable "Y" with silicone grease.

11. Center splice body over the connector so that the leading edge aligns with the marker tape. Remove the marker tape.

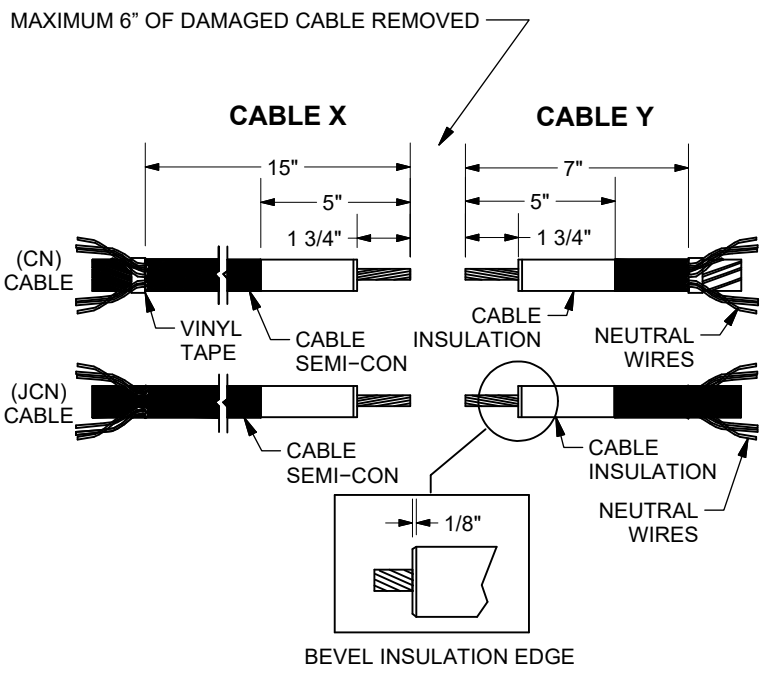


Figure 1

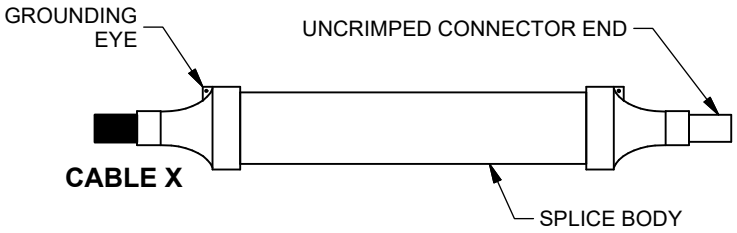


Figure 2

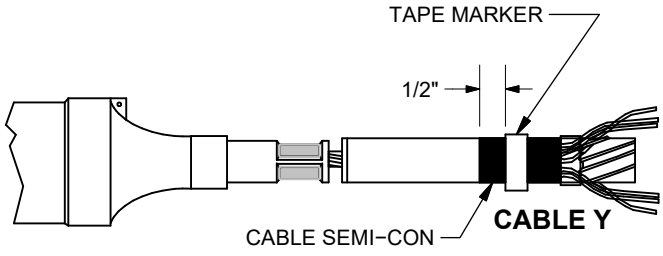


Figure 3

REV	DATE	ENG	DESCRIPTION
6	01/01/23	EJB	Converted to new format
5	09/16/10	EJB	

12. Connect the concentric neutral wires back over the cable and splice body as follows: for the 4/0 cable with 11 #14 AWG concentric wires (3 ph) make two bundles of wires (one with five wires and one with six wires) and place them into the #4 copper sleeves. Crimp the sleeves. For the 4/0 cable with twenty #12 AWG concentric wires, (1 ph), make three bundles of wires (two with seven wires and one with six wires), and place them into the #2 copper sleeves. Crimp the sleeves. It may be necessary to add concentric wires in order to jumper across the splice. See Figure 4. Make sure that the neutral wires are against the splice body. Connect one concentric wire on each side to its respective grounding eye and return it back to the wire bundle.

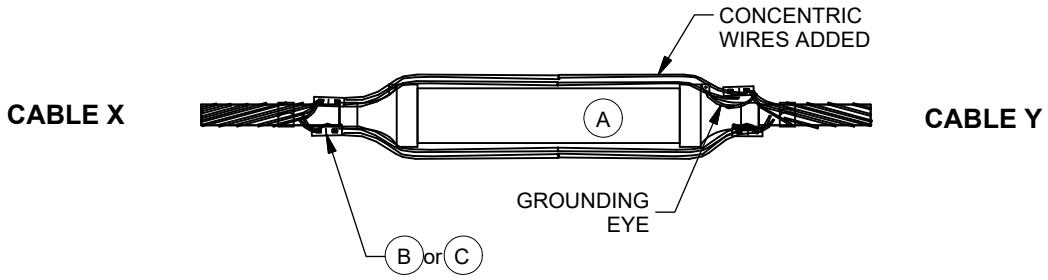


Figure 4

13. If cold shrinkable covers are used, place a layer of mastic around the end of each cable jacket. Slide the first cold shrink sleeve over the splice with the end of the sleeve overlapping the opposite cable jacket cut off (or mastic strip) by 2" Shrink the sleeve down. Wrap one layer of mastic at the inner end of shrunken sleeve. Slide the second sleeve and overlap the first sleeve by at least 2". Shrink the second sleeve down.

14. When splicing a non-jacketed cable to a jacketed cable or whenever jacketed cables are joined and shrinkable covers are not used, the jackets must be sealed per DCS **59 40 90 14**.

CONSTRUCTION NOTE(s):
1. Bare concentric cable shown. It could be jacketed or a combination of jacketed and non-jacketed cables.

DCS#	Description
41 34 36 03	4/0, 1 Phase
41 34 36 04	4/0, 3 Phase

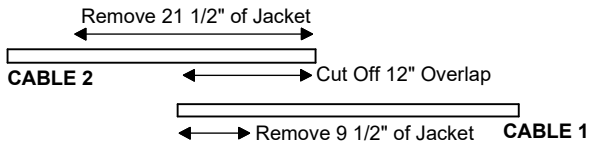
	ITEM	STK / DCS #	DESCRIPTION **41 34 36 ****	03	04
	A	17 55 298	Splice − Long Repair Unit, 4/0 Al. 15 kV	1	1
	B	17 63 127	Sleeve − #2 Copper	6	-
	C	17 60 103	Sleeve − #4 Copper	-	4
@	D	17 55 443	Sleeve − Cold Shrinkable	1	1
		415	Op Code Splice 4/0 AL or CU Str. 15 kV	1	1

UNDERGROUND CABLE SPLICE

Premolded CNX/CNR
#2 AL CNX/CNR to 4/0 AL

41 34 40 **
15 kV
1 of 4

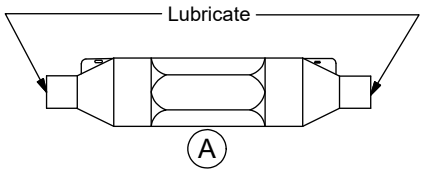
INSTRUCTIONS:

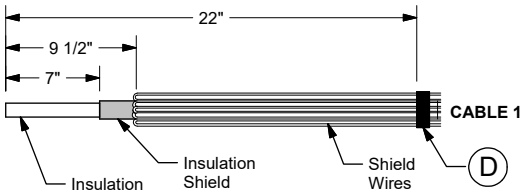


1. Overlap Cables and Remove Cable Jackets

   A. Have Cable 2 overlap Cable 1 by 12". Wipe each cable clean for 36".

   B. Remove 21-½" of Cable 2 jacket and 9-½" of Cable 1 jacket. Cut 12" of cable off Cable 2.

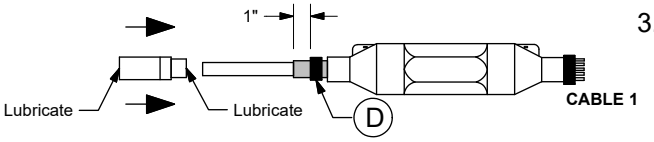




2. Install the Housing

   A. Fold back the wire shields and tape the ends of the wires on Cable 1 to the jacket. Allow enough extra wire to reconnect over the splice.

   B. On each cable, clean the surface of the insulation shield, shield wires, and jacket for a distance of 22". Lubricate the inside of the splice on both ends. Slide onto Cable 1 to a distance of 9-½". Carefully remove the insulation shield 7" from both cables. <u>Do Not Cut or Nick the Insulation.</u>

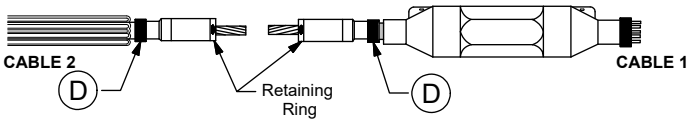


3. Prepare the Cable / Install the Adapter

   A. Wrap two turns of tape 1" from the edge of the insulation shield as a marker on both cables.

   B. Clean the cable insulation. Lubricate in the direction of the arrows to provide a build-up or ramp of lubricant at the edge of the insulation shield.

   C. Lubricate the inside of both ends of the cable adapter and install until it meets near end of the tape as shown. Repeat for the second cable adapter.



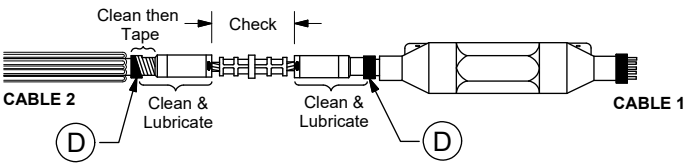
4. Install the Retaining Rings

   A. Bare the conductor of each cable flush with the edge of the cable adapters. Do Not Cut or Nick the Conductor.

   B. Slide the retaining ring onto the conductor of Cable 1 up to the cable adapter. Tighten the screws until the retaining ring is firmly secured to the conductor.

   C. Install the second retaining ring on Cable 2 as described above

REV	DATE	ENG	DESCRIPTION
1	01/01/23	EB	New Standard



5. Install the Splice

   A. For cable re-jacketing, slide the cold shrink sleeves over Cable 2 and park them for use in Step 6.

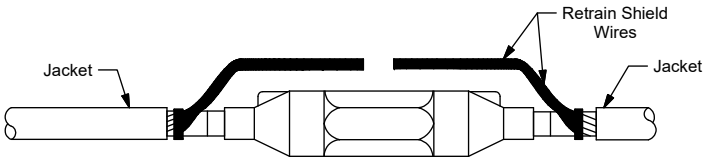
   B. Thoroughly clean the end of the cable adapter and Cable 2. Wrap several turns of electrical tape from the adapter to the cable as shown to hold the adapter in place during final assembly.

   C. Wire brush the exposed conductors of both cables and immediately insert into the splicing sleeve. Confirm that the "Check" dimension does not exceed 5-1/8"; otherwise, redo the assembly.

   D. Crimp the splicing sleeve.

   E. Wipe off all excess inhibitor. Confirm that the distance between the cable adapters does not exceed 5-3/8"; otherwise, redo the assembly.

   F. Clean and lubricate the outside surface of the cable adapters before sliding the housing into final position.



6. Complete the Splice Assembly

   A. Slide the housing into final position, centering it over the cable adapters.

   B. Remove all tape. The cable and cable adapter insulation must not be exposed after positioning the splice.

   C. Reshape the shield wires.

7. Connect the Concentric Neutral Wires

   A. Use two shear bolt connectors for single phase cables and one shear bolt connector for three phase cables.

   B. Apply inhibitor inside of the connector (s).

   C. Back out the bolts for clearance but do not completely remove them.

   D. For single phase cables divide up the neutral strands between the two connectors.

   E. Insert the neutral strands through each side of the connector to the other end but not sticking out.

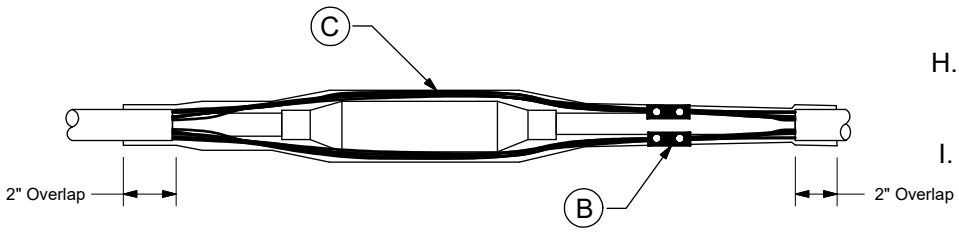
   F. Cut off excess length of neutral wires.

   G. Tuck the connector(s) against the splice body.

   H. Hand tighten the bolts to firmly grip the neutral strands in place.

   I. Hold the connector body with a pliers and use a cordless impact wrench or socket wrench to tighten the bolts until they shear off.

   J. Smooth off any sharp edges, clean the connector and apply a wrap of plastic tape over the connector(s).



8. Cover Splice and Jacket Ends with Cold Shrink Sleeve

   A. Place a layer of mastic around the end of each cable jacket.
   B. Slide the first cold shrink sleeve over the splice with the end of the sleeve overlapping the opposite cable jacket cut off (or mastic strip) by 2". Shrink the sleeve down.

   C. Wrap one layer of mastic at the inner end of the shrunken sleeve.

   D. Slide the second sleeve over the splice and overlap the first sleeve by 2". Shrink the second sleeve down.

   E. The cold shrink sleeve will not shrink completely down on the #2 cable. Seal the end of the sleeve with three layers of plastic tape from 1 inch on the sleeve to 1 inch on the cable jacket.

CONSTRUCTION NOTE(s):

1. When splicing a non-jacketed cable to a long length of jacketed cable, seal up the jacketed side per DCS **59 40 90 14**.

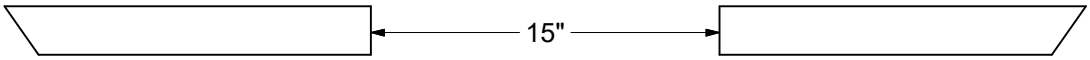
2. To splice a three phase cable, three Dist. Standards **41 34 40 02** will need to be called out.

41 34 40 01	Single Phase Installation
41 34 40 02	Three Phase Installation

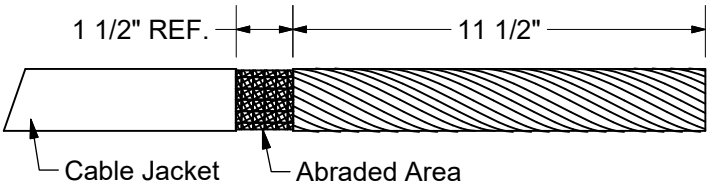
	ITEM	STK / DCS #	DESCRIPTION 41 34 40 **	01	02
	A	17 55 854	Splice, Straight, #2 to 4/0 AL, 15 kV	1	1
	B	17 64 250	Connector - Shear Bolt	2	1
@	C	17 55 443	Sleeve, Cold Shrinkable	1	1
	D	25 53 055	Tape - Plastic (RL)	1	1
		415	Op Code Splice 4/0 AL or CU Str. 15 kV	1	1

INSTRUCTIONS - CONCENTRIC NEUTRAL WIRES OR FLAT STRAP SHIELDED CABLES:

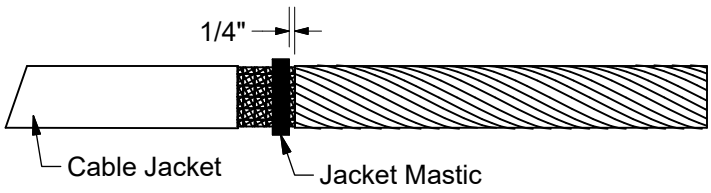
1. Positioning the cables:
   A. Straighten and train the cable ends.
   B. Cut the cables with 15" between them to allow space for the bus.
   C. Clean the cable jacket up to 36" from the end of the cable.



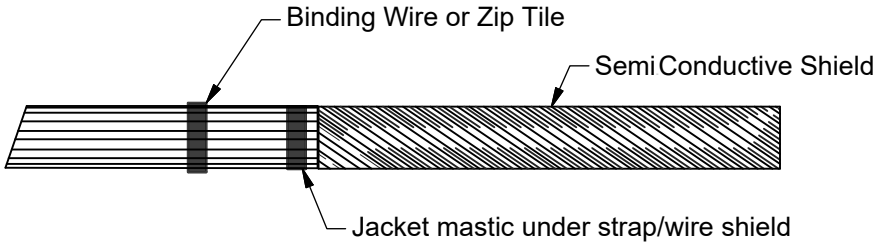
2. Exposing the Metallic Shield:
   A. Remove the cable jacket 11-1/2" as shown below.
   B. Abrade the area as shown.



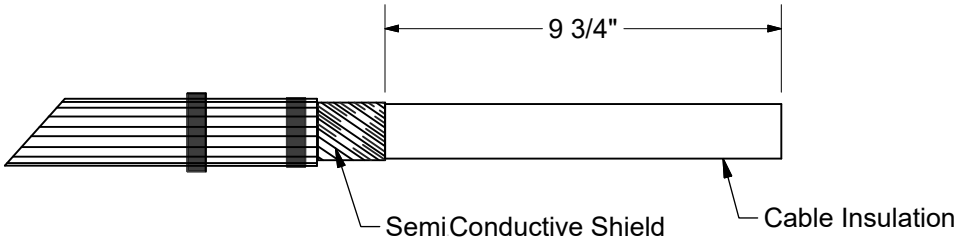
3. Apply the Jacket Mastic:
   A. Apply one piece of jacket mastic at the position shown below by stretching and wrapping with light tension fully around the outer jacket.



4. Exposing the Cable Semi-Conductive Shield:
   A. Fold back the wire / flat strap shields and press firmly into the jacket mastic.
   B. Secure the wires / flat straps 3" back from the jacket mastic with a binding wire or zip tie as shown below.



5. Remove the semi-conductive shield 9-3/4" as shown below. Do not knick or cut the cable insulation.

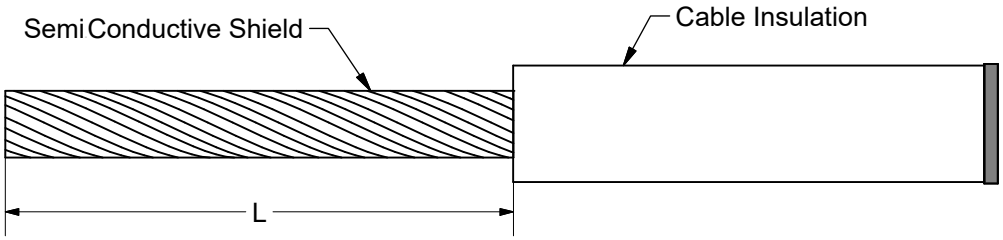


REV	DATE	ENG	DESCRIPTION
16	01/01/23	EJB	Converted to new format
15	07/01/19	EJB	

6. Remove the cable insulation for the length (L) in inches per each dis-con kit as shown below:

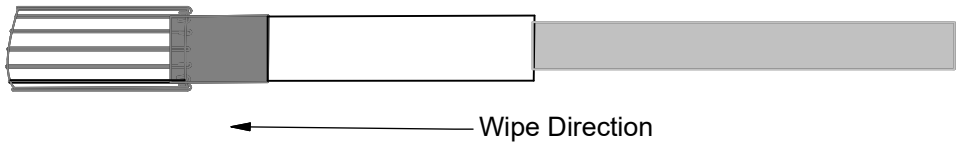
Kit Stock #	Length (L)
17 05 522	2"
17 05 525	2-3/4"
17 05 523	2-3/4"
17 05 524	3-3/8" *

*Use as (L) for 1000 kcmil Cable



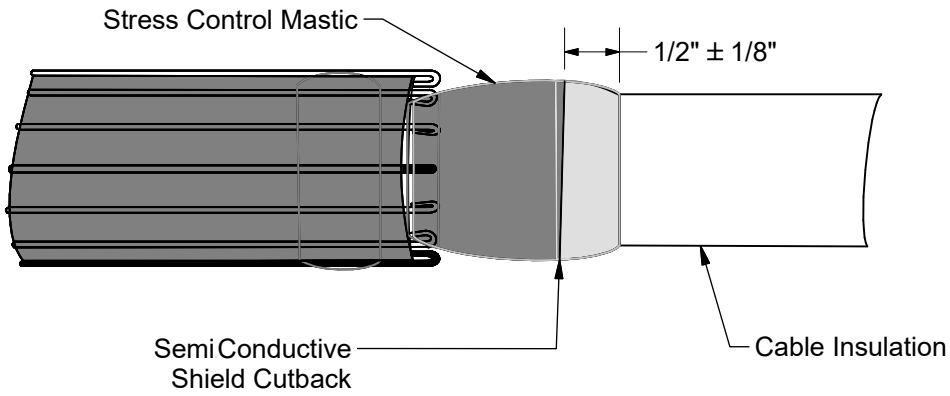
7. Repeat Steps 1 to 6 for the other cable(s).

8. Clean the insulation with the cleaning wipes by wiping from the lug to the shielding.

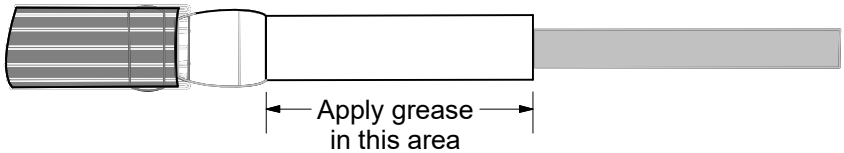


9. Applying the Stress Control Mastic.
   A. Apply the stress control mastic centered over edge of semi-con shield cut back and overlapping the cable insulation by 1/2" as shown below. Apply the mastic with light tension so that it slightly stretches and completely wraps the cable. If installing 15kV #2 cable, use the smaller piece of stress control mastic.

Applying Stress Control Mastic

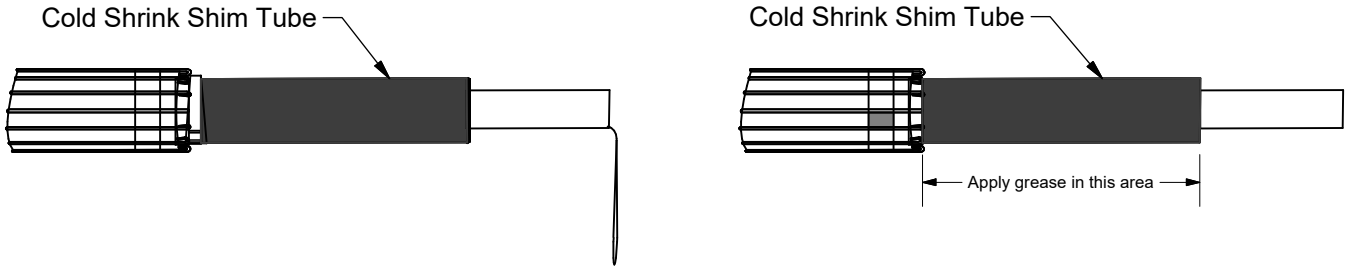


10. Applying Grease
    A. Apply grease over the cable insulation as shown below. Use only the grease supplied in the kit. Avoid applying any grease on the stress control mastic; this may prevent adhesion to the sealing mastic in Step 19.



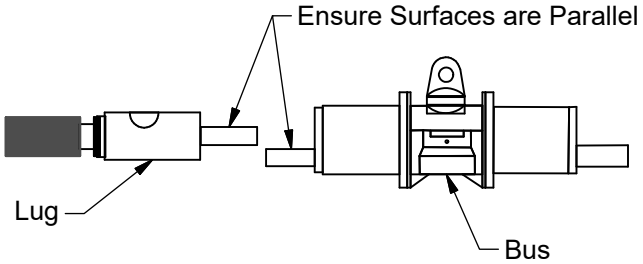
REV	DATE	ENG	DESCRIPTION
16	01/01/23	EJB	Converted to new format
15	07/01/19	EJB	

11. Installing the Shim Tube:
    For Stock #17 05 522 (15kV #2 AWG DIS-CON KIT) ONLY.
    A. Align the cold shrink shiim tube over the cable end so that the tube will land over the applied stress control mastic, butted up to the concentric wire / flat strap fold back.
    B. Unwind the spiral holdout to shrink the sleeve in place.
    C. Once deployed, insulation may extend slightly past end of shim tube.
    D. Clean shim tube surface. Apply grease over shim tube.

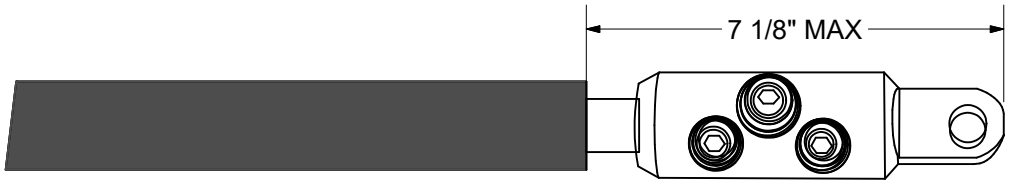


12. Installing the Lug:
    A. Clean the conductor. For aluminum conductor, wire brush and immediately insert the lug onto the conductor. Slide the lug until the conductor is fully seated within the lug barrel.
    B. Rotate the lug so that the spade is parallel to the contact face of the bus as shown.
    C. Snug all of the bolts starting with the bolt closest to the cable insulation and moving towards the lug pad.
    D. Shear off all of the bolts in the same order.
    E. See the table below for the correct Allen Hex socket for each lug and dis-con kit.

Cable	Table 1 - Dis-Con Kit Socket Selection		
	Lug	Dis-Con Kit	Allen Hex Socket
1/0-500	17 55 843	17 05 523 & 17 05 525	86 44 455 (6mm)
#2	17 55 842	17 05 522	86 44 454 (5mm)
750 kcmil	17 55 844	17 05 524	85 35 776 (8mm)
1000 kcmil	17 55 846	-	85 35 776 (8mm)



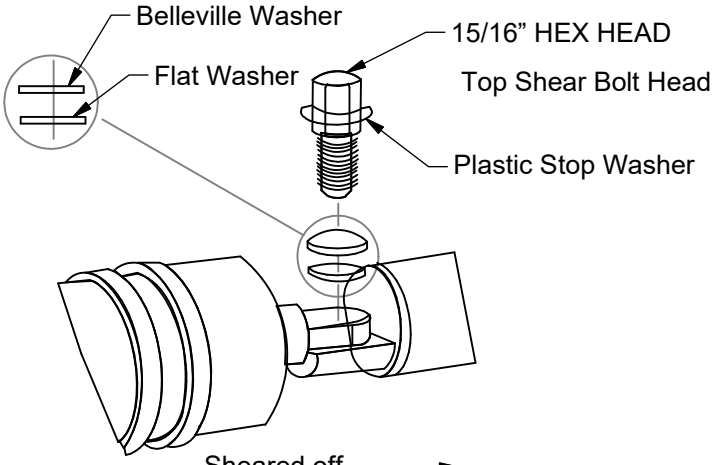
13. Checking the Lug:
    A. Confirm that the distance after installing the lug does not exceed the 7-1/8" dimension shown below.

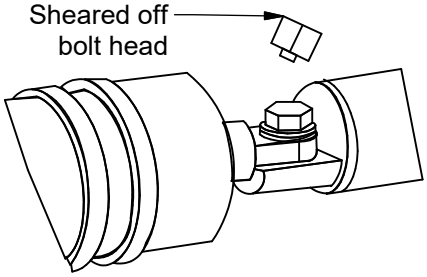


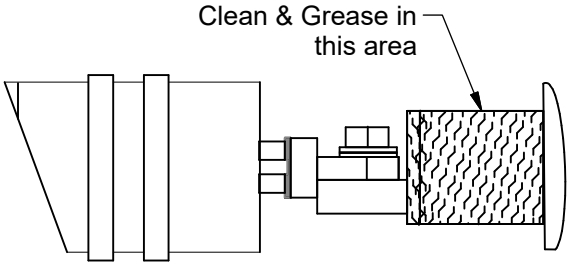
REV	DATE	ENG	DESCRIPTION
16	01/01/23	EJB	Converted to new format
15	07/01/19	EJB	

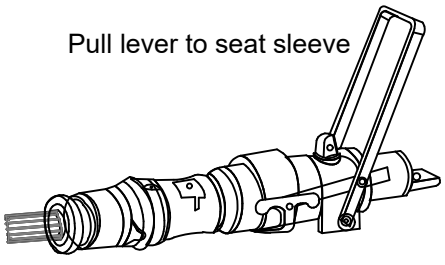
14. Parking the Sleeve:
    A. Slide the sleeve body over the cable so that the hole in the lug is visible as shown below.

15. Installing the Sleeve:
    A. Position the Belleville washer and the flat washer as shown.
    B. Insert the bolt through the lug and hand thighten the bolt to ensure that all of the cables fit on the bus.
    C. Tighten the top 15/16" shear bolt head until it shears off.
    D. Clean the splice interface as shown.
    E. Apply grease over the bus interface as shown. Use only the grease supplied in the kit.
    F. Slide the sleeve body over the lug and push it onto the bus. This can be accomplished by hand or by use of an installation tool as shown below.

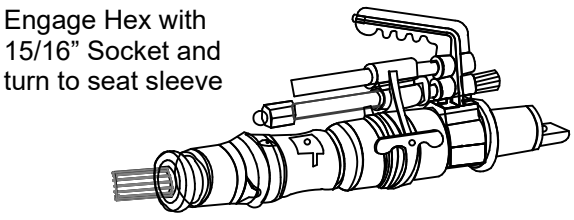








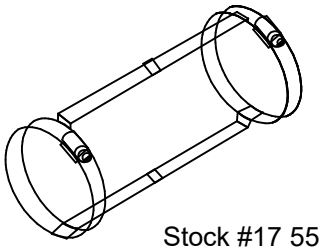
Installation/Removal tool (optional)



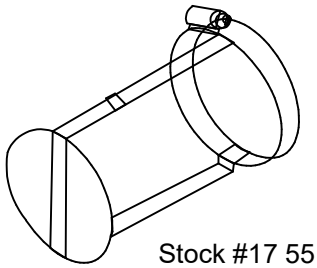
Installation/Removal tool (optional)

16. Repeat Steps 1 to 15 for the other cables.

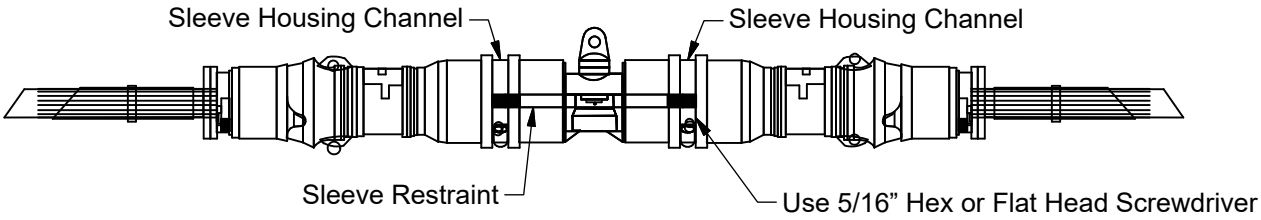
17. Sleeve Restraints:
    A. Apply sleeve restraints in the sleeve housing channels.
    B. The hose clamp can be tightened with a 15/16" hex or flat headed screwdriver. Fully tighten the hose clamp on the sleeve restraint until the screw "clicks". It is designed to click when fully tightened and cannot be over-tightened.
    C. Apply the sleeve restraints as follows:
        a. I Splice: one Stock #17 55 802 double end.
        b. Y Splice: one Stock #17 55 802 double end and one Stock #17 55 801 single end.
        c. H Splice: two Stock #17 55 802 double ends.
        d. U Splice: two Stock #17 55 801 single ends.
        e. E Splice: three Stock #17 55 802 double ends
    D. If sleeves are not fully seated onto splice, the sleeve restraints cannot be installed.



Stock #17 55 802



Stock #17 55 801

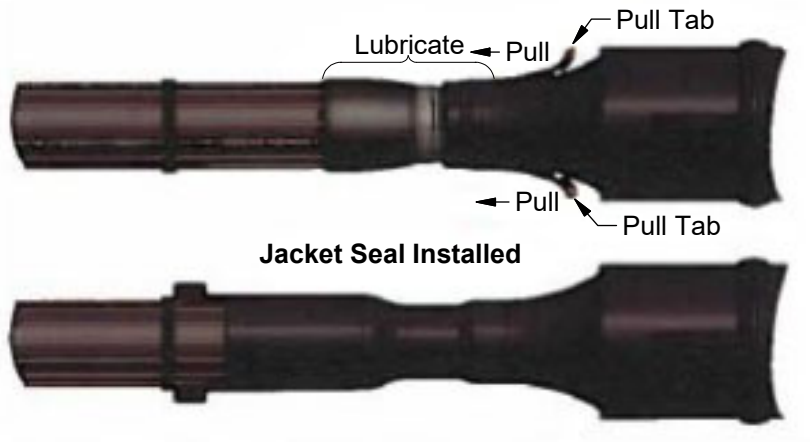


18. Removing the Core From the Sleeve:
    A. Grasp the removal ring. Push the ring against the core flange and twist so that the cutting teeth break the tape on both sides. Check that the tape is broken.
    B. Completely remove the core from the rubber housing by hand. DO NOT twist the core while removing it.

REV	DATE	ENG	DESCRIPTION
16	01/01/23	EJB	Converted to new format
15	07/01/19	EJB	

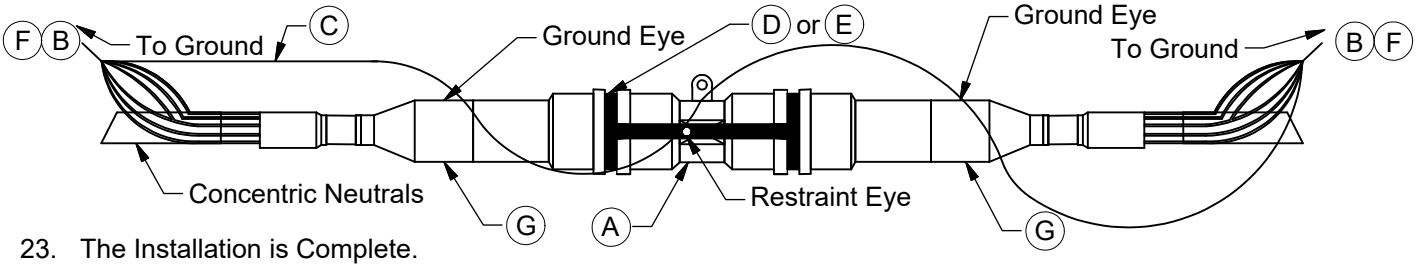
19. Applying the Sealing Mastic:
    A. Apply sealing mastic to overlap the stress control mastic and completely overlap the jacket mastic as shown below.
    B. Compress the sealing mastic to create a smooth transition to the stress control mastic. This will assist during jacket seal application.

20. Applying the Jacket Seal:
    A. Apply grease over the area as shown. Only use the silicone grease supplied with the kit.
    B. Hold onto both of the tabs and pull out to completely cover the sealing mastic as shown below.
    C. Ensure that the sealing mastic is not dislodged when unfolding the seal.



21. Repeat Steps 17 to 20 for other cable(s).

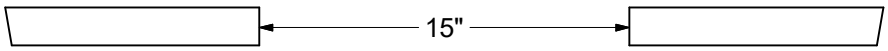
22. Connecting the Splice to Ground:
    A. For each cable, insert one end of a #14 wire through the restraint eyelet and twist to make a small loop.
    B. Wrap the other end through the sleeve eyelet and connect to the shield wires with two bolt clamps.
    C. Connect the neutral wires to ground wiring 600V #2 AWG copper covered wire.



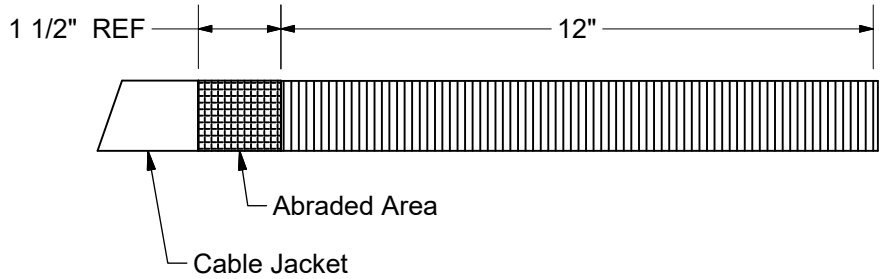
23. The Installation is Complete.

INSTRUCTIONS - LC SHIELDED CABLES:

1. Positioning the Cables:
    A. Straighten and train the cable ends.
    B. Cut the cables with 15" between them to allow space for the bus.
    C. Clean the cable jacket up to 36" from the end of the cable.

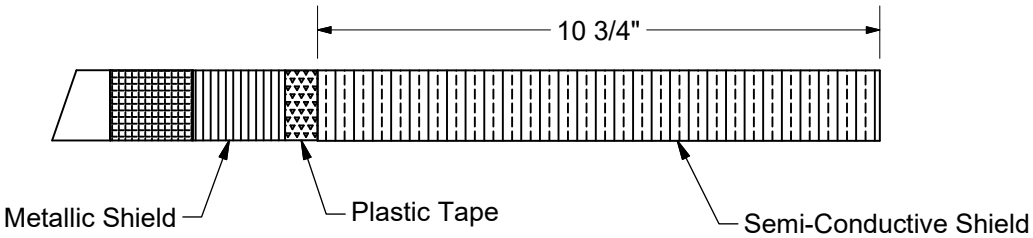


2. Exposing the Metallic Sheath:
    A. Remove the cable jacket to the dimensions shown below.
    B. Abrade the area as shown.



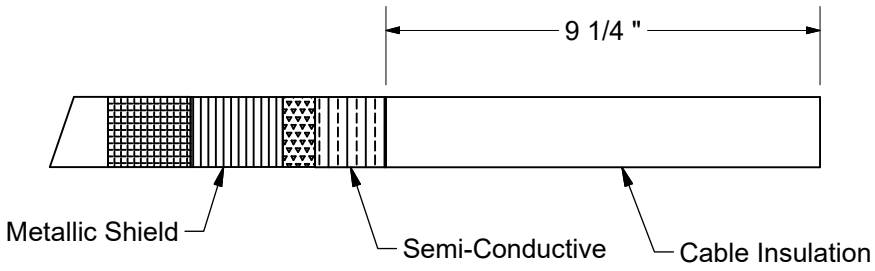
3. The jacket mastic will be applied in Step 13.

4. Exposing the Semi-Conductive Shield:
    A. Wrap two layers of plastic tape at the dimension shown below to secure the metallic shield.
    B. Remove the metallic shield up to the plastic tape as shown below.



REV	DATE	ENG	DESCRIPTION
16	01/01/23	EJB	Converted to new format
15	07/01/19	EJB	

5. Exposing the Cable Insulation
   A. Remove the semiconductive shield to the dimension shown below. Do not nick or cut the cable insulation.

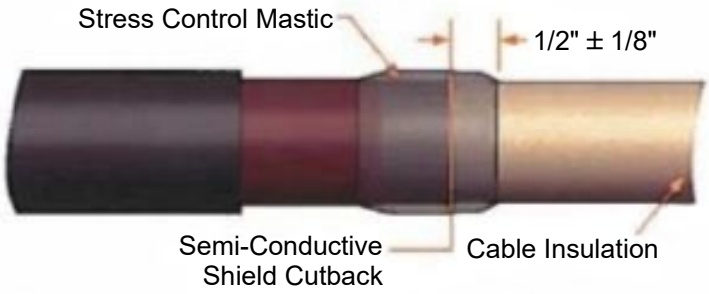


6. Exposing the Conductor
   A. Remove the cable insulation based on the cable kit stock number shown in Step 6 for the wire shielded cable.
   B. Do not cut or nick the cable strands.

7. Repeat Steps 1 through 6 for the other cable(s).

8. Applying the Stress Control Mastic:
   A. Remove the plastic tape from Step 4.
   B. Apply the stress control mastic on tip of the exposed semi-con shield cutback and overlapping the cable insulation by 1/2" as shown below. Allow the mastic with light tension so that it slightly stretches and completely wraps the cable.

Applied Stress Control Mastic



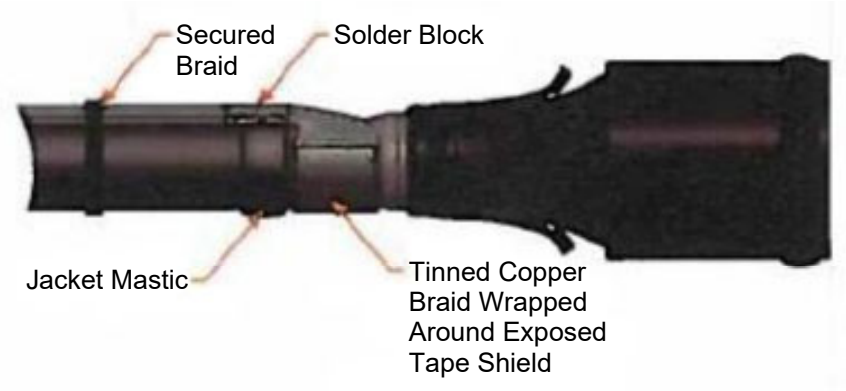
9. Applying Grease:
   A. Apply grease over the exposed cable insulation as shown. Use only the grease supplied in the kit. Avoid applying any grease on the stress control mastic as it may prevent adhesion to the sealing mastic applied later on.

10. Install and check the Lug Dimension and Park and Install the Sleeves in the Same Manner as the Wire Shielded Cable. Repeat Steps 8 through 10 for the Other Cable(s).

11. Add Sleeve Restraints to all Cables. See instructions for Wire Shielded Cables.

12. Remove the Core on Each Cable. See the Instructions for Wire Shielded Cables.

13. Preparing the Metallic Shield:
   A. Install the jacket seal mastic on the cable jacket aligned with the jacket cutback.
   B. Wrap tinned copper braid around the exposed LC shield.
   C. Align the edge of the solder block with the jacket cutback.
   D. Secure the copper braid 3" back from the end of the jacket mastic with zip tie or binding wire.



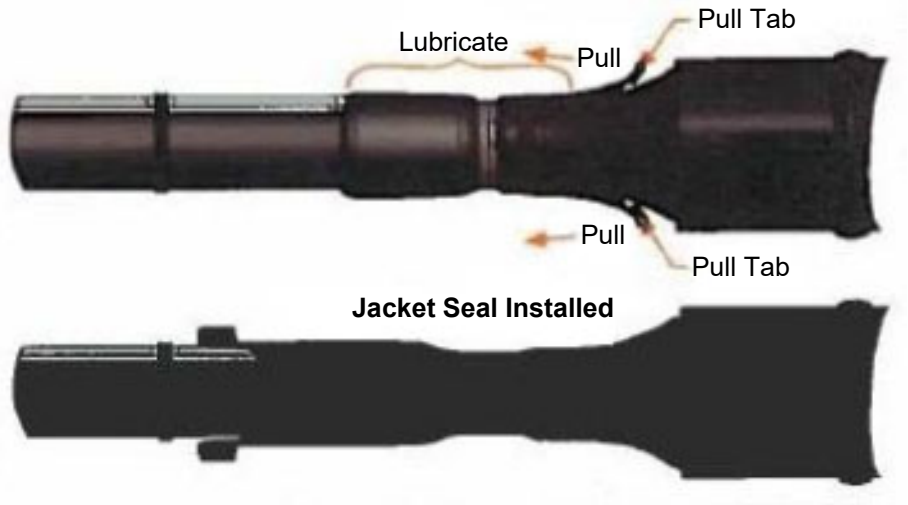
E. Install the constant force spring over the wrapped copper braid.
F. Wrap two layers of plastic tape over the constant force spring.
G. Press the solder block into the jacket mastic.

14. Applying the Sealing Mastic:
    A. Align the sealing mastic to completely overlap the jacket mastic as shown below.
    B. Compress the sealing mastic to create a smooth transition to the stress control mastic; this will assist during the jacket application.

Sealing Mastic Installed

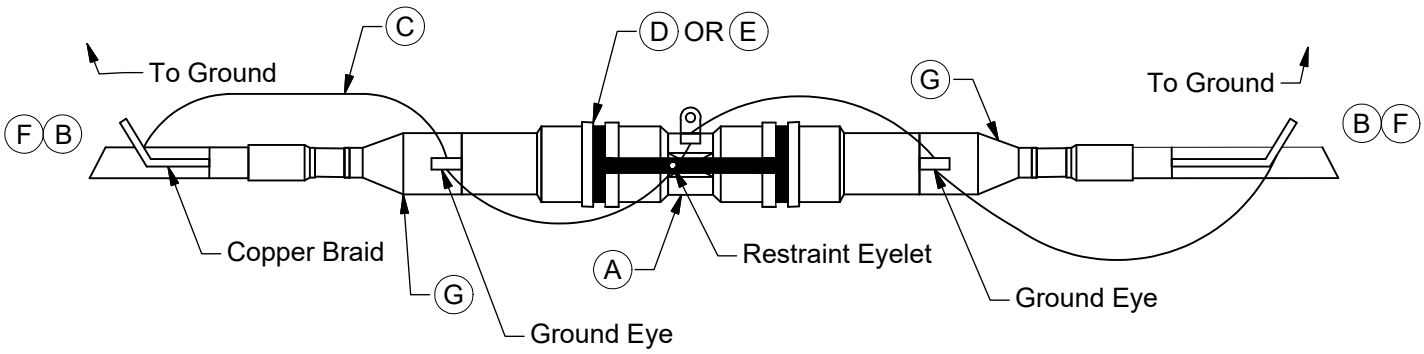
REV	DATE	ENG	DESCRIPTION
16	01/01/23	EJB	Converted to new format
15	07/01/19	EJB	

15. Applying the Jacket Seal:
    A. Apply grease over the area shown below. Only use grease supplied with the kit.
    B. Hold onto both tabs and pull out to completely cover the sealing mastics as shown below.
    C. Ensure that the sealing mastic is not dislodged when unfolding the seal.



16. Repeat Steps 13 to 15 for the other cables.

17. Connecting the Splice to Ground:
    A. For each cable insert one end of a #14 wire through the restraint eyelet and twist to make a small loop.
    B. Wrap the other end through the sleeve eyelet and connect to the copper braids with two bolt clamps.
    C. Connect the copper braids to ground using 600V #2 copper covered wire.



18. The Installation is Complete.

REV	DATE	ENG	DESCRIPTION
16	01/01/23	EJB	Converted to new format
15	07/01/19	EJB	

Table 2 - Dis-Con Kit Selection	
Cable Size	**Dis-con Kit Stock #**
750 NSR, 5kV	17 05 524
#2 AL, CNR, P, 15 kV	17 05 522
4/0 AL, CNR, P, 15 kV	17 05 525
350 FSR, P, RW, 15 kV	17 05 525
350 CNR, P, 15 kV	17 05 523
500 AL, CNR, P, 15 kV	17 05 523
750 FSR, P, RW, 15 kV	17 05 524
750 AL, CNR, P, 15 kV	17 05 524
750 CNR, P, 15 kV	17 05 524
1000 TSR, P, 15 Kv	17 05 528 (Sleeve) & 17 55 846 (Lug) & 21 53 112 (Barrier Bolt)
1/0 AL, CNR, P, 35 kV	17 05 523
350 CNR, P, 35 kV	17 05 523
750 FSR, P, 35 kV	17 05 524

DCS#	Description
41 35 31 01	I Splice (2-way)
42 35 31 02	Y Splice (3-way)
43 35 31 03	H Splice (4-way)
44 35 31 04	U Splice (2-way)
45 35 31 05	E Splice (6-way)
46 35 31 06	L Splice (2-way)

REV	DATE	ENG	DESCRIPTION
16	01/01/23	EJB	Converted to new format
15	07/01/19	EJB	

-	ITEM	STK / DCS #	DESCRIPTION 41 35 31 **	01	02	03	04	05	06
	A	17 05 530	Bus Bar, I Splice, 15/35 kV (2-way)	1	-	-	-	-	-
		17 05 372	Bus Bar, Y Splice, 15/35 kV (3-way)	-	1	-	-	-	-
		17 05 529	Bus Bar, H Splice, 15/35 kV (4-way)	-	-	1	-	-	-
		17 05 541	Bus Bar, U Splice, 15/35 kV (2-way)	-	-	-	1	-	-
		17 55 851	Bus Bar, E, Splice, 15/35 kV (6-way)	-	-	-	-	1	-
		17 55 852	Bus Bar, L, Splice, 15/35 kV (2-way)	-	-	-	-	-	1
	B	18 54 027	Wire - #2 Copper, 600 V Cov.	12	12	20	12	25	12
	C	18 52 018	Wire - #14 Copper, Binding, Bare	5	8	10	5	12	5
	D	17 55 801	Restraint - Splice, Single Housing End	-	1	-	2	-	-
	E	17 55 802	Restraint - Splice, Double Housing End	1	1	2	-	-	-
	F	17 54 140	Connector - Wire, #8 - 4/0 CU, 2 Bolt	2	2	2	2	2	2
	G	17 05 522	Dis-con Kit, #2 AWG 15 kV Only	#	#	#	#	#	#
		17 05 525	Dis-con Kit, 1/0 - 350 kcmil RW 15 kV	#	#	#	#	#	#
@		17 05 523	Dis-con Kit, 350 - 500 kcmil 15 kV & 1/0 - 350 kcmil 35 kV	#	#	#	#	#	#
		17 05 524	Dis-con Kit, 750 kcmil 5/ 15/ 35 kV	#	#	#	#	#	#
@	H	17 54 306	Connector Cable Grounding, 15-35 kV	#	#	#	#	#	#
@	I	17 05 315	Cap - Insulating End	#	#	#	#	#	#
6@	J	17 05 526	Sleeve Only, #2 - 350 kcmil RW 15 kV, with Shim Tube	#	#	#	#	#	#
6@	K	17 05 527	Sleeve Only, 350 kcmil RW 15 kV and 1/0 - 350 kcmil 35 kV	#	#	#	#	#	#
6@	L	17 05 528	Sleeve Only, 750 kcmil 5 / 15 / 35 kV, 1000 kcmil 15 kV	#	#	#	#	#	#
7@	M	17 55 842	Lug Only, #2 AWG 15 kV, AL / CU	#	#	#	#	#	#
7@	N	17 55 843	Lug Only, 1/0 - 500 kcmil, AL / CU	#	#	#	#	#	#
7@	O	17 55 844	Lug Only, 350 - 750 kcmil, AL / CU	#	#	#	#	#	#
7@	P	17 55 846	Lug Only, 1000 kcmil, AL / CU	#	#	#	#	#	#
@	Q	21 53 112	Bolt - Barrier, Shear, with Washer and Belleville Washer	#	#	#	#	#	#

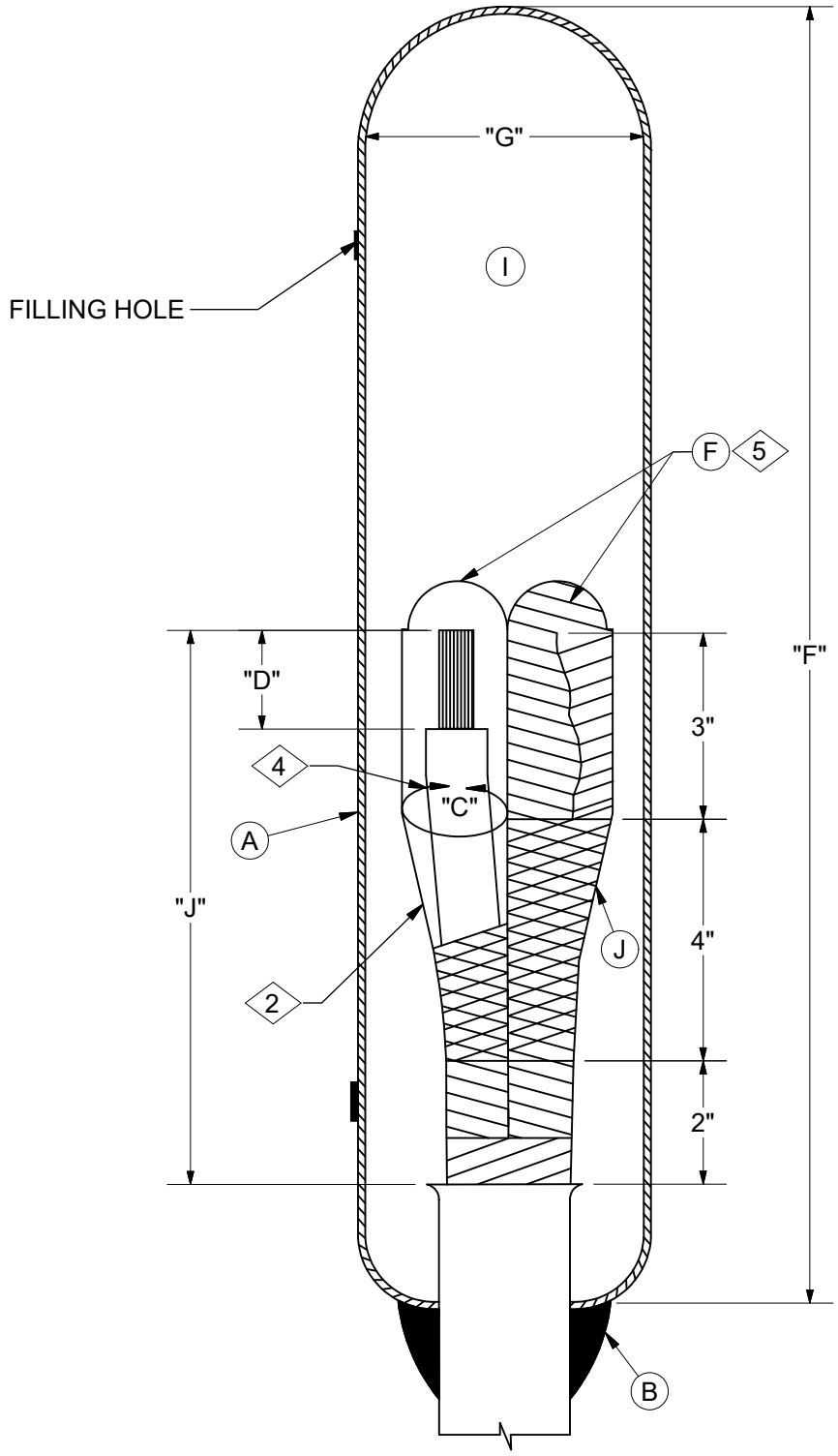
DESIGN NOTE(s):

1. For each "I" or "U" or "L" Splice (Item A) choose a combination of two Dis-con kits (Item G) or a Dis-con kit and an End Cap (Item I). Restraints are included with the "L" bus.
2. For Each "Y" Splice (Item A) choose a combination of three Dis-con kits (Item G) or Dis-con kit(s) and End Cap(s) (Item I).
3. For Each "H" Splice (Item A) choose a combination of four Dis-con kits (Item G) or Dis-con kit(s) and End Cap(s) (Item I).
4. For Each "E" Splice (Item A) choose a combination of six Dis-con kits (Item G) or Dis-con kit(s) and End Cap(s) (Item I). Restraints are included with the "E" bus.
5. For a three-phase cable splice installation the selected bus, Dis-con kits, and grounding materials should be multiplied by three.
6. When reconnecting cables to the splices, use the Sleeve Only Items (J, K, and L).
7. When replacing a shear bolt lug, use the Lug Only Items (M, N, O, and P).

OPERATIONS NOTE(s):

8. A Test Point Indicator (Stock #17 05 483) may be applied to the bus to show that the splice is energized. However, a non-indication of the Test Point Indicator should not be used to prove that the splice is de-energized.

REV	DATE	ENG	DESCRIPTION
16	01/01/23	EJB	Converted to new format
15	07/01/19	EJB	



REV	DATE	ENG	DESCRIPTION
2	01/01/23	EJB	Converted to new format
1	10/07/10	EJB	

CONSTRUCTION NOTE(s):

1. Shielded joint shown. For belted joint, omit shielding braid.
2. Shielding braid to be butt wrapped and soldered in a line along top and to cable shielding avoid openings between wrapping.
3. Unless otherwise noted, Petrolatum is referred to as "Compound", "Oil Insoluble Compound", or "Insulating Compound" in the standard drawings.
4. Terminate shielding braid at this point.
5. Apply 3 layers of 1/2 Lapped VP tape.

Dimensions Table

DCS#	SIZE OF CABLE	CIRCUMFERENCE OVER INSULATION "C"		LENGTH OF BARE COPPER "D" (IN)	LEAD SLEEVE		LENGTH LEAD REMOVED "J"	
		5000V (IN)	15000V (IN)		LENGTH "F" (IN)	I.D. "G" (IN)	5kV (IN)	15 kV (IN)
41 36 11 01	1/0	3	3-7/8	1-3/8	20	3-1/2	9	11
42 36 11 02	4/0	3-5/8	4-5/8	1-5/8	21	4	9	11
43 36 11 03	300 kcmil	4-1/4	5	1-5/8	22	4-1/2	9	11
44 36 11 04	350 kcmil	4-3/8	5-1/4	1-5/8	22	4-1/2	9	11
45 36 11 05	500 kcmil	5-1/4	–	2	22	4-1/2	9	–
46 36 11 06	800 kcmil	5-7/8	–	2-5/8	24	5	10	–
47 36 11 07	800 kcmil	–	6-7/8	2-5/8	24	5-1/2	–	13

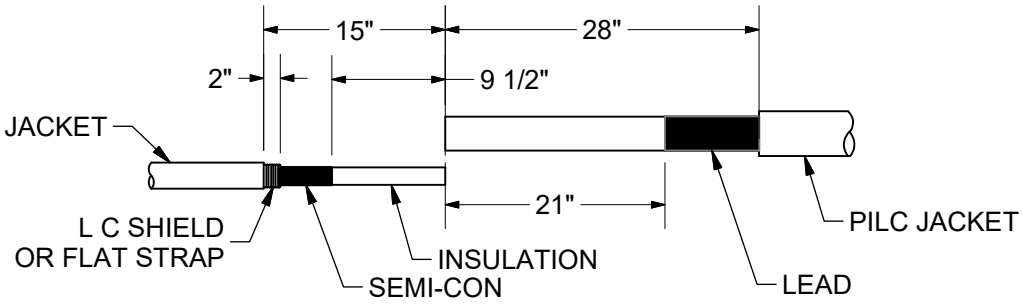
ITEM	STK / DCS #	DESCRIPTION 41 36 11 **	01	02	03	04	05	06	07
A	12 53 062	Sleeve – Lead, 3 ½" x 20"	1	-	-	-	-	-	-
	12 53 063	Sleeve – Lead, 4" x 21"	-	1	-	-	-	-	-
	12 53 064	Sleeve – Lead, 4 ½" x 22"	-	-	1	1	1	-	-
	12 53 065	Sleeve – Lead, 5" x 24"	-	-	-	-	-	1	-
	12 53 052	Sleeve – Lead, 5 ½" x 28"	-	-	-	-	-	-	1
B	22 02 282	Solder – Wiping (Lb.)	12	12	12	12	12	12	12
C	22 02 273	Solder – 50 – 50 (Lb.)	2	2	2	2	2	2	2
D	22 02 276	Solder – String, ¼" (Lb.)	1	1	1	1	1	1	1
E	22 02 255	Solder – Paste (Cn.)	1	1	1	1	1	1	1
F	25 53 022	Tape – V.P., 1" x 8 Yd. (Rl.)	1	1	1	1	1	1	1
G	31 53 007	Stearine (Ea.)	1	1	1	1	1	1	1
H	22 05 213	Cloth – Sanding, 1 ½" W (Ft.)	2	2	2	2	2	2	2
I	31 51 062	Petrolatum – 3 Lb. Pkg. (Pk.)	1	1	1	1	1	1	1
J	18 66 101	Braid – Copper Mesh, 1" x 15' (Rl.)	3	3	3	3	3	3	3
	435	Op Code Test Cap 15 kV	1	1	1	1	1	1	1

REV	DATE	ENG	DESCRIPTION
2	01/01/23	EJB	Converted to new format
1	10/07/10	EJB	

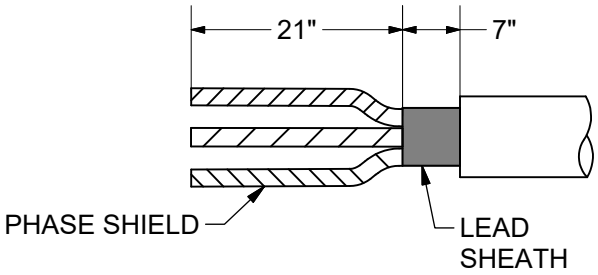
INSTRUCTIONS:

1. Heat Shrink Basics
   A. Adjust the flame so that it is an overall 12" bushy flame.
   B. Apply outer 3" to 4" tip of the flame to heat shrinkable material with a rapid brushing motion.
   C. Unless otherwise instructed start shrinking tubes at center working the flame around all sides of the tubes to apply uniform heat.
   D. Concentrate on heating the back of the tubes as well as the front of the tubes.
   E. If it is necessary to interrupt the shrinking process and the tubes cool, you must reheat prior to shrinking the next tube.
   F. Inspect all installed tubes. Reheat any flat spots or wrinkles, paying particular attention to the back of the splice.

2. Prepare Cables
   A. Secure the end of the strap or LC Shield with a length of copper foil tape or a minimal width of plastic tape.



3. Prepare and Remove Lead Sheath
   A. Remove lead oxide from the lead sheath and clean with an approved solvent. Remove the lead sheath as shown.

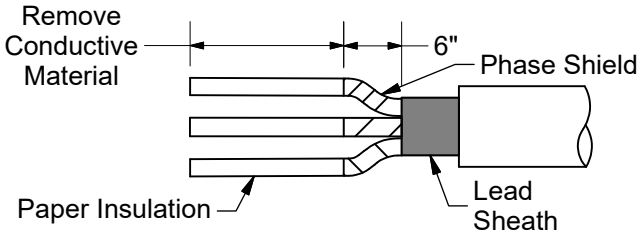


   B. For Phase Holding
   If an existing 3/C PILC cable is being cut and spliced to three new single conductor cables, "Phase Holding" may be required. After opening the lead sheath to expose the shielded phase conductors, place several wraps of colored tape around each phase before cutting the conductors. Use "white" to signify the "Held Phase A", blue to signify the "Held Phase B", and "red" to signify the "Held Phase C". The phase colors do not identify the actual phases but they represent the "Held Phase" of the system.

   Due to the covering of the phases during the preparation of the splice, it will be necessary to move the markers several times throughout the splicing process. Each time the "Phase Holding" tape is to be moved to a new location, "Phase Holding" will be noted in the installation instructions.

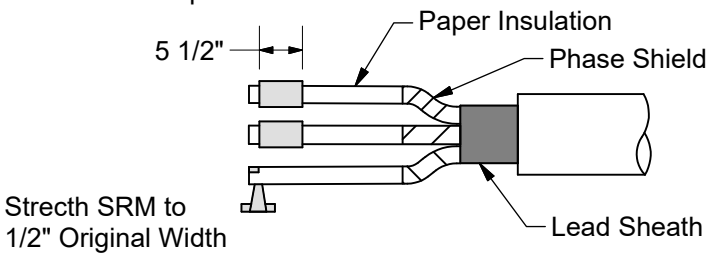
   If "Phase Holding" is not a requirement for this splice, then the "Phase Holding" comments should be ignored.

4. Remove Shield
   A. Cut back and bedding and/or shield tapes over all three phases to the lead sheath cutback.
   B. Cut back phase shields and remove any conductive material from paper insulation as shown.



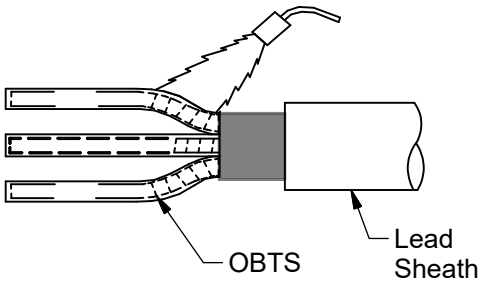
C. Tape phase shields at edge to prevent unwrapping. DO NOT use string. use one wrap of colored "Phase Holding" tape or plastic tape.

5. Apply Stress Relief Material (SRM)
   A. Mark the insulation 5-1/2" from the end of the PILC cable.
   B. Remove the backing strip from one side of a long strip of SRM.
   C. Roll up the SRM and remaining backing strip into a convenient size.
   D. Removing the remaining backing strip, tightly wrap one half lapped layer of SRM around each phase from the cable end to the mark. Wrap the SRM in the same direction as the insulating papers on the cable.



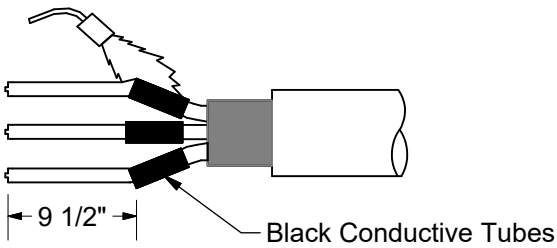
6. Position and Shrink Oil Barrier Tubes (OBT)
   A. Place an oil barrier tube over each phase, butted to the lead sheath cutback.
   B. Shrink the OBT's in the crotch area first. After the crotch is done, shrink one tube at a time.
   C. Inspect the installed OBT's. The OBT's should have a smooth, wrinkle free surface after shrinking. Reheat to smooth any wrinkled areas.

   1. OBT may shrink 1/4" - 1/2" away from lead sheath cutback. This is okay.
   2. To achieve a smooth wrinkle free installation, use a reduced flame to install the thin walled OBT's.

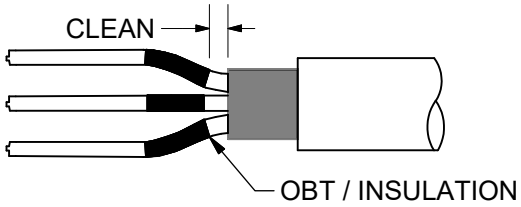


   D. Phase Holding: Wrap a layer of "Phase Holding" tape to the connection end of the OBT before positioning and shrinking the black conductive tubes.

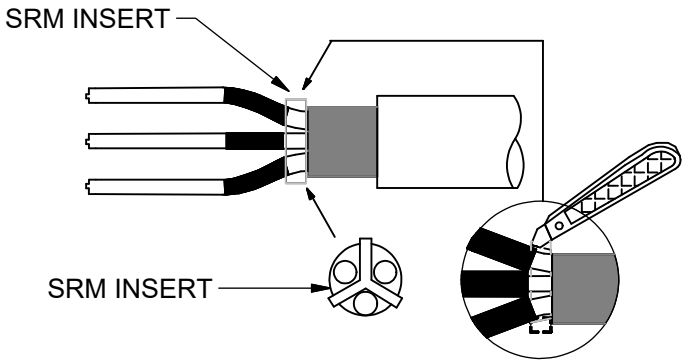
7. Position and Shrink Black Conductive Tubes
   A. Place a black conductive tube over each phase and position as shown.
   B. Shrink the tubes in place starting at the end nearest to the center of the splice.



8. Clean OBT's and Install SRM Insert
   A. Using an approved solvent, clean the OBT/insulation, as shown.

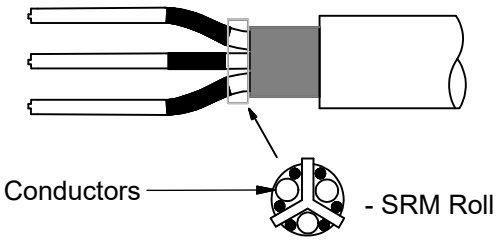


   B. Assemble SRM insert per box instructions.
   C. Spread the phases and position the SRM insert as shown.
   D. Trim the SRM insert to extend 1/8" beyond each phase.
   E. Reclean the lead sheath using an approved solvent.



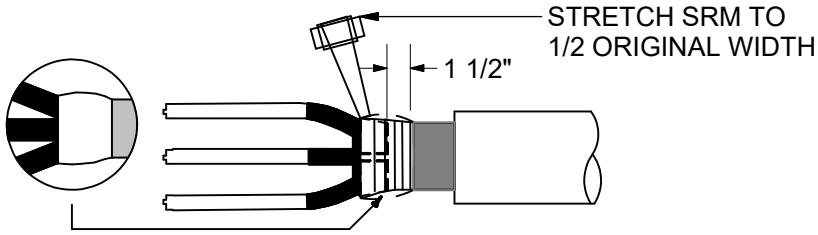
   F. The SRM insert is packaged inside the conductive breakout.

9. Fill Gaps Between SRM Insert and Conductors
   A. Cut a 6" piece of SRM into six 1" strips.
   B. Remove the backings and rollup each 1" piece.
   C. Place two of the SRM rolls on each side of the SRM insert to fill the gaps between the insert and the conductors as shown.

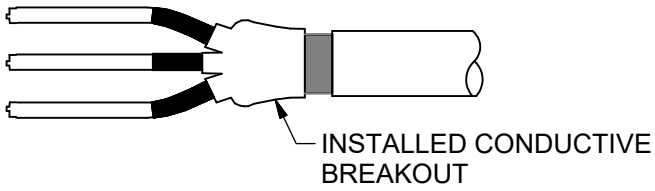


10. Install Oil Seal
   A. Mark the lead sheath 1-1/2" from the end.
   B. Remove the backing from one side of a long strip of SRM. Roll the SRM and remaining backing strip into a convenient size.
   C. While removing the remaining backing strip, tightly wrap the SRM from the mark on the lead sheath to the outer edge of the SRM insert.
   D. Four to six strips of SRM should be used to build the SRM to the shape shown.

      a. The SRM will stick better if the lead sheath is preheated.
      b. <u>DO NOT</u> over apply SRM, the finished diameter must not exceed that of the breakout boot.

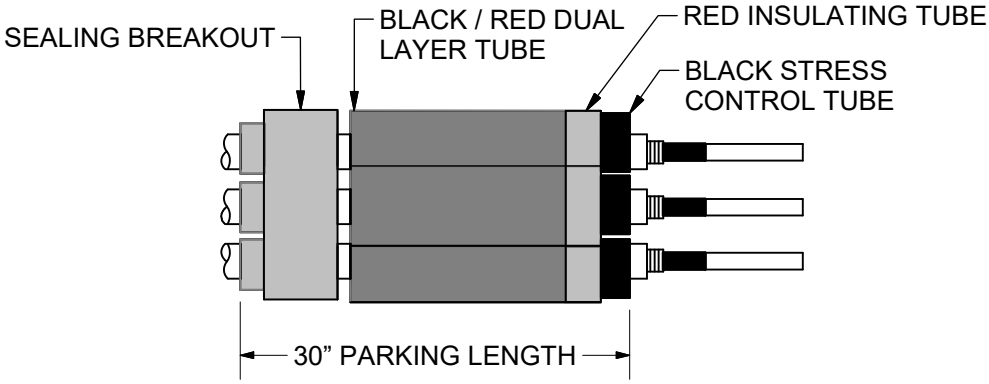


11. Position and Shrink Conductive Breakout
    A. Position the conductive breakout over the SRM so that the inside butts up hard against the SRM.
    B. Shrink the conductive breakout in place starting at the fingers and working toward the other end.
    C. After the breakout has shrunk continue to apply heat until the breakout has a smooth, uniform surface.

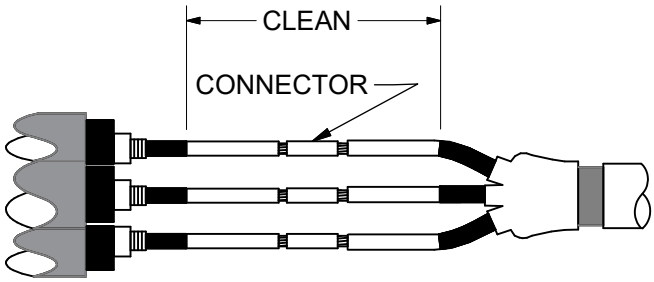


    D. "Phase Holding": After breakout is cool, apply "Phase Holding" tape to the fingers of the cable breakout (last and final location for "Phase Holding" tape).

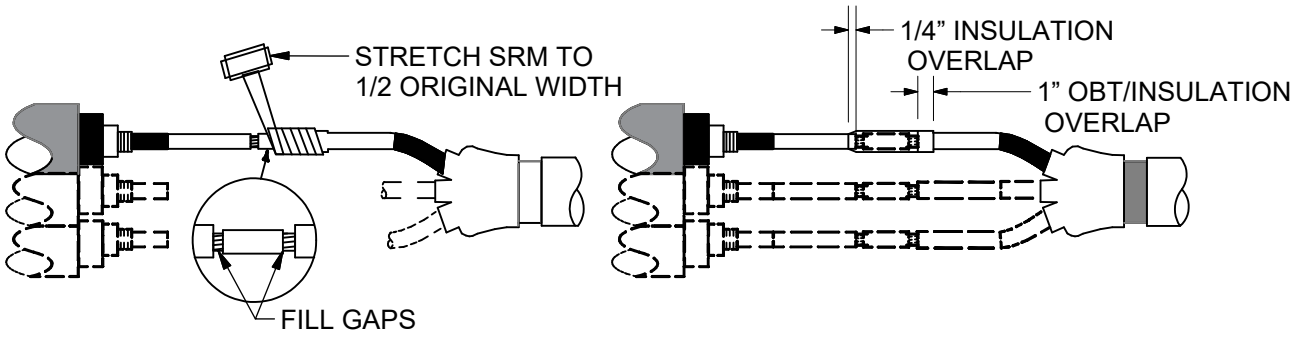
12. Position Splice Components on Solid Dielectric Cables
    A. Clean 30" of cable jacket.
    B. Place sealing breakout over the cables with the fingers pointing away from the splice center.
    C. Place one set of nested tubes over each clean cable.



13. Remove Insulation and Install Connectors
    A. Determine the insert depth of the connector.
    B. The insulation cutback should equal the connector insert depth plus 1/4".
    C. Chamfer or cut the sharp edge off of the EPR insulation for 1/4".
    D. Install the connectors. Protect the OBTs, if using soldered connector by wrapping them with cotton or glass fiber tape.
    E. Make sure connections are smooth.
    F. Using an approved solvent, clean the insulation as shown. Pay particular attention to the OBT/insulation surface.

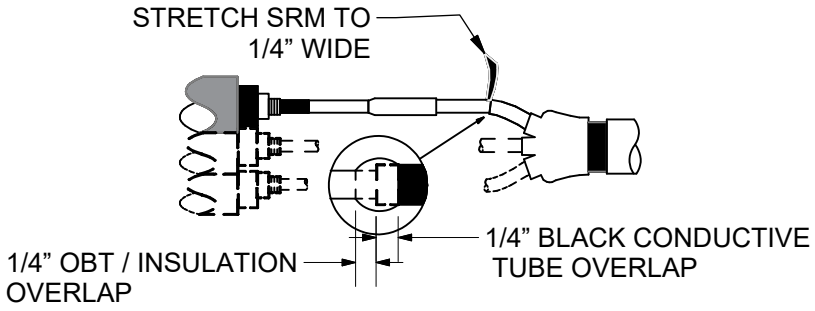


14. Apply SRM Over Connector (Complete Steps 14 and 15 working on one phase at a time.)
    A. Remove backing from one side of a long strip of SRM, roll the SRM and remaining backing strip into a convenient size.
    B. While removing the remaining backing strip, tightly wrap the SRM around the connector and exposed conductor. Be sure to fill the gaps and low spots around the connector.
    C. Continue to wrap the SRM onto the insulation as shown.



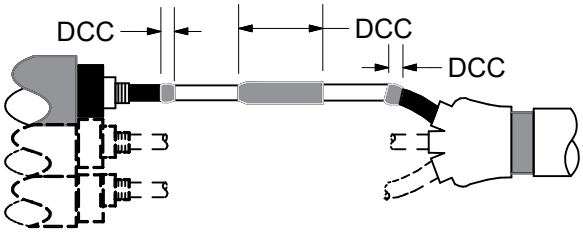
    D. If the connector diameter is larger than the insulation diameter, apply two half lapped layers of SRM over the entire connection.

15. Apply SRM at Black Conductive Tube and Semi-con Steps, Apply Discharge Control Compound, and Then Position Black Stress Control Tube
    A. Remove the backing from the short angle-cut piece of SRM. Place the tip of SRM at the black conductive tube step and tightly wrap to fill the step. Overlap black conductive tube and OBT/insulation and taper as shown.
    B. Repeat the above procedure for the semi-con step.



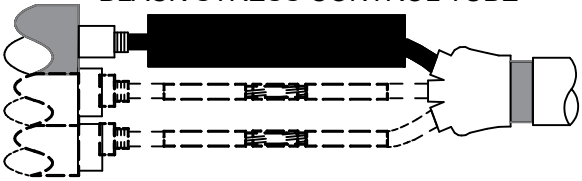
    C. Snip open the end of DCC tube and apply thin film of compound on the SRM over the connector and semi-con steps.

APPLY THIN FILM OF DCC OVER SURFACE OF INSTALLED SRM



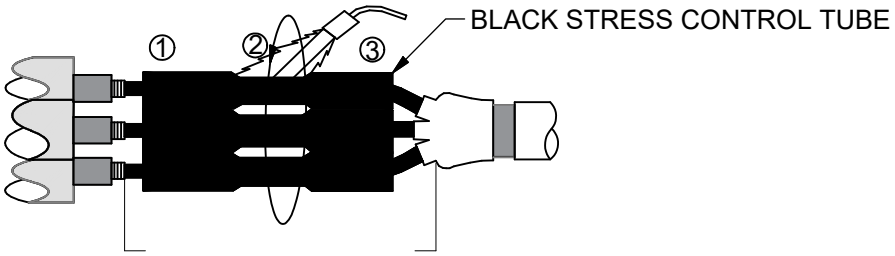
    D. Center the black stress control tube over the completed connector area. Be sure to equally overlap the semi-con and the black conductive tube.

BLACK STRESS CONTROL TUBE

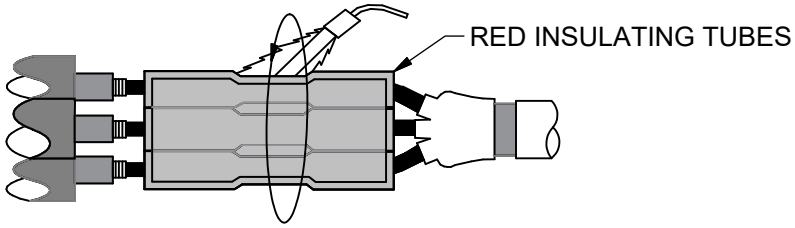


COMPLETE STEPS 14 AND 15 FOR THE REMAINING TWO PHASES BEFORE PROCEEDING TO STEP 16.

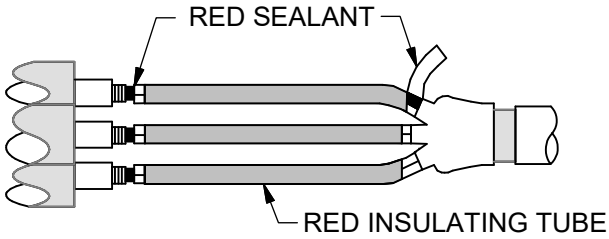
16. Shrink Black Stress Control Tubes
    A. Make sure that each tube is centered over the connection area, equally overlapping the semi-con and black conductive tube.
    B. Shrink all three tubes in place at the same time.
    C. Begin shrinking at center of tubes (1), working torch with a smooth brushing motion around the tubes.
    D. After center portions shrink, work torch toward one end (2), then to opposite end (3). Post heat all tubes.
    E. Apply sufficient heat to ensure softening of the SRM, indicated by a smooth surface profile.



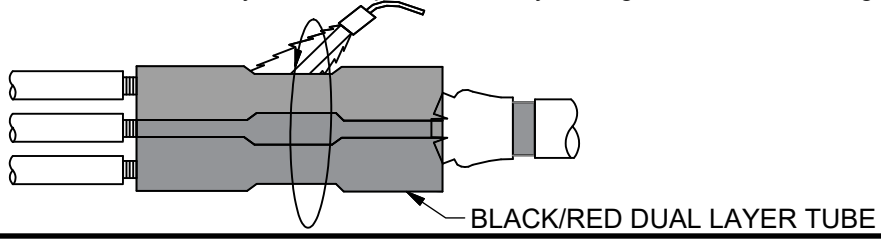
17. Position and Shrink Red Insulating Tubes
    A. Center red insulating tubes over the black stress control tubes.
    B. Shrink in place using the same method as Step 16.
    C. Do not allow the red insulating tubes to cool before applying red sealant and installing the black/red dual layer tubes.



18. Apply Red Sealant
    A. Remove backing from red sealant.
    B. Using light tension, wrap sealant over the cable and butt against the red insulating tube as shown.
    C. Build the sealant to the level of the red insulating tube.



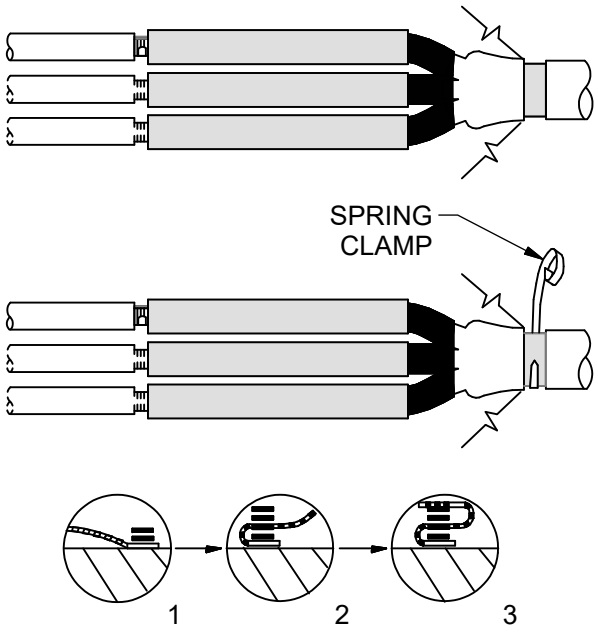
19. Position and Shrink Black/Red Dual Layer Tubes
    A. Center the tubes over the red insulating tubes.
    B. Shrink in place using the method described in Step 16 except stop shrinking 4" from each end. Then shrink each end.
    C. After initial shrinking, heat the entire tubes for approximately one minute. The raised ridges should disappear. Absence of ridges can be observed by visual inspection and by feeling the surface with a gloved hand.



20. Install Ground Leads to PILC Cable

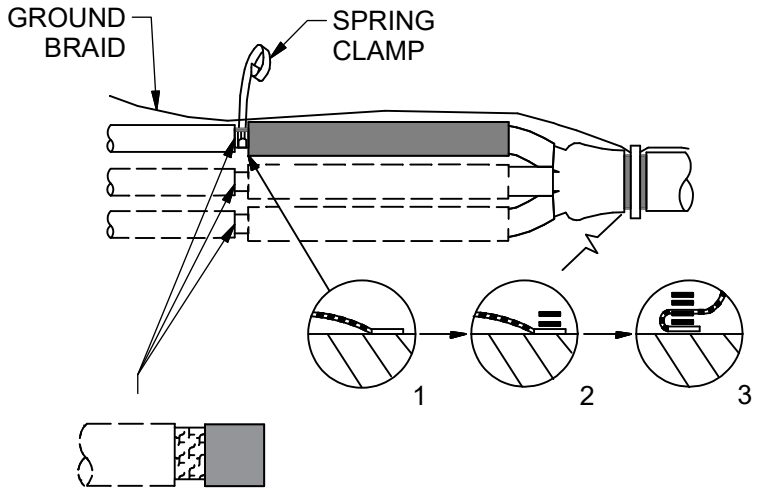
There are three long braids provided with this kit. One end of the braid has a short length of heat shrink tube installed next to a 2" wide solder block. This is the end of the braid which will be positioned over the jacket for external grounding.

A. Wrap three layers of 2" wide copper mesh around the cleaned lead sheath on the 3/C PILC side of the joint Tie off with a half hitch or equivalent knot.
B. Lay three braids across the joint evenly spaced around the joint circumfrence so that the braids overlap the mesh and the solder block is positioned over the jacket and aligned with the cable jacket cutback. Temporarily tape the braids into position.
C. (1) Wrap two turns of the LARGE spring clamp OVER the three braids and mesh. (2) Fold the long end of the braid back over the spring clamp and wrap two additional turns. (3) Fold long end one more time over the spring clamp over the braid. (The long end of the braid should be going across the splice at this time.)



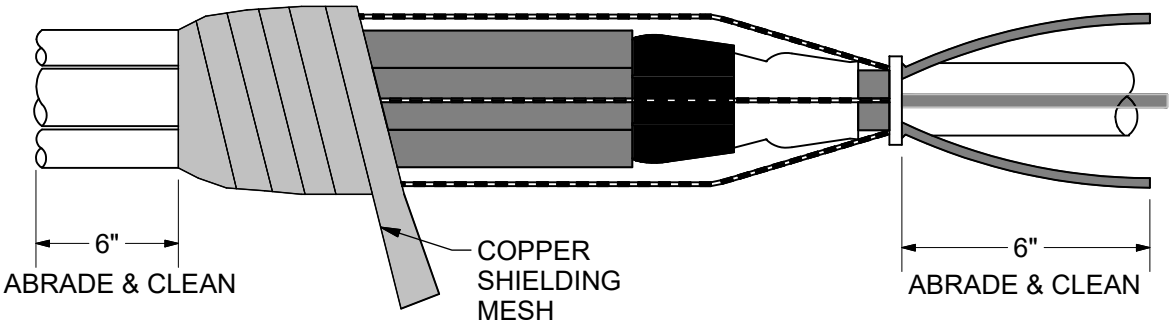
21. Install Ground Leads to Metallic Shields

A. Wrap three layers of 2" wide copper mesh around the metallic shields of the solid dielectric cable and tie off with a half hitch or equivalent knot. (Wrap around flat strap, concentric wires or LC Shield.)
B. (1) Lay braid directly over the mesh. (2) Wrap two turns of the SMALL spring clamp OVER the braid and mesh. (3) Fold back the braid over the spring clamp and complete wrapping the spring clamp over the braid. (Excess braid should be going across the splice at this time.) Excess braid may be cut off or left over the splice.
C. Repeat this step for remaining phases until all three phases are completed.

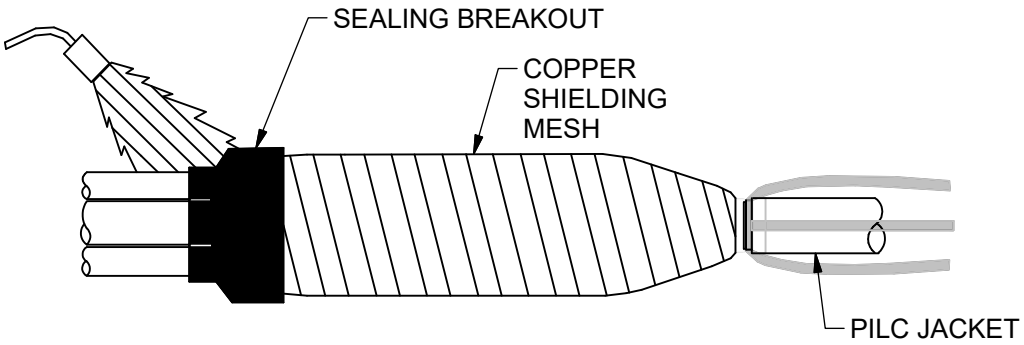


REV	DATE	ENG	DESCRIPTION
2	01/01/23	EJB	Converted to new format
1	05/25/07	EJB	

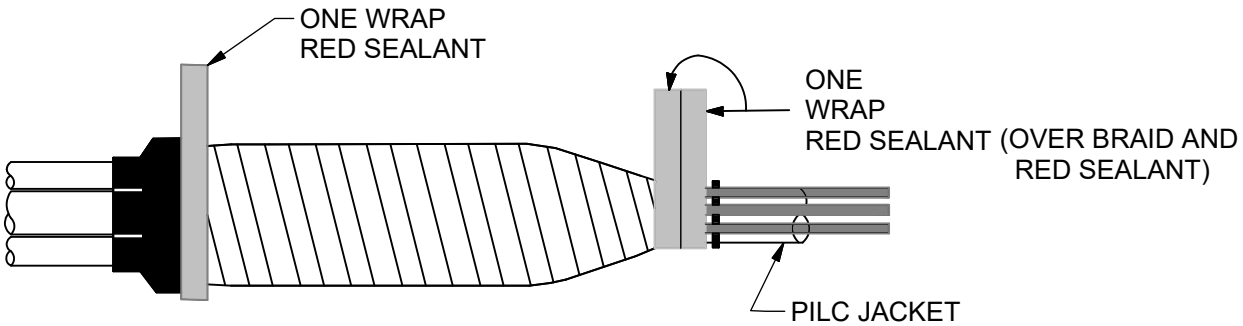
22. Apply Shielding Mesh
    A. Starting over the ground connections on the extruded solid dielectric cable side of the splice, wrap one half lapped layer of 2" wide shielding mesh across the splice and tie off to the PILC cable lead sheath.
    B. Abrade and solvent clean the cable jackets (or lead sheath) as shown.



23. Position and Shrink Non-conductive Sealing Breakout
    A. Slide the breakout into position. Make sure that the full length of the fingers of the breakout are over the cable jackets and the body is extending over the splice.
    B. Shrink in place starting at the fingers and working toward the splice center.



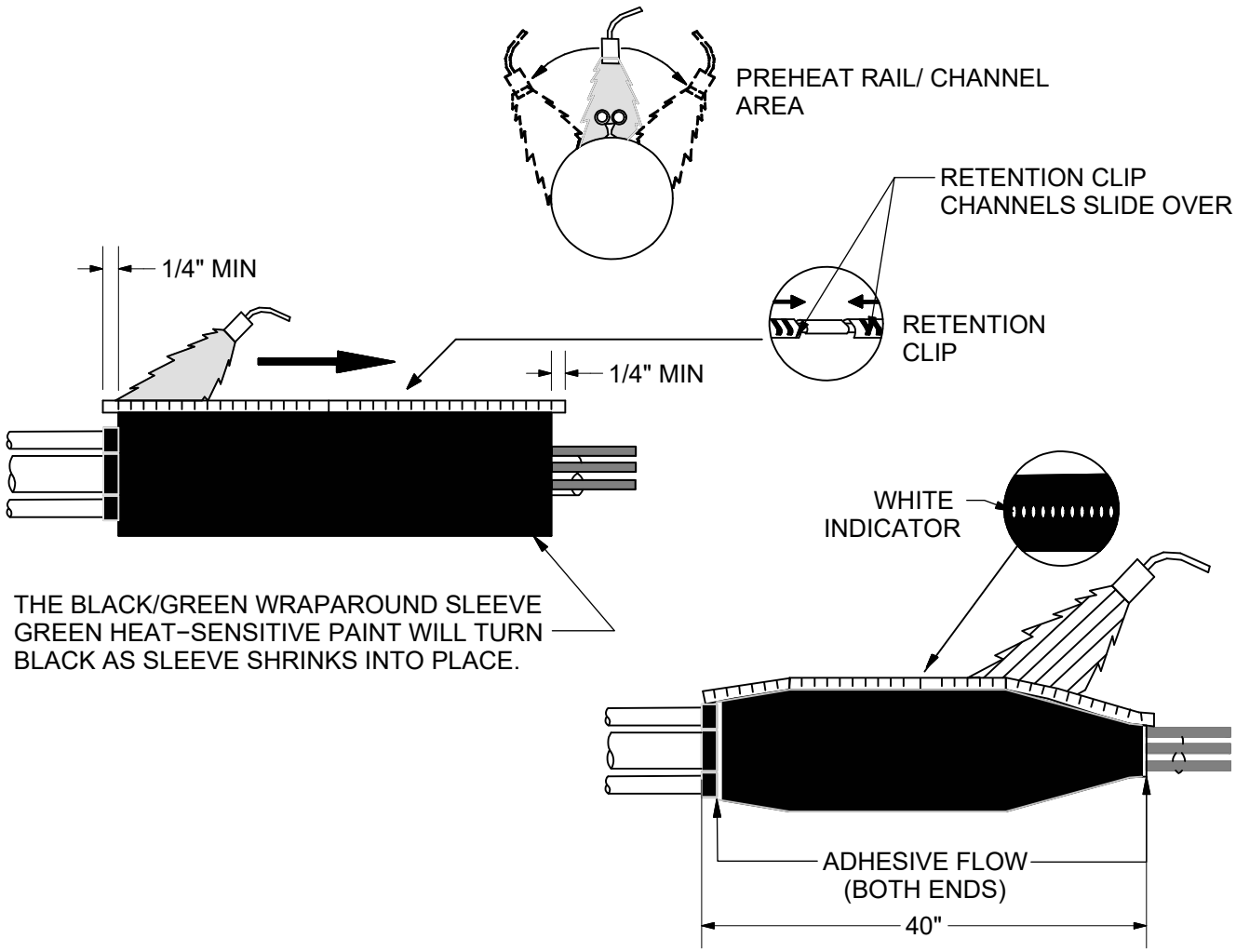
24. Apply Red Sealant
    A. Allow the breakout to cool sufficiently to touch before proceeding.
    B. Apply two single wraps of red sealant under the ground braids on the PILC cable side. Wraps should be side by side and butted up to the cable jacket cutback.
    C. Lay the braids down and press the solder blocked portion and the end of the heat shrink tubing into the red sealant.
    D. Apply two additional single wraps of red sealant over the braids and the first layers of red sealant.
    E. Apply one wrap of red sealant over the body of the breakout as shown.



REV	DATE	ENG	DESCRIPTION
2	01/01/23	EJB	Converted to new format
1	05/25/07	EJB	

25. Position and Shrink Wraparound Sleeve
    A. Remove or tape over all sharp points to prevent puncture of wraparound sleeve.
    B. Remove the backing from the wraparound sleeve and center sleeve over splice.
    C. Slide the metal retention clip onto the butted rails. Connect the channels by overlapping the retention clip as shown below.
    D. Channel(s) must overlap sleeve edges by 1/4" minimum.
    E. Preheat evenly along both sides of the rail/channel area until this area begins to shrink. (Critical Step)
    F. Begin shrinking at the center of the sleeve and work all the way around the sleeve and toward each end.
    G. Apply heat until the sleeve is completely shrunk and the green paint is completely converted to black.
    H. Post heat the entire length, concentrating on the metal channel area. The post heat should be for 30 seconds after the sleeve is completely shrunk. A white line should be visible in the channel gaps indicating sufficient heating.
    I. Look for adhesive flow at both ends of the sleeve.
    J. Allow the sleeve to cool before moving or placing in service.

The splice is now complete.



