

# TABLE OF CONTENTS

<b><u>Section</u></b>	<b><u>Title</u></b>
100	General
200	Overhead Distribution Basic Units
310	1Ø Distribution - Up to 2/0 ACSR
320	2Ø Distribution - Up to 2/0 ACSR
330	3Ø Distribution - Up to 397 AAC
340	3Ø Heavy Distribution - 795 AAC & 336 ACSR
350	Overhead Fiber Optic
400	Overhead Conductor
410	Overhead Secondary
500	Crossarms & Poles
600	Grounding
700	Guys & Anchors
800	Line Devices
900	Metering
1000	Streetlighting
1100	Overhead Transformers
1150	Clearances
1200	Underground General & Trenching
1300	Underground Risers, Cables & Connectors

## **TABLE OF CONTENTS (CONTINUED)**

<b><u>Section</u></b>	<b><u>Title</u></b>
1400	Underground Transformers
1500	Underground J-Boxes & Vaults
1600	1000 MCM Cable
1610	Vault Rooms
1700	Underground Secondary
1790	Transmission Basic Units
1800	Transmission
1910	Joint Use

**100**  
**GENERAL**  
11/11/22

<b>R</b>	SC100	Standards Committee General Information
<b>N</b>	BEC	Bolted Electrical Connections

<b>N</b>	New Standard
<b>R</b>	Redrawn Standard
<b>C</b>	Changed Standard
<b>~</b>	No Change

## SECTION 100

### GENERAL INFORMATION

#### 1. Purpose of Construction Standards

The purpose of Clark Public Utilities Construction Standards is to promote safe, economical, and uniform practices in the design, construction, and maintenance of CPU's electrical systems. Journey-level workers can safely operate and maintain a standard system because of familiarity with materials and equipment, and associated operating practices and ratings. Standards meet the applicable state and federal codes to ensure public safety.

#### 2. Scope of Construction Standards

The CPU Construction Standards provide information applicable to design and construction of the CPU transmission and distribution systems.

CPU Standards are intended to cover the majority of typical installations. They do not cover every possible situation or "one of a kind" installations. The lack of a standard should not pose a problem if good engineering judgment and construction practices are followed.



#### 3. Electrical Codes

All design and construction practices shall meet the provisions of the Washington State Electrical Construction Code and the National Electrical Safety Code in so far as they are applicable. Nothing in these standards is intended to be interpreted so as to conflict with the regulations of the state of Washington or any other regulatory bodies having jurisdiction.

#### 4. Use of Standards

- Standards shall be adhered to on new construction.
- Standards shall be complied with on rebuilding or maintenance. When such practice is impractical, or not economically feasible, changes or additions to the standard practice will be permissible.
- Each department and each individual is expected to become familiar with those standards pertaining to their work and to adhere to those Standards. It is not the intent of standardization to, in any way, impede progress in adopting new ideas in materials, methods, or designs. On the contrary, it is expected that standardization will stimulate the use of such ideas, and through a program of trial use, incorporate into CPU standards those items which improve design and construction practices.

Rev 1: Deleted text for RIO system, corrected grammatical errors and updated language.

	<b>CONSTRUCTION STANDARDS</b> STANDARDS COMMITTEE GENERAL INFORMATION		REVISIONS			
				DATE	ENGR	OPS
	PAGE: 1 of 2	<b>SC100</b>	CAD FILE: SC100	APP: JH	SECTION <b>100</b>	GM
			DATE: 2/22/00			



5. Deviation from Standards

When deviations from the CPU Standards are deemed necessary, the individual responsible for the deviations must provide good reasons and make the changes only with the approval of their supervisor. The Standards Engineer shall be notified of any deviations from the standards that are expected to be repetitive.

While it is desirable that standards be adhered to as much as possible, it is also recognized that items of material and methods of assembly and construction become obsolete because of improvements, developments of new materials, or economic reasons. New and/or better methods of performing work are constantly being derived.

6. Responsibility

Responsibility for adherence to standards rests with the individual directly in charge of the work.