DCS #	PILC CABLE	SOLID DIELECTRIC CABLE
41 43 22 01	350^3	3-350 CNRP
41 43 22 02	800^3	3-750 FSRP

	ITEM	STK / DCS #	DESCRIPTION 41 43 22 **	01	02
	A	17 05 317	Splice-Cond., Trif., H.S., 350 kcmil & 750-800 kcmil	1	1
	B	17 60 359	Sleeve-Cmpsn., 350kcmil Cu.	3	-
		17 60 504	Sleeve-Cmpsn., 800 kcmil to 750 kcmil Cu.	-	3
	C	25 53 055	Tape-Plastic (RL)	1	1
		745	Op Code Splice 35 kV Heat Shrink	1	1

INSTRUCTIONS:

1. HEAT SHRINK BASICS

A. Adjust the flame so that it is an overall 12 inch bushy flame.

B. Apply outer 3 to 4 inch tip of the flame to heat−shrinkable material with a rapid brushing motion.

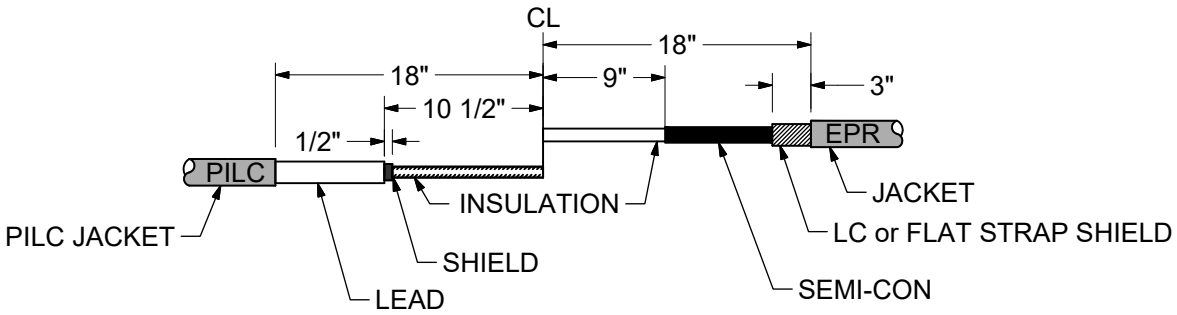
C. Unless otherwise instructed, start shrinking tubes at the center working the flame around all sides of the tubes to apply uniform heat.

D. Concentrate on heating the back of the tubes as well as the front of the tubes.

E. If it is necessary to interrupt the shrinking process and the tubes cool, you must reheat prior to shrinking the next tube.

F. Inspect all installed tubes. Reheat any flat spots or wrinkles, paying particular attention to the back of the splice.

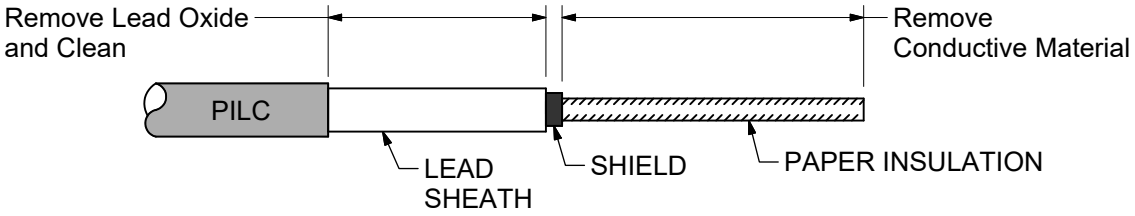
2. PREPARE CABLES



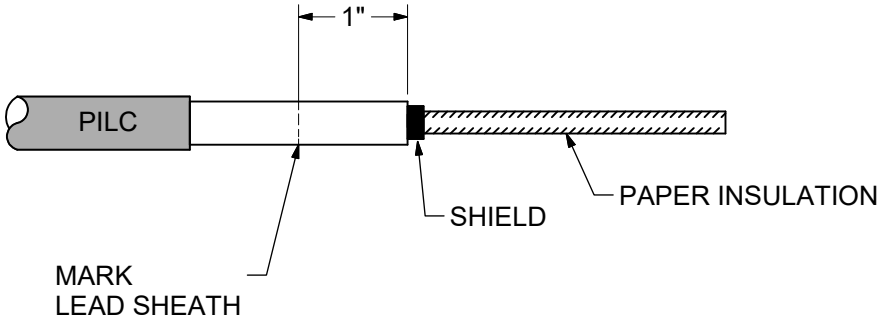
3. PREPARE LEAD SHEATH AND PAPER INSULATION

A. Remove lead oxide from the lead sheath and clean with oil−free solvent.

B. Remove conductive material from the paper insulation.
Remove lead oxide from the lead sheath and clean with an approved solvent. Remove the lead sheath as shown.



4. MARK LEAD SHEATH



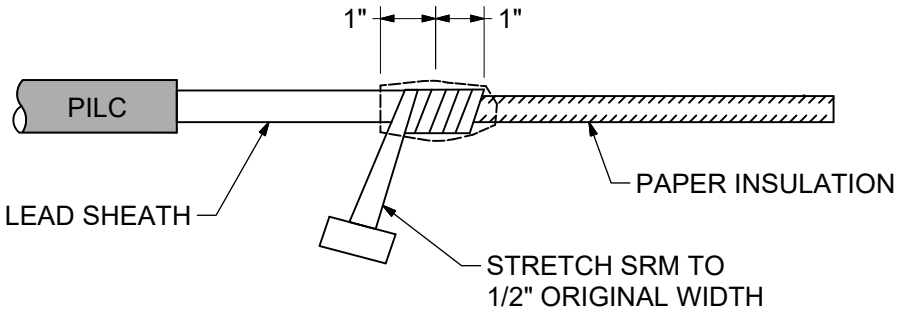
REV	DATE	ENG	DESCRIPTION
2	01/01/23	EJB	Converted to new format
1	04/19/2020	EJB	

5. APPLY STRESS RELIEF MATERIAL (SRM) AT LEAD SHEATH CUTBACK

A. Remove backing from one side of a long strip of SRM. Roll the SRM and remaining backing strip into a convient size.

B. Remove the remaining backing strip and tightly wrap SRM around the shield. Continue wrapping to the mark on the lead sheath, then back across the shield onto the paper insulation as shown.

C. Apply a maximun thickness of 1/8” of SRM over the lead sheath to prevent excessive diameter buildup. Save the remaining SRM.

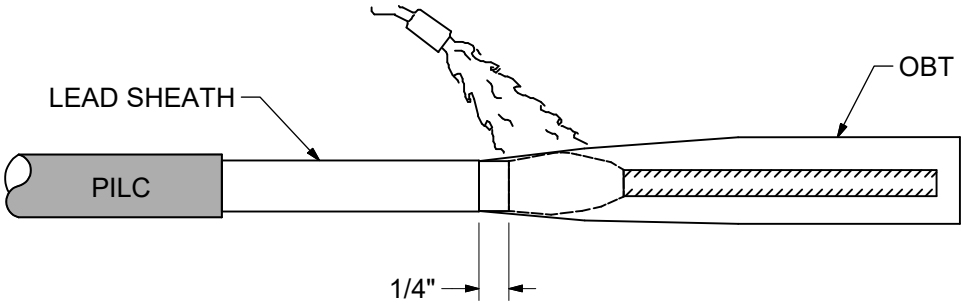


6. POSITION AND SHRINK OIL BARRIER TUBES (OBT)

A. Place the OBT over the PILC cable as shown.

B. Shrink in place starting at the SRM. Work around the tube with a smooth brushing motion.

To achieve a smooth wrinkle free installation, use a reduced flame to install the thin walled OBT.

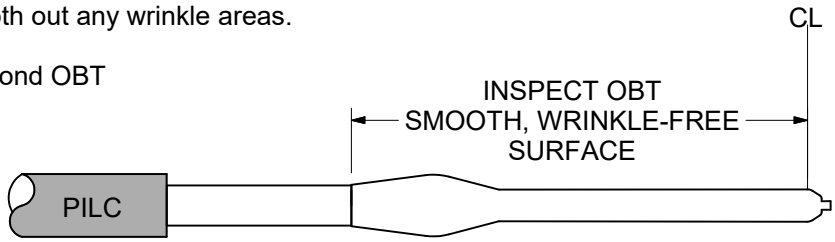


7. INSPECT THE OBT

A. The OBT should have a smooth, wrinkle free surface after shrinking.

B. Reheat to smooth out any wrinkle areas.

C. Discard the second OBT



REV	DATE	ENG	DESCRIPTION
2	01/01/23	EJB	Converted to new format
1	04/19/2020	EJB	

8. REMOVE INSULATION FROM PILC AND EPR CABLES

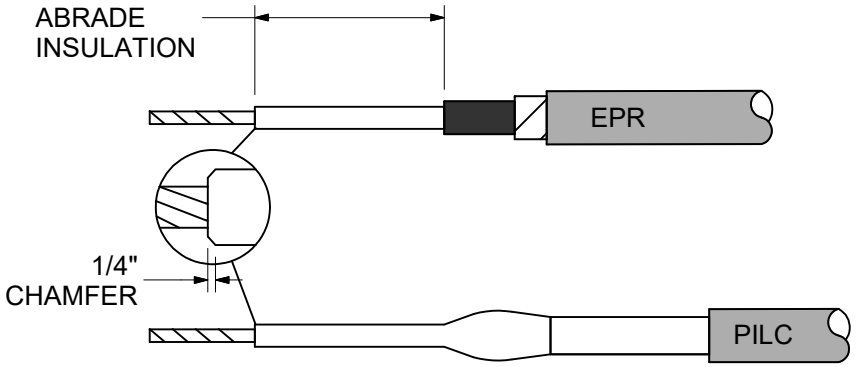
A. Mark the insulation 1/2 the length of the connector plus 1/2” from the end of each cable.

B. Cut off the insulation to the mark on each cable.

9. ABRADE THE EPR INSULATION

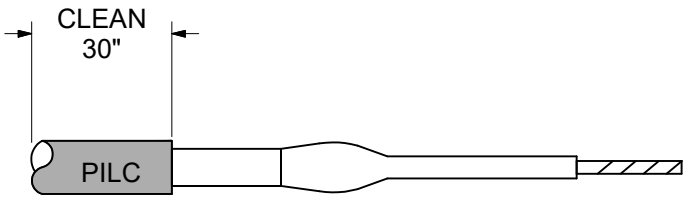
A. Chamfer the insulations for 1/4”.

B. Clean the EPR insulation



10. CLEAN THE PILC CABLE

A. Clean the PILC cable for the length of the nested tubes.

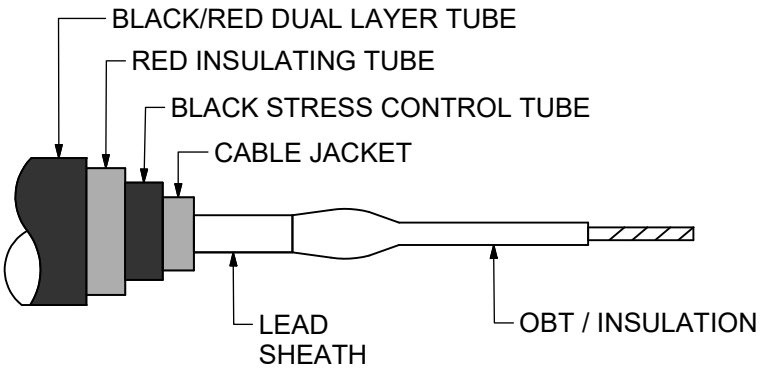


11. PLACE THE NESTED TUBES OVER THE PILC CABLE

A. Place nested tubes over PILC cables as shown

.

B. Protect tubes from end of conductor as they are placed over cable end.



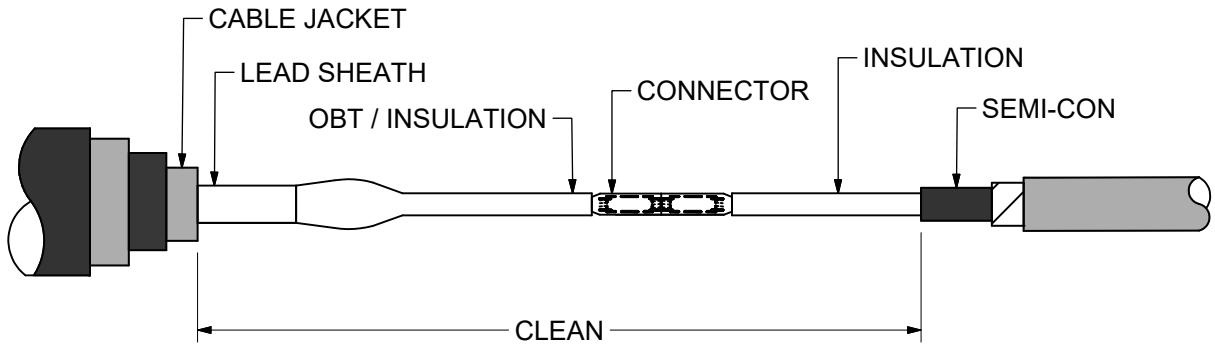
REV	DATE	ENG	DESCRIPTION
2	01/01/23	EJB	Converted to new format
1	04/19/2020	EJB	

12. INSTALL THE CONNECTOR

A. Slide the cables into the connector and crimp the connector.

B. Make sure that the crimps are smooth. Deburr the connector if necessary.

C. Clean the insulation and OBT's.

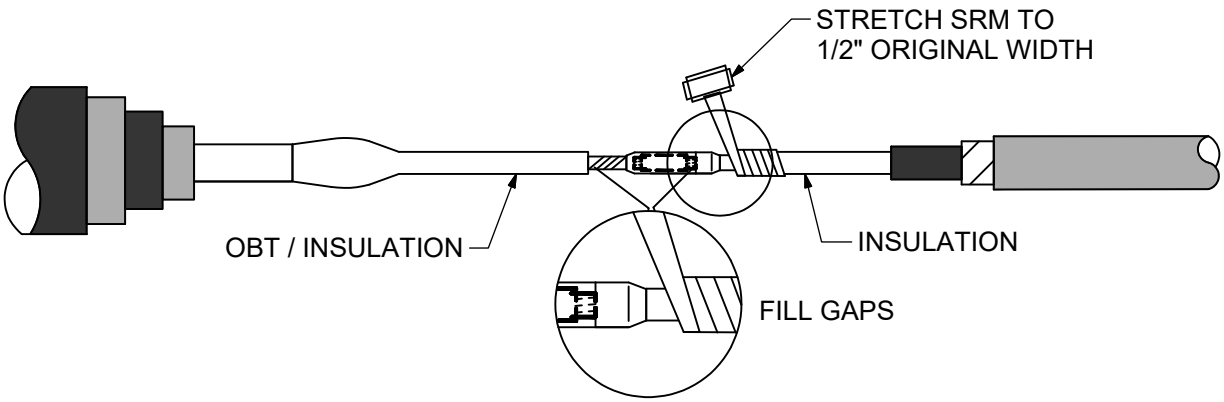


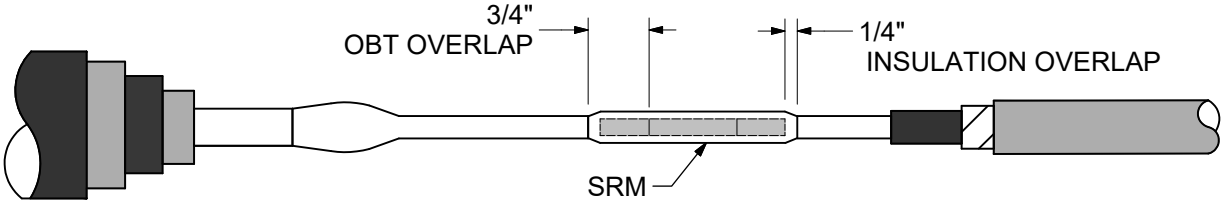
13. APPLY SRM OVER CONNECTOR

A. Remove backing from one side of a long strip of SRM, roll the SRM and remaining backing strip into a convenient size.

B. While removing the remaining backing strip, tightley wrap the SRM around the connector and exposed conductor. Be sure to fill the gaps and low spots around the connector.

C. Continue to wrap the SRM onto the insulation as shown.





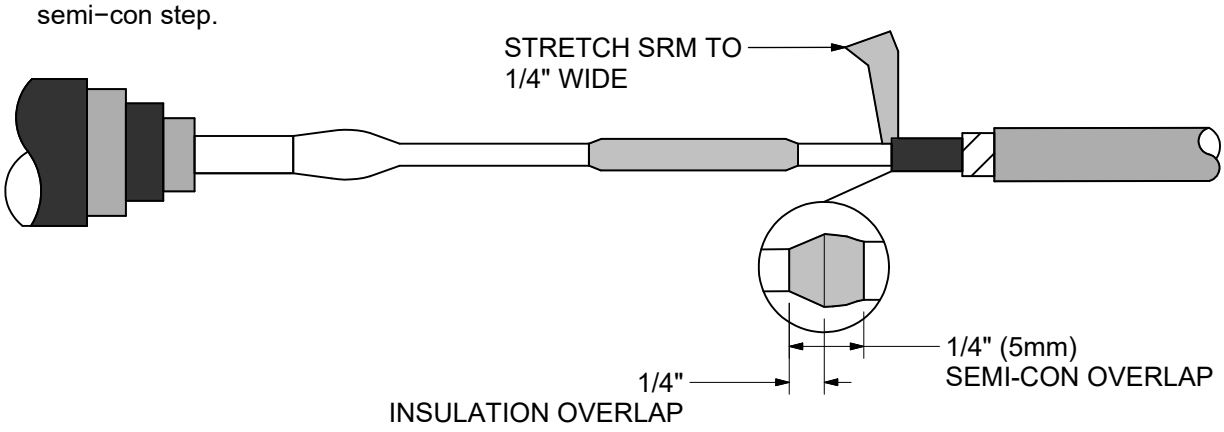
14. APPLY SRM AND DISCHARGE CONTROL COMPOUND (DCC) AT SEMICON CUTBACK

A. Remove the backing from the short anglecut piece of SRM.

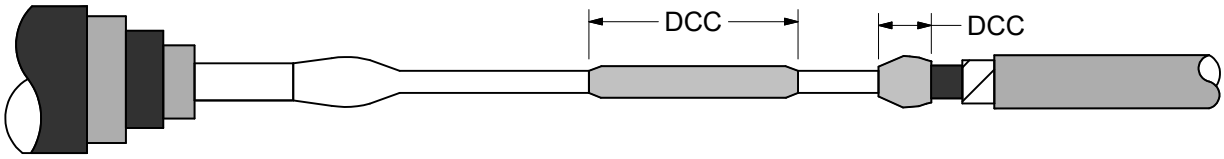
B. Place the tip of the SRM at the semicon cutback and tightly wrap to fill the semicon step.

C. Overlap the semicon and the insulation as shown. Taper the SRM down to meet the insulation.

D. Snip open the end of the DCC ampule and apply a thin film of compound on the SRM over the connector and the semi−con step.



APPLY THIN FILM OF DCC OVER SURFACE OF INSTALLED SRM



15. POSITION AND SHRINK THE BLACK STRESS CONTROL TUBE

A. Center the tube over the splice.

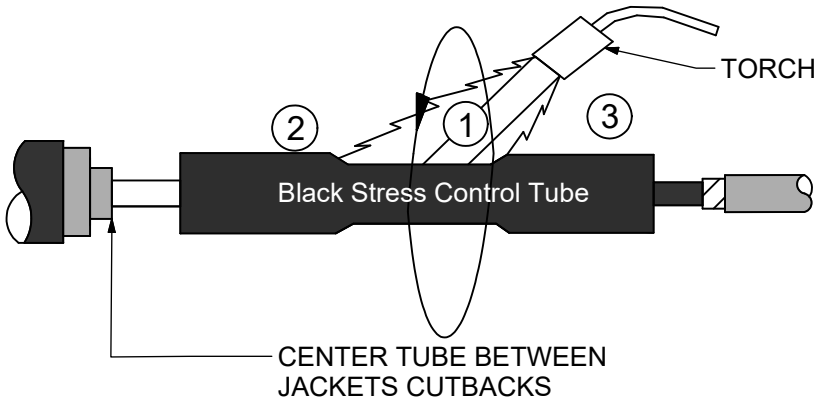
B. Begin shrinking at the center (1) of the tube, working the torch around all sides of the tube.

C. After the center portion shrinks, work towards one end (2) and then to the opposite end (3).

D. Do not point the flame at the cable semi−con.

E. The rings of the SRM wraps may be visible as the tubing is shrunk.

F. Post heat the connector area until the tube surface is smooth.

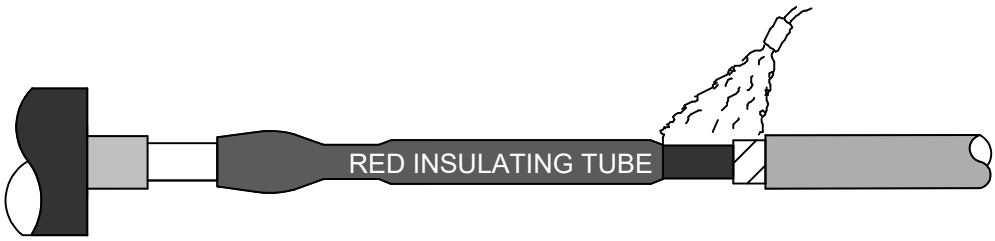


16. POSITION AND SHRINK THE RED INSULATING TUBE

A. Center red insulating tube over black stress control tube.

B. Shrink in place using the same method as 15.

C. Do not allow the red insulating tube to cool before applying red sealant and installing the black/red dual layer tube.

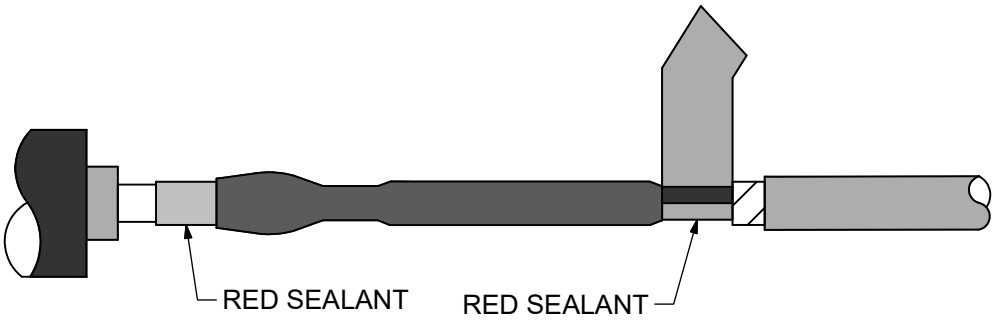


17. APPLY RED SEALANT

A. Remove backing from sealant.

B. Using light tension, wrap sealant over the cable and butt against the red insulating tube as shown.

C. Build the sealant to the level of the red insulating tube.



18. POSITION AND SHRINK THE BLACK/RED DUAL LAYER TUBE

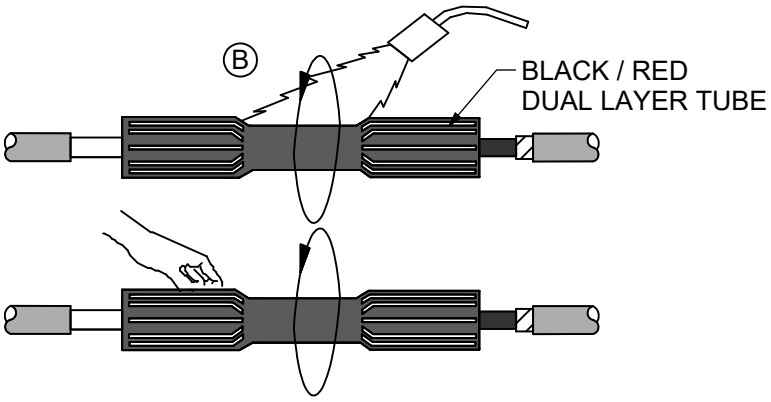
A. Center Tube Over Joint

B. Begin shrinking in center of tube, working torch around all sides of the tube. Pay particular attention to the back and underside of the tube.

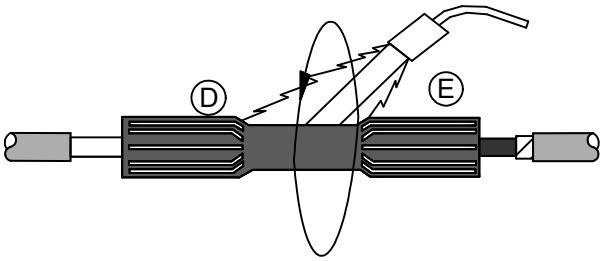
C. Before continuing, gently twist the unshrunk end of the tube to feel for resistance to movement in center indicating the center is shrunk.

D. Shrink from the center toward one end and stop about 5” from the end of the tube.

E. Return to the center and shrink toward the other end, again stopping about 5” from the tube end.



Ⓒ TWIST GENTLY TO CHECK FOR
RESISTANCE TO MOVEMENT IN CENTER

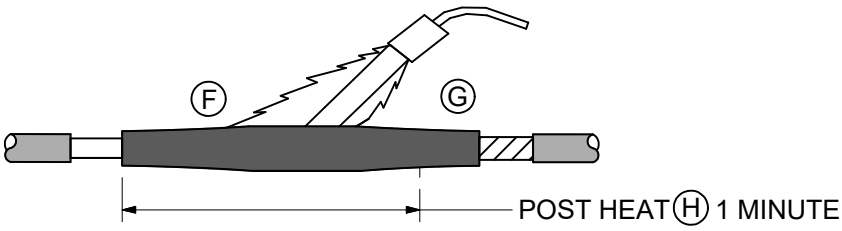


F. Go back to first end and shrink the remaining 5” of tube.

G. Go back to second end and shrink the remaining 5” of tube.

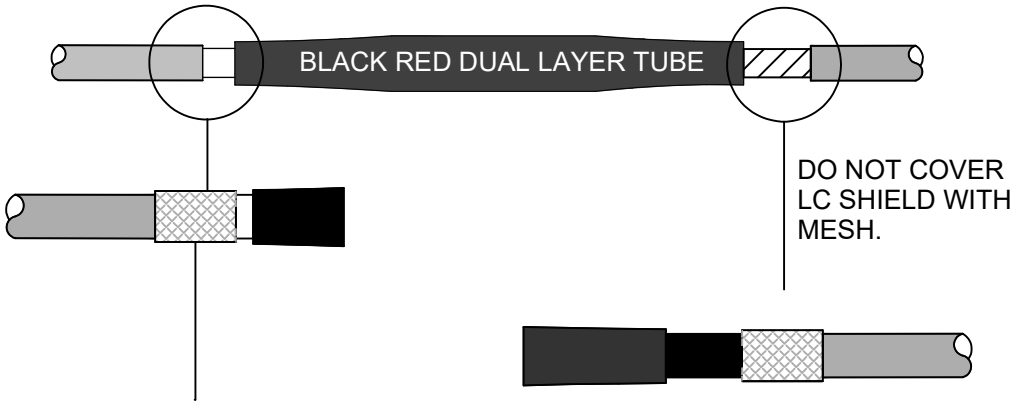
H. After completing these steps, heat the entire tube for approximately 1 minute.

I. When completely shrunk down, the raised ridges should disappear.



Ⓘ INSPECT TUBE. ABSENCE OF RAISED RIDGES CAN BE OBSERVED BY
VISUAL INSPECTION AND BY FEELING THE SURFACE WITH A GLOVED HAND.

19. INSTALL MESH ON THE CABLES

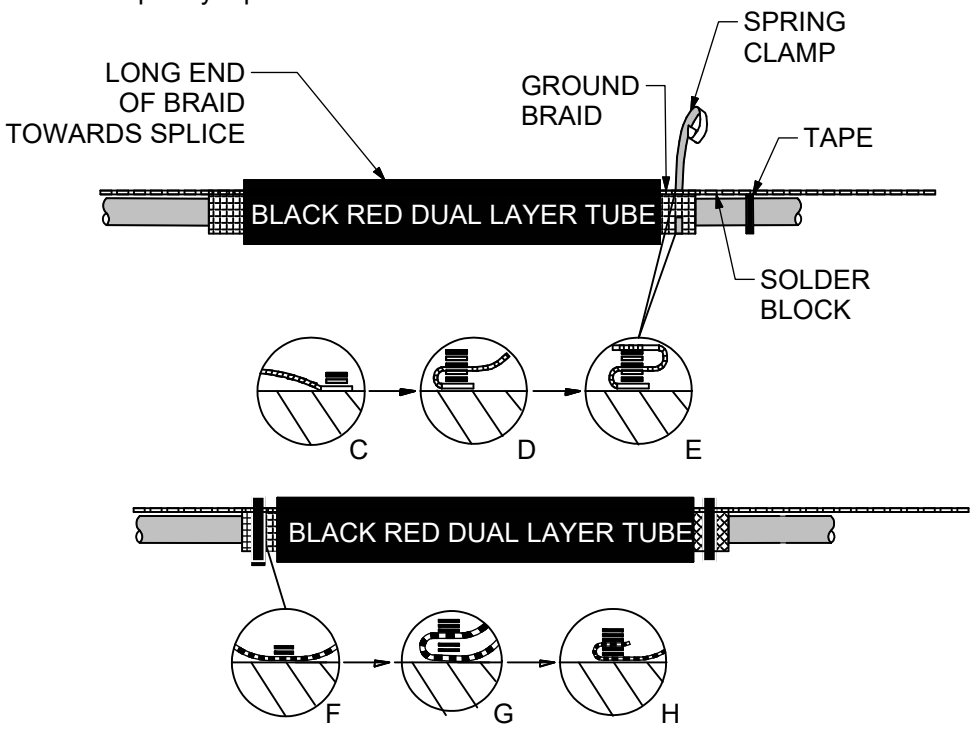


A. COVER THE CLEANED LEAD SHEATH WITH 4 LAYERS OF 2" WIDE TINNED COPPER MESH, TIE OFF.

B. COVER FLAT STRAP NEUTRAL WITH 4 LAYERS OF 2" WIDE TINNED COPPER MESH, TIE OFF.

20. INSTALL THE GROUND BRAID AND THE GROUND SPRINGS

A. Lay the braid across the splice with the inner edge of the solder block aligned with the cable jacket cutback.
B. The shortest length of braid from the solder block should extend away from the splice. Tape the braid to the cable jacket to temporarily keep it in place.
C. Starting at the solder blocked end, wrap two turns of the spring clamp over the braid and mesh or metallic shield.
D. Fold the long side of the braid back over the spring clamp and wrap the remainder of the clamp over the braid.
E. Fold the braid back over the clamp and route across the splice.
F. Wrap two turns of the second spring clamp over the braid and the mesh covered lead sheath.
G. Fold the braid back over the clamp and wrap the remainder of the clamp over the braid
H. If no external ground connection, cut off the short length of braid at the solder block.
I. Remove the temporary tape.

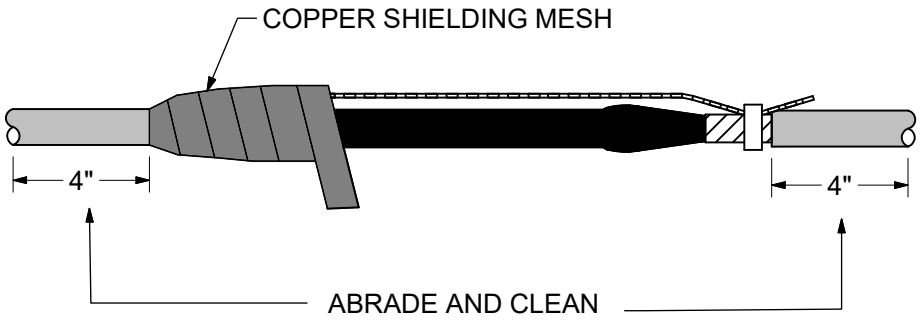


REV	DATE	ENG	DESCRIPTION
2	01/01/23	EJB	Converted to new format
1	04/19/2020	EJB	

21. INSTALL THE SHIELDING MESH

A. Wrap a halflapped layer of the copper mesh across the entire splice from the PILC cable lead sheath to the opposite cable jacket and tie off.

B. Abrade and solvent clean the cable jacket and lead sheath to provide an oil−free surface.



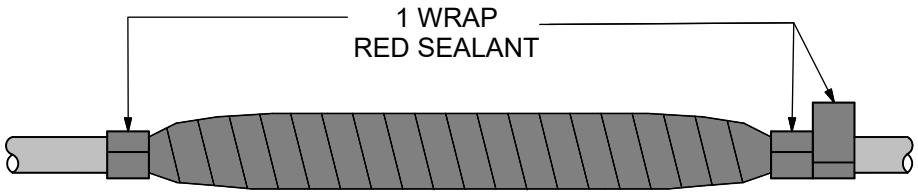
22. APPLY THE RED SEALANT

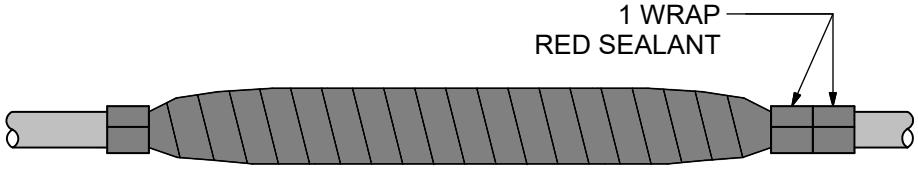
A. Apply 1 layer of red sealant on the PILC cable at the jacket cutback.

B. Lift the solder−block braid end and make two single wraps of sealant, side by side, butted up to the EPR cable jacket cutback.

C. Lay the solder−block braid end down and press it into the red sealant.

D. Apply two single wraps of sealant, side by side, over the solder−blocked braid end and directly over the first layer of red sealant.





REV	DATE	ENG	DESCRIPTION
2	01/01/23	EJB	Converted to new format
1	04/19/2020	EJB	

23. POSITION AND SHRINK WRAPAROUND SLEEVE

A. Remove or tape over all sharp points to prevent puncture of wraparound sleeve.

B. Remove the backing from the wraparound sleeve and center sleeve over splice.

C. Slide the metal retention clip onto the butted rails. Connect the channels by overlapping the retention clip as shown below.

D. Channel(s) must overlap sleeve edges by 1/4” minimum.

E. Preheat evenly along both sides of the rail/channel area until this area begins to shrink. (Critical Step).

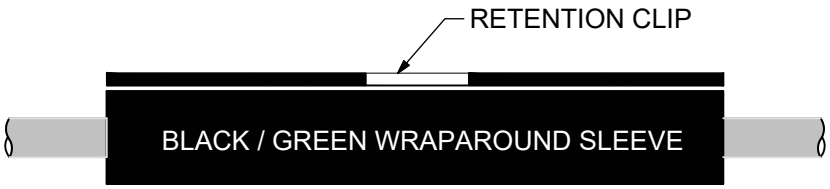
F. Begin shrinking at the center of the sleeve and work all the way around the sleeve and toward each end.

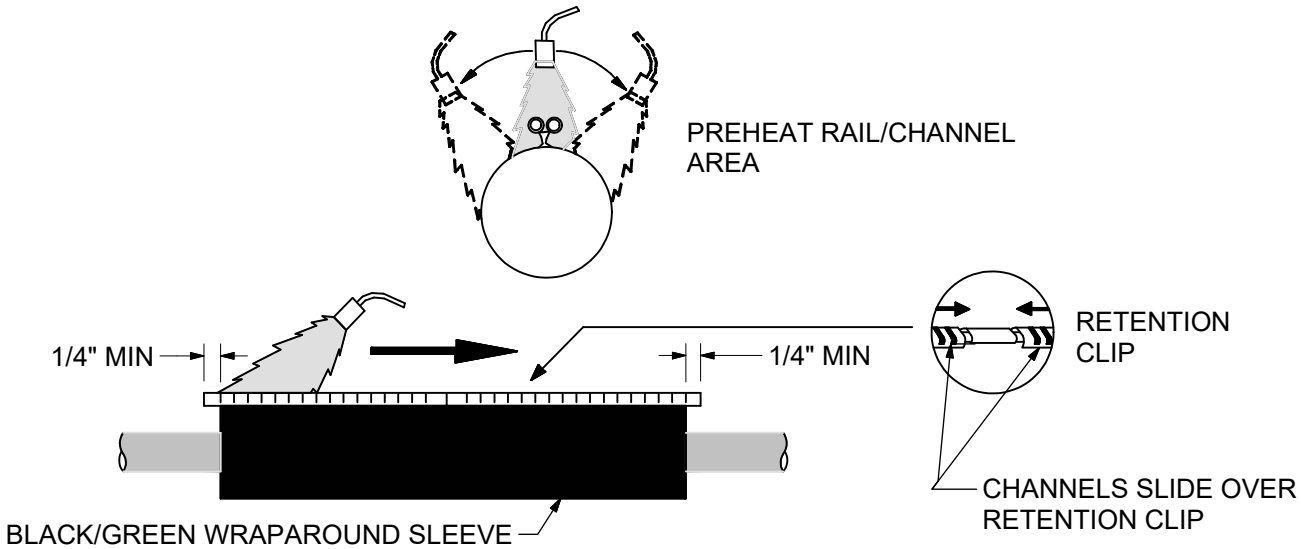
G. Apply heat until the sleeve is completely shrunk and the green paint is completely converted to black.

H. Post heat the entire length, concentrating on the metal channel area. The post heat should be for 30 seconds after the sleeve is completely shrunk. A white line should be visible in the channel gaps indicating sufficient heating.

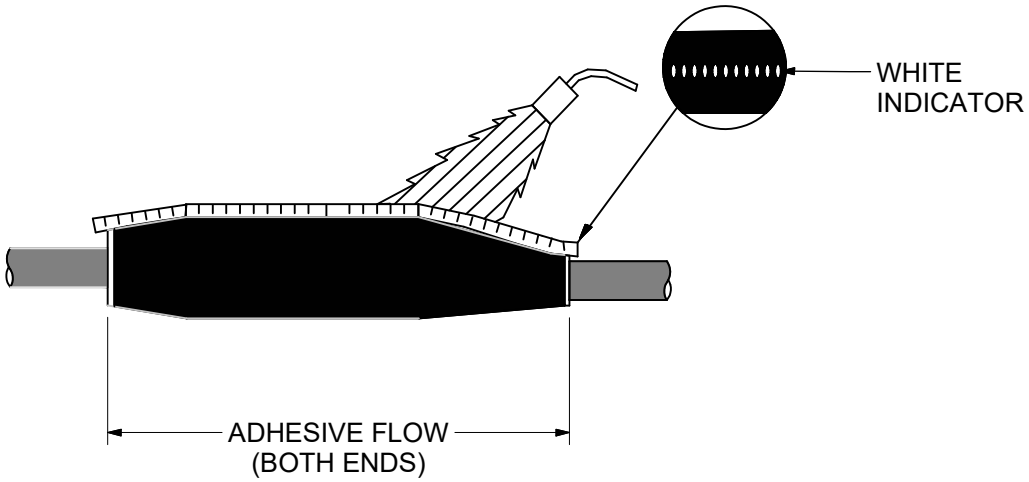
I. Look for adhesive flow at both ends of the sleeve.

J. Allow the sleeve to cool before moving or placing in service.





NOTE: GREEN HEAT-SENSITIVE PAINT WILL TURN BLACK AS SLEEVE SHRINKS INTO PLACE.



THE SPLICE IS NOW COMPLETE

DCS #	PILC CABLE TO	SOLID DIELECTRIC CABLE
41 44 21 01	350[1]	1−350 CNRP
41 33 22 02	750[1]	1−750 FSRP

	ITEM	STK / DCS #	DESCRIPTION 41 44 21 **	01	02
	A	17 05 481	Splice−Cond., 1C ., H.S., 350 kcmil & 750−800 kcmil	1	1
	B	17 60 359	Sleeve−Cmpsn., 350 kcmil Cu.	1	-
		17 60 360	Sleeve−Cmpsn., 750 kcmil Cu.	-	1
	C	25 53 055	Tape−Plastic (RL)	1	1
		425	Op Code Splice Non Lead Str. 35 kV	1	1

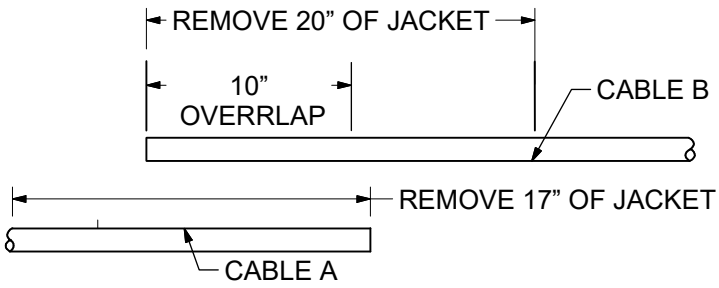
REV	DATE	ENG	DESCRIPTION
2	01/01/23	EJB	Converted to new format
1	04/19/2020	EJB	

UNDERGROUND CABLE SPLICE

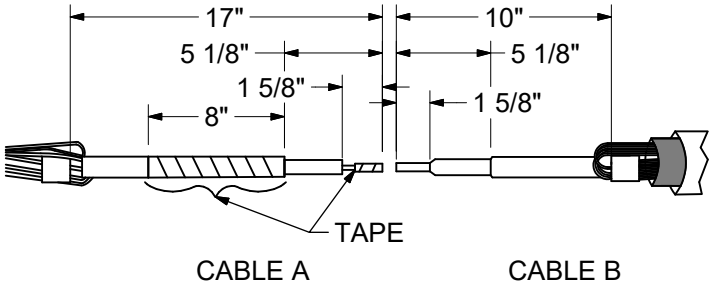
PREMOLDED - 3M

1/0, CNR, P

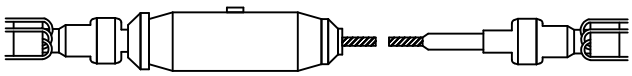
41 44 30 03
35 kV
1 of 2



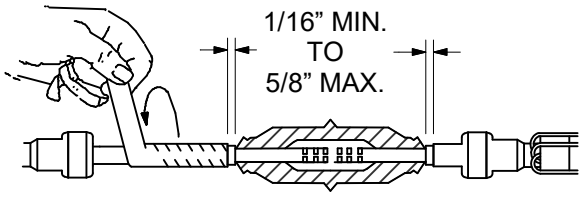
STEP 1



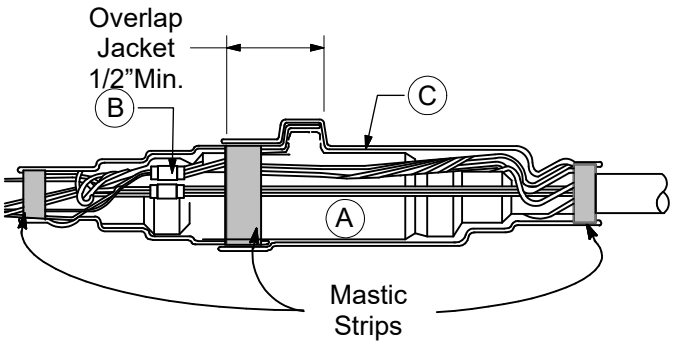
STEP 2 - 4



STEP 5 - 6



STEP 7 - 11



STEP 12 - 15

INSTRUCTIONS:
Keep the cable clean at all times, but do not use solvent on the semi−conductive jacket.

1. There must be a 10 inch overlap of the cables. Wipe the cable clean 2 feet on each side.

2. Saw cut and prepare both cables according to the dimensions shown. Bevel the edge of the cable insulation at 45° angle. Do not exceed 1/8”. Cable ”A” dimensions are different from cable ”B” dimensions.

3. If both cables are jacketed, slide the cold shrink sleeve(s) over one of the cables.

4. Apply one−half lapped layer of brightly colored vinyl tape for the distance shown over the semi−conductive jacket of cable A. Begin tape 1/4” on the insulation of the cable. Apply 2 layers of brightly colored vinyl tape on the end of the conductor of cable A.

5. Apply silicone grease over the cable insulation and vinyl tape.

6. Slide the splice end caps onto each cable until butted against the concentric neutral wires.

7. Slide the splice body onto cable A. Do not slide past the end of the vinyl tape.

8. Remove the previously applied vinyl tape from the end of conductor of cable A.

9. Prior to installing the connector, clean the exposed conductor with a stainless steel wire brush. Some splice kits may contain a small disposable stainless steel wire brush, if so, it should be used. If there is no wire brush in the kit use one of the stocked stainless steel wire brushes. Crimp the connector onto the cable.

10. Slide the splice body into final position over connector. A small area of insulation should be left exposed at the ends of splice body as shown.

11. Remove the remaining vinyl tape from cable A.

12. Slide end caps onto the splice body. Two locking grooves exist on the splice body. Insure that end caps are fully seated. There should be no visible gap between the cap and splice body.

REV	DATE	ENG	DESCRIPTION
2	01/01/23	EJB	Converted to new format
1	10/21/10	EJB	

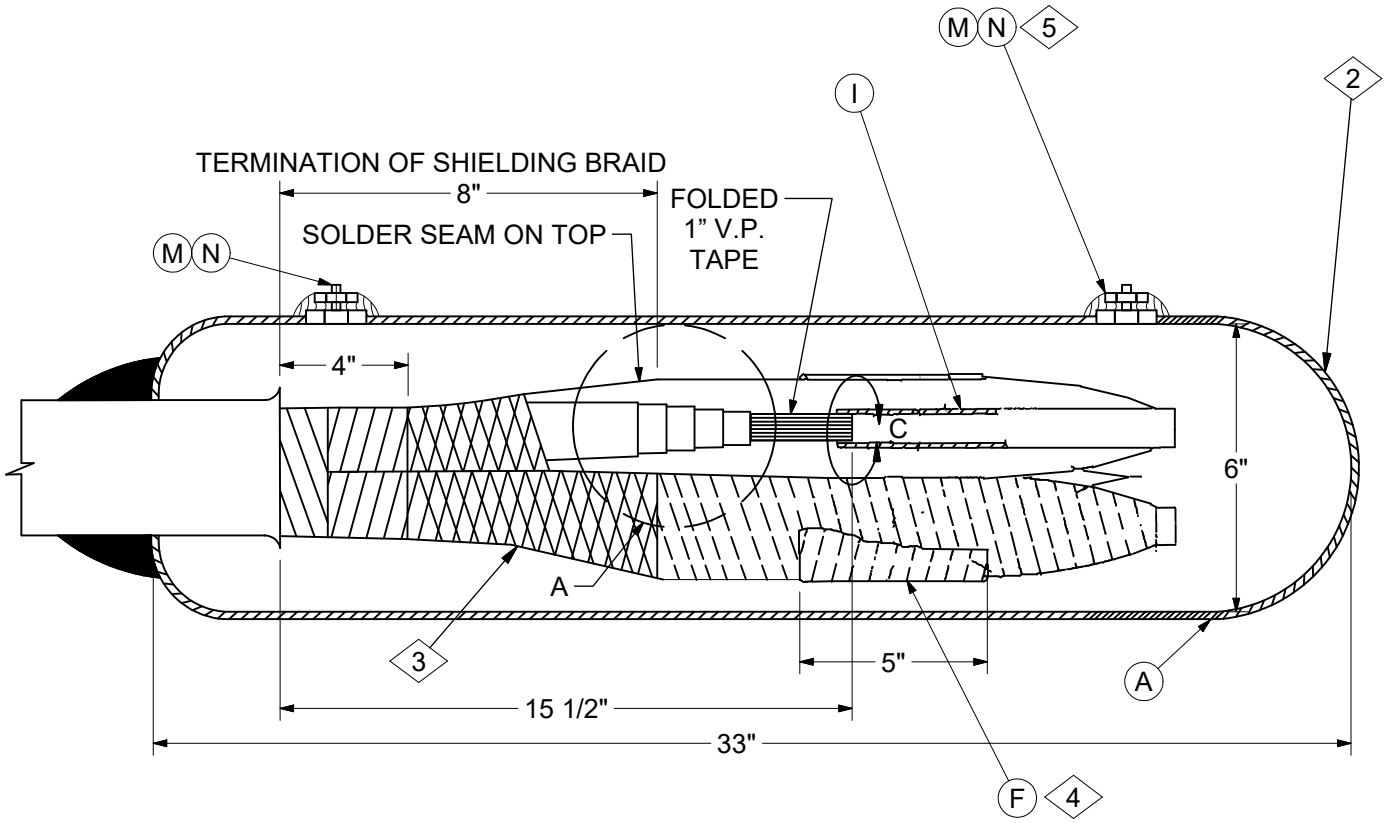
13. Connect the concentrics with three #4 sleeves on cable "A" side. Place 5 and 6 wire bundles into separate sleeves. Snug the sleeves and wires tightly against the splice and the cable. In manholes, bring the remaining concentric neutral strands outside of the splice cover. Attach a #2 copper bond wire to the neutral wires using a two bolt clamp (17 54 140). Attach the other end of the bond wire to the system ground.

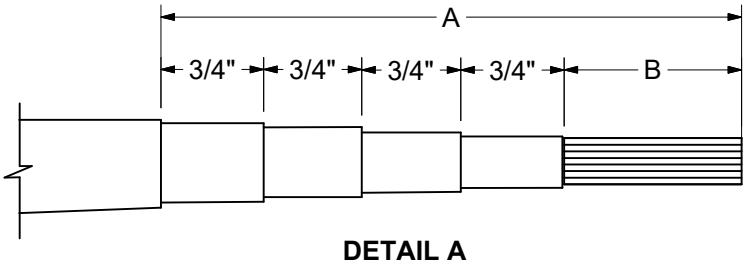
14. For jacketed cable(s), wrap a layer of mastic at the end of each cable jacket. Slide the first cold shrink sleeve over the splice with the end of the sleeve overlapping the opposite cable jacket cut off (or mastic strip) by two inches. Shrink the sleeve down.

15. Wrap one layer of mastic at the inner end of the shrunken sleeve. Slide the second sleeve over the splice and overlap the first sleeve by 1/2 inch minimum. Shrink the second sleeve down.

	ITEM	STK / DCS #	DESCRIPTION 41 44 30 **	03
	A	17 05 230	Splice-Straight, 1/0 Al. 35 kV	1
	B	17 60 103	Sleeve-Compression, #4 Copper	3
@	C	17 55 443	Sleeve-Cold Shrink, Sealing, 2 Pieces	1

REV	DATE	ENG	DESCRIPTION
2	01/01/23	EJB	Converted to new format
1	10/21/10	EJB	





DETAIL A

CONSTRUCTION NOTE(s):

1. Shielded joint shown. For belted joint, omit shielding braid.

2. Place joint in position so that the end cap of the joint is higher.

3. Shielding braid to be butt wrapped and soldered in a line along top and to the cable shielding. Avoid openings between the wrapping.

4. 3 Layers 1" v.p. tape over all three conductors

5. 1/8" x 1/2" Bushing soldered in sleeve

DCS #	Cable Size	L Joint to Stepping A	Circumference Over Insulation C	Length of Bare Copper B
41 46 11 01	350 kcmil	4−3/4”	7−1/2”	1−3/4”
41 46 11 02	500 kcmil	5”	8”	2”

ITEM	STK / DCS #	DESCRIPTION 41 46 11 **	01	02
A	12 53 025	Sleeve – Lead, 6" x 34"	1	1
B	22 02 282	Solder – Wiping (Lb.)	12	12
C	22 02 273	Solder – 50 – 50 (Lb.)	3	3
D	22 02 276	Solder – String, ¼" (Lb.)	1	1
E	22 02 255	Solder – Paste (Cn.)	1	1
F	25 53 063	Tape – V.P., 1" x 4 Yd. (Rl.)	1	1
G	18 66 101	Braid – Copper Mesh, 1" x 15' (Rl.)	3	3
H	31 51 003	Compound – Insul. Oil (GE219)	4	4
I	25 52 055	Tube – Fiber, ¾" I.D. x 9"	3	-
	12 51 197	Conduit – PVC, Sch. 40, 1" x 10', Cut to Three 9" Length Tubes	-	1
J	31 53 007	Stearine (Ea.)	1	1
K	25 53 103	Tape – 4" Plastic x 160' (Rl.)	1	1
L	22 05 213	Cloth – Sanding, 1 ½" W (Ft.)	2	2
M	19 11 094	Bushing – 1/8" x 1/2"	2	2
N	19 11 015	Plug – Pipe, 1/8"	2	2
	731	Op Code Test Cap 35 kV	1	1

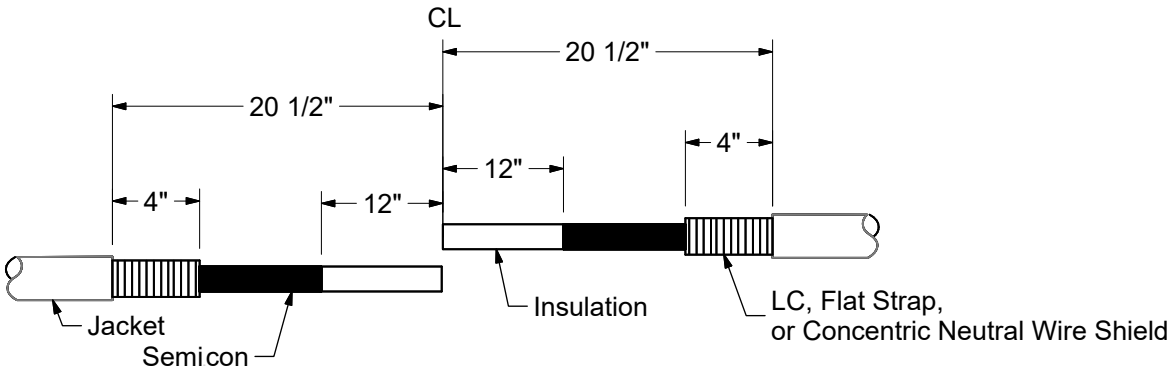
REV	DATE	ENG	DESCRIPTION
2	01/01/23	EJB	Converted to new format
1	03/30/11	EJB	

INSTRUCTIONS:

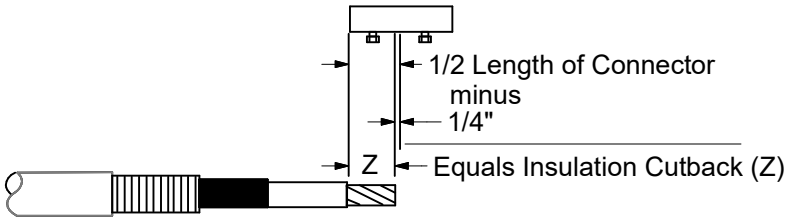
1. HEAT SHRINK BASICS

A. Adjust the flame so that it is an overall 12−inch bushy flame.
B. Apply outer 3− to 4−inch tip of the flame to heat−shrinkable material with a rapid brushing motion.
C. Unless otherwise instructed, start shrinking tubes at the center, working the flame around all sides of the tubes to apply uniform heat.
D. Concentrate on heating the back of the tubes as well as the front of the tubes.
E. If it is necessary to interrupt the shrinking process and the tubes cool, you must reheat prior to shrinking the next tube.
F. Inspect all installed tubes. Reheat any flat spots or wrinkles, paying particular attention to the back of the splice.
G. A 2 inch diameter torch head (Stk. #85 36 326) is recommended to properly shrink the splice.

2. PREPARE CABLE

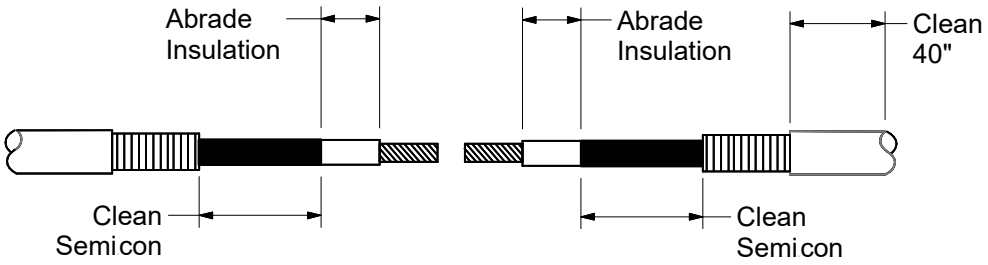


A. Make sure that the cables to be joined are straight and level.
B. Overlap the two cables 8” and cut at the centerline.
C. Remove the cable jacket and metallic shield as shown above.
D. Secure end of metallic shield with copper foil tape provided.
E. Remove semicon as shown above.
a. Carefully score the semicon with a straight, fixed blade. Do not nick or cut the insulation!
b. Apply heat to the semicon while removing strips with a pliers. Keep the semicon hot for a clean separation between the semicon and the insulation.
c. Use a round file to smooth out the semicon cut off.



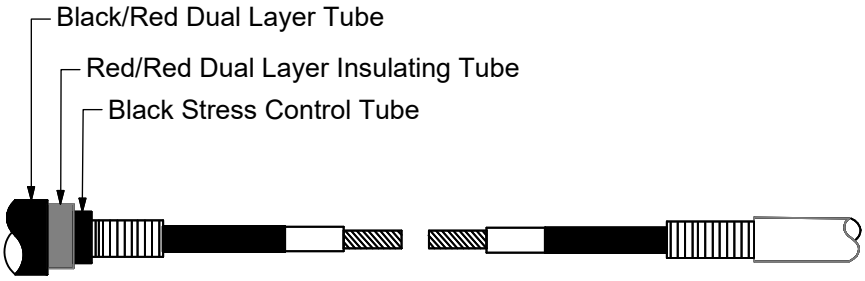
F. Remove insulation as shown above. The insulation cut backs should equal 1/2 the connector length minus 1/4"

3. ABRADE THE INSULATION AND CLEAN THE CABLES



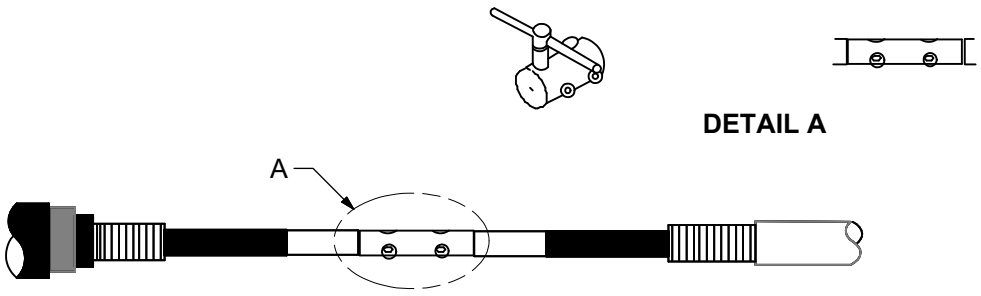
A. Abrade and clean insulation (120 Grit nonconductive sanding tape works well) to remove imbedded semicon and smooth out the surface.
B. Clean cable jacket as shown.
C. It is very important that the cable insulation is clean, smooth, and free of nicks and cuts. Damaged or dirty insulation will cause the splice to fail!

4. PLACE NESTED TUBES OVER THE CABLE



A. Protect the tubes from the end of the conductor by placing a plastic tube storage bag over one of the cable ends.
B. Slide the tubes over the plastic bag.

5. INSTALL CONNECTOR & APPLY FILLER

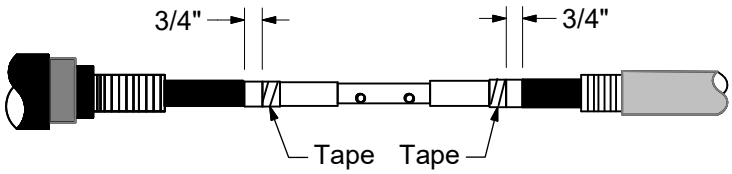


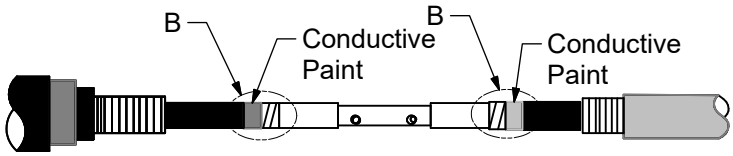
A. Fit conductors into connector so that connector ends line up with the insulation.
B. Make sure that no gaps are left between the connector and insulation.
C. “Hand tighten” each bolt. Then, using a wrench, tighten each bolt an additional 1/2 turn.
D. Continue to tighten each bolt until the head shears off.
E. Apply filler over the sheared bolts to obtain a smooth finish.

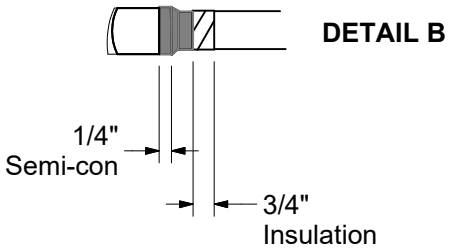
6. APPLY TAPE AND CONDUCTIVE PAINT

A. Apply tape (adhesive side up) on the insulation 3/4” from the semicon cutback. Repeat on the other cable.

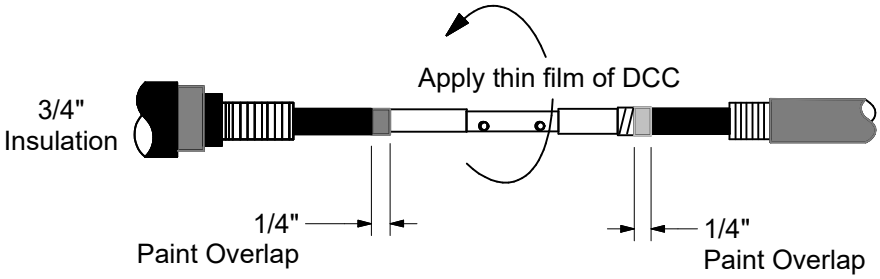
B. Shake the conductive paint bottle for 30 seconds. Apply the paint onto the 3/4” of insulation and overlap the semicon shied by 1/4”. Repeat on the other cable.





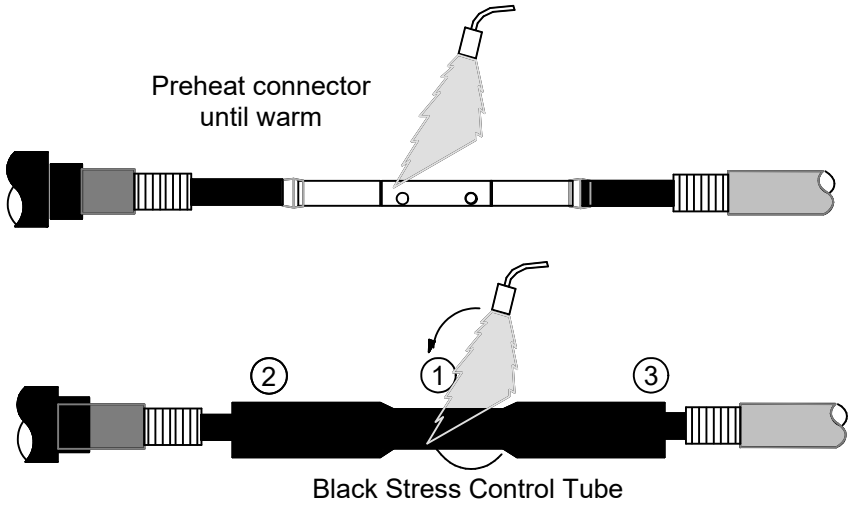


7. APPLY THE DISCHARGE CONTROL COMPOUND (DCC)



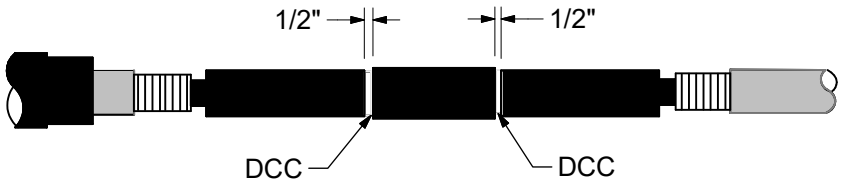
A. Apply a thin layer of DCC to the surface of the insulation and the connector. Overlap the conductive paint by 1/4”.

8. PREHEAT CONNECTOR; POSITION AND SHRINK BLACK STRESS CONTROL TUBE



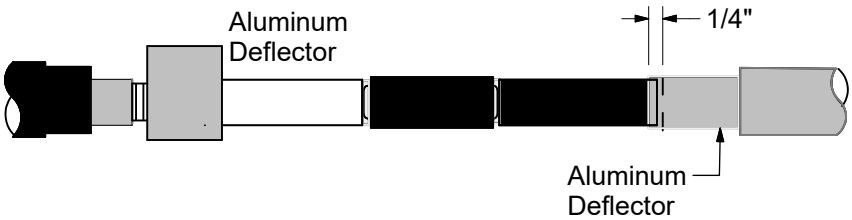
A.Preheat the connector for approximately 1 minute or until warm.
B. Center the black stress control tube over the splice.
C. Begin shrinking at the center of the tube (1). Work the torch with a smooth brushing motion around the tube.
D. After the center portion shrinks, work the torch toward one end (2) and then to the other end (3). Apply sufficient heat to ensure complete shrinkage as indicated by a smooth profile. Do not point the flame directly at the semi−con layer

9. APPLY DCC TO MATTE SURFACE



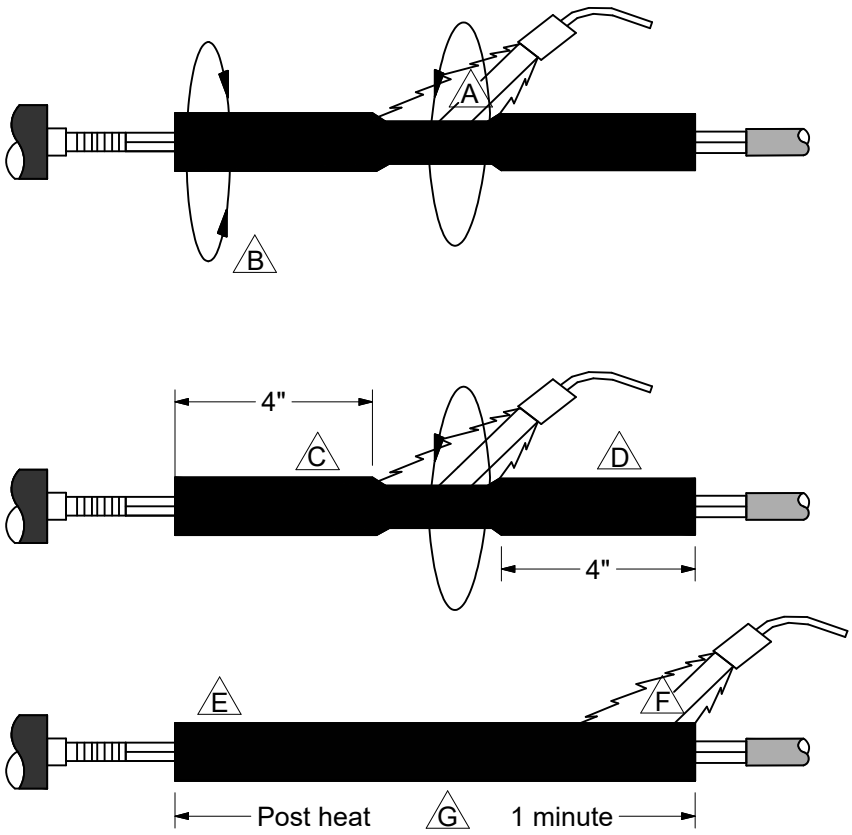
A. Apply a thin film of DCC approximately 1/2” width around the edges of the matte surface in the center of the stress control tube.

10. INSTALL ALUMINUM DEFLECTORS



A. Remove the backing and wrap the aluminum deflectors 1/4” onto the black stress control tube and over the shielding as shown.

11. POSITION THE RED/RED DUAL LAYER INSULATING TUBE AND SHRINK IN PLACE



A. Center the tube over the joint. Begin shrinking in the center of the tube. Work the torch around all sides particularly the back and underside of the tube.

B. Before continuing, gently twist the unshrunk end of the tube. Feel for resistance to movement in the center which would indicate that the center is shrunk.

C. Shrink from the center toward one end and stop about 4” from the end of the tube.

D. Return to the center and shrink toward the other end of the tube stopping 4” from the end.

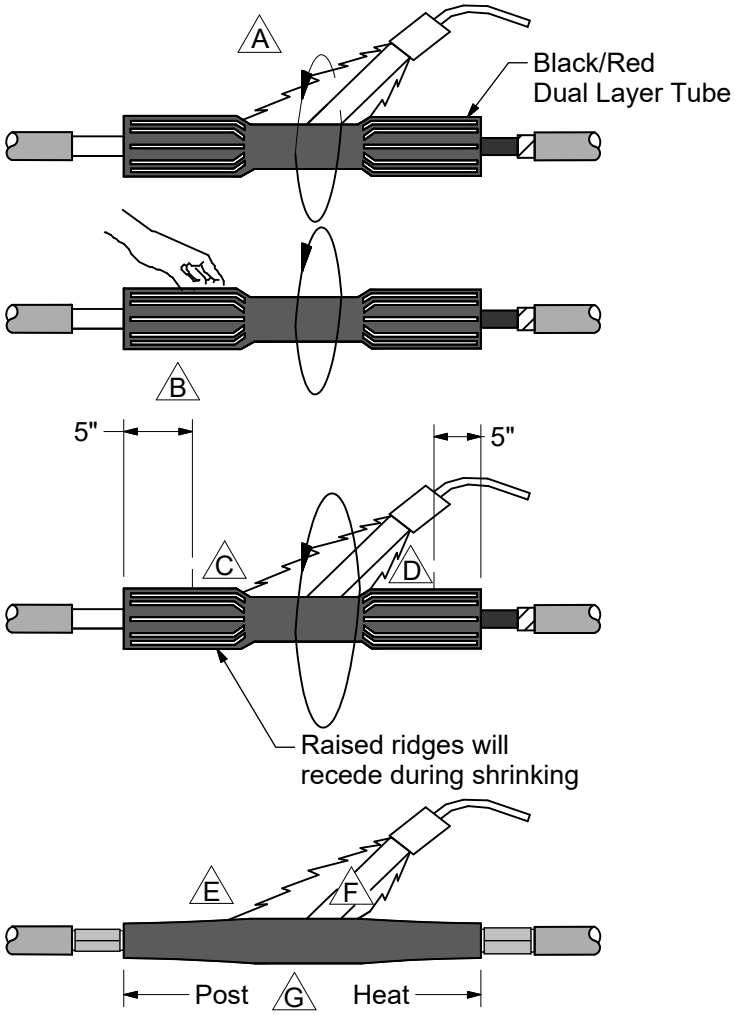
E. Go back to the first end and shrink the remaining 4” of tube.

F. Go back to the second end and shrink the remaining 4” of tube.

G. After completion of these steps, heat the entire tube for 1 minute.

H. Inspect the tube. Look for absence of raised ridges. A gloved hand may also be used to feel the surface of the tube for raised ridges. Absence of these ridges indicates a complete shrink down.

12. POSITION THE BLACK/RED DUAL LAYER TUBE AND SHRINK IN PLACE



Note: The dual layer insulating/shielding tube takes longer to shrink than previous tubes.

A. Center tube over joint. Begin shrinking in the center of the tube, working the torch around all sides of the tube.Pay particular attention to the back and underside of the tube.

B. Before continuing, gently twist the unshrunk end of the tube to feel for resistance to movement in the center indicating that the center is shrunk.

C. Shrink from the center toward one end and stop about 3” from the end of the tube.

D. Return to the center and shrink toward the other end, once again stopping about 3” from the tube end.

E. Go back to the first end and shrink the remaining 3” of the tube.

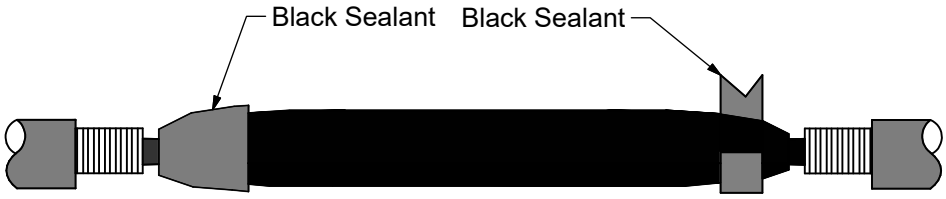
F. Go back to the second end and shrink the remaining 3” of the tube.

G. After completing these steps, heat the entire tube for about 1 minute.

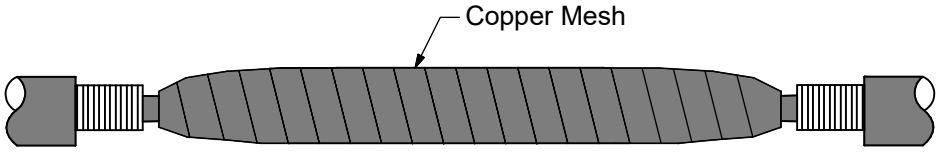
H. Inspect the tube. Look for the absence of raised ridges. A gloved hand may also be used to feel the surface of the tube for raised ridges. Absence of these ridges indicates a complete shrink down.

I. Remove the aluminum deflectors from the cables.

13. INSTALL SEALANT AND MESH

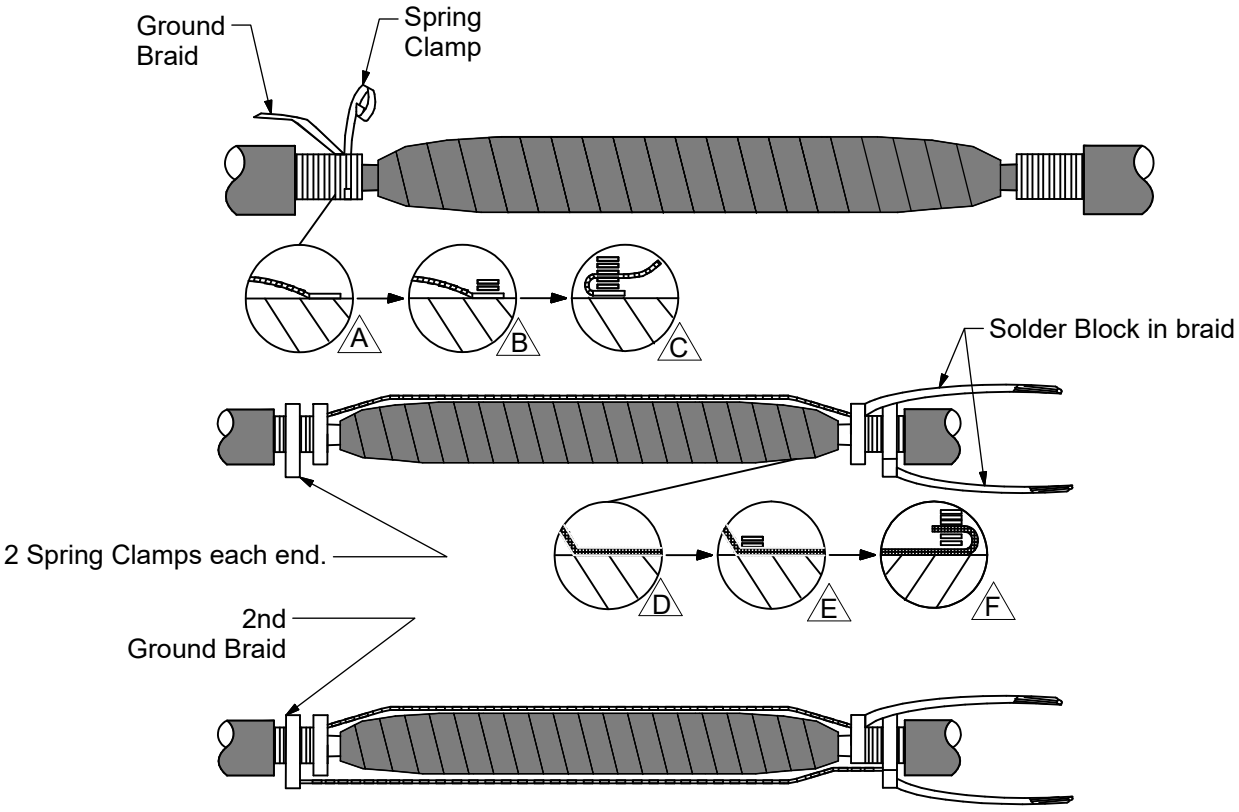


A. Remove the backing strips from the black sealant.
B. Apply the sealant to smooth out the steps at the sleeve ends as shown above.
C. Apply the sealant onto the semicon being careful not to overlap onto the metallic shields.



D. Wrap a half lapped layer of copper mesh across the splice butted up to the metallic shield on both sides and tie off.

14. INSTALL AND CONNECT GROUNDING
(External Grounding with 2#2 AWG Solder Blocked Braids, Without Shield Break)



A. Position the solder blocked portion of the braid at the end of the jacket on either side of the splice with the short covered portion positioned away from the splice. Repeat with the second braid. Use tape to hold the braids in place.

REV	DATE	ENG	DESCRIPTION
2	01/01/23	EJB	Converted to new format
1	10/01/10	EJB	

B. Use the heavy duty constant tension clamps to attach the 2 braids to the metallic shield. Make two wraps of spring clamp over the braid.

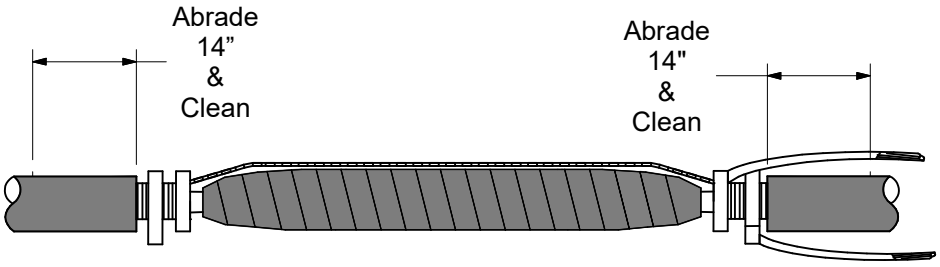
C. Fold the braids back over the spring clamps. Continue to wrap the remaining clamp over the braid. Tighten the clamp by twisting it in the direction it is wrapped and secure with copper foil tape.

D. Lay the braids across the splice tube and onto the metal shield on the other side of the splice.

E. For each braid, make two wraps of each clamp over the braid.

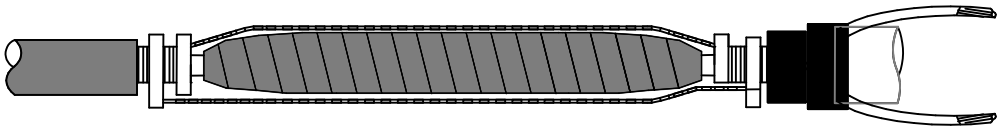
F. Fold the braids back toward the splice and finish wrapping the clamp. Tighten and secure each braid. Cut off excess braid. The second ground braid should be placed opposite the first ground braid and the second set of spring clamps installed outside of the first set of spring clamps and over the metallic shield.

15. CLEAN AND ABRADE CABLE JACKETS



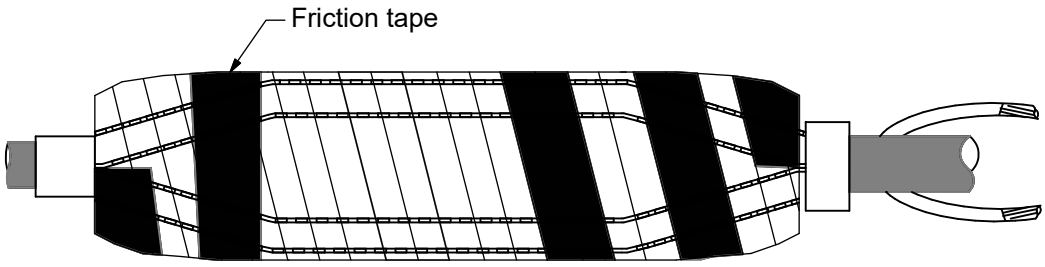
A. Abrade the cable jackets and clean with an approved solvent.

16. APPLY THE BLACK SEALANT



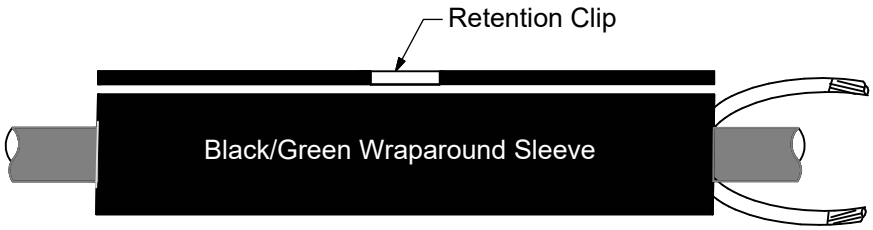
A. Apply one wrap of black sealant starting at the jacket cutbacks around both cable jackets.
B. On the external braid end apply a second one wrap layer of sealant next to the first one on the cable jacket. Push the solder blocks and covered braid ends into the sealant.
C. Wrap one more layer of black sealant over the top of the first two layers to encapsulate the solder blocks and the covered external braid ends.

17. APPLY FRICTION TAPE



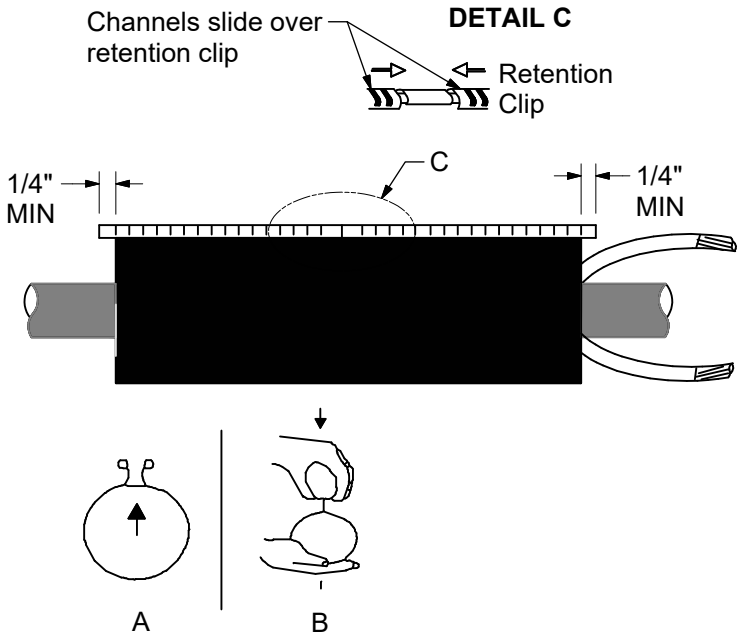
A. Apply a wrap of friction tape to hold the ground braids in position.
B. Tape down external braid ends.
C. Tape over all sharp points.

18. POSITION OUTER WRAP AROUND SLEEVE



A. Remove the backing from the wrap around sealing sleeve and center the sleeve over the splice.
B. Slide the metal retention clip onto the butted rails and position in the center of the sleeve.

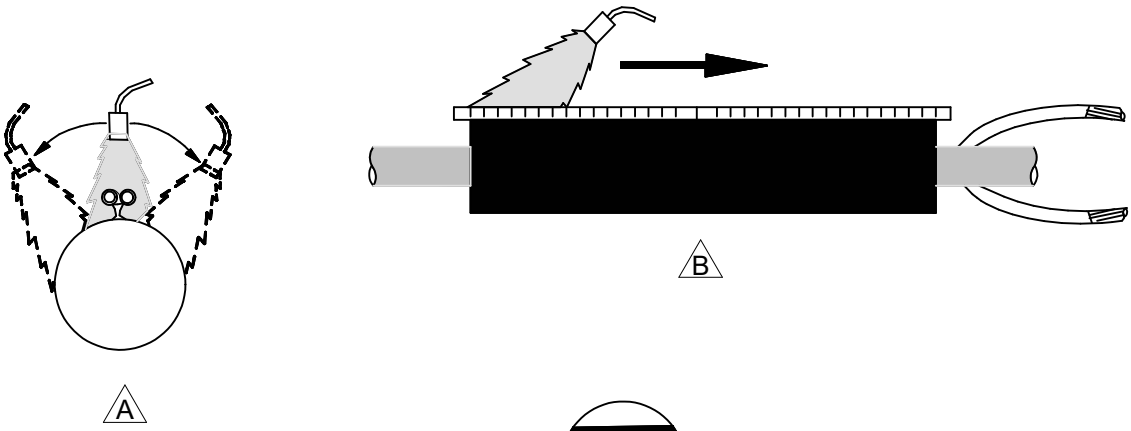
19. INSTALL THE CHANNELS

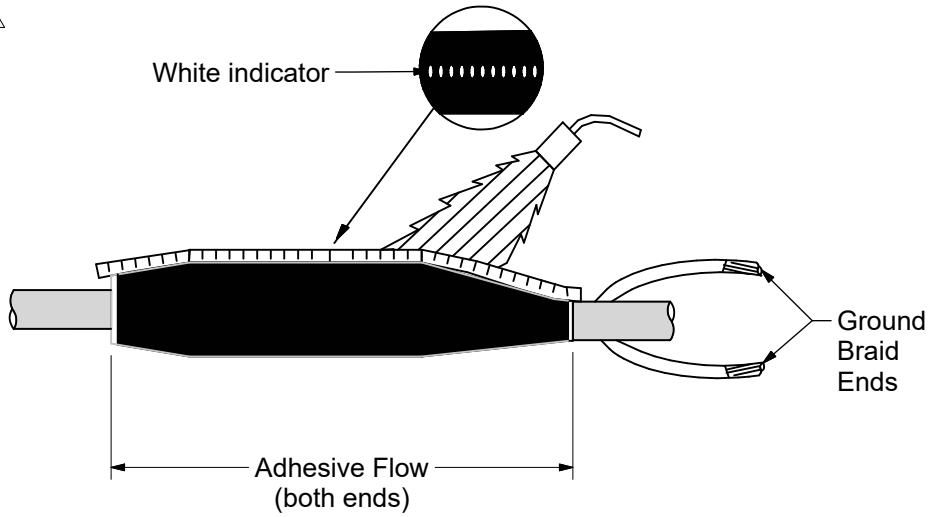


A. Slide the channels onto the rail.
B. Connect the channels by having them overlap the retention clip as shown. (Channels must overlap the edge of the wrap around sleeve by 1/4” minimum.

C. If the channels fit tight make sure that the sleeve flap is not pinched between the rails (A).
D. Push the sleeve up from the bottom and down from the top while sliding the channels onto the sleeve (B). This keeps the channels from binding

20. SHRINK THE WRAP AROUND SLEEVE





A. Preheat evenly along both sides of the rail/channel area until this area begins to shrink.

B. In order to achieve a uniform heating, move the flame back and forth from one side of the channel to the other (A) while also moving the flame along the entire length of the channel (B) until the sleeve starts to shrink.

C. Begin shrinking at the center of the sleeve and work toward each end.

D. Apply heat until the sleeve is fully shrunk and the heat sensitive green paint is completely converted to black.

E. Continue heating the rail/channel area for another 5 seconds per foot. A white line should be visible in the channel gaps indicating sufficient heating.

F. This completes the splice.

G. Connect external ground braid ends into ground rods or ground bond wire using ground clamps or two bolt clamps and covering the connections with plastic tape.

H. Allow the splice to cool before moving it or placing it in service.

DCS #	DESCRIPTION
41 54 30 01	750 kcmil, AL, 69kV Cable
41 54 30 02	500 kcmil, AL, 69kV Cable
41 54 30 03	1000 kcmil, CU, 69kV Cable

	ITEM	STK / DCS #	DESCRIPTION	01	02	03
	A	17 05 313	Splice - 500-750 kcmil, 69kV	1	1	-
		17 05 538	Splice - 1000 kcmil, 69kV	-	-	1
	B	17 54 378	Connector, Shearing Screw, 750 kcmil AL/CU	1	-	-
		17 54 379	Connector, Shearing Screw, 500 kcmil AL/CU	-	1	-
		17 54 971	Connector, Shearing Screw, 1000 kcmil AL/CU	-	-	1
	C	25 53 055	Tape - Plastic (RL)	1	1	1
	D	25 53 027	Tape - Friction, 1 1/2" Wide (RL)	2	2	2
@	E	17 54 140	Connector - Two Bolt	2	2	2
@	F	17 52 032	Clamp - Ground Rod, Cast Bronze	2	2	2
@	G	18 54 027	Wire - 2 Cu.	#	#	#

REV	DATE	ENG	DESCRIPTION
2	01/01/23	EJB	Converted to new format
1	10/01/10	EJB	

INSTRUCTIONS:

1. Prepare the Cables and Apply the Copper Mesh as Shown in Figure 1.

   A. The copper mesh installation requirements, for each jacketed cable type, are shown in Figure 1. If bare concentric neutral cable must be spliced, go to Step "1" for cable preparation instructions.
   B. Wrap the copper mesh around the cable so that it is located in the 1−1/2" metallic shield area as shown. The copper mesh should be pulled tight around the cable and tied off. After tying off the copper mesh, cut it so that only a very short tail remains.
   C. Use Stock #22 05 213 or the aluminum oxide strip included in the splice kit to abrade/scuff tcable jacket, see Figure 1.

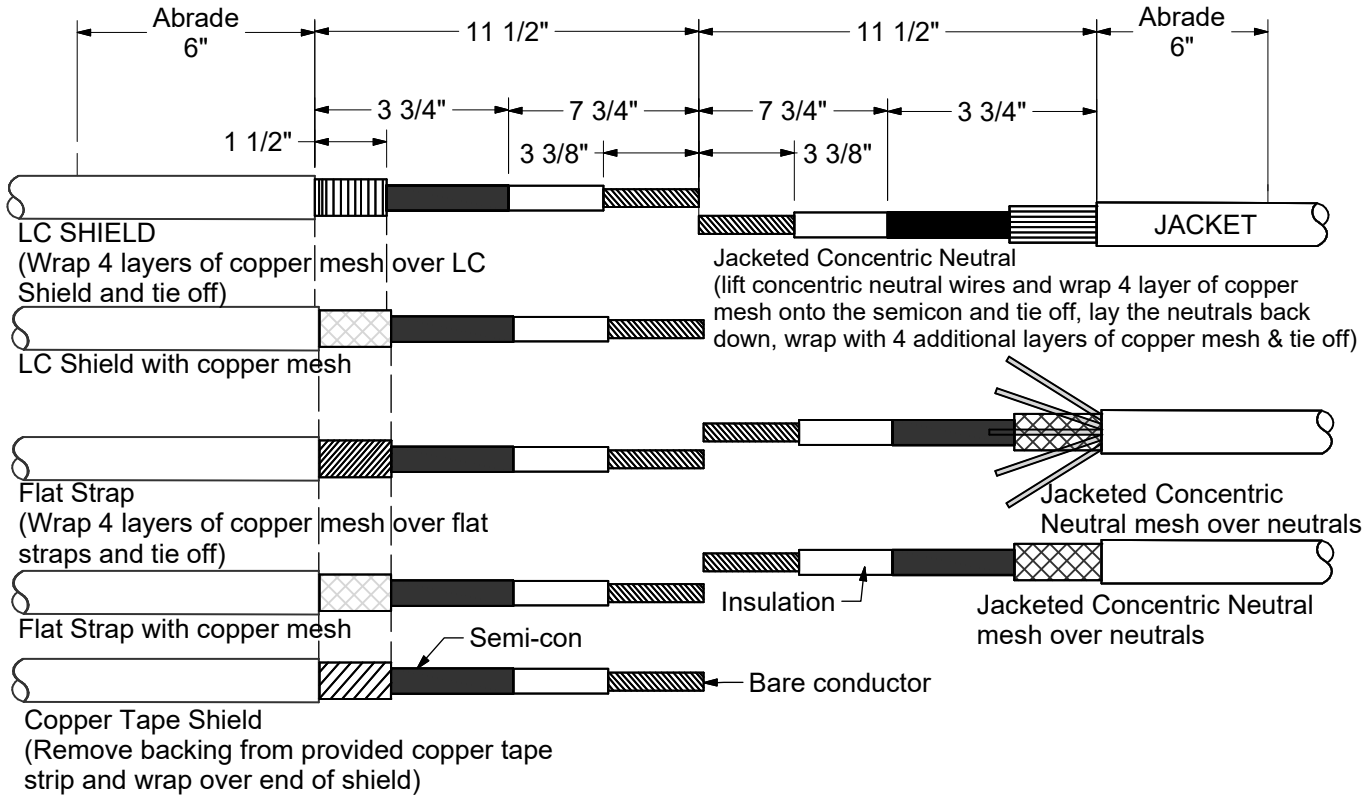
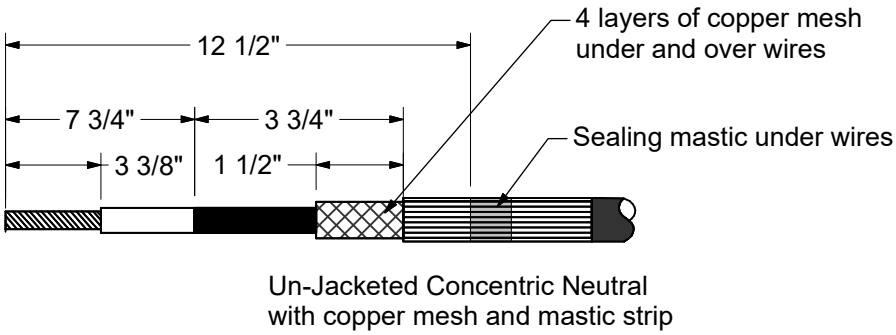


Figure 1

Initial when Step 1 is complete. _____

1A Prepare Bare Concentric Neutral Cables

A. Bare concentric neutral cable will be prepared using the dimensions shown in Figure 2.



Un-Jacketed Concentric Neutral
with copper mesh and mastic strip

Figure 2

A. After preparing the BCN cable as shown in Figure 2, carefully lift the bare concentric neutral wires and clean the underlying semicon.

B. Wrap a strip of the gray sealing mastic under the concentric neutral wires. Place the mastic strip 12 1/2” from the end of the cable.

D. While the concentric neutral wires are still lifted, wrap four layers of copper mesh around the cable and tie off the end. The copper mesh wrap must start 10” from the end of the cable and end 11 1/2” from the end of the cable.

E. Lay the concentric neutral wires back down over the semicon, making sure the ends of the concentric neutral wires align with the edge of the copper mesh. Press the concentric neutral wires into the sealing mastic.

F. Apply four additional wraps of copper mesh over the concentric neutral wires and tie off. Verify that the installed copper mesh provides a 1 1/2” connection area at the ends of the concentric neutral wires.

Initial when Step 1A is complete. _____

2. Place Splice Body Over Cleaned Cable

A. Clean 30” of cable jacket on the cable where the splice body will be placed or stored prior to making the shearbolt connection.
B. Slide the splice body over the cable end so that the holdout core release strip points toward the cable end.
C. Figure 3 shows the placement of the splice body on the cable. Also shown in Figure 3 is the optional use of the plastic bag supplied with the splice body to cover the cable to maintain cleanliness.