7. Cooperation

All department heads, as well as employees who use the standards in their work, are expected to give the standards program full cooperation and assistance and to help resolve problems that arise.

8. Continuous Improvement

The Constructions Standards program is flexible. Employees are urged to submit suggestions for improvements by either contacting the Standards Engineer or a member of the Standards Committee. Good reasons in support of the proposed change or new standard should be provided when submitting the suggestion. As a courtesy to the submitter, the Standards Committee will review all suggestions and provide a response to the individual originally providing the suggestion.

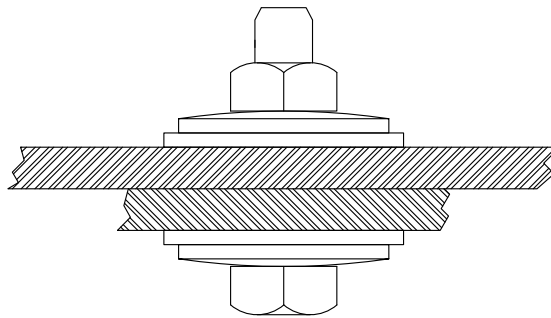
Rev 1: Deleted text for RIO system, corrected grammatical errors and updated language.

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PAGE: 2 of 2	<b>SC100</b>		CAD FILE: SC100	APP: JH DATE: 2/22/00	SECTION <b>100</b>															


## 1. General

- 1.1 Bolted connections can be broken into three categories: aluminum-to-aluminum, aluminum-to-copper and copper-to-copper. Because of the difference in thermal expansion between aluminum and copper alloys, bronze bolts must not be used on aluminum connections and aluminum bolts must not be used on copper connections. Type 304 stainless steel bolts used in conjunction with stainless steel flat and Belleville washers are suitable for all three types of connections and are the recommended standard bolt assembly for connections on CPU's electrical system.
- 1.2 Galvanized bolts, nuts and lock washers shall not be used in making electrical connections. When subjected to short circuit currents and resultant heat, the galvanizing tends to flow from under the threads, reducing the strength of the connection.
- 1.3 Aluminum bolts shall not be reused after they have been torqued.
- 1.4 To determine minimum bolt length, add 7/8" (for nut and washers) to the thickness of the terminals to be bolted together.
- 1.5 Install bolt heads down whenever possible. This will help identify loose bolt connections because they will be visible from ground level.

## 2. Bolted Flat Connections



- 2.1 File away burrs and ridges to reduce corona.
- 2.2 Remove oxide coatings by wire brushing all contact surfaces of the connectors until they are like new. Do not wire brush tin-plated or silver-plated contact surfaces.
- 2.3 Immediately apply a coat of inhibitor to the contact surfaces. Wire brush all of the bolted surfaces through the inhibitor. Apply additional inhibitor. Do not remove the previously applied inhibitor.
- 2.4 Assemble the connection. Use 1/2" stainless steel bolt assemblies. Assemble the bolted connection as shown in the figure above. When connecting aluminum to copper, the aluminum terminal must be placed above the copper terminal to prevent copper salts from eroding the aluminum.
- 2.5 Tighten the bolts alternately and evenly until the Belleville washers are flat then back off until the Bellevilles start to unflatten (about 1/16 of a turn). Refer to the following table for recommended torque values.

	<b>CONSTRUCTION STANDARDS</b> BOLTED ELECTRICAL CONNECTIONS		REVISIONS																	
			<table border="1"> <thead> <tr> <th>DATE</th> <th>ENGR</th> <th>OPS</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </tbody> </table>	DATE	ENGR	OPS														
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## Recommended Torque Values for Commonly Used Bolts

		Stainless Steel 304 or Silicon Bronze		Aluminum 6061 - T6	
Bolt Size - Threads/In	Condition of Threads	Inch-lb	Foot-lb	Inch-lb	Foot-lb
3/8" - 16	Dry	240	20	180	15
	Lubricated	180	15	180	15
1/2" - 13	Dry	480	40	360	30
	Lubricated	360	30	300	25
5/8" - 11	Dry	840	70	720	60
	Lubricated	600	50	480	40
3/4" - 10	Dry	1200	100	1140	95
	Lubricated	1020	85	720	60
7/8" - 9	Dry	1800	150	1560	130
	Lubricated	1440	120	900	75
1" - 8	Dry	2400	200	1920	160
	Lubricated	1920	160	1140	95

### 3.0 Application of Tension for Bolt Clamping





For bolted electrical connections it is necessary to have adequate clamping pressure which is obtained by the correct application of tension to the bolts at the assembly.