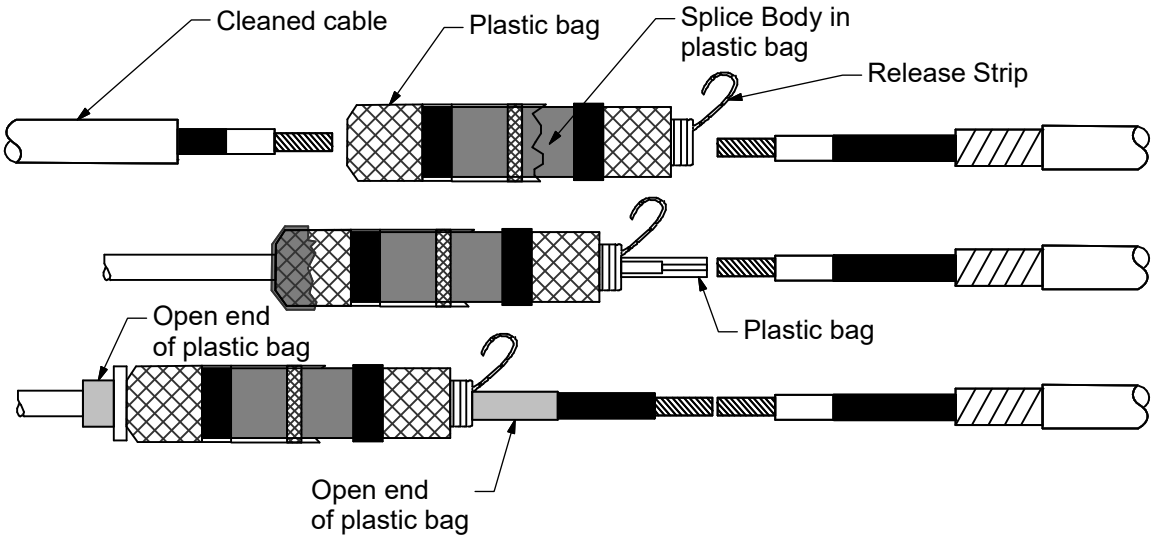


Figure 3

Initial when Step 2 is complete. _____

3. Install Shearbolt Connector

A. Before shearing bolts, confirm that the dimension between semi con cutbacks is between 15 ½” and 16 ¼” for proper placement of the splice body. See Figure 4.
B. Use the small wire brush included in the kit to clean the surface of the aluminum conductor before placing the conductor into the connector.
C. If the conductor is larger than 400 kcmil, don't use the inserts in the connector.
D. Insert the cable conductor into the connector until it butts up with the centerstop of the connector.
E. Tighten the shear bolts by hand until they are snug against the conductor. Complete the installation by tightening and shearing the bolts in the sequence shown in Figure 4. Use an 8mm hex socket (85-32-776). Install the plastic caps over the shear bolt holes.

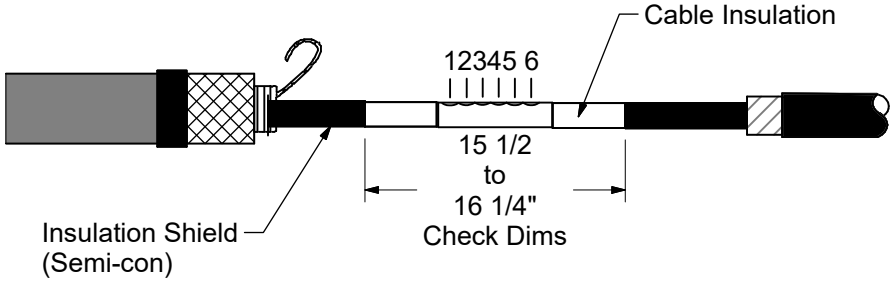


Figure 4

Initial when Step 3 is complete. _____

REV	DATE	ENG	DESCRIPTION
1	01/01/23	EJB	Converted to new format
	xx/xx/xx	EJB	

4. Clean Cable and Install Marking Tape
   A. CLEAN AND DEGREASE THE CONNECTOR AREA (REMOVE ALL EXCESS INHIBITOR).
   A. CLEAN THE CABLE INSULATION. WHEN CLEANING THE INSULATION, ALWAYS WIPE TOWARD THE SEMI-CON.

   C. Install several turns of marking tape onto the cable semicon 9 ¼" from the center of the connector as shown in Figure 5. This tape will be used as a guide for positioning the splice body. The marking tape is to be installed on the same cable that the splice body is on.

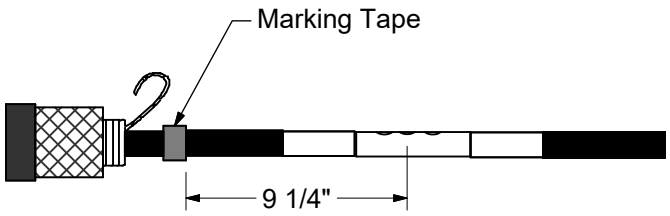


Figure 5

Initial when Step 4 is complete. _____

5. Lubrication

   A. Put on the glove provided in the kit and then use the gloved hand to lubricate the cable insulation up to the semicon cutback and marking tape with the supplied DISCHARGE CONTROL COMPOUND (DCC). Be sure to use extra DCC to form a bead around the semicon cutbacks on each cable. See Figure 6 for areas to lubricate.
   B. USE ALL OF THE DCC SUPPLIED IN THE KIT TO HELP FILL VOIDS. DO NOT USE STANDARD SILICONE GREASE.

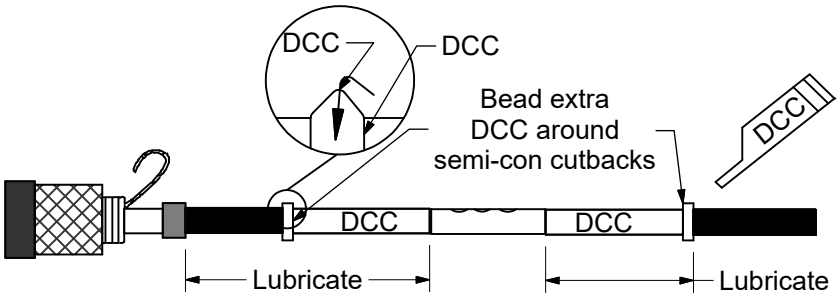


Figure 6

Initial when Step 5 is complete. _____

6. Installation of Splice Body

A. If the optional plastic bag was used in Step 2 to maintain cleanliness, it should now be removed.
B. Position the splice body so that the silicone splice body's transparent edge is aligned with the edge of the marking tape. It is important that the splice body remain aligned with the marking tape while the spiral holdout is removed.
C. Remove the spiral holdout (core) by pulling the release strip counterclockwise while holding the splice body in place. The spiral holdout cannot be pulled out all at once. Slowly pull the spiral holdout on top of the cable and then pass it around and underneath the cable until the spiral holdout has been completely removed. Once the splice is partially shrunk adjacent to the marking tape, there is no need to hold the splice. Use two hands at this point to remove the remaining spiral holdout. (See Figure 7.
D. Remove the marking tape.

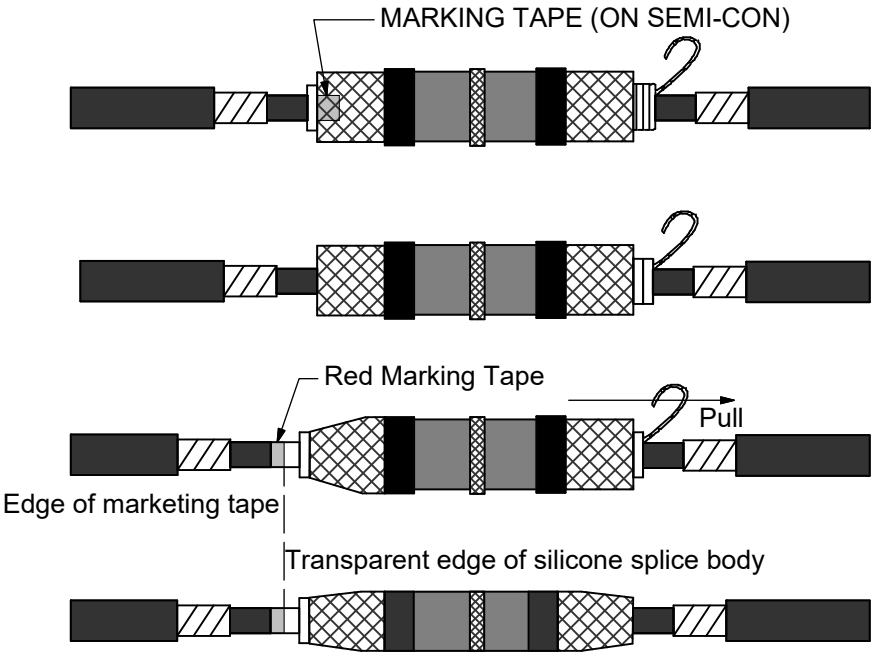


Figure 7

Initial when Step 6 is complete. _____

7. Straighten Out Mesh Sock Wires, Install Spring Clamps & Tape

A. IF AN EXTERNAL GROUND CONNECTION IS REQUIRED, PROCEED TO STEP 8.
B. USE THE SMALL SPRING CLAMP “F” FOR 15 KV CABLES UP TO AND INCLUDING 500 KCMIL AND 1/0 35 KV. FOR ALL OTHERS, USE THE LARGE SPRING CLAMP “G”.
C. Remove the black tape holding the ends of the mesh sock wires on the splice body. If a knife is used to cut the tape, take care not to damage the underlying rejacketing material.
D. Straighten the mesh sock wires out over the previously installed copper mesh tape. Install two turns of the spring clamp over the mesh sock and the mesh tape covering the cable metallic shield. After two turns are installed, fold the mesh sock back over the spring clamp and continue to install the remaining turns on the spring clamp over the mesh sock.
E. Secure the spring clamp with three wraps of vinyl tape (Stk. # 2553055) wrapped in the same direction as the spring clamp. Continue taping over the ends of the mesh to cover all sharp points. Follow the above steps to complete the other side. See Figure 8.

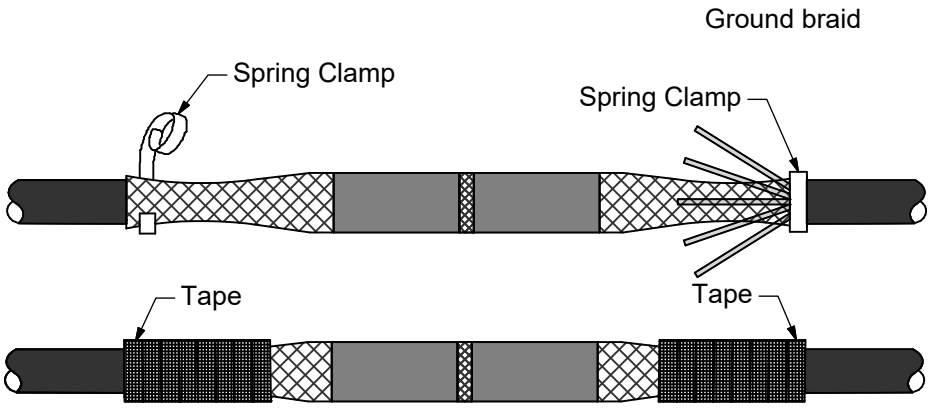


Figure 8

Initial when Step 7 is complete. _____

8. Installation of Wraparound Ground Braid Used for External Ground Connection Optional

A. Straighten the mesh sock wires out over the previously installed copper mesh. Fold the edges of the mesh sock back toward the center of the splice end where the ground braid will be installed. If the edges of the mesh sock are very long, they may be secured with vinyl tape.
B. Select one of the three mastic strips from the grounding kit (Stk. # 1754306). Remove liners and wrap the mastic around the cable jacket, ½" from the cut edge. Discard any excess mastic from the piece.
C. Position the twin preformed ground braid over the folded back mesh sock with one tail along the cable jacket. Verify that the ground braid is positioned over the 1 ½" area where the cable metallic shield and copper mesh tape are located. Press one tail of the preformed ground braid into the previously applied mastic and secure the tail to the cable jacket with vinyl tape,1 ½" from the edge of the jacket. Additional wraps of vinyl tape can be used along the length of the tail to hold it into place.
D. Wrap the braid around the mesh sock and metallic shield of the cable. Secure the ground braid with a spring clamp from the splice kit. Use the small spring clamp "F" for 15 kV cable up to and including 500 kcmil and 1/0 35 kV. For all others, use the large spring clamp "G". Wrap the spring in the same direction as the braid and tighten the final lap.
E. Position the second tail of the preformed ground braid along the cable and secure the tail to the cable with vinyl tape.Press the second tail into the previously applied mastic strip.
F. Apply a second mastic strip layer over the braid tails. The second mastic strip must be positioned so that it overlays the previously installed mastic strip. Press the two mastic strips together to form a water tight seal around the ground braid tails.
G. Secure the spring clamp with three wraps of vinyl tape (Stk. # 25 53 055) wrapped in the same direction as the spring clamp. Continue taping over the ends of the mesh to cover all sharp points.
H. Connect the other end of the mesh sock as detailed in Step 7. See Figure 9.

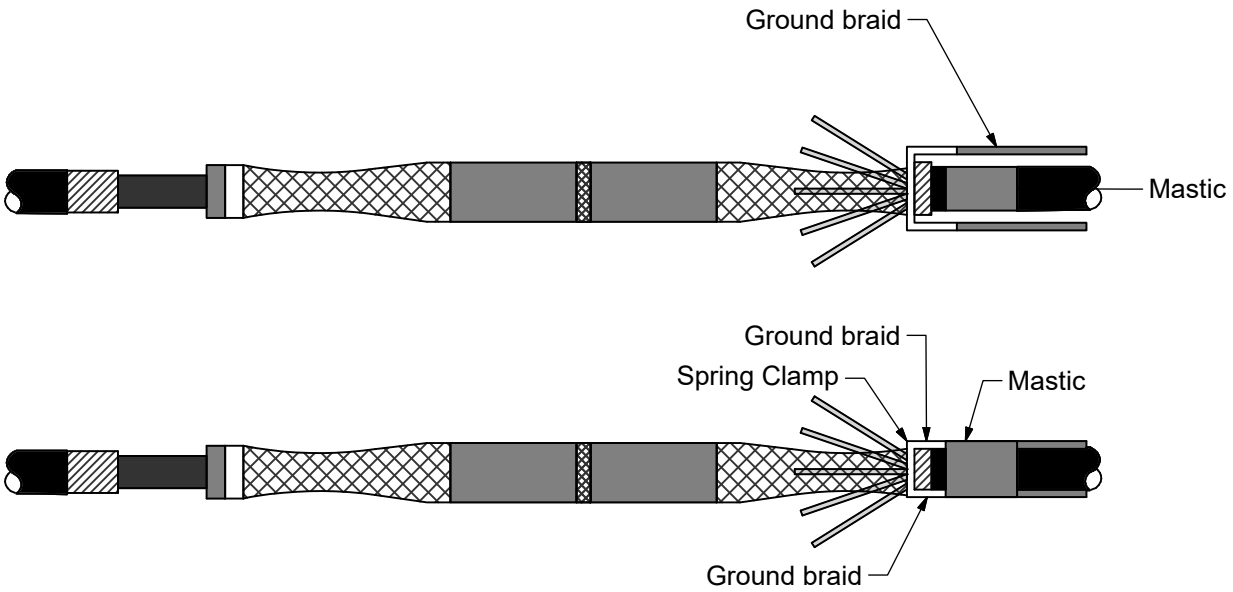


Figure 9

Initial when Step 8 is complete. _____

REV	DATE	ENG	DESCRIPTION
1	01/01/23	EJB	Converted to new format
	xx/xx/xx	EJB	

9. Expand Re−Jacketing Sleeve

   A. Install a strip of gray sealing mastic at each jacket cutback. Be sure that mastic has been applied under and over the tails of the external ground braid if one is installed. If Bare Concentric Neutral cable is being spliced, be sure to apply a strip of gray sealing mastic over the strip that was applied under the concentric neutral wires in Step 1.1.
   B. Wipe off the black rejacketing sleeve to allow for a positive grip on the sleeve. Twist the black rejacketing sleeve from side to side to release the lubricating grease. Slide one side of the rejacketing sleeve over the mesh sock and spring clamp connector and onto the cable jacket. Repeat this step on the other side.
   C. Cut off the red mesh sleeve, being careful not to damage the rejacketing sleeve or the splice body.
   D. Using approved solvent, clean the surface to the rejacketing sleeve to remove excess grease.
   E. Wrap four layers of vinyl tape (Stk. # 25 53 055) over each end of the rejacketing sleeve. The tape is not being applied to seal the rejacketing sleeve. The vinyl tape is being applied to finish the ends of the rejacketing sleeve. See Figure 10.

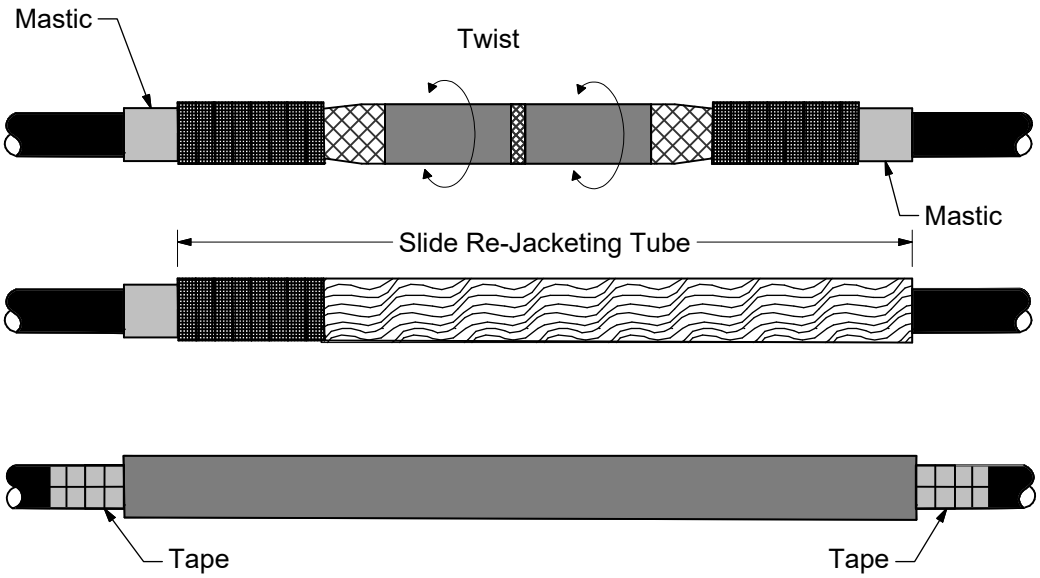


Figure 10

Initial when Step 9 is complete. _____

10. Connect Ground Braid to System Ground (Only if External Ground Braid was Installed in Step 8)

A. Connect the external ground braid ends to the system ground with a 2−bolt connector (Stock #17 54 140) and a #2 copper wire (Stock #18 54 027).
B. Seal the 2-bolt connection with poly sealer (Stock #31 53 055). Tape over poly sealer with vinyl tape (Stock #25 53 055). See Figure 11.

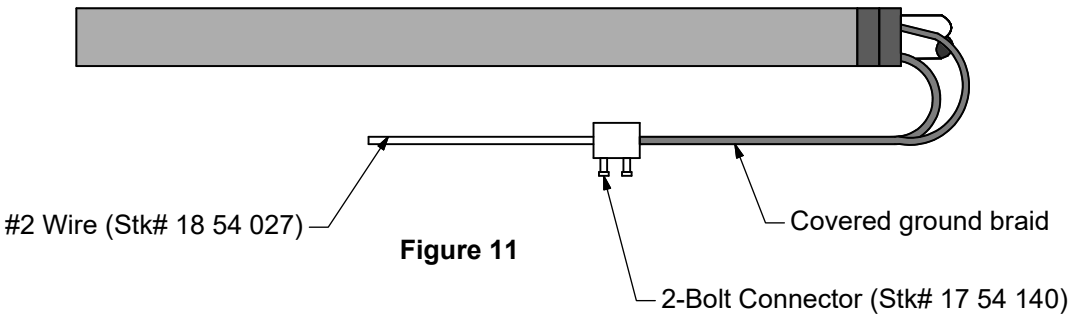


Figure 11

Initial when Step 10 is complete. _____

	ITEM	STK / DCS #	DESCRIPTION	00
	A	17 05 500	Splice - 350-750 kcmil Cu/AL, 15/35 kV	1
	B	25 53 055	Tape - Vinyl	1
@	C	17 54 306	Connector - Cable Ground w/Constant Force Spring	1
@	D	17 54 140	Connector - Wire, #8-4/0 Cu, 2-Bolt	1
@	E	31 53 055	Compound - Sealer	1

UNDERGROUND CABLE TERMINATION 42

#2 - 4/0 AWG CABLE TERMINATOR INDOOR - OUTDOOR, 15kV..... 42 34 59 **

350 kcmil - 1000 kcmil CABLE TERMINATOR AL/CU JACKETED OR NON-JACKETED (INDOOR-OUTDOOR), 15kV..... 42 34 61 **

#2, 1/0, AND 4/0 AWG STANDARD, REPAIR, AND FUSED LOADBREAK ELBOW, 15kV..... 42 34 62 **

#2 AWG - 4/0 AWG CABLE TERMINATOR (INDOOR USE ONLY), 15kV..... 42 34 63 **

4/0 AWG - 750 kcmil CABLE 600 AMP DEADBREAK ELBOW, 15kV..... 42 34 64 **

4/0 AWG, 350 kcmil, & 750 kcmil CABLE 600 AMP DEAD-BREAK ELBOW WITH BALL GROUND, 15kV..... 42 34 65 **

1/0 AWG - 750 kcmil CABLE TERMINATOR AL/CU JACKETED OR NON-JACKETED (INDOOR-OUTDOOR), 35kV..... 42 44 12 **

1/0 AWG - 750 kcmil CABLE 600 AMP DEADBREAK ELBOW, 35kV..... 42 44 13 **

350 kcmil - 1000 kcmil CABLE TERMINATOR COLD - SHRINKABLE, 69kV..... 42 54 11 **

INSTRUCTIONS

1. Train the cable into position and cut to required length. For all installations allow sufficient neutral wire length beyond the finished cable end for proper grounding connection.

2. Prepare the cable using the dimensions shown in Figure 1. Be sure to check the lug or pin terminal connector being used to determine the insert depth "X". Provide an additional 1/4" of exposed conductor to allow for growth of the aluminum lug or connector during crimping.

   All measurements should be made from the jacket cutback.

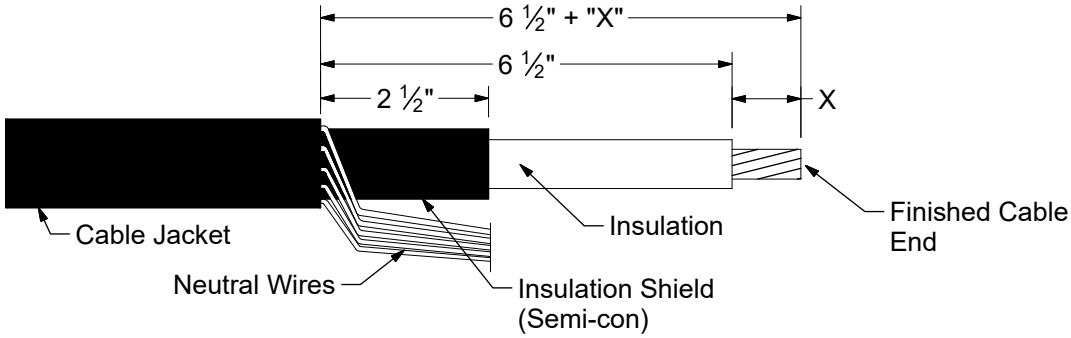


Figure 1

3. Select one of the mastic strips from the kit and remove the white release liners. Using light tension apply a single wrap of mastic around the cable jacket 1/4" from the edge. Cut off excess mastic. See Figure 2.

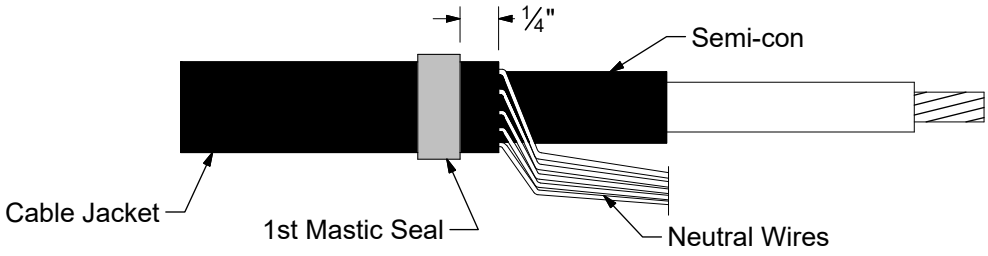


Figure 2

4. Bend neutral wires back over applied mastic, secure the wires to the cable jacket with vinyl tape. The tape should be placed a distance of 4-1/2" from the edge of the semi-con. See Figure 3. NOTE: The vinyl tape serves as a marker tape, so position carefully.

5. Select a second mastic strip from the kit and remove the white release liners. Apply a second single wrap of mastic over the neutral wires and the previously applied mastic. Cut off excess. See Figure 3.

6. Compress the neutral wires into the mastic. Over-wrap the mastic strips with two highly stretched layers of vinyl tape. Be sure that all exposed mastic is covered. See Figure 3.

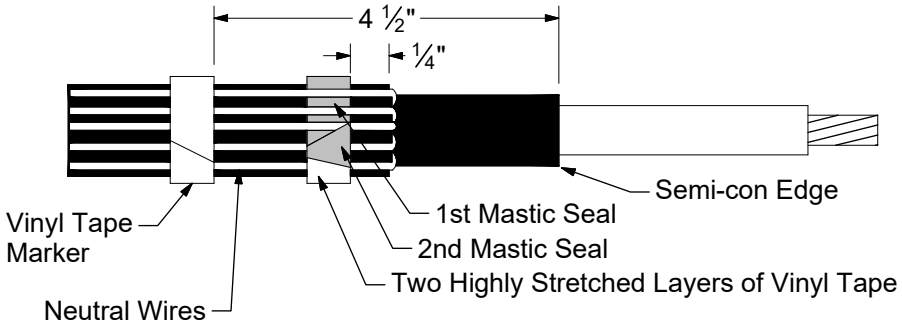


Figure 3

7. Clean the cable insulation.

8. Remove the red support core from the terminator and slide the terminator onto the cable. The terminator must be positioned beyond the exposed conductor to allow installation of the lug or pin connector. See Figure 4.

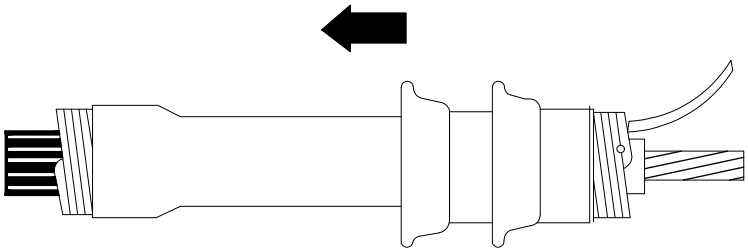


Figure 4

9. Install either the lug or pin terminal connector using the Y-35 tool with a U25ART die for #2 or 1/0 and a U249 or U28ART die for 4/0. Crimp as many times as possible without overlap. Remove excess oxide inhibitor and sharp crimp flashing. See Figure 5.

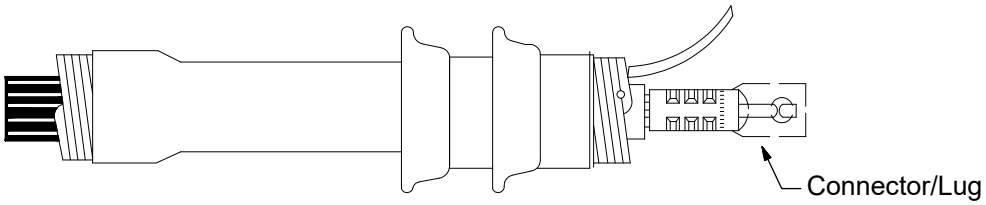


Figure 5

10. Re-position the terminator body on the cable and remove the core. Make sure the terminator body (not the core) is butted up to the edge of the vinyl marker tape. While removing the core, unwind it in a counter-clockwise direction. See Figure 6.

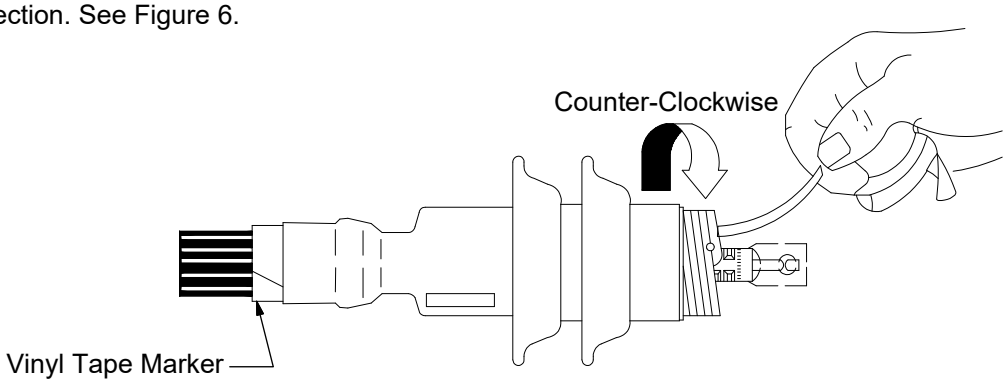


Figure 6

Once the terminator has made contact over the mastic seal area, there is no need to continue supporting the assembly. Do not push or pull on the terminator while unwinding the core.

11. When using a short barrel lug/connector on small cable, it may be necessary to trim excess terminator insulation from the lug or connector.

12. Collect all neutral wires together and connect to system ground. See Figure 7.

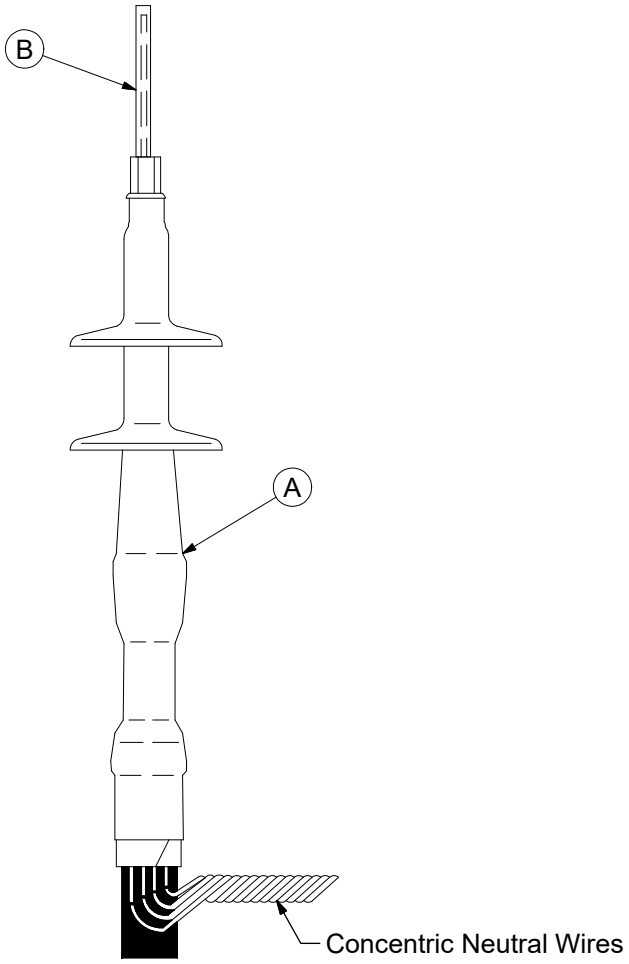


Figure 7

DCS #	CABLE SIZE	CONNECTION
42 34 59 01	#2 AWG	Pin Terminal
42 34 59 02	#2 AWG	2 Hole Lug
42 34 59 05	1/0 AWG	Pin Terminal
42 34 59 06	1/0 AWG	2 Hole Lug
42 34 59 03	4/0 AWG	Pin Terminal
42 34 59 04	4/0 AWG	2 Hole Lug

ITEM	STK / DCS #	DESCRIPTION 42 34 59 **	01	02	03	04	05	06
A	17 07 145	Termination, Cable, 15kV, Indoor or Outdoor, #2 − 4/0	1	1	1	1	1	1
B	17 54 232	Connector, Cable Pin Terminal #2	1	-	-	-	-	-
	17 55 257	Lug, Compression, #2	-	1	-	-	-	-
	17 54 357	Connector, Cable Pin Terminal 1/0	-	-	-	-	1	-
	17 55 456	Lug, Compression 1/0	-	-	-	-	-	1
	17 54 233	Connector, Cable Pin Terminal 4/0	-	-	1	-	-	-
	17 55 256	Lug, Compression, 4/0	-	-	-	1	-	-

INSTRUCTIONS - Cable With Concentric Neutral Wires or Flat Strap Neutral

1. Train cable into position and cut to required length. Strip the cable to the dimensions shown in Figure 1. Check the lug being used to determine insert depth ”X”. Provide an additional 1/2” of exposed conductor on 500 kcmil and smaller cables and 3/4” of exposed conductor on 750 kcmil cables. This will accommodate growth during crimping of aluminum lugs. If a shearhead bolt lug is used, additional exposed conductor is not required.

2. Allow sufficient neutral wire length to make ground connections.

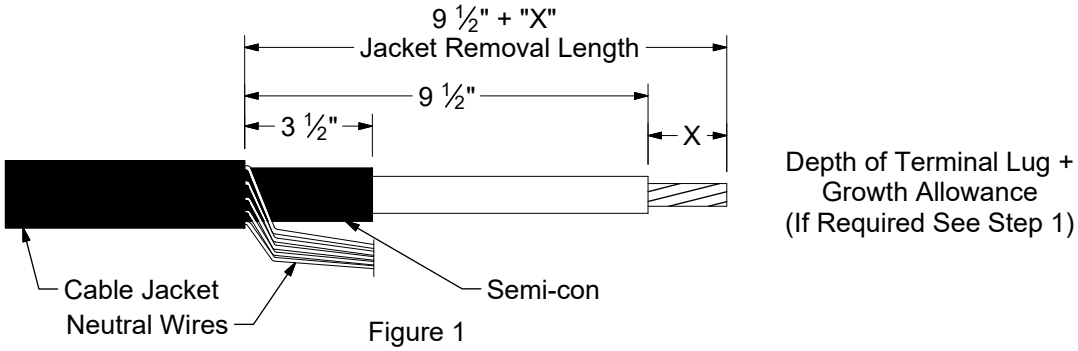


Figure 1

3. Select one of the two mastic strips from the kit and remove white release liners. Using light tension apply a single wrap of mastic around the cable jacket 1/4” from the cut edge. Cut off excess mastic. See Figure 2.

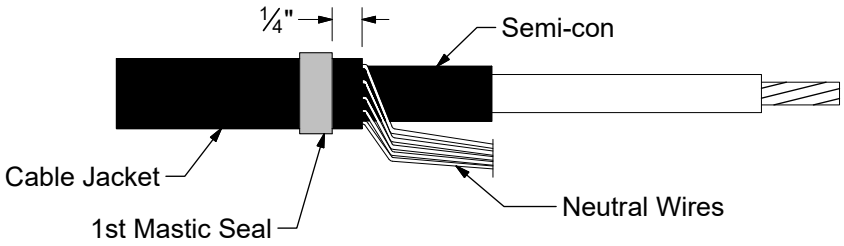


Figure 2

4. Bend neutral wires back over applied mastic and secure to cable jacket 4-1/2” from the edge of the semi-con. Use vinyl tape to secure the wires. This tape will also be used to position the terminator, so the location is critical. See Figure 3.

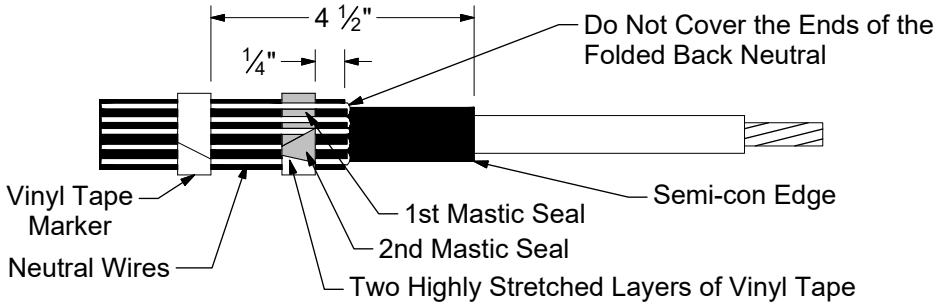


Figure 3

5. Select the second mastic strip from the kit and remove the white release liners. Apply a second mastic band over the neutral wires and the previously applied mastic strip. Cut off excess. See Figure 3. Compress the neutral wires into the mastic by over-wrapping the strips with two highly stretched layers of vinyl tape. Be sure to cover all exposed mastic. See Figure 3.

6. Remove the red support core from the terminator. Verify that the terminator body will fit over the lug being used. If the lug will not fit through the core, clean the insulation and slide the terminator onto the cable before installing the lug. Do not remove the core at this time.

7. Use a stainless steel wire brush to clean the exposed aluminum conductor. Position and install 750 kcmil copper lugs, using a L39RT die. For 750 kcmil aluminum lugs, use a U608 die. For 500 kcmil aluminum lugs, use a U34ART die. For 350 kcmil copper lugs, use a U31RT die. For1000 kcmil copper lugs, use a P44RT die. After the lug is installed remove excess oxide inhibitor and all sharp crimp flashing. The shearhead bolt lug (Stock #17 55 804) may be used instead of the 350 kcmil through 750 kcmil copper and aluminum compression lugs.

   Shearhead Bolt Lug Installation Instructions.

   A. Battery powered impact wrench with a 7/8" hexagonal socket should be used to install shearhead bolt lugs.

   B. Remove the insert from the lug body if the conductor to be installed is greater than 600 kcmil compact stranded.

   C. Back out all bolts to give clearance for the conductor - DO NOT completely remove the bolts from the connector body.

   D. Insert the cleaned conductor into the lug. There should be no gap between the insulation and lug body.

   E. Hand tighten the bolts to firmly grip the conductor. Use the tightening sequence shown in Figure 4 to tighten the bolts one-and-a-half turns. Bolts should remain un-sheared.

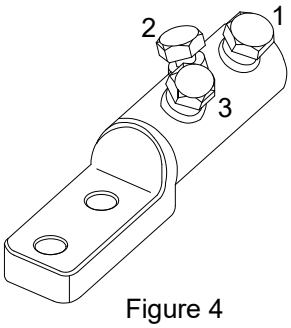


Figure 4

   F. Repeat the sequence in step “E” tightening each bolt until the head shears off. DO NOT bend the conductor while shearing the bolts.

   G. Smooth any sharp edges of protruding bolts with the abrasive provided. Clean the connector to remove particles and excess inhibitor.

8. Position the terminator body on the cable. The base of the terminator body (not the core), must be butted up to the edge of the vinyl marker tape. Remove the core while unwinding in a counterclockwise direction. Once the terminator body has made contact over the mastic seal area, there is no need to continue supporting the assembly. DO NOT push or pull the terminator while unwinding the core. See Figure 5.

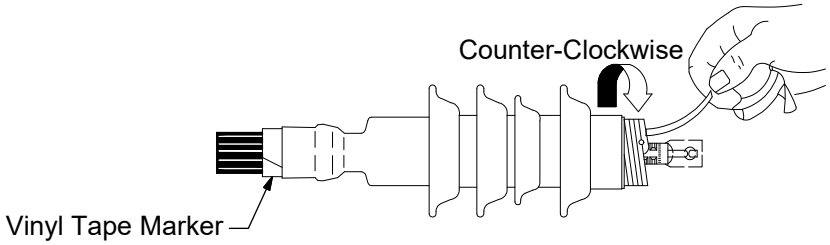


Figure 5

9. For outdoor installations, attach a bronze four bolt lug to the compression lug or shearhead bolt lug using a ground stud in the upper hole and a 1/2” x 2” bolt in the lower hole. See Figure 6.

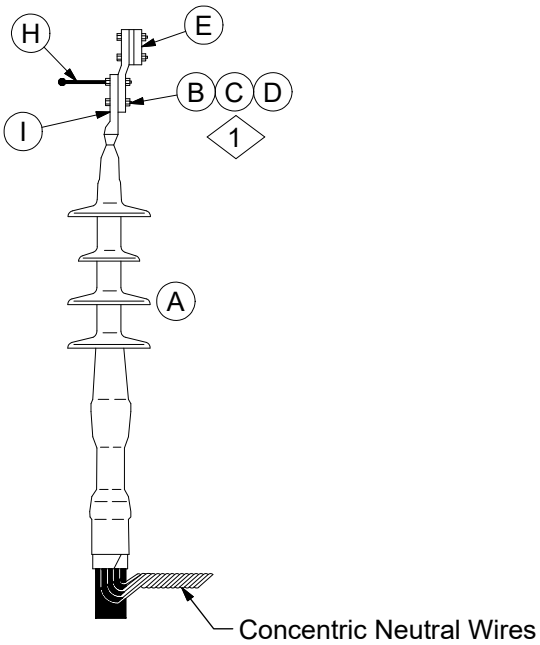


Figure 6

10. Collect all concentric neutral wires (straps) together and connect to system ground.

11. If a shearhead bolt lug is used, verify that the terminator body covers all bolt positions to prevent moisture ingress. If a bolt position is not covered with the termination body, cover the bolt position with mastic and silicone tape.

INSTRUCTIONS - Cables With Metallic Shields (LC (shown) or Tape)

1. Train cable into position and cut to required length. Strip the cable to the dimensions shown in Figure 1A. Check the lug being used to determine insert depth "X".

   A. Special shears (Stock #85 32 240) should be used to cut the LC shield.

   B. To prevent a taped shield from unrolling, hold down the edge with a single wrap of semi-conducting tape (Stock #25 53 076).

   C. Provide an additional 1/2" of exposed conductor on 500 kcmil aluminum cables and provide an additional 3/4" of exposed conductor on 750 kcmil aluminum cables to accommodate growth during crimping of aluminum lugs. If a shearhead bolt lug is used, additional exposed conductor is not required.

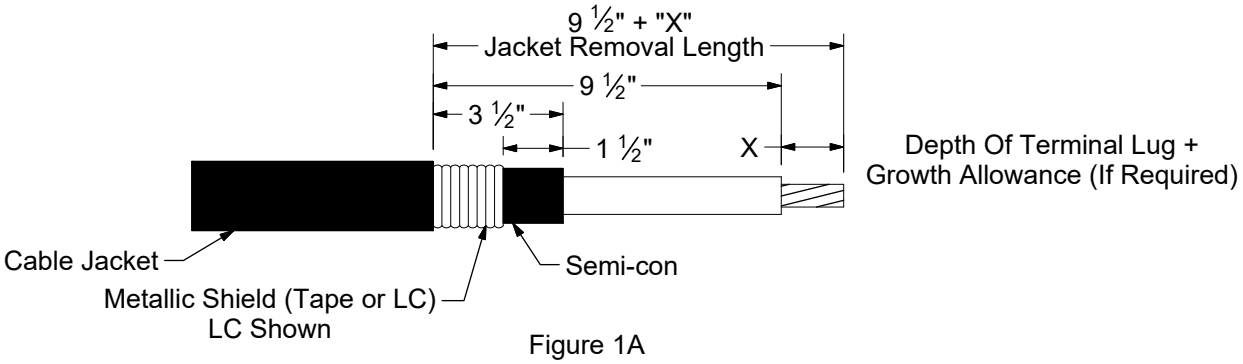


Figure 1A

2. Select one of the two mastic strips from the kit and remove white release liners. Using light tension apply a single wrap of mastic around the cable jacket 1/4" from the cut edge. Cut off excess mastic. See Figure 2A.

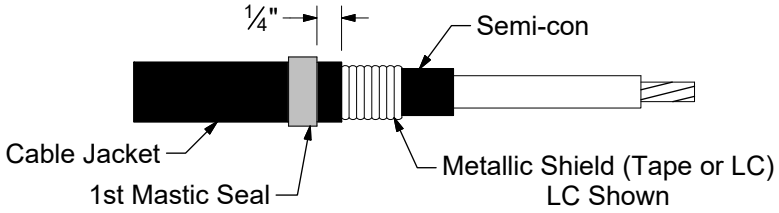


Figure 2A

3. Position a pre-formed ground braid (Stock #17 54 306) with the "U" section over the metallic shield directly adjacent to the cable jacket cut edge. Position one tail of the ground braid over the cable jacket with the heat-shrinkable covering in contact with the mastic strip. Secure the tail to the cable jacket 4-1/2" from the edge of the semi-con using vinyl tape. NOTE: Position the vinyl tape with care since it also serves as a marker for positioning the terminator. See Figure 3A.

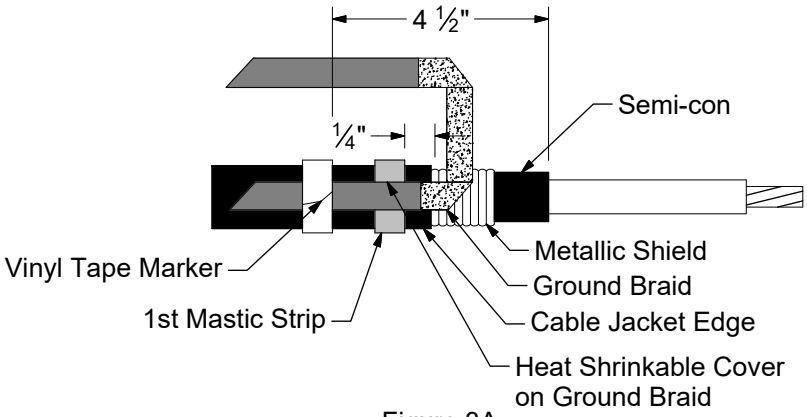


Figure 3A

REV	DATE	ENG	DESCRIPTION
10	01/01/22	EJB	Converted to new format
9	09/08/15	EJB	

4. Wrap the ground braid around the metallic shield and secure in place with the constant force spring. Tighten the spring after wrapping the final turn. Position the finish ground braid tail over the cable jacket. The finish tail of the ground braid does not have to be on top of the first tail. See Figure 4A.

5. Select the second mastic strip from the kit and remove the white release liners. Apply the second mastic strip over the previously applied mastic. If ground braids overlap on cable jacket be sure to apply mastic between the braids. Secure ground braids to cable jacket 4-1/2" from cable semi-con edge using vinyl tape. Apply tape directly over previously applied marker tape. See Figure 4A.

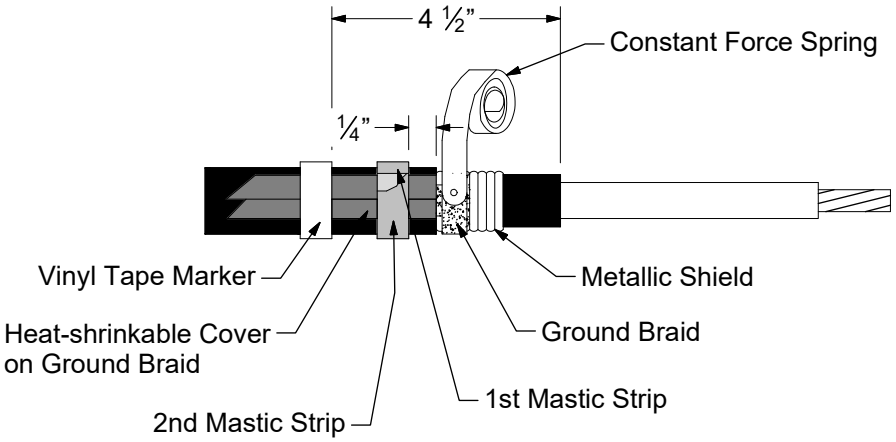


Figure 4A

6. Wrap two half-lapped layers of vinyl tape around the mastic seal. Apply two half-lapped layers of semi-conducting tape over the constant force spring, and exposed metallic shield. Do not cover the exposed semi-con insulation shield. See Figure 5A.

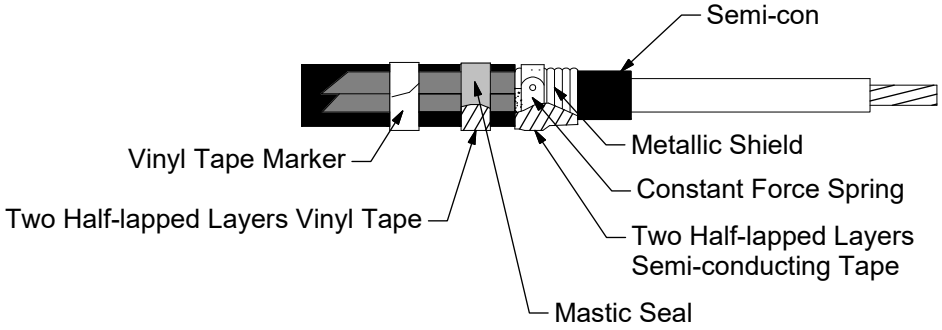


Figure 5A

7. Remove the red support core from the terminator. Verify that the terminator body will fit over the lug being used. If the lug will not fit through the core, clean the insulation and slide the terminator onto the cable before installing the lug.

8. Use a stainless steel wire brush to clean the exposed aluminum conductor. Position and install 750 kcmil copper lugs, using a L39RT die. For 750 kcmil aluminum lugs, use a U608 die. For 500 kcmil aluminum lugs, use a U34ART die. For 350 kcmil copper lugs, use a U31RT die. For 1000 kcmil copper lugs, use a P44RT die. After the lug is installed remove excess oxide inhibitor and all sharp crimp flashing. The shearhead bolt lug (Stock #17 55 804) may be used instead of the 350 kcmil through 750 kcmil copper and aluminum compression lugs. See shearhead bolt lug installation instructions on Sheet 2.

9. Position the terminator body on the cable. The base of the terminator body (not the core), must be butted up to the edge of the vinyl marker tape. Remove the core while unwinding in a counterclockwise direction. Once the terminator body has made contact over the mastic seal area, there is no need to continue supporting the assembly DO NOT push or pull the terminator while unwinding the core. See Figure 6A.

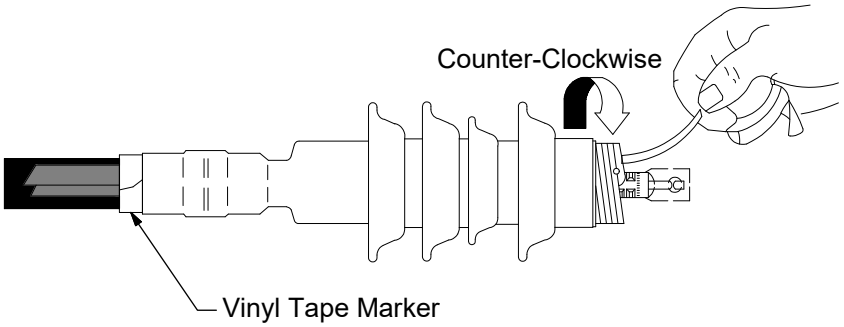


Figure 6A

10. For outdoor installations, attach a bronze four bolt lug to the compression lug or shearhead bolt lug using a ground stud in the upper hole and a 1/2” x 2” bolt in the lower hole. See Figure 7A.

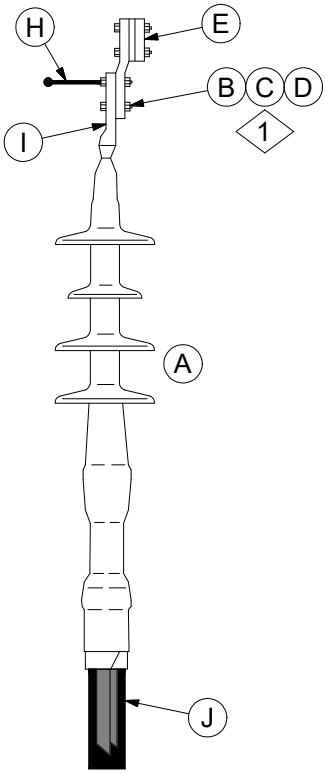


Figure 7A

REV	DATE	ENG	DESCRIPTION
10	01/01/22	EJB	Converted to new format
9	09/08/15	EJB	

11. Connect ground braids to system ground using a two-bolt connector (Stock #17 54 140).

12. If a shearhead bolt lug is used, verify that the terminator body covers all bolt positions to prevent moisture ingress. If a bolt position is not covered with the terminator body, cover the bolt position with mastic and silicone tape.

DCS #	CABLE SIZE	CONDUCTION MATERIAL / SHIELD TYPE
42 34 61 01	750 kcmil	Copper LC/CN Shield (Indoor)
42 34 61 02	750 kcmil	Copper LC/CN Shield (Outdoor)
42 34 61 03	750 kcmil	Aluminum CN (Indoor)
42 34 61 04	750 kcmil	Aluminum CN (Outdoor)
42 34 61 05	350 kcmil	Copper CN (Indoor)
42 34 61 06	350 kcmil	Copper CN (Outdoor)
42 34 61 07	1000 kcmil	Copper Tape Shield (Indoor)
42 34 61 08	1000 kcmil	Copper Tape Shield (Outdoor)
42 34 61 09	500 kcmil	Aluminum CN (Indoor)
42 34 61 10	500 kcmil	Aluminum CN (Outdoor)

CONSTRUCTION NOTE(s):

1. For washer stacking order see DCS **59 52 00 43**.

	ITEM	STK / DCS #	DESCRIPTION 42 34 61 **	01	02	03	04	05	06	07	08	09	10
	A	17 07 142	Terminator – Cable, 15 kV, 350-1000 kcmil	1	1	1	1	1	1	1	1	1	1
	B	21 56 078	Bolt – Machine 1/2" x 2" SS	2	1	2	1	2	1	2	1	2	1
	C	12 56 052	Washer–Belleville–Spring, 1/2"x 2" SS	2	2	2	2	2	2	2	2	2	2
	D	12 56 053	Washer-Flat, 1/2", SS	4	4	4	4	4	4	4	4	4	4
	E	17 54 177	Connector – Cable to Flat Bronze	-	1	-	1	-	1	-	1	-	1
	F	25 53 055	Tape – Vinyl Plastic, 3/4" x 66'	1	1	1	1	1	1	1	1	1	1
	G	17 54 140	Connector – Wire, #8-4/0, 2-Bolt	1	1	-	-	-	-	1	1	-	1
	H	23 64 051	Stud – Grounding, 7" Long, Ball End	-	1	-	1	-	1	-	1	-	1
@	I	17 55 260	Lug – Compression, 750 AL, 2 Hole	-	-	1	1	-	-	-	-	-	-
		17 05 214	Lug – Compression, 750 Cu, 2 Hole	1	1	-	-	-	-	-	-	-	-
		17 55 296	Lug – Compression, 350 Cu, 2 Hole	-	-	-	-	1	1	-	-	-	-
		17 55 324	Lug – Compression, 500 Al, 2 Hole	-	-	-	-	-	-	-	-	1	1
		17 05 236	Lug – Compression, 1000 Cu, 2 Hole	-	-	-	-	-	-	1	1	-	-
		17 55 804	Lug – Shearhead Bolt, 350-750 Cu/Al, 2 Hole	1	1	1	1	1	1	-	-	1	1
@	J	17 54 306	Connector – Cable Ground Braid	1	1	-	-	-	-	1	1	-	-

REV	DATE	ENG	DESCRIPTION
10	01/01/22	EJB	Converted to new format
9	09/08/15	EJB	

DCS #	CABLE SIZE	CONDUCTION MATERIAL / SHIELD TYPE
42 34 61 11	750 kcmil	Reduced Wall Copper FS Shield (Indoor)
42 34 61 12	750 kcmil	Reduced Wall Copper FS Shield (Outdoor)
42 34 61 13	350 kcmil	Reduced Wall Copper FS Shield (Indoor)
42 34 61 14	350 kcmil	Reduced Wall Copper FS Shield (Outdoor)
42 34 61 15	500 kcmil	Reduced Wall Copper FS Shield (Indoor)
42 34 61 16	500 kcmil	Reduced Wall Copper FS Shield (Outdoor)
42 34 61 17	750 kcmil	Copper LC/CN Shield (Substation Cubicle)

	ITEM	STK / DCS #	DESCRIPTION 42 34 61 **	11	12	13	14	15	16	17
	A	17 07 142	Terminator – Cable, 15 kV, 350-1000 kcmil	1	1	1	1	1	1	1
	B	21 56 078	Bolt – Machine 1/2" x 2" SS	2	1	2	1	2	1	2
	C	12 56 052	Washer–Belleville–Spring, 1/2"x 2" SS	2	2	2	2	2	2	2
	D	12 56 053	Washer-Flat, 1/2", SS	4	4	4	4	4	4	4
	E	17 54 177	Connector – Cable to Flat Bronze	-	1	-	1	-	1	-
	F	25 53 055	Tape – Vinyl Plastic, 3/4" x 66'	1	1	1	1	1	1	1
	G	17 54 140	Connector – Wire, #8-4/0, 2-Bolt	1	1	1	1	1	1	1
	H	23 64 051	Stud – Grounding, 7" Long, Ball End	-	1	-	1	-	1	1
	I	17 05 214	Lug – Compression, 750 Cu, 2 Hole	1	1	-	-	-	-	-
		17 55 296	Lug – Compression, 350 Cu, 2 Hole	-	-	1	1	-	-	-
@		17 55 792	Lug – Compression, 500 Cu, 2 Hole	-	-	-	-	1	1	-
		17 55 804	Lug – Shearhead Bolt, 350-750 Cu/Al, 2 Hole	1	1	1	1	1	1	-
		17 05 569	Lug – Compression, 750 Cu, 3 Hole	-	-	-	-	-	-	1
@	J	17 54 306	Connector – Cable Ground Braid	#	#	#	#	#	#	#

REV	DATE	ENG	DESCRIPTION
10	01/01/22	EJB	Converted to new format
9	09/08/15	EJB	

INSTRUCTIONS - Standard Elbow

1. Train the cable into position (at the center line of the bushing) and cut excess cable off squarely.

2. Remove 4 feet of cable jacket and bend back 4 feet of concentric neutral wires. Twist the strands together.

3. Unwrap and bind the concentric wires 9 inches from the end of the cable. The cable jacket may be removed to 1 inch above the transformer pad, but the concentrics must be in place 9” from the end of the cable.

4. Check the insert depth ”X” of the contact being used. Remove the semi-con and insulation from the cable end.

5. Wire brush the exposed aluminum conductor and install the contact. Position the contact so that the threaded hole aligns with the bushing bore. Crimp the #2 and 1/0 contacts with the Nicropress ”Peach” tool. Crimp the 4/0 contact with a U27ART die in a Y35 press. Start crimping at the crimp mark on the contact and rotate each successive crimp 180°. Make as many crimps as possible without overlap. Wipe off excess inhibitor.

6. Remove the semi-con to a point 6-7/8" from the end of the contact. The edge of the semi-con should be straight, smooth, and squared. Do not cut the insulation while removing the semicon.

7. Clean the cable insulation.

8. Lubricate the cable insulation and inside of the elbow housing with the silicone grease provided or Stock #31 51 050.

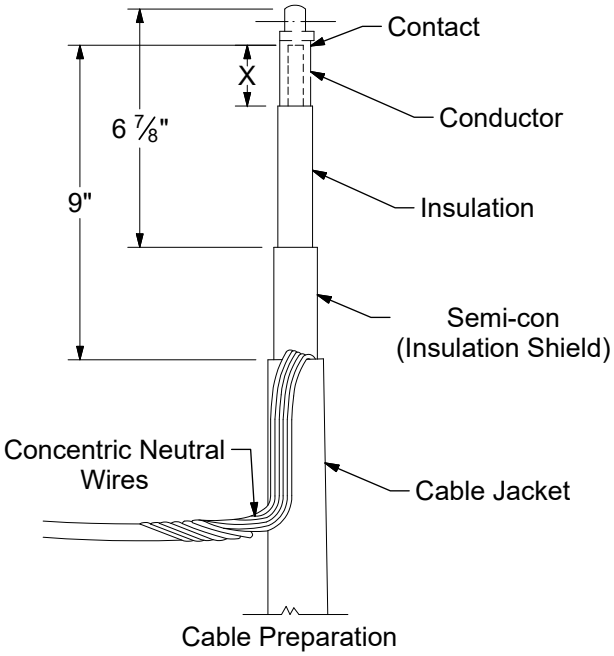
9. Slide the elbow onto the cable. Use a back and forth twisting motion. After the elbow is seated, align the elbow with the contact’s threaded hole. Wipe off all excess silicone grease.

10. Thread the probe into the contact by hand, taking care not to cross-thread. Finish tightening the probe, with the wrench, until the wrench bends 90°.

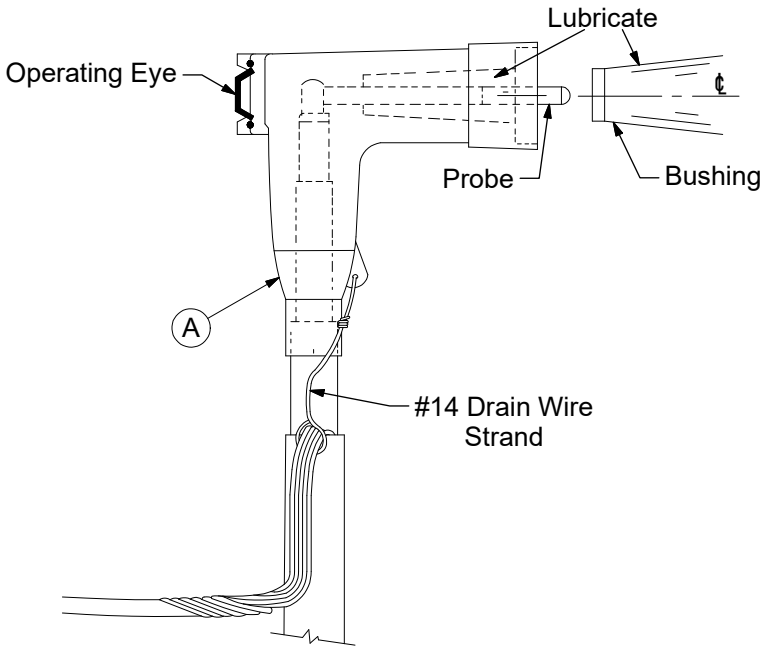
11. Retain a scrap piece of concentric neutral wire or use #14 copper wire (Stock #18 52 018). Insert one end of the wire through the grounding eye on the elbow and carefully twist it so as to not damage the eye. Wrap the other end of the wire around the neutral wire bundle and twist it. Connect the neutral wire bundle to ground.

12. Lubricate the interface of the elbow with silicone grease. Lubricate the mating bushing only if the bushing is known to be de-energized. Use Stock #31 51 050.

13. The elbow is now ready to install



Cable Preparation



Assembled View

REV	DATE	ENG	DESCRIPTION
7	01/01/22	EJB	Converted to new format
6	07/04/15	EJB	

INSTRUCTIONS - Repair Elbow

1. Remove the old elbow, damaged contact, and damaged cable section - **REMOVED CABLE SECTION AND CONTACT LENGTH SHALL NOT EXCEED 3-1/2"**. If more than 3-1/2" has to be removed, do not use the repair elbow. Use a hacksaw to obtain a clean square cut when removing the damaged cable. Retain all neutral wires.

2. Unwrap and bind the concentric wires 9-1/2" from the end of the cable. If jacketed cable is used, the jacket may be removed to 1" above the transformer pad. Twist the wires together.

3. Remove 2" of insulation shield (semi-con) and insulation from the cable end.

4. Wire brush the exposed aluminum conductor and install the contact. Position the contact so that the threaded hole aligns with the bushing bore. Crimp the #2 and 1/0 contacts with the Nicropress "Peach" tool. Crimp the 4/0 contact with a U27ART Die in a Y35 press. Start crimping at the crimp mark on the contact and rotate each successive crimp 180°. Make as many crimps as possible without overlap. Wipe off excess inhibitor.

5. Remove the semi-con to a point 10" from the end of the contact. The edge of the semi-con should be straight, smooth, and squared. Do not cut the insulation while removing the semi-con.

6. Clean the cable insulation.

7. Lubricate the cable insulation and inside of the elbow housing with silicone grease.

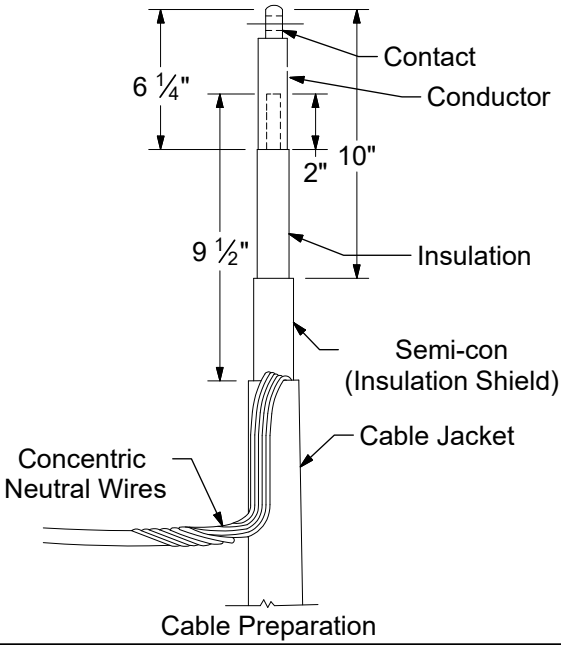
8. Slide the elbow onto the cable. Use a back and forth twisting motion. After the elbow is seated properly, align the elbow with the contact's threaded hole. Wipe off all excess silicone grease.

9. Thread the probe into the contact by hand, taking care not to cross-thread. Finish tightening the probe, with the wrench, until the wrench bends 90°.

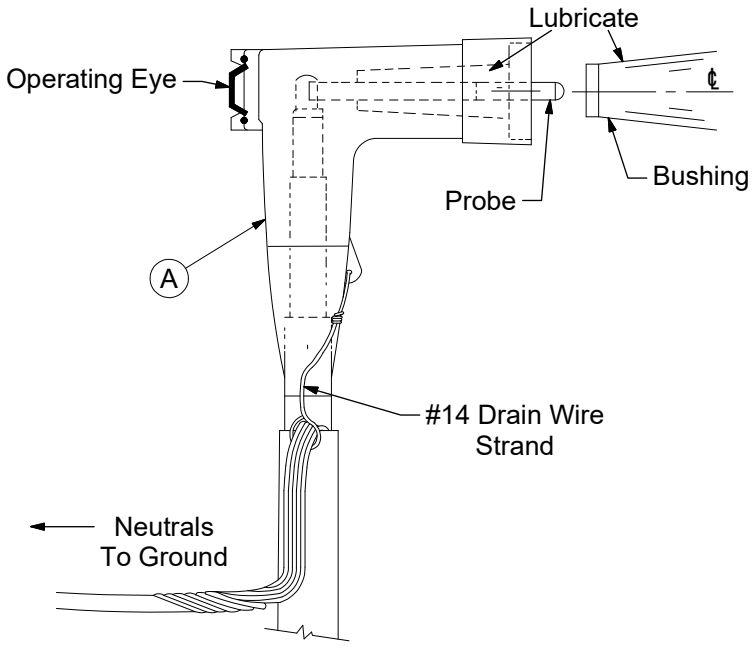
10. Retain a scrap piece of concentric neutral wire or use #14 copper wire (Stock #18 52 018). Insert one end of the wire through the grounding eye on the elbow and carefully twist it so as to not damage the eye. Wrap the other end of the wire around the neutral wire bundle and twist it. Connect the neutral wire bundle to ground.

11. Lubricate the interface of the elbow with silicone grease. Lubricate the mating bushing only if the bushing is known to be de-energized.

12. The elbow is now ready to install.



Cable Preparation



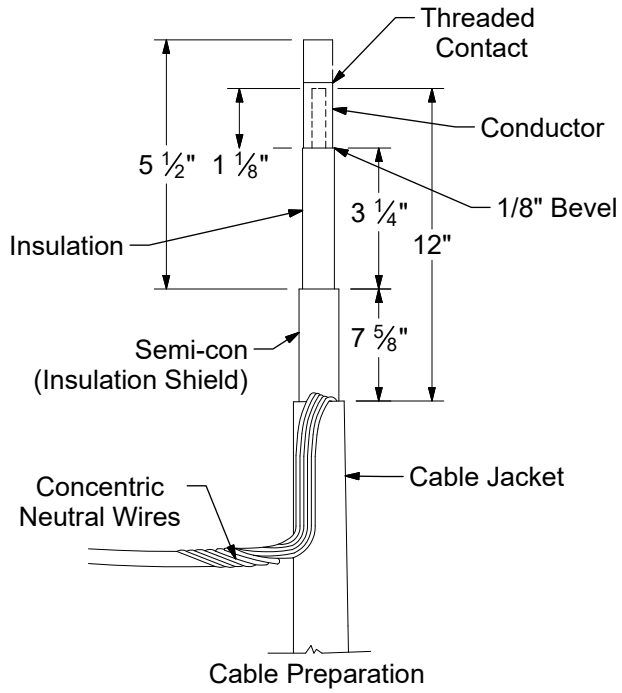
Assembled View

REV	DATE	ENG	DESCRIPTION
7	01/01/22	EJB	Converted to new format
6	07/04/15	EJB	

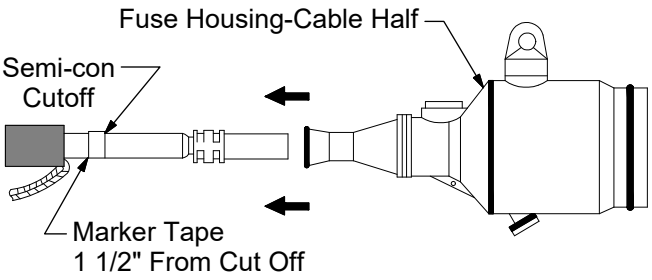
DCS #	15 kV Elbow Type
42 34 62 01	#2 Al, Stranded 175 or 220 Mil
42 34 62 04	#2 Al, Solid 175 Mil
42 34 62 05	1/0 Al, Stranded 175 Mil
42 34 62 02	4/0 Al, Stranded 175 Mil
42 34 62 03	#2 Al, Stranded 175 or 220 Mil (Long Repair)
42 34 62 06	#2 Al, Solid 175 Mil (Long Repair)
42 34 62 07	1/0 Al, Stranded 175 Mil (Long Repair)
42 34 62 08	4/0 Al, Stranded 175 Mil (Long Repair)

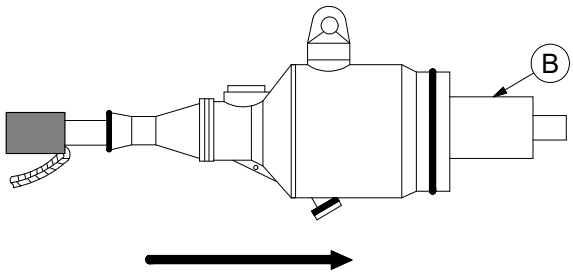
ITEM	STK / DCS #	DESCRIPTION 42 34 62 **	01	02	03	04	05	06	07	08
A	17 05 183	Elbow − Loadbreak, #2 Al, Stranded	1	-	-	-	-	-	-	-
	17 05 203	Elbow − Loadbreak, 4/0 Al, Stranded	-	1	-	-	-	-	-	-
	17 05 253	Elbow − Loadbreak, #2 Al, Solid	-	-	-	1	-	-	-	-
	17 05 254	Elbow − Loadbreak, 1/0 Al, Stranded	-	-	-	-	1	-	-	-
	17 05 250	Elbow − Loadbreak, #2 Al, Stranded, Long Repair	-	-	1	-	-	-	-	-
	17 05 303	Elbow − Loadbreak, #2 Al, Solid, Long Repair	-	-	-	-	-	1	-	-
	17 05 304	Elbow − Loadbreak, 1/0 Al, Stranded, Long Repair	-	-	-	-	-	-	1	-
	17 05 305	Elbow − Loadbreak, 4/0 Al, Stranded, Long Repair	-	-	-	-	-	-	-	1

REV	DATE	ENG	DESCRIPTION
7	01/01/22	EJB	Converted to new format
6	07/04/15	EJB	



Cable Preparation





Pull Up Against Tightened Fuse

INSTRUCTIONS - Fused Elbow

1. Remove 4 feet of the cable jacket and bend back 4 feet of concentric neutral wires. Keep 2 strands of concentric neutral wires separated from the others. Cut off 3 feet of excess cable squarely. Cut off remaining neutral wires at the cable jacket cut back.

2. Slide a heat shrink sleeve down the cable.

3. Remove 4-3/8 inches of semi-con and 1-1/8 inches of insulation from the end of the cable. Wire brush the exposed aluminum conductor and install the threaded contact. Crimp the #2 contact with the Nicopress “Peach” tool. Start crimping at the crimp mark and rotate each successive crimp 180 degrees. Make as many crimps as possible and wipe off excess inhibitor.

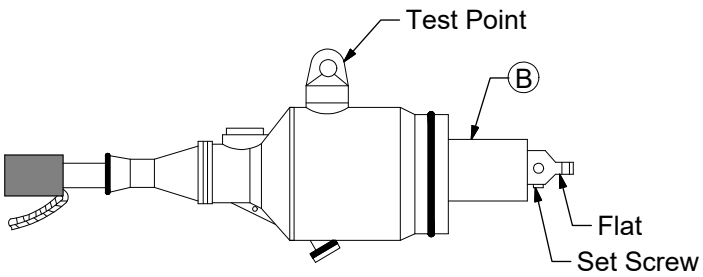
4. Clean the cable insulation and apply a tape marker on the semi-con 1-1/2 inches from the cut off.

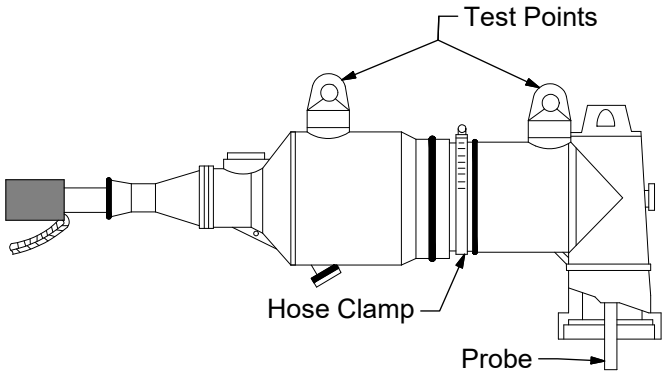
5. Apply silicone grease to the outside of the threaded contact, cable insulation and semi-con and the cable half of the fuse housing. Slide the housing onto the cable up to the marker tape on the semi-con. Remove the marker tape.

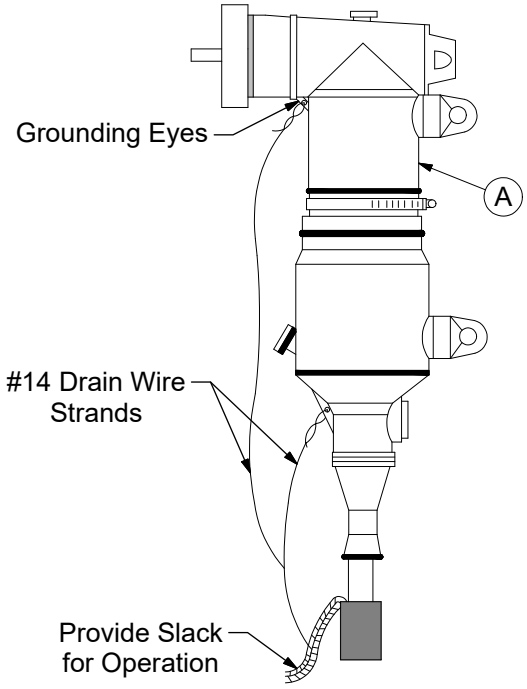
6. Insert the threaded end of the fuse into cable half of the fuse housing and thread into the contact. HAND TIGHTEN ONLY! Pull the fuse housing up against the bottom of the tightened fuse.

7. Assemble the probe connector to the fuse terminal. Rotate the probe connector so that the flats are perpendicular to the mating bushing. Lock the probe connector in position by tightening the set screws with the allen wrench supplied.

8. Apply silicone grease to the elbow half of the fuse housing and push it onto the cable half of the fuse housing. The rubber surfaces should butt and the probe connector should face the opening of the elbow half of the fuse housing. The two test points should be in line with each other.







9. Insert the probe into the probe connector and start the threads by hand. Tighten using the torque limiting wrench supplied. Tighten the probe with the wrench until the wrench bends 90 degrees.

10. Position the hose clamp as shown and tighten snug. DO NOT OVERTIGHTEN THE HOSE CLAMP.

11. Retain two scrap pieces of concentric neutral wire or use #14 copper wire (Stock #18 52 018). Insert one end of each wire through a grounding eye on the fused elbow and carefully twist them so as to not damage the eyes. Wrap the other end of each wire around the neutral wire bundle and twist it. Connect the neutral wire bundle to ground. Provide slack in the drain wires for elbow operation.

12. Lubricate the interface of the elbow with silicone grease. If de-energized, the mating bushing should also be lubricated. Use Stock #31 51 050.

13. The fused elbow is complete.

INSTRUCTIONS - #2 Fusible Elbow Jumper (DCS 42 34 62 09)

1. Obtain a 12 ft. length of #2 AWG, 15kV cable (Stock #18 07 238)

2. Assemble end "A":

   A. Remove 4 ft. of cable jacket and bend back the concentric neutral wires. Cut off the stripped back conductor.

   B. Slide a heat shrink sleeve down the cable.

   C. Separate one neutral wire from the others. Twist the other neutral wires together.

   D. Continue the elbow assembly from step #4 of DCS # 42 34 62 01.

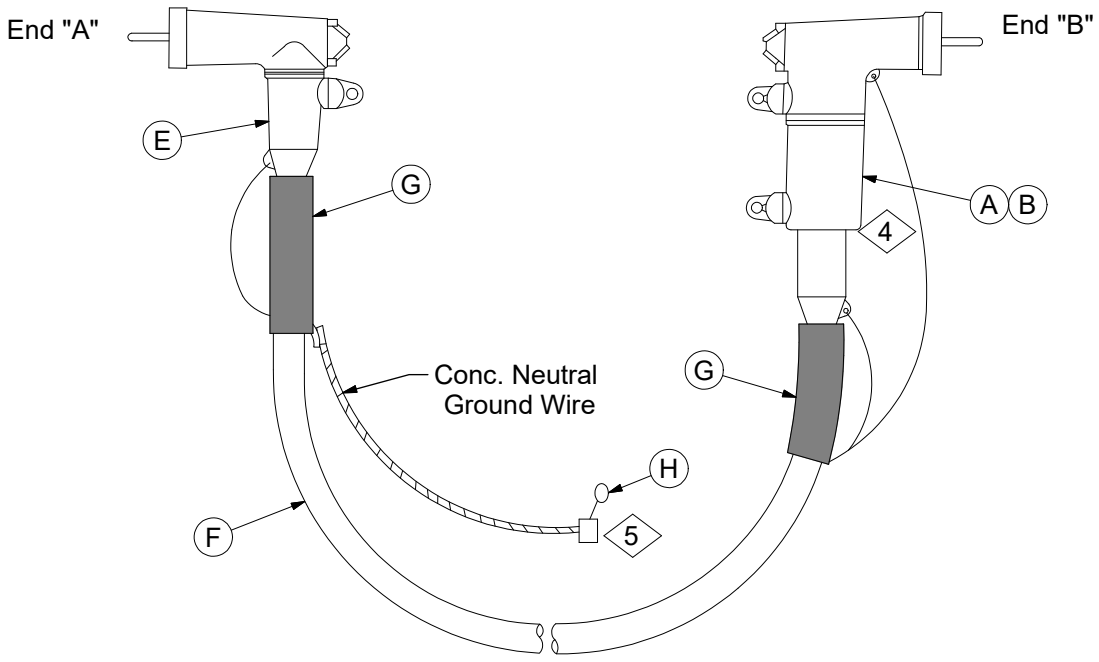
   E. When the elbow assembly is complete, place the heat shrink sleeve over the elbow neck approx. 1-1/2 inches and shrink the sleeve completely down over the elbow and cable jacket.

3. Assemble end “B”:

   A. Assemble the fused elbow per the instructions on sheet 4.

   B. When the fused elbow assembly is complete, place the heat shrink sleeve over the fused elbow neck approx. 1-1/2 inches and shrink the sleeve completely down over the fused elbow and the cable jacket.

4. Add a hot line clamp to the end of the twisted concentric neutral wires.



REV	DATE	ENG	DESCRIPTION
7	01/01/22	EJB	Converted to new format
6	07/04/15	EJB	

CONSTRUCTION NOTE(s):

1. Fused elbow jumpers are to be installed only in the single phase junction box.
2. Install a fault indicator on the heat shrink sleeve below the fused elbow. The fault indicator will aide in determining the condition of the fuse.
3. Order 1 spare fuse (Stock #20 04 859) for each junction cabinet.
4. For the Fused Elbow, 8.3kV, Maximum WT.= 5.25 Lbs.
5. Connect ground wire to junction cabinet ground bus.

	ITEM	STK / DCS #	DESCRIPTION 42 34 62 **	09
	A	17 05 476	Elbow − Loadbreak, Fused, #2Al. Strand	1
3	B	20 04 859	Fuse − 8.3 kV, 30A, Current Limiting	2
2	D	60 55 034	Indicator − Fault, Fast Response	1
	E	17 05 183	Elbow − Loadbreak, #2 Al. Stranded	1
	F	18 07 238	Cable − #2 Al., 15kV, Stranded (ft.)	12
	G	12 53 078	Tube - Heat Shrink, 1.5” ID x 9” Long	2
	H	23 78 394	Clamp − Hotline, #6−2/0, CU	1

UNDERGROUND CABLE TERMINATION

#2 - 4/0 AWG Cable Termination
Indoor Use Only

42 34 63 **
15kV
1 of 2

INSTRUCTIONS

1. Train the cable into position and cut to required length. For all installations allow sufficient neutral wire length beyond the finished cable end for proper grounding connection.

2. Prepare the cable using the dimensions shown in Figure 1. Be sure to check the lug or pin terminal connector being used to determine the insert depth "X". Provide an additional 1/4" of exposed conductor to allow for growth of the aluminum lug or connector during crimping.

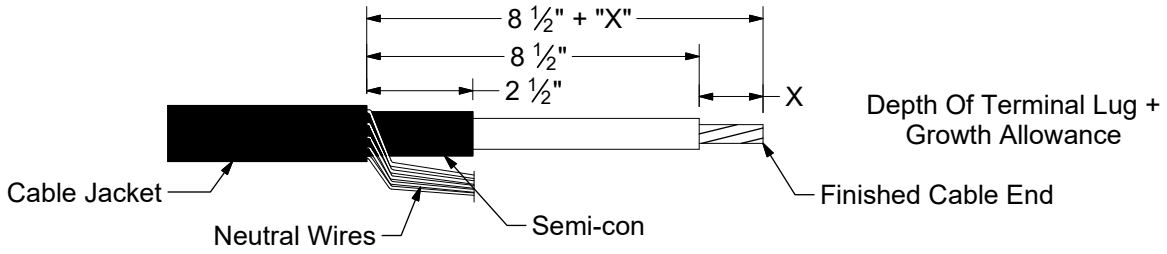


Figure 1

3. Select one of the mastic strips from the kit and remove the white release liners. Using light tension apply a single wrap of mastic around the cable jacket 1/4" from the edge. Cut off excess mastic. See Figure 2

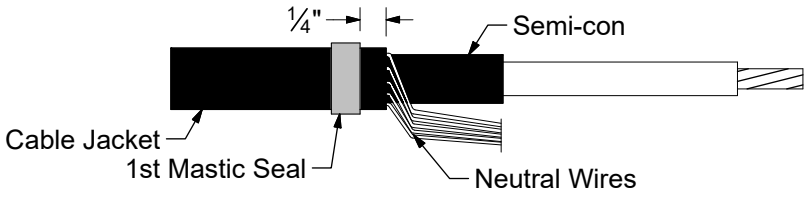


Figure 2

4. Bend neutral wires back over applied mastic. Secure the wires to the cable jacket with vinyl tape. The tape should be placed a distance of 4-1/2" from the edge of the semi-con. See Figure 3.

   The vinyl tape serves as a marker tape, so position carefully.

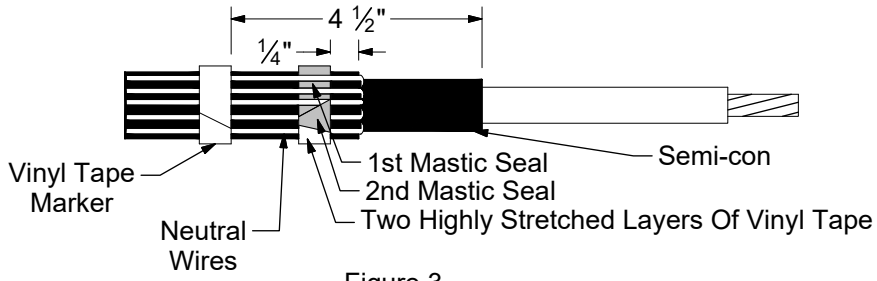


Figure 3

5. Select a second mastic strip from the kit and remove the white release liners. Apply a second mastic band over the neutral wires and the previously applied mastic. Cut off excess. See Figure 3.

6. Compress the neutral wires into the mastic. Over-wrap the mastic strips with two highly stretched layers of vinyl tape. Be sure that all exposed mastic is covered. See Figure 3.

7. Remove the red support core from the terminator and check to insure the terminator will fit over the lug or pin terminal connector being used. If the lug or pin terminal connector will not fit through the termination core, clean the insulation and slide the terminator on the cable before installing the lug/connector. Do Not remove the core at this time. Position terminator beyond the exposed conductor to allow installation of the lug/connector.

8. Install either the lug or pin terminal connector using the Y-35 tool with a U25ART die for #2 or 1/0 and a U249 or U28ART die for 4/0. Crimp as many times as possible without overlap. Remove excess oxide inhibitor and sharp crimp flashing. If the insulation has not been cleaned, clean at this time.

REV	DATE	ENG	DESCRIPTION
4	01/01/22	EJB	Converted to new format
3	03/22/11	EJB	

9. Re-position the terminator body on the cable and remove the core. Make sure the terminator body (not the core) is butted up to the edge of the vinyl marker tape. While removing the core, unwind it in a counter-clockwise direction. See Figure 4.

   Once the terminator has made contact over the mastic seal area, there is no need to continue supporting the assembly. Do not push or pull on the terminator while unwinding the core.

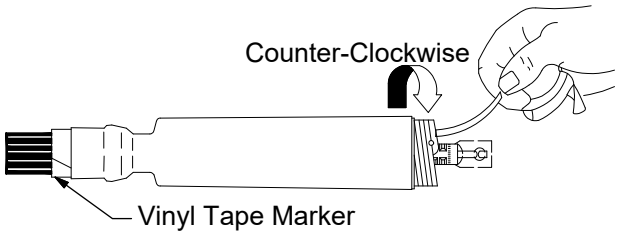


Figure 4

10. When using a short barrel lug/connector on small cable, it may be necessary to trim excess terminator insulation from the lug or connector.

11. Collect all neutral wires together and connect to system ground. See Figure 5.

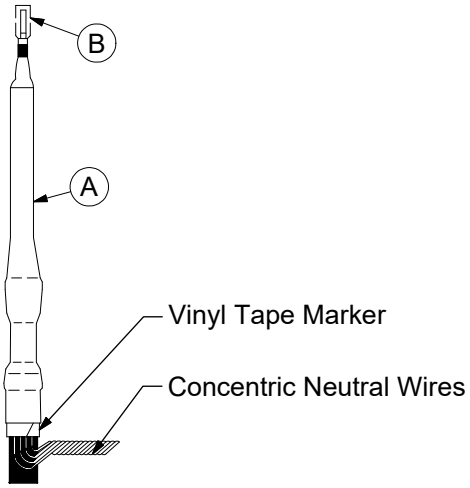


Figure 5

DCS #	Cable Size	Connection
42 34 63 01	#2 AWG	Pin Terminal
42 34 63 02	#2 AWG	2 Hole Lug
42 34 63 05	1/0 AWG	Pin Terminal
42 34 63 06	1/0 AWG	2 Hole Lug
42 34 63 03	4/0 AWG	Pin Terminal
42 34 63 04	4/0 AWG	2 Hole Lug

ITEM	STK / DCS #	DESCRIPTION 42 34 63 **	01	02	03	04	05	06
A	17 07 150	Termination, Cable, 15 kV Indoor #2−4/0	1	1	1	1	1	1
B	17 54 232	Connector, Cable Pin Terminal #2	1	-	-	-	-	-
	17 55 257	Lug, Compression, #2	-	1	-	-	-	-
	17 54 357	Connector, Cable Pin Terminal 1/0	-	-	-	-	1	-
	17 54 233	Connector, Cable Pin Terminal 4/0	-	-	1	-	-	-
	17 55 256	Lug, Compression, 4/0	-	-	-	1	-	-
	17 55 456	Lug, Compression, 1/0	-	-	-	-	-	1

REV	DATE	ENG	DESCRIPTION
4	01/01/22	EJB	Converted to new format
3	03/22/11	EJB	

INSTRUCTIONS - Cooper T-OP II

1. Train The Cable

   A. Center the cable between the apparatus bushing and the parking stand pocket. The cable should be located 7 inches from the apparatus front plate.

   B. Provide adequate slack for cable movement between the apparatus bushing and the standoff bushing.

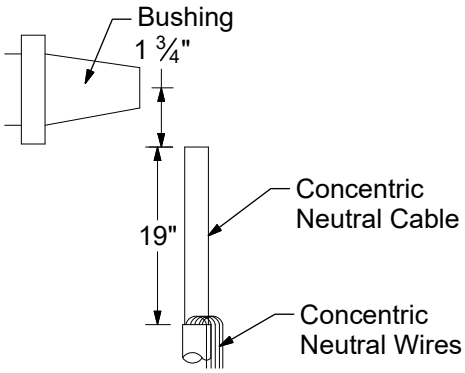
   C. Cut the cable 1 3/4 inches from the centerline of the bushing. Clean 24 inches of the outer cable jacket.

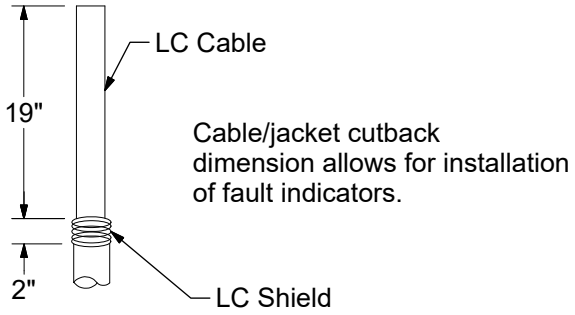
2. Cut Back The Cable

   Cable with LC Shield

   A. Remove 21 inches of cable jacket

   B. Remove 19 inches of LC shield. Cover the sharp end of the LC shield with a wrap of plastic tape. Go to part C.





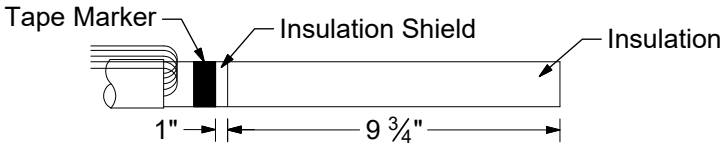
   Cable with Concentric Neutral Wires

   A. Remove 19 inches of cable jacket

   B. Allow enough extra concentric neutral wires to connect to ground and allow movement to the standoff bushing.

   C. Remove 9-3/4 inches of insulation shield.

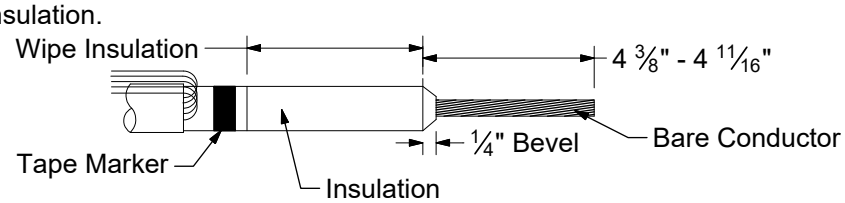
   D. Place a tape marker 1 inch from the end of the insulation shield.



   E. Remove 4-$\frac{3}{8}$ - 4-$\frac{11}{16}$ inches of insulation.

   F. Bevel the insulation edge 1/4 inch at a 45 degree angle.

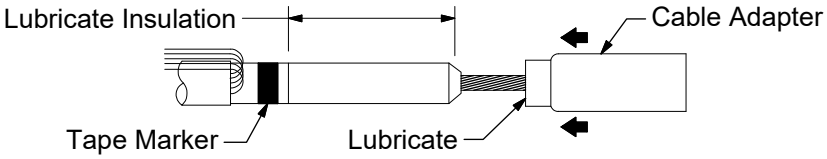
   G. Thoroughly clean the insulation.



3. Install The Cable Adapter

   A. Lubricate the exposed insulation and the inside of the cable adapter.

   B. Slide the small end of the cable adapter over the cable using a twisting motion until the small end is flush with the tape marker.



4. Install The Compression Connector

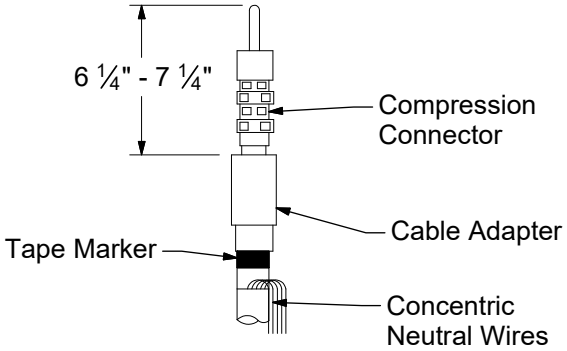
   A. Wire brush the aluminum conductor.

   B. Insert the conductor into the compression connector and rotate until the flats of the compression connector and the apparatus bushing are aligned.

   C. Make 5 crimps using the U34ART die (for 500 kcmil cable) or L39ART die (for 750 kcmil cable) or U31ART die (for 350 AWG cable and for 4/0 AWG cable). Make the first crimp at the first line below the shoulder of the connector. Rotate each crimp 90 degrees and allow 1/8 inch between crimps.

   D. Wipe off excess inhibitor.

   E. Check connector length as shown.



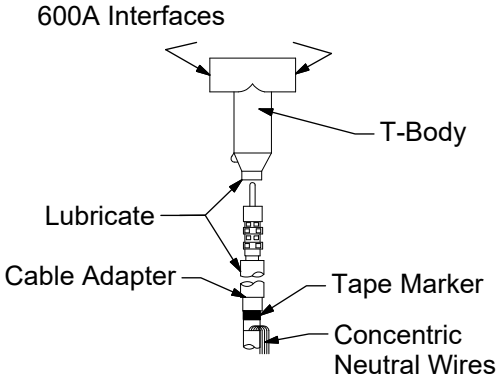
5. Install T-Body

   A. Clean and lubricate the outside of the cable adapter.

   B. Clean and lubricate the inside of the T-body.

   C. Slide the T-body onto the cable until the compression connector eye is centered in the 600 Amp interfaces.

   D. Remove the tape marker



6. Install The LRTP Into The T-Body

A. Clean and lubricate the mating 600 Amp interface of the LRTP (Load Reducing Tap Plug) and the T-body.

B. Remove the shipping cap from the 200 Amp interface of the LRTP and the thread protector on the threaded end.

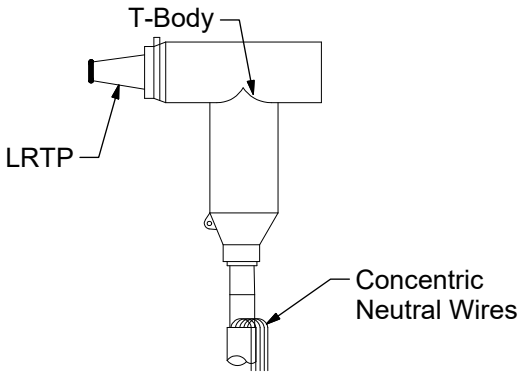
C. Insert the T-wrench (Stock #85 41 370) into the throat of the LRTP and thru the rotating nut and engage the alignment segment.