There are several ways to achieve the proper tension to a bolt in critical applications. CPU has approved the following methods:

1. Use of torque wrench
2. Turn-of-the-nut method
3. Load indicating washers (Belleville washers)

Tension Measuring Method	% Accuracy	Relative Cost
Feel (Operator's Judgement)	+/- 35	1
*Torque Wrench	+/- 25	1.5
*Turn-of-the-Nut	+/- 15	3
*Load Indicating Washers	+/- 10	7
Fastener Elongation	+/- 3 to 5	15
Strain Gages	+/- 1	20

\* CPU approved methods

	CONSTRUCTION STANDARDS		REVISIONS															
	BOLTED ELECTRICAL CONNECTIONS		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 5%;"></th> <th style="width: 20%;">DATE</th> <th style="width: 20%;">ENGR</th> <th style="width: 20%;">OPS</th> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table>		DATE	ENGR	OPS											
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PAGE: 2 of 3	BEC	CAD FILE: BEC	APP: CRM/GM DATE: 10/6/22	SECTION <b>100</b>														

### 3.1 Use of Torque Wrench

For proper tensioning of bolts, a torque wrench will be used to tighten a bolt by applying the appropriate torque value as given in the table "Recommended Torque Values for Commonly Used Bolts" on page 2.

### 3.2 Turn-of-the-Nut Method

The Industrial Fastener Institute has developed a means of properly tensioning structural steel bolting by what is known as the "Turn-of-the-Nut" method. This method applies only to bolts with UNC threads.



Turn-of-the-nut tightening process encompasses a low initial "threshold" torque to achieve "snug tight" condition followed by a prescribed amount of nut turning to develop the required tension. This technique has gained acceptance for installation of high strength structural bolts and can be extrapolated down for reliable use on smaller fasteners as long as assumptions upon which the technique is based are considered. For instance, the ideal snug tight condition will vary with each application.

The Research Council for Structural Connections published *Specification for Structural Joints Using High-Strength Bolts* (2014) which recommends a turn count based on the length and diameter of the steel bolt in the connection. According to Table 8.2 in the RCSC specification, when installing a 1/2" bolt use 1/2 turns for lengths 2-4" and 2/3 turns for lengths 4-6".

### 3.3 Load Indicating Washers (Belleville Washers)

Not applicable to aluminum bolts. For non-aluminum bolts, Belleville spring washers and wide-series flat steel washers shall be used. Care shall be taken to install the Belleville washers with the crown up toward the nut or bolthead, with the concave side at the Belleville bearing on a heavy duty, wide-series flat washer with a larger diameter than the Belleville. Bellevilles shall be tightened to flat and then backed off 1/16 of a turn.

For proper tensioning of bolts, a Belleville washer will be used that has a load-to-flat value approximately equal to but not exceeding 80% of the yield strength of the bolt.

	<b>CONSTRUCTION STANDARDS</b> BOLTED ELECTRICAL CONNECTIONS		REVISIONS			
				DATE	ENGR	OPS
	PAGE: 3 of 3	<b>BEC</b>	CAD FILE: BEC	APP: CRM/GM	SECTION	
			DATE: 10/6/22	<b>100</b>		