D. Insert the threaded ferrule end of the LRTP into the side of the T-body opposite the apparatus bushing.

E. Thread the alignment segment into the threads of the compression connector by turning the T-wrench until a positive stop is felt.

F. Continue applying clockwise force to the T-wrench until the pin shears and the alignment segment rotates freely.

G. Remove the alignment segment by applying pressure to the T-wrench until the segment separates. Discard the segment.



7. Install The 600 AMP Elbow Onto The Apparatus Bushing

A. In padmounted switchgears, remove the factory installed studs from the apparatus bushings. Use the copper studs included in the 600 Amp elbow kit.

B. Screw the short end of the stud into the threaded hole in the apparatus bushing. The long end of the stud faces out.

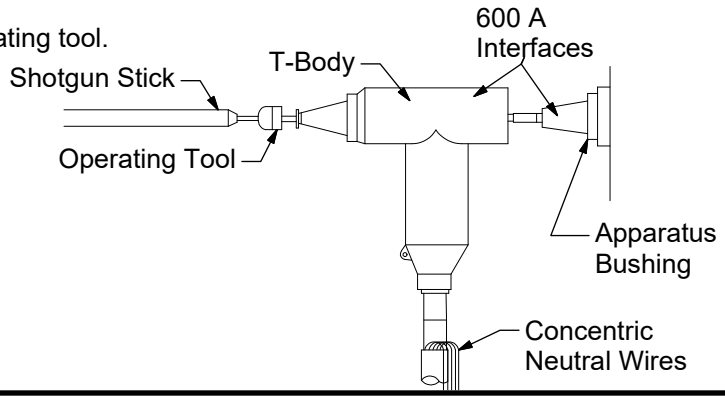
C. Clean and lubricate the mating interfaces of the apparatus bushing and the T-body.

D. Grasp the eye of the operating tool (Stock #83 28 045) with a shotgun stick and pull the eye fully into it.

E. Using the shotgun stick, insert the operating tool into the LRTP throat and engage the rotating nut.

F. While pushing the T-body onto the apparatus bushing, turn the operating tool clockwise to make a threaded connection. Turn until the torque head rachets. An audible click will be heard.

G. Remove the operating tool.

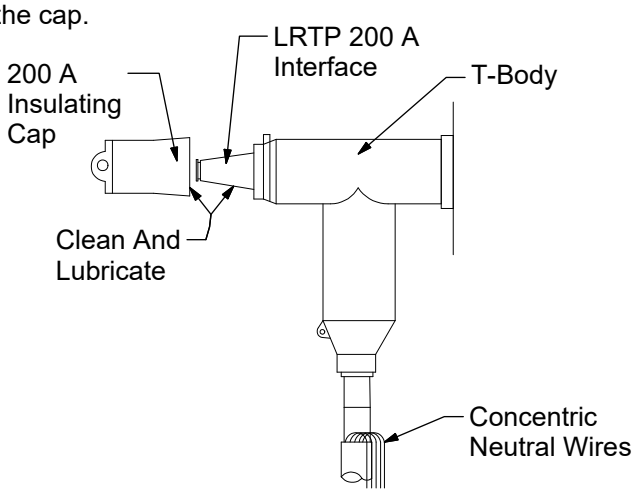


REV	DATE	ENG	DESCRIPTION
13	01/01/22	EJB	Converted to new format
12	10/14/16	EJB	

8. Cap The 200 AMP Interface

A. Clean and lubricate the 200 Amp interface on the LRTP and the inside of an insulating cap (Stock #17 55 227).

B. Cover the interface with the cap.



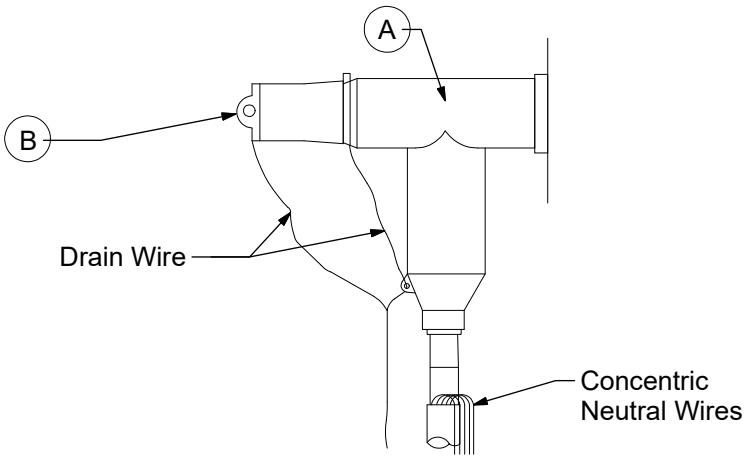
9. Ground The Elbow

A. Connect the tie off tabs of the LRTP and the T-body with a strand of drain wire (concentric neutral wire) and connect the drain wire to ground.

B. Connect the insulating cap drain wire to ground with appropriate connector.

C. Connect the cable concentric neutral wires or flatstraps to ground. For LC Shield Cables use DCS **59 40 93 44**.

D. See DCS **59 40 60 01** for additional 600 Amp accessories.



INSTRUCTIONS - Richards R800

1. Train The Cable

   A. Center the cable between the apparatus bushing and the parking stand pocket. The cable should be located 7 inches from the apparatus front plate.

   B. Provide adequate slack for cable movement between the apparatus bushing and the standoff bushing.

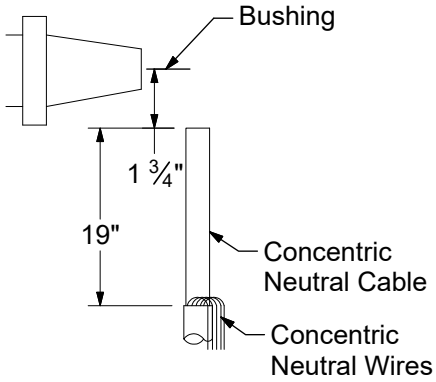
   C. Cut the cable 1-3/4 inches from the centerline of the bushing. Clean 24 inches of the outer cable jacket.

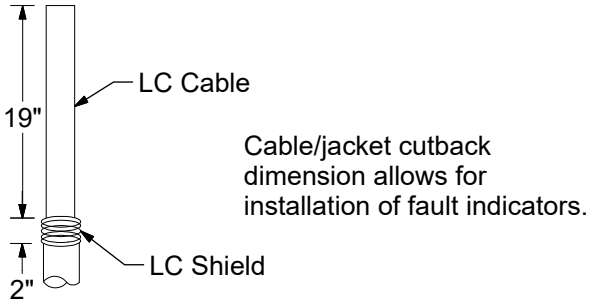
2. Cut Back The Cable

Cable with LC Shield

A. Remove 21 inches of cable jacket.

B. Remove 19 inches of LC shield. Cover the sharp end of the LC shield with a wrap of plastic tape. Go to part C.





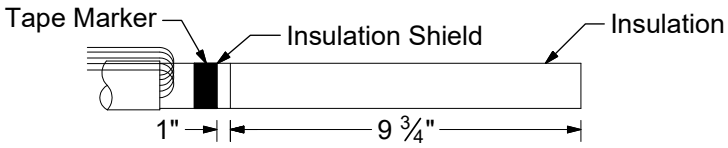
Cable with Concentric Neutral Wires

A. Remove 19 inches of cable jacket.

B. Allow enough extra concentric neutral wires to connect to ground and allow movement to the standoff bushing.

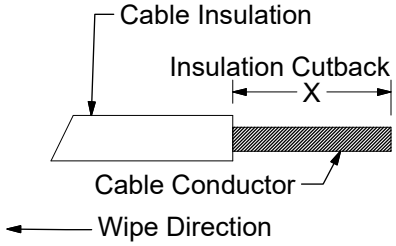
C. Remove 9-3/4 inches of insulation shield.

D. Place a tape marker 1 inch from the end of the insulation shield.



E. Remove cable insulation. Refer to chart for insulation cutback dimension "X".

F. Thoroughly clean the insulation.



Cable Size	Insulation Cutback (X)
4/0 AWG	2"
350 kcmil cmpt - 500 kcmil	2-3/4"
750 kcmil	3-3/8"
1000 kcmil	4"

If insulation cutback in table differs from cutback on lug package use lug package description

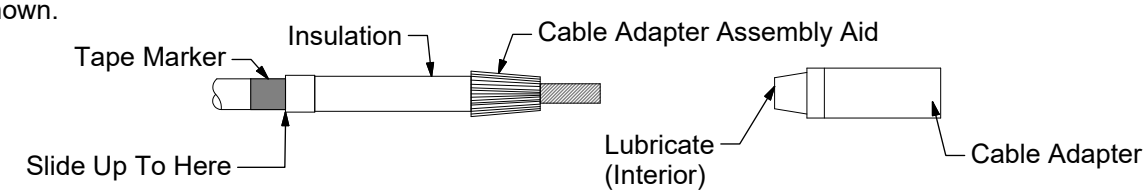
REV	DATE	ENG	DESCRIPTION
13	01/01/22	EJB	Converted to new format
12	10/14/16	EJB	

3. Install The Cable Adapter

A. Slide cable adapter aid up to insulation.

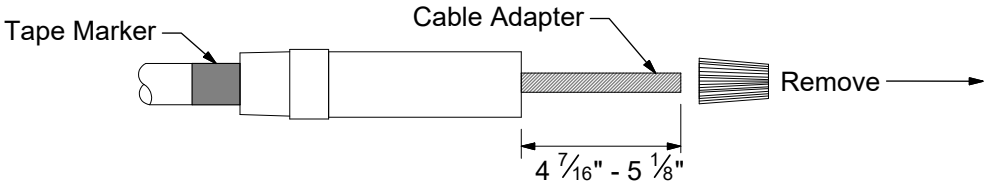
B. Apply silicone lubricant to cable insulation, cable adapter assembly aid, and inside of cable adapter as shown.

C. Slide cable adapter onto cable until the cable adapter sits flush with the leading edge of the tape marker as shown.



D. Remove cable adapter assembly aid.

E. Confirm cable adapter is positioned as shown below.



Check: Confirm that edge of tape marker is flush with end of cable adapter as shown.

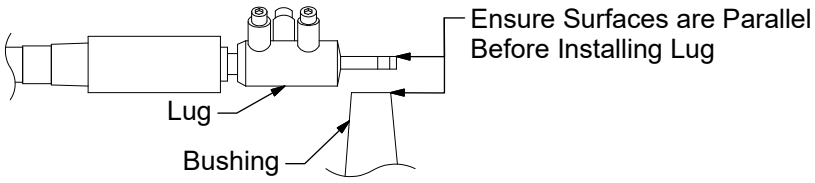
Check: Confirm that the dimension from the end of the conductor to the cable adapter edge satisfies criteria shown above.

4. Install The Shear Bolt Connector

A. If the cable conductor can accept a centering ring (provided with the connector), insert it into the barrel of the lug.

B. Wire brush the aluminum conductor and immediately insert the lug onto the conductor.

C. Rotate the connector until the flats of the paddle and the apparatus bushing are aligned.



D. Snug all of the shear bolts starting with the bolt closest to the cable insulation and moving towards the lug pad.

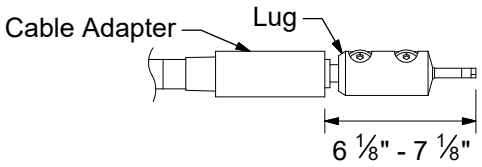
E. Shear off all of the bolts in the same order as Step D.

F. The shear bolt lug included in this kit requires an Allen hex head socket based on the cable size:

Cable Size	Hex Size	Ameren Stock #
4/0 AWG	5mm	86 44 454
350-1000 kcmil	8mm	85 32 776

G. Snap the black cover caps into the shear bolt holes on the lug connector.

H. After installing the lug, confirm that the distance from the end of the lug to the closest end of the cable adapter is within the range of 6-1/8" to 7-1/8". This range must be met or the assembly must be redone.

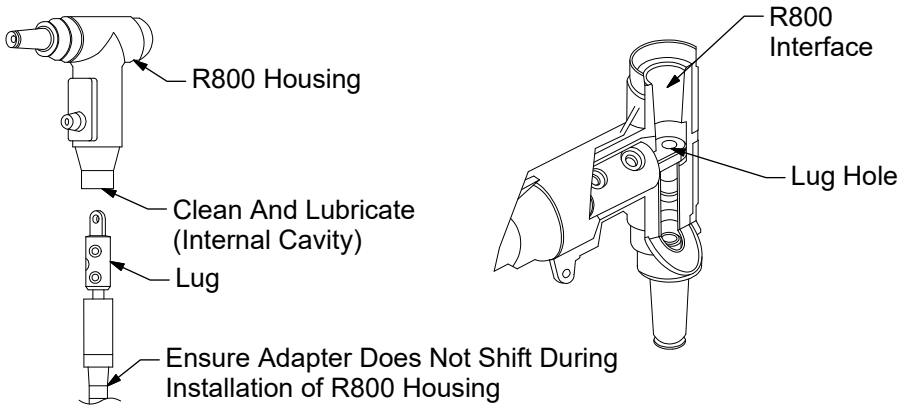


5. Install R800 Housing

A. Clean the outside of the cable adapter.

B. Lubricate the entire surface of the cable adapter and the cable entrance of the R800.

C. Without moving the cable adapter, install the R800 on the cable adapter and push until the lug is firmly seated inside of the R800. Remove the tape marker.



6. Install The 600 AMP Elbow Onto The Apparatus Bushing

A. In padmounted switchgears, remove the factory installed studs from the apparatus bushings. Use the copper studs included in the 600 Amp elbow kit.

B. Screw the short end of the stud into the threaded hole in the apparatus bushing. The long end of the stud faces out.

C. Clean and lubricate the mating interfaces of the apparatus bushing and the T-body.

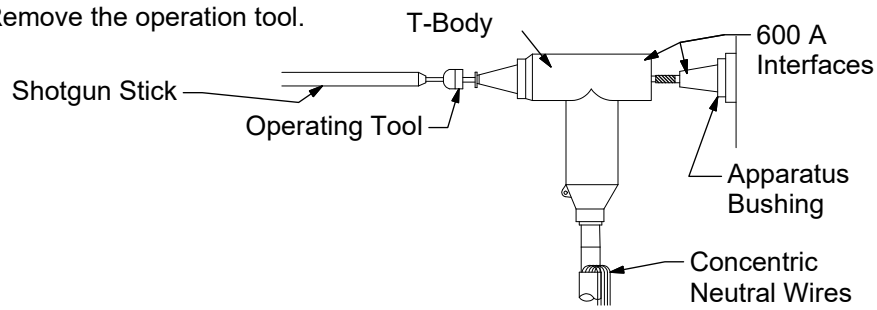
D. Grasp the eye of the operating tool (Stock #83 28 045) with a shotgun stick and pull the eye fully into it.

E. Using the shotgun stick, insert the operating tool into the LRTP throat and engage the fastener.

F. Slide the fastener into forward position through the lug hole.

G. While pushing the T-body onto the apparatus bushing, turn the operating tool clockwise to make a threaded connection. Turn until the torque head rachets. An audible click will be heard.

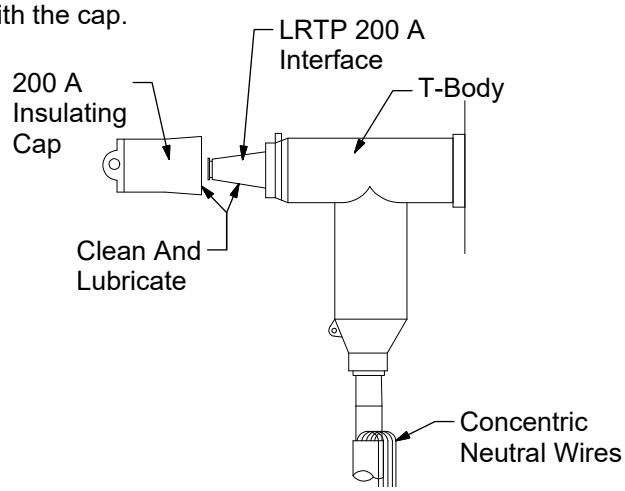
H. Remove the operation tool.



7. Cap The 200 AMP Interface

   A. Clean and lubricate the 200 Amp interface on the LRTP and the inside of an insulating cap (Stock #17 55 227).

   B. Cover the interface with the cap.



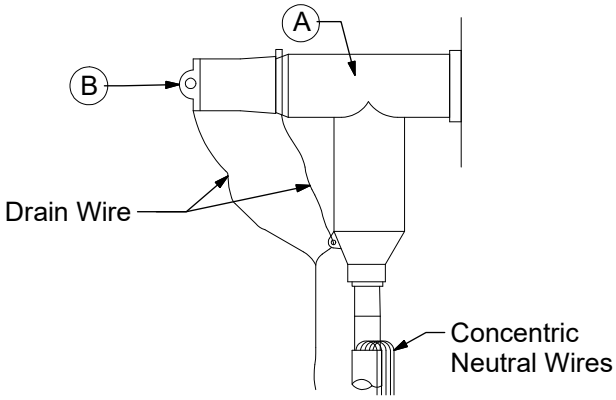
8. Ground The Elbow

   A. Connect the tie off tabs of the LRTP and the T-body with a strand of drain wire (concentric neutral wire) and connect the drain wire to ground.

   B. Connect the insulating cap drain wire to ground with appropriate connector.

   C. Connect the cable concentric neutral wires or flatstraps to ground. For LC Shield Cables use DCS **59 40 93 44**.

   D. See DCS **59 40 60 01** for additional 600 Amp accessories.



DCS #	DESCRIPTION	DCS #	DESCRIPTION
42 34 64 01	500 kcmil AL CN Cable	42 34 64 02	750 kcmil AL/CU CN Cable
42 34 64 03	750 kcmil LC Cable	42 34 64 04	4/0 AWG AL CN Cable
42 34 64 05	350 kcmil FS, Reduced Wall Cable	42 34 64 06	350 kcmil CN Cable

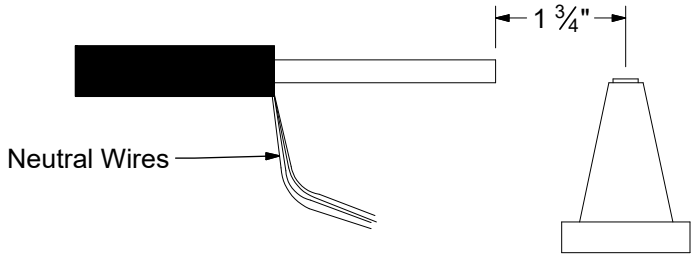
	ITEM	STK / DCS #	DESCRIPTION 42 34 64 **	01	02	03	04	05	06
	A	17 05 255	Elbow − Deadbreak, 500 kcmil Al, Stranded	1	-	-	-	-	-
		17 05 224	Elbow − Deadbreak, 750 kcmil Al or Cu, Stranded	-	1	1	-	-	-
		17 05 374	Elbow − Deadbreak, 4/0 AWG Al, Stranded	-	-	-	1	-	-
		17 05 326	Elbow − Deadbreak, 350 kcmil Cu, RW, Compact Str.	-	-	-	-	1	-
		17 05 492	Elbow − Deadbreak, 350 kcmil Cu, Stranded	-	-	-	-	-	1
	B	17 55 227	Cap − Insulating, 15kV, with Drain Wire	1	1	1	1	1	1
@	C	17 54 306	Connector − Cable Ground Braid	-	-	1	-	-	-

REV	DATE	ENG	DESCRIPTION
13	01/01/22	EJB	Converted to new format
12	10/14/16	EJB	

INSTRUCTIONS - Concentric Neutral Wires or Flat Strap Shielded Cables

1. Train the Cable

   A. Position the cable between the apparatus bushing and the parking stand pocket. It should be located in the final assembled position with enough slack to provide adequate clearance for removing the elbows. Cut back the jacket and unwind the concentric neutral wires to allow enough length to make a connection to ground. Cut the cable 1- ¾“ from the center line of the mating bushing.

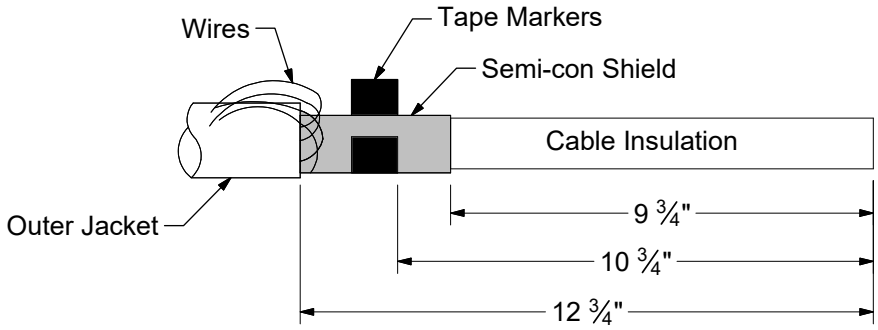


2. Clean the Cable

   A. Clean the outer jacket of the cable for 24 inches.

3. Cable Preparation

   A. Follow the cable cut backs for jacketed concentric neutral wires shown below:



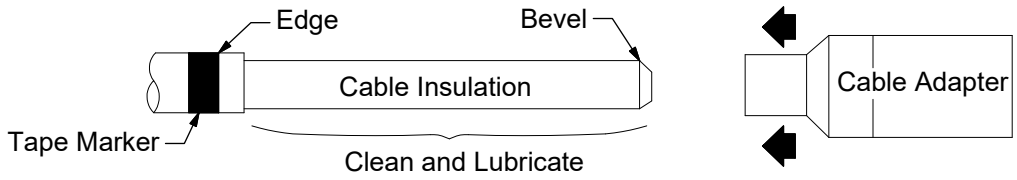
REV	DATE	ENG	DESCRIPTION
1	01/01/22	EJB	Converted to new format
0	10/01/19	EJB	

4. Install the Cable Adapter:

   A. Bevel the end of the cable insulation at 45 degree angle, approximately ¼" back.

   B. Thoroughly clean, then lubricate the cable insulation always working toward the semi-con shield.

   C. Install the cable adapter, small end first, until it is flush with the edge of the tape marker.



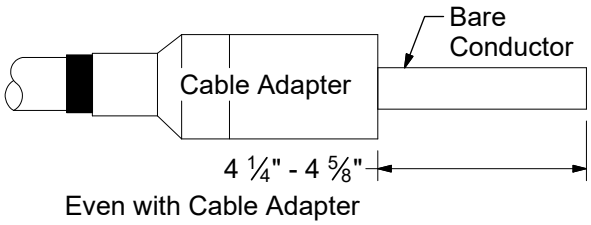
5. Expose the Conductor:

   A. Remove the cable insulation and expose the conductor by cutting it even with the cable adapter.

   B. Do not cut or nick the cable adapter or the conductor.

   C. The length of exposed conductor should be length 4-¼" to 4-⅝".

   D. Otherwise, redo the assembly.



6. Install the Shear Bolt Lug

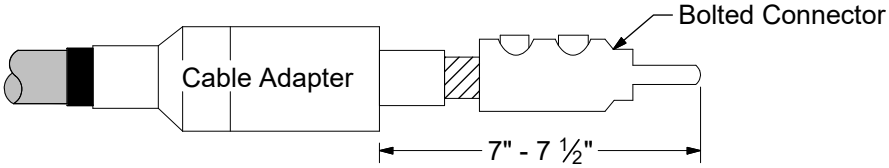
   A. For copper conductor insert the shear bolt lug onto the bare conductor. For aluminum conductor wire brush it and immediately insert the shear bolt lug onto the bare conductor.

   B. The 4/0 AWG lug will require a ⅜" hex socket, the 350 kcmil lug will require a ½" hex socket, and the 750 kcmil lug will require a ¾" hex socket.

   C. Start with the shear bolt at the open end of the connector and move towards the eye of the lug.

   D. Wipe off all excess inhibitor after installation.

   E. The distance from the end of the bolted connector to the cable adapter after installation should be in the range of 7" to 7-½". If not, redo the assembly.



   F. Remove any sharp edges from the bolted connector to avoid damage to the elbow.

7. Install the T-Elbow Body to the Cable

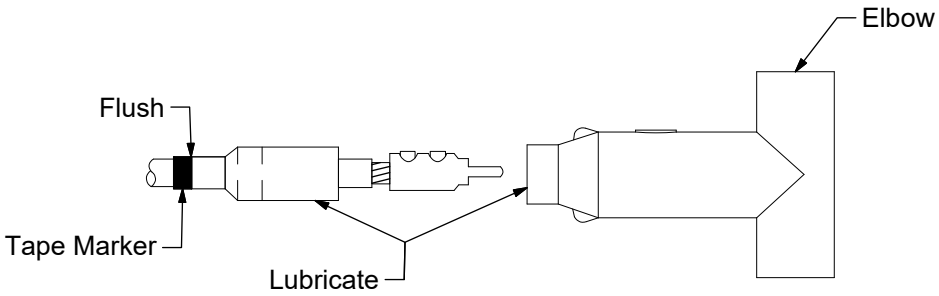
   A. Lubricate the cable adapter and the inside of the elbow cable entrance.

   B. Install the elbow onto the cable adapter until the elbow cannot advance further.

   C. Make sure that the cable adapter is still flush with the tape marker.

   D. If not, reposition the cable adapter.

   E. Remove the tape marker.



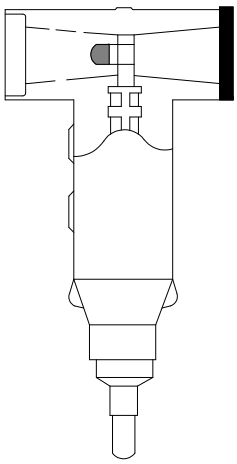
8. Install the T-Elbow to the 600 Amp Bushing.

   A. Remove the protective caps from both ends of the T-elbow and from the 600 amp bushing.

   B. Hand tighten the threaded stud supplied with the T-elbow into the 600 amp bushing.

   C. Clean and lubricate both the T-elbow and the 600 amp bushing with the lubricant supplied.

   D. Push the T-elbow onto the 600 amp bushing, lining up the hole in the compression lug with the stud on the mating part.

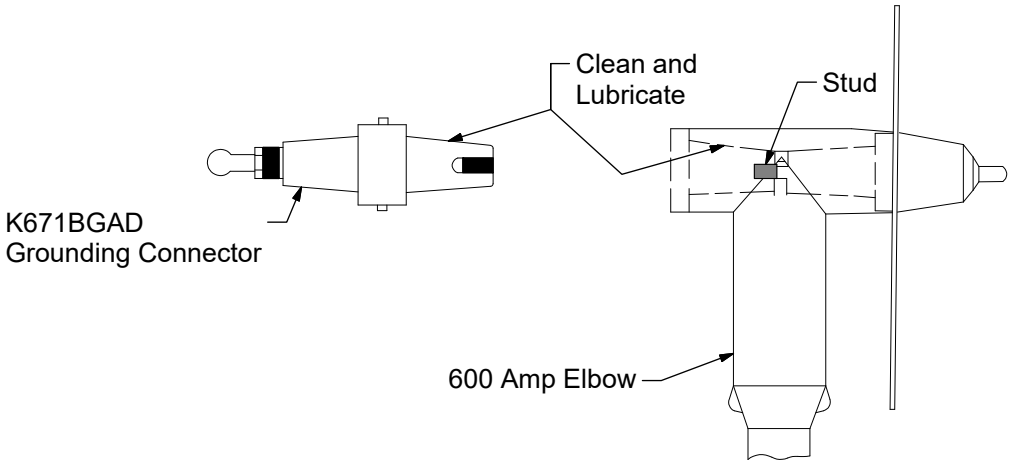


9. Install the Ball Ground Connector to the T-Elbow

A. The Ball Ground Connector (K671BGAD) is installed on the rear position of the T-elbow.

B. Clean and lubricate the Ball Ground Connector interface and the 600 amp T-elbow interface with the lubricant supplied.

C. Insert the Ball Ground Connector into the T-elbow and rotate clockwise to engage the stud.

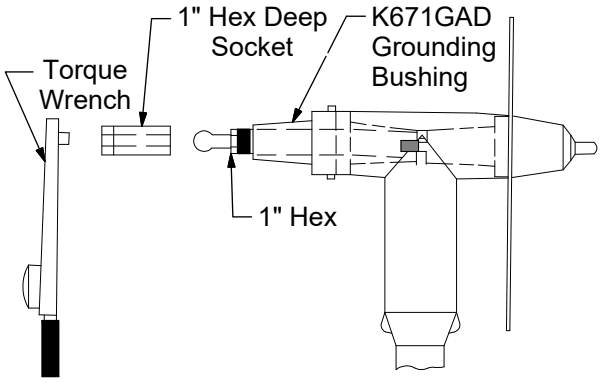


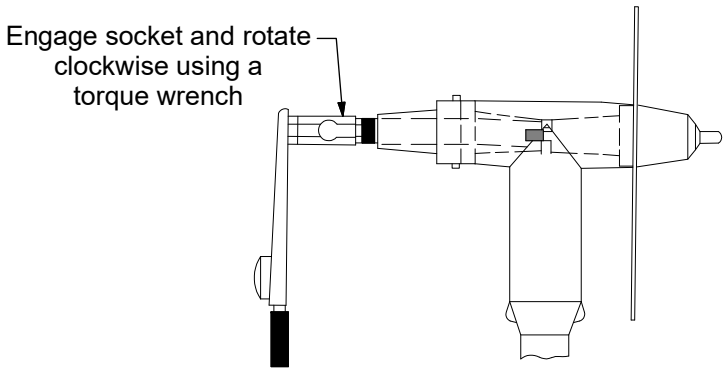
10. Tighten the Ball Ground Connector to the T-Elbow

A. Engage a 1” deep socket (Stock #86 14 400) onto the ball ground connector by placing it over the ball ground. Attach a torque wrench (Stock #85 40 005) to the socket and continue rotating.

B. When the Ball Ground Connector stops rotating, tighten it to 55/60 foot-pounds torque.

C. Remove the wrench and socket from the Ball Ground Connector.





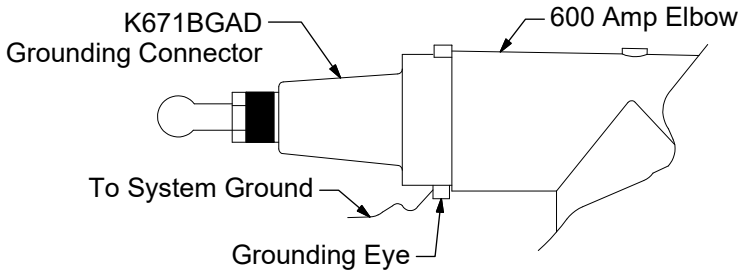
REV	DATE	ENG	DESCRIPTION
1	01/01/22	EJB	Converted to new format
0	10/01/19	EJB	

11. Install the Drain Wires and Ground Drain wires and Neutral Wires

A. Using a separate #14 copper wire, insert one end through the grounding eye on the Ball Ground Connector. twist lightly taking care nor to damage the eye. The other end of the wire must be connected to system ground.

B. Repeat step “A” to connect a drain wire from a tab on the T-elbow to system ground.

C. Twist the neutral wires of the cable together and connect them to system ground.

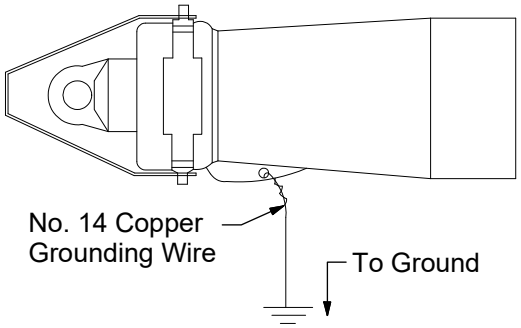


12. Installing the Insulating Cap

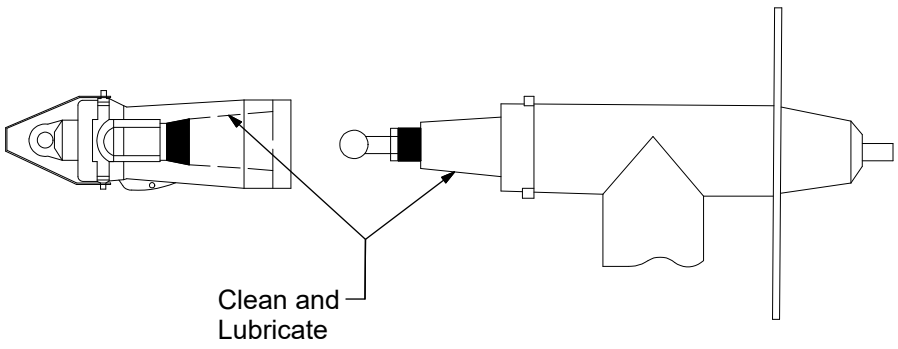
A. Insert a length of #14 copper wire through the grounding eye of the Insulating Cap (K676BGADDR).

B. Make a small loop and twist lightly, taking care not to damage the grounding eye.

C. Connect the free end of the grounding wire to the system ground. The length of the grounding wire should be sufficient for the distance from the grounding point to the grounding eye of the Insulated Cap plus enough wire to wrap round the Insulated Cap 10 times (90”) during assembly.

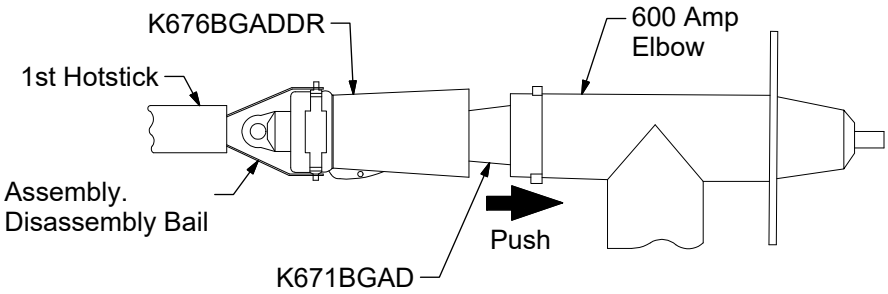


D. Clean and lubricate the Insulated Cap and the Ball Ground Connector with lubricant supplied.

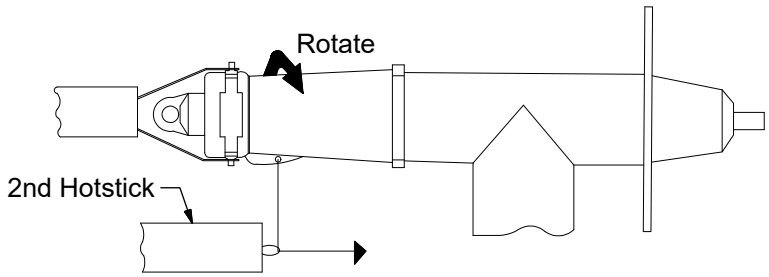


E. Two hot sticks are required for installation of the Insulating Cap. During installation of the Insulating Cap, the grounding wire will be wrapped around the body of the Insulating Cap.

F. Attach the first hot stick tool to the Insulating Cap assembly / disassembly bail and push the cap onto the bushing interface as far as it will go.



G. With the second hot stick, engage the grounding wire and establish slight tension (see the figure below).



H. With the first hot stick, while pushing against the bushing surface, rotate the cap clockwise until the threads between the stud mounted on the bushing and the Insulating Cap engage; continue turning without pushing until resistance is felt. DO NOT OVERTIGHTEN.

I. Remove the second hot stick.

13. Removing the Insulating Cap

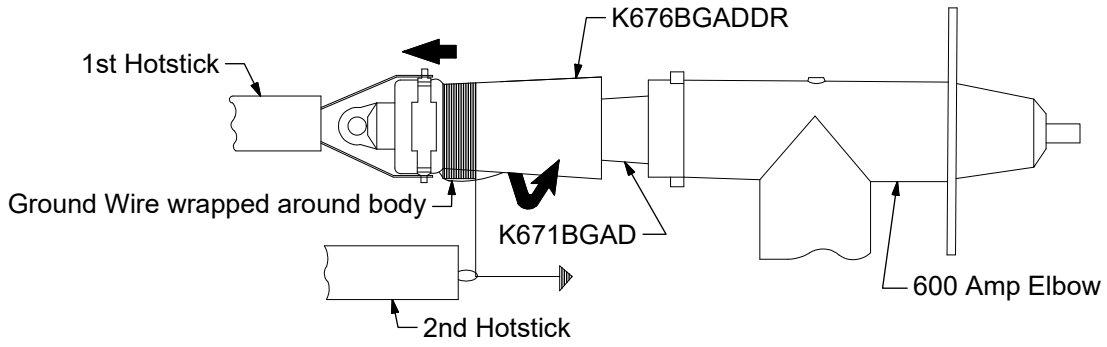
WARNING: DO NOT DISCONNECT THE INSULATING CAP WHILE THE ELBOW IS ENERGIZED!

A. After the circuit is known to be de-energized, securely fasten a hot stick to the assembly / disassembly bail.

B. Without exerting any pulling force, rotate the Insulating Cap counter-clockwise eight or nine turns.

C. With a second hot stick tool, control the unwound ground wire so that the wire will not interfere with adjacent devices or entangle itself with the first hot stick tool.

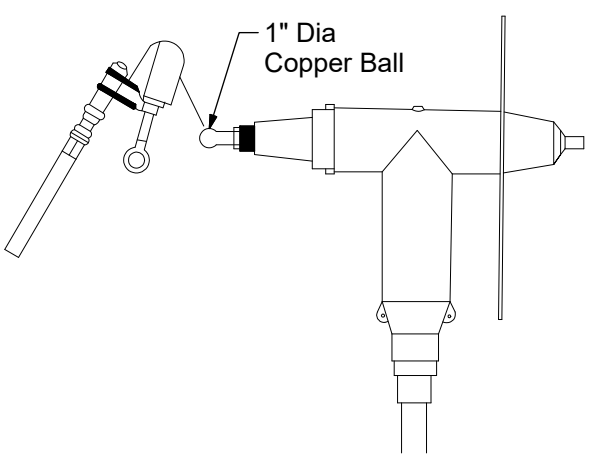
D. Exert a pulling force to remove the Insulating Cap from the Ball Ground Connector interface.

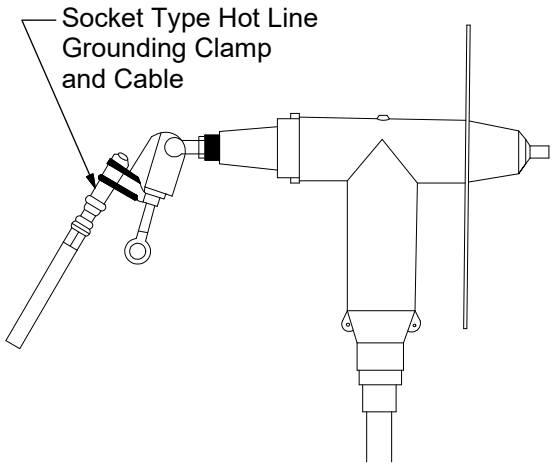


14. Installing the Ball Ground Clamp

A. The Ball Ground Connector (K671BGAD) has a 1” copper ball extending out from the interface end so that a socket type hot line grounding clamp can be attached.

B. FOLLOW AMEREN OPERATING PROCEDURES FOR GROUNDING THIS CONNECTION.





15. Removing the Ball Ground Clamp and Installing the Insulating Cap.

A. When repairs have been completed, remove the hot line ball ground clamp.

B. Install the Insulating Cap (K676BGADDR) as shown in Step 12.

DCS #	DESCRIPTION
42 34 65 01	350 CNRP
42 34 65 02	4/0 ALCNRP
42 34 65 03	750 ALCNRP or CNRP

CONSTRUCTION NOTE(s):

1. Use the Grounding Connector (Item C) and the Hex Nut (Item D) to connect the drain wires of the dead break Elbow and the 600 amp Insulating cap to the ground bus bar of the vault mounted switchgear.

	ITEM	STK / DCS #	DESCRIPTION 42 34 65 **	01	02	03
	A	17 05 556	Elbow − Dead break, 15kV, 600 A, 350 kcmil, with Ball Ground & Cap	1	-	-
		17 05 554	Elbow − Dead break, 15kV, 600 A, 4/0 AWGI, with Ball Ground & Cap	-	1	-
		17 05 555	Elbow − Dead break, 15kV, 600 A, 750 kcmil, with Ball Ground & Cap	-	-	1
	B	18 52 018	Wire − #4 Copper, Binder, Bare	15	15	15
1 @	C	17 54 435	Connector − Grounding, #8 to 2/0	1	1	1
1 @	D	21 61 007	Nut − Hex, ½”, 13 TPI, Everdur	1	1	1

DESIGN NOTE(s):

2. Each 15kV padmounted switchgear will require 3-12 15kV 600 amp dead break elbow terminations.

3. Each 15kV vault mounted switchgear will require 6-12 15kV 600 amp dead break elbow terminations.

4. The Ball Ground Connector has a 25 kA fault current rating vs. the 200 amp load break tap on the standard 600 amp T-body connection which has a 10 kA fault rating.

INSTRUCTIONS - Cable With Concentric Neutral Wires or Flat Strap Neutrals

1. Train cable into position and cut to required length. Strip the cable to the dimensions shown in Figure 1. Check the lug being used to determine insert depth "X". Provide an additional 1/4" of exposed conductor on 1/0 - 350 kcmil aluminum cables and an additional 3/4" of exposed conductor on 750 kcmil cables. This will accommodate growth during crimping of aluminum lugs. If a shearhead bolt lug is used, additional exposed conductor is not required.

2. Allow a sufficient length of concentric wires or flat straps to make the ground connections.

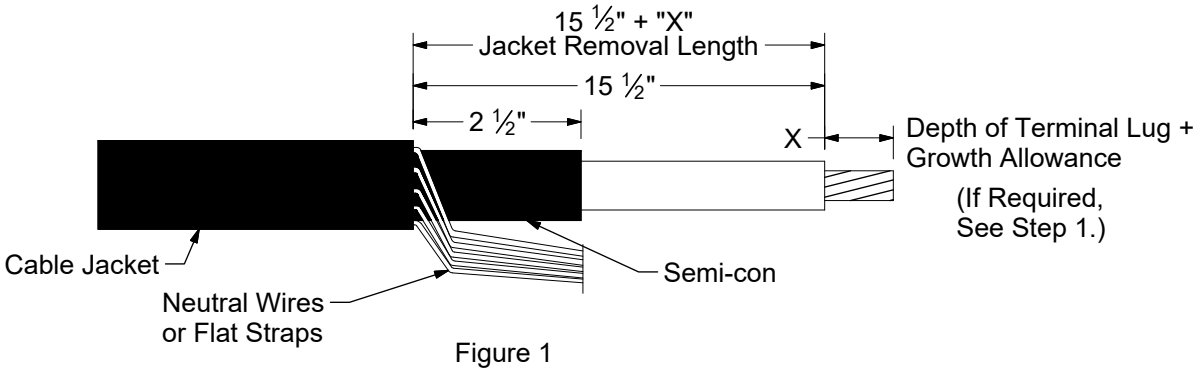


Figure 1

3. Select one of the two mastic strips from the kit and remove white release liners. Using light tension apply a single wrap of mastic around the cable jacket 1/4" from the cut edge. Cut off excess mastic. See Figure 2.

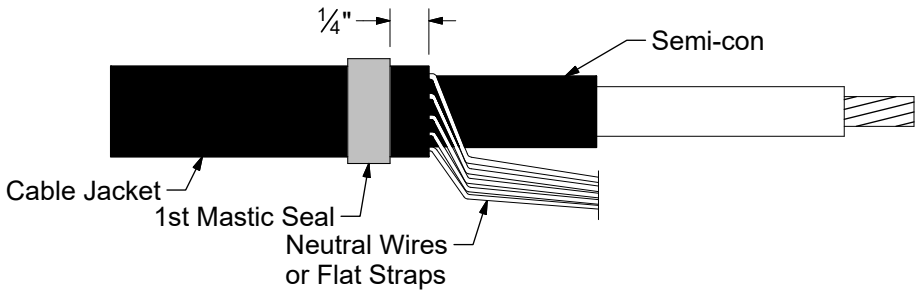


Figure 2

4. Bend the neutral wires (flat straps) back over applied mastic and secure to cable jacket 4-½" from the edge of the semi-con. Use vinyl tape to secure the wires (straps). This tape will be used to position the terminator, so the location is critical. See Figure 3.

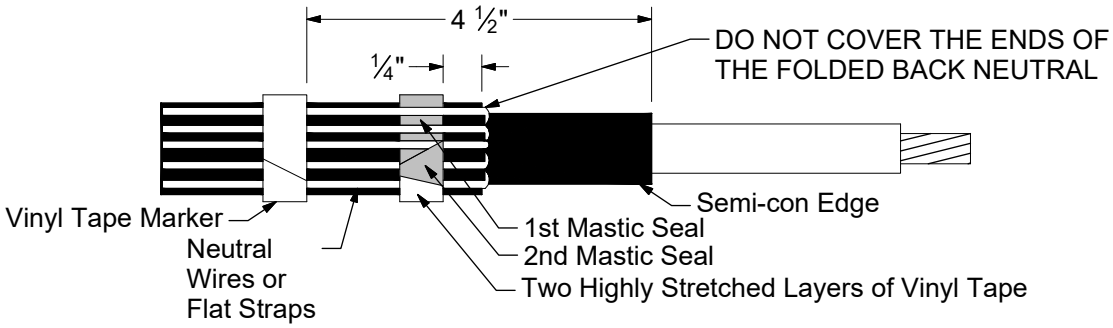


Figure 3

5. Select the second mastic strip from the kit and remove the white release liners. Apply a second single wrap of mastic over the neutral wires (straps) and the previously applied mastic strip. Cut off excess. See Figure 3.

Compress the neutral wires (straps) into the mastic by overwrapping the strips with two highly stretched layers of vinyl tape. Be sure to cover all exposed mastic. See Figure 3.

6. Remove the red support core from the terminator. Verify that the terminator body will fit over the lug being used. If the lug will not fit through the core, clean the insulation and slide the terminator onto the cable before installing the lug. DO NOT remove the core at this time.

7. Use a stainless steel wire brush to clean the exposed aluminum conductor. Position and install the 4/0 aluminum lug using a U249 die. For the 350 kcmil copper lug, use a U31RT die. For the 750 kcmil aluminum lug, use a U608 die. For the 750 kcmil copper lug, use a L39RT die. For the 1/0 aluminum lug, use a U25ART die. Make as many crimps as possible without overlap. After the lug is installed remove excess oxide inhibitor and all sharp crimp flashing.

   The shearhead bolt lug (Stock #17 55 804) may be used instead of the 350 kcmil through 750 kcmil copper and aluminum compression lugs.

   Shearhead Bolt Lug Installation Instructions.

   A. Battery powered impact wrench with a ⅞" hexagonal socket should be used to install shearhead bolt lugs.

   B. Remove the insert from the lug body if the conductor to be installed is greater than 600 kcmil compact stranded.

   C. Back out all bolts to give clearance for the conductor - DO NOT completely remove the bolts from the connector body.

   D. Insert the cleaned conductor into the lug. There should be no gap between the insulation and lug body.

   E. Hand tighten the bolts to firmly grip the conductor. Use the tightening sequence shown in Figure 4 to tighten the bolts one-and-a-half turns. Bolts should remain un-sheared.

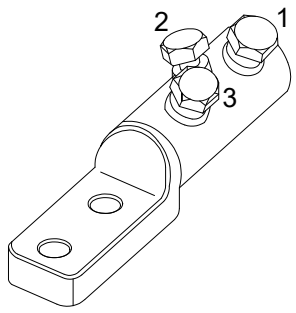


Figure 4

   F. Repeat the sequence in step "E" tightening each bolt until the head shears off. DO NOT bend the conductor while shearing the bolts.

   G. Smooth any sharp edges of protruding bolts with the abrasive provided. Clean the connector to remove particles and excess inhibitor.

8. Position the terminator body on the cable. The base of the terminator body (not the core) must be butted up to the edge of the vinyl marker tape. Remove the core while unwinding in a counter-clockwise direction. Once the terminator body has made contact over the mastic seal area, there is no need to continue supporting the assembly. DO NOT push or pull the terminator while unwinding the core. See Figure 5.

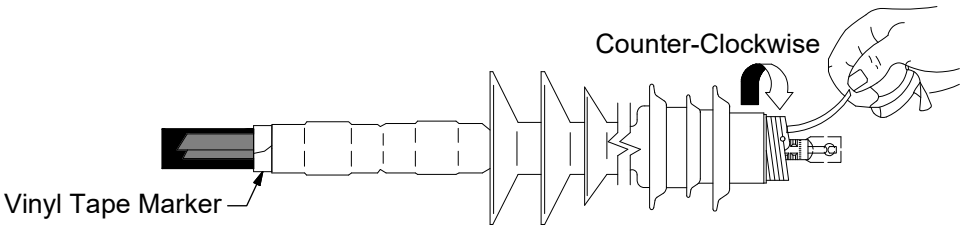


Figure 5

9. For 1/0 - 750 kcmil outdoor installations, attach a bronze four bolt lug to the compression lug or shearhead bolt lug using a ground stud in the upper hole and a 1/2” x 2” bolt in the lower hole. See Figure 6.

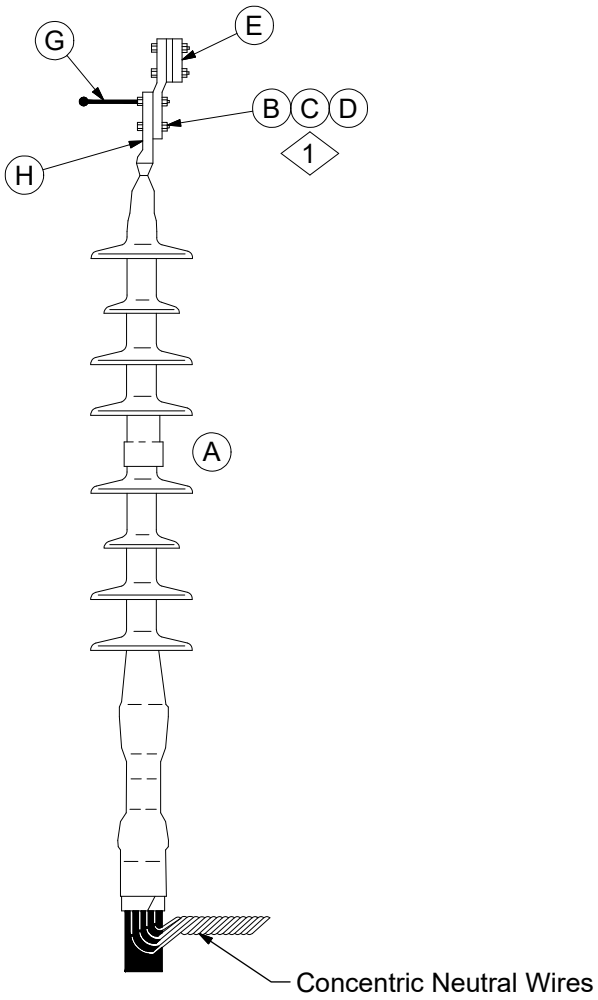


Figure 6

10. Collect all concentric neutral wires (straps) together and connect to system ground.

11. If a shearhead bolt lug is used, verify that the terminator body covers all bolt positions to prevent moisture ingress. If a bolt position is not covered with the terminator body, cover the bolt position with mastic and silicone tape.

REV	DATE	ENG	DESCRIPTION
10	01/01/22	EJB	Converted to new format
9	09/08/15	EJB	

INSTRUCTIONS - Cables With Metallic Shields (LC or Tape (shown))

1. Train cable into position and cut to required length. Strip the cable to the dimensions shown in Figure 1A. Check the lug being used to determine insert depth "X".

   A. Special shears (Stock #85 32 240) should be used to cut the LC shield.

   B. To prevent a taped shield from unrolling, hold down the edges with a single wrap of semi-conducting tape (Stock #25 53 076).

   C. Provide an additional 1/4" of exposed conductor on 1/0-350 kcmil cables and an additional 3/4" of exposed conductor on 750 kcmil cables. This will accommodate growth during crimping of aluminum lugs. If a shearhead bolt lug is used, additional exposed conductor is not required.

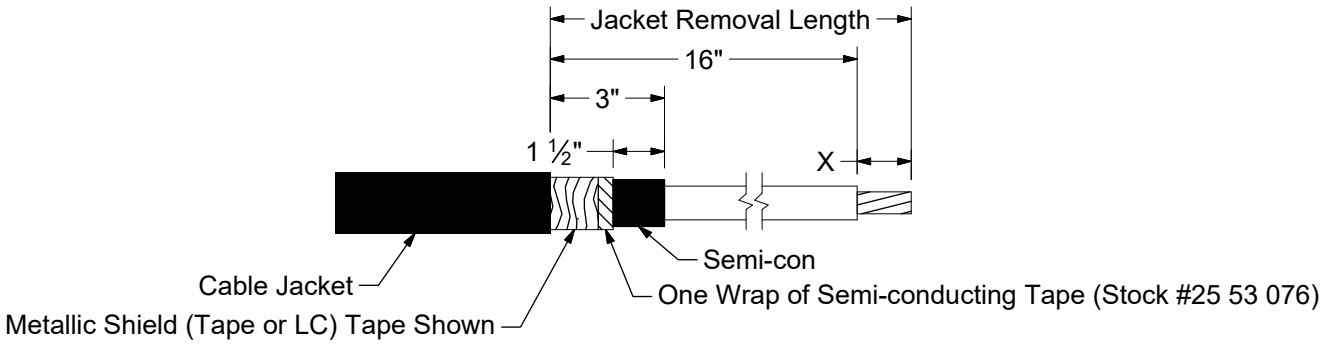


Figure 1A

2. Select one of the two mastic strips from the kit and remove white release liners. Using light tension apply a single wrap of mastic around the cable jacket 1/4" from the cut edge. Cut off excess mastic. See Figure 2A.

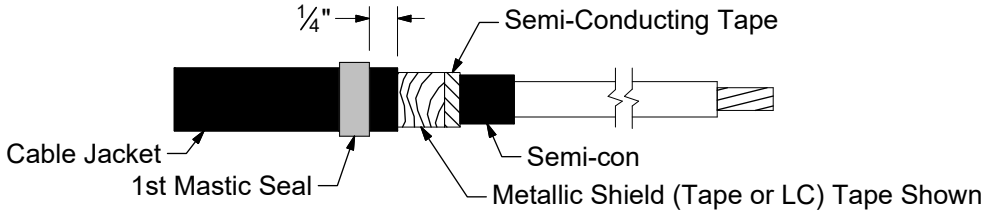


Figure 2A

3. Position a preformed ground braid (Stock #17 54 306) with the ”U” section over the metallic shield directly adjacent to the cable jacket cut edge. Position one tail of the ground braid over the cable jacket with the heat-shrinkable covering in contact with the mastic strip. Secure the tail to the cable jacket 4-1/2” from the edge of the semi-con using vinyl tape. Note: Position the vinyl tape with care since it also serves as a marker for positioning the terminator. See Figure 3A.

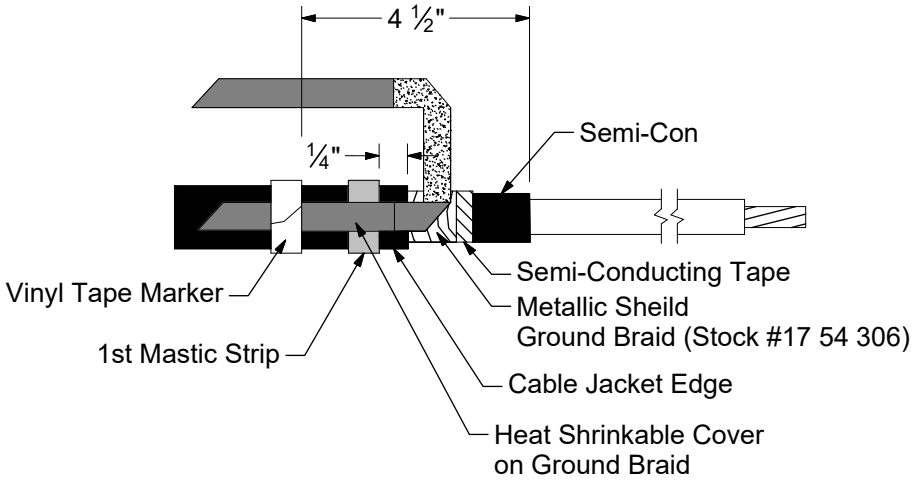


Figure 3A

REV	DATE	ENG	DESCRIPTION
10	01/01/22	EJB	Converted to new format
9	09/08/15	EJB	

4. Wrap the ground braid around the metallic shield and secure in place with the constant force spring. Tighten the spring after wrapping the final turn. Position the ground braid tails over the cable jacket. The tails of the ground braid do not have to be on top of each other. See Figure 4A.

5. Select the second mastic strip from the kit and remove the white release liners. Apply a single wrap of the second mastic strip over the previously applied mastic. If ground braids overlap on cable jacket be sure to apply mastic between the braids. Secure ground braids to cable jacket 4-1/2" from cable semi-con edge using vinyl tape. Apply tape directly over previously applied marker tape. See Figure 4A.

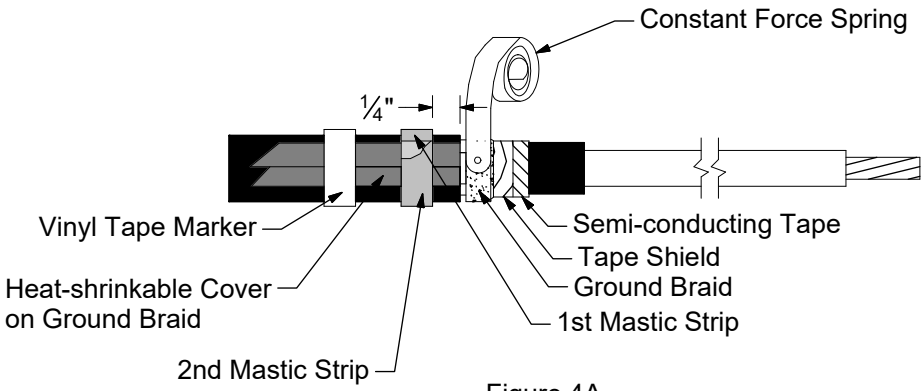


Figure 4A

6. Wrap two half-lapped layers of vinyl tape around the mastic seal. Apply two half-lapped layers of semi-conducting tape over the constant force spring and exposed metallic shield. Do not cover the exposed semi-con insulation shield. See Figure 5A.

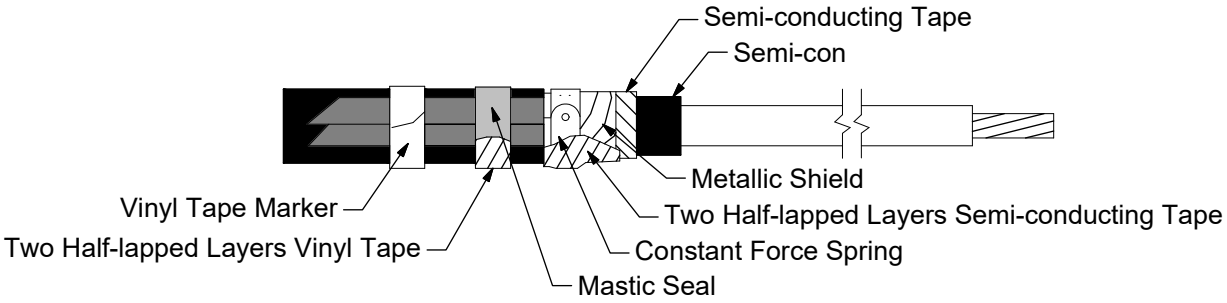


Figure 5A

7. Remove the red support core from the terminator. Verify that the terminator body will fit over the lug being used. If the lug will not fit through the core, clean the insulation and slide the terminator onto the cable before installing the lug. Do not remove the core at this time.

8. Use a stainless steel wire brush to clean the exposed aluminum conductor. Position and install the 4/0 aluminum lug using a U249 die. For the 350 kcmil copper lug, use a U31RT die. For the 750 kcmil aluminum lug, use a U608 die. For the 750 kcmil copper lug, use a L39RT die. Make as many crimps as possible without overlap. After the lug is installed remove excess oxide inhibitor and all sharp crimp flashing. The shearhead bolt lug (Stock #17 55 804) may be used instead of the 350 kcmil through 750 kcmil copper and aluminum compression lugs. See shearhead bolt lug installation on Sheet 2.

9. Position the terminator body on the cable. The base of the terminator body (not the core) must be butted up to the edge of the vinyl marker tape. Remove the core while unwinding in a counter-clockwise direction. Once the terminator body has made contact over the mastic seal area, there is no need to continue supporting the assembly. DO NOT push or pull the terminator while unwinding the core. See Figure 6A.

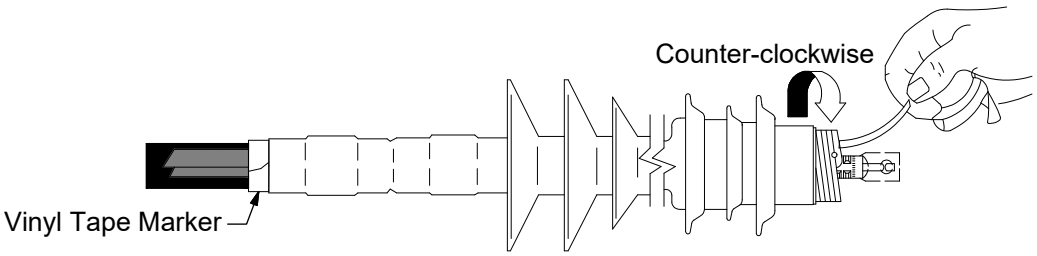


Figure 6A

10. For outdoor installations, attach a bronze four bolt lug to the compression lug or shearhead bolt lug using a ground stud in the upper hole and a 1/2” x 2” bolt in the lower hole. See Figure 7A.

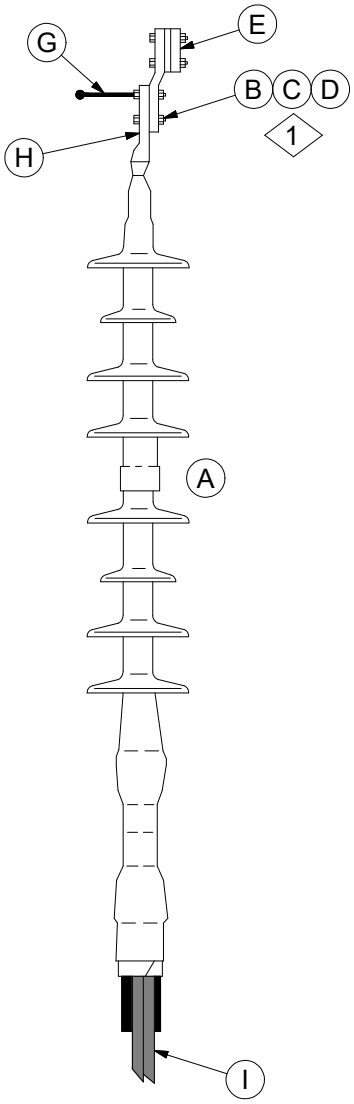


Figure 7A

11. Connect ground braids to system ground using a two-bolt connector (Stock #17 54 140).

REV	DATE	ENG	DESCRIPTION
10	01/01/22	EJB	Converted to new format
9	09/08/15	EJB	

12. If a shear head bolt lug is used, verify that the terminator body covers all bolt positions to prevent moisture ingress. If a bolt position is not covered with the terminator body, cover the bolt position with mastic and silicone tape.

DCS #	DESCRIPTION
42 44 12 01	4/0 Al Compression Lug
42 44 12 02	350 CU Compression Lug/Shearhead Bolt Lug
42 44 12 03	750 CU Compression Lug/Shearhead Bolt Lug
42 44 12 04	750 AL Compression Lug/Shearhead Bolt Lug
42 44 12 05	1/0 AL Lug

CONSTRUCTION NOTE(s):

◇1.◇ For washer stacking order see DCS **59 52 00 43**.

	ITEM	STK / DCS #	DESCRIPTION 42 44 12 **	01	02	03	04	05
	A	17 07 151	Terminator - Cable, 15 kV, 1/0-750 kcmil	1	1	1	1	1
2	B	21 56 078	Bolt - Machine ½" x 2" SS	1	1	1	1	1
	C	12 56 052	Washer-Belleville-Spring, 1/2"x 2" SS	2	2	2	2	2
	D	12 56 053	Washer-Flat, ½", SS	4	4	4	4	4
2	E	17 54 177	Connector - Cable to Flat Bronze	1	1	1	1	1
	F	17 54 140	Connector - Wire, #8-4/0, 2-Bolt	1	1	1	1	1
2	G	23 64 051	Stud - Grounding, 7" Long, Ball End	1	1	1	1	1
	H	17 55 456	Lug - Compression, 1/0, 2 Hole Al	-	-	-	-	1
		17 05 256	Lug - Compression, 4/0, 2 Hole Al	1	-	-	-	-
@		17 55 296	Lug - Compression, 350, 2 Hole Cu	-	1	-	-	-
		17 55 214	Lug - Compression, 750, 2 Hole Cu	-	-	1	-	-
		17 05 260	Lug - Compression, 750, 2 Hole Al	-	-	-	1	-
		17 55 804	Lug - Shearhead Bolt, 350-750 Cu/Al, 2 Hole	-	1	1	1	-
@	I	17 54 306	Connector - Cable Ground Braid	-	1	1	1	-
			Operation Code 720	1	1	1	1	1

DESIGN NOTE(s):

2. For indoor installations omit items "E" and "G" and increase the quantity of item "B" by one.

REV	DATE	ENG	DESCRIPTION
10	01/01/22	EJB	Converted to new format
9	09/08/15	EJB	

INSTRUCTIONS

1. Train The Cable

   A. Center the cable between the apparatus bushing and the parking stand pocket. The cable should be located 7 inches from the apparatus front plate.

   B. Provide adequate slack for cable movement between the apparatus bushing and the standoff bushing.

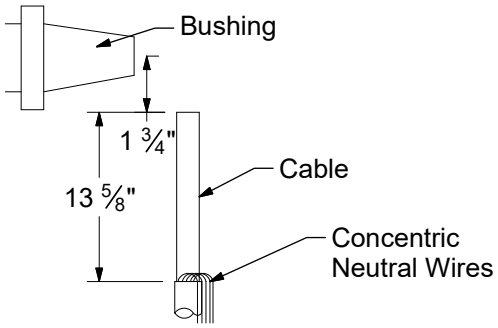
   C. Cut the cable 1-3/4 inches from the centerline of the bushing.

   D. Clean 24 inches of the outer cable jacket.

2. Cut Back The Cable

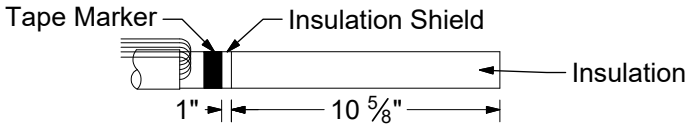
   A. Remove 13-5/8 inches of cable jacket.

   B. Allow enough extra concentric neutral wires to connect to ground and allow movement to the standoff bushing.



   C. Remove 10-5/8 inches of insulation shield.

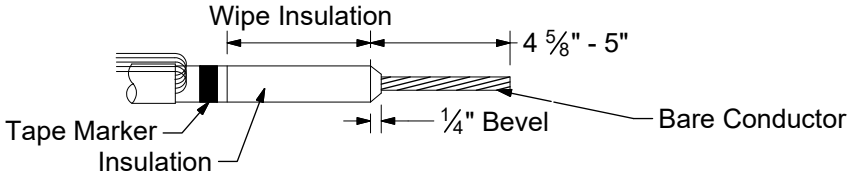
   D. Place a tape marker 1 inch from the end of the insulation shield.



   E. Remove 4-5/8 - 5 inches of insulation.

   F. Bevel the insulation edge 1/4 inch at a 45 degree angle.

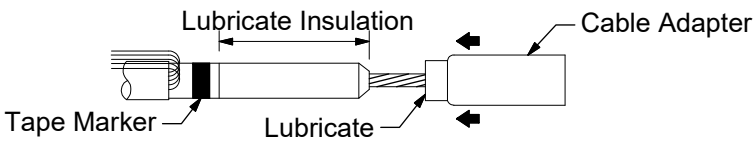
   G. Thoroughly clean the insulation.



3. Install The Cable Adapter

   A. Lubricate the exposed insulation and the inside of the cable adapter.

   B. Slide the small end of the cable adapter over the cable using a twisting motion until the small end is flush with the tape marker.



4. Install The Compression Connector

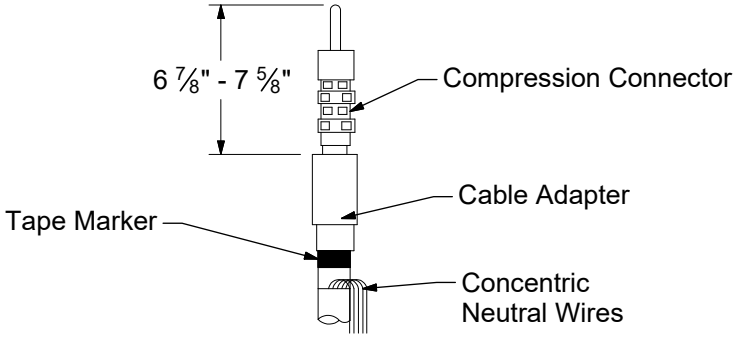
   A. Wire brush the aluminum conductor.

   B. Insert the conductor into the compression connector and rotate until the flats of the compression connector and the apparatus bushing are aligned.

   C. Make 3 crimps using the U28ART die for 1/0 AWG AL cable, or U31 ART die for 350 kcmil cable, or L39ART die for 750 kcmil cable. Make the first crimp at the first line below the shoulder of the connector. Rotate each crimp 90 degrees and allow 1/8 inch between crimps.

   D. Wipe off excess inhibitor.

   E. Check connector length as shown.



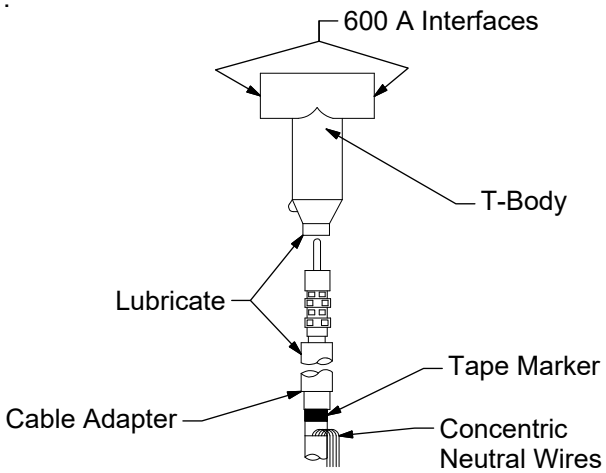
5. Install T-Body

   A. Clean and lubricate the outside of the cable adapter. Remove the protective caps from the T-body.

   B. Clean and lubricate the inside of the T-body.

   C. Slide the T-body onto the cable until the compression connector eye is centered in the 600 Amp interfaces.

   D. Remove the tape marker.



6. Install The 600 AMP Elbow Onto The Apparatus Bushing

   A. Screw the threaded stud into the threaded hole in the LRTP if a stud is not already installed on the apparatus bushing.

   B. Clean and lubricate the mating interfaces of the apparatus bushing, the LRTP, and the T-body.

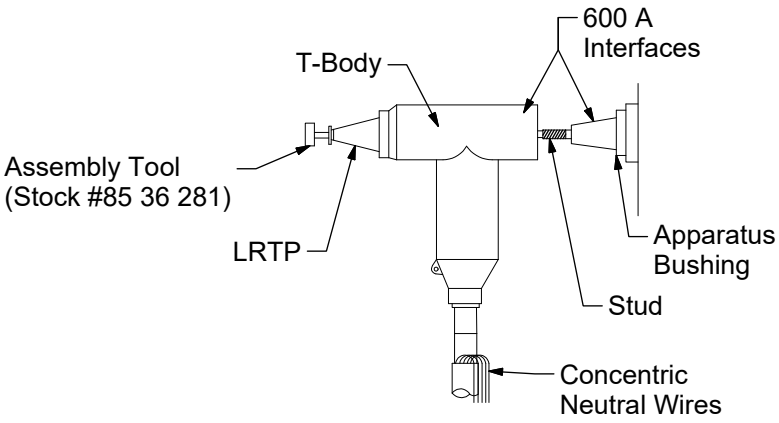
   C. Push the T-body onto the apparatus bushing.

D. Insert the LRTP into the back of the T-body and engage the stud by turning the LRTP by hand.

E. Insert the assembly tool into the LRTP throat and engage the internal nut.

F. Turn and tighten the LRTP using the assembly tool to a torque of 50-60 ft-lbs.

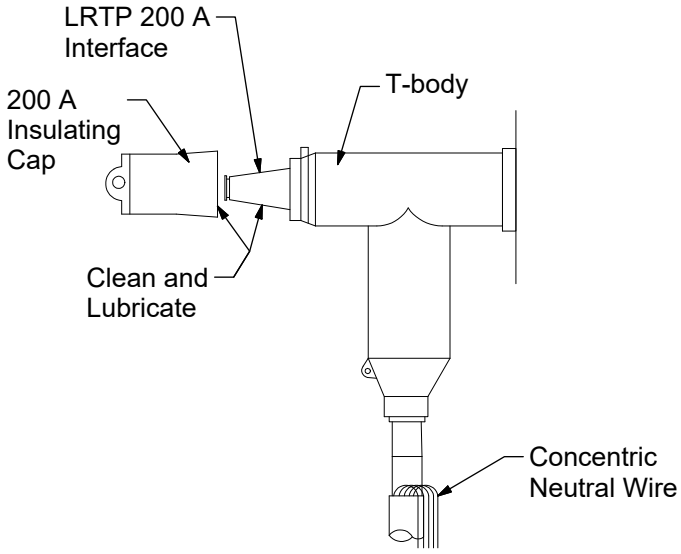
G. Remove the assembly tool.



7. Cap The 200 AMP Interface

A. Clean and lubricate the 200 Amp interface on the LRTP and the inside of an insulating cap.

B. Cover the interface with the cap.



REV	DATE	ENG	DESCRIPTION
7	01/01/22	EJB	Converted to new format
6	10/01/19	EJB	

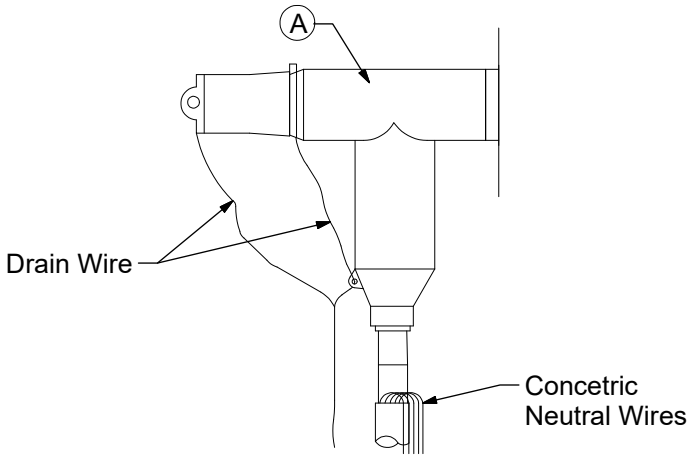
8. Ground The Elbow

   A. Connect the tie off tabs of the LRTP and the T-body with a strand of drain wire (concentric neutral wire) and connect the drain wire to ground.

   B. Connect the insulating cap drain wire to ground.

   C. Connect the cable concentric neutral wires to ground.

   D. For LC shield cables use DCS **59 40 93 44**.



DCS #	DESCRIPTION
42 44 13 01	1/0 ALCNRP
42 44 13 02	350 CNRP
42 44 13 03	750 FSRP

CONSTRUCTION NOTE(s):

1. A 35kV elbow arrester may be inserted onto the LRTP in lieu of the 200 A insulating cap.

	ITEM	STK / DCS #	DESCRIPTION 42 44 13 **	01	02	03
	A	17 05 321	Elbow − Deadbreak, 35kV, 1/0 AWG, Stranded	1	-	-
		17 05 472	Elbow − Deadbreak, 35kV, 350 kcmil, Stranded	-	1	-
		17 05 542	Elbow − Deadbreak, 35kV, 750 kcmil, Stranded	-	-	1
1 @	B	10 01 163	Arrester − Elbow, 35kV	1	1	1
@	C	17 54 306	Connector − Cable Ground Braid	-	1	-

NOTE: These Instructions Require Sign Off Lines

Sixty-nine kV terminators have numerous installation steps and it is critical that each step be completed in the correct order and as detailed in the following instructions. To help ensure that the installation instructions are followed and completed in order, a sign-off/check-off line has been added at the end of each step. After the work outlined in a specific step has been completed, the sign-off/check-off line is to be initialed by the individual completing the step.

By using the sign-off/check-off lines there will be no errors associated with skipped or overlooked instructions. Additionally, there will never be a question about where one is in the installation process.

INSTRUCTIONS

1. Prepare cable using dimensions shown in Figure 1. Be sure to allow for depth of terminal lug plus 1/2” plus crimp growth allowance. If a shear head bolt lug is used, additional exposed conductor is not required.

Conductor Size	350	400 - 650	750 - 1000
Crimp Growth Allowance	1/4"	1/2"	3/4"

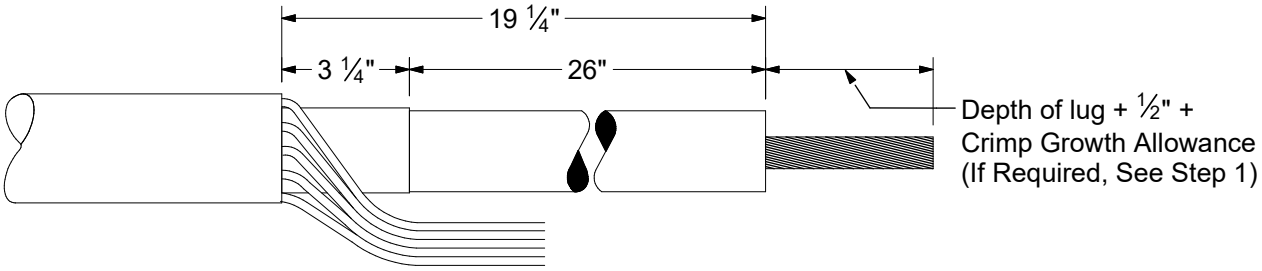


Figure 1

Initial when Step 1 is complete._____

2. Select the roll of 1” wide Scotch Sealing Mastic 2229 from the kit. Cut a length of the mastic long enough to wrap around the cable jacket. Remove the release liner from the mastic and, using a light tension, apply a single wrap of mastic around the cable jacket 1” from the edge. (Figure 2)

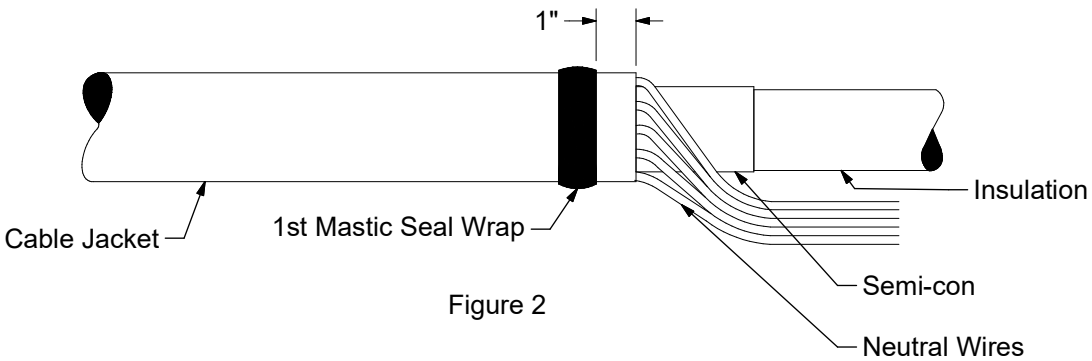


Figure 2

Initial when Step 2 is complete._____

3. Bend neutral wires back over applied sealing mastic and secure to cable jacket with vinyl tape 6” below jacket cutback. (Figure 3)

Initial when Step 3 is complete._____

4. Select the roll of 1” wide Scotch Sealing Mastic 2229 from the kit and cut a length of the mastic long enough to wrap around the cable jacket and neutral wires. Remove the release liner and, using a light tension, apply a single wrap of mastic around the cable jacket over the neutral wires and previously applied mastic. (Figure 3)

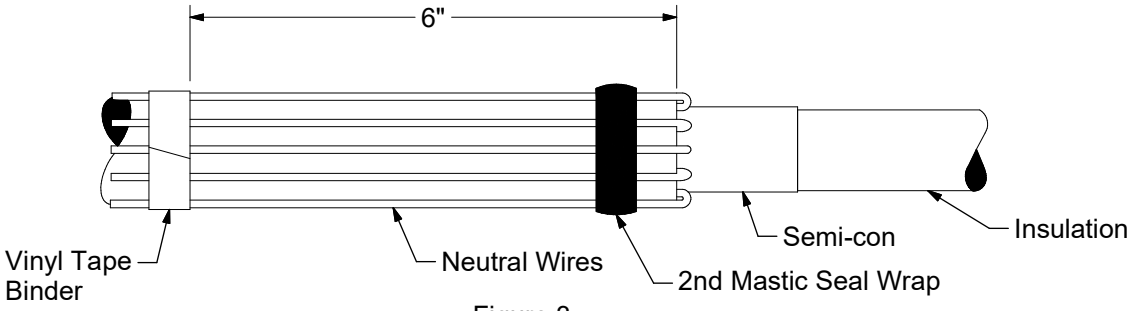


Figure 3

Initial when Step 4 is complete._____

5. Compress neutral wires into mastic by over-wrapping seal strips with two half-lapped layers of highly-tensioned Scotch Vinyl Electrical Tape Super 88. Cover all exposed mastic and neutral wires, overlapping 1/4” onto the exposed cable semi-con. (Figure 4) Take care to leave 3” of exposed semi-con.

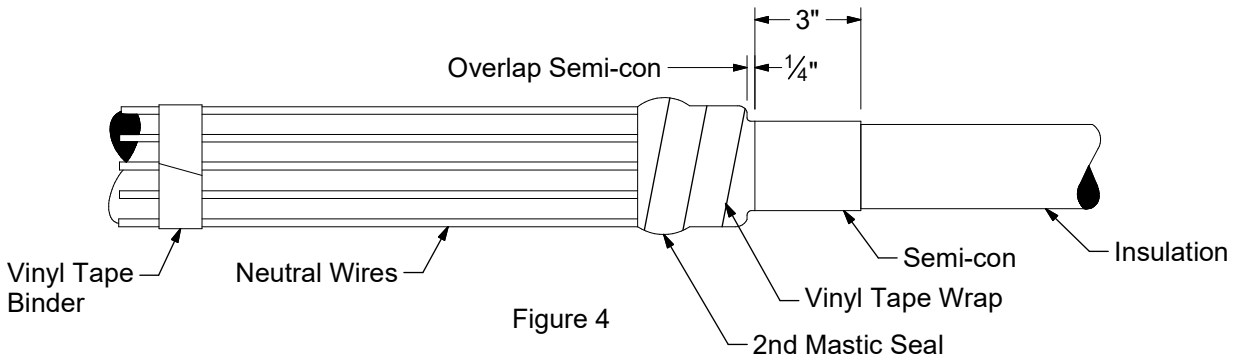


Figure 4

Initial when Step 5 is complete._____

6. Wipe the cable insulation clean with an approved solvent. Do not allow the solvent to touch the semi-con insulation shield.

   If an abrasive is required.

   Use only aluminum oxide abrasive to finish and polish insulation surface.

   Use abrasive only on cable insulation. Do not use on semi-con.

   When using abrasive, do not reduce the cable insulation diameter below that allowed by kit.

Initial when Step 6 is complete._____

7. Slide the ground seal assembly onto the cable jacket, loose core end first. (Figure 5)

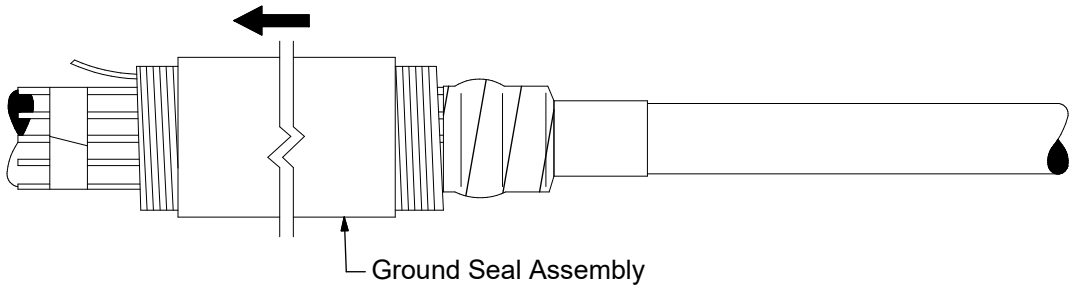


Figure 5

Initial when Step 7 is complete._____

8. Place a marker tape on the cable semi-con located 1-3/4” from the end of the semi-con. (Figure 6)

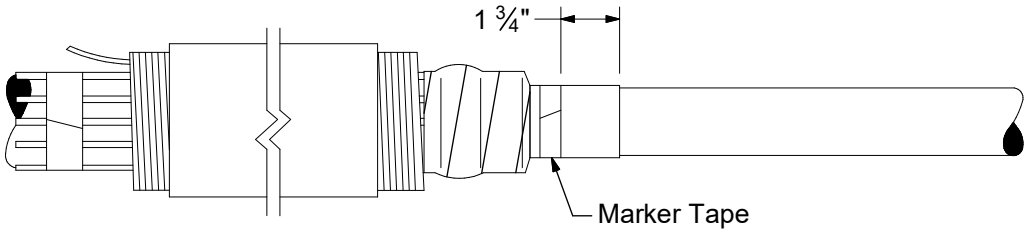


Figure 6

Initial when Step 8 is complete._____

9. Apply 1 tube 3M Red Dielectric Compound P55/R starting at marker tape and continuing onto the cable insulation for approximately 8” (Figure 7)

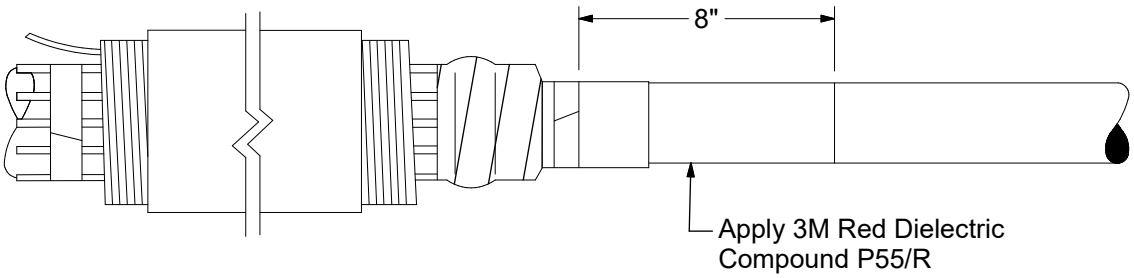


Figure 7

Initial when Step 9 is complete._____

10. Select the Stress Control Assembly (medium length tubular assembly on white core) from the kit. Slide the Stress Control Assembly over the cable with the loose core end toward the cable end. Align the Stress Control Assembly Tube (not the core) with the marker tape, and remove the core by pulling the loose end while unwinding counter-clockwise. (Figure 8)

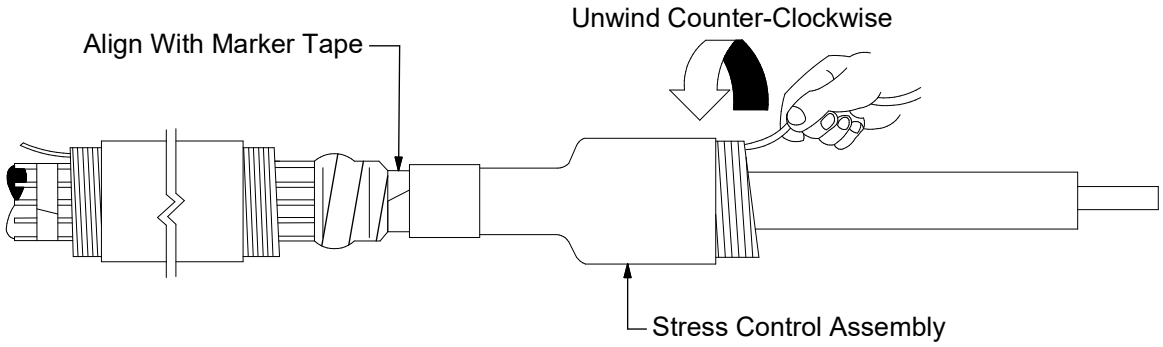


Figure 8

Initial when Step 10 is complete._____

11. Apply 2 tubes 3M Red Dielectric Compound P55/R to the exposed insulation and stress control adapter. Fill the top edge of the stress control tube and the semicon step with the 3M Red Dielectric Compound P55/R. (Figure 9)

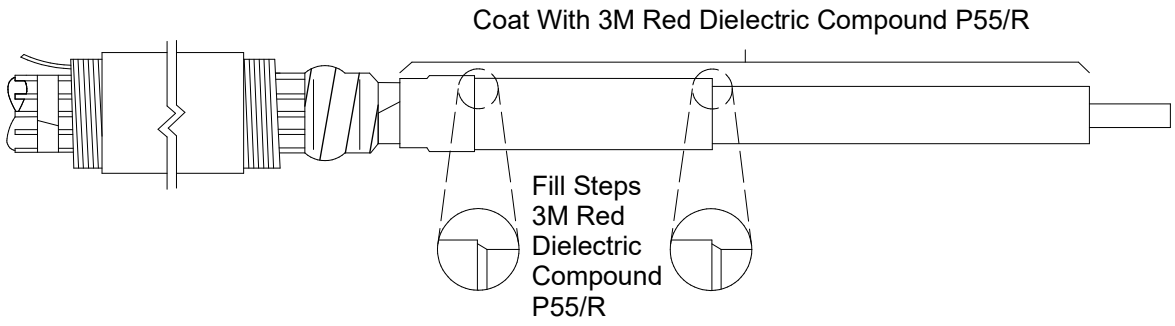


Figure 9

Initial when Step 11 is complete._____

12. Slide the Silicone Rubber Skirted Insulator Assembly onto the cable. Align the assembly tube (not the core) with the sealing mastic/wire cover tape located 3.0” from the end of the cable semi-con, and remove the core by pulling the loose end while unwinding counter-clockwise. (Figure 10)

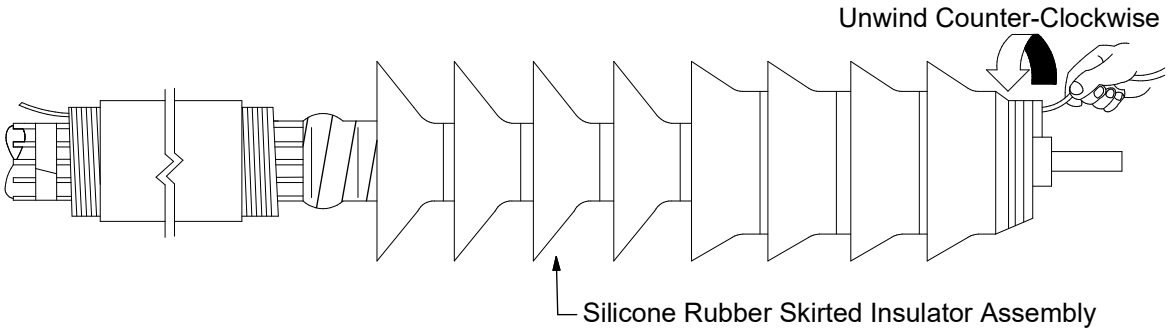


Figure 10

Initial when Step 12 is complete._____

13. Use a stainless steel wire brush to clean the aluminum conductor. Position and install the 500 kcmil lug using a U34ART die. For the 750 kcmil lug use a U608 die. For the 1000 kcmil copper lug use a P44RT die. Make as many crimps as possible without overlap. Remove excess oxide inhibitor and sharp crimp flashing.

    A shear head bolt lug (Stock #17 55 804) may be used instead of the aluminum compression lugs.

Shearhead Bolt Lug Installation Instructions.

A. Battery powered impact wrench with a 7/8” hexagonal socket should be used to install shearhead bolt lugs.

B. Remove the insert from the lug body if the conductor to be installed is greater than 600 kcmil compact stranded.

C. Back out all bolts to give clearance for the conductor - DO NOT completely remove the bolts from the connector body.

D. Insert the cleaned conductor into the lug. There should be no gap between the insulation and lug body.

E. Hand tighten the bolts to firmly grip the conductor. Use the tightening sequence shown in Figure 11 to tighten the bolts one-and-a-half turns. Bolts should remain un-sheared.

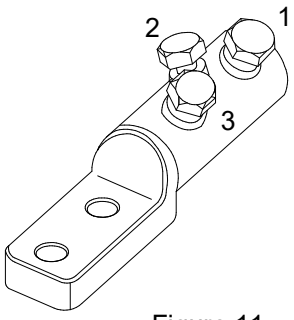


Figure 11

F. Repeat the sequence in step “E” tightening each bolt until the head shears off. DO NOT bend the conductor while shearing the bolts.

G. Smooth any sharp edges of protruding bolts with the abrasive provided. Clean the connector to remove particles and excess inhibitor.