## 200

### OVERHEAD DISTRIBUTION BASIC UNITS

11/11/2016

<b>C</b>	BR1	22" Multi-purpose Bracket with Clip & Insulator for Slack Span
<b>C</b>	BR3	22" Multi-purpose Bracket with Clip for Tension Span
<b>C</b>	BR10	1000MCM Cable Termination Mounting Bracket
<b>C</b>	CR20A	Single 8' Crossarm - Flat Brace
<b>C</b>	CR21A	Double 8' Crossarm - Flat Braces
<b>C</b>	CR23A	Single Crossarm - Angle Brace
<b>C</b>	CR24A	Double Crossarm - Angle Braces
<b>C</b>	CR26A	Pre-assembled Deadend, 8' & 10', 3-Position - 397 AAC Max Wire
<b>C</b>	CR27B	Pre-assembled Deadend, 10', 4-Position - 397 AAC Max Wire
<b>C</b>	CR28A	Pre-assembled Deadend, 8' & 10', 3-Position - 795 AAC Max Wire
<b>C</b>	CR29B	Pre-assembled Deadend, 10', 4-Position - 795 AAC Max Wire
<b>C</b>	CRA50A	Single Crossarm - Alley Arm
<b>C</b>	CRA52A	Double Crossarm - Alley Arm
<b>C</b>	PR1	Pole-Top Pin - Single Insulator
<b>C</b>	PR2	Pole-Top Pin - Double Insulators
<b>C</b>	PR4	Single Crossarm Pin
<b>C</b>	PR5	Single Crossarm Angle Pin
<b>C</b>	PR19	Double Crossarm Pin
<b>C</b>	PR20	Horizontal Jumper Support
<b>C</b>	PR21	Deadend with Eyebolt
<b>C</b>	PR22	Deadend with Long Eyebolt
<b>C</b>	PR23	Deadend with Extension
<b>C</b>	PR24	Deadend
<b>C</b>	PR25	Deadend with Extension
<b>N</b>	New Standard	
<b>R</b>	Redrawn Standard	
<b>C</b>	Changed Standard	
<b>~</b>	No Change	

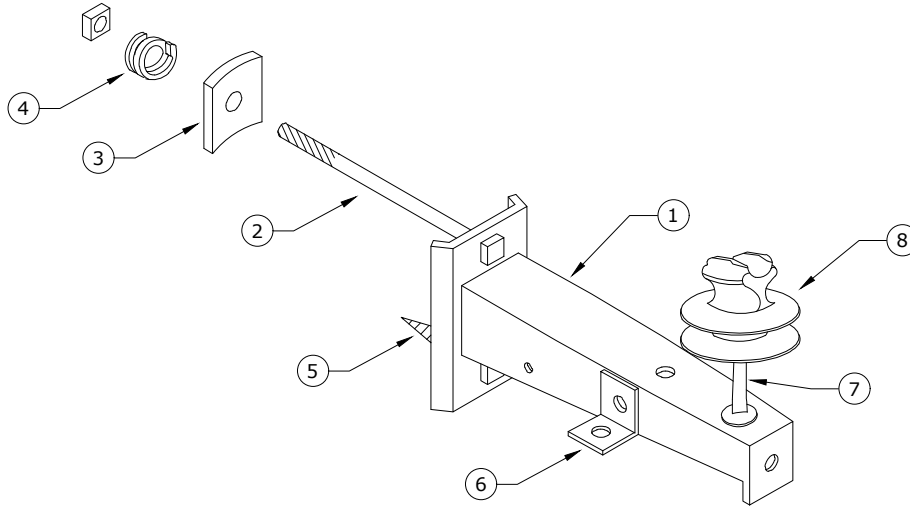
## **200 (CONTINUED)**

### **OVERHEAD DISTRIBUTION BASIC UNITS**

11/11/2016

<b>C</b>	PR40	Pole-Top Pin Single Vise-Top Insulator
<b>C</b>	PR41	Pole-Top Pin - Double Vise-Top Insulators
<b>C</b>	PR42	Single Vise-Top Insulator on Crossarm
<b>C</b>	PR43	Double Vise-Top Insulators on Crossarms
<b>C</b>	PR44	Single Angle Vise-Top Insulator on Crossarm
<b>C</b>	PR56	Single Clamp-Top Twiggy Arm 21"
<b>C</b>	PR57	Double Clamp-Top Twiggy Arm 21"
<b>C</b>	PR58	Single Clamp-Top Twiggy Arm 27"
<b>C</b>	PR59	Double Clamp-Top Twiggy Arm 27"
<b>C</b>	PR60	Single Twiggy Arm 18"
<b>N</b>	PR60V	Single Twiggy Arm 18" Vise-Top Insulator
<b>C</b>	PR61	Double Twiggy Arm 18"
<b>N</b>	PR61V	Double Twiggy Arm 18" Vise-Top Insulator
<b>C</b>	PR62	Single Twiggy Arm 24"
<b>N</b>	PR62V	Single Twiggy Arm 24" Vise-Top Insulator
<b>C</b>	PR63	Double Twiggy Arm 24"
<b>N</b>	PR63V	Double Twiggy Arm 24" Vise-Top Insulator
<b>C</b>	S1	Neutral Tangent Spool
<b>C</b>	S2	Neutral Angle Spool
<b>C</b>	S3	Heavy Neutral Angle Spool
<b>C</b>	S4,S4A	Slack Neutral Conductor Deadends
<b>C</b>	S10	Neutral Deadend
<b>C</b>	S11	Neutral Double Deadend
<b>C</b>	S12	Single White Neutral Insulator on Crossarm
<b>C</b>	S13	Double White Neutral Insulators on Crossarms
<b>C</b>	S14	Single Angled White Neutral Insulator on Crossarm

**N** New Standard  
**R** Redrawn Standard  
**C** Changed Standard  
~ No Change



PREFORMED TIES	S/N
2/0 ACSR	2242
#2 ACSR	2241

Rev. 7 - Changed to Polymer insulator and updated material list.

ITEM NO.	DESCRIPTION	BR1	
		QTY.	S/N
1	Bracket, Steel, Galv., Multi-purpose, 22"	1	2262
2	Bolt, Machine, 5/8" x 16" Galv., 12,400 lbs Ultimate Tensile	1	157
3	Washer, Square, Curved, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
4	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217
5	Screw, Lag, 1/2" x 4 1/2" Twist Drive, Drive Point *	1	1132
6	Adapter, Steel, Galv., Clip Angle *	1	2248
7	Pin, Insulator, Short Shank 6" Above Arm *	1	2249
8	Insulator, Pin, C Neck, Polymer	1	1968*



**CONSTRUCTION STANDARDS**  
**BASIC UNITS**  
**22" MULTI-PURPOSE BRACKET**  
**WITH CLIP AND INSULATOR FOR SLACK SPAN**