Initial when Step 13 is complete._____

14. Wrap Scotch Rubber Mastic Tape 2228 half-lapped around the exposed conductor between the cable insulation and lug. Build the mastic up to the insulation O.D. Cover 2 inches of the lug barrel. (Figure 12)

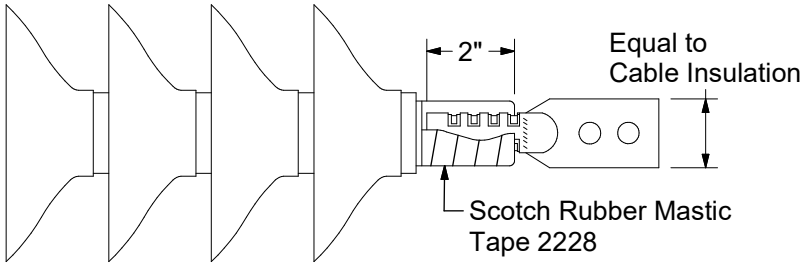


Figure 12

Initial when Step 14 is complete._____

REV	DATE	ENG	DESCRIPTION
3	01/01/22	EJB	Converted to new format
2	03/12/15	EJB	

15. Slide the parked ground seal assembly onto the termination. Start to shrink underneath the first skirt. Remove the core by pulling the loose end while unwinding counter-clockwise. (Figure 13)

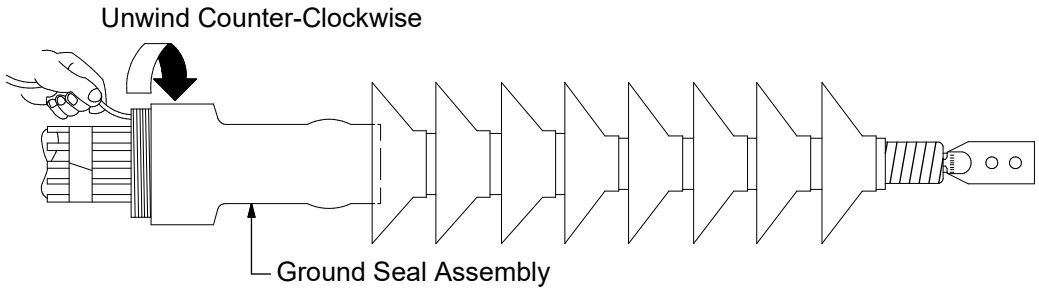


Figure 13

Initial when Step 15 is complete._____

16. Slide the lug sealing tube onto the lug/termination, as shown. Start to shrink the tube near the top of the last skirt and onto the lug barrel. If the tube overlaps the lug pad or is not tight to the lug barrel, carefully trim the tube just past (1/4") the Scotch Rubber Mastic Tape 2228 sealing tape. A roll of Scotch Self-fusing Silicone Rubber Tape 70 is provided to cover the edge of the trimmed tube, apply with moderate tension, stretching only enough to conform to the lug barrel and tube. (Figure 14)

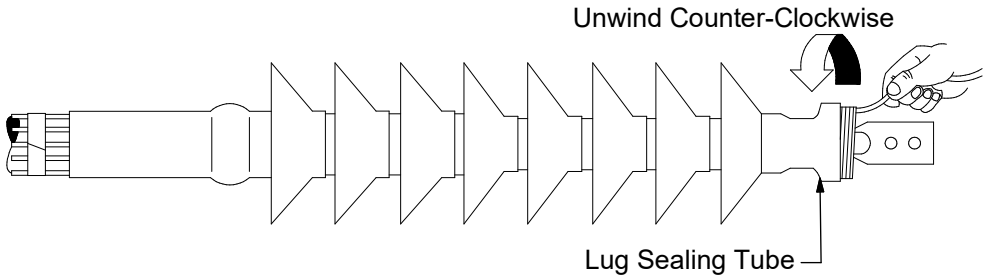


Figure 14

Initial when Step 16 is complete._____

REV	DATE	ENG	DESCRIPTION
3	01/01/22	EJB	Converted to new format
2	03/12/15	EJB	

17. Attach the bronze four bolt lug to the compression or shear head bolt lug. If the terminator lug is being attached directly to a flat surface the bronze connector may be omitted. (Figure 15)

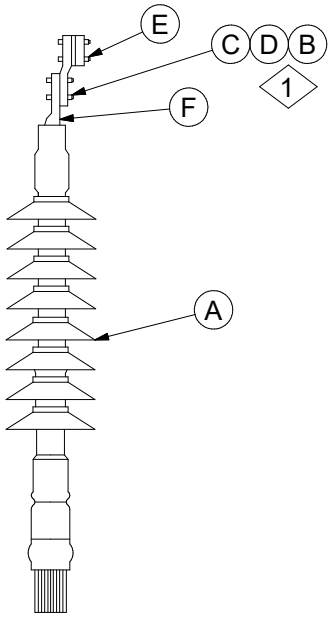


Figure 15

Initial when Step 17 is complete._____

18. Connect the concentric neutral wires to system ground using a two-bolt connector.

Initial when Step 18 is complete._____

DCS #	DESCRIPTION
42 54 11 01	1-500 kcmil ALCNRP
42 54 11 02	1-750 kcmil ALCNRP
42 54 11 03	1-1000 kcmil CNRP

CONSTRUCTION NOTE(s):

1. For washer stacking order see DCS **59 52 00 43**.

	ITEM	STK / DCS #	DESCRIPTION 42 54 11 **	01	02	03
	A	17 07 249	Termination−Cable, 69kV , 350 kcmil−1000 kcmil	1	1	1
	B	21 56 078	Bolt, Machine 1/2” x 2” SS	2	2	2
	C	12 56 052	Washer−Belleville Spring 1/2” SS	2	2	2
	D	12 56 053	Washer−Flat 1/2” SS	4	4	4
	E	14 54 177	Connector−Cable to Flat Bronze	1	1	1
@	F	17 55 324	Lug−Compression, 500Al., 2 Hole	1	-	-
		17 55 260	Lug−Compression, 750Al., 2 Hole	-	1	-
		17 05 236	Lug−Compression, 1000 Cu, 2 Hole	-	-	1
		17 55 804	Lug−Shear Head Bolt, 350−750 CU/AL, 2 Hole	1	1	-

UNDERGROUND NETWORK SYSTEM 43

RING BUS INSTALLATION.....43 16 01 00

CONNECTIONS TO RING BUS.....43 16 02 00

MOLE CONNECTORS.....43 16 03 **

STUD MOLE CONNECTORS.....IL ONLY.....43 16 04 **

CABLE TO MOLE CONNECTORS.....IL ONLY.....43 16 05 **

CRAB CONNECTOR LIMITER INSTALLATION.....43 16 06 **

SYSTEM NETWORK TRANSFORMER AND RING BUS.....43 16 96 00
TYPICAL ONE LINE DIAGRAM

A.C. NETWORK SERVICE COMPARTMENT AND RING BUS.....43 16 97 00
TYPICAL ONE LINE DIAGRAM

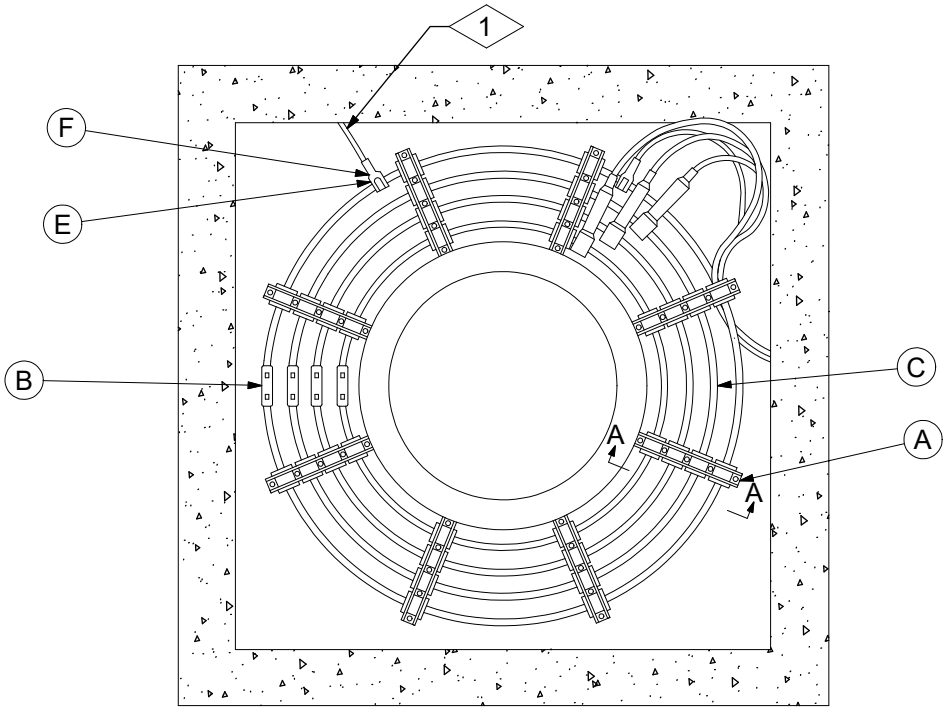
SYSTEM VAULT (SERVICE COMPARTMENT) DETAIL OF LIGHTING LAYOUT.....43 17 01 00

STANDARD BUS BAR DRILLING AND SPACING FOR LIMITER LUGS.....43 17 02 00
IN SERVICE COMPARTMENTS

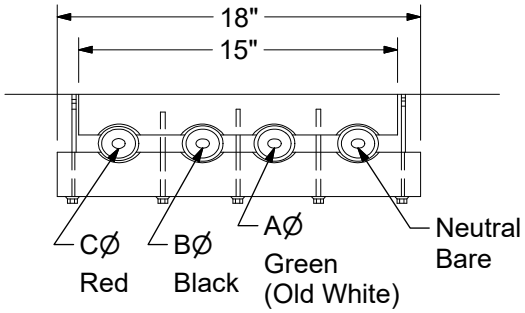
SYSTEM VAULT DETAIL OF LIGHTING LAYOUT.....43 18 01 **

SERVICE COMPARTMENT BUS BAR SYSTEM.....43 19 01 **

TRANSFORMERS, MAINS, & SERVICE CONNECTIONS.....43 38 00 00



Ring Bus - Viewed From Manhole Floor



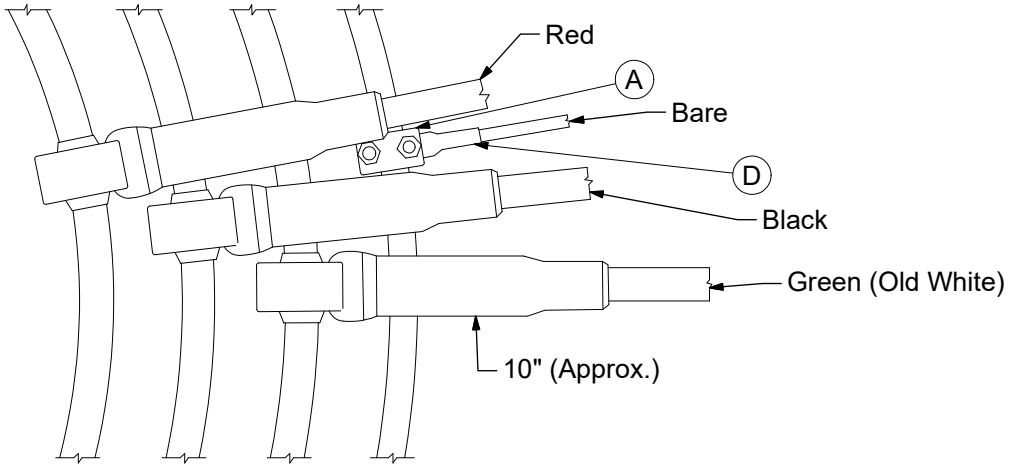
Length of Cable Required	
Phase	Length (ft)
A	18
B	16
C	14

Section A-A - Ring Bus Insulator Clamp

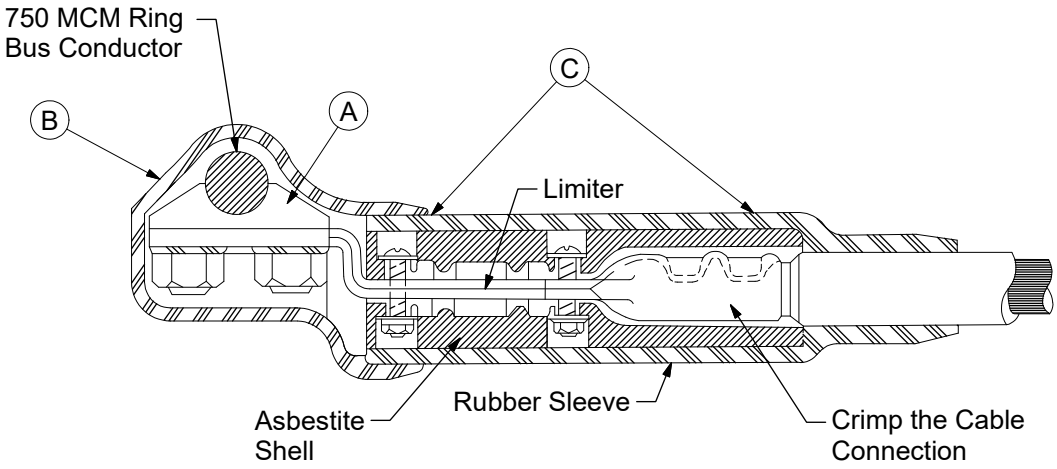
CONSTRUCTION NOTE(s):

1. Connect bonding wire, (Stock #18 52 030), to Bonding System with "T" connector, (Stock #17 54 022)

ITEM	STK / DCS #	DESCRIPTION 43 16 01 **	00
A	25 07 061	Insulator − Ring Bus 4 Cond.	8
B	17 60 360	Sleeve − Compression, 750 kcmil, Cu	4
C	18 07 011	Cable − NW 750 kcmil (ft)	48 (See Table)
D	18 52 022	Wire − 750 kcmil Bare (ft)	20
E	17 52 005	Connector − Cable to Lug	1
F	17 05 194	Lug − Hypress 4/0	1
G	17 54 022	Connector − T−4/0	1
H	18 52 030	Wire − 4/0 Tinned Copper (ft)	10
	753	Op Code Ring Bus	1



Ring Bus - Connections Viewed From Manhole Floor



Limiter Lug and Connection to Ring Bus

CONSTRUCTION NOTE(s):

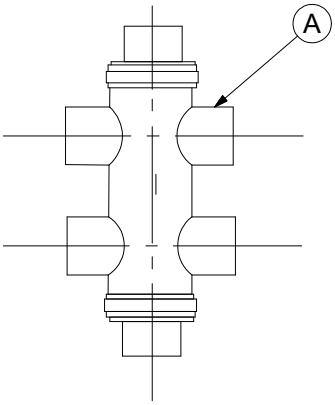
1. Limiter lug consists of limiter, asbestite shell, and rubber sleeve.

2. Use 500 kcmil hypress lug (Stock #17 05 195) on direct runs from transformer to ring bus.

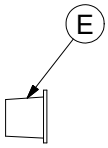
	ITEM	STK / DCS #	DESCRIPTION 43 16 02 **	00
	A	17 52 005	Connector − Cable to Lug	4
	B	17 53 015	Hood − Rubber Insulating	3
1	C	17 05 193	Lug − Limiter	3
2	D	17 05 194	Lug − Hypress 4/0	1

REV	DATE	ENG	DESCRIPTION
2	04/01/2023	EJB	Converted to new format
1	07/06/2011	EJB	

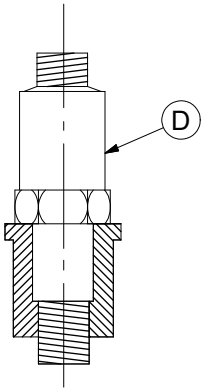
ILLINOIS ONLY



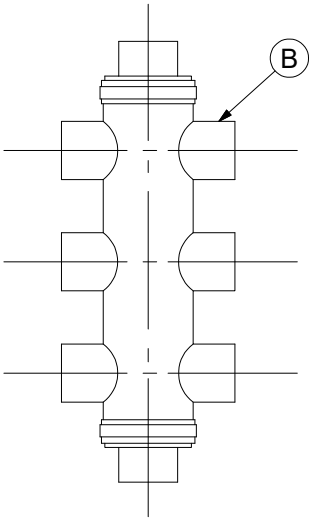
43 16 03 01
6 Way



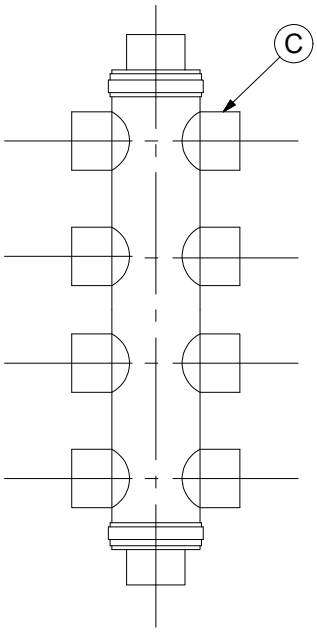
43 06 03 05
Outlet Plug



43 16 03 04
Mole Coupler



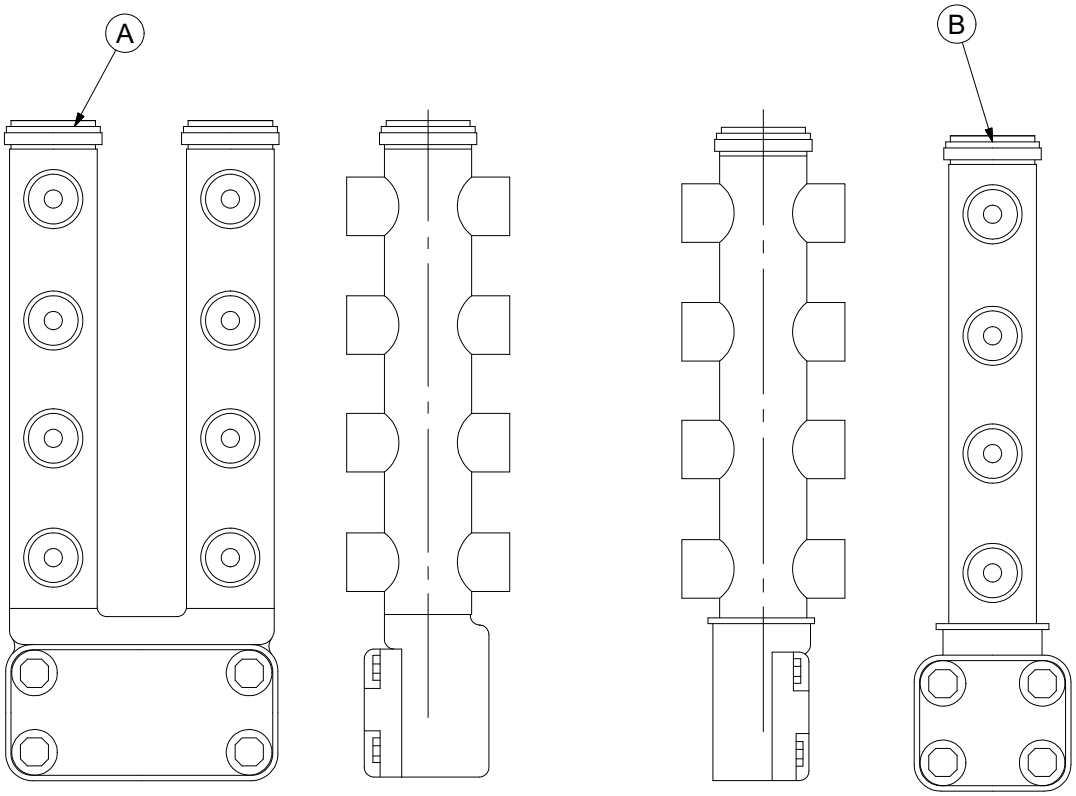
43 16 03 02
8 Way



43 16 03 03
10 Way

ITEM	STK / DCS #	DESCRIPTION 43 16 03 **	01	02	03	04	05
A	17 62 207	Connector − Mole, 6 Way, 1500A	1	-	-	-	-
B	17 62 208	Connector − Mole, 8 Way, 1500A	-	1	-	-	-
C	17 62 209	Connector − Mole, 10 Way, 1500A	-	-	1	-	-
D	17 62 213	Coupler − Mole	-	-	-	1	-
E	17 62 182	Plug − Mole, Diatex	-	-	-	-	1

ILLINOIS ONLY

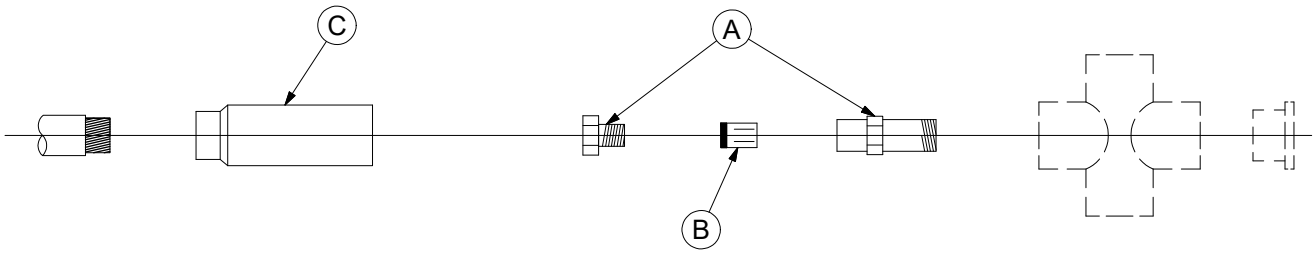


43 16 04 01
16 Way

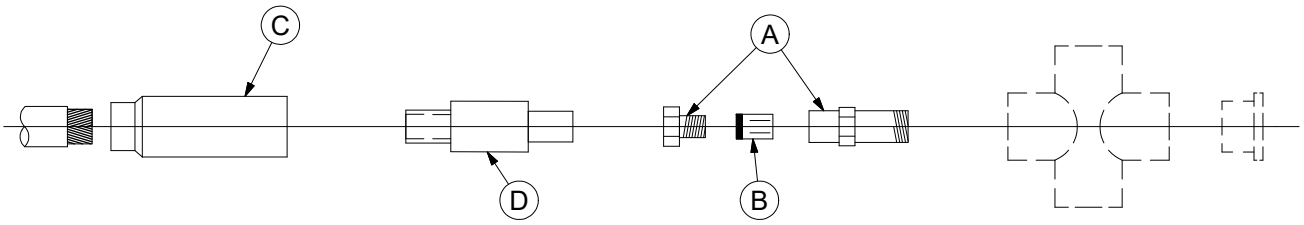
43 16 04 (02 & 03)
8 Way

ITEM	STK / DCS #	DESCRIPTION 43 16 04 **	01	02	03
A	17 62 212	Connector − Mole, Stud, 16 Way, 3000A	1	-	-
B	17 62 210	Connector − Mole, Stud, 8 Way, 2500A	-	1	-
C	17 62 211	Connector − Mole, Stud, 8 Way, 3000A	-	-	1

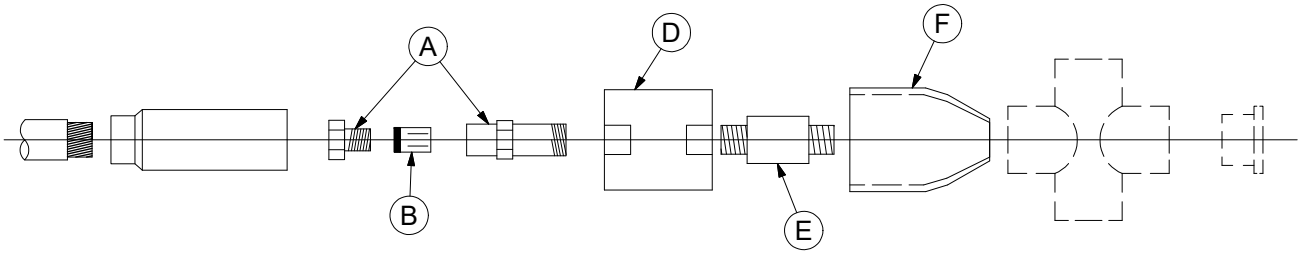
ILLINOIS ONLY



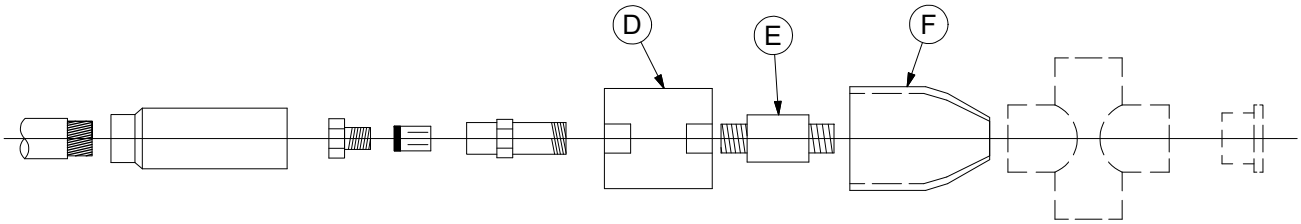
DCS #	DESCRIPTION
43 16 05 01	1/0 Cable/Mole Conn.
43 16 05 02	4/0 Cable/Mole Conn.
43 16 05 03	300 kcmil Cable/Mole Conn.
43 16 05 04	350 kcmil Cable/Mole Conn.
43 16 05 05	500 kcmil Cable/Mole Conn.



DCS #	DESCRIPTION
43 16 05 06	4/0 Cable/Mole Conn. With Limiter



DCS #	DESCRIPTION
43 16 05 07	500 kcmil Cable/Mole Conn. With Limiter

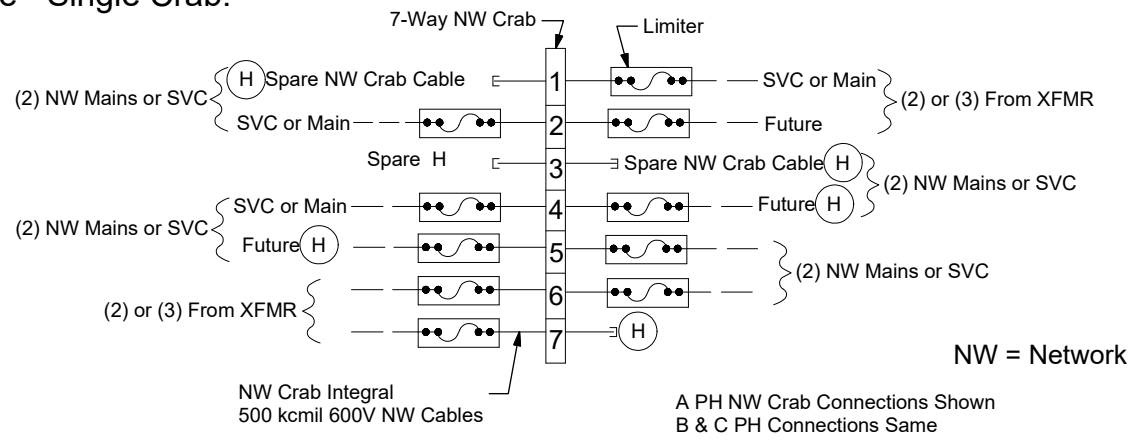


DCS #	DESCRIPTION
43 16 05 08	500 kcmil Limiter Added to Cable

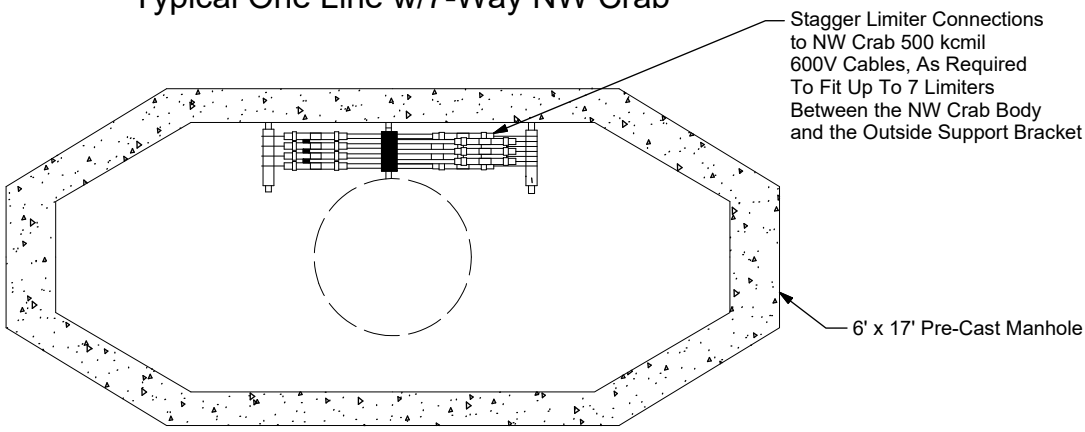
ILLINOIS ONLY

ITEM	STK / DCS #	DESCRIPTION 43 16 05 **	01	02	03	04	05	06	07	08
A	17 62 214	Termination − Socket & Nut, 4/0	1	1	-	-	-	1	-	-
	17 62 175	Termination − Socket & Nut, 500 kcmil	-	-	1	1	1	-	1	-
B	17 62 205	Connector − Cone, Cmpr., 1/0	1	-	-	-	-	-	-	-
	17 62 178	Connector − Cone, Cmpr., 4/0	-	1	-	-	-	1	-	-
	17 62 206	Connector − Cone, Cmpr., 300 kcmil	-	-	1	-	-	-	-	-
	17 62 202	Connector − Cone, Cmpr., 350 kcmil	-	-	-	1	-	-	-	-
	17 62 177	Connector − Cone, Cmpr., 500 kcmil	-	-	-	-	1	-	1	-
C	17 60 618	Sleeve − Insulating, 4/0 Limiter	1	1	-	-	-	1	-	-
	17 62 181	Sleeve − Insulating, 500 kcmil	-	-	1	1	1	-	-	-
D	17 05 327	Fuse − Limiter, 4/0, 480V	-	-	-	-	-	1	-	-
	17 05 328	Fuse − Limiter, 500 kcmil, 480V	-	-	-	-	-	-	1	1
E	17 63 230	Coupling − Limiter	-	-	-	-	-	-	1	1
F	17 60 619	Sleeve − Insulating, for Limiter	-	-	-	-	-	-	1	1

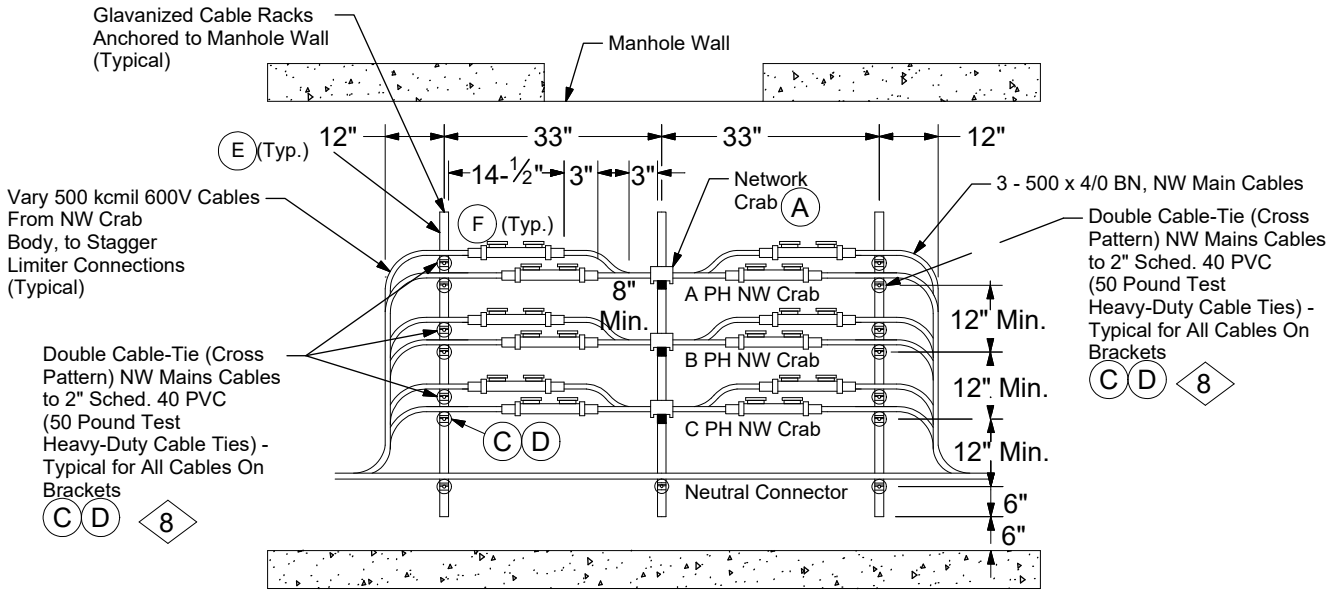
Manhole - Single Crab:



Typical One Line w/7-Way NW Crab



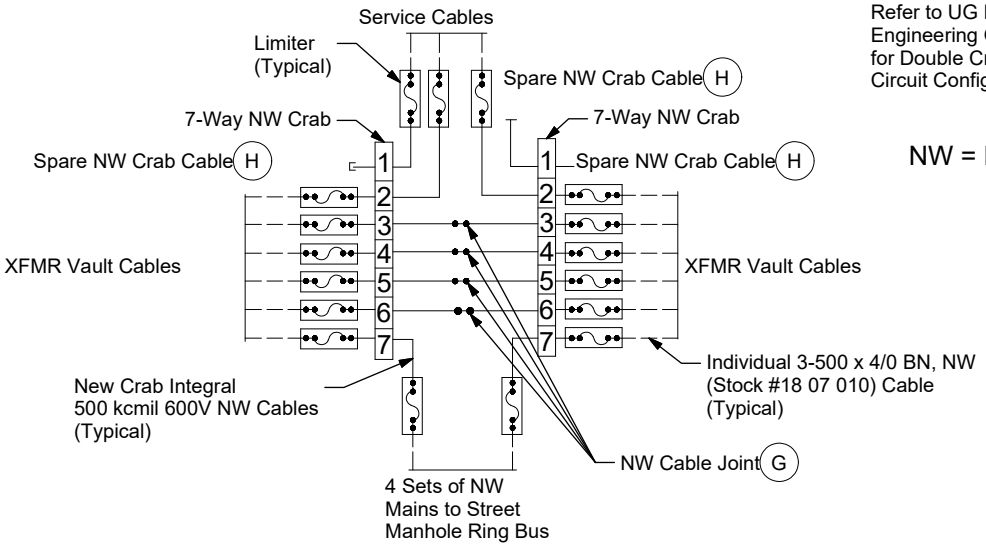
Top View



Side View

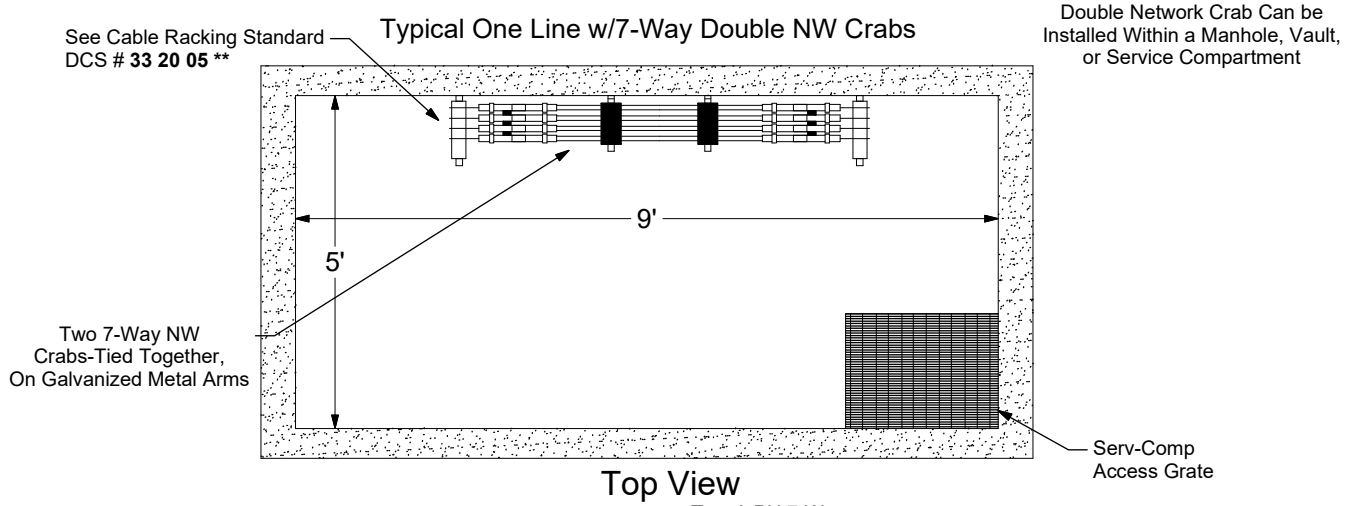
CONSTRUCTION NOTE(s):
1. Consult UG Division Engineering for specific network connection configuration, as required.
2. Single network crab can installed within a manhole, vault, or service compartment.
3. All dimensions are minimum

Service Compartment - Double Crab:



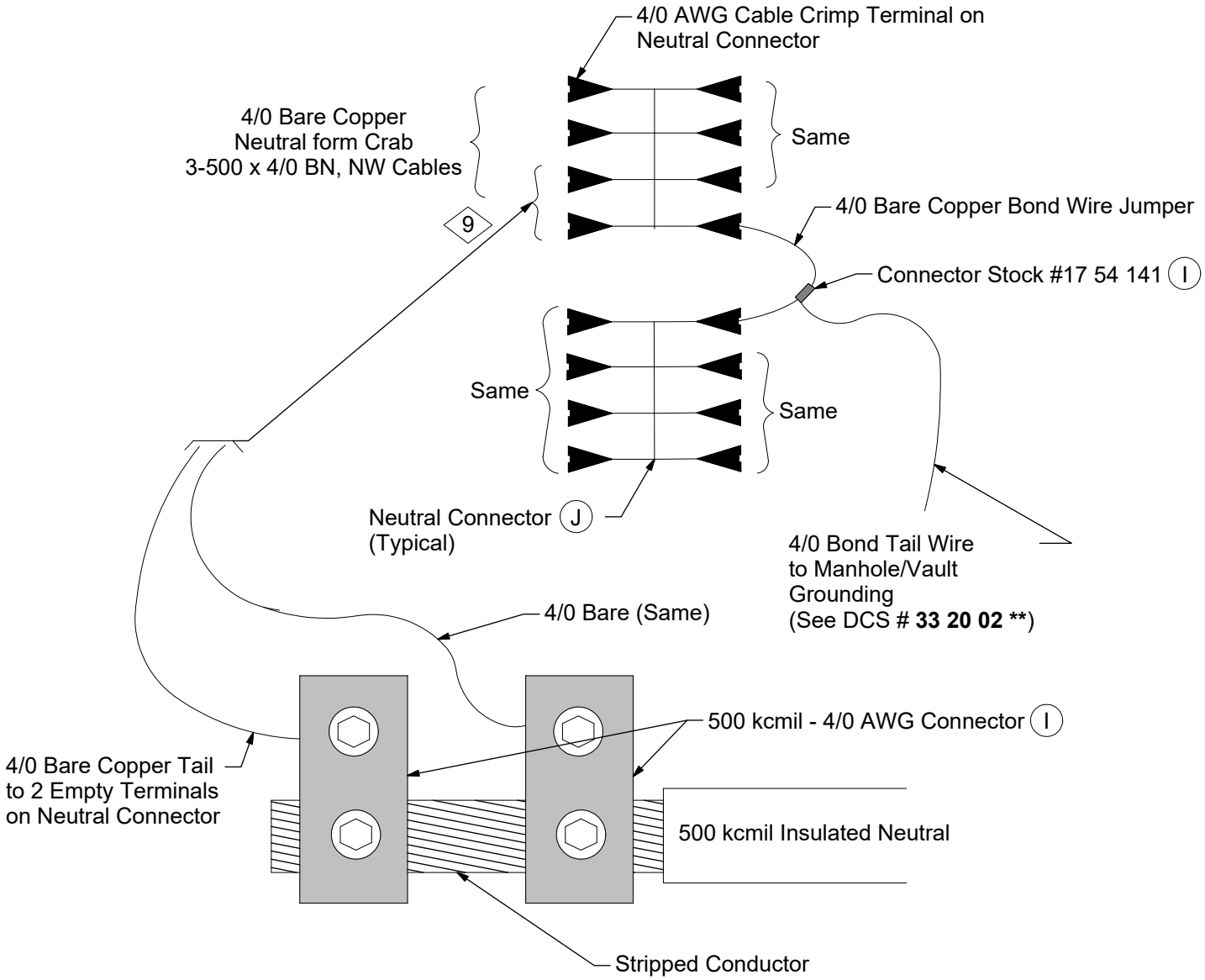
Refer to UG Division Engineering One-Line for Double Crab Circuit Circuit Configuration

NW = Network



REV	DATE	ENG	DESCRIPTION
4	04/01/2023	EJB	Converted to new format
3	03/30/2015	EJB	

Neutral Connector:



500 kcmil Detail

CONSTRUCTION NOTE(s):

4. Add limiters as directed by one-line or UG engineering to network main or service to crab connector.

5. Utilize 600V-500 kcmil cable straight splice to join crab connectors.

6. Cable mounting rack is included in new precast manholes. Add rack as necessary to existing network installations.

◇7. Neutral connections can be made using either the neutral connector or crab (see item J) based on field conditions. The neutral connector is the preferred connection method as it saves space for cable training.

◇8. For cable mount arm (14” or “16), when using 2” dia. PVC sleeve, the PVC sleeve shall be anchored to the arm by 50 pound test cable tie-strap prior to installing crabs. The cables shall be cross tie-strapped to the 2” PVC sleeve - to prevent movement.

◇9. If a 7-500 NW Cable is used or exists, the 500 kcmil Neutral shall be connected as shown in the 500 kcmil Detail.

10. Add approved 600V cable cap to the ends of any spare crab connector cables.

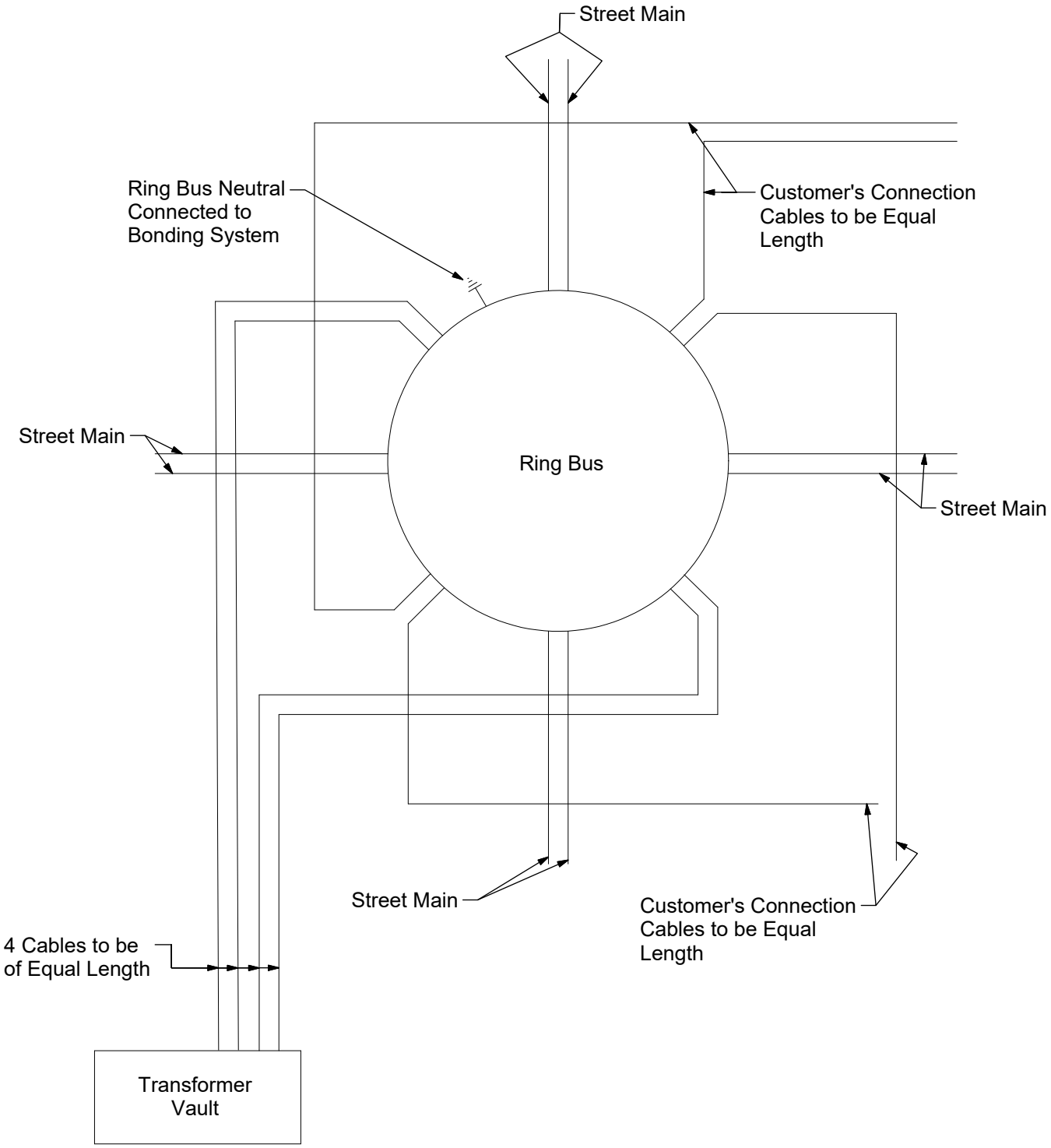
11. Add connectors as necessary to connect neutrals/bond wire to crab connector.

12. For all 4/0 neutrals use the 4/0 bare crab connection. For 500 kcmil neutrals, use 500 kcmil crab reducing sleeves (I) as needed for 4/0 neutrals. See neutral detail or connector.

DCS #	DESCRIPTION
43 16 06 01	3-Way Single NW Crab
43 16 06 02	5-Way Single NW Crab
43 16 06 03	7-Way Single NW Crab
43 16 06 04	3-Way Single NW Crab
43 16 06 05	5-Way Single NW Crab
43 16 06 06	7-Way Single NW Crab

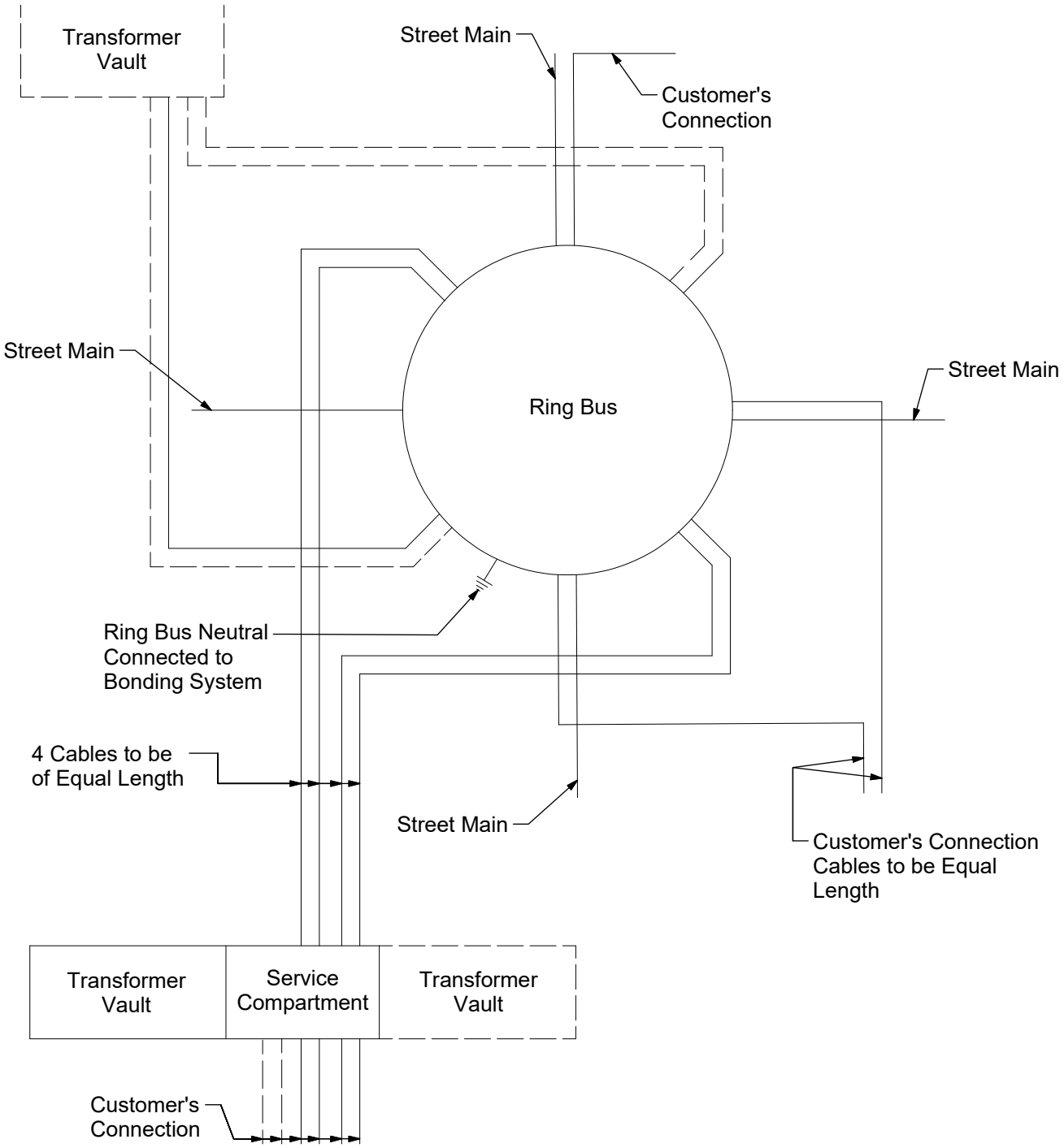
	ITEM	STK / DCS #	DESCRIPTION 43 16 06 **	01	02	03	04	05	06
	A	17 05 488	Crab – 500 kcmil, 600 V, NW, 3-Way	3	-	-	6	-	-
		17 05 485	Crab – 500 kcmil, 600 V, NW, 5-Way	-	3	-	-	6	-
		17 05 484	Crab – 500 kcmil, 600 V, NW, 7-Way	-	-	3	-	-	6
	B	18 52 024	Wire – 4/0 AWG, Cu, Bare Soft Drawn (ft.)	10	10	10	10	10	10
	C	40 59 715	Tie – Cable, Black, 10" Dia.	48	80	112	64	112	160
	D	12 56 112	Arm – Cable Mounting, 14"	9	-	-	12	-	-
		12 56 113	Arm – Cable Mounting, 18"	-	9	9	-	12	12
3@	E	12 56 116	Rack – Cable Mounting, 55", 37 Holes	3	3	3	4	4	4
		12 56 115	Rack – Cable Mounting, 30", 18 Holes	3	3	3	4	4	4
1@	F	17 05 548	Limiter – 500 kcmil, 120 V, Fused	#	#	#	#	#	#
2@	G	41 14 36 11	Splice – 600 V, 500 kcmil, Str.	-	-	-	6	9	12
4@	H	40 59 166	Cap – Cable End – 500 kcmil NW. (600 V)	#	#	#	#	#	#
5@	I	17 54 141	Connector – Wire, 2 - 500 kcmil, Cu (Neut.)	#	#	#	#	#	#
6@	J	17 05 501	Neutral Connection – 4/0 AWG, 600 V, NW, 4-Way, Bare Crimp (Neut.) (8 total connections – 4 per side)	1	2	2	3	3	3
		17 05 485	Crab – 500 kcmil, 600 V, NW, 5-Way (Neut.)	1	1	1	1	1	1

REV	DATE	ENG	DESCRIPTION
4	04/01/2023	EJB	Converted to new format
3	03/30/2015	EJB	



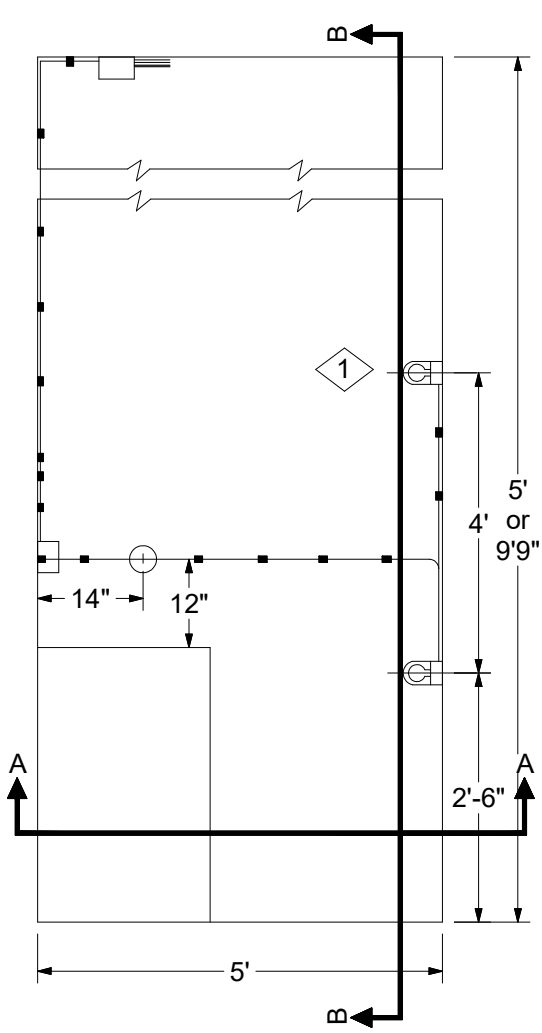
DESIGN NOTE(s):

1. Connections to ring bus shall be arranged to maintain balanced loading of the ring bus under various operating conditions. Variations in this arrangement of connections may be made as required to meet specific conditions. The number of street mains and customers' connections depends on requirements at each location.

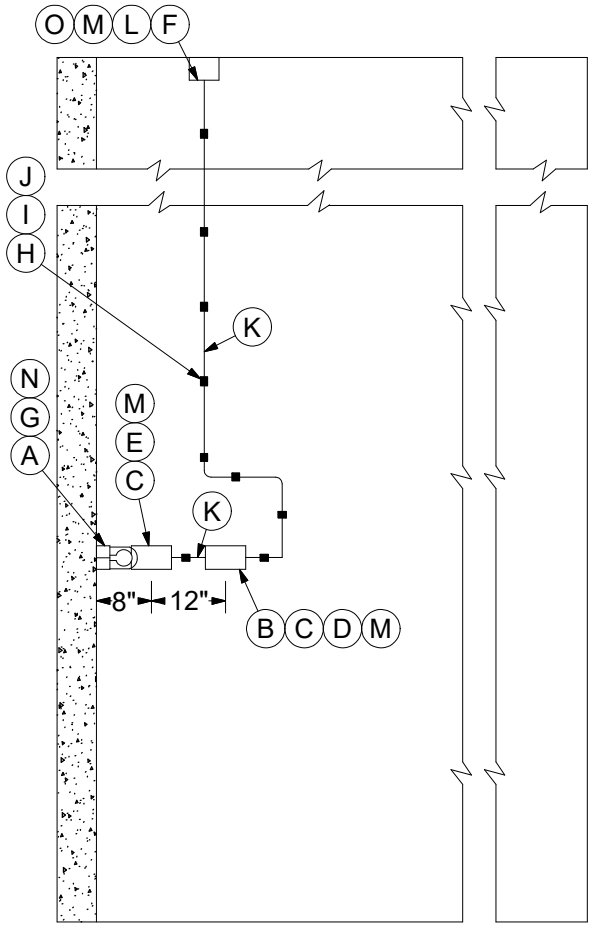


DESIGN NOTE(s):

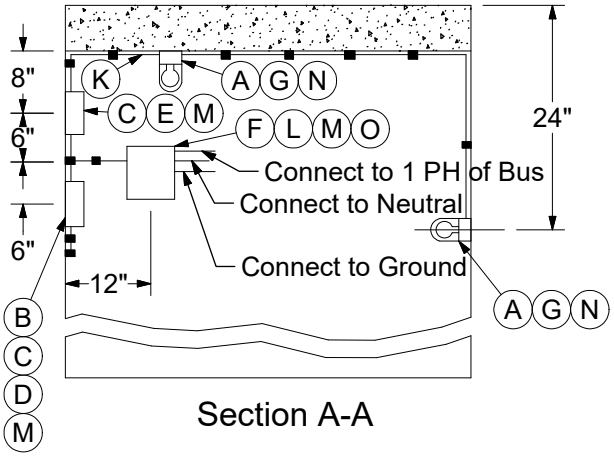
1. Connections to ring bus shall be arranged to maintain balanced loading of the ring bus under various operating conditions. Variations in this arrangement of connections may be made as required to meet specific conditions. The number of street mains and customers' connections depends on requirements at each location.



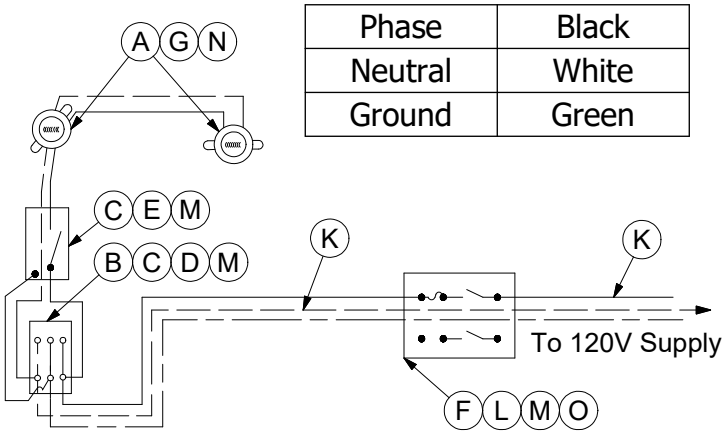
Plan View



Section B-B



Section A-A



Phase	Black
Neutral	White
Ground	Green

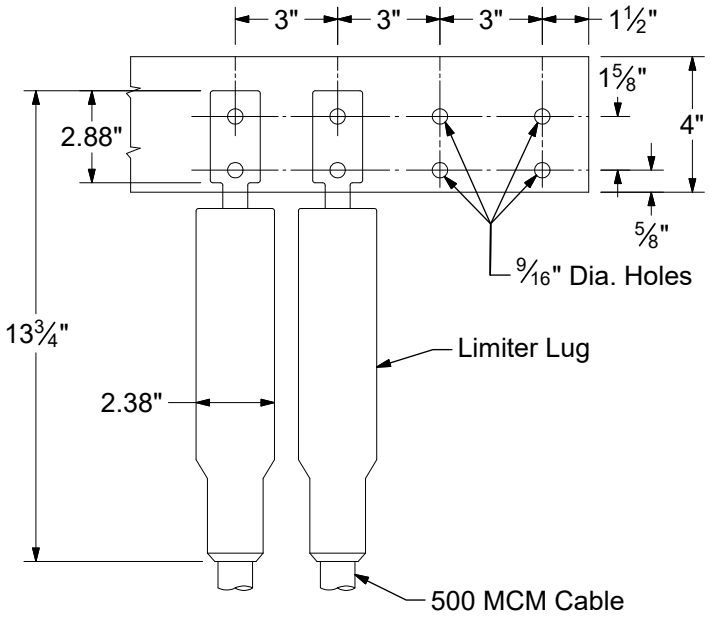
Wiring Diagram

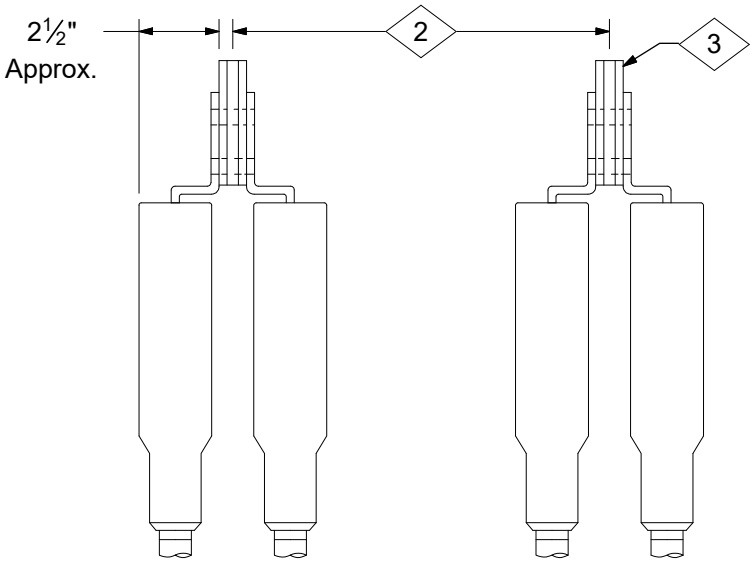
REV	DATE	ENG	DESCRIPTION
5	04/01/2023	EJB	Converted to new format
4	06/13/2011	EJB	

ITEM	STK / DCS #	DESCRIPTION 43 17 01 **	00
A	40 55 925	Fixture − Incandescent Lighting 150W with Globe	2
B	40 56 505	Receptacle − Duplex,GFI, 15A	1
C	40 01 105	Box − Surface Wiring, Outdoor	2
D	40 56 506	Plate Receptacle Cover, Outdoor	1
E	40 58 509	Switch − Toggle Outdoor, 10A, with Cover	1
F	20 52 041	Fuse − 15A., Cartridge, Type FRN	1
G	26 03 012	Lamp − General Purpose, 60 W Med. Screw Base	2
H	21 51 001	Anchor − Expansion 8−32	24
I	21 68 036	Screw − Rd. Hd. Brass 8−32 3/4” Long	24
J	23 67 128	Cleat − Cable, Plastic	24
K	18 61 113	Cord − Electrical, 600V, #14−3, Wet Rated (ft)	55
L	40 08 226	Switch − Safety, 30A Fusible, Outdoor	1
M	40 52 053	Connector − Cord, 3/4” Hub	6
N	40 52 065	Connector − Cord, 1/2” Hub	2
O	40 53 189	Nut − Conduit Lock, 3/4”	2
P	21 51 005	Anchor − Expansion 1/4”−20	12
Q	21 68 034	Screw − Rd. Hd. Brass 1/4”−20 1” Long	12
	1399	Op Code Lighting, Vault & Ser. Comp.	2

DESIGN NOTE(s):

1. For extra lamp required on 9'-9” service compartment vault, requisition one receptacle Stock #40 55 925 and one lamp Stock #26 03 012. Lamp not required on 5' vault.





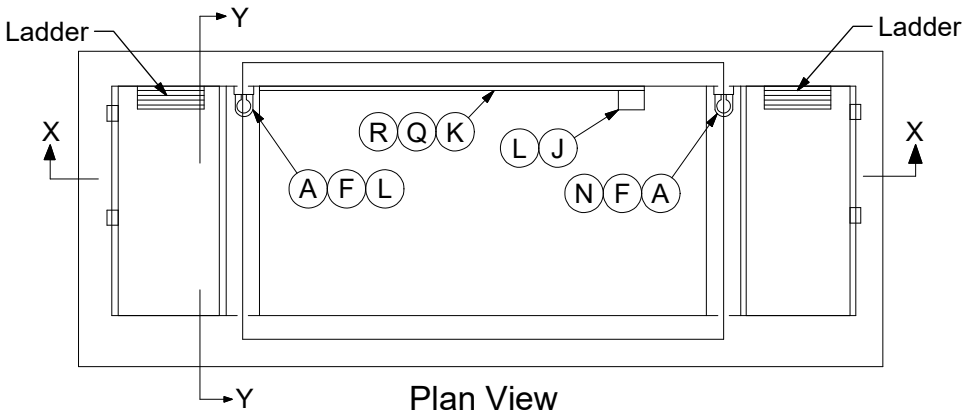
End View Showing Spacing

Drilling Plan for Cable Limiter Lugs	
2000 Amp Bus	4 Lugs Per Phase
3000 Amp Bus	6 Lugs Per Phase
4000 Amp Bus	8 Lugs Per Phase

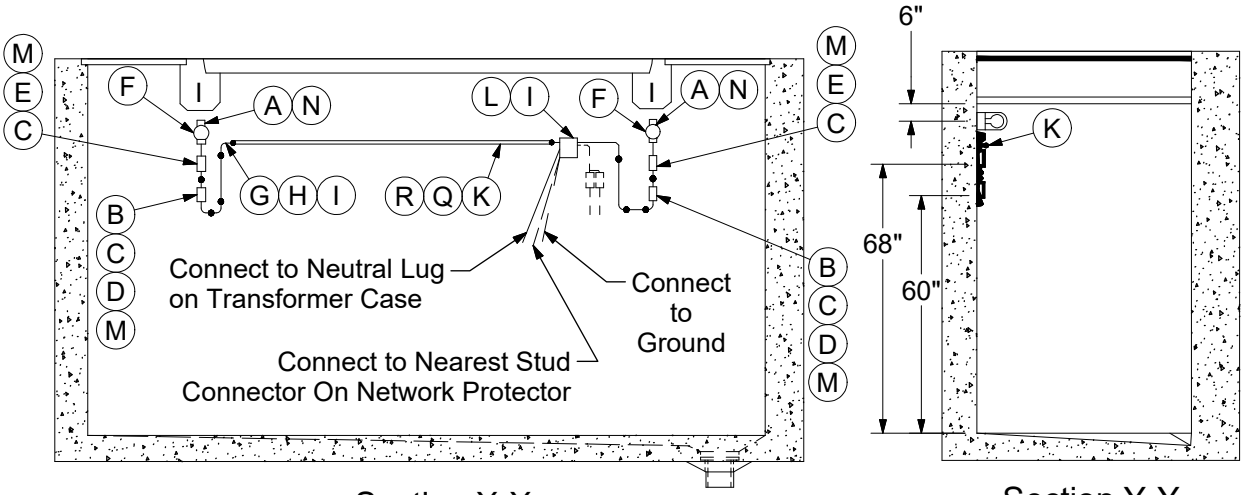
CONSTRUCTION NOTE(s):

1. Arrangement shown is for cables connecting from bottom of bus. Bus drilling must be reversed if cables connect from the top.
2. 12" Phase to Phase Spacing Where Space Permits. Otherwise, 10" Minimum Phase to Phase Spacing.
3. Number of bars as required by bus rating.

REV	DATE	ENG	DESCRIPTION
2	04/01/2023	EJB	Converted to new format
1	07/27/2011	EJB	



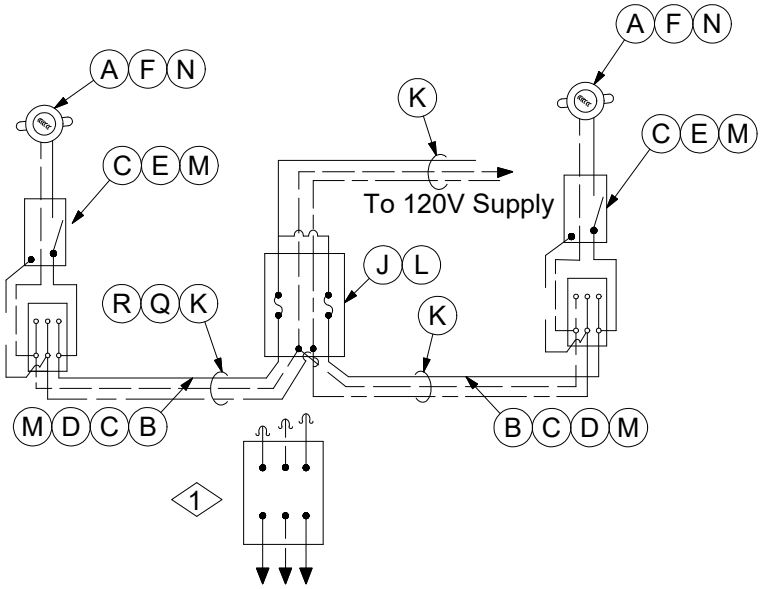
Plan View



Section X-X

Section Y-Y

Phase	Black
Neutral	White
Ground	Green



Wiring Diagram

CONSTRUCTION NOTE(s):

1. Connections for sump pump and automatic water spray system to be Installed only when required.

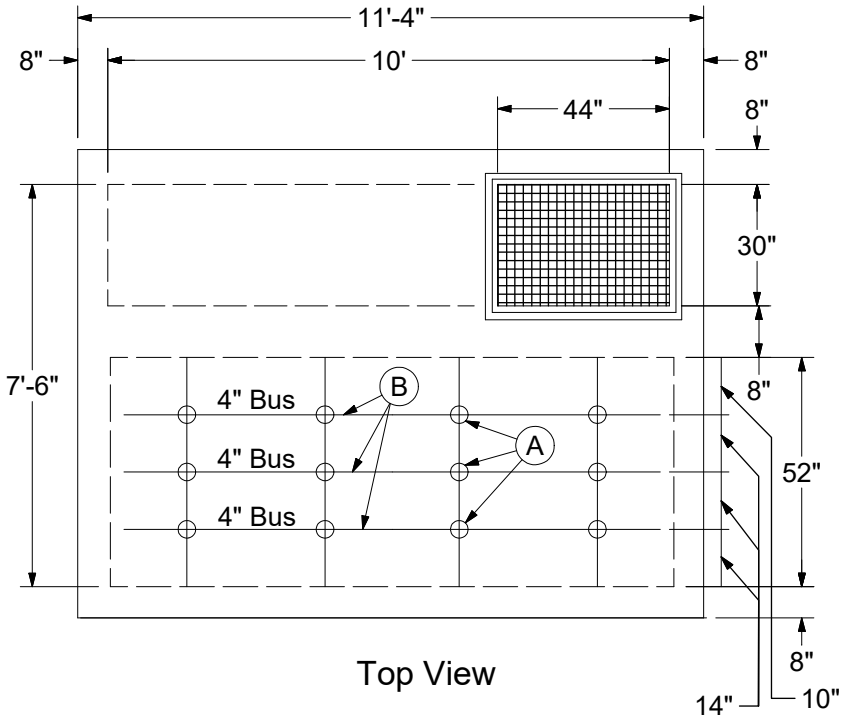
	ITEM	STK / DCS #	DESCRIPTION 43 18 01 **	01	02
	A	40 55 925	Fixture - Lighting, 150W, w/ Globe	2	2
	B	40 56 505	Receptacle - Duplex, GFI, 15A	2	2
	C	40 51 653	Box - Surface Wiring, PVC, Outdoor	4	4
	D	40 56 687	Cover - Receptacle - Outdoor	2	2
	E	40 58 509	Switch - Toggle, Outdoor, 10A, w/ Cover	2	2
	F	26 06 856	Lamp - LED, 120V, 8.5W (60W Eq.), Medium Base	2	2
	G	21 51 001	Anchor - Expansion 8-32	24	24
	H	21 68 036	Screw - Round Head Brass 8-32, ¾" Long	24	24
	I	23 67 128	Cleat - Cable, Plastic	24	24
2	J	20 52 041	Fuse - 15 A, 600V, Cartridge, Type CC	2	2
	K	18 61 130	Cord - Electrical, 600V, #12-3, Wet Rated	55'	55'
3	L	40 51 644	Box - Fuse, 600V, 30A, 10" Wide x 8" High X 4" Deep	1	-
		40 51 652	Box - Fuse, 600V, 30A, 6" Wide x 6" High X 4" Deep	-	1
	M	40 52 053	Connector - Cord, ¾" Hub	8	8
	N	40 52 065	Connector - Cord, ½" Hub	2	2
	O	21 51 005	Anchor - Expansion ¼"-20	24	24
	P	21 68 034	Screw - Round Head, Brass ¼"-20, 1" Long	24	24
	Q	12 51 197	Conduit - PVC, 5ch. 40, 1" x 10'	1	1
	R	40 52 455	Clamp - Conduit, 1", PVC	4	4
		1399	Op Code Lighting, Vault & Service Compartment	2	2

DESIGN NOTE(s):

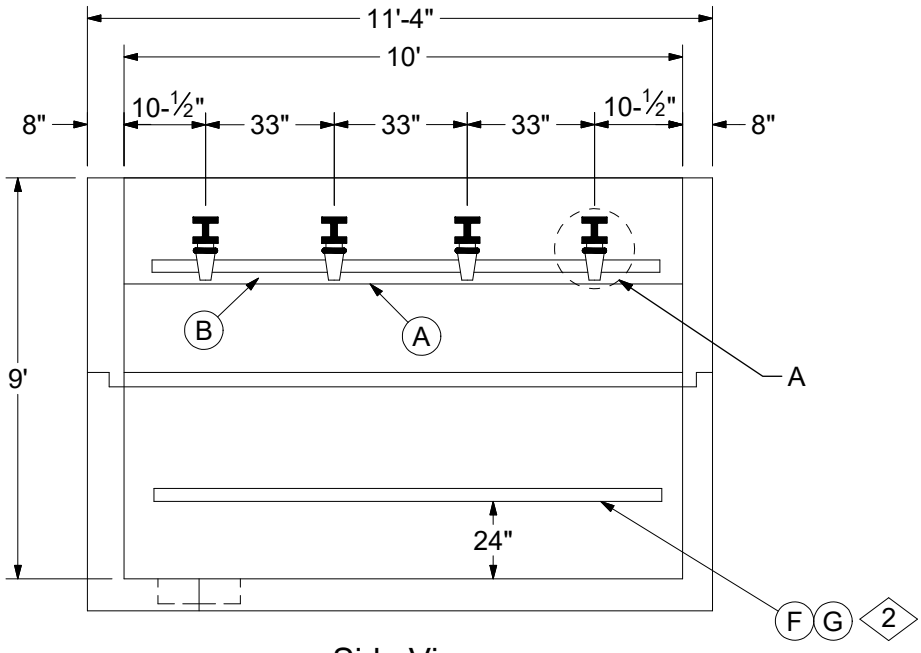
2. A fuse puller tool Stock # 85 29 163 is available to remove the fuse from the carriage.

3. Installation of the large fuse box (DCS # **43 18 01 01**) is preferred in vaults where space allows.

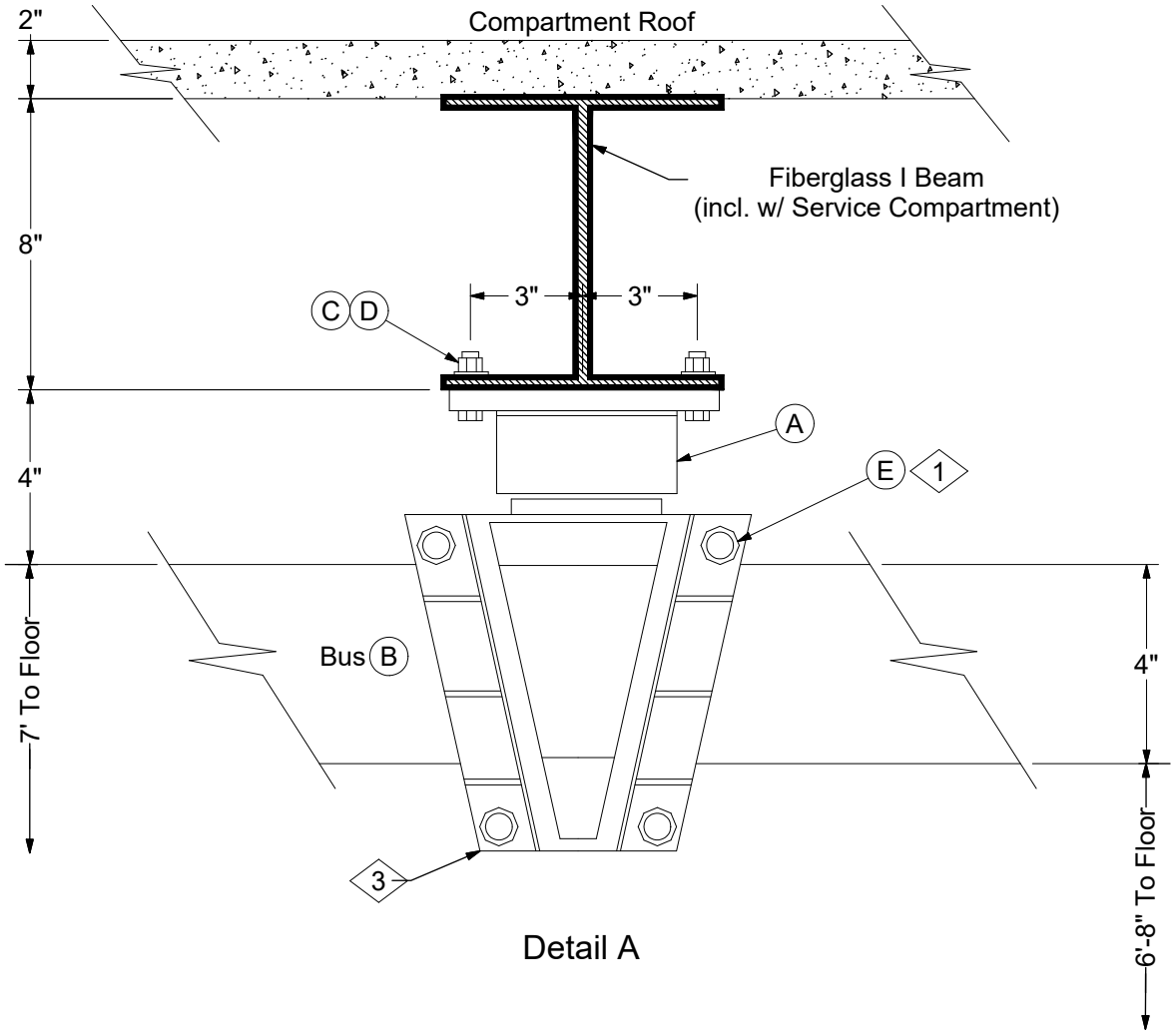
Precast Network Service Compartment



Top View



Side View



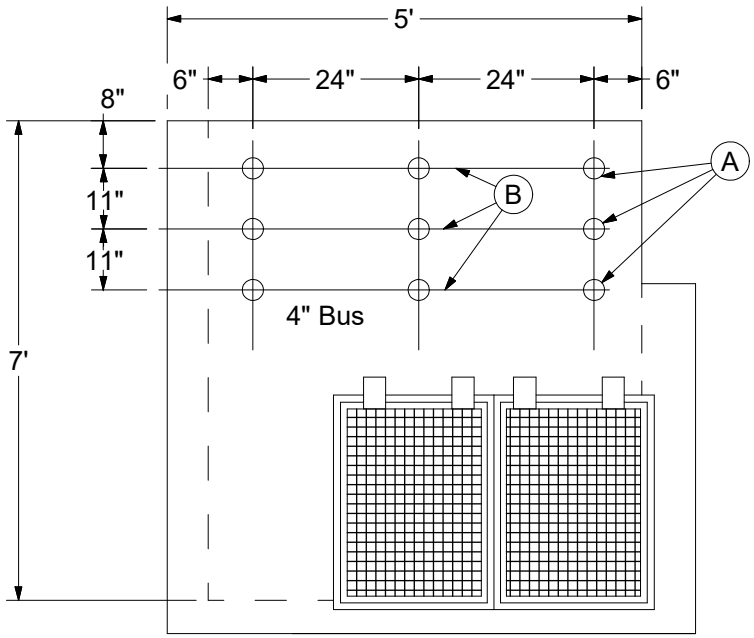
Detail A

BUS AMPACITY	
1000 Amps	43 19 01 01
2000 Amps	43 19 01 02
3000 Amps	43 19 01 03

	ITEM	STK / DCS #	DESCRIPTION 43 19 01 **	01	02	03
	A	25 07 024	Support - Network Bus, Vertical, Heavy Duty	12	12	12
	B	18 12 126	Bar - Bus, Copper, ¼" x 4" x 9', Predrilled	3	6	9
	C	21 56 078	Bolt - Machine, SS, ½" x 2", Hex Head w/Hex Nut	24	24	24
	D	23 66 005	Washer - Lock, Galv. Steel, ½"	24	24	24
1	E	17 55 810	Spacer, Bus Support, ¼" x 4" x 4", Copper	-	12	24
	F	18 12 125	Bar - Bus, Neutral/Ground Kit, ¼" x 4" x 9', w/Mounts	1	1	1
	G	21 53 049	Bolt - Machine, Everdur, ⅜" x 6", Hex Head w/Nut	8	8	8

REV	DATE	ENG	DESCRIPTION
2	04/01/2023	EJB	Converted to new format
1	02/05/2018	EJB	

Small Network Service Compartment



Top View

BUS AMPACITY	
1000 Amps	43 19 01 04
2000 Amps	43 19 01 05
3000 Amps	43 19 01 06

CONSTRUCTION NOTE(s):

1. Insert the copper spacers (E) between the bus bars (A) at each network bus support (B) as necessary.

2. Attach the Neutral/Ground Bus to the bond wire using 4/0 copper wire (Stock #18 52 024) and a two bolt connector (Stock #17 54 132) and a copper lug (Stock #17 05 194).

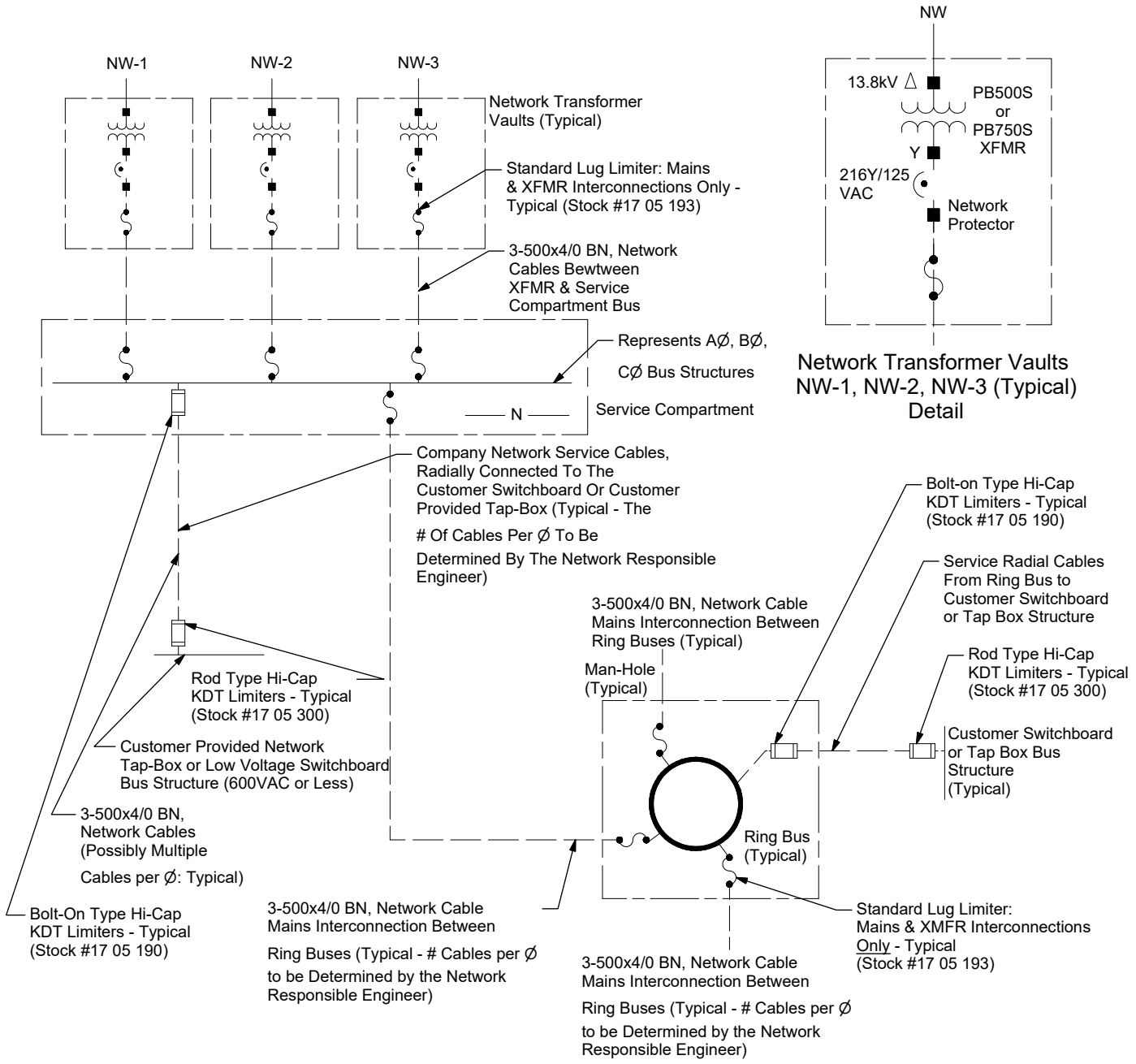
3. For all bus bar connections tighten bolts to a torque value of 20 ft-lbs.

	ITEM	STK / DCS #	DESCRIPTION 43 19 01 **	04	05	06
1	A	25 07 024	Support - Network Bus, Vertical, Heavy Duty	9	9	9
	B	18 12 124	Bar - Bus, Copper, ¼" x 4" x 53", Predrilled	3	6	9
	C	21 56 078	Bolt - Machine, SS, ½" x 2", Hex Head w/Hex Nut	18	18	18
	D	23 66 005	Washer - Lock, Galv. Steel, ½"	18	18	18
	E	17 55 810	Spacer, Bus Support, ¼" x 4" x 4", Copper	-	9	18
	F	18 12 127	Bar - Bus, Neutral/Ground Kit, ¼" x 4" x 4', w/Mounts	1	1	1
	G	21 53 049	Bolt - Machine, Everdur, ⅜" x 6", Hex Head w/Nut	6	6	6

DESIGN NOTE(s):

4. This standard covers new pre-cast network service compartment installations, custom scratch built service compartments, and rebuilt existing service compartments. Consult the project one-line and drawings for additional connection and circuit information. All other standard requirements are contained herein.

REV	DATE	ENG	DESCRIPTION
2	04/01/2023	EJB	Converted to new format
1	02/05/2018	EJB	



CONSTRUCTION NOTE(s):

1. Hi-cap KDT limiters shall be used only on 480Y/277V spot network connections and for 216Y/125V radial secondary network taps to customer equipment from a ring bus or service compartment.

2. The hi-cap KDT limiter's interrupting rating is 200,000 amps, symmetrical, and the standard lug limiter's interrupting rating is 14,000 amperes, symmetrical.

3. Neutral connections not shown on this drawing (limiters not used on neutral conductors).

4. PB500S transformer interconnections: (4) 3-500x4/0 BN,Network Cable PB 750S transformer interconnections: (6) 3-500x4/0 BN,Network Cable

5. Unless otherwise noted, all devices exist in all three phases.

6. This standard is complimentary to DCS **43 16 96 00** & **43 16 97 00**.

NOTES

PRIMARIES UG EQUIPMENT 51

PADMOUNTED - DEADFRONT - SINGLE PHASE DUMMY TRANSFORMER
FOR #2 AL CABLE ONLY - 5, 15kV.....51 11 02 **

TRANSFORMER - PADMOUNTED - SINGLE PHASE 25kVA AND ABOVE - 5, 15kV.....51 11 04 **

PRIMARY PEDESTAL SINGLE PHASE 2-3-4 WAY 200A LOADBREAK - 5, 15kV.....51 11 06 **

TRANSFORMER - PADMOUNTED, SINGLE PHASE 25kVA AND ABOVE - 25kV.....51 11 07 **

TRANSFORMER - PADMOUNTED - DEAD FRONT - THREE PHASE
RADIAL FEED 75 THROUGH 2500 kVA - 5, 15kV.....51 12 00 **

TRANSFORMER - PADMOUNTED - DEADFRONT - THREE PHASE
LOOP FEED 75 THRU 1000 kVA - 5 , 15kV.....51 12 02 **

PRIMARY PEDESTAL THREE PHASE 4 WAY 200A LOAD BREAK - 5, 15kV.....51 12 03 **

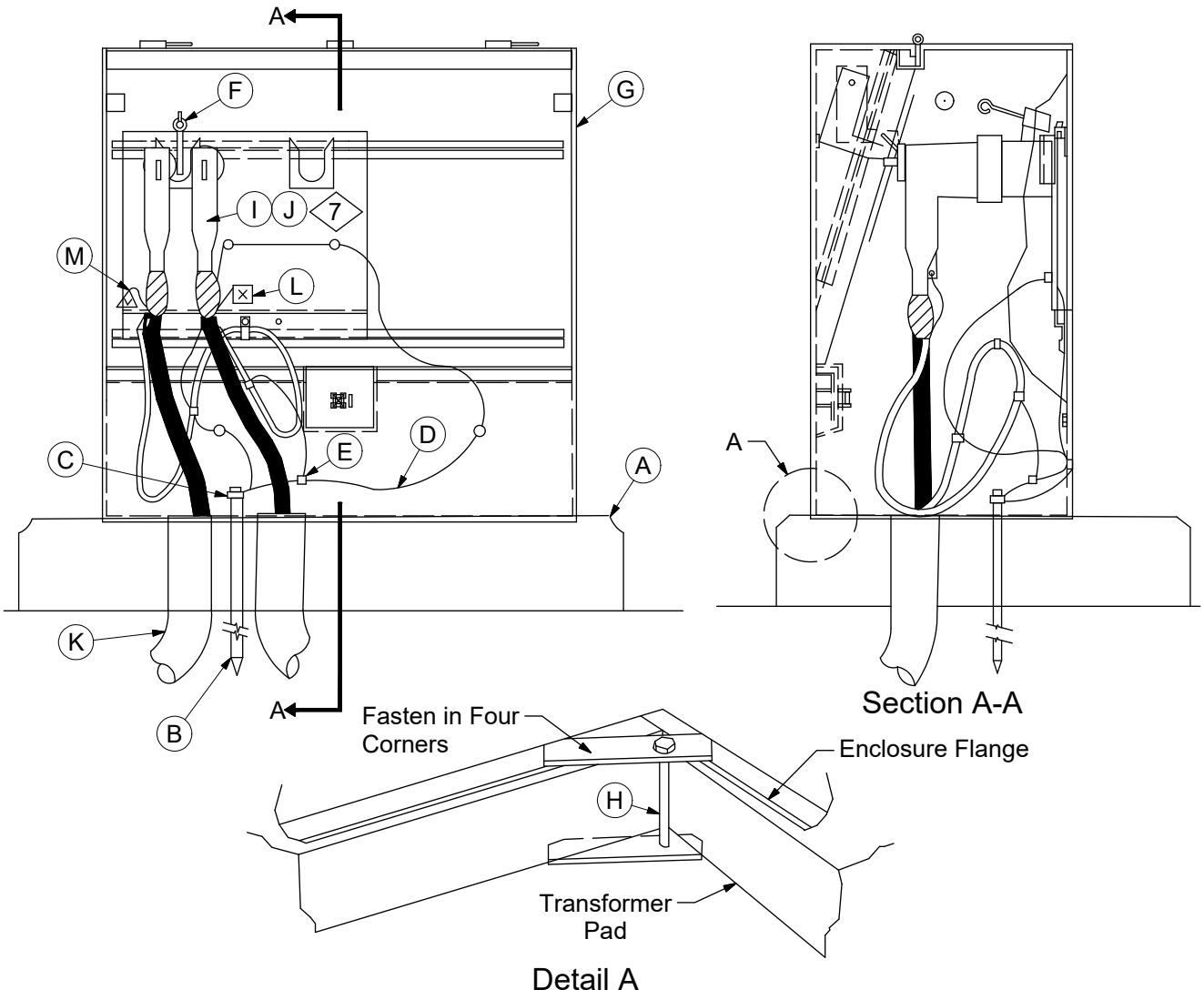
PADMOUNTED CAPACITOR, LOOP OR RADIAL FEED 600 THRU 1800 kVAR - 5, 15kV.....51 12 04 **

PRIMARY PEDESTAL THREE PHASE 600 AMP DEAD OR LOAD BREAK - 5, 15kV.....51 12 05 **

TRANSFORMER - PADMOUNTED - DEAD FRONT - THREE PHASE
RADIAL FEED 1500 THROUGH 3000 kVA - 35kV.....51 12 34 01

TRANSFORMER - PADMOUNTED - DEAD FRONT - THREE PHASE
LOOP FEED 300 THROUGH 2500 kVA - 35kV.....51 12 34 02

NETWORK TRANSFORMER - CATHODIC PROTECTION - 15kV.....51 13 02 01



CONSTRUCTION NOTE(s):

1. Secure compartment to pad using hold down plates and hold down brackets. Hold down plates will be furnished with the composite pads and hold down brackets will be furnished with the compartments. If hold down brackets are missing or if additional brackets are required they may be ordered (Stock #23 56 041).

2. See DCS **34 21 05 ****** for the location of conduits.

3. Train cables so that elbows can be operated safely and easily. Ground as shown.

4. Remove the shipping caps from a feed thru bushing and wipe the surfaces clean. Apply silicone grease (Stock #31 51 050) before installing a loadbreak elbow, insulating cap, or elbow lightning arrester. Place the feed thru bushing into one of the parking stands provided. If more than two cable positions are required, use DCS **51 11 06 ****.

5. DO NOT ENERGIZE a feed thru bushing with a shipping cover in place. Covers are only intended to keep the bushing interfaces clean during shipping and handling. Use a high voltage insulating cap (Stock #17 55 227) to cover an unused position on the feed thru bushing.

6. A minimum clearance of 10' shall be provided at the front of the compartment.

7. Install elbow arrester if cable does not feed through this enclosure.

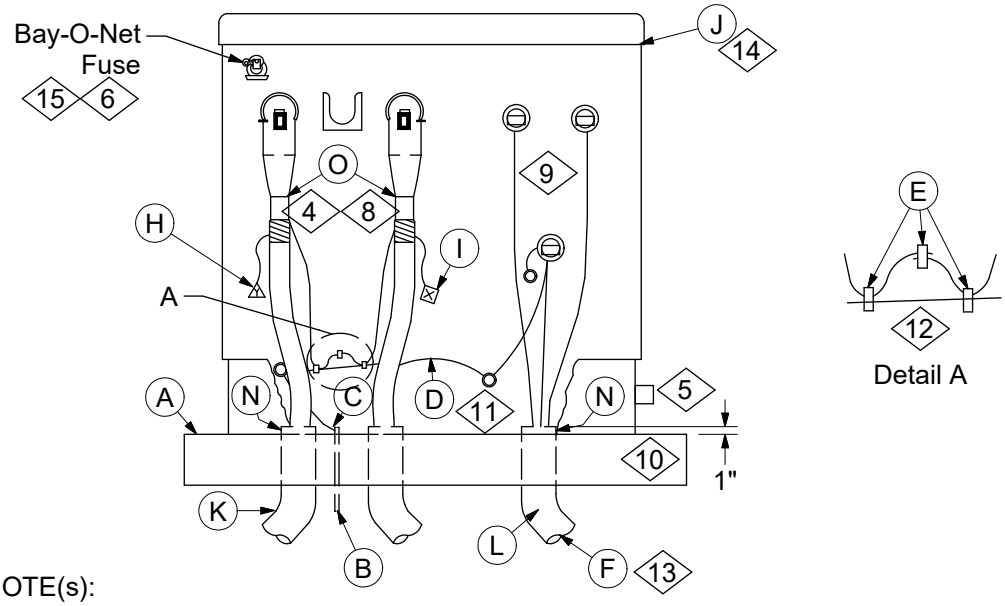
REV	DATE	ENG	DESCRIPTION
12	01/01/23	DG	Converted to new format
11	09/07/17	DG	

	ITEM	STK / DCS #	DESCRIPTION 51 11 02 **	01	02
8	A	12 06 198	Pad - Transf. 42” x 42” x 4”, Composite	1	-
	B	23 13 069	Rod - Grd. 5/8” x 8’	1	1
	C	17 52 032	Clamp - Grd. Rod. 5/8” for #8 -- 1/0	1	1
	D	18 52 025	Wire - Cu., # 2 S.D. (ft.)	10	10
	E	17 54 373	Connector - Split Bolt	3	3
	F	17 55 228	Bushing - Feed Thru	1	1
	G	54 07 235	Enclosure - Primary Pedestal	1	1
	H	23 56 041	Bracket - Hold Down	4	4
@	I	**42 34 62 01**	Termination - Elbow, #2	#	#
7 @	J	**54 11 01 01**	Arrester, 10kV Elbow	#	#
8 @	K	12 51 173	Bend - Plastic, 3”, 36” Rad	#	#
@	L	16 51 079	Tag - Letter X, Red Sq.	1	1
@	M	16 51 080	Tag - Letter Y, Blue Tri.	1	1

DESIGN NOTE(s):

8. In Missouri residential developments, the contractor will install the pad and bends. Use DCS **51 11 02 02**.

9. Faulted circuit indicators (Stock #60 55 001) may be installed on the out-going cables.



CONSTRUCTION NOTE(s):

1. Train cables and provide enough concentric neutral length to allow movement of the elbows from the bushings to the parking stand. Primary and secondary cables must have a minimum of 1" clearance to the enclosure walls.