REVISIONS			
DATE	ENGR	OPS	
12/17/04	LB	AH	4
3/19/07	LB	AH	5
8/25/09	CM	AH	6
12/22/16	CM	DK	7

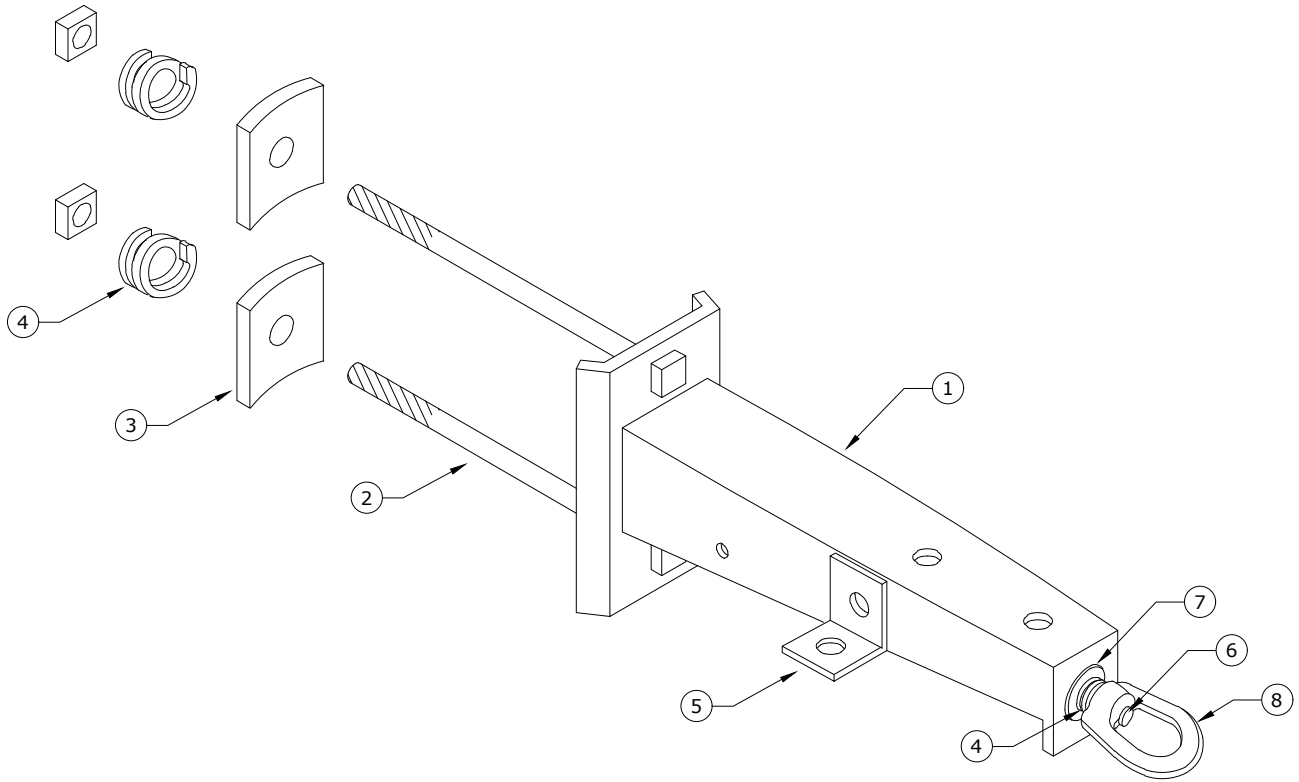
PAGE:  
1 of 1

**BR1**

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BR1

APP: TRO  
DATE: 7/17/96

SECTION  
**200**



## 22" BRACKET

(MULTI-PURPOSE W/ CUTOUT CLIP)

**Note:** For tension applications.

Rev. 6 - Corrected material list and drawing.

ITEM NO.	DESCRIPTION	BR3	
		QTY.	S/N
1	Bracket, Steel, Galv., Multipurpose, 22"	1	2262
2	Bolt, Machine, 5/8" x 16" Galv., 12,400 lbs Ultimate Tensile	2 *	157
3	Washer, Square, Curved, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2 *	1392
4	Washer, Lock, Spring, Double Coil, Galv., 5/8"	3 *	2217
5	Adapter, Steel, Galv., Clip Angle *	1	2248
6	Bolt, Machine, 5/8" x 2" Galv., 12,400 lbs Ultimate Tensile	1	149 *
7	Washer, Flat Round Galv. 5/8"	1	1395 *
8	Nut, Eye Oval 5/8" Galv.	1	913

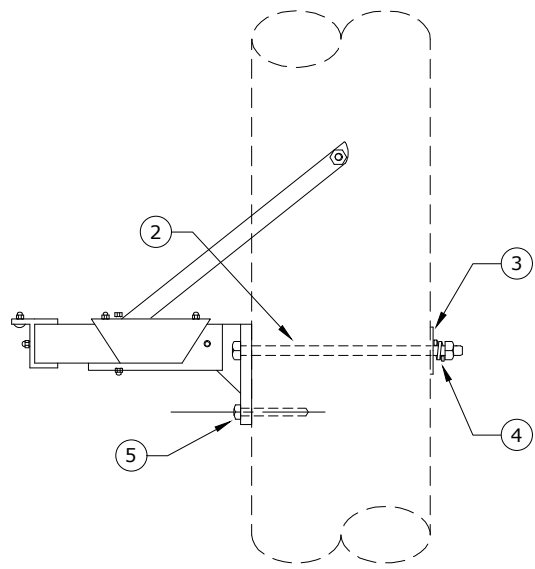
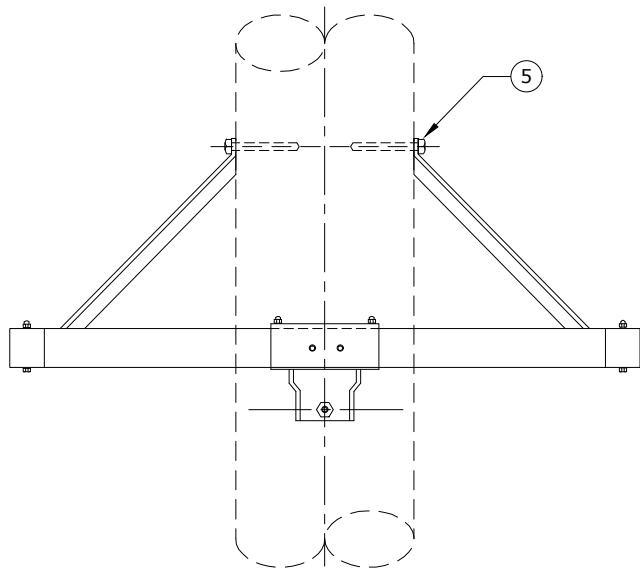
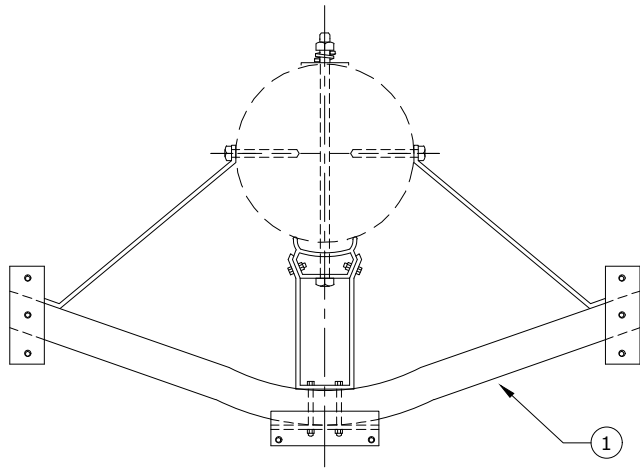


**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 22" MULTI-PURPOSE BRACKET  
 WITH CLIP FOR TENSION SPAN

REVISIONS			
DATE	ENGR	OPS	
2/23/00	HWH	MA	
12/17/04	LB	AH	
10/17/08	CM	AH	
11/11/16	KJP		

PAGE: 1 of 1	<b>BR3</b>	CAD FILE: BR3	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>APP: TRO</td> <td>SECTION: 200</td> </tr> <tr> <td>DATE: 7/17/96</td> <td></td> </tr> </table>	APP: TRO	SECTION: 200	DATE: 7/17/96	
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Rev. 2 - Changed to 48" bracket.

ITEM NO.	DESCRIPTION	BR10	
		QTY.	S/N
1	Bracket, Terminator Mount, 48", 1000 MCM *	1	2842 *
2	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	1	156
3	Washer, Square, Curved, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
4	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217
5	Screw, Lag, 1/2" x 4 1/2", Twist Drive, Drive Point *	3	1132
6	Support, Cable, 1000 MCM *	3	2229



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 1000MCM CABLE TERMINATION  
 MOUNTING BRACKET