2. Bolts and hold down plates for securing the transformer to the pad are provided with the pad.

3. See DCS **34 21 05 ****** for pad installation.

4. Order two elbows if in a loop, one elbow if at end of a radial feed. For 4/0 cable, substitute elbow termination with DCS **42 34 62 02**.

5. External provision for grounding - for use by communication companies.

6. Positions of bay-o-net fuses may vary.

7. For most Illinois transformer installations, Ameren will install the pad and bends-see DCS **51 11 04 04**. For Missouri residential and commercial developments the contractor will install the pad and bends - see DCS **51 11 04 02**. For some Missouri individual transformer installations, Ameren will install the pad and bends - see DCS **51 11 04 03**.

8. Elbow arresters should be installed at all open points including the last transformer in a radial feed - see DCS **54 11 01 01**.

9. Transformers are delivered with slip-fit set screw type lugs on each secondary bushing stud. The lugs have eight positions and will accommodate cables up to 500 kcmil. If larger cables are used, the lugs can be replaced with five position lugs that will accommodate cables up to 750 kcmil. For 75kVA and smaller transformers use Stock #17 55 230. For 100kVA and larger transformers use Stock #17 55 229.

10. If bends are cut off, apply a bell end coupling (O) over the end of each conduit.

11. Run continuous length of #2 bare CU ground wire to connect an open port of the X2 connector, to the two lower tank grounds, and to the ground rod. Ground rod can be located where most convenient in the pad opening to avoid the incoming and outgoing conduit elbows.

12. Grounding practices are different in Missouri and Illinois.
In Missouri - Connect cable concentric neutrals to the #2 bare CU ground and then end-to-end using 3 split bolt connectors as shown in this detail.
In Illinois - Cable Concentric neutrals may be single-point connected to the #2 bare CU ground using hot-line clamps or split bolt connectors.

REV	DATE	ENG	DESCRIPTION
22	01/01/23	DG	Converted to new format
21	01/01/20	DG	

DCS #	Description
51 11 04 01	Ameren Installed with Lightweight Pad
51 11 04 02	Contractor Installed with Heavy Pad
51 11 04 03	Ameren Installed with Heavy Pad
51 11 04 04	Ameren Installed with Lightweight Pad and Conduit ◇13◇

	ITEM	STK / DCS #	DESCRIPTION 51 11 04 **	01	02	03	04
7	A	**34 21 05 01**	Pad, Transformer, Lightweight	1	-	-	1
		34 21 05 02	Pad, Transformer, Heavy	-	C	1	-
	B	23 13 069	Rod, Ground, 5/8" x 8'	1	1	1	1
	C	17 52 032	Clamp, Ground Rod, 5/8" For #8 − 1/0	1	1	1	1
	D	18 52 025	Wire, Cu., #2 S.D. (ft.)	5	5	5	5
	E	17 54 373	Connector, Split Bolt	3	3	3	3
13 @	F	12 01 263	Conduit, 2−1/2", SCH 40 PVC, (200 A Service) (ft.)	-	-	-	#
		12 01 279	Conduit, 3" , SCH 40 PVC, (400 A Service) (ft.)	-	-	-	#
13 @	G	49 55 520	Marker, Buried Conduit, Red	-	-	-	#
@	H	16 51 080	Tag, Letter "Y", Blue Tri.	1	1	1	1
@	I	16 51 079	Tag, Letter "X", Red Sq.	1	1	1	1
14 @	J	MR- - -X	Transformer, 7200V or	1	1	1	1
		MZ- - -X	Transformer, 7200V or	1	1	1	1
		TR- - -X	Transformer, 7970V or	1	1	1	1
		WR- - -X	Transformer, 2400V x 7200V or	1	1	1	1
		SR- - -X	Transformer, 7620V or	1	1	1	1
		SZ- - -X	Transformer, 7620V or	1	1	1	1
		ZR- - -X	Transformer, 2400V x 7200V x 7620V or	1	1	1	1
		ZZ- - -X	Transformer, 2400V x 7200V x 7620V	1	1	1	1
@	K	12 51 173	Bend, Conduit, PVC, 3", 36" Rad. (Primary)	#	C	#	#
13 @	L	12 51 173	Bend, Conduit, PVC, 3", 36" Rad. (Secondary & 400A Service)	-	C	-	#
		12 51 331	Bend, Conduit, PVC, 1-1/2", 24" Rad. (Streetlight)	-	C	-	-
		12 51 264	Bend, Conduit, PVC, 2-1/2", 24" Rad. (200 A Service)	-	-	-	#
8 @	M	**54 11 01 01**	Arrester, 10kV Elbow or	#	-	#	#
		54 11 01 03	Arrester, 10kV Parking Stand	#	-	#	#
10 @	N	40 83 492	Coupling − Conduit, PVC, Bell End, 1-1/2"	#	C	#	#
		12 51 398	Coupling − Conduit, PVC, Bell End, 2-1/2"	#	#	#	#
		12 51 008	Coupling − Conduit, PVC, Bell End, 3"	#	C	#	#
4 @	O	**42 34 62 01**	Elbow, Termination, #2 Al.	#	#	#	#

"C" = Contractor Installed Materials (Missouri Only)

DESIGN NOTE(s):

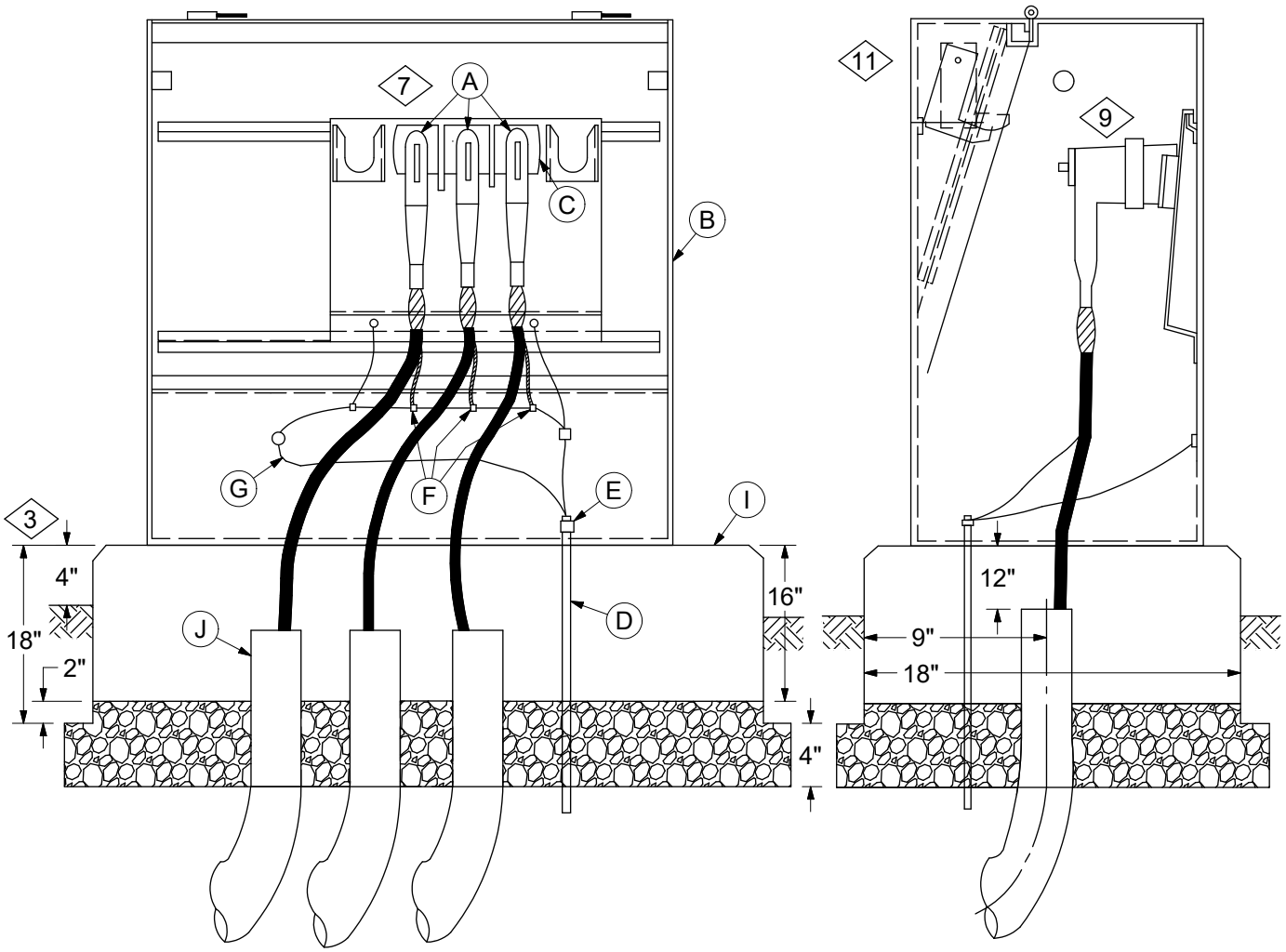
◇13◇ DCS **51 11 04 04** is required in Illinois for residential subdivision developments when the transformer is placed on the property line. Adder items F,G and L need to be ordered depending on the expected size (200 A or 400A) and quantity of services and secondary runs anticipated.

◇14◇ See DCS **13 00 01 02** for single-phase padmount transformer selection.
See DCS **13 00 04 01** for typical transformer dimensions, weight, and oil volumes.

OPERATING NOTE(s):

◇15◇ See DCS **59 51 53 40** for bay-o-net fuse operation and replacement.

REV	DATE	ENG	DESCRIPTION
22	01/01/23	DG	Converted to new format
21	01/01/20	DG	



FRONT VIEW

SIDE VIEW

CONSTRUCTION NOTE(s):

1. An initial depth of 18” shall be excavated and all loose soil shall be removed or tamped. The length and width of the hole should be sized to allow a minimum of 6” of clearance on all sides.

2. To install the 36” radius bends, an increase in the initial excavation depth will be required. After the bends have been installed, crushed stone screening shall be placed and tamped to the level shown.

3. The final depth should be adjusted to provide 4” of exposed ground sleeve pad at final grade.

4. Stabilize the ground sleeve pad over the conduits before backfilling so that there will be no shifting. Provide 12” of space between the load bearing surface of the ground sleeve pad and the end of each conduits.

5. To further stabilize the ground sleeve pad and the bends, place additional screening inside the ground sleeve pad and hand tamp in place.

6. Backfill with loose material, DO NOT backfill next to the ground sleeve pad with chunks of material or rocks. Pack loose backfill by foot tamping and do not tamp excessively close to the ground sleeve pad sides.

REV	DATE	ENG	DESCRIPTION
16	01/01/23	JMW	Converted to new format
15	09/14/17	JMW	

7. Drawing illustrates a 3-way Junction. To install 3-way or 4-way junctions, remove the mounting plate from the enclosure. Mount 3-way junctions using the two"U" straps and bolts furnished with the junctions. Mount 4-way junctions using the three "U" straps and bolts furnished with the junction. Mount the junctions so that the center line is approximately 24" from the top of the pad. After the junction is installed, replace the mounting plate. Secure the plate in a convenient location.

   NOTE: If only two cables will be installed, use a feed thru bushing. Place the feed thru bushing into one of the parking stands. If the installation is to be a dummy transformer, see DCS **51 11 02 01**.

8. Train cables so that elbows can be operated safely and easily. Ground as shown.

9. Remove the shipping covers from the junctions and wipe the surfaces clean. Apply silicone grease (Stock #31 51 050) before installing a loadbreak elbow, insulating cap, or lightning arrester.

10. CAUTION: If all junction positions are not used, a high voltage insulating cap (Stock #17 55 227) must be installed on the unused positions.
    DO NOT ENERGIZE a junction with a shipping cover in place. Covers are only intended to keep the bushing interfaces clean during shipping and handling.

11. 10’ minimum clearance shall be provided at the front of the primary pedestal.

12. Faulted circuit indicators should be installed on the elbows at the cable entrance. All concentric neutral wires must be outside of the faulted circuit indicator closed core CT. Faulted circuit indicators should be installed on the out-going cables.

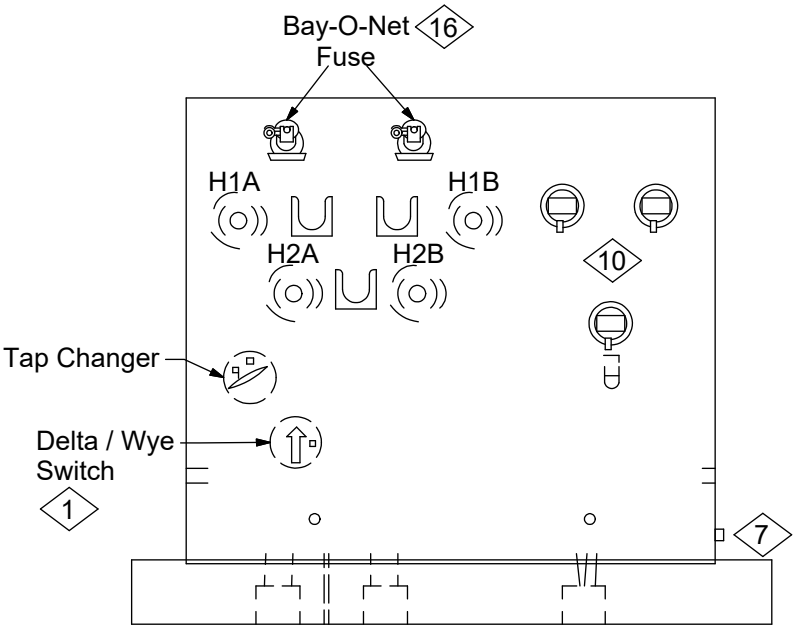
13. In Missouri residential developments, the contractor will install the sleeve and bends. See DCS **51 11 06 04** thru **51 11 06 06**.

14. Lightning protection should be installed at open points. See DCS **54 11 01 ****.

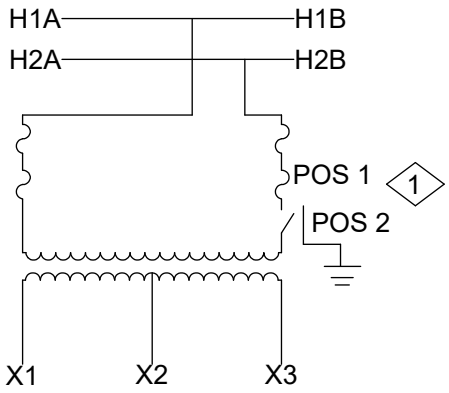
15. If bends are cut off apply a bell end coupling (M) over the end of each conduit.

	ITEM	STK / DCS #	DESCRIPTION 51 11 06 **	01	02	03	04	05	06
	A	**42 34 62 01**	Termination - Elbow, #2	2	3	4	2	3	4
	B	54 07 235	Enclosure - Primary Pedestal	1	1	1	1	1	1
	C	17 07 137	Junction - Load Break 3--way	-	1	-	-	1	-
		17 07 138	Junction - Load Break 4--way	-	-	1	-	-	1
	D	23 13 069	Rod - Grd. 5/8” x 8’	1	1	1	1	1	1
	E	17 52 032	Clamp - Grd Rod 5/8” For #8 -- 1/0	1	1	1	1	1	1
	F	17 54 373	Conector - Split Bolt	3	3	4	3	3	4
	G	18 52 025	Wire - Cu. #2 S.D. (ft.)	12	12	12	12	12	12
	H	17 55 228	Bushing - Feed Thru	1	-	-	1	-	-
	I	12 06 134	Pad - Ground Sleeve	1	1	1	-	-	-
@	J	12 51 173	Bend - Plastic, 3” 36” Rad	2	3	4	-	-	-
		12 51 176	Bend - Plastic, 4” 36” Rad	-	-	-	-	-	-
@	K	60 55 001	Indicator - Faulted Circuit	1	2	3	1	2	3
@	L	12 51 008	Coupling - Conduit, Plastic, Bell End, 3”	#	#	#	#	#	#
		12 51 254	Coupling - Conduit, Plastic, Bell End, 4”	#	#	#	#	#	#

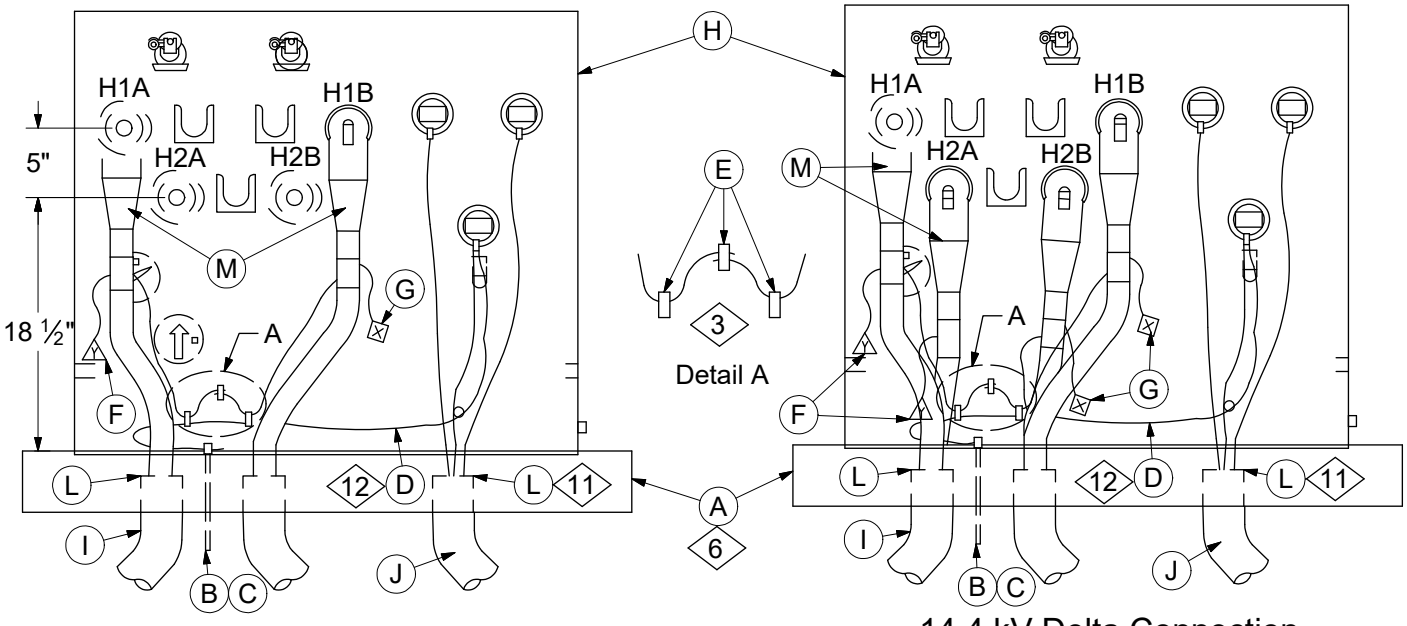
REV	DATE	ENG	DESCRIPTION
16	01/01/23	JMW	Converted to new format
15	09/14/17	JMW	



Transformer Face



Nameplate Diagram



24.9 GrdY/14.4 kV Connection
Operating Switch - Position 2
DCS **51 11 07 01**
DCS **51 11 07 02**
2

14.4 kV Delta Connection
Operating Switch - Position 1
DCS **51 11 07 03**
DCS **51 11 07 04**
2

REV	DATE	ENG	DESCRIPTION
0	01/01/23	DG	New Standard

CONSTRUCTION NOTE(s):

1. Delta / Wye Switch Setting - Prior to energizing transformer:
   a) If installing the transformer on a 14.4kV Delta circuit, set the Delta / Wye switch to Position 1.
   b) If installing the transformer on a 24.9 GrdY/14.4kV circuit, set the Delta / Wye switch to Position 2.

2. Primary Bushing Connections:
   a) If installing the transformer on a 14.4kV Delta circuit:
      i) If in loop-feed, all four of the H1 and H2 bushings are utilized. H1A and H2A for incoming cables. H1B and H2B for outgoing cables
      ii) If last transformer in radial-feed, only the H1A and H2A bushings are utilized for cable connections. 18kV arresters (Stock #10 01 267) are installed on the H1B and H2B bushings.
   b) If installing the transformer on a 24.9 GrdY/14.4kV circuit:
      i) If in loop-feed, only the H1A and H1B bushings are utilized for cable connections.
      ii) If last transformer in radial-feed, only the H1A bushing is utilized for cable connection. 18kV arrester (Stock #10 01 267) is installed on the H1B bushing.
   c) Insulating bushing caps (Stock #17 55 853) must be installed on all unused bushings.

3. Connect cable concentric neutrals to the #2 bare CU ground and then end-to-end using 3 split bolt connectors as shown in this detail. Transformers in loop-feed 14.4kV Delta circuits will have one of these neutral connections for the H1A to H1B concentric neutrals and a second for the H2A to H2B concentric neutrals.

4. Train cables and provide enough concentric neutral length to allow movement of the elbows from the bushings to the parking stand. Primary and secondary cables must have a minimum of 1" clearance to the enclosure walls.

5. Bolts and hold down plates for securing the transformer to the pad are provided with the pad.

6. See DCS **34 21 04 02** for pad installation.

7. External provision for grounding - for use by communication companies.

8. For some Missouri individual transformer installations, Ameren will install the pad and bends - use DCS **51 11 07 01** or **03**. For Missouri residential and commercial developments, the contractor will install the pad and bends - use DCS **51 11 07 02** or **04**.

9. Elbow arresters should be installed at all open points including the last transformer in a radial feed.

10. Transformers are delivered with slip-fit set screw type lugs on each secondary bushing stud. The lugs have eight positions and will accommodate cables up to 500 kcmil. If larger cables are used, the lugs can be replaced with five position lugs that will accommodate cables up to 750 kcmil. For 75kVA and smaller transformers, use Stock #17 55 230. For 100kVA and larger transformers, use Stock #17 55 229.

11. If bends are cut off, apply a bell end coupling (L) over the end of each conduit.

12. Run continuous length of #2 bare CU ground wire to connect an open port of the X2 connector, to the two lower tank grounds, and to the ground rod. Ground rod can be located where most convenient in the pad opening to avoid the incoming and outgoing elbows.

DCS #	DESCRIPTION	INSTALLED BY
51 11 07 01	24.9 GrdY/14.4 kV	Ameren
51 11 07 02	24.9 GrdY/14.4 kV	Contractor
51 11 07 03	14.4 kV Delta	Ameren
51 11 07 04	14.4 kV Delta	Contractor

	ITEM	STK / DCS #	DESCRIPTION 51 11 07 **	01	02	03	04
8	A	12 06 163	Vault, Box Pad, 42" x 48" x 18"	1	C	1	C
	B	23 13 069	Rod, Ground, 5/8" x 8'	1	1	1	1
	C	17 52 032	Clamp, Ground Rod, 5/8" For #8 − 1/0	1	1	1	1
	D	18 52 025	Wire, Cu., #2 S.D. (ft.)	5	5	5	5
	E	17 54 373	Connector, Split Bolt	3	3	6	6
@	F	16 51 080	Tag, Letter "Y", Blue Tri.	1	1	2	2
@	G	16 51 079	Tag, Letter "X", Red Sq.	1	1	2	2
15 @	H	RR- - - -X	Transformer, 14400V Delta x 24940 GrdY/14400V	1	1	1	1
@	I	12 51 173	Bend, Conduit, PVC, 3", 36" Rad. (Primary)	2	C	-	-
		12 51 176	Bend, Conduit, PVC, 4", 36" Rad. (Primary)	-	-	2	C
@	J	12 51 173	Bend, Conduit, PVC, 3", 36" Rad. (Secondary & 400A Service)	#	C	#	C
		12 51 331	Bend, Conduit, PVC, 1 1/2", 24" Rad. (Streetlight)	#	C	#	C
		12 51 264	Bend, Conduit, PVC, 2 1/2", 24" Rad. (200 A Service)	#	#	#	#
2,9 @	K	10 01 267	Arrester, 18 kV Elbow	#	#	#	#
11 @	L	40 83 492	Coupling − Conduit, PVC, Bell End, 1 1/2 "	#	C	#	C
		12 51 398	Coupling − Conduit, PVC, Bell End, 2 ½"	#	#	#	#
		12 51 008	Coupling − Conduit, PVC, Bell End, 3"	#	C	#	#
		12 51 254	Coupling − Conduit, PVC, Bell End, 4"	-	-	2	C
13,14 @	M	17 05 539	Elbow Termination, 25 kV, 1/0 AL, 360 MIL	#	#	#	#
2 @	N	17 55 853	Cap, Insulating, 25 kV	2	2	-	-

"C" = Contractor Installed Materials (Missouri Only)

DESIGN NOTE(s):

13. 1/0 AL, 35kV, 345 MIL insulated cabled is required to be used for RRxxxxX transformer installations.

14. For 24.9 GrdY/14.4 kV installation, order two elbows if in a loop, one elbow if at end of a radial feed.
For 14.4 kV Delta installation, order four elbows if in a loop, two elbows if at end of a radial feed.

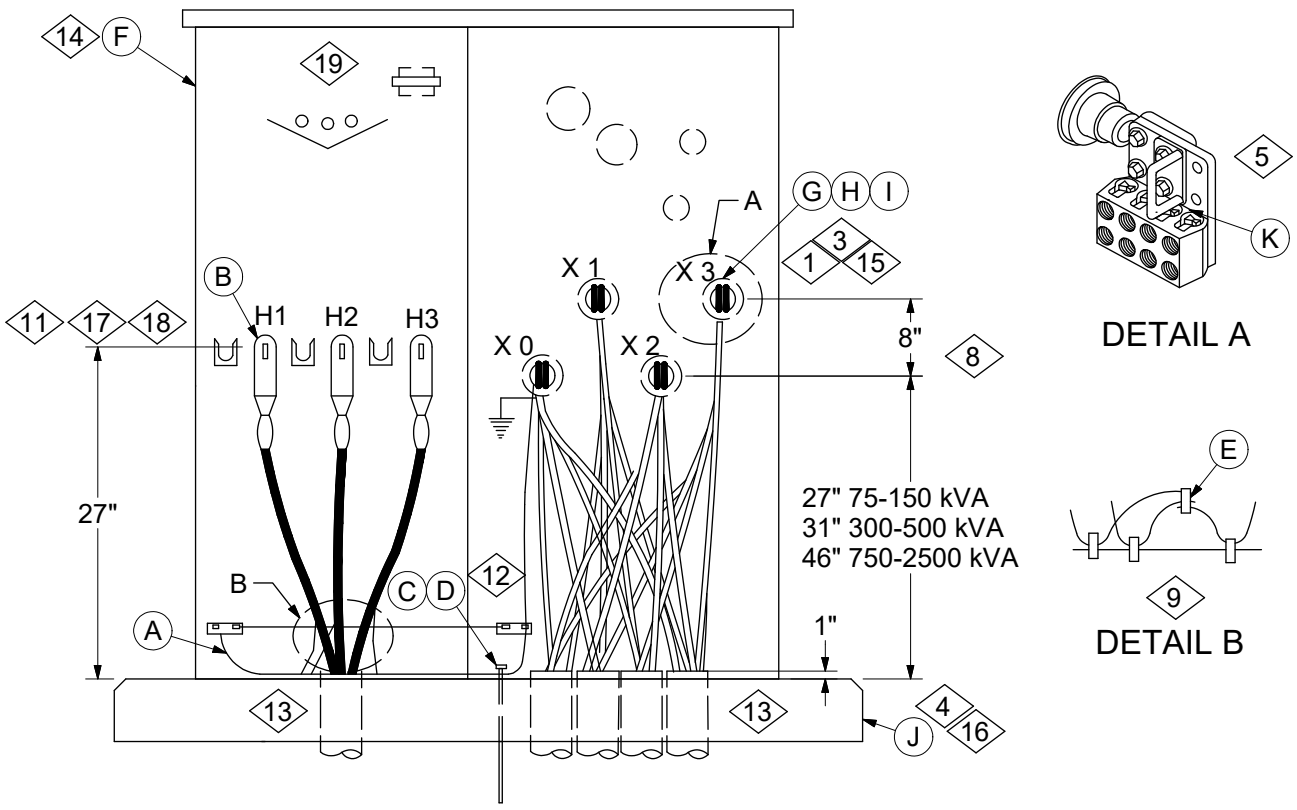
15. See DCS **13 00 01 02** for single-phase padmount transformer selection.
See DCS **13 00 04 01** for typical transformer dimensions, weight, and oil volumes.

OPERATING NOTE(s):

16. See DCS **59 51 53 40** for bay-o-net fuse operation and replacement.

17. Use grounding elbow (Stock #17 63 295) for grounding transformer. Use grounding elbow (Stock #17 63 295) with feed-thru bushing (Stock #17 05 577) for grounding cable.

REV	DATE	ENG	DESCRIPTION
0	01/01/23	DG	New Standard



CONSTRUCTION NOTE(s):

1. When installing secondary lugs use the maximum number of mounting holes that will align with the spade holes.

2. Provide enough concentric neutral length to attach to ground and also allow movement of the elbow from the bushing to the parking stand. Primary and secondary cables must have a minimum of 1" clearance to enclosure walls.

3. Stainless steel machine bolts and Belleville spring washers are required for bolting aluminum lugs to secondary terminals. Clean the lugs and terminals and apply inhibitor to the mating interfaces. See DCS **59 52 00 43** for Belleville washer installation instructions.

4. See DCS **34 21 05 04** or **34 21 05 05** for pad installations.

5. If the grounding stirrup is installed, longer bolts may be required. If used, stirrups are installed on X1, X2, and X3.

6. Install ground rod clamp 3” below top of rod to provide space for attaching ground set.

7. 480 Volt Three Wire Service From 480Y/277 Volt Four Wire Transformer
   CAUTION: DO NOT MAKE THIS CONVERSION ON WYE-WYE TRANSFORMERS WITH INTERNALLY CONNECTED PRIMARY AND SECONDARY NEUTRALS.

   A. If 480 volt three-wire grounded service is required, follow these steps to convert a 480Y/277 volt four-wire transformer.

      a. Remove the secondary neutral ground strap.

      b. Tape the secondary neutral terminal to prevent accidental contact and any misunderstanding as to which terminals are being used and the type service being provided.

c. Run a #2 copper lead from the ”A” phase secondary terminal to the tank ground connector. Ground the transformer tank to the driven ground rod and to the common system neutral (if present).

CAUTION: AFTER THE “A” PHASE SECONDARY TERMINAL IS ENERGIZED, THE TAPED NEUTRAL TERMINAL IS ENERGIZED.

d. Before connecting the customer’s cable, determine which cable the customer has grounded and connect that cable to the now grounded “A” phase secondary terminal.

B. If 480 volt three-wire ungrounded service is required, follow these steps to convert a 480Y/277 volt four-wire transformer:

a. Remove the secondary neutral ground strap.

b. Tape the secondary neutral terminal to prevent accidental contact and any misunderstanding as to which terminals are being used and the type of service being provided.

c. Ground the transformer tank to the driven ground rod and to the common system neutral (if present).

8. 150kVA and smaller transformers manufactured prior to mid-2010 will have 6” vertical spacing between secondary bushings.

9. Grounding practices are different in Missouri and Illinois.
In Missouri - Connect cable concentric neutrals to the #2 bare CU ground and then end-to-end using 4 split bolt connectors as shown in this detail.
In Illinois - Cable Concentric neutrals may be single-point connected to the #2 bare CU ground using hot-line clamps or split bolt connectors.

10. The Aluminum lugs can be used for Aluminum or Copper conductors.

11. Fault current indicators can be installed to aid in determining if a fault has occurred in the transformer or the cable feeding the transformer.

12. Loop the #2 CU ground bus from the ground rod, through the two transformer tank ground connectors, and back to the ground rod. Use a separate piece of #2 CU ground wire to connect from an open position of the X0 connector to the ground bus. The ground rod can be located where most convenient in the pad opening to avoid the incoming and outgoing conduit elbows.

13. If bends are cut off, bell end couplings are to be installed over the end of each conduit.

REV	DATE	ENG	DESCRIPTION
13	01/01/23	DG	Converted to new format
12	10/12/15	DG	

	ITEM	STK / DCS #	DESCRIPTION 51 12 00 **	02	04
12	A	18 52 025	Wire, Copper, #2 Solid, Soft Drawn	15	15
17	B	**42 34 62 01**	Termination, 15kV, #2 Elbow	3	-
		42 34 62 02	Termination, 15kV, #4/0 Elbow	-	3
	C	23 13 069	Rod, Ground, 5/8” x 8’	1	1
	D	17 52 032	Clamp, Ground Rod, 5/8” For #8 - 1/0	2	2
9	E	17 54 373	Connector, Split Bolt, #2 Str. CU.	3	3
		17 54 182	Connector, Split Bolt, #3 Str. CU.	1	1
14 @	F	**13 00 01 02**	Transformer, Three Phase, Dead Front, Radial Feed	1	1
3,5 @	G	21 56 078	Bolt, Machine, 1/2” x 2”, Stainless Steel	#	#
		21 54 316	Bolt, Machine, 1/2” x 2-1/2”, Stainless Steel	#	#
		21 56 075	Bolt, Machine, 1/2” x 1-1/2”, Stainless Steel	#	#
3 @	H	12 56 052	Washer, Belleville Spring, 1/2”, Stainless Steel	#	#
		12 56 053	Washer, Flat, 1/2”, Stainless Steel (2 ea. per Belleville)	#	#
1,10,15 @	I	17 55 190	Lug, Alum 1 - 1/0 to 1000 kcmil, Lay-In, 2 Hole	#	#
		17 55 289	Lug, Alum 2 - 1/0 to 1000 kcmil, Lay-In, 2 Hole	#	#
		17 55 209	Lug, Alum 3 - 1/0 to 1000 kcmil, Lay-In, 6 Hole	#	#
		17 55 233	Lug, Alum 6 - 1/0 to 500 kcmil, Lay-In, 10 Hole	#	#
		17 55 232	Lug, Alum 6 - 1/0 to 1000 kcmil, Lay-In, 12 Hole	#	#
		17 55 343	Lug, Alum 1 - 1/0 to 750 kcmil, 2 Hole	#	#
		17 55 344	Lug, Alum 2 - 1/0 to 750 kcmil, 4 Hole	#	#
		17 55 345	Lug, Alum 4 - 1/0 to 750 kcmil, 6 Hole	#	#
		17 55 346	Lug, Alum 5 - 1/0 to 750 kcmil, 8 Hole	#	#
		17 55 349	Lug, Alum 6 - 1/0 to 750 kcmil, 8 Hole	#	#
		17 55 350	Lug, Alum 8 - 1/0 to 750 kcmil, 8 Hole	#	#
16 @	J	12 06 123	Pad, Composite, 75 - 750 kVA	1	1
		12 06 124	Pad, Composite, 1000 - 2500 kVA	1	1
5 @	K	17 55 510	Stirrup, Grounding, Bolted	3	3
18 @	L	17 55 265	15kV Bushing Insert, 200A Feed-Thru	3	3
18 @	M	10 01 138	10kV Elbow Arrester	3	3
		10 01 244	10kV Bushing Well Arrester	3	3
11 @	N	60 55 001	Indicator, Fault Current, 1 Phase	3	3

DESIGN NOTE(s):

14. See DCS **13 00 01 02** for three phase padmount transformer selection.
See DCS **13 00 04 01** for typical transformer dimensions, weight, and oil volumes.
Radial-feed transformers with Type Code "A" have Bay-O-Net fuses.

15. Preferred number of secondary cables per terminal is six or less. In no case shall the number of cables per terminal exceed twelve.

16. See DCS **34 21 04 05** if vault is needed for cable training.

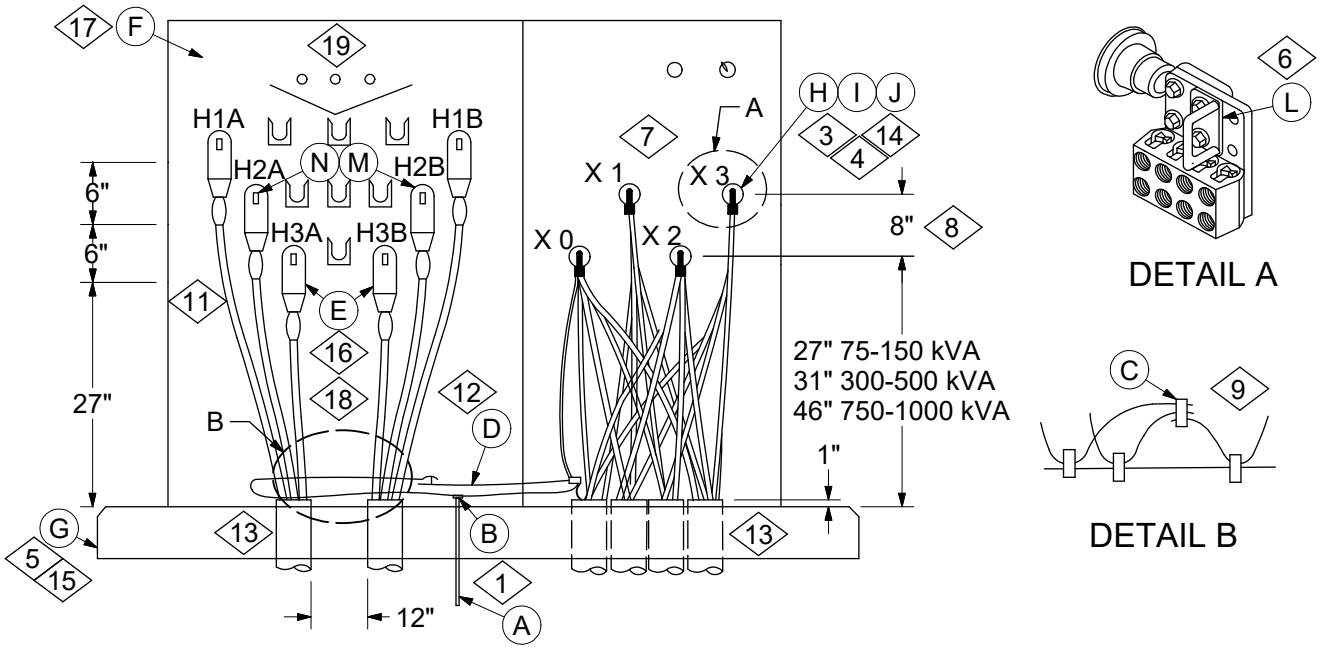
17. For non-standard primary cable sizes, see DCS **42 34 62 ****** for proper elbow termination. 4kV transformers 1500kV and larger require 600 amp non-load break terminations (DCS **42 34 64 ****).

18. Three-phase radial-feed padmount transformers connected to EPR insulated primary cable do not need arresters. If connected to XLPE insulated primary cable, replace the single-bushing inserts with double-bushing inserts and install elbow arresters (Stock #17 55 265 and #10 01 138), or install bushing well arrester (Stock #10 01 244).

REV	DATE	ENG	DESCRIPTION
13	01/01/23	DG	Converted to new format
12	10/12/15	DG	

OPERATING NOTE(s):

19. Radial-feed transformers with Type Code "A" have Bay-O-Net fuses. See DCS **59 51 53 40** for Bay-O-Net fuse operation and replacement.



CONSTRUCTION NOTE(s):

1. Install ground rod clamp 3” below top of rod to provide space for attaching ground set.

2. Provide enough concentric neutral length to attach to ground and also allow movement of the elbow from the bushing to the parking stand. Primary and secondary cables must have a minimum of 1" clearance to enclosure walls.

3. Stainless steel machine bolts and Belleville spring washers required for bolting aluminum lugs to secondary terminals. Clean lugs, terminals, and use inhibitor. See DCS **59 52 00 43** for Belleville washer installation instructions.

4. When installing secondary lugs use the maximum number of mounting holes that align with the spade holes.

5. See DCS **34 21 05 05** for pad installation.

6. If the grounding stirrup is installed, longer bolts may be required. If used, stirrups are installed on X1, X2, and X3.

7. 480 Volt Three Wire Service From 480Y/277 Volt Four Wire Transformer
CAUTION: DO NOT MAKE THIS CONVERSION ON WYE-WYE TRANSFORMERS WITH INTERNALLY CONNECTED PRIMARY AND SECONDARY NEUTRALS.

   A. If 480 volt three-wire grounded service is required, follow these steps to convert a 480Y/277 volt four-wire transformer:

      a. Remove the secondary neutral ground strap.

      b. Tape the secondary neutral terminal to prevent accidental contact and any misunderstanding as to which terminals are being used and the type service being provided.

      c. Run a #2 copper lead from the ”A” phase secondary terminal to the tank ground connector. Ground the transformer tank to the driven ground rod and to the common system neutral (if present).

REV	DATE	ENG	DESCRIPTION
16	01/01/23	DG	Converted to new format
15	09/22/15	DG	

CAUTION: AFTER THE “A” PHASE SECONDARY TERMINAL IS ENERGIZED, THE TAPED NEUTRAL TERMINAL IS ENERGIZED.

d. Before connecting the customer’s cable, determine which cable the customer has grounded and connect that cable to the now grounded “A” phase secondary terminal.

B. If 480 volt three-wire ungrounded service is required, follow these steps to convert a 480Y/277 volt four-wire transformer:

a. Remove the secondary neutral ground strap.

b. Tape the secondary neutral terminal to prevent accidental contact and any misunderstanding as to which terminals are being used and the type of service being provided.

c. Ground the transformer tank to the driven ground rod and to the common system neutral (if present).

8. 150kVA and smaller transformers manufactured prior to mid-2010 will have 6” vertical spacing between secondary bushings.

9. Grounding practices are different in Missouri and Illinois.
In Missouri - Connect cable concentric neutrals to the #2 bare CU ground and then end-to-end using 4 split bolt connectors as shown in this detail.
In Illinois - Cable Concentric neutrals may be single-point connected to the #2 bare CU ground using hot-line clamps or split bolt connectors.

10. The Aluminum lugs can be used for Aluminum or Copper conductors.

11. Fault current indicators can be installed to aid in determining if fault has occurred in the transformer or the cable feeding the transformer.

12. Loop the #2 CU ground bus from the ground rod, through the two transformer tank ground connectors, and back to the ground rod. Use a separate piece of #2 CU ground wire to connect from an open position of the X0 connector to the ground bus. The ground rod can be located where most convenient in the pad opening to avoid the incoming and outgoing conduit elbows.

13. If bends are cut off, bell end couplings are to be installed over the end of each conduit.

	ITEM	STK / DCS #	DESCRIPTION 52 12 02 **	01	02
	A	23 13 069	Rod, Ground, 5/8" x 8'	1	1
	B	17 52 032	Clamp, Ground Rod, 5/8" For #8 - 1/0	2	2
9	C	17 54 373	Connector, Split Bolt, #2 Str. CU	6	6
		17 54 182	Connector, Split Bolt, 3-#2 Str. CU	2	2
12	D	18 52 025	Wire, Copper, #2 Solid S.D.	15	15
18 @	E	**42 34 62 01**	Termination, Elbow #2	#	-
		42 34 62 02	Termination, Elbow 4/0	-	#
17 @	F	**13 00 01 02**	Transformer, Three Phase, Dead Front, Loop Feed	1	1
15 @	G	12 06 124	Pad, Composite, 1000 kVA & below	1	1
3,6 @	H	21 56 075	Bolt, Machine 1/2" x 1−1/2", Stainless Steel	#	#
		21 56 078	Bolt, Machine 1/2" x 2", Stainless Steel	#	#
		21 54 316	Bolt, Machine 1/2" x 2−1/2", Stainless Steel	#	#
3 @	I	12 56 052	Washer, Belleville Spring,1/2", Stainless Steel	#	#
		12 56 053	Washer, Flat, 1/2", Stainless Steel (2 ea. per Belleville)	#	#
4,10,14 @	J	17 55 190	Lug, Alum 1 - 1/0 to 1000 kcmil, Lay-In, 2 Hole	#	#
		17 55 289	Lug, Alum 2 - 1/0 to 1000 kcmil, Lay-In, 2 Hole	#	#
		17 55 209	Lug, Alum 3 - 1/0 to 1000 kcmil, Lay-In, 6 Hole	#	#
		17 55 233	Lug, Alum 6 - 1/0 to 500 kcmil, Lay-In, 10 Hole	#	#
		17 55 232	Lug, Alum 6 - 1/0 to 1000 kcmil, Lay-In, 12 Hole	#	#
		17 55 343	Lug, Alum 1 - 1/0 to 750 kcmil, 2 Hole	#	#
		17 55 344	Lug, Alum 2 - 1/0 to 750 kcmil, 4 Hole	#	#
		17 55 345	Lug, Alum 4 - 1/0 to 750 kcmil, 6 Hole	#	#
		17 55 346	Lug, Alum 5 - 1/0 to 750 kcmil, 8 Hole	#	#
		17 55 349	Lug, Alum 6 - 1/0 to 750 kcmil, 8 Hole	#	#
		17 55 350	Lug, Alum 8 - 1/0 to 750 kcmil, 8 Hole	#	#
16 @	K	**54 11 01 01**	Arrester, 10kV Elbow	#	#
@	L	17 55 510	Stirrup, Grounding, Bolted	3	3
@	M	16 51 079	Tag, Letter "X", Red Sq.	3	3
@	N	16 51 080	Tag, Letter "Y", Red Sq.	3	3
11 @	O	60 55 001	Indicator, Fault Current, 1 Phase	3	3

DESIGN NOTE(s):

14. Preferred number of secondary cables per bushing is six or less. In no case shall the number of cables per bushing exceed twelve.

15. See DCS **34 21 04 05** if vault is needed for cable training.

16. Elbow arresters should be installed at all open points. DCS **54 11 01 ****** shows a single-phase elbow arrester. installation. Make adjustments for three-phase use.

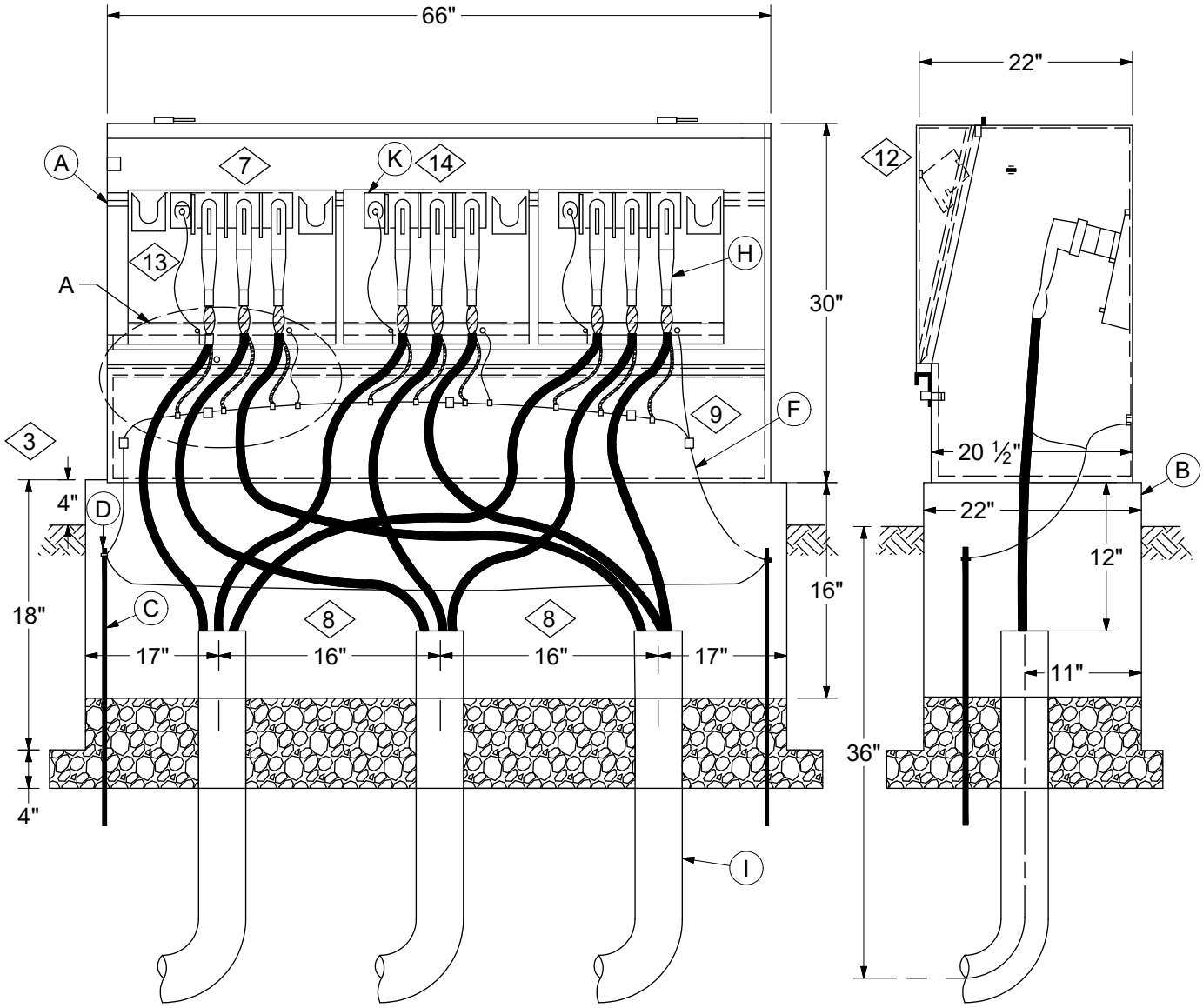
17. See DCS **13 00 01 02** for three-phase padmount transformer selection.
See DCS **13 00 04 01** for typical transformer dimensions, weight, and oil volumes.

18. For non-standard primary cable sizes, see DCS **42 34 62 ****** for proper elbow termination.

OPERATING NOTE(s):

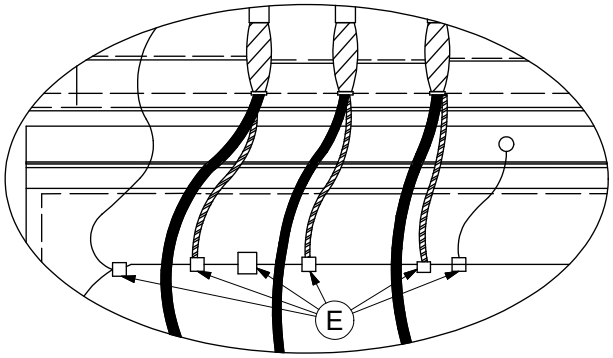
19. See DCS **59 51 53 40** for bay-o-net fuse operation and replacement.

REV	DATE	ENG	DESCRIPTION
16	01/01/23	DG	Converted to new format
15	09/22/15	DG	



FRONT VIEW

SIDE VIEW



Detail "A"

REV	DATE	ENG	DESCRIPTION
14	01/01/23	JMW	Converted to new format
13	09/07/17	JMW	

CONSTRUCTION NOTE(s):

Excavation and Placement of Fiberglass Ground Sleeve Pad

1. An initial depth of 18” shall be excavated and all loose soil shall be removed or tamped. The length and width of the hole should be sized to allow a minimum of 6” of clearance on all sides.

2. To install the 36” radius bends, an increase in the initial excavation depth will be required. After the bends have been installed, crushed stone screenings shall be placed and tamped to the level shown in Figure 1.

3. The final depth should be adjusted to provide 4” of exposed ground sleeve pad at final grade.

4. Stabilize the ground sleeve pad over the conduits before backfilling so that there will be no shifting. Provide 12” of space between the load bearing surface of the ground sleeve pad and the end of each conduit. See Figure 2.

5. To further stabilize the ground sleeve pad and the bends, place additional screenings inside the ground sleeve pad and hand tamp in place.

6. Backfill with loose material, DO NOT backfill next to the ground sleeve pad with chunks of material or rocks. Pack loose backfill by foot tamping and do not tamp excessively close to the ground sleeve pad sides. NOTE: Hydraulic tamping is not recommended.

7. Illustration shows 3-Way. If used as 4-Way, reduce space between conduit bends to 12"-13".

8. If bends are cut off apply a bell end coupling (L) over the end of each conduit.

This installation will not withstand pulling long cable lengths through the bends. If restrained bends are needed, refer to DCS **31 47 01 ****.

Accessory Installation

9. Connect concentric neutral wires from each cable to the #2 copper wire connected to the ground rods. Also attach the #2 copper wire to each ground connector in the primary pedestal.

10. Install elbows as required.

11. All exposed bushings must be covered with insulating caps, elbows, or elbow arresters.

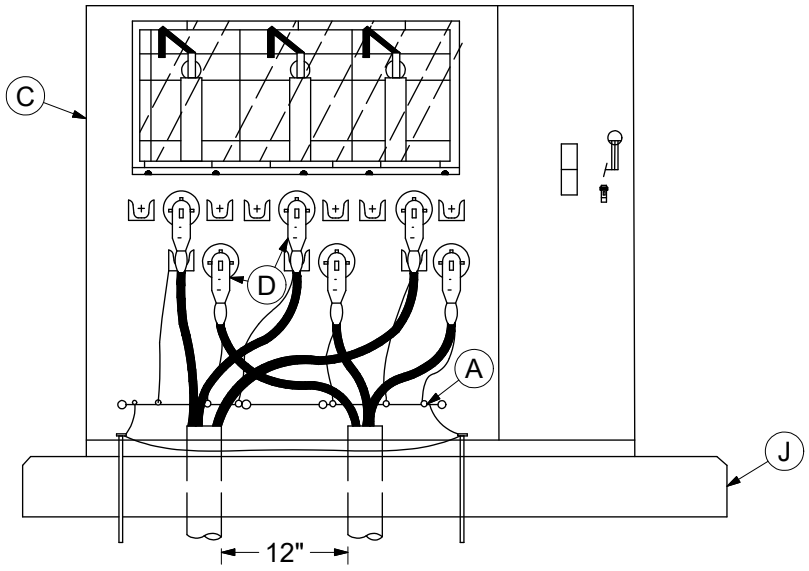
12. 10’ minimum clearance shall be provided at the front of the primary pedestal.

13. Faulted circuit indicators should be installed at the elbows below the cable entrance. All concentric neutral wires must be outside of the faulted circuit indicator closed core CT. Faulted circuit indicators should be installed on the out-going cables.

14. Cover any open positions with an insulating cap.

	ITEM	STK / DCS #	DESCRIPTION 53 12 03 **	01
	A	54 07 297	Enclosure - Primary Pedestal 3	1
	B	12 06 120	Pad - Ground Sleeve	1
	C	23 13 069	Rod - Ground, 5/8” x 8’	2
	D	17 52 032	Clamp - Ground Rod, 5/8” For #8 -- 1/0	2
	E	17 54 373	Connector - Split Bolt	15
	F	18 52 025	Wire - Cu, #2 S. D. (Ft.)	20
	G	-	Screenings	#
	H	**42 34 62 01**	Termination - #2 Elbow	#
@		**42 34 62 02**	Termination - 4/0 Elbow	#
		42 34 62 05	Termination - 1/0 Elbow	#
@	I	12 51 176	Bend - Plastic, 4” 36” Rad.	3
5,@	J	60 55 001	Indicator - Faulted Circuit	#
6,@	K	17 55 227	Cap - Insulating, 15kV	1
8,@	L	12 51 254	Coupling - Conduit, Plastic, Bell End, 4”	3

REV	DATE	ENG	DESCRIPTION
14	01/01/23	JMW	Converted to new format
13	09/07/17	JMW	



CONSTRUCTION NOTE(s):

1. Insure that the concentric neutral wires and the cable is long enough to allow movement of the elbow from bushing to parking stand. Some of the elbows must be raised to the level of the parking stands.

2. Most banks are radial fed. If loop fed, position bends as shown.

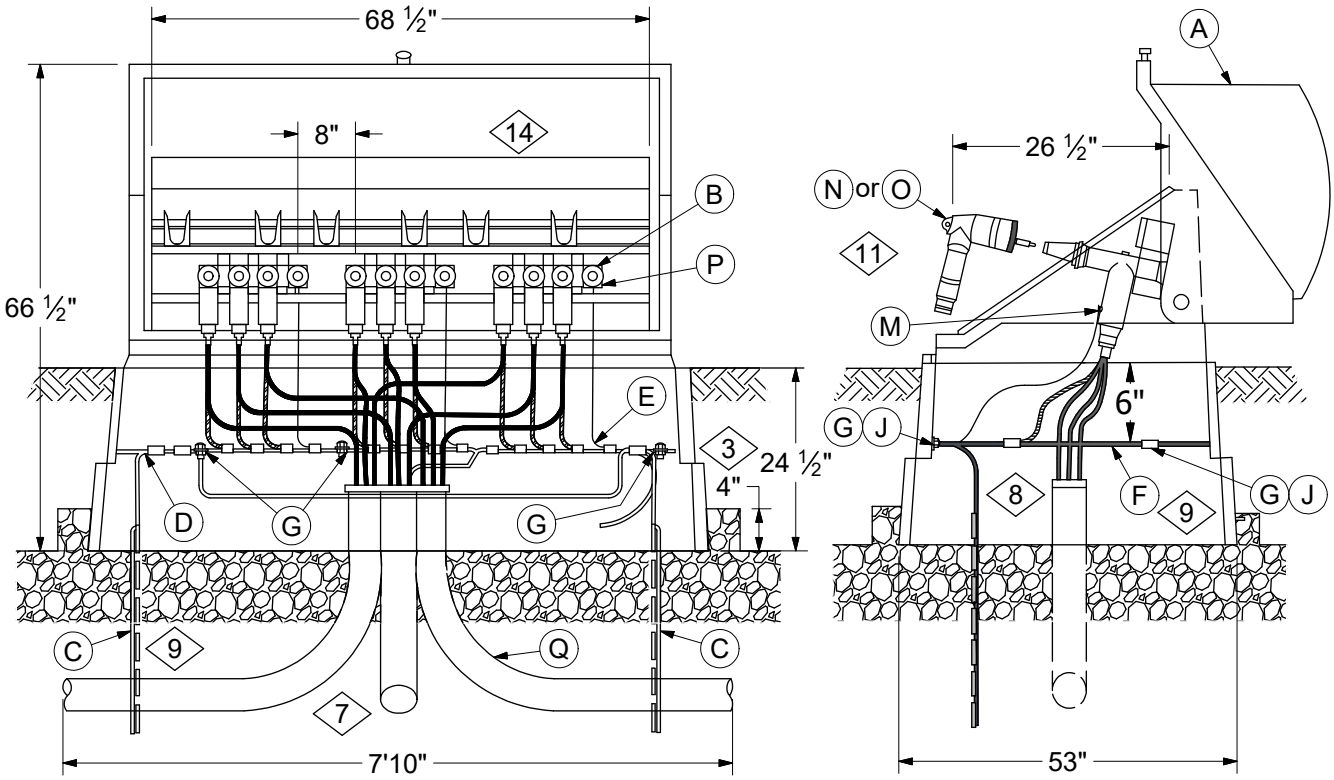
3. All padmounted capacitors are supplied with the required fusing plus an extra set of refills. Fuses listed in this standard are for replacement only. Check the nameplate of the unit to determine the proper fusing.

4. Open switches to capacitor cells before removing elbows.

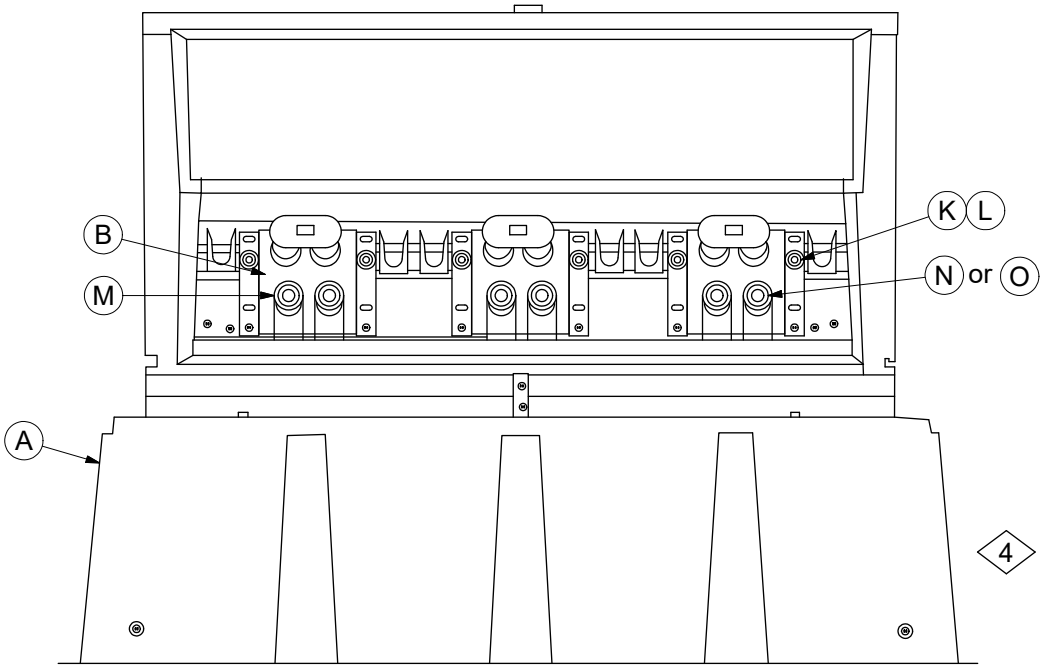
DCS #	DESCRIPTION
51 12 04 02	600 kVAR
51 12 04 04	1200 kVAR
51 12 04 06	1800 kVAR

	ITEM	STK / DCS #	DESCRIPTION 51 12 04 **	02	04	06
	A	17 54 132	Connector - Two Bolt, #8-350 kcmil	8	8	8
	B	18 52 025	Wire - Copper, #2 Solid S.D.	10	10	10
	C	69 11 198	Capacitor - 12kV, 600 kVAR, Padmount	1	-	-
		69 11 200	Capacitor - 12kV, 1200 kVAR, Padmount	-	1	-
		69 11 199	Capacitor - 12kV, 1800 kVAR, Padmount	-	-	1
@	D	**42 34 62 02**	Termination, 15kV, #2 Elbow	6	6	6
		42 34 62 02	Termination, 15kV, 4/0 Elbow	6	6	6
3 @	E	20 04 527	Fuse - 65A, Type NX	-	-	-
		20 04 852	Fuse - 1.5A, Type NX	-	-	-
		20 04 853	Fuse - 50A, Type NX	-	-	-
3 @	F	20 04 480	Fuse - 65A, Type NXC	-	-	-
3 @	G	20 04 486	Fuse - 40A, Type NXC	-	-	-
@	H	69 11 307	Control, Capacitor	1	1	1
@	I	69 11 304	Sensor - Neutral Current (Used With Control)	1	1	1
@	J	**34 21 04 05**	Pad for Capacitor Bank	1	1	1

REV	DATE	ENG	DESCRIPTION
7	01/01/23	JMW	Converted to new format
6	09/14/17	JMW	



DCS #	DESCRIPTION
51 12 05 01	Dead-Break Junction - 3 Way
51 12 05 02	Dead-Break Junction - 4 Way



DCS #	DESCRIPTION
51 12 05 03	Load-Break Junction - 2 Way CLEER Type

REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format
0	11/17/17	EJB	

CONSTRUCTION NOTE(s):

Excavation and Placement of Fiberglass Ground Sleeve Pad

1. An initial depth of 18” shall be excavated and all loose soil shall be removed or tamped. The length and width of the hole should be sized to allow a minimum of 6” of clearance on all sides.

2. To install the 36” radius bends, an increase in the initial excavation depth will be required. After the bends have been installed, crushed stone screenings shall be placed and tamped to the level shown in Figure 1.

3. The final depth should be adjusted to provide 4” of exposed ground sleeve pad at final grade.

4. Stabilize the ground sleeve pad over the conduits before backfilling so that there will be no shifting. Provide 12” of space between the load bearing surface of the ground sleeve pad and the end of each conduit.

5. To further stabilize the ground sleeve pad and the bends, place additional screenings inside the ground sleeve pad and hand tamp in place.

6. Backfill with loose material, DO NOT backfill next to the ground sleeve pad with chunks of material or rocks. Pack loose backfill by foot tamping and do not tamp excessively close to the ground sleeve pad sides. NOTE: Hydraulic tamping is not recommended.

7. Illustration shows 3-Way. If a 4-way is used, additional bend will be installed.

8. If bends are cut off apply a bell end coupling (R) over the end of each conduit.

This installation will not withstand pulling long cable lengths through the bends. If restrained bends are needed, refer to DCS **31 47 01 ****.

Accessory Installation

9. Connect concentric neutral wires from each cable to the #2 copper wire connected to the ground rods. Also attach the #2 copper wire to each ground connector in the primary pedestal.

10. Install elbows as required.

11. All exposed bushings must be covered with insulating caps, elbows, or elbow arresters.

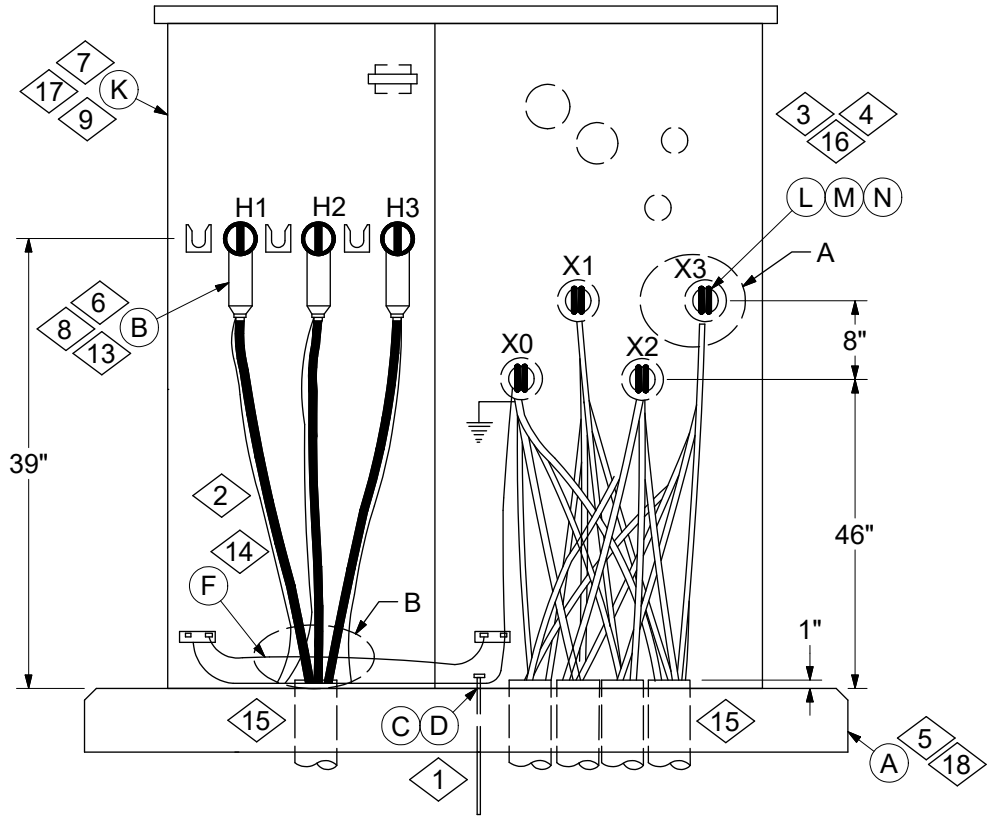
12. 10’ minimum clearance shall be provided at the front of the primary pedestal.

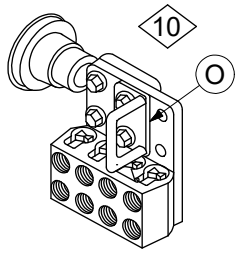
13. Faulted circuit indicators should be installed at the elbows below the cable entrance. All concentric neutral wires must be outside of the faulted circuit indicator closed core CT. Faulted circuit indicators should be installed on the out-going cables.

14. Cover any open positions with an insulating cap.

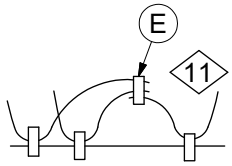
	ITEM	STK / DCS #	DESCRIPTION 51 12 05 **	01	02	03
	A	54 07 498	Enclosure - Primary Cable Junction, 15 kV, 600 A, 3ph	1	1	1
	B	17 07 239	Junction - 15 kV, 600 Amp, Bolted, 3-Way w/ U Straps	3	-	-
		17 07 242	Junction - 15 kV, 600 Amp, Bolted, 4-Way w/ U Straps	-	3	-
		17 07 256	Junction - 15 kV, 600 Amp, Load-break, 2 Position Square	-	-	3
	C	23 13 069	Rod - Ground, 5/8” x 8’	2	2	2
	D	17 52 032	Clamp - Ground Rod, 5/8”, For #8 to 1/0	2	2	2
	E	17 54 132	Connector - Wire, 8-350 kcmil, CU	11	14	11
	F	18 52 025	Wire - #2, S. D. (Ft.)	9	9	9
	G	17 54 435	Connector - Grounding, #8 to 2/0	8	8	-
	H	17 05 513	Bushing - Standoff, Double, 15 kV, 600 Amp,	-	-	3
	I	17 55 835	Cap - Insulating, 15 kV, 600 Amp, Load-break	-	-	6
	J	21 61 007	Nut - Hex, ½”, 13 TPI, Everdur	8	8	8
	K	21 56 078	Bolt - Hex, ½”, Stainless, w / Nut	-	-	6
	L	21 75 105	Washer - ½”, Stainless, 1 ¼” OD	-	-	6
@	M	**42 34 64 ** **	Termination - 15 kV, 600 Amp, 4/0 AWG - 750 kcmil	-	-	6
@	N	10 01 138	Arrester - Lighting, Elbow, 10 kV	-	-	-
11,@	O	17 55 227	Cap - Insulating, 15 kV, 200 Amp, Load-break	-	-	-
11,@	P	17 55 386	Cap - Insulating, 15 kV, 600 Amp, Load-break	-	-	-
@	Q	12 51 176	Bend, Plastic, 4", 36" Rad.	3	3	3
@	R	12 51 254	Coupling, - Conduit, Plastic, Bell End, 4"	#	#	#
@	S	60 55 001	Indicator - Faulted Circuit	#	#	#

REV	DATE	ENG	DESCRIPTION
1	01/01/23	JMW	Converted to new format
0	11/17/17	EJB	





DETAIL A



DETAIL B

CONSTRUCTION NOTE(s):

1. Install ground rod clamp 3” below top of rod to provide space for attaching ground set.

2. Provide enough concentric neutral length to attach to ground and also allow movement of the elbow from the bushing to the parking stand. Primary and secondary cables must have a minimum of 1" clearance to the enclosure walls.

3. Stainless steel machine bolts and belleville spring washers are required for bolting aluminum lugs to secondary terminals. Clean the lugs and terminals and apply inhibitor to the mating interfaces. See DCS **59 52 00 43**.

4. When installing secondary lugs use the maximum number of mounting holes that align with the spade holes.

5. See DCS **34 11 00 00** for poured-in-place radial-feed pad instructions.

6. The 200A loadbreak reducing tap plug on the end of the 600A nonloadbreak elbow will be covered with a 35kV elbow arrester (Stock #10 01 163). Construction personnel are to install an elbow arrester on each elbow.

7. Transformer will be equipped with a storage rack inside the primary cable compartment for storing grounding elbows. Construction personnel are to leave three grounding elbows on the storage rack. Coil the leads and leave the interfaces covered.

8. If the 600A nonloadbreak elbows are removed from the transformer bushings, they must be placed on 35kV, 600A standoff bushings (Stock #17 05 323). Construction personnel are to install a standoff bushing in each parking stand.

9. Construction personnel are to leave an elbow installation tool (Stock #85 36 281) in the storage pocket.

10. If the grounding stirrup is installed, longer bolts may be required. If used, stirrups are installed on X1, X2, and X3.

REV	DATE	ENG	DESCRIPTION
7	01/01/23	DG	Converted to new format
6	09/07/17	JMW	

11 Grounding practices are different in Missouri and Illinois.
In Missouri - Connect cable concentric neutrals to the #2 bare CU ground and then end-to-end using 4 split bolt connectors as shown in this detail.
In Illinois - Cable Concentric neutrals may be single-point connected to the #2 bare CU ground using hot-line clamps or split bolt connectors

12. The Aluminum lugs can be used for Aluminum or Copper conductors.

13 Fault current indicators can be installed to aid in determining if fault has occurred in the transformer or the cable feeding the transformer.

14 Loop the #2 CU ground bus from the ground rod, through the two transformer tank ground connectors, and back to the ground rod. Use a separate piece of #2 CU ground wire to connect from an open position of the X0 connector to the ground bus. The ground rod can be located where most convenient in the pad opening to avoid the incoming and outgoing conduit elbows.

15 If bends are cut off, bell end couplings are to be installed over the end of each conduit.

	ITEM	STK / DCS #	DESCRIPTION 51 12 34 **	01
5	A	**34 11 00 00**	Pad, Concrete,1500-2500 kVA, Radial-Feed	1
2,6	B	**42 44 13 01**	Termination, 35kV, 600A Deadbreak Elbow	3
	C	23 13 069	Rod, Ground, 5/8” x 8’	1
	D	17 52 032	Clamp, Ground Rod, 5/8” For #8 - 1/0	2
11	E	17 54 373	Connector, Split Bolt, #2 Str. CU.	3
		17 54 182	Connector, Split Bolt, 3-#2 Str. CU.	1
14	F	18 52 025	Wire, Copper, #2 Solid, Soft Drawn	15
7	G	17 63 295	Ground, Elbow, 35kV	3
6	H	10 01 163	Arrester, Lightning, 35kV	3
8	I	17 05 323	Bushing, Standoff, 35kV	3
9	J	85 36 281	Tool - Elbow Installation (Elastimold)	1
17 @	K	QF____M	Transformer, Three-Phase, Dead Front	1
	L	21 56 078	Bolt, Machine, 1/2” x 2”, Stainless Steel	#
3 @		21 54 316	Bolt, Machine, 1/2” x 2-1/2”, Stainless Steel	#
		21 56 075	Bolt, Machine, 1/2” x 1-1/2”, Stainless Steel	#
3 @	M	12 56 052	Washer, Belleville Spring, 1/2”, Stainless Steel	#
		12 56 053	Washer, Flat, 1/2”, Stainless Steel (2 ea. per Belleville)	#
4,12,16 @	N	17 55 190	Lug, Alum, 1 - 1/0 to 1000 kcmil, Lay-In, 2 Hole	#
		17 55 289	Lug, Alum, 2 - 1/0 to 1000 kcmil, Lay-In, 2 Hole	#
		17 55 209	Lug, Alum, 3 - 1/0 to 1000 kcmil, Lay-In, 6 Hole	#
		17 55 233	Lug, Alum, 6 - 1/0 to 500 kcmil, Lay-In, 10 Hole	#
		17 55 232	Lug, Alum, 6 - 1/0 to 1000 kcmil, Lay-In, 12 Hole	#
		17 55 343	Lug, Alum, 1 - 1/0 to 750 kcmil, 2 Hole	#
		17 55 344	Lug, Alum, 2 - 1/0 to 750 kcmil, 4 Hole	#
		17 55 345	Lug, Alum, 4 - 1/0 to 750 kcmil, 6 Hole	#
		17 55 346	Lug, Alum, 5 - 1/0 to 750 kcmil, 8 Hole	#
		17 55 349	Lug, Alum, 6 - 1/0 to 750 kcmill, 8 Hole	#
		17 55 350	Lug, Alum, 8 - 1/0 to 750 kcmill, 8 Hole	#
10 @	O	17 55 510	Stirrup, Grounding	3
13 @	P	60 55 001	Indicator, Fault Current, 1 Phase	3

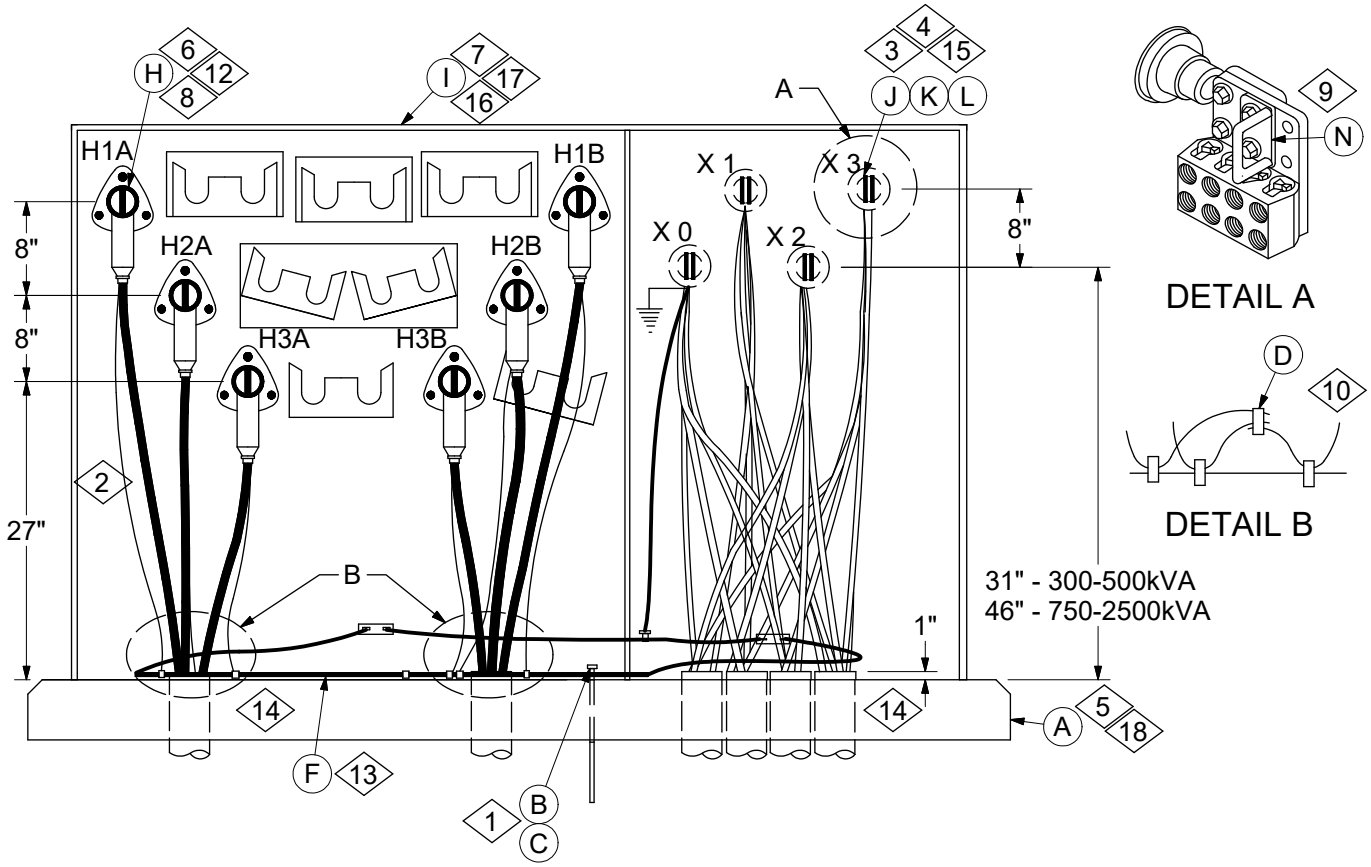
REV	DATE	ENG	DESCRIPTION
7	01/01/23	DG	Converted to new format
6	09/07/17	JMW	

DESIGN NOTE(s):

16. Preferred number of secondary cables per terminal is six or less. In no case shall the number of cables per terminal exceed twelve.

17. See DCS **13 00 01 02** for three-phase padmount transformer selection.
See DCS **13 00 04 01** for typical transformer dimensions, weight, and oil volumes.

18. See DCS **59 81 51 (10 &11)** for minimum clearances from the edge of the transformer pad to protective barriers/fences or other obstructions.



CONSTRUCTION NOTE(s):

1. Install ground rod clamp 3” below top of rod to provide space for attaching ground set.

2. Provide enough concentric neutral length to attach to ground and also allow movement of the elbow from the bushing to the parking stand. Primary and secondary cables must have a minimum of 1" clearance to the enclosure walls.

3. Stainless steel machine bolts and belleville spring washers are required for bolting aluminum lugs to secondary terminals. Clean the lugs and terminals and apply inhibitor to the mating interfaces. See DCS **59 52 00 43**.

4. When installing secondary lugs use the maximum number of mounting holes that align with the spade holes.

5. See DCS **34 11 00 00**, for poured-in-place loop-feed pad instructions.

6. If transformer is used as open point in the cable loop, install elbow arresters (Stock #10 01 177) in the open bushings and install feed-thru bushing stand-offs (Stock #17 63 245) with elbow arresters for the open cable termination.

7. Transformer will be equipped with a storage rack inside the primary cable compartment for storing grounding elbows. Construction personnel are to leave three grounding elbows on the storage rack. Coil the leads and leave the interfaces covered.

8. If the 200A loadbreak elbows are removed from the transformer bushings, they must be placed on 35kV, 200A standoff bushings (Stock #17 63 246). Construction personnel are to install three standoff bushings in each transformer.

9. If the grounding stirrup is installed, longer bolts may be required. If used, stirrups are installed on X1, X2, and X3.

REV	DATE	ENG	DESCRIPTION
4	01/01/23	DG	Converted to new format
3	08/18/17	JMW	

10. Grounding practices are different in Missouri and Illinois.
In Missouri - Connect cable concentric neutrals to the #2 bare CU ground and then end-to-end using 4 split bolt connectors as shown in this detail.
In Illinois - Cable concentric neutrals may be single-point connected to the #2 bare CU ground using hot-line clamps or split bolt connectors.

11. The Aluminum lugs can be used for Aluminum or Copper conductors.

12. Fault current indicators can be installed to aid in determining if fault has occurred in the transformer or the cable feeding the transformer.

13. Loop the #2 CU ground bus from the ground rod, through the two transformer tank ground connectors, and back to the ground rod. Use a separate piece of #2 CU ground wire to connect from an open position of the X0 connector to the ground bus. The ground rod can be located where most convenient in the pad opening to avoid the incoming and outgoing conduit elbows.

14. If bends are cut off, bell end couplings are to be installed over the end of each conduit.

	ITEM	STK / DCS #	DESCRIPTION 51 12 34 **	02
5	A	**34 11 00 00**	Pad, Concrete, Poured-in-Place, Loop-Feed	1
	B	23 13 069	Rod, Ground, 5/8” x 8’	1
	C	17 52 032	Clamp, Ground Rod, 5/8” For #8 - 1/0	2
10	D	17 54 373	Connector, Split Bolt, #2 Str. CU.	8
		17 54 182	Connector, Split Bolt, 3-#2 Str. CU.	2
7	E	17 63 296	Ground, Elbow, 35kV, Large Interface	3
13	F	18 52 025	Wire, Copper, #2 Solid, Soft Drawn	10
8	G	17 63 246	Bushing, Standoff, 35kV, Large Interface	3
2,6 @	H	17 05 228	Termination, 35kV, 200A Loadbreak Elbow, Large Interface	#
16,17 @	I	QC____L	Xfmr, 3-Phase, 35kVΔ-208Y/120, Loopfeed	1
		QF____L	Xfmr, 3-Phase, 35kVΔ-480Y/277, Loopfeed	1
		VC____L	Xfmr, 3-Phase, 35kV Grd Y-208Y/120, Loopfeed	1
		VF____L	Xfmr, 3-Phase, 35kV Grd Y-480Y/277, Loopfeed	1
3,9 @	J	21 56 078	Bolt, Machine, 1/2” x 2”, Stainless Steel	#
		21 54 316	Bolt, Machine, 1/2” x 2-1/2”, Stainless Steel	#
		21 56 075	Bolt, Machine, 1/2” x 1-1/2”, Stainless Steel	#
3 @	K	12 56 052	Washer, Belleville Spring, 1/2”, Stainless Steel	#
		12 56 053	Washer, Flat, 1/2”, Stainless Steel (2 ea. per Belleville)	#
4,11,15 @	L	17 55 190	Lug, Alum 1 - 1/0 to 1000 kcmil, Lay-in, 2 Hole	#
		17 55 289	Lug, Alum 2 - 1/0 to 1000 kcmil, Lay-In, 2 Hole	#
		17 55 209	Lug, Alum 3 - 1/0 to 1000 kcmil, Lay-In, 6 Hole	#
		17 55 233	Lug, Alum 6 - 1/0 to 500 kcmil, Lay-In, 10 Hole	#
		17 55 232	Lug, Alum 6 - 1/0 to 1000 kcmil, Lay-In, 12 Hole	#
		17 55 343	Lug, Alum 1 - 1/0 to 750 kcmil, 2 Hole	#
		17 55 344	Lug, Alum 2 - 1/0 to 750 kcmil, 4 Hole	#
		17 55 345	Lug, Alum 4 - 1/0 to 750 kcmil, 6 Hole	#
		17 55 346	Lug, Alum 5 - 1/0 to 750 kcmil, 8 Hole	#
		17 55 349	Lug, Alum 6 - 1/0 to 750 kcmil, 8 Hole	#
		17 55 350	Lug, Alum 8 - 1/0 to 750 kcmil, 8 Hole	#

REV	DATE	ENG	DESCRIPTION
4	01/01/23	DG	Converted to new format
3	08/18/17	JMW	

	ITEM	STK / DCS #	DESCRIPTION 51 12 34 **	02
6 @	M	10 01 177	Arrester, Lightning, 35kV, Large Interface	#
9 @	N	17 55 510	Stirrup, Grounding	3
6 @	O	17 63 245	Bushing, Standoff, Feed-Thru, 35kV	3
12 @	P	60 55 001	Indicator, Fault Current, 1 Phase	3

DESIGN NOTE(s):

15. Preferred number of secondary cables per terminal is six or less. In no case shall the number of cables per terminal exceed twelve.

16. VC and VF transformers should only be used for like-kind replacement if QC or QF transformers will not work due to phase angle conflicts.

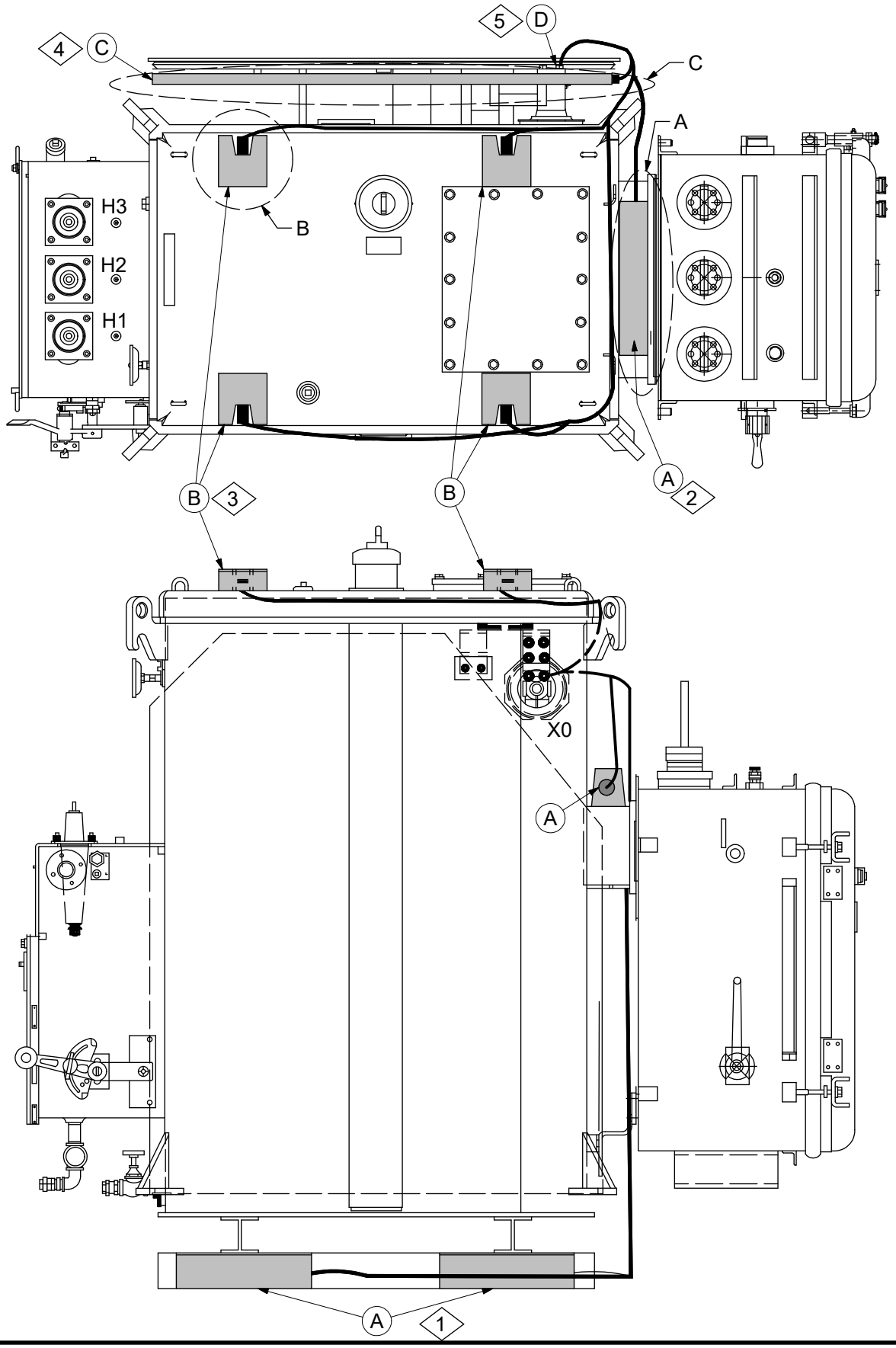
17. See DCS **13 00 01 02** for three-phase padmount transformer selection.
See DCS **13 00 04 01** for typical transformer dimensions, weight, and oil volumes.

18. See DCS **59 81 51 (10 & 11)** for minimum clearances from the edge of the transformer pad to protective barriers/fences or other obstructions.

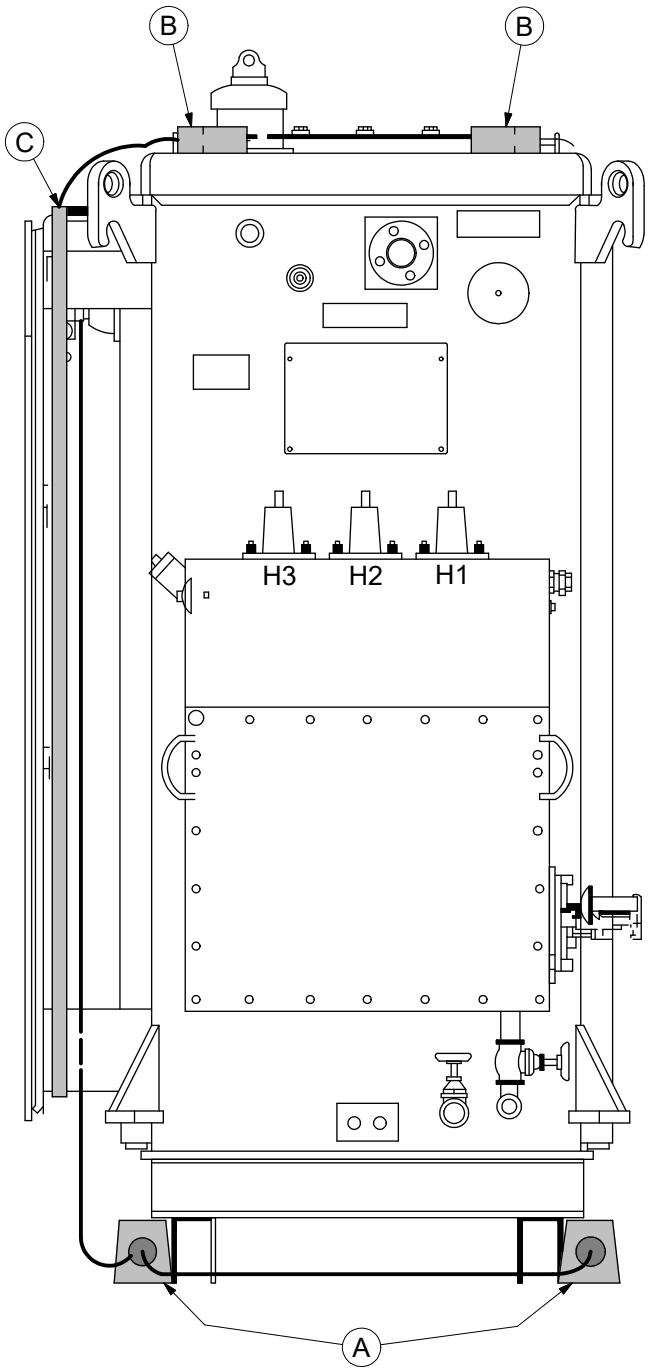
OPERATIONS NOTE(s):

19. Contact Distribution Standards for replacement fuse stock #.

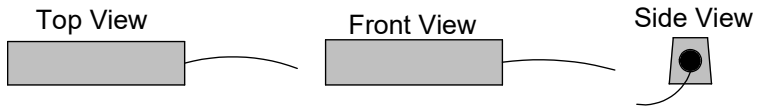
REV	DATE	ENG	DESCRIPTION
4	01/01/23	DG	Converted to new format
3	08/18/17	JMW	



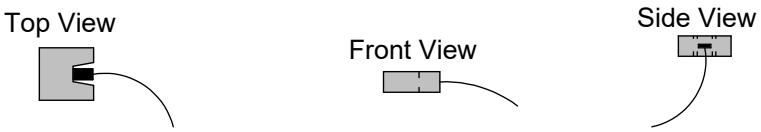
REV	DATE	ENG	DESCRIPTION
1	01/01/23	DT	Converted to new format
0	10/01/19	DT	



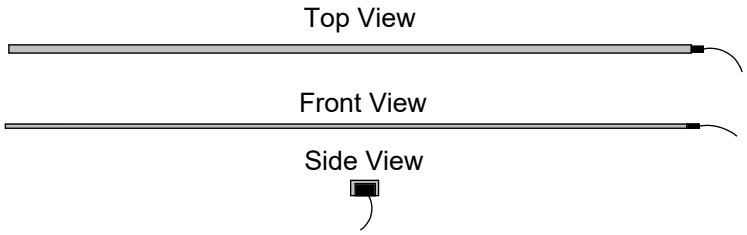
REV	DATE	ENG	DESCRIPTION
1	01/01/23	DT	Converted to new format
0	10/01/19	DT	



DETAIL A



DETAIL B



DETAIL C

CONSTRUCTION NOTE(s):

1. Four 17 lb. magnesium anodes shall be placed on the floor next to U-channel under the transformer.

2. One 17 lb. magnesium anode shall be placed on the network protector throat. The anode shall be secured with a small bead of silicone caulk, approximately one inch long, on both ends of the anode. A continuous bead of silicone shall not be applied around the base of the anode and no silicone shall be applied to the mating surface of the anode.

3. Four 3 lb. magnesium anodes shall be placed on the top surface of the transformer. Each anode shall be secured to the transformer with 4 small beads of silicone caulk at the corners of the anode. Each bead shall be approximately one inch long. Do not use a continuous bead of caulk around the anode or apply any silicone caulk to the mating surface of the anode.

4. One 7 ft. long magnesium anode ribbon shall be shaped and positioned on the transformer cooling panel brackets. The anode shall be secured with a small bead of silicone caulk that shall be applied on the side of the anode where it contacts the cooling panel bracket. Do not use a continuous bead of caulk around the anode or apply any silicone caulk to the mating surface of the anode.

5. Each individual wire for all ten anodes shall be routed and bonded to the transformer X0 bushing with connector.

ITEM	STK / DCS #	DESCRIPTION 51 13 02 **	01
A	40 54 490	17 Lb. Magnesium anode with 20’ #10 CU	5
B	40 54 491	3 Lb. Magnesium anode with 15’ #10 CU	4
C	40 54 492	7’ Ribbon Magnesium anode with 13.5’ #10 CU	1
D	17 51 114	Lug, Bolted, #8-2/0	1

REV	DATE	ENG	DESCRIPTION
1	01/01/23	DT	Converted to new format
0	10/01/19	DT	

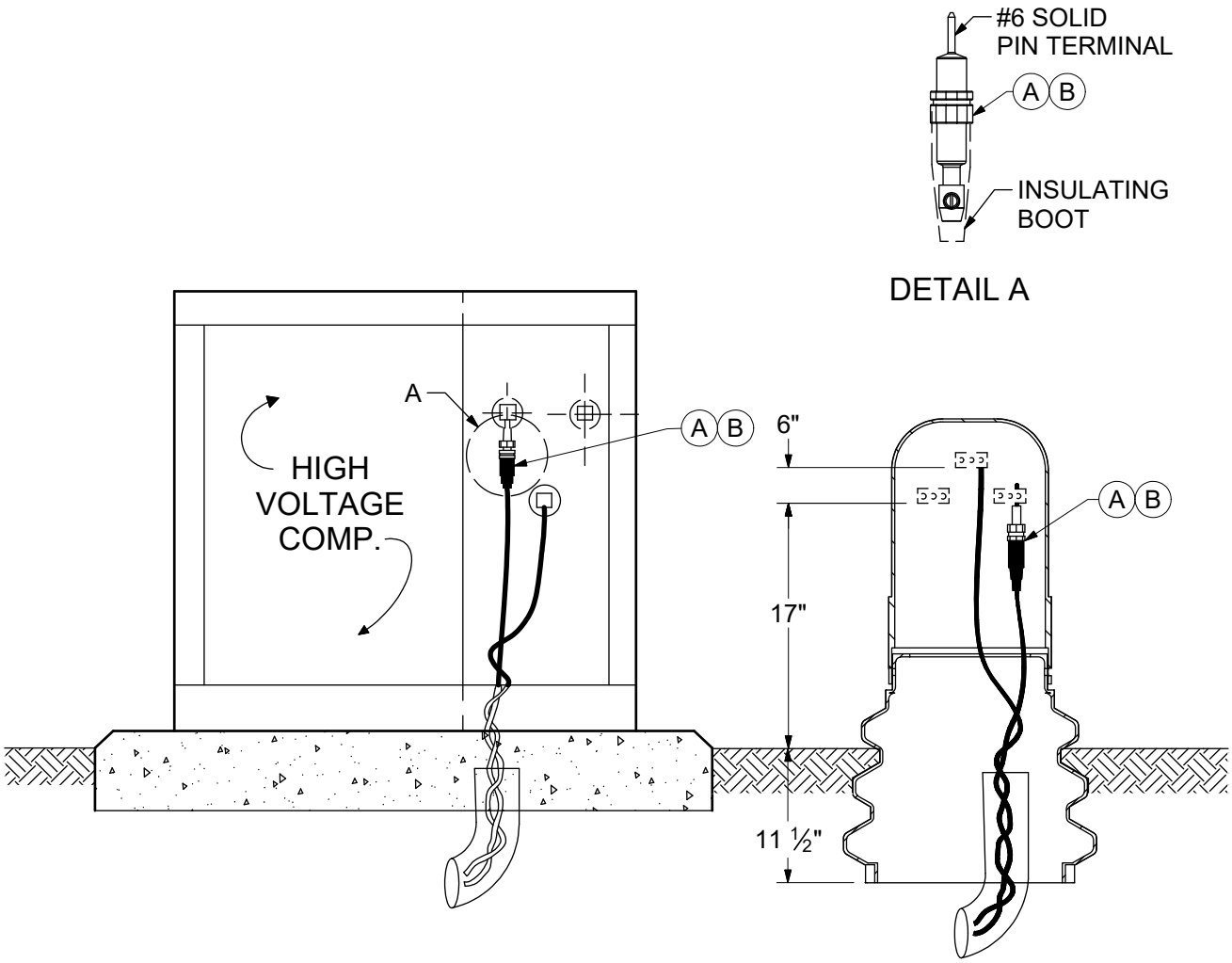
EQUIPMENT CONNECTIONS 52

FUSED STREETLIGHT CABLE CONNECTIONS, PADMOUNTED TRANSFORMER OR PEDESTAL.....52 00 01 **

GROUND WIRE PROVISION FOR COMMUNICATIONS.....52 00 02 **

THREE PHASE MULTIPLE SECONDARY/SERVICE, TERMINATION CABINET.....52 10 01 00

SECONDARY PEDESTAL, ABOVE GRADE - POLYETHLENE.....52 11 01 **



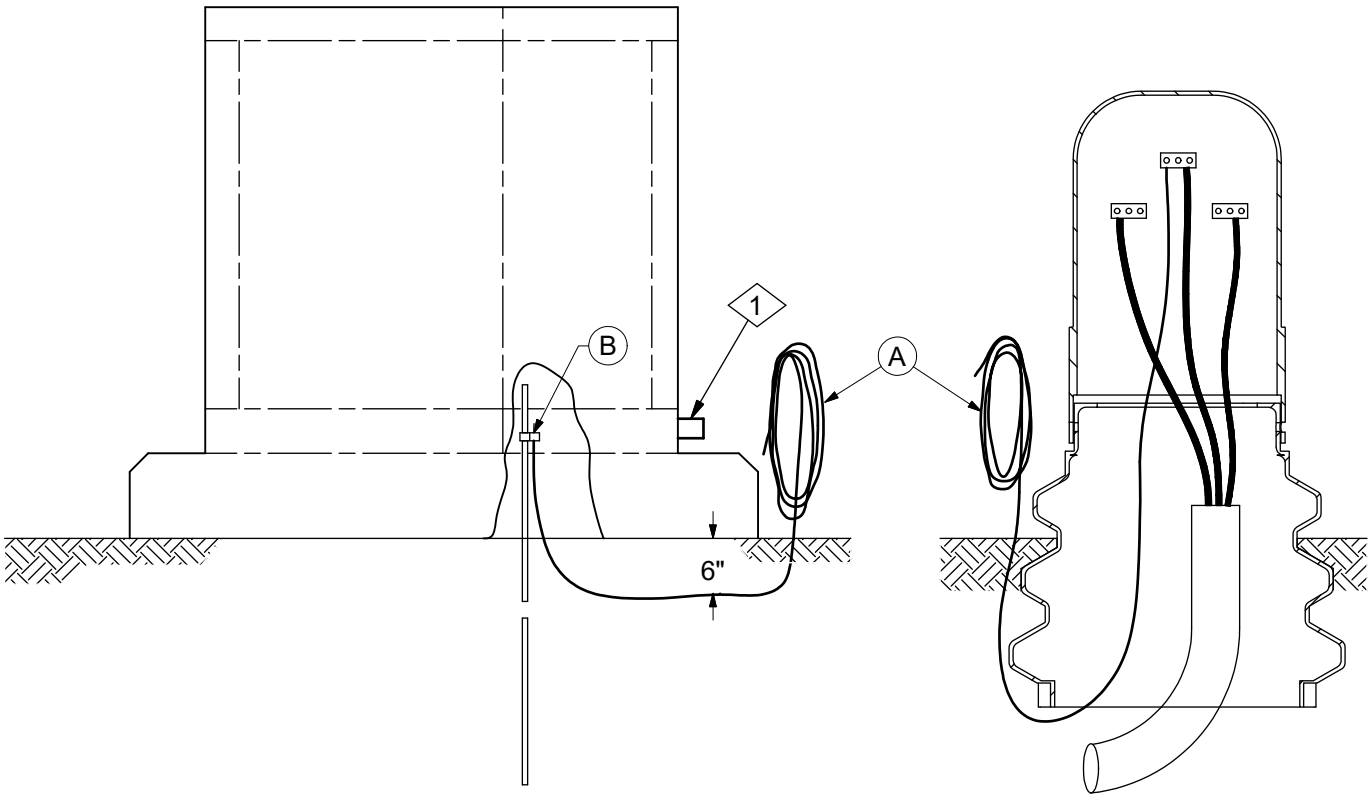
CONSTRUCTION NOTE(s):

1. To fuse underground streetlight cable on overhead secondaries, see DCS **15 74 50 01**.

2. Fuseholder, Stock #20 76 144, is stocked with a cable connector on each end. This fuseholder should be used whenever connectors are too full of cables to readily use fuseholder, Stock #20 76 141 or if the connectors are covered with a PVC insulated cover that prevents the pin terminal from being inserted.

	ITEM	STK / DCS #	DESCRIPTION 52 00 01 **	01	02
2	A	20 76 141	Fuseholder−InLine, with Copper Pin Terminal	1	-
		20 76 144	Fuseholder−InLine, with Two Screw Terminals	-	1
	B	20 76 140	Fuse−Cartridge, 30 Amp.	1	1

REV	DATE	ENG	DESCRIPTION
5	01/01/23	JMW	Converted to new format and updated title
4	08/04/11	EJB	



DCS #	DESCRIPTION
52 00 02 01	Ameren connects ground wire at time of transformer or pedestal installation and leaves wire coiled for Communication Company.
52 00 02 02	Ameren connects ground wire left by Communication Company after transformer or pedestal have been installed.

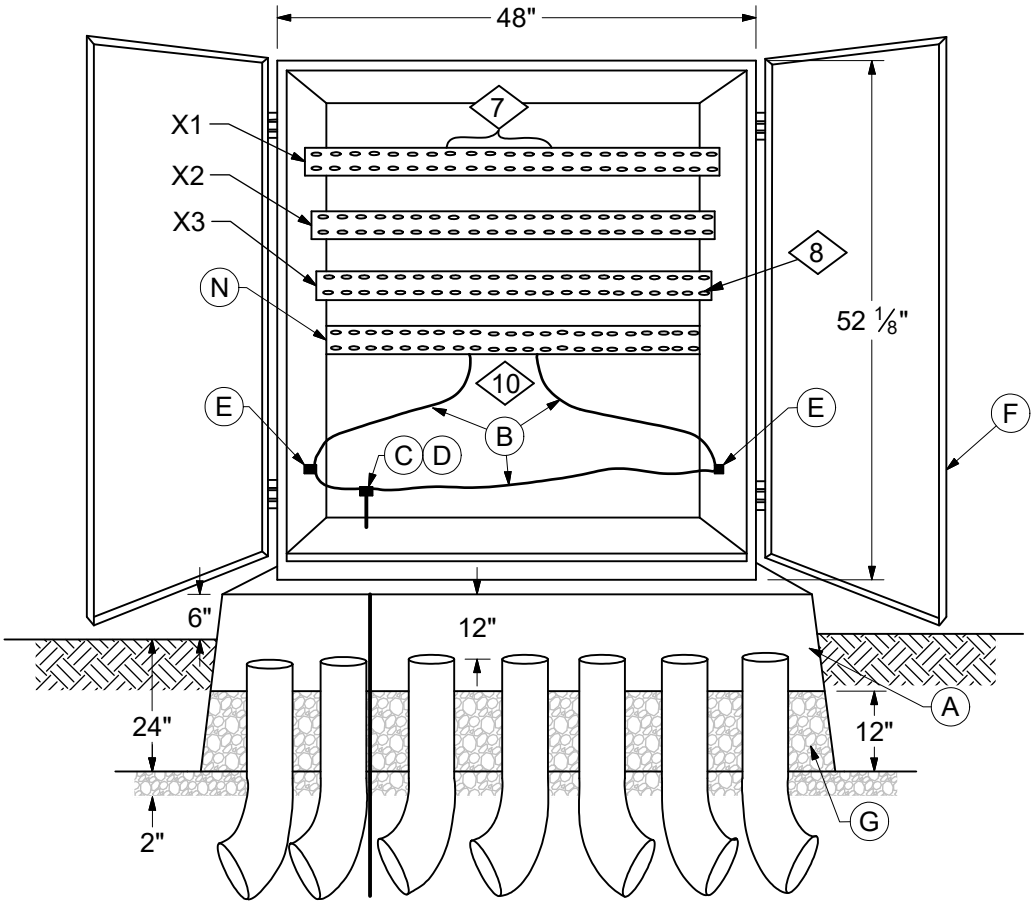
CONSTRUCTION NOTE(s):

1. New padmount transformers are equipped with an external ground lug.

ITEM	STK / DCS #	DESCRIPTION 52 00 02 **	01	02
A	18 51 021	Wire - Cu., #6 Poly Cov. Ft.	18	-
B	17 52 032	Clamp - Grd. Rod. 5/8" For #8 - 1/0	1	1
C	712	Op Code Ground Connection for Coms	1	1

DESIGN NOTE(s):

2. If metallic box is less than 6' from a transformer or pedestal, it must be connected to an Ameren provided ground as shown.



CONSTRUCTION NOTE(s):

1. An initial depth of 26” shall be excavated and all loose soil shall be removed or tamped. The length + width of the hole shall be sized to allow a minimum of 6” of clearance on all sides.

2. Add 2” of screening, compact, and set box pad.

3. Final depth should be adjusted to provide 6” of exposed ground pad at final grade.

4. Provide 12” of space between the top of the box pad and the end of the conduits.

5. Stabilize the box pad and conduits by placing 12” of crushed stone screening inside the box pad and tamp in place.

6. Backfill with loose material, DO NOT backfill next to the ground sleeve pad with chunks of material or rocks. Pack loose backfill by foor tamping and do not tamp excessively close to the ground sleeve pad sides.

◇7. Center positions of each bus are reserved for Ameren feed cables.

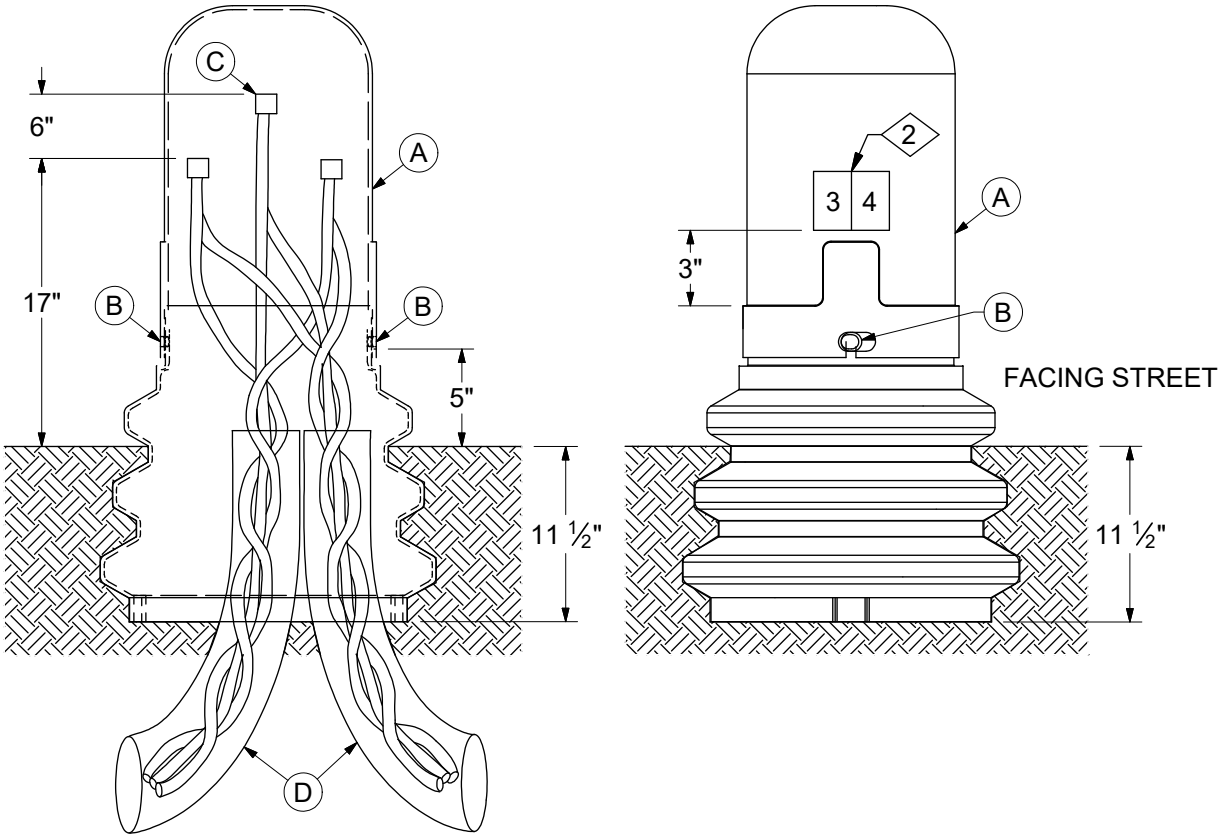
◇8. Bus has 22 lay-in style connectors that accept up to 1000 kcmil. Clean the contact surfaces of connectors and cables then coat them with inhibitor.

9. Secure the enclosure to the pad.

◇10. Be sure that the enclosure is grounded by attaching ground wires to the ground rod and to the neutral bus.

REV	DATE	ENG	DESCRIPTION
7	01/01/23	JMW	Converted to new format
8	09/07/17	JMW	

	ITEM	STK / DCS #	DESCRIPTION 52 10 01 **	00
	A	12 06 196	Pad - Fiberglass 49" x 24" x 30"	1
	B	18 52 025	Wire - Copper, #2 Solid, Soft Drawn	12
	C	23 13 069	Rod - Ground, 5/8" x 8'	1
	D	17 52 032	Clamp - Ground Rod, 5/8" #8 - 1/0	1
	E	69 58 121	Connector - Ground	2
	F	54 07 236	Enclosure - Padmount, 3 Ph Secondary	1
	G	-	Screenings	#



DCS #	DESCRIPTION
52 11 01 01 & 06	Ameren Installed 1 Phase
52 11 01 02	Contractor Installed 1 Phase
52 11 01 03 & 05	Ameren Installed 3 Phase
52 11 01 07	Ameren IL Installed 1 Phase

CONSTRUCTION NOTE(s)

1. When used for 3 phase applications, the top should be marked ”3 PH ” using reflective numbers and letters.

◇2.◇ Use reflective numbers (Stock #16 04 108 thru 16 04 116) to show the LAST 2 DIGITS of the source pad transformer.

3. See DCS **59 40 00 10** for conduit/cable burial depths.

4. Three (3) ft. minimum clearance required from obstructions such as buildings, street light poles, telephone or cable company pedestals, etc.

	ITEM	STK / DCS #	DESCRIPTION 52 11 01 **	01	02	03	04	05	06	07
	A	12 05 049	Pedestal - Above Ground, Polyethylene	1	-	1	1	1	1	1
	B	12 55 034	Cap, Pedestal Latch, 1.5", Dark Green	2	-	2	2	2	2	2
	C	17 64 218	Connector - Ped, 6 Pos., 6-500kcmil, Insulated	3	3	4	-	-	-	3
		17 64 219	Connector - 4 Pos., 1/0-750 kcmil, w/cover	-	-	-	4	-	-	-
		17 64 220	Connector - 6 Pos., 1/0-750 kcmil, w/cover	-	-	-	-	4	-	-
		17 64 238	Connector - Ped, 4 Pos., 6-500 kcmil, Insulated	-	-	-	-	-	3	-
	D	12 51 252	Bend-Plastic, 2", 24" Rad. (Streetlight)	#	-	-	-	-	-	-
5,@		12 51 173	Bend-Plastic, 3", 36" Rad. (Secondary & 400 A Service)	#	-	-	-	-	-	-
		12 51 264	Bend-Plastic, 2 1/2", 24" Rad. (200 A Service)	#	-	-	-	-	-	2
5,@	E	12 01 263	Conduit, PVC, 2 1/2" x 10', Sch 40	-	-	-	-	-	-	2
@	F	49 55 520	Marker, Buried Conduit, Red	-	-	-	-	-	-	2

DESIGN NOTE(s):

5. For Missouri residential developments the contractor will install the pedestal, pedestal caps, and bends. See DCS **52 11 01 02**.

6. DCS **52 11 01 07** is required in Illinois for residential subdivision developments when the pedestal is placed on the property line. It includes Item D (Stock #12 51 264) and Item E (Stock #12 01 263), for future use.

EQUIPMENT - SWITCHING 53

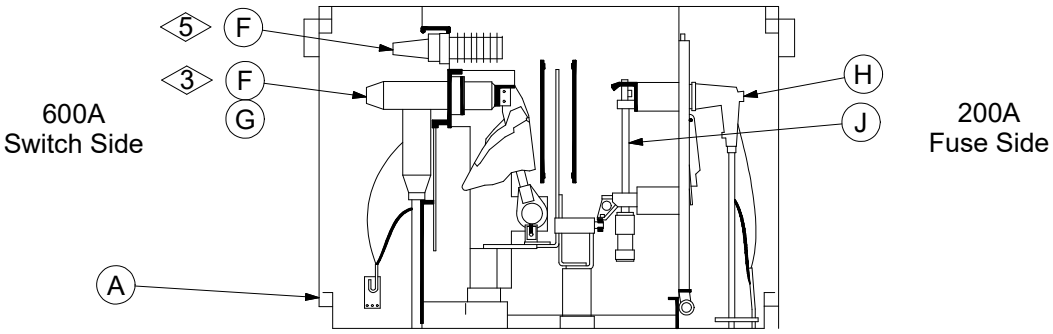
PADMOUNTED SWITCHGEAR - 600A SW / 200A FUSED, MANUAL OPERATION - 15kV.....53 11 01 **

PADMOUNTED SWITCHGEAR - 600A SW / 200A FUSED, REMOTE SUPERVISORY CONTROL - 15kV.....53 11 02 **

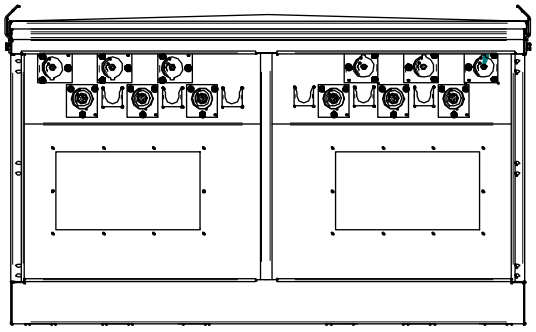
PADMOUNTED SWITCHGEAR - 600A, REMOTE SUPERVISORY CONTROL, S&C VISTA - 15kV.....53 11 05 **

PADMOUNTED SWITCHGEAR - 600A, MANUAL OR REMOTE SUPERVISORY CONTROL S&C VISTA - 35kV.....53 11 06 **

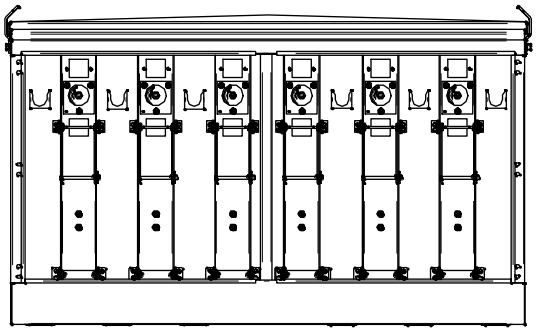
PADMOUNTED SWITCHGEAR - 600A SW / 200A FUSED, FUSE INSTALLATION & REPLACEMENT GUIDE - 15kV.....53 11 10 01



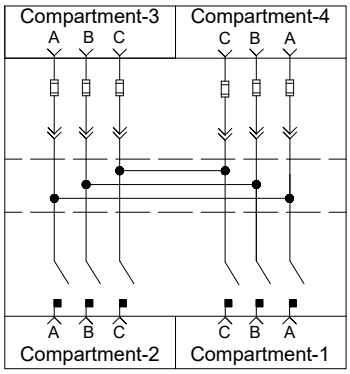
Side View



Front View
600A Switched Compartments

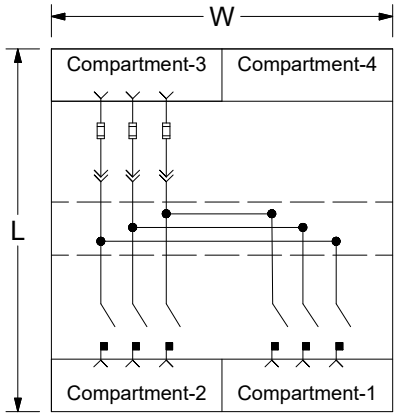


Front View
200A Fused Compartments

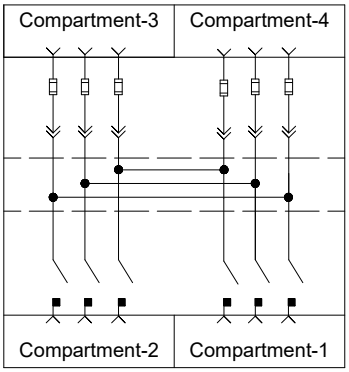


Compartment Phasing
Designation

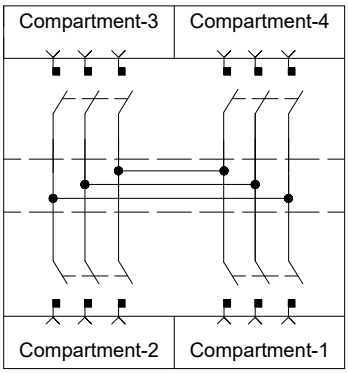
Switchgear Configurations:



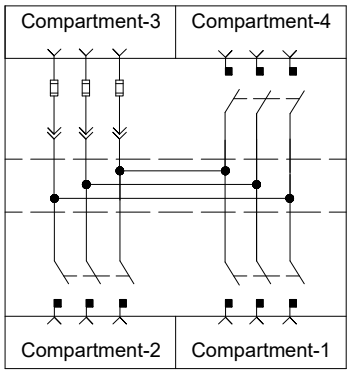
53 11 01 05
Type 6



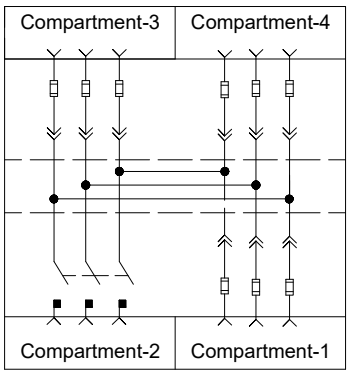
53 11 01 01
Type 9



53 11 01 02
Type 10



53 11 01 03
Type 11



53 11 01 04
Type 12

Switchgear Dimensions	
Height	45-1/8" + 6" Base Adapter (All Types)
Width (W)	75" (All Types)
Length (L)	69-3/4" (Types 6, 9, and 12)
	72-3/4" (Types 10 and 11)

CONSTRUCTION NOTE(s):

1. Confirm the visible break through the windows.
2. See DCS **42 34 64 ****** and **59 40 60 01** for 600 amp elbow terminator details.
3. 200 Amp loadbreak elbows with #2 AWG, 1/0 or 4/0 cables may be installed in the switch compartments when necessary. Install a 200 amp to 600 amp bushing adaptor (Stock #17 05 256) on each 600 amp bushing. See DCS **59 40 60 01**.
4. 600 amp elbows are non-loadbreak and can only be removed from a de-energized bushing.
5. 200 amp bushings located above the 600 amp bushings are interconnected, and shall be used for grounding when 600 amp connections are installed or removed.
6. For duct banks terminating in padmounted switchgear, retain approximately 5ft of 4/0 copper bond wire and connect it to a ground rod using a 2 bolt clamp (Stock #17 54 132).
7. Install a label on the switchgear where it can be seen from the street with the proper pad number. Use the appropriate reflective numbers (Stock #'s 16 04 108 to 16 04 116).
8. Install a label on each compartment door with the letters LAT_____or DIP_____. Use reflective letters (Stock #'s 16 04 320, 16 04 317, 16 04 321 or 16 04 148, 16 04 419, 16 04 737) and the appropriate reflective numbers (Stock #'s 16 04 108 to 16 04 116).
9. Install a label by each switch handle with the letter D_____. Use reflective letter (Stock #16 04 418) and the appropriate reflective numbers (Stock #'s 16 04 108 to 16 04 116).
10. Cover all 200 amp load reducing tap plugs on 600 amp elbows with an insulated cap (Stock #17 55 227) or an elbow arrestor (Stock #10 01 138).
11. Add appropriate letters and numbers (Stock #'s 16 01 195 through 16 01 225) to tag holders.
12. Cover all open 600 amp bushings with 600 amp insulated caps (Stock #17 55 386) or 200 amp to 600 amp bushing adapters (Stock #17 05 256).
13. Cover all open 200 amp bushings with insulated caps (Stock #17 55 227). Cover all grounding bushings with insulated caps.
14. 600 amp elbows are installed on bushings in the switchgear using a "T" wrench (Stock #85 41 370) or an "OAT" Operating Tool (Stock #83 28 045).
15. If installing deadfront switchgear on existing livefront pad (Stock #12 06 109), order base adapter (Stock #12 06 195) for type 6, 9, 12, or base adapter (Stock #12 06 194) for type 10 or 11.
16. A fiber optic cable (Stock #18 66 658) can be added at each fault indicator installed for remote viewing on the door. See DCS **59 53 51 00**.
17. See DCS **34 21 10 ****** for pad installation instructions.
18. If conduit bend is cut with saw, install bell end fitting to prevent cable damage.
19. See DCS **53 11 10 01** for fuse installation and replacement instructions.

	ITEM	STK / DCS #	DESCRIPTION 53 11 01 **	01	02	03	04	05
	A	54 07 287	Switchgear − Type 9, 2 Sw, 6 Fuses	1	-	-	-	-
		54 07 300	Switchgear − Type 10, 4 Sw	-	1	-	-	-
		54 07 288	Switchgear − Type 11, 3 Sw, 3 Fuses	-	-	1	-	-
		54 07 290	Switchgear − Type 12, 1 Sw, 9 Fuses	-	-	-	1	-
		54 07 529	Switchgear − Type 6, 2 Sw, 3 Fuses	-	-	-	-	1
@	B	**34 21 10 ** **	Pad − Deadfront Switchgear, Composite	1	1	1	1	1
	C	17 54 132	Connector − Wire, 8−350 kcmil Cu.	10	16	13	7	10
	D	17 54 373	Connector − Wire, #2 Cu, Split Bolt	6	-	3	9	3
12 @	E	17 55 386	Cap − Insulating, 15kV, 600A	3	3	3	3	3
10, 13	F	17 55 227	Cap − Insulating, 15kV, 200A	12	24	18	6	12
3 @	G	**42 34 64 ** **	Terminator - Elbow, Deadbreak 600A	6	12	9	3	6
	H	**42 34 62 01**	Elbow − Loadbreak, 200A, #2 AWG	6	-	3	9	3
3 @		**42 34 62 02**	Elbow − Loadbreak, 200A, 4/0 AWG	6	-	3	9	3
		42 34 62 03	Elbow − Loadbreak, 200A, 1/0 AWG	6	-	3	9	3
11 @	I	16 06 276	Holder − Tag, Black, 5 Position	-	-	-	-	-
		16 06 277	Holder − Tag, Black, 7 Position	-	-	-	-	-
@	J		Refill − Fuse, 14.4kV, SMU − 20	6	-	3	9	3
16 @	K	60 55 001	Indicator − Faulted Circuit, 1 PH (350 kcmil)	-	-	-	-	-
		60 55 024	Indicator − Faulted Circuit, 1 PH (750 kcmil)	-	-	-	-	-
@	L	**54 11 01 01**	Arrester − Elbow, 10kV	-	-	-	-	-
15 @	M	12 06 195	Base Adapter − Type 6, 9, and 12	-	-	-	-	-
		12 06 194	Base Adapter − Type 10 and 11	-	-	-	-	-
3 @	N	17 05 256	Bushing Adapter - 200A to 600A	6	12	9	3	6

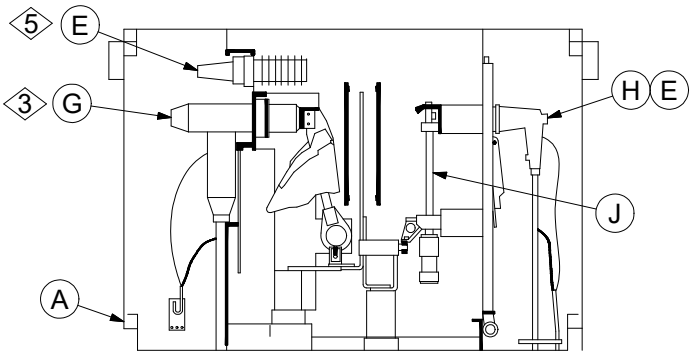
DESIGN NOTE(s):

20. Switched positions are 600 amp. Fuse positions are 200 amp. Both are rated 14.0kA sym., 22.4kA asym. Fuse holders are SMD-20 style and refills are SMU type.

21. See DCS **59 81 51 11** for the required clearance around switchgear.

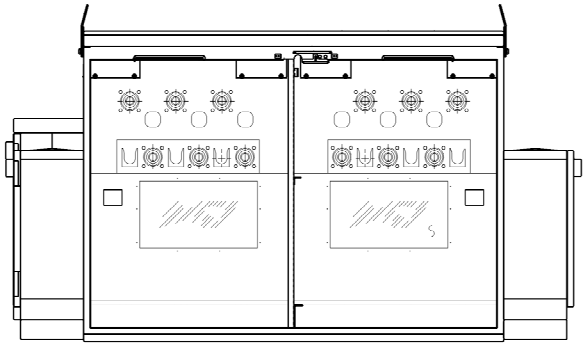
REV	DATE	ENG	DESCRIPTION
0	04/01/2023	JMW	New, moved from 53 11 05 **, updated format

600A
Switch Side

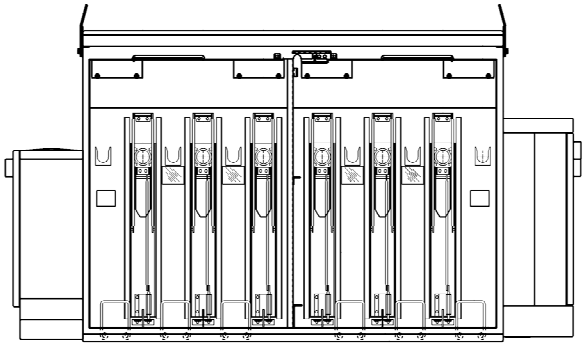


200A
Fuse Side

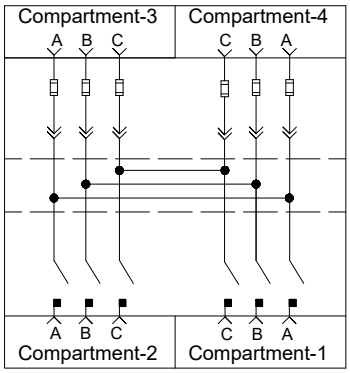
Side View



Front View
600A Switched Compartments

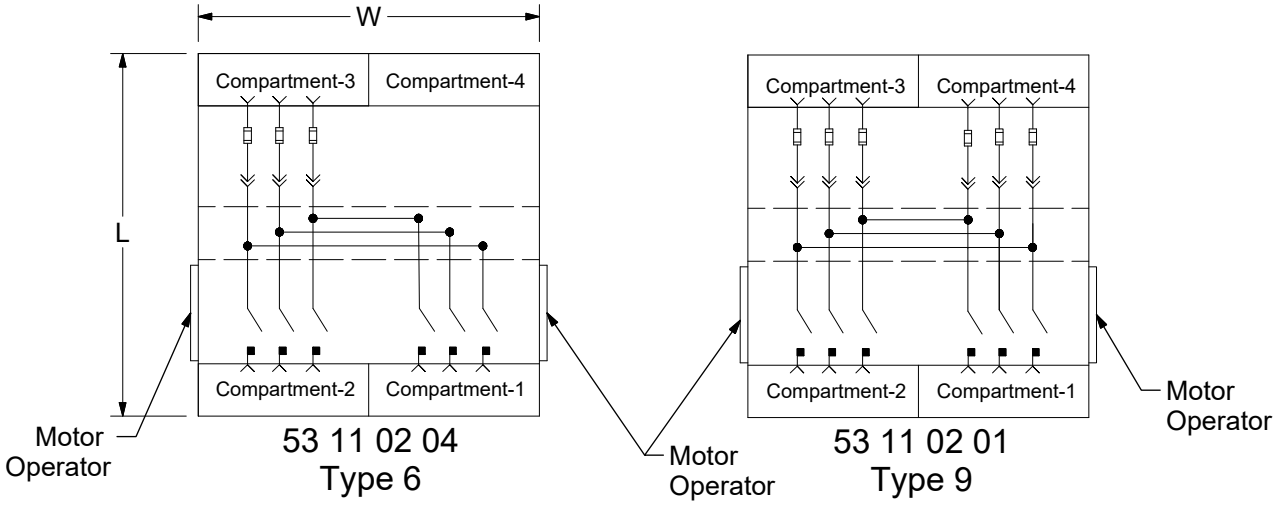


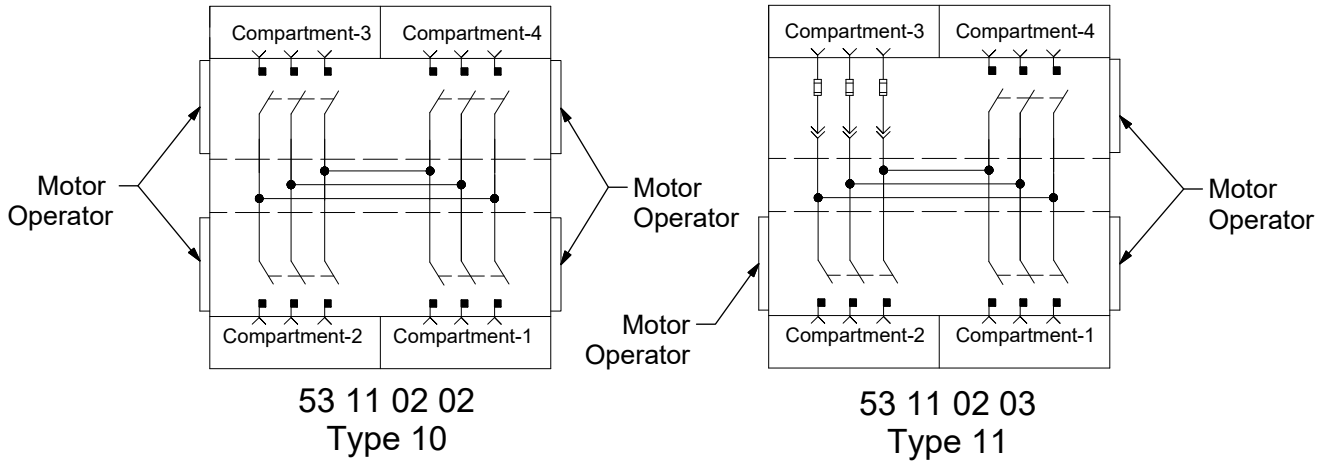
Front View
200A Fused Compartments



Compartment Phasing
Designation

Switchgear Configurations:





Switchgear Dimensions	
Height	45-1/8" + 6" (All Types)
Width (W)	75" (All Types)*
Length (L)	69-3/4" (Types 6 and 9)
	72-3/4" (Types 10 and 11)

*Each motor extends 14" beyond the cabinet width.

CONSTRUCTION NOTE(s):

1. Confirm the visible break through the windows.

2. See DCS **42 34 64 ****** and **59 40 60 01** for 600 amp elbow terminator details.

3. 200 Amp loadbreak elbows with #2 AWG, 1/0 or 4/0 cables may be installed in the switch compartments when necessary. Install a 200 amp to 600 amp bushing adaptor (Stock #17 05 256) on each 600 amp bushing. See DCS **59 40 60 01**.

4. 600 amp elbows are non-loadbreak and can only be removed from a de-energized bushing.

5. 200 amp bushings located above the 600 amp bushings are interconnected, and shall be used for grounding when 600 amp connections are installed or removed.

6. For duct banks terminating in padmounted switchgear, retain approximately 5ft of 4/0 copper bond wire and connect it to a ground rod using a 2 bolt clamp (Stock #17 54 132).

7. Install a label on the switchgear where it can be seen from the street with the proper pad number. Use the appropriate reflective numbers (Stock #'s 16 04 108 to 16 04 116).

8. Install a label on each compartment door with the letters LAT_____or DIP_____. Use reflective letters (Stock #'s 16 04 320, 16 04 317, 16 04 321 or 16 04 148, 16 04 419, 16 04 737) and the appropriate reflective numbers (Stock #'s 16 04 108 to 16 04 116).

9. Install a label by each switch handle with the letter D_____. Use reflective letter (Stock #16 04 418) and the appropriate reflective numbers (Stock #'s 16 04 108 to 16 04 116).

10. Cover all 200 amp load reducing tap plugs on 600 amp elbows with an insulated cap (Stock #17 55 227) or an elbow arrestor (Stock #10 01 138).

11. Add appropriate letters and numbers (Stock #'s 16 01 195 through 16 01 225) to tag holders.

12. Cover all open 600 amp bushings with 600 amp insulated caps (Stock #17 55 386) or 200 amp to 600 amp bushing adapters (Stock #17 05 256).

13. Cover all open 200 amp bushings with insulated caps (Stock #17 55 227). Cover all grounding bushings with insulated caps.

14. 600 amp elbows are installed on bushings in the switchgear using a "T" wrench (Stock #85 41 370) or an "OAT" Operating Tool (Stock #83 28 045).

15. If installing deadfront switchgear on existing livefront pad (Stock #12 06 109), order base adapter (Stock #12 06 195) for type 6, 9, 12, or base adapter (Stock #12 06 194) for type 10 or 11.

16. A fiber optic cable (Stock #18 66 658) can be added at each fault indicator installed for remote viewing on the door. See DCS **59 53 51 00**.

17. See DCS **34 21 10 ****** for pad installation instructions.

18. If conduit bend is cut with saw, install bell end fitting to prevent cable damage.

19. See DCS **53 11 10 01** for fuse installation and replacement instructions.

20. Motor Operated (M.O.'s) are on switched compartments.

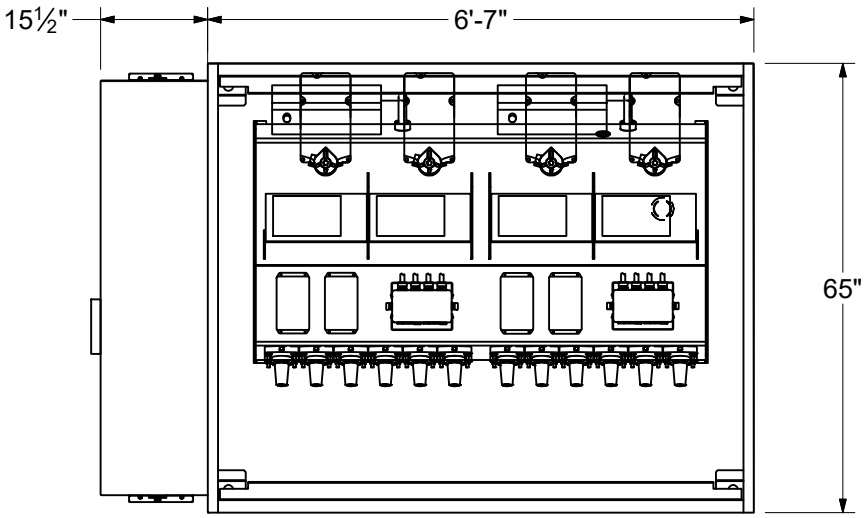
	ITEM	STK / DCS #	DESCRIPTION 53 11 02 **	01	02	03	04
20	A	54 07 547	Switchgear − Type 9, 2 Sw, 6 Fuses, M.O. on 1 & 2	1	-	-	-
		54 07 546	Switchgear − Type 10, 4 Sw, M.O. on 1, 2, 3, & 4	-	1	-	-
		54 07 567	Switchgear − Type 11, 3 Sw, 3 Fuses, M.O. on 1, 2, & 3	-	-	1	-
		54 07 570	Switchgear − Type 6, 2 Sw, 3 Fuses, M.O. on 1 & 2	-	-	-	1
	B	17 54 132	Connector − Wire, 8−350 kcmil Cu.	10	16	13	10
	C	17 54 373	Connector − Wire, #2 Cu, Split Bolt	6	-	3	3
16 @	D	60 55 001	Indicator − Faulted Circuit, 1 PH (350 kcmil)	-	-	-	-
		60 55 024	Indicator − Faulted Circuit, 1 PH (750 kcmil)	-	-	-	-
12 @	E	17 55 386	Cap − Insulating, 15kV, 600A	3	3	3	3
10,13	F	17 55 227	Cap − Insulating, 15kV, 200A	12	24	18	12
@	G	**34 21 10 ** **	Pad − Deadfront Switchgear, Composite	1	1	1	1
3 @	H	**42 34 64 ** **	Terminator − Elbow, Deadbreak 600A	6	12	9	6
3 @	I	**42 34 62 01**	Elbow − Loadbreak, 200A, #2 AWG	6	-	3	3
		42 34 62 02	Elbow − Loadbreak, 200A, 4/0 AWG	6	-	3	3
		42 34 62 03	Elbow − Loadbreak, 200A, 1/0 AWG	6	-	3	3
11 @	J	16 06 276	Holder − Tag, Black, 5 Position	-	-	-	-
		16 06 277	Holder − Tag, Black, 7 Position	-	-	-	-
@	K		Refill − Fuse, 14.4kV, SMU − 20	6	-	3	3
@	L	**54 11 01 01**	Arrester − Elbow, 10kV	-	-	-	-
15 @	M	12 06 195	Base Adapter − Type 6, 9, and 12	-	-	-	-
		12 06 194	Base Adapter − Type 10 and 11	-	-	-	-
3 @	N	17 05 256	Bushing Adapter - 200A to 600A	6	12	9	6

DESIGN NOTE(s):

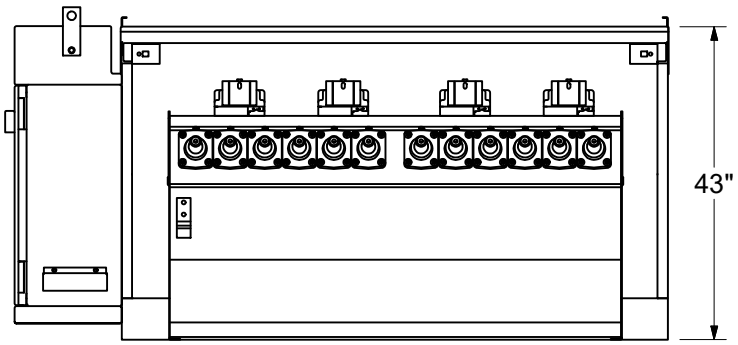
21. Switched positions are 600 amp. Fuse positions are 200 amp. Both are rated 14.0 kA sym., 22.4 kA assym. Fuse holders are SMD-20 style and refills are SMU type.

22. If automated switchgear is used on a 4 kV circuit, the switchgear must be fed by an external 120V voltage source. In addition, a circuit board must be changed in the controls. Use Stock #54 07 581. The PME-9's take one, and the PME-10's and 11's take two circuit.

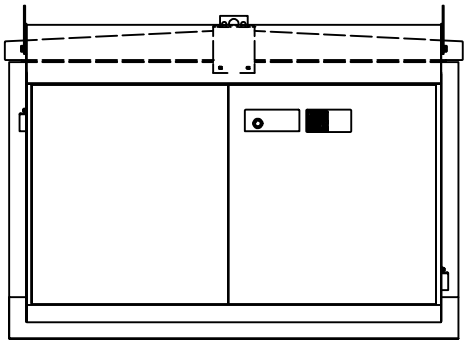
23. See DCS **59 81 51 11** for the required clearance around switchgear.



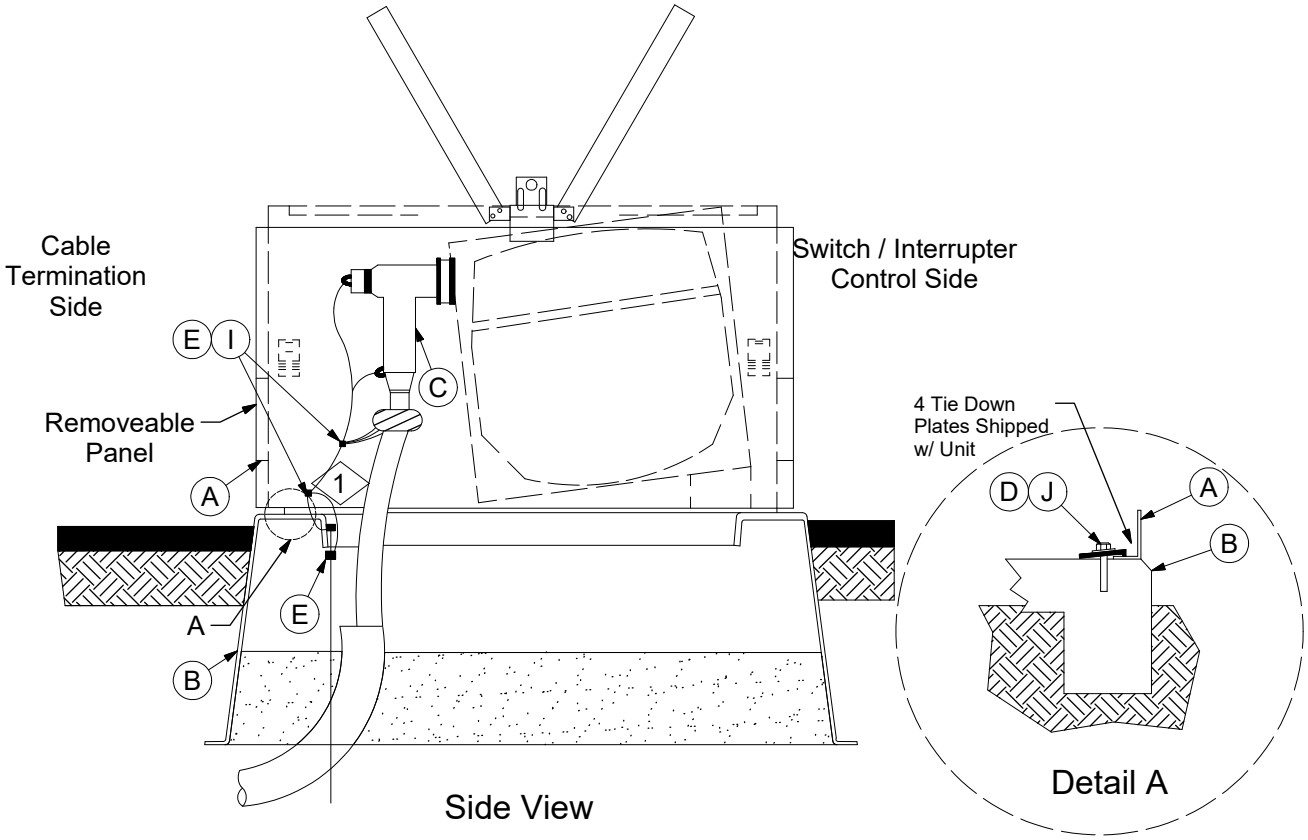
Open Top View



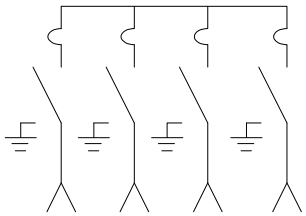
Open Front Termination View



Side View



Switchgear Configuration



53 11 05 **
4 Fault Interrupter Switches

CONSTRUCTION NOTES:

1. Connect neutral wires from each cable to #2 Cu. wire connected to grd. rod and compartment grd. bar. Construct compartment ground bar using 3 ground rods and 2 bolt connectors.

2. Install a label on the switchgear where it can be seen from the street with the proper Pad number. Use the appropriate Reflective Numbers (Stock #16 04 1XX).

3. Install a label on the inside of the compartment lid (both termination and control side) with the letters LAT_____ or DIP_____. Use Reflective Letters (Stock #'s 16 04 320, 16 04 317, 16 04 321 or 16 04 148, 16 04 419, 16 04 737) and the appropriate Reflective Numbers (Stock #'s 16 04 108 to 16 04 116). Also install "15kV" below each LAT or DIP label using Reflective Numbers (Stock #'s 16 04 111 and 16 04 113 and Reflective Letters (Stock #'s 16 04 420 and 16 14 041).

4. Install a label (inside the unit) by each switch handle with the letter D_____. Use Reflective Letter (Stock #16 04 418) and the appropriate Reflective Numbers (Stock #16 04 1XX).

5. See sheets DCS **34 21 10 **** for fiberglass pad installation instructions.

6. Install Faulted Circuit Indicator above the cable jacket cut off.

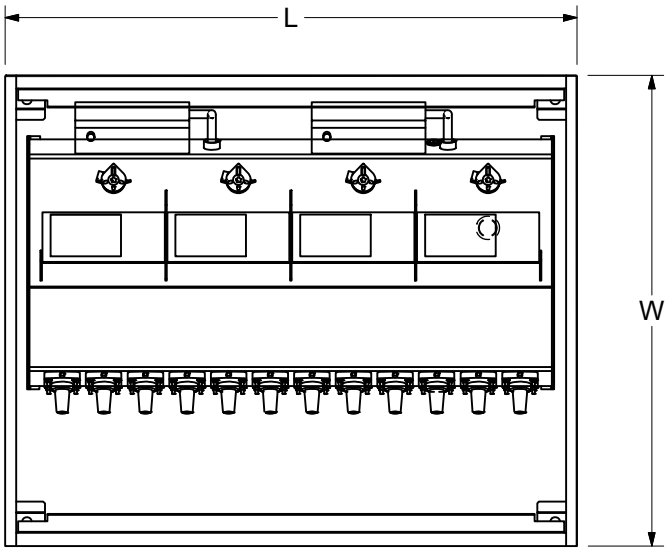
7. Cover over unused bushings with 15kV insulated caps (Stock #17 55 386).

9. The 200A tap on the back of each 600A termination can be covered with an elbow arrester (Stock #10 01 138) instead of an insulated cap.

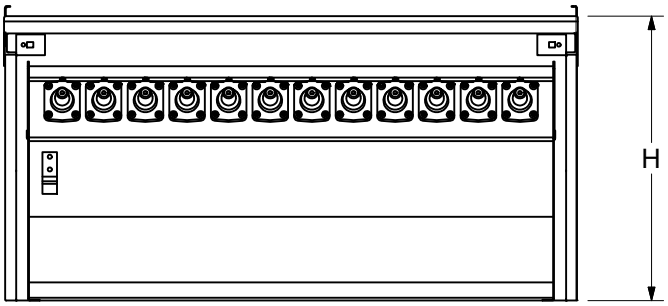
	ITEM	STK / DCS #	DESCRIPTION 53 11 05 **	01
10	A	54 07 580	Switchgear - 4 Fault Interrupters and Switches	1
	B	**34 21 11 02**	Pad - Switchgear, Fiberglass, 66” x 84” x 36”	1
	C	**42 34 64 ****	Termination - Elbow, Deadbreak 600A	-
	D	21 56 078	Bolt - Mach., S.S., Hex, 1/2” x 2”	8
	E	17 54 132	Connector - Wire, 8-350 kcmil Cu.	14
	I	17 54 182	Connector - Wire, #2 Cu., Split Bolt	24
	J	21 75 105	Washers - Rnd., 1/2”, S.S.	8
	K	17 55 386	Cap - Protective, 600A, 15kV	-
@	L	60 55 001	Indicator - Faulted Circuit, 1 PH	-
	M	**54 11 01 01**	Arrester - Elbow, 10kV	-

DESIGN NOTE(s):

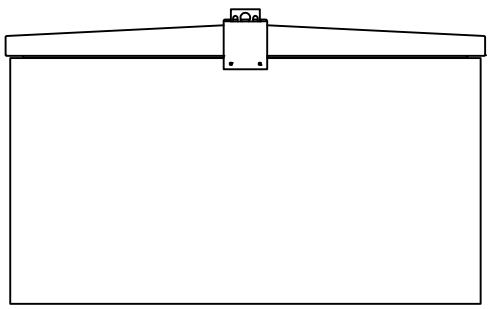
9. All positions are 600 amp. Fault interrupting rating is 25kA asym.
10. Automated switchgear must be fed by an external 120V voltage source.
11. See DCS **59 81 51 11** for the required clearance around switchgear.



Open Top View

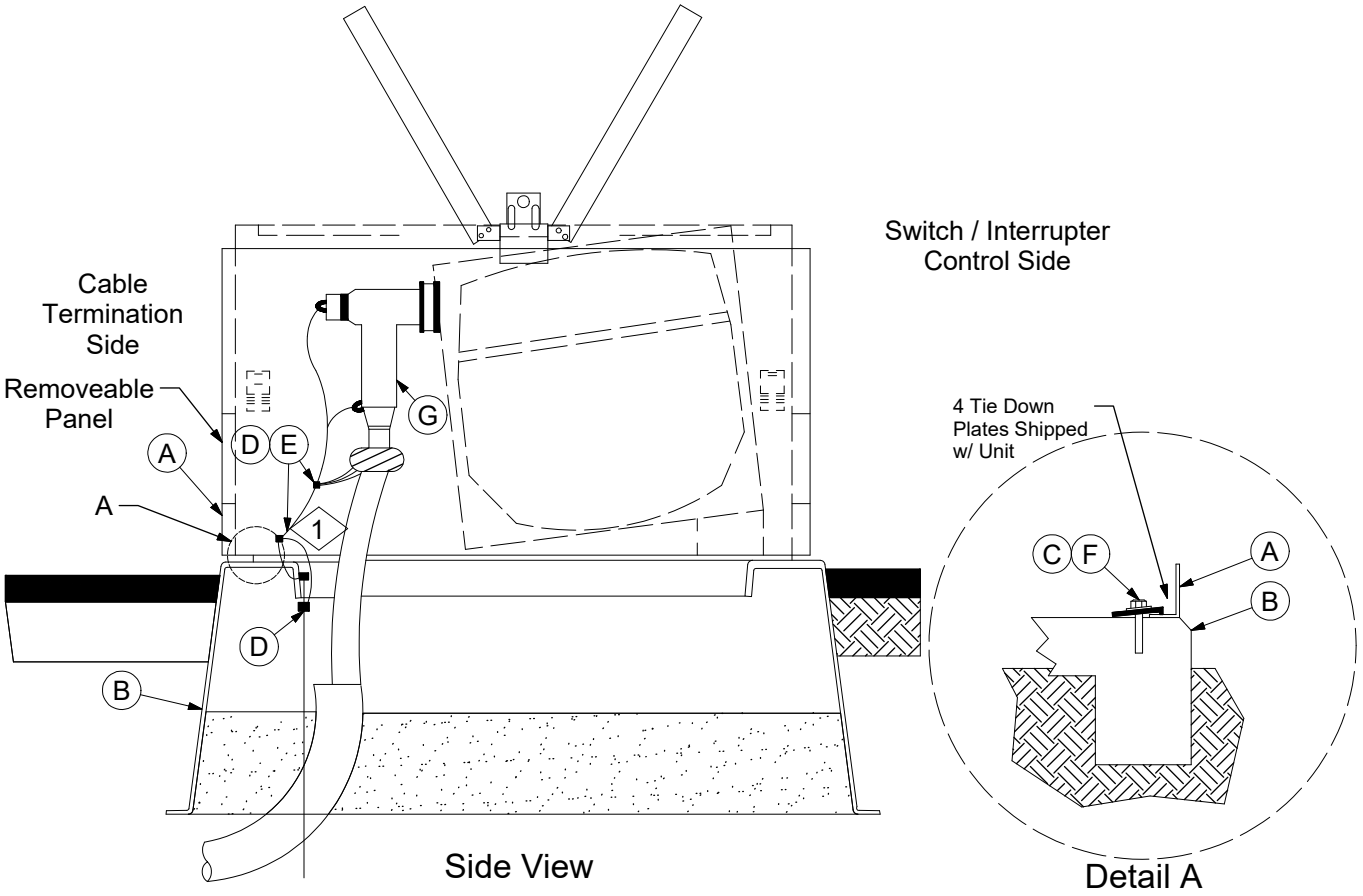


Open Front Termination View

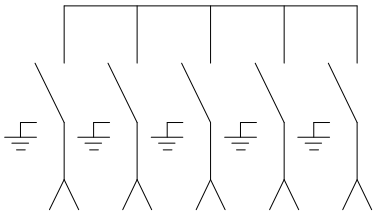


Side View

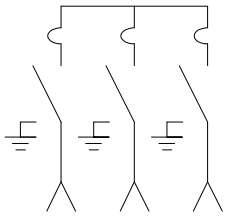
Switchgear Dimensions		
	1, 3, 4 Sw.	5 Sw.
Length (L)	79"	113"
Width (W)	65"	65"
Height (H)	45-3/8"	39-5/16"



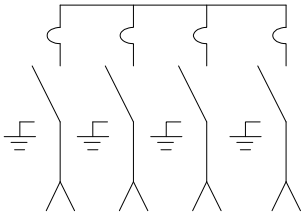
Switchgear Configurations



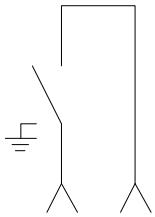
53 11 06 01
5 Load Interrupter Switches



53 11 06 02
53 11 06 03
3 Fault Interrupter Switches



53 11 06 04
4 Fault Interrupter Switches



53 11 06 05
1 Load Interrupter Switch

REV	DATE	ENG	DESCRIPTION
15	04/01/2023	JMW	New model switchgear added, updated format
14	19/07/2017	JMW	

CONSTRUCTION NOTES:

1. Connect neutral wires from each cable to #2 Cu. wire connected to grd. rod and compartment grd. bar. Construct compartment ground bar using 3 ground rods and 2 bolt connectors.

2. Install a label on the switchgear where it can be seen from the street with the proper Pad number. Use the appropriate Reflective Numbers (Stock #16 04 1XX).

3. Install a label on the inside of the compartment lid (both termination and control side) with the letters LAT_____ or DIP_____. Use Reflective Letters (Stock #'s 16 04 320, 16 04 317, 16 04 321 or 16 04 148, 16 04 419, 16 04 737) and the appropriate Reflective Numbers (Stock #'s 16 04 108 to 16 04 116). Also install "35kV" below each LAT or DIP label using Reflective Numbers (Stock #'s 16 04 111 and 16 04 113) and Reflective Letters (Stock #'s 16 04 420 and 16 14 041).

4. Install a label (inside the unit) by each switch handle with the letter D_____. Use Reflective Letter (Stock #16 04 418) and the appropriate Reflective Numbers (Stock #16 04 1XX). Also, label the outside of the unit with 35 kV.

5. See DCS **34 21 10 ****** fiberglass pad installation instructions.

6. Install Faulted Circuit Indicator above the cable jacket cut off.

7. Cover over unused bushings with 35kV insulated caps (Stock #17 55 509).

8. The 200A tap on the back of each 600A termination can be covered with an elbow arrester (Stock #10 01 163) instead of an insulated cap.

9. Add at least 3 grounding elbows per switchgear. Choose type(s) of grounding elbows depending on cable size(s).

	ITEM	STK / DCS #	DESCRIPTION 53 11 06 **	01	02	03	04	05
		54 07 438	Switchgear - 5 L.I. Sw.	1	-	-	-	-
		54 07 437	Switchgear - 3 F.I. Sw.	-	1	-	-	-
11	A	54 07 575	Switchgear - 3 L.I. Sw. remote supv. control	-	-	1	-	-
		54 07 527	Switchgear - 4 F.I. Sw.	-	-	-	1	-
		54 07 534	Switchgear - 1 L.I. Sw.	-	-	-	-	1
	B	**34 21 11 01**	Pad - Switchgear, Fiberglass, 74" x 118" x 36"	1	-	-	-	-
		34 21 11 02	Pad - Switchgear, Fiberglass, 66" x 84" x 36"	-	1	1	1	1
	C	21 56 078	Bolt - Mach., S.S., Hex, 1/2" x 2"	8	8	8	8	8
	D	17 54 132	Connector - Wire, 8-350 kcmil Cu.	17	11	11	14	8
	E	17 54 182	Connector - Wire, #2 Cu., Split Bolt	30	18	18	24	12
	F	21 75 105	Washers - Rnd., 1/2", S.S.	8	8	8	8	8
@	G	**42 44 13 ******	Termination - 1/0 Al. 350 Cu., and 750 Cu. 35kV	-	-	-	-	-
7 @	H	17 55 509	Cap - Protective, 600A, 35kV Bushing	-	-	-	-	-
@	I	60 55 024	Indicator - Fault, CRNT Reset, Vari. Trip	-	-	-	-	-
8 @	J	10 01 163	Arrester - 34kV Elbow, 200A	-	-	-	-	-
9 @	K	17 63 295	Elbow - Grounding, 35kV	3	3	3	3	3

DESIGN NOTE(s):

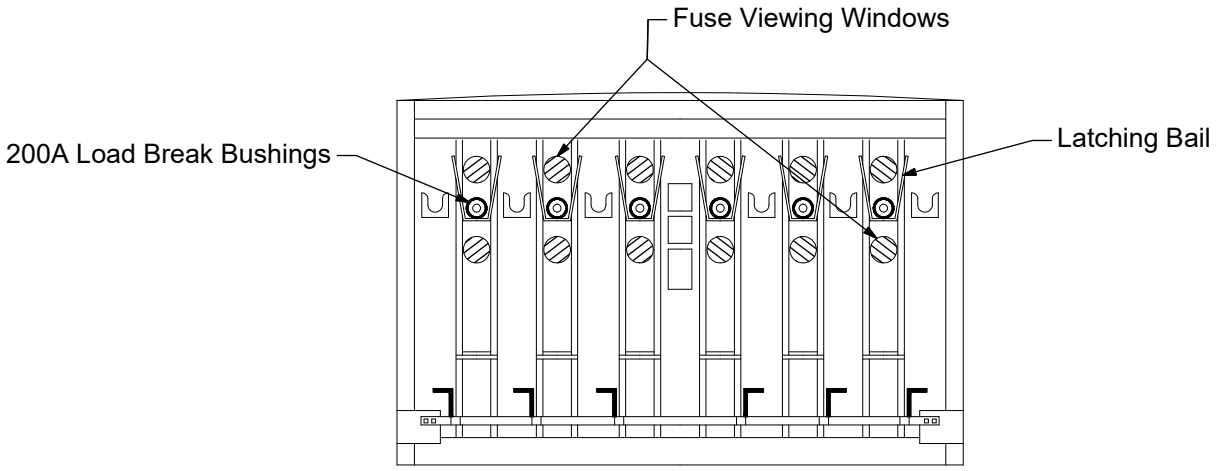
10. All positions are 600 amp. Fault interrupting ratting is 25 kA assym.

11. Remote supv. control switchgear Stock #54 07 575 must be fed by an external 120V voltage source.

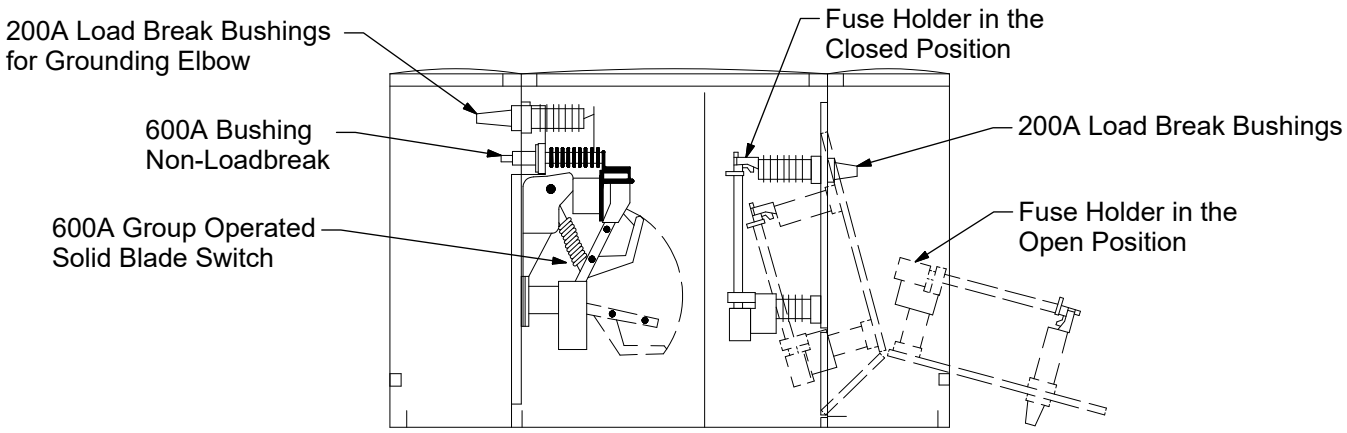
12. See DCS **59 81 51 11** for the required clearance around switchgear.

REV	DATE	ENG	DESCRIPTION
15	04/01/2023	JMW	New model switchgear added, updated format
14	19/07/2017	JMW	

Federal Pacific Switchgear



Front View of 200A Fuse Side

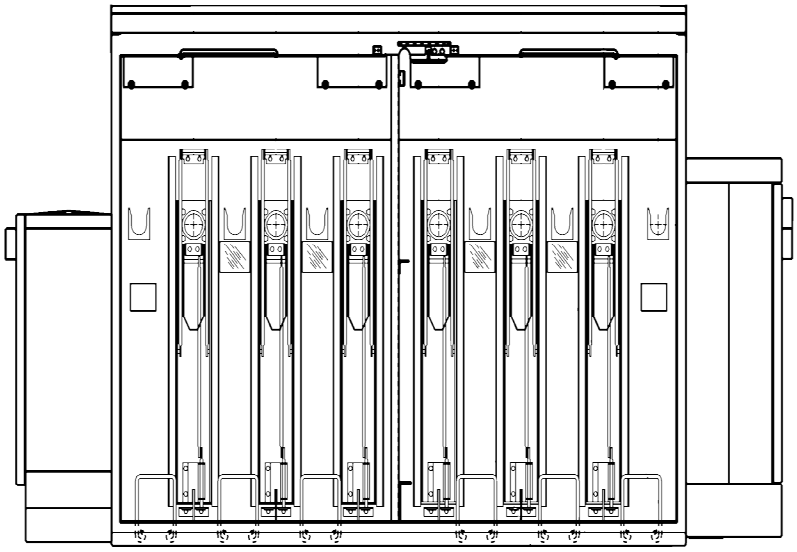


Side View

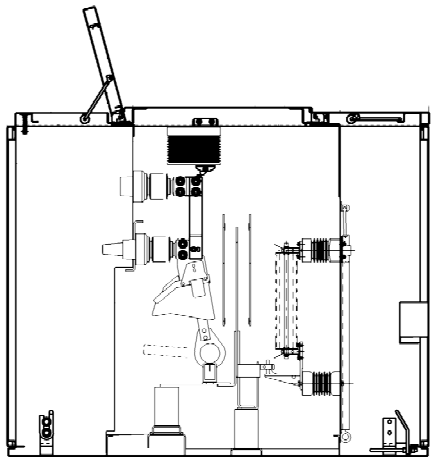
OPERATION NOTE(s):

1. Always use hotline tools when replacing fuses.
2. Loadbreak elbow must be placed on a parking stand before the latching bail can be raised.
3. After the elbow has been parked, the latching bail on the fuse door can be raised with a shotgun stick and the fuse door lowered into position.
4. The fuse can then be removed from the holder with the shotgun stick.
5. These units require S&C SMU-20 fuses. Fittings to hold the fuses are included with new switchgear. If damaged or lost, replacement SML-20 fittings are Stock #20 04 499.

S&C Switchgear



Front View of 200A Fuse Side



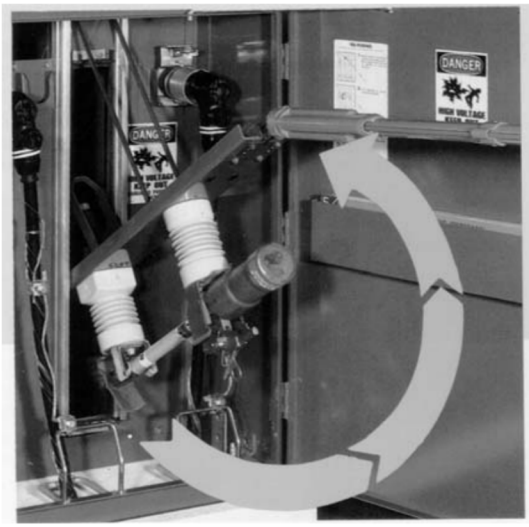
Side View

200A Fuse Operation (S&C)

The operator moves the loadbreak elbow to a feedthru or stand insulator on the parking stand, interrupting any fuse load.

This allows the mechanical interlock to be raised , unlocking the TransFuser Mounting.

A slight pull unlatches the TransFuser Mounting.



The balanced mounting virtually self pivots to its open position and latches in place - its a swift, controlled action that guards against exposure to energized live parts.

In the open position, the de-energized and isolated fuse is accessible to the operator for replacement.

OPERATION NOTE(s):

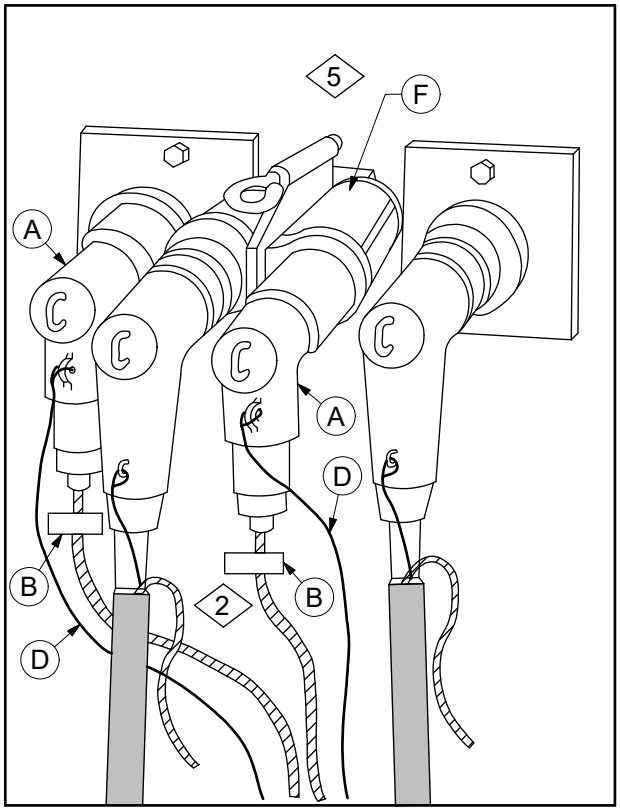
6. Always use hotline tools when replacing fuses.

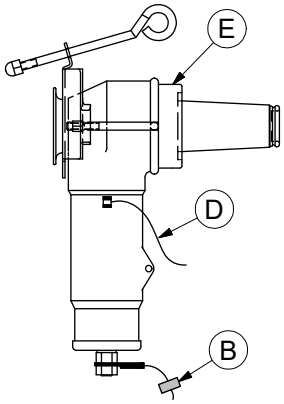
7. The fuse installation procedure is a reverse of fuse removal.

8. S&C SMU - 20 fuses and fuse mountings are sandard. S&C Deadfront switchgear uses SME-20 fuse end fittings (Stock #20 04 496).

ELBOW ARRESTER - FOR OPEN-POINT PADMOUNT EQUIPMENT - 5kV, 15kV.....54 11 01 **

SINGLE-PHASE PDMT XFMR - REPLACEMENT OF
LOW WITH HIGH PROFILE - 5kV, 15kV.....54 12 01 **





Parking Stand Arrester

DCS #	DESCRIPTION
54 11 01 01	Installation on transformer w/ under oil arrester
54 11 01 01	No under oil arrester, increase items A & B to 2 each
54 11 01 02	No under oil arrester and limited space between bushings
54 11 01 03	Installation on transformer w/ under oil arrester and limited space between bushings
54 11 01 04	Installation on 25 kV transformer and no under oil arresters

CONSTRUCTION NOTE(s):

1. Care must be taken to avoid confusing elbow arresters with grounding elbows. Grounding elbows are for grounding isolated URD primary cables and are generally either yellow or orange in color. Care must also be taken to avoid confusing a parking stand arrester with an insulating standoff bushing.

2. Elbow arresters and parking stand arresters should always be identified with the special “Lightning Arrester” nameplate. The nameplate should be attached to the ground lead prior to installing the arrester.

3. The arrester mating interface must be coated with a thin layer of silicone lubricant prior to installation.

4. When installing arresters, the ground lead must always be attached first. The ground lead must be attached to the transformer/enclosure ground using a hot line clamp. A #14 copper drain wire must be attached from the arrester body to the transformer/enclosure ground connection.

5. All transformers shall have an arrester installed at open points unless the transformer is equipped with an under oil lightning arrester. If the transformer has an under oil arrester, an arrester will not be placed on the open transformer bushing. Instead of an arrester an insulating cap (Stock # 17 55 227) will be placed on the open transformer bushing.

REV	DATE	ENG	DESCRIPTION
9	07/01/21	EJB	Converted to new format; Added 04 standard; Revised Title
8	05/31/13	EJB	

6. Install elbow arresters on feed thru bushings or equipment bushings in a manner similar to installing a loadbreak elbow. Due to space limitations in the Type II transformers it may be necessary to use a parking stand arrester instead of a feed thru bushing and elbow arrester. The parking stand arrester is installed in a manner similar to installing a feed thru bushing. The open point loadbreak elbow is installed on the parking stand arrester and an elbow arrester is installed on the open equipment bushing.

	ITEM	STK / DCS #	DESCRIPTION 54 11 01 **	01	02	03	04
	A	10 01 138	10 kV Elbow Arrester	1	1	-	-
		10 01 267	18 kV Elbow Arrester	-	-	-	2
2	B	16 01 147	Plate, Name, 1 1/4" x 2", Red, "Lightning Arrester"	1	2	1	2
	C	23 78 183	Hot Line Clamp	1	2	1	2
4	D	18 52 018	Wire, Copper, Binding, #14 (ft.)	4	8	4	8
6	E	10 01 151	Parking Stand Arresor - 10kV	-	1	1	-
@	F	17 55 228	Bushing - Feed Thru, 15 kV	1	-	-	1

DESIGN NOTE(s):

7. Single-phase installation shown. Adjust quantities for three-phase applications.

8. Arresters are for 4160 Grd. Y/2400V, 12470 Grd. Y/7200V,13200 Grd. Y/7620 and 13800 Grd. Y/7970 volt padmounted transformers and padmounted junction enclosures. Elbow arresters are not installed on radial feed 3 phase padmount transformers.

9. If an elbow arrester is to be installed on both the feed thru bushing and the spare transformer / enclosure bushing, then enter a quantity of 2 when estimating DCS 54 11 01 01 standard.

OPERATING NOTE(s):

10. Elbow arresters are to be removed with an elbow pulling tool (Stk.#83 29 136). The pulling tool must be attached to the pull ring on the back of the elbow arrester.

11. Whenever installing or removing arresters, care must be taken to avoid bending or twisting the arrester. If arresters are subjected to excessive bending, twisting, or pounding or if the arresters appear to be defective they must not be used.

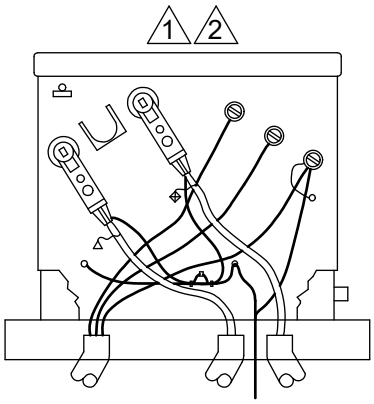
12. If open points are found while performing routine work, they should be retrofitted with arresters.

REV	DATE	ENG	DESCRIPTION
9	07/01/21	EJB	Converted to new format; Added 04 standard; Revised Title
8	05/31/13	EJB	

Option 1 - Rotate Pad 180 Degrees

The Transformer pad can be rotated 180 degrees if:

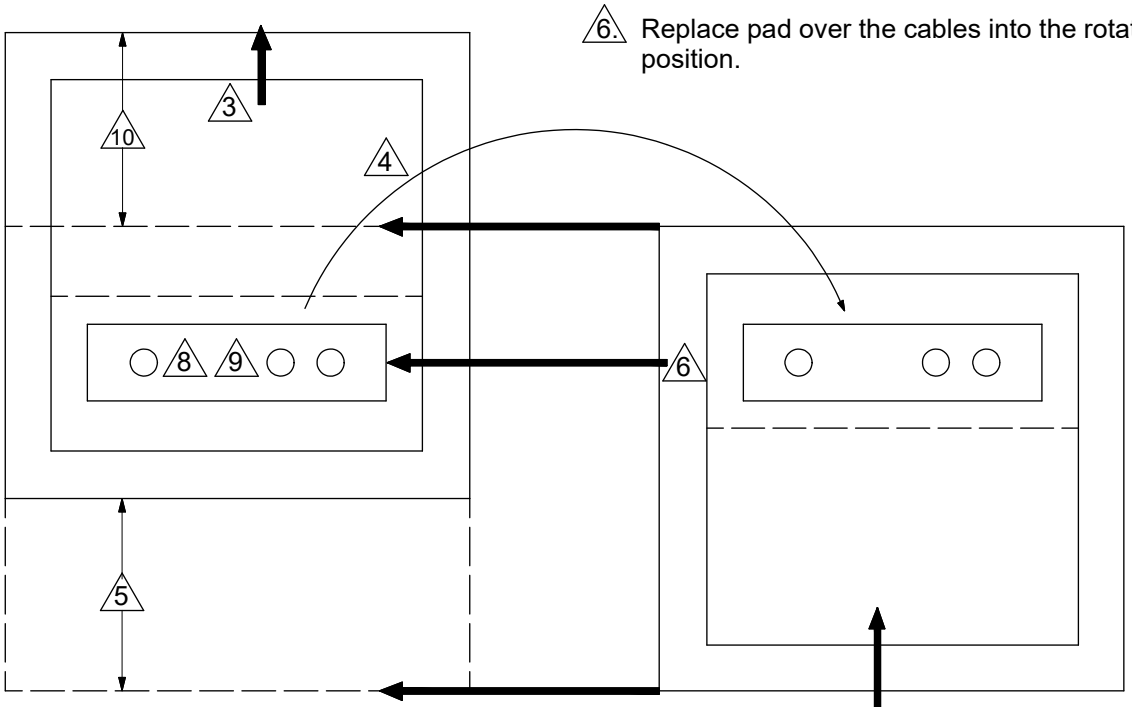
A) The easement allows
B) There are no obstructions in front of the rotated pad to prevent 10 ft. access
C) primary cables and secondary wire were installed per low-profile standards.



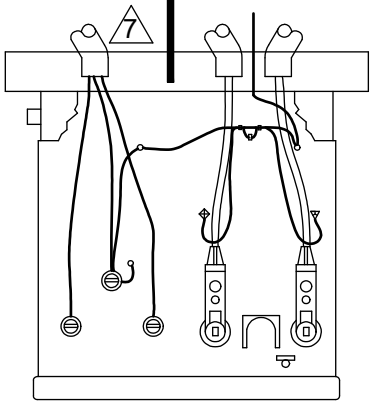
TYPE II - 24" HIGH

INSTRUCTIONS - Option 1

1. De-energize the transformer and primary cables feeding into the transformer.
2. Disconnect and ground all cable and wire connections.
3. Remove the low-profile transformer from the pad.
4. Remove the pad.
5. Level and prepare rotated pad location.
6. Replace pad over the cables into the rotated position.



7. Place new high-profile transformer onto the rotated pad.
8. Reorient and reconnect all cables and wires to the new transformer.
9. Reenergize the primary cables and the new transformer.
10. Back-fill and restore remainder of the old pad location as needed.

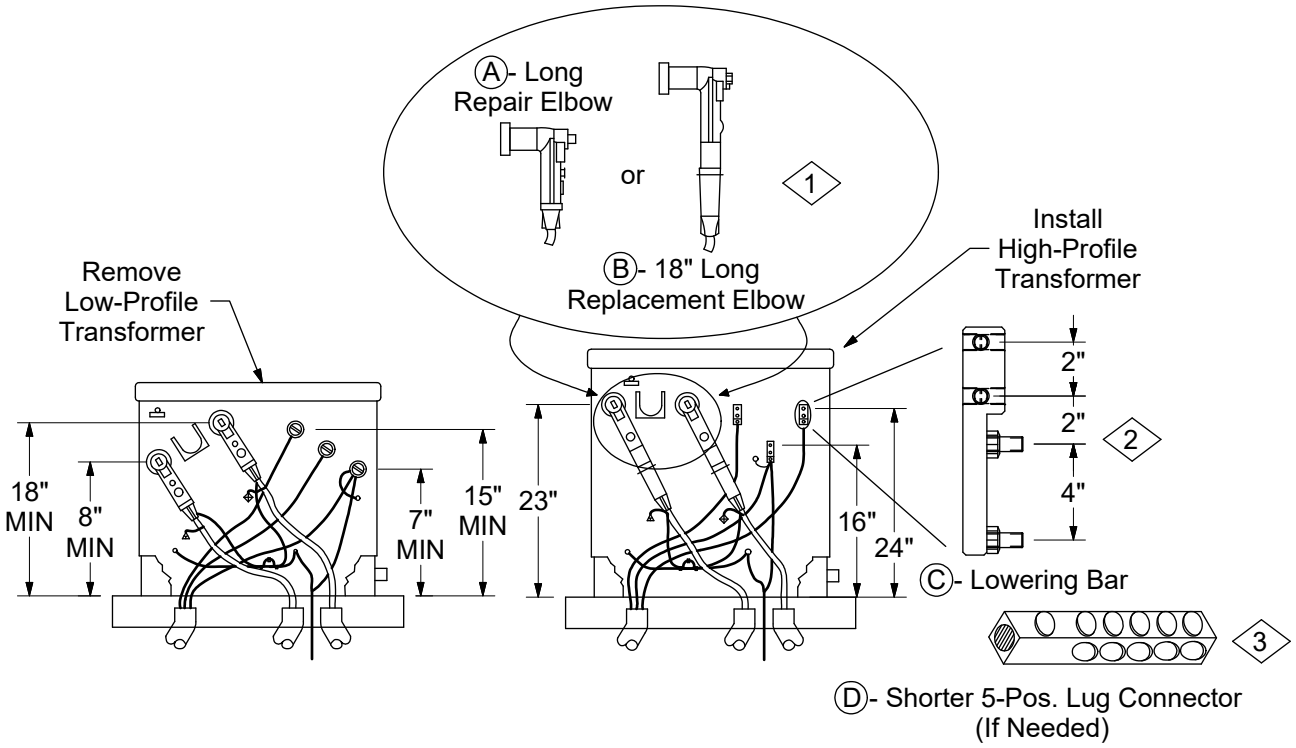


TYPE I - 32" HIGH

REV	DATE	ENG	DESCRIPTION
1	07/01/21	DG	Updated to new format; Changed Lowering Bar stock #s; & more
0	10/22/15	DG	Initial Release

Option 2 - Keep Pad Orientation and Re-Terminate Primary Cables and Secondary Wires

If the transformer pad cannot be rotated 180 degrees, the primary cables and secondary wires will likely not be long enough. The following materials can be used as needed to re-terminate the cable and wires to the new High-Profile transformer.

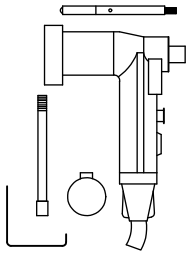


CONSTRUCTION NOTE(s):

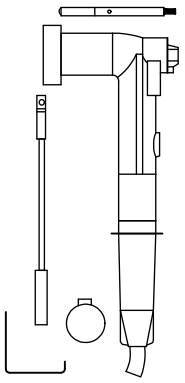
1. Load-Break Repair or Replacement Elbows
There are two versions of longer load-break elbows available that can be used to re-terminate the primary cables so they will reach the higher mounted primary bushings:

Ⓐ - The “Long Repair” elbow has an extended length contact and elbow housing that results in a net gain of 3-1/4 inches in length.

Ⓑ - The “18” Long Replacement” elbow has an extended length contact and elbow housing that results in a net gain of 8-7/8 inches in length.



Ⓐ- Long Repair Elbow



Ⓑ- 18" Long Replacment Elbow

REV	DATE	ENG	DESCRIPTION
1	07/01/21	DG	Updated to new format; Changed Lowering Bar stock #s; & more
0	10/22/15	DG	Initial Release

2. Secondary Bushing Lowering Bar

The secondary connectors can be disconnected from the low−profile transformer and secondary lowering bars installed to provide lower conductor connection points on the replacement high−profile transformer. The existing connectors are then reinstalled onto one of the studs of the lowering bar. In many cases this may lower the connectors enough to allow connection of the secondary conductors without splicing.

There are two secondary bushing lowering bars. Both provide for lowering the connectors either 2”, 4”, 6" or 8".

- Stock #18 12 128 has 5/8” slip-fit holes for connection to transformers up to 75 kVA.
- Stock #18 12 129 has 1” slip-fit holes for connection to transformers from 100 to 167 kVA.

3. Shorter 5-Position Secondary Lug Connector

In some cases, the connectors on the transformer being replaced may be too long and when installed on the lowering bar, cause inadequate clearance to the door of the transformer. In these cases, the lug connectors will need to be replaced with shorter lug connectors. These shorter lug connectors are limited to 5 conductors with a range of 1/0 to 750 per conductor position.

- Stock #17 55 230 has 5/8” slip-fit holes for connection to transformers up to 75 kVA.
- Stock #17 55 229 has 1” slip-fit holes for connection to transformers from 100 to 167 kVA.

	ITEM	STK / DCS #	DESCRIPTION 54 12 01 **	01	02	03	04	05	06	07	08	09	10
	A	17 05 250	#2 AWG Al, STR, 175 or 220 Mil (Long Repair)	2	-	-	-	-	-	-	-	-	-
		17 05 303	#2 AWG Al, SOL,175 Mil (Long Repair)	-	2	-	-	-	-	-	-	-	-
		17 05 304	1/0 AWG Al, STR, 175 Mil (Long Repair)	-	-	2	-	-	-	-	-	-	-
		17 05 514	3/0 AWG Al, CPR, 175 Mil (Long Repair)	-	-	-	2	-	-	-	-	-	-
		17 05 305	4/0 AWG Al, STR, 175 Mil (Long Repair)	-	-	-	-	2	-	-	-	-	-
	B	17 05 494	#2 AWG Al, STR, 175 or 220 Mil (18 Inch Long Replacement)	-	-	-	-	-	2	-	-	-	-
		17 05 498	#2 AWG Al, SOL, 175 or 220 Mil (18 Inch Long Replacement)	-	-	-	-	-	-	2	-	-	-
		17 05 499	1/0 AWG Al, STR, 175 Mil (18 Inch Long Replacement)	-	-	-	-	-	-	-	2	-	-
		17 05 515	3/0 AWG Al, CPR, 175 Mil (18 Inch Long Replacement)	-	-	-	-	-	-	-	-	2	-
		17 05 493	4/0 AWG Al, STR, 175 Mil (18 Inch Long Replacement)	-	-	-	-	-	-	-	-	-	2
@	C	18 12 128	Lowering Bar, 5/8” Slip-Fit for Up to 75 kVA	3	3	3	3	3	3	3	3	3	3
		18 12 129	Lowering Bar, 1” Slip−Fit for 100−167 kVA	3	3	3	3	3	3	3	3	3	3
@	D	17 55 230	Lug, 5−Pos., 5/8” Slip−Fit for Up to 75 kVA	3	3	3	3	3	3	3	3	3	3
		17 55 229	Lug, 5−Pos., 1” Slip−Fit for 100−167kVA	3	3	3	3	3	3	3	3	3	3

Option 3 - Splice or Replace Primary Cables and Secondary Conductors

If neither Options 1 or 2 allow the primary cables and secondary conductors to be reconnected to the replacement high-profile transformer, then splicing or replacement of primary and secondary cables/conductors will be required.

For the 600 V secondary, refer to DCS **41 14 36 ** or 41 14 37 01** for splicing materials and instructions.

For the 15 kV primary cable, refer to DCS **41 34 34 **, or 41 34 35 **** for splicing materials and instructions. Refer to DCS **42 34 62 **** for load break elbow materials and instructions.

REV	DATE	ENG	DESCRIPTION
1	07/01/21	DG	Updated to new format; Changed Lowering Bar stock #s; & more
0	10/22/15	DG	Initial Release

NOTES

BROKEN CONDUIT REPAIR SYSTEM.....59 14 40 40

INSTRUCTIONS FOR INSTALLING SPLIT/LACED CABLE SUPPORT GRIPS.....59 14 42 00

INFLATABLE DUCT SEALING SYSTEM.....59 31 31 40

DIRECT BURIED CABLE BURIAL DEPTH.....59 40 00 10

CABLE BENDING RADII.....59 40 00 11

CURRENT CARRYING CAPACITY OF UNDERGROUND DISTRIBUTION CABLES.....59 40 00 12

CABLE TAGGING.....59 40 00 40

CABLE TAGGING USING LEAD TAGS.....59 40 00 41

JOINT TRENCH AND SWIMMING POOL CABLE CLEARANCE REQUIREMENTS.....59 40 00 44

SEAL - CABLE END.....59 40 00 45

CONDUIT - JOINTING AND REPAIRS.....59 40 40 45

CONDUIT - JOINING PVC TO HDPE.....59 40 41 01

15KV 600 AMP T-BODY TERMINATION AND ACCESSORIES.....59 40 60 01

SEAL - JACKETED CABLE.....59 40 90 14

FIRE AND ARC PROOFING CABLES AND ACCESSORIES.....59 40 90 42

BOND FOR GROUNDING - LC AND TAPE SHIELDED CABLES.....59 40 93 44

STRIPPING TAPE SHIELDED SOLID DIELECTRIC CABLES.....59 41 41 42

34.5kV TERMINATIONS & CABLE TRAINING AT SUBSTATION.....59 42 44 10

BOND FOR GROUNDING AERIAL CABLE.....59 49 90 44

PADMOUNTED EQUIPMENT AND CABLE LABELING.....59 51 00 01

TRANSFORMER AND ABOVE GRADE PEDESTAL LOCATION.....59 51 10 41

TRENCH AND CABLE DETAILS NON-JOINT CONSTRUCTION.....IL ONLY.....59 51 10 44

5kV, 15 kV DRY WELL FUSE OPERATION AND REPLACEMENT.....IL ONLY.....59 51 53 39

BAY-O-NET FUSE OPERATION AND REPLACEMENT.....59 51 53 40

CABLE GROUNDING THROUGH A FEED-THRU BUSHING.....59 51 53 41

IDENTIFICATION OF SECONDARY AND SERVICE CABLES
UNDERGROUND RESIDENTIAL SUBDIVISION.....MO ONLY.....59 52 00 41

PROCEDURE FOR INSTALLING BELLEVILLE (SPRING) WASHERS.....59 52 00 43

FCI FIBER OPTIC CABLE INSTALLATION INSTRUCTIONS
PADMOUNT SWITCHGEAR.....59 53 51 00

PROTECTIVE BARRIER INSTALLATION.....59 81 51 10

REQUIRED CLEARANCES FOR PADMOUNTED TRANSFORMERS
AND SWITCHGEAR.....59 81 51 11

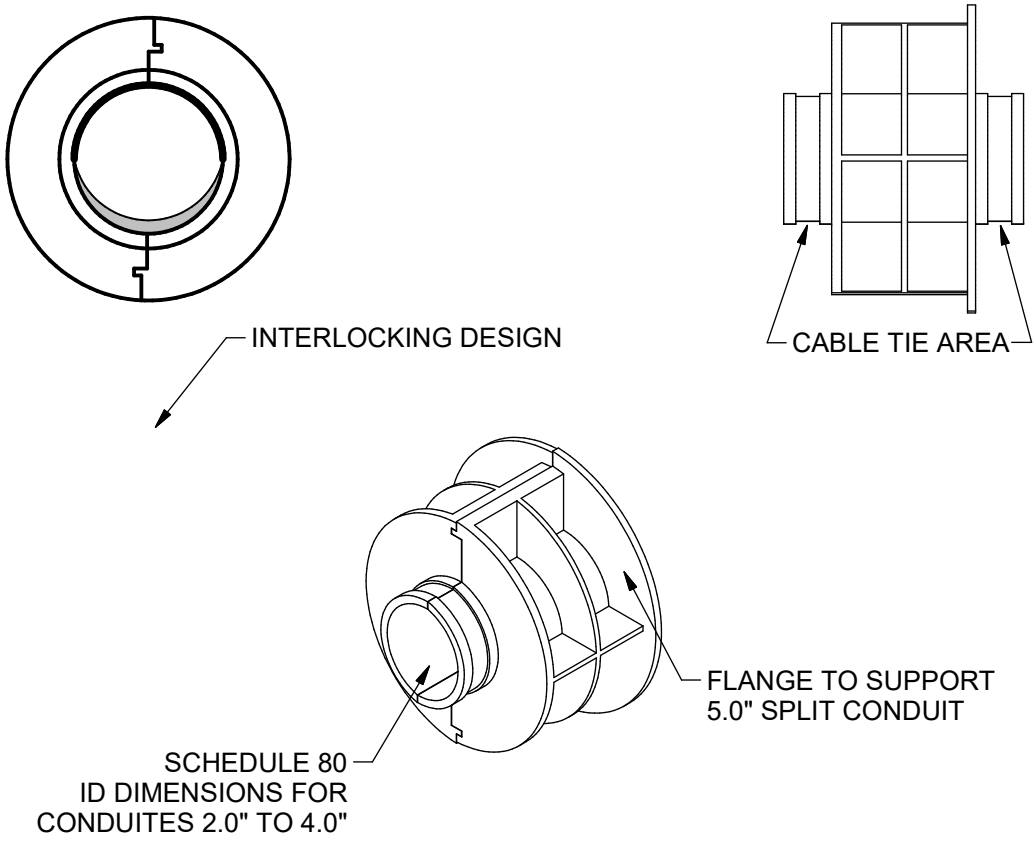
The Broken Conduit Repair System (BCRS) will be used to repair broken PVC conduit installed on poles or in the ground. The BCRS will allow Ameren Linemen to make repairs to broken conduit without having to remove the installed cables and thereby reducing customers' interruptions and the associated customers'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

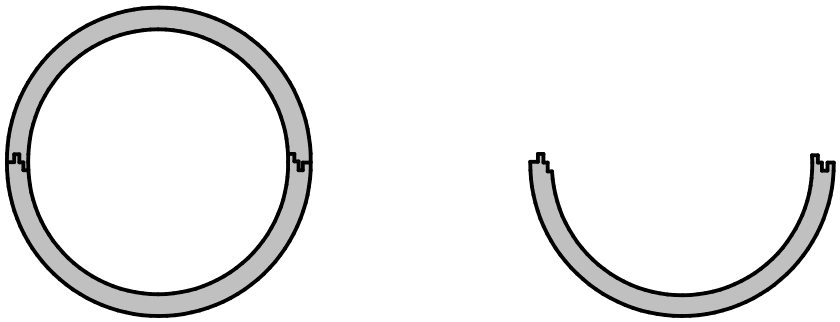
COMPONENTS OF THE BCRS

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

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.

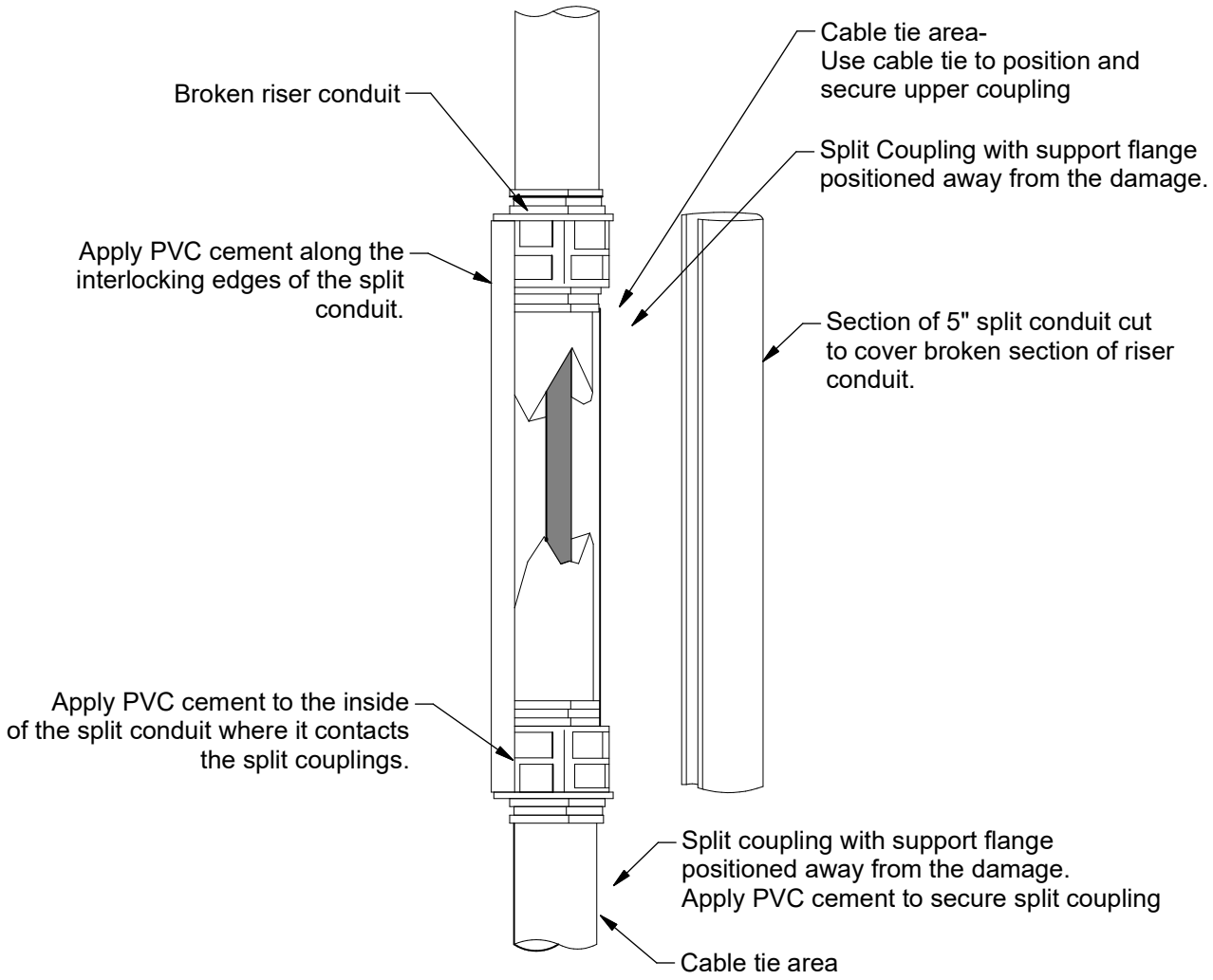


Illustration shows a repair on a riser conduit

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

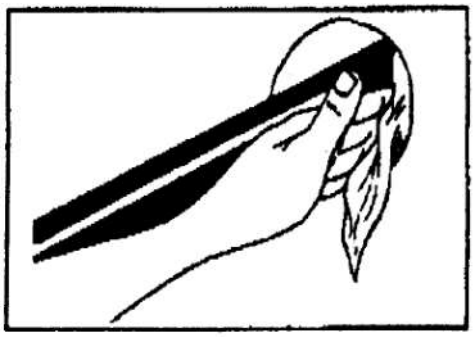
CONSTRUCTION NOTE(s):

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.

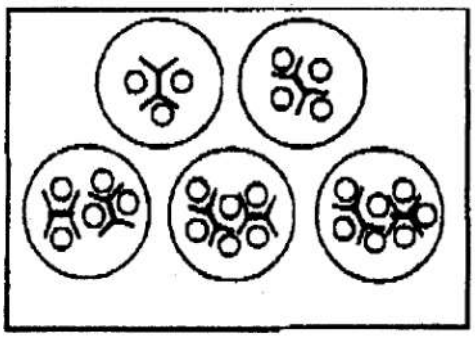
The Inflatable Duct System (DSS) may be used in conjunction with plastic, concrete, tile, fiberglass, or steel ducts to provide a watertight duct seal. The IDSS consists of an inflatable sealed bladder, made of flexible metallic laminate material, which has pre-installed, high-temperature sealant strips 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



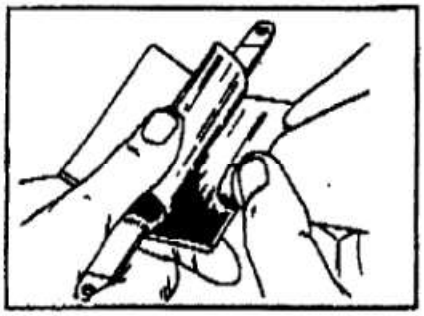
1. It is recommended to wet clean the duct and cable Sheath. Remove as much dirt, crust, mud, etc. as possible. **For ducts with 3 or more cables, continue with step 2. For 0, 1, or 2 cables skip to step 9.**



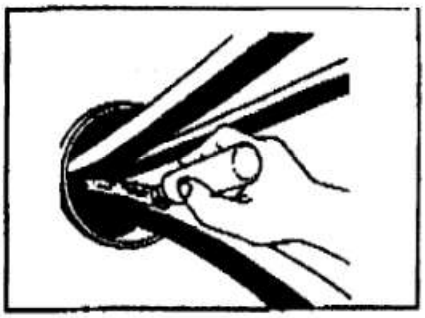
2. Examples for different multiple cable configuration. One RDSS-Clip can seal up to four cables. If more cables are to be sealed, use one extra clip per three additional cables.

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

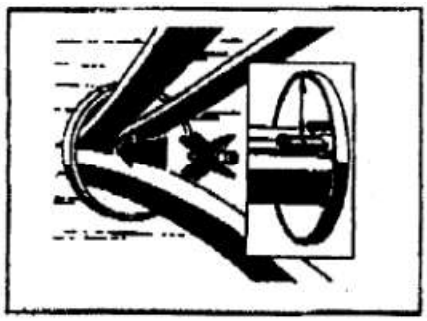
4. Remove one protection paper and lubricate abundantly the larger surface of the clip wing.



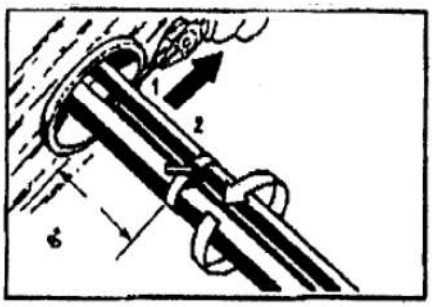
5. Repeat steps 3 & 4 for the other clip wings. Remove protection paper only after lubricating at least one wing side.



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

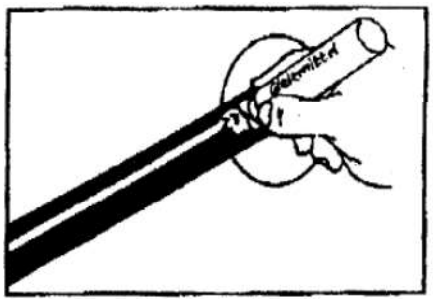


7. Insert the clip in between the cables, assuring that there is only one cable between each clip wing (see picture, step 2). Make sure that the central part of the clip is well positioned in the crotch area. The raised line on center stick should be flush with the end of the duct. Use the short tie-wrap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

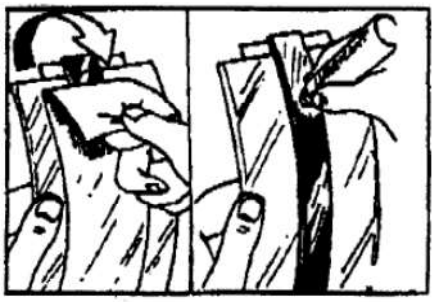


8. Install the long tie-wrap around the cable bundle at a distance of approx. 8" from the duct entrance.

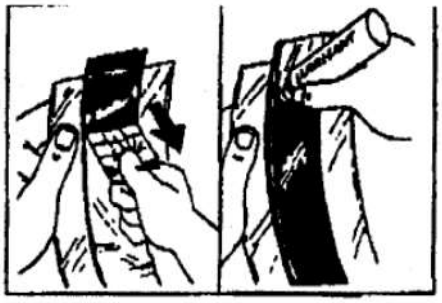
REV	DATE	ENG	DESCRIPTION
2	07/01/21	EJB	Converted to new format, added description and stock # to step F
1	02/14/12	HLH	Reaffirmed



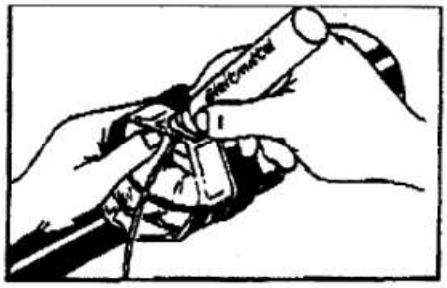
9. For ease of installation lubricate the cable.



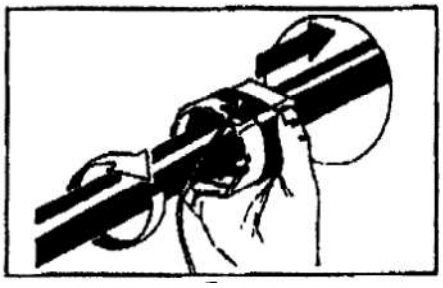
10. Remove the protective paper from the outside of the sealing strip and lubricate abundantly.



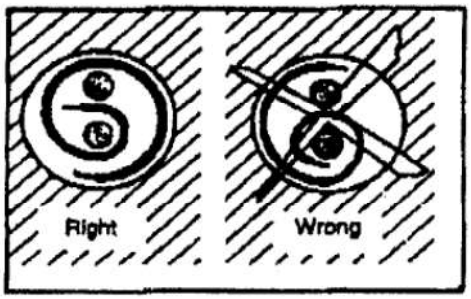
11. Continue with lubrication of the inside of the sealing strip.



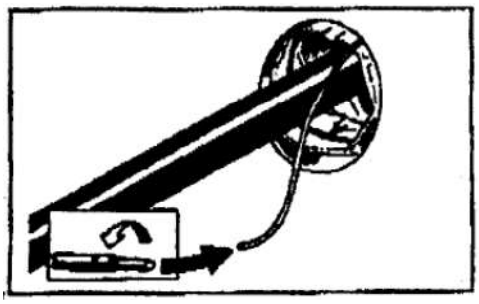
12. Lubricate the filling tube on the bladder section.



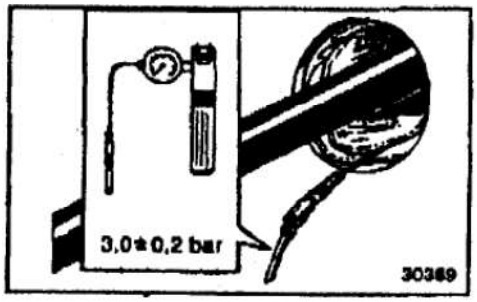
13. Wrap bladder around the cable (or cable bundle) and slide completely into the duct.



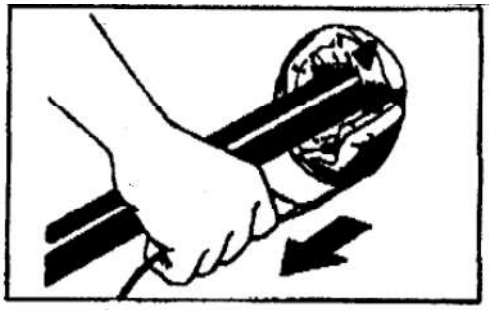
14. In case of two cables, wrap bladder around the cables as shown starting with the largest cable.



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.

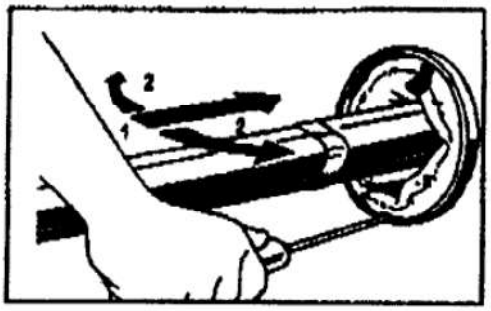


16. Inflate bladder up to the pressure of 3.0 bar (43.5 psi) and keep the pressure there for 30 seconds, after which the tool must be shut off. **Note:** Refer to the operation manual for the specific inflation tooling being used.



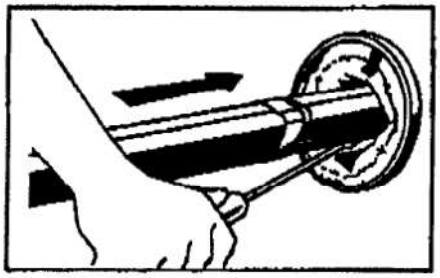
17. BEFORE removing the installation tool connection from the filling tube, pull out of the filling tube in one gentle move in the direction of the cable installation to complete.

REMOVAL INSTRUCTIONS

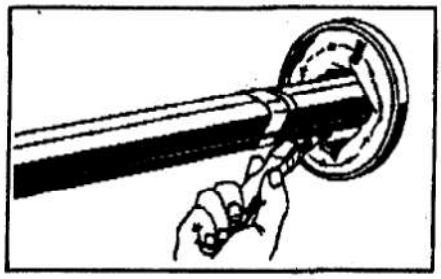


1. Deflate the bladder by piercing with a screw driver. Release the bladder from the duct wall by using a blunt tool.

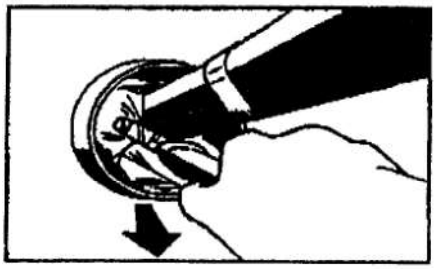
REV	DATE	ENG	DESCRIPTION
2	07/01/21	EJB	Converted to new format, added description and stock # to step F
1	02/14/12	HLH	Reaffirmed



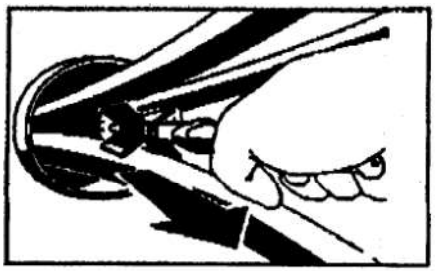
2. Release bladder from the cable or cable bundle.



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.

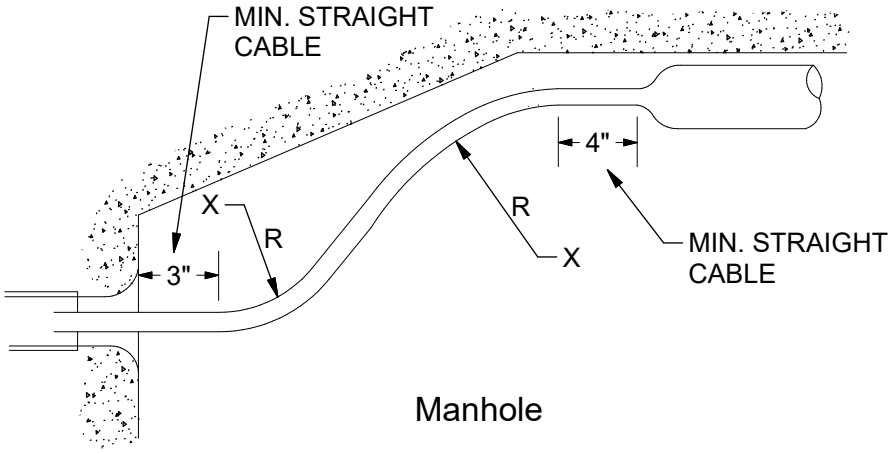
   D. When the material excavated from a trench is not itself suitable backfill, a field decision by the Company Construction Supervisor or his representative will be made to either obtain suitable backfill, use conduit, or use cable in duct.

   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.

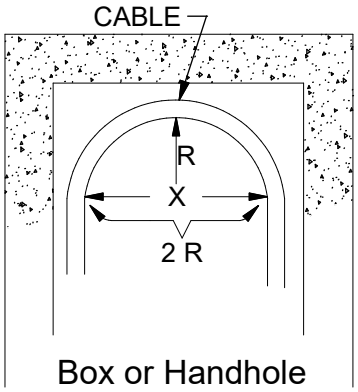
This standard covers minimum bending radii for training underground cables.

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

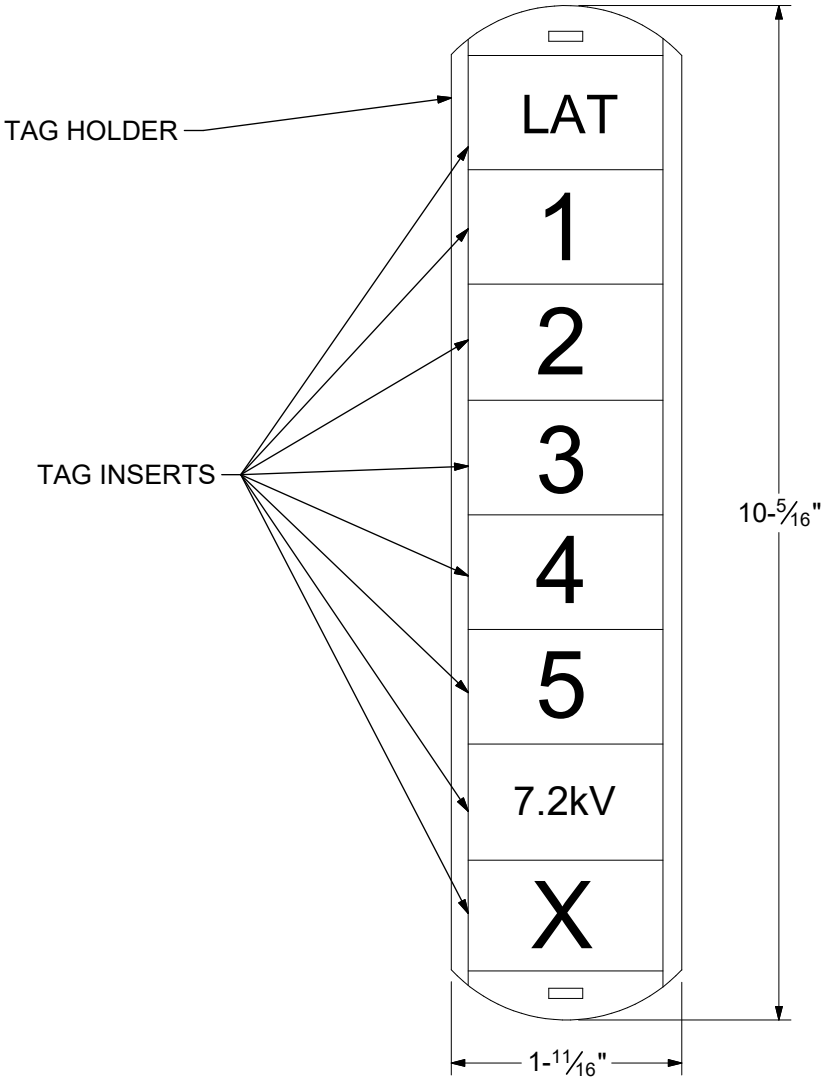
Table 3 - Quadruplex 600 Volt Cross-Linked Polyethelene Cable Ratings in Amps (Three-Phase Service)		
Number of Conduits	Stk. # 18 07 288 3-350 x 1-4/0 Al	Stk. # 18 07 217 3-750 x 1- 350 Al
1	335	509
3	278	421
6	228	346
9	208	316

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

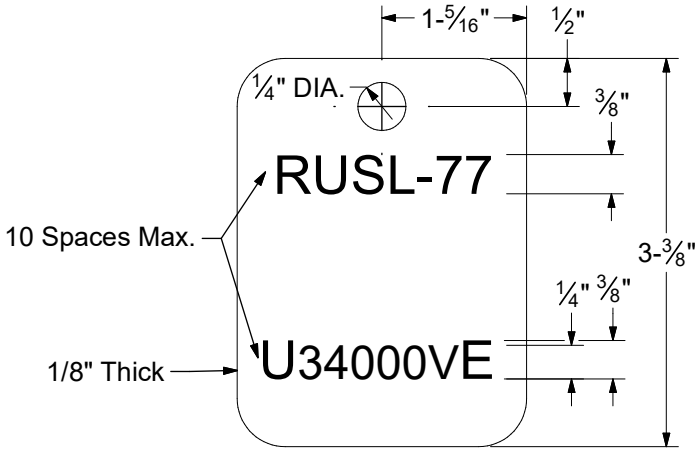
CONSTRUCTION NOTE(s):

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".

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

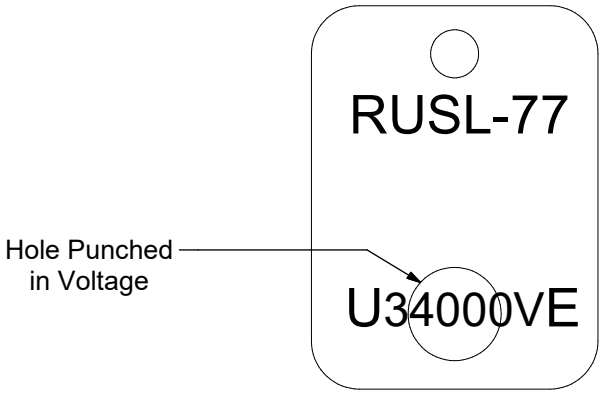
See DCS **59 40 00 40** for tags used on terminal poles.

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.

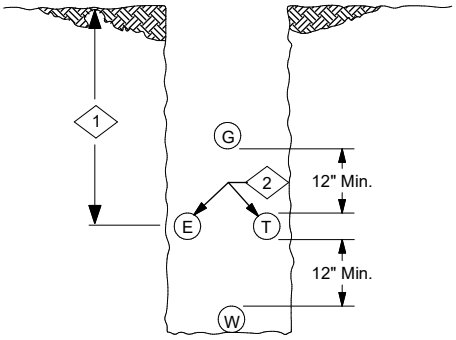


Method to Identify Dead Cables

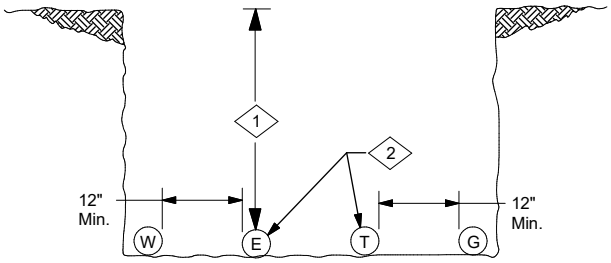
REV	DATE	ENG	DESCRIPTION
5	07/31/21	EJB	Converted to new format
4	08/04/11	HLH	

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.

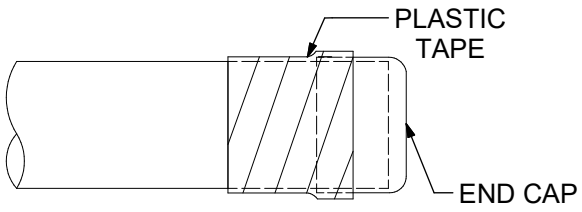
B. Supply cables installed in conduit have no clearance requirement. Burying under a swimming pool, even in conduit, should be avoided.

ATTENTION: ALL CABLES MUST BE SEALED.

INSTRUCTIONS

Sealing with End Caps

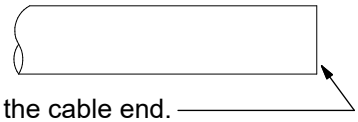
This method is for service, non-jacketed and jacketed cable.



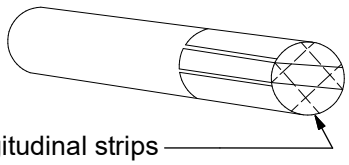
1. Choose the proper end cap for the cable being sealed.
2. Square cut the cable end.
3. Insert the cable into the end cap.
4. Secure the end cap with plastic tape (Stock #25 53 055). Note: The heat shrinkable end cap requires no taping. Just shrink cap using an appropriate torch.

Sealing Without End Caps

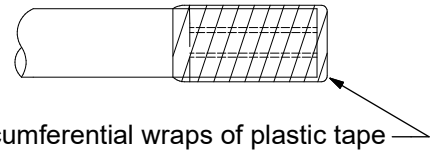
This method is to be used when end caps are not available.



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.

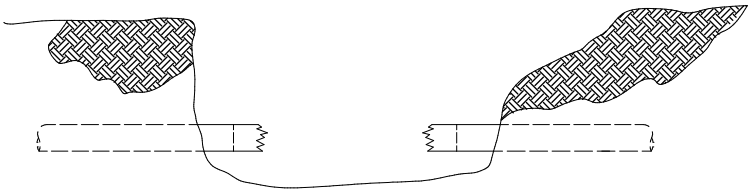
Cable End Caps						
STOCK NO.	**COLOR**	**I.D. (INCHES)**	**600 VOLT CABLE SIZE**	**5 kV NON-SHIELDED CABLE**	**15 kV JACKETED CABLE**	**35 kV EPR JACKETED**
40 59 144	RED	.437	1/0			
40 59 145	YELLOW	.562	3/0 4/0			
40 59 146	ORANGE	.813	350	1/0		
40 59 171	MAROON	1.00			#2 AL.	
40 59 166	BLACK	1.125	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	

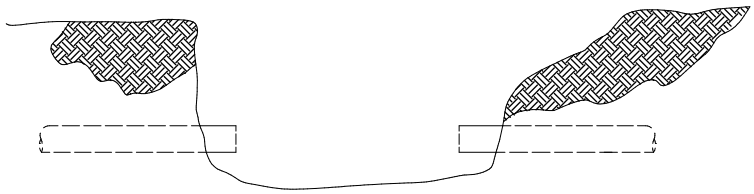
This standard provides for joining, sealing, placing, and repair of plastic conduit.

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.

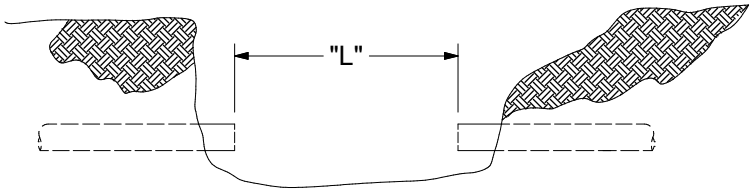
INSTRUCTIONS



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

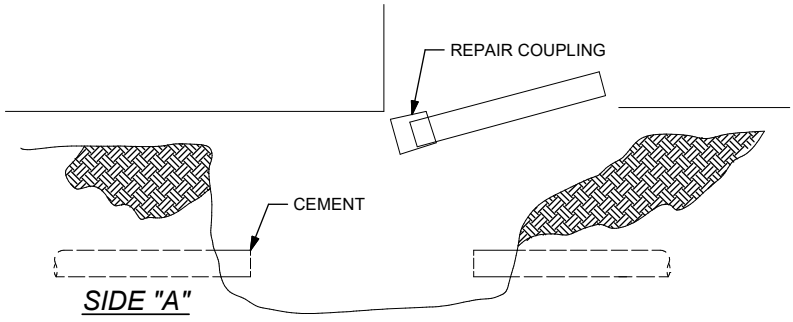


2. Square cut edges, making sure that male ends have an inside beveled edge.



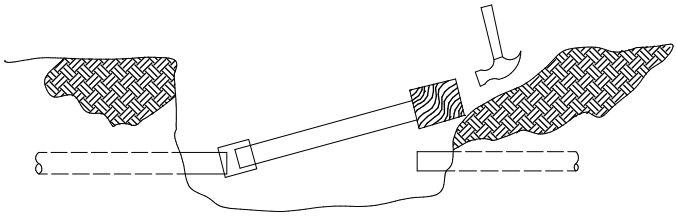
3. Measure and cut repair piece 1/2" shorter than "L" (see table). Clean all edges to be fitted

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

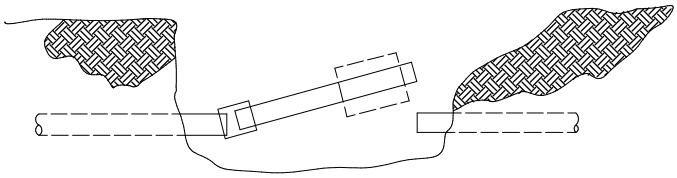


4. Apply a liberal amount of cement, coating the entire length of the socket, and install coupling on repair length and apply cement to side "A". Slip the conduit into the socket with a firm twist until bottom is felt, holding the joint motionless for 15 seconds longer when the weather is very cold. 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	



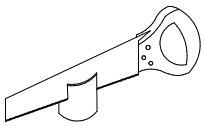
5. Use hammer block to drive repair piece into place.



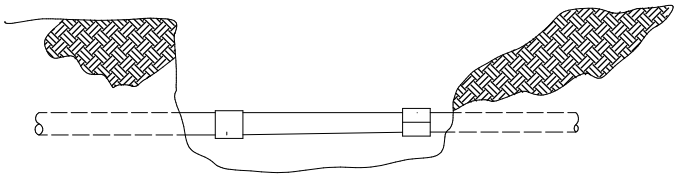
6. Slide repair sleeve on conduit past joint.

OR

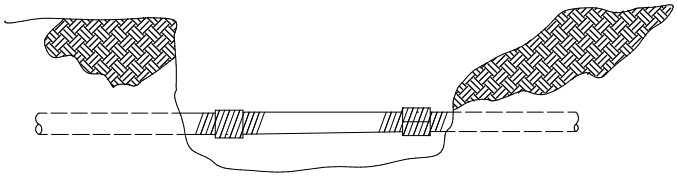
OR



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.

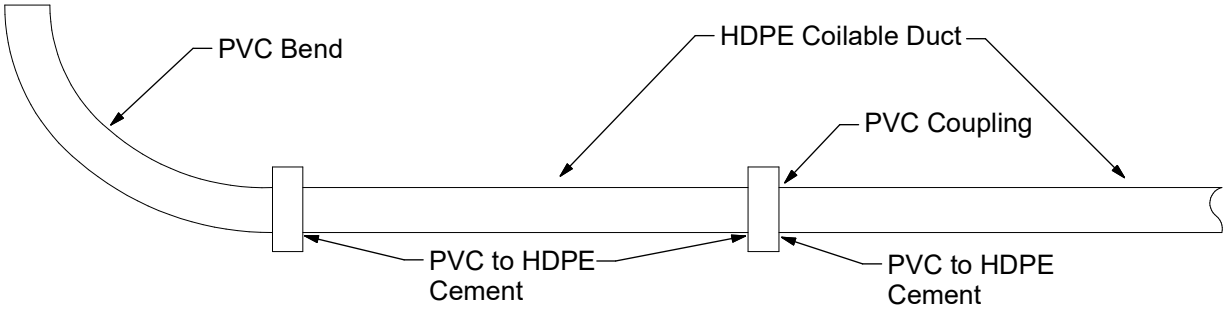
9. Allow cement to set, then carefully backfill from the center of the ditch toward the ends or from one tie in point to the other.

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



INSTRUCTIONS

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

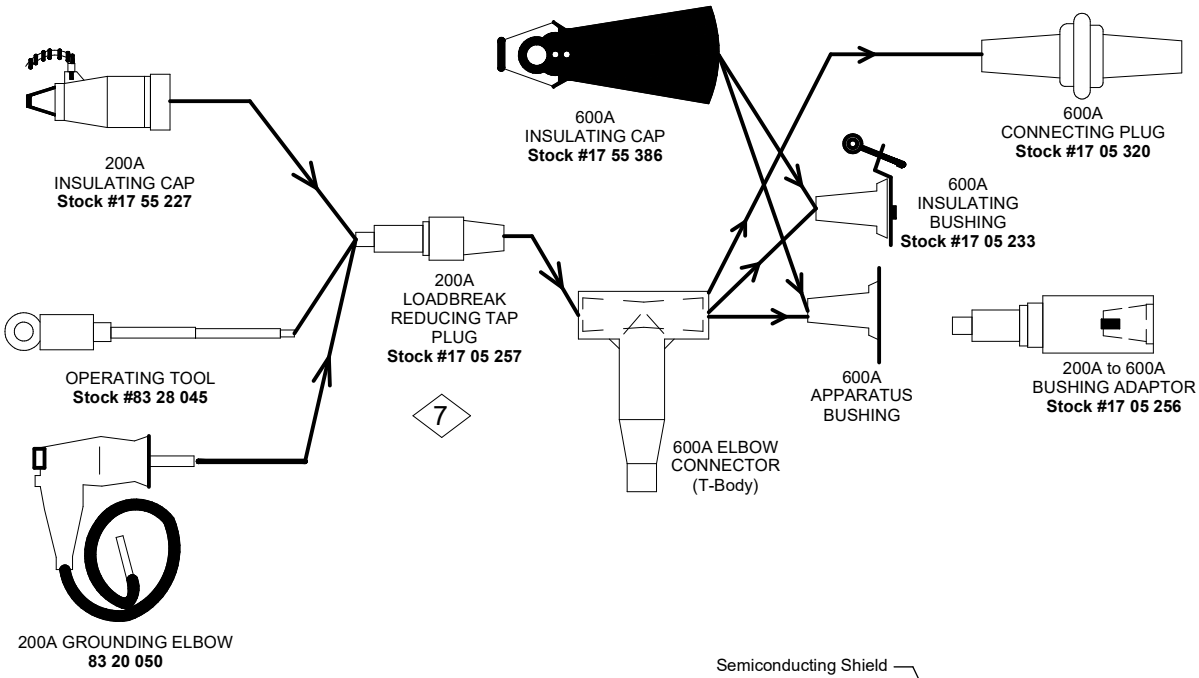
1. Cut the HDPE coilable duct to the desired length at a 90 - degree angle. A straight cut will maximize adhesion.
2. For coilable duct over 3 inches, taper the end at a 45 - degree angle using a knife.
3. Clean the coilable duct and the coupling or bend thoroughly to remove dirt and grime.
4. Using the abrasive cloth provided with the bonding kit, sand the outside of the coilable duct from the end to 1/2 inch 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.
5. Clean the adhesion surfaces again to remove loose material or water.
6. To avoid waste of the epoxy cement clean as many coilable duct ends, couplings, and bends as possible before opening the adhesive cartridge.
7. Place the epoxy cement cartridge into the dispensing tool and snap it into place.
8. Twist the cap off of the epoxy cement cartridge.
9. 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.
10. 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.
11. 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.
12. Smooth any excess epoxy cement. Use gloves to smooth out the cement.
13. 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

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

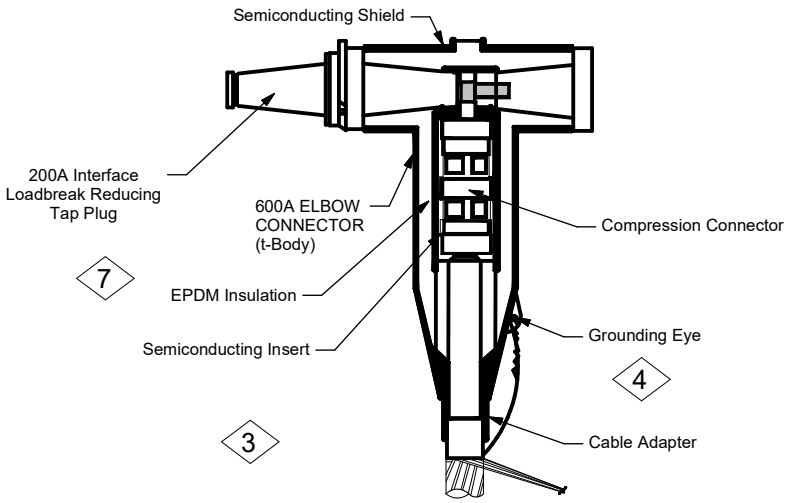
REV	DATE	ENG	DESCRIPTION
2	07/31/21	EJB	Converted to new format
1	04/22/15	EJB	

15. The working temperature for the epoxy cement is 35 Deg. F to 95 Deg. F.
16. The following epoxy cement components are stocked by Ameren:
    A. Starter Kit (Dispensing tool, 2 cartridges, and 10 nozzles) Stock #12 06 126
    B. Case of 12 cartridges and 24 mixing nozzles Stock #12 06 127
    C. Mixing Nozzles (each) Stock #12 06 128



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

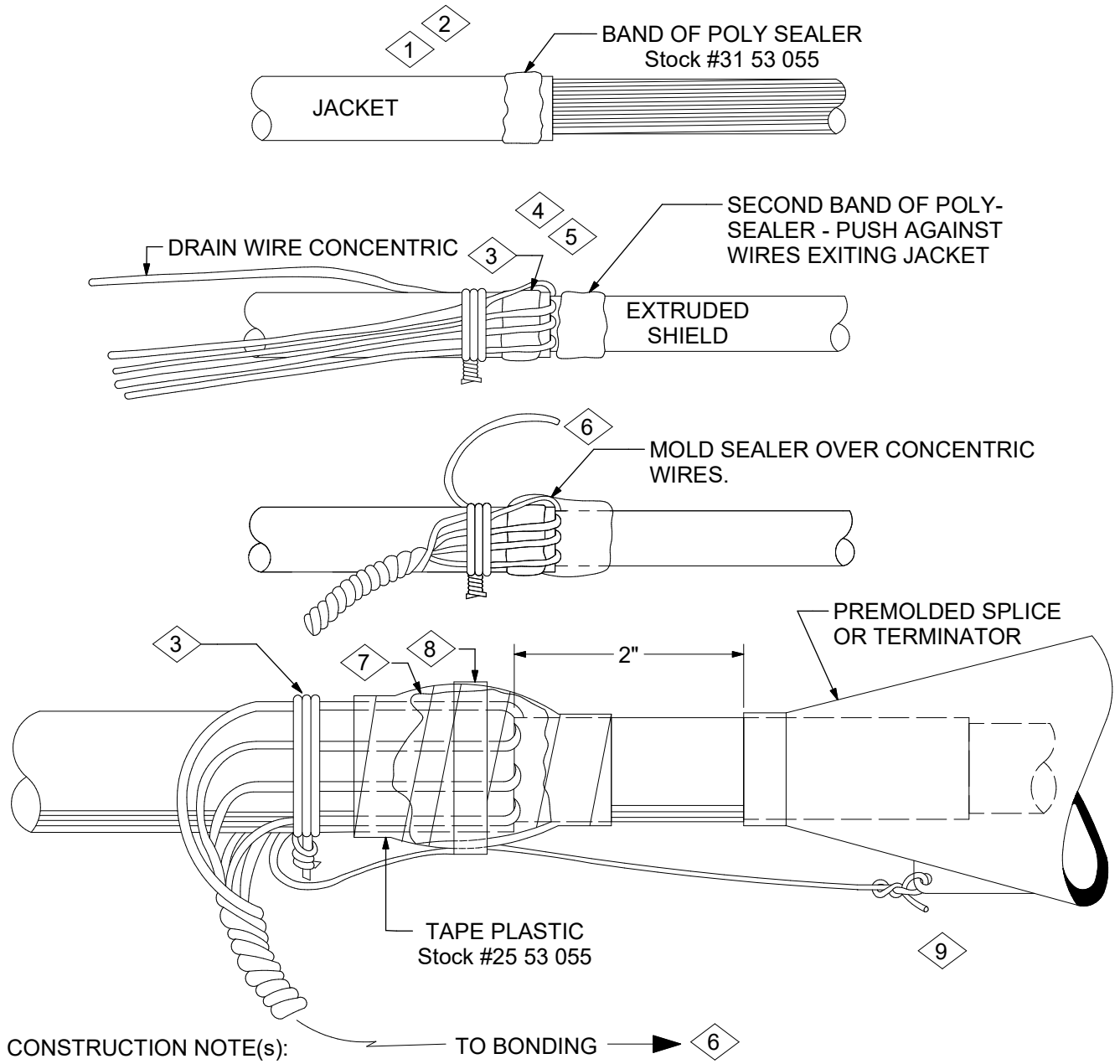
CAUTION: **600 Amp elbows are non-loadbreak elbows and can only be removed after the circuit is de-energized.**



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.



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

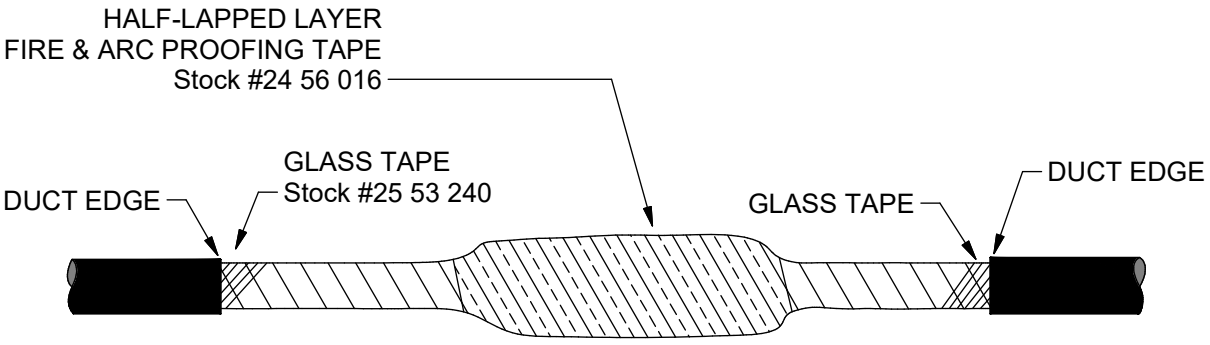
1. All cables in manholes and vaults, where personnel may be present, and the cables are operating at 2400 volts and above should be protected from fire and arcing. Note: Do not cover bond wires or bare neutral wires.

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.

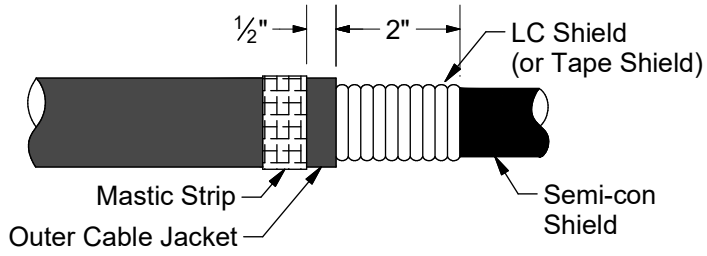


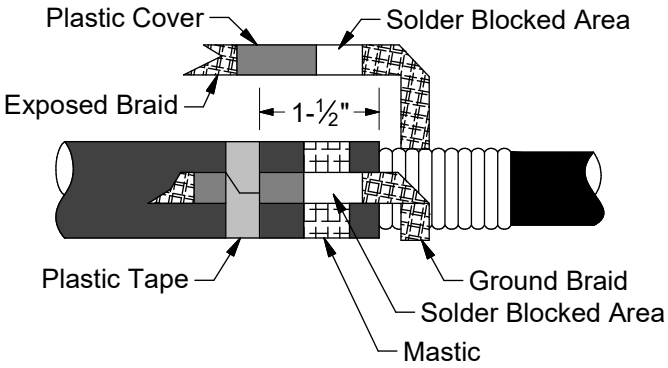
CABLE & SPLICE COVERED

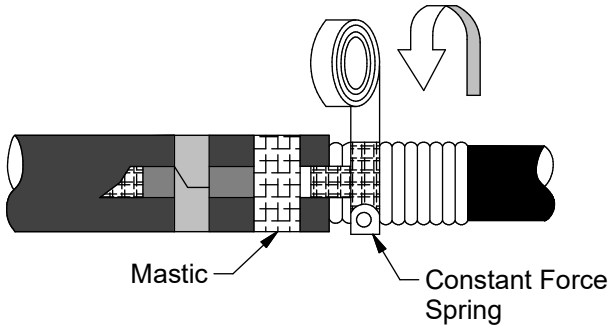
REV	DATE	ENG	DESCRIPTION
2	07/01/21	EJB	Converted to new format
1	01/17/14	HLH	

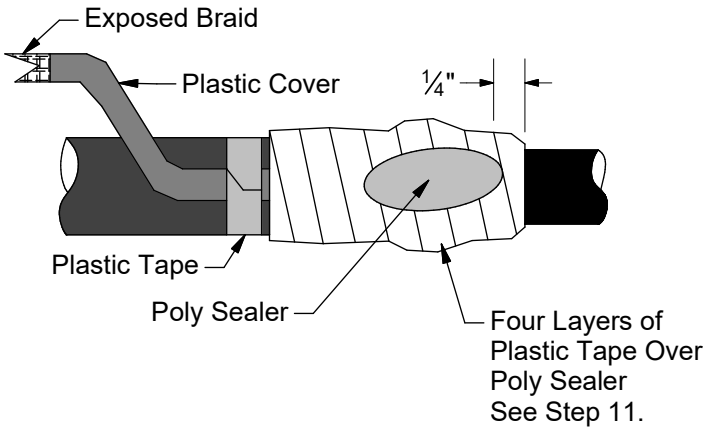
The constant force spring connector can be used on either LC shielded or tape shielded cables.

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

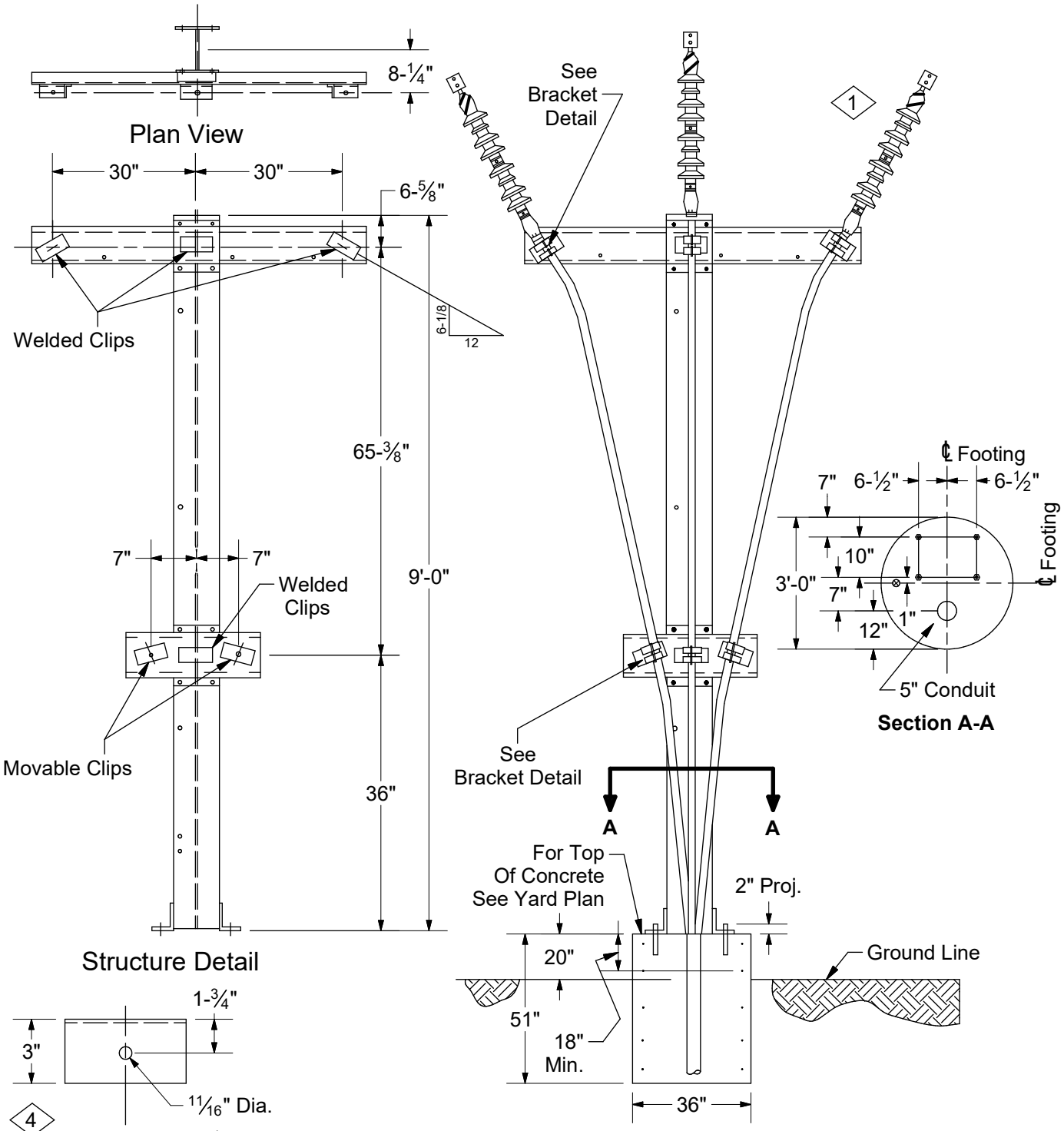
Removal of the semicon shield should be done with the banana peelerscoring tool (Stock #85 32 090). Using the banana peeler to score the semicon is the most controllable method to accomplish this task.

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).



CONSTRUCTION NOTE(s):

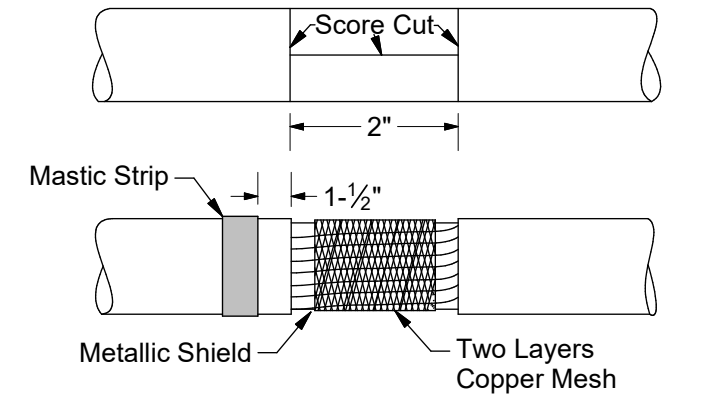
1. Install terminations per DCS **42 44 12 ****.
2. Attach ground leads to the structure.
3. Use support brackets (Stock #23 67 197) for positioning the cables.
4. Clips similar to Stock #23 06 052, may be required when replacing potheads with terminations.

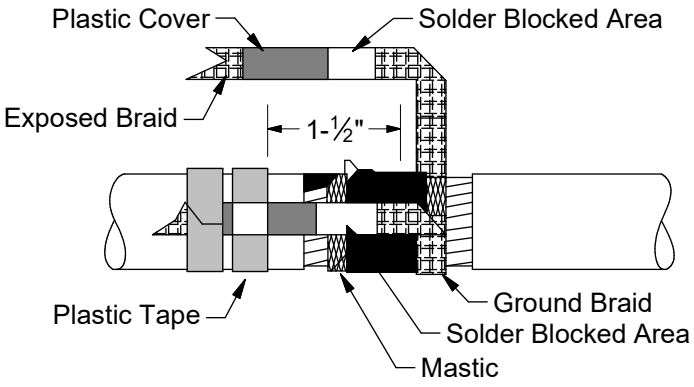
REV	DATE	ENG	DESCRIPTION
3	07/31/21	EJB	Converted to new format
2	08/08/08	HLH	

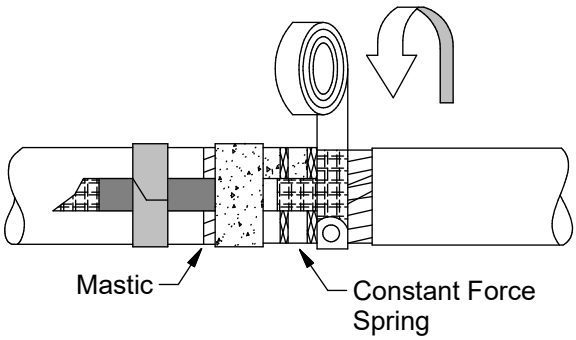
UNDERGROUND INSTRUCTIONS

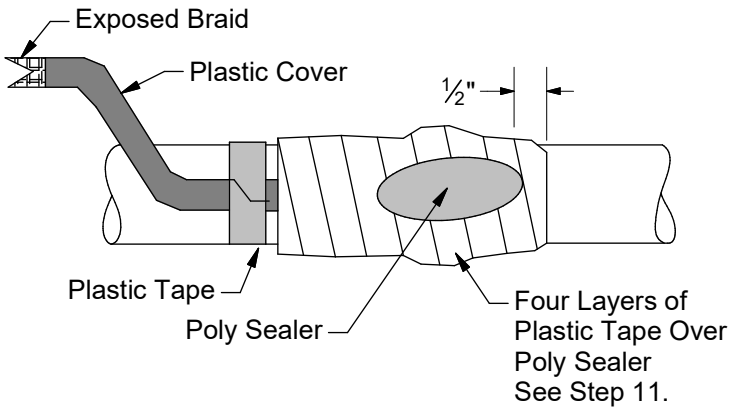
Bond for Grounding Aerial Cable

59 49 90 44
1 of 1









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.

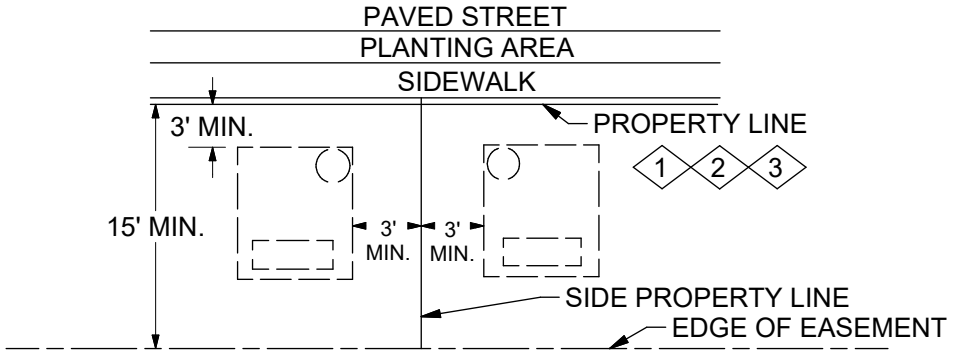
The cable ends will be marked X or Y as shown by the one line by applying a "tag - blue formica triangle - letter Y" (Stock #16 51 080) or "tag - orange formica square - letter X" (Stock #16 51 079), tied with a small copper wire to the cable at the end of the concentric neutral strands or just below 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.

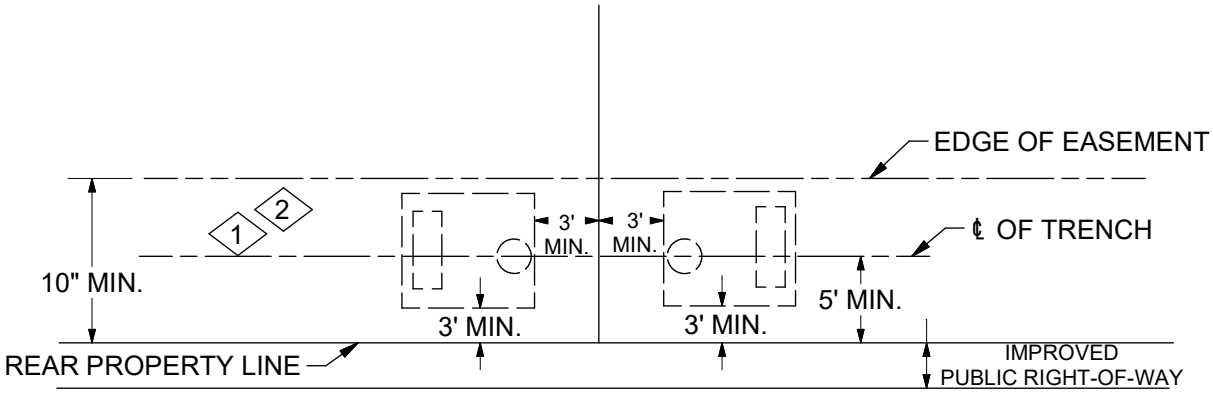
3. Construction personnel shall number each pad mounted switching or fusing compartment by applying pressure sensitive high visibility numbers. These numbers shall be located on the outside of the compartment facing in the direction of most likely access.

   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.

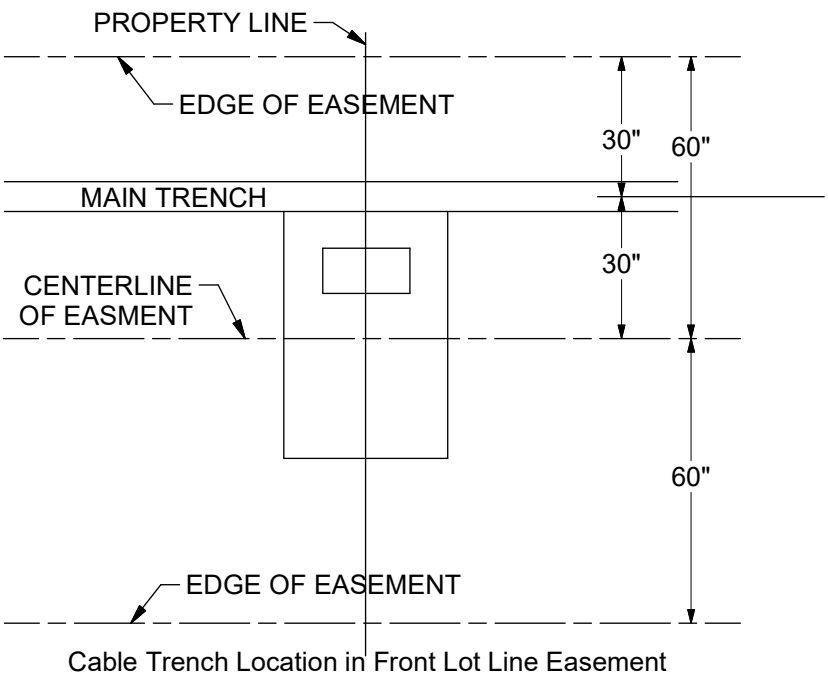
DESIGN NOTE(s):

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.

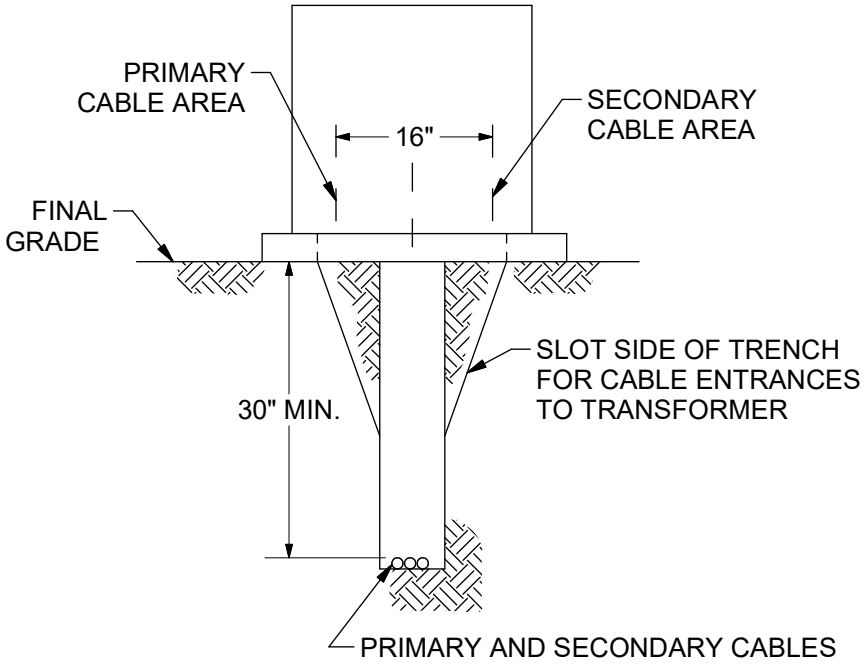
7. In multifamily developments, transformers should be located within 15 feet of a paved surface intended for vehicular traffic. Transformers should be oriented to maintain 10 feet minimum of clear working room on the front (door-side) and 3 feet minimum on the other three sides.

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.

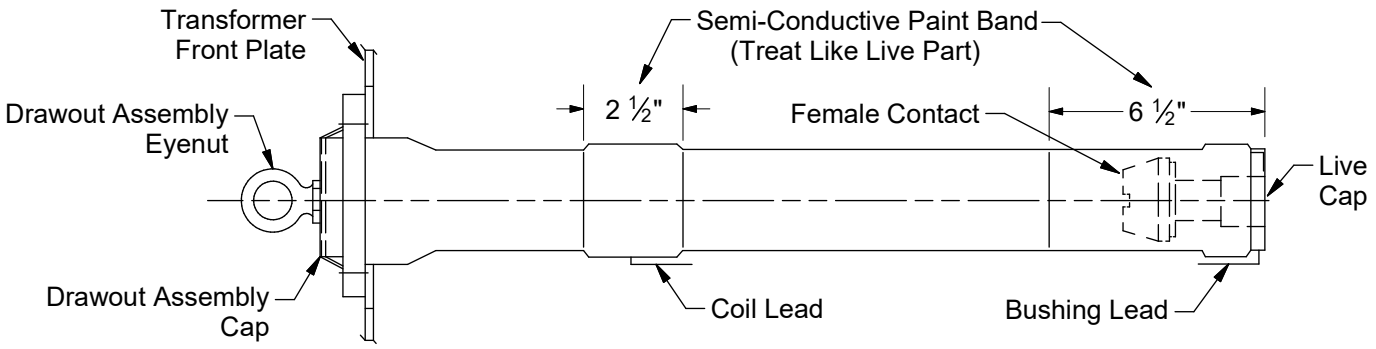


Figure 1 - Loadbreak Dry Well Fuseholder Housing

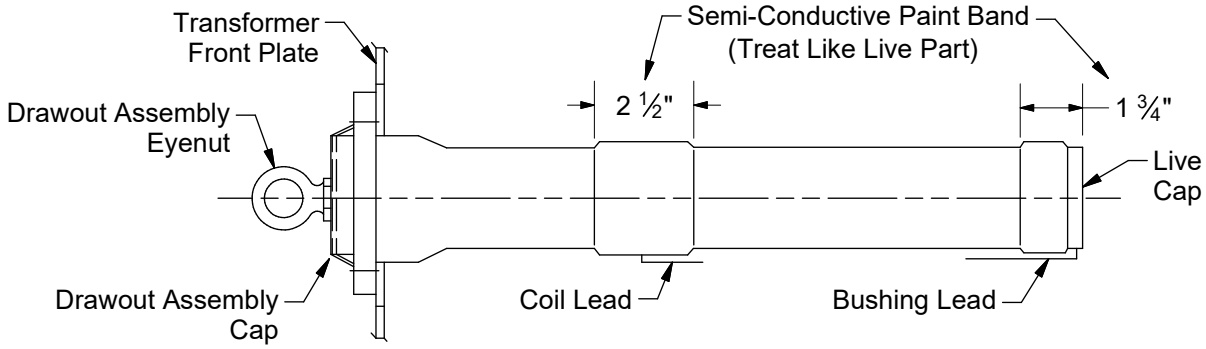


Figure 2 - Non-Loadbreak Dry Well Fuseholder Housing

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

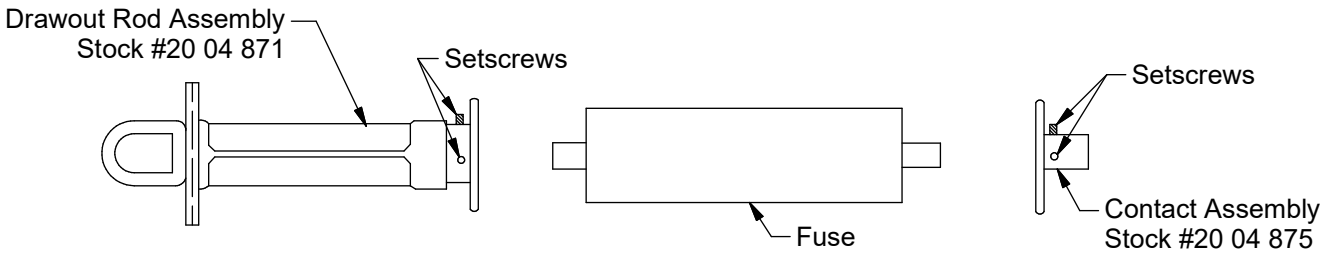
1. Attach live-line tool to the drawout assembly eyenut.

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.

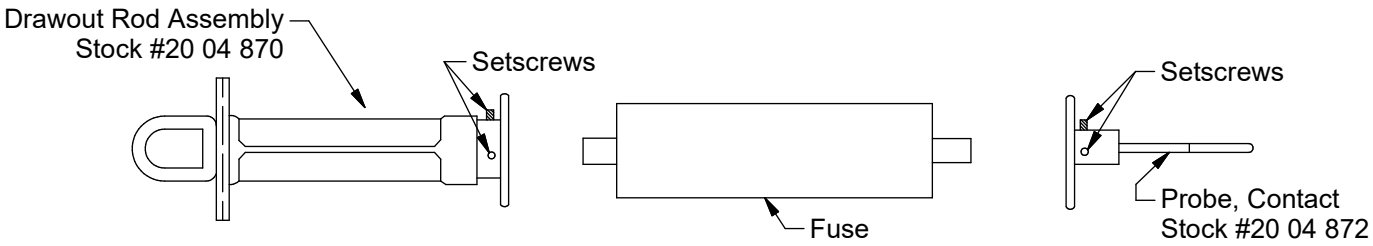
B. Replace the blown fuse with a new fuse of the same rating.

C. Reassemble with the parts oriented as shownabove.

D. Securely tighten the set screws.

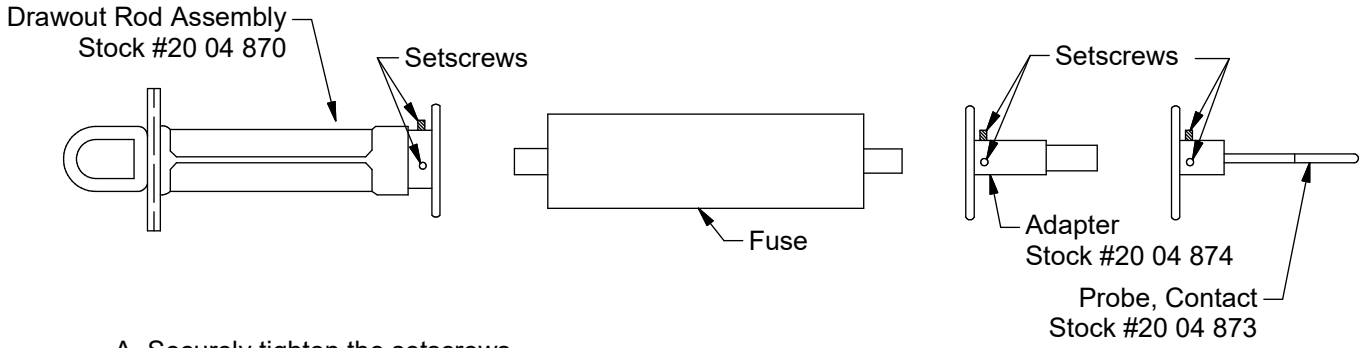
Figure 3 - Non-Loadbreak Fuse Assembly

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.

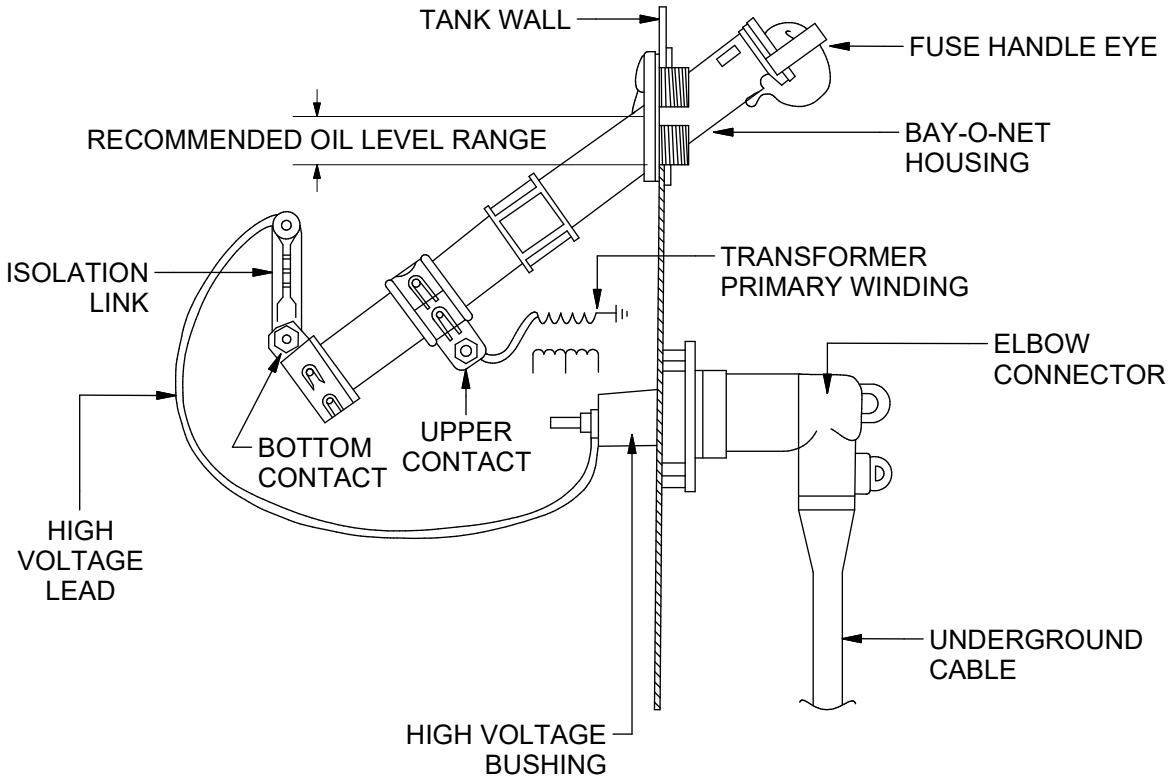
◇4. Fault current interrupting capability of these fuses is 50,000 Amps symmetrical.

◇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.

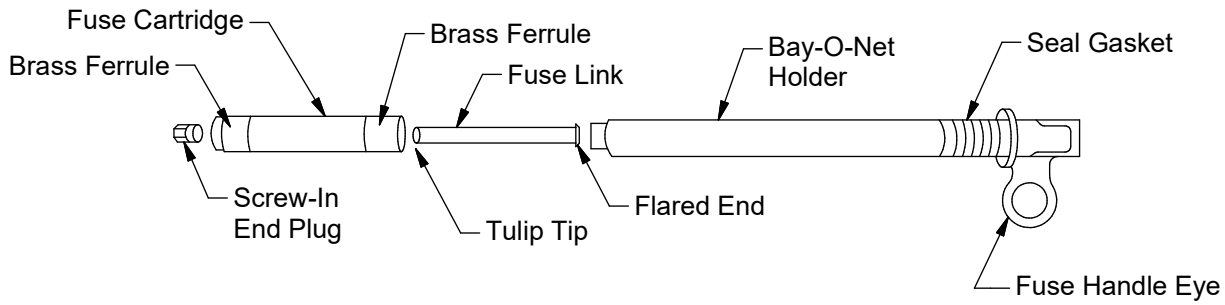
5. Turn away from the transformer and slam the Bay-O-Net home.

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	

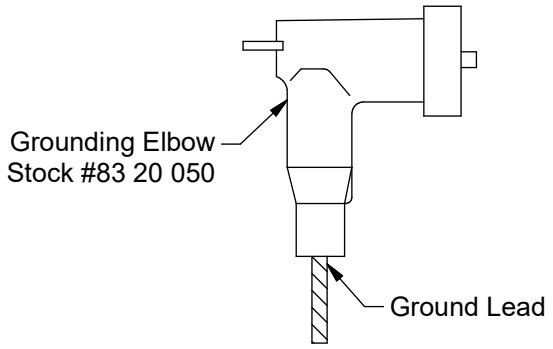


Figure 1

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.

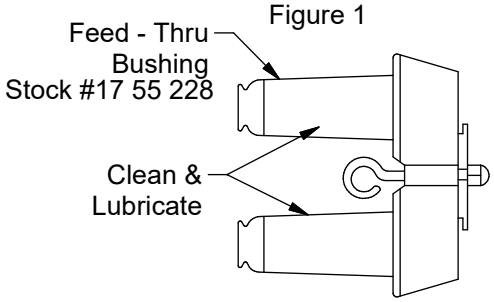


Figure 2

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.

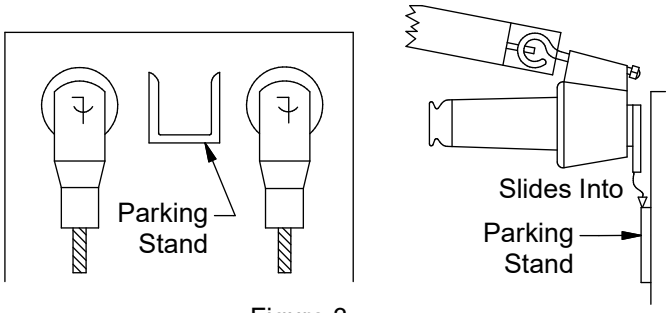


Figure 3

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.

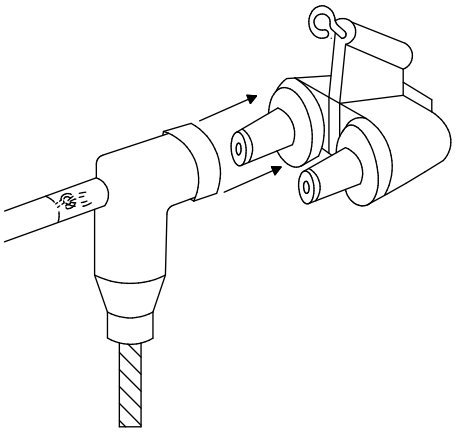


Figure 4

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	

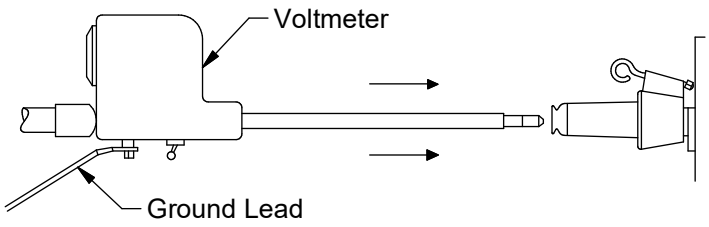


Figure 5

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.

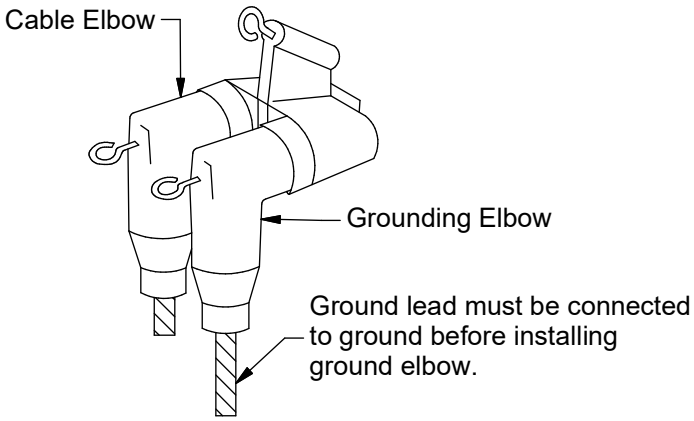


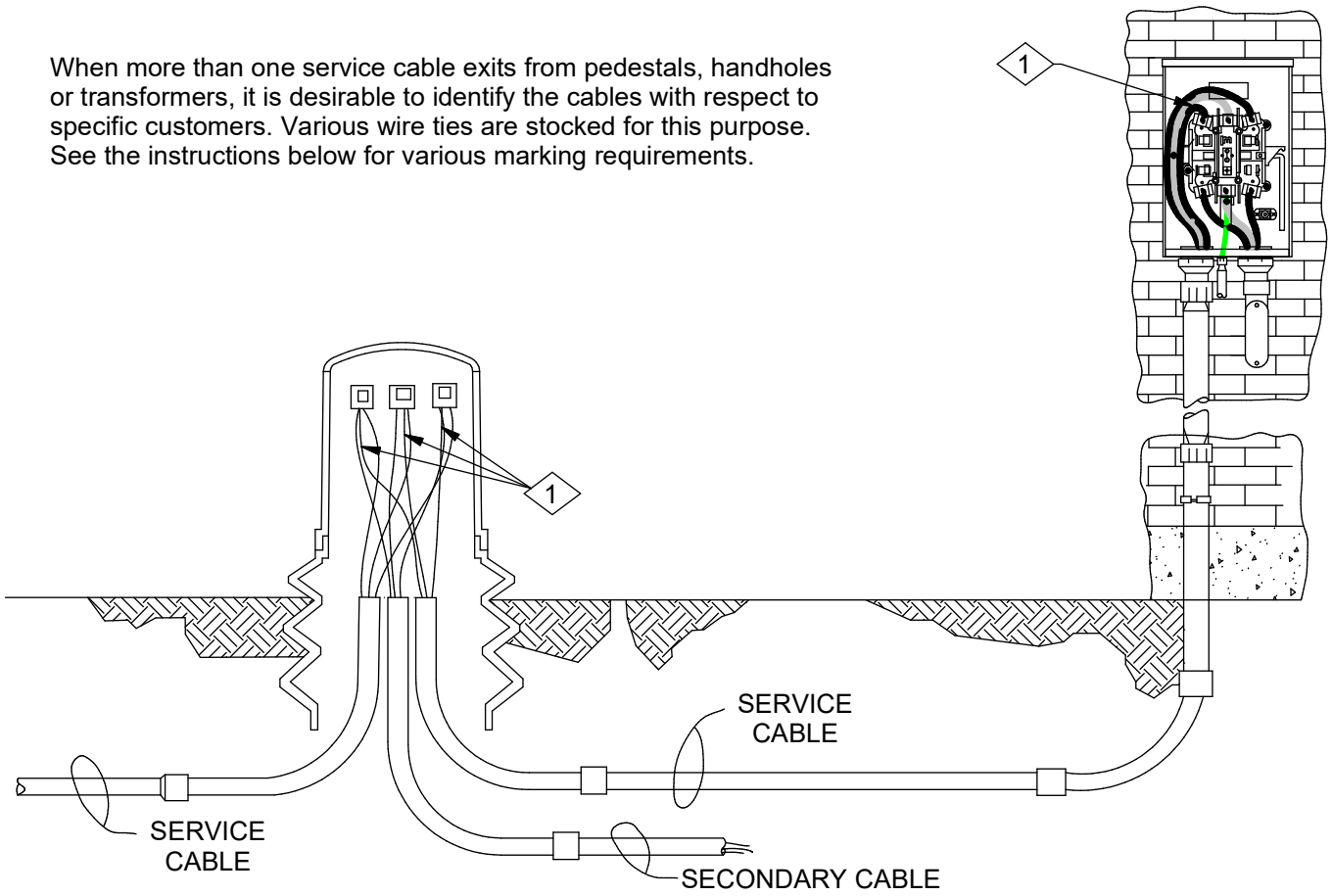
Figure 6

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

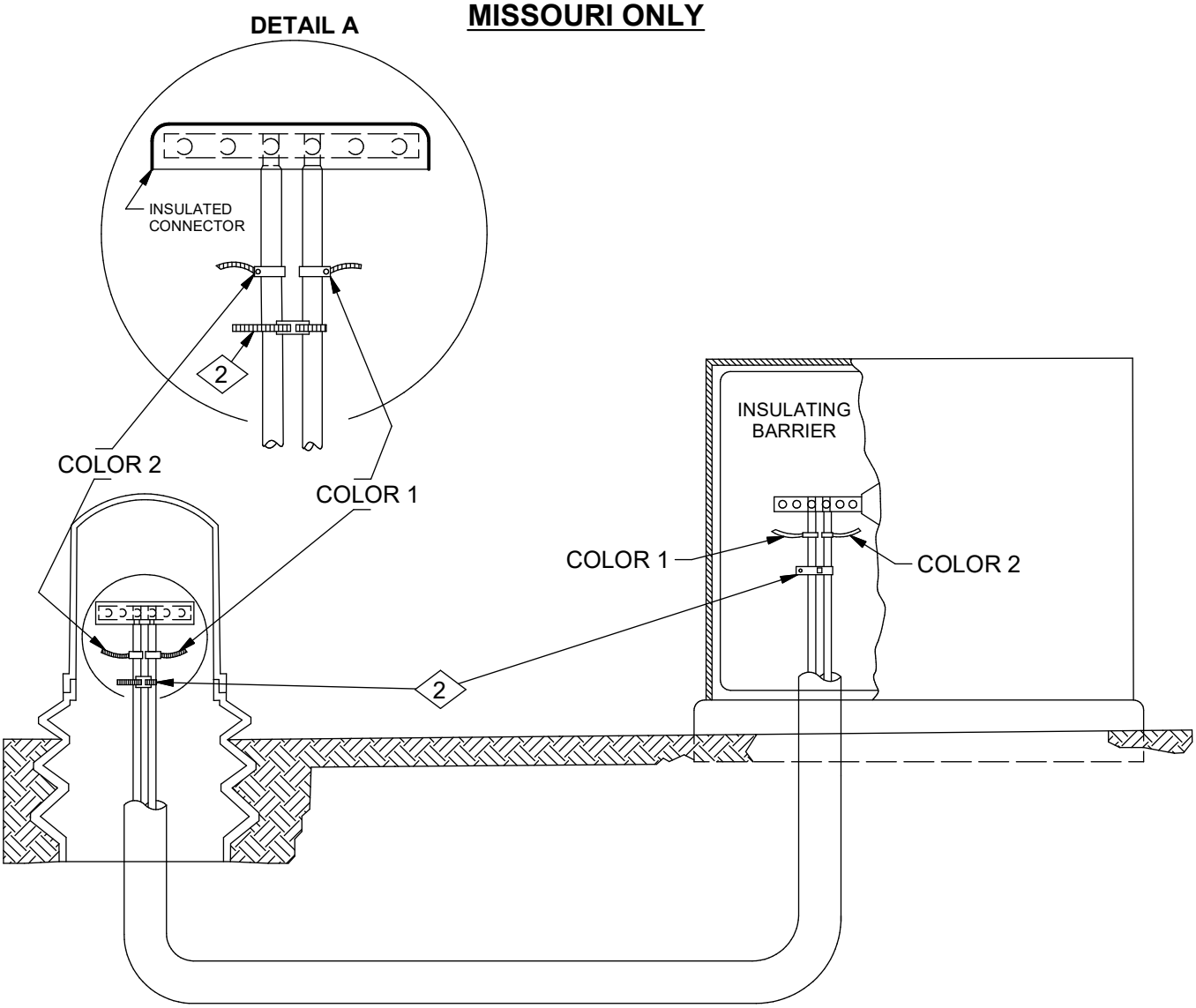
When more than one service cable exits from pedestals, handholes or transformers, it is desirable to identify the cables with respect to specific customers. Various wire ties are stocked for this purpose. See the instructions below for various marking requirements.



	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

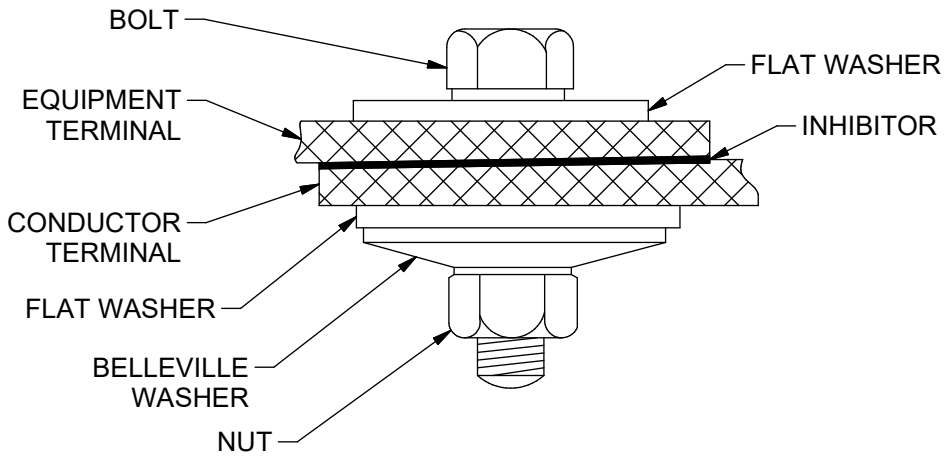
All aluminum contact surfaces that are not either silver plated or tin plated must be properly cleaned prior to making the electrical connection. Clean the contact surfaces with a wire brush to remove the oxide coating. Immediately coat the brushed contact surface with a liberal amount of corrosion inhibitor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

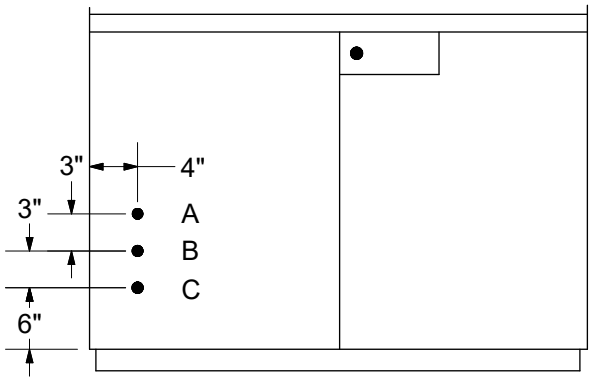


Figure 1

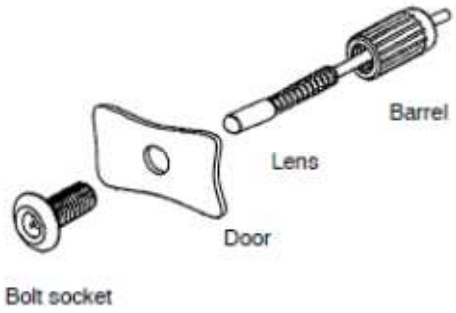


Figure 2

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.

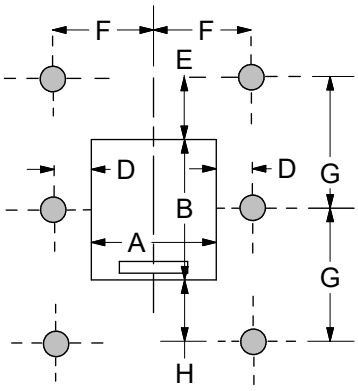
3. Install a faulted circuit indicator (Stock # 60 55 001) onto each outgoing cable/lug.
   Note: Faulted circuit indicator Stock #60 55 024 may be used if the cable/lug OD is larger than 1.57”.

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.

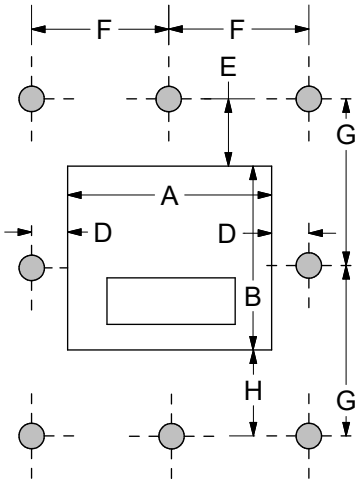
5. Remove the bolt socket from the fiber optic cable barrel. The bolt socket will then be inserted through the 5/16” hole. See Figure 2.

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.

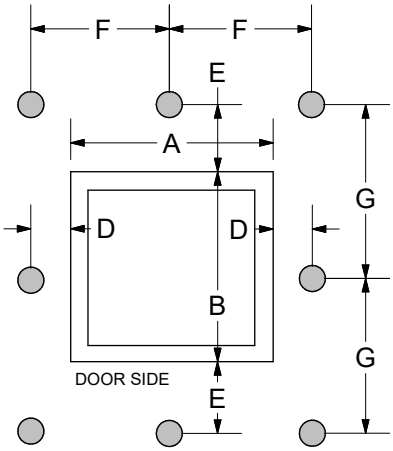
REV	DATE	ENG	DESCRIPTION
2	07/01/21	EJB	Converted to new format
1	03/28/11	HLH	



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.

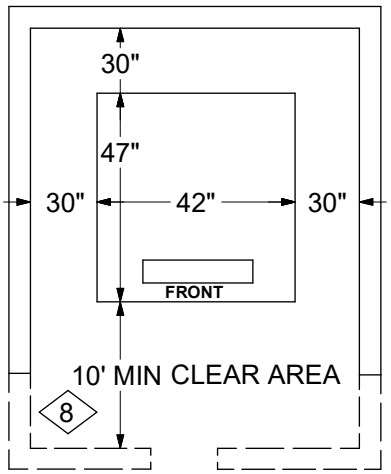
2. Construct the pipe barriers as follows:
   A. Use 8' 6"sticks of steel pipe.
   B. Drill holes with an 8" auger.
   C. Bury 56" of pipe leaving 46" of pipe exposed above grade.
   D. Fill the hole around the pipe with concrete to the top of grade.
   E. Fill the pipe with concrete.
   F. Paint the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

DESIGN NOTES:

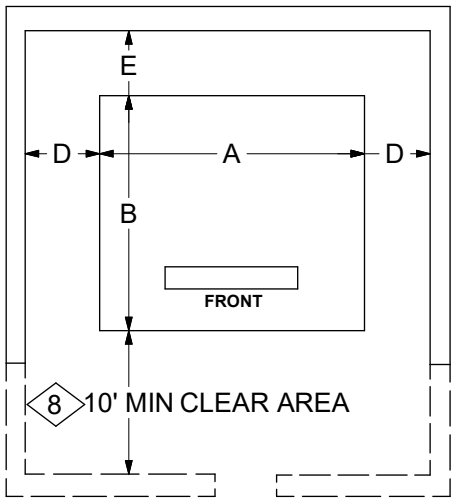
◇3. Dimension (C) is the height or thickness of the pad.

◇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	