PAGE:  
1 of 1

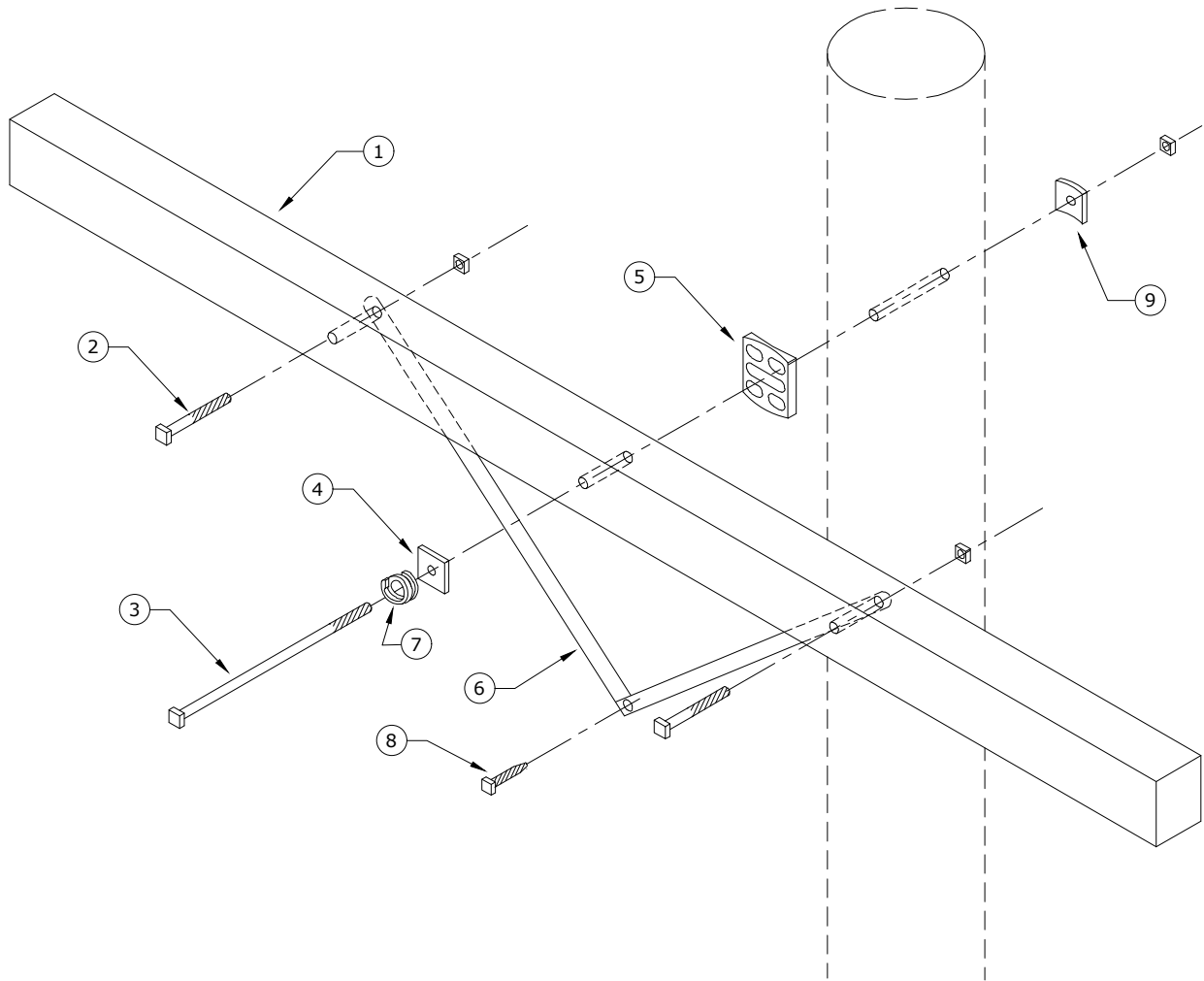
**BR10**

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REVISIONS			
DATE	ENGR	OPS	
10/7/05	LB	AH	
2/22/16	KJP		

APP: TRO	SECTION
DATE: 7/17/96	<b>200</b>



(FLAT BRACE)

Rev. 4 - Updated material.

ITEM NO.	DESCRIPTION	CR20A	
		QTY.	S/N
1	Arm, Cross (Distr.), 8' x 3 3/4" x 4 3/4"	1	25
2	Bolt, Carriage, 3/8" x 5", Galv., 4250 lbs Ultimate Tensile *	2	78
3	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile *	1	157
4	Washer, Square, Flat 5/8", 2 1/4" x 2 1/4"	1	1412
5	Gain, Pole Plastic	1	709
6	Brace, Crossarm 28", Galv. Stl *	2	205
7	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217
8	Screw, Lag 1/2" x 4 1/2", Twist Drive, Drive Point *	1	1132
9	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392



## CONSTRUCTION STANDARDS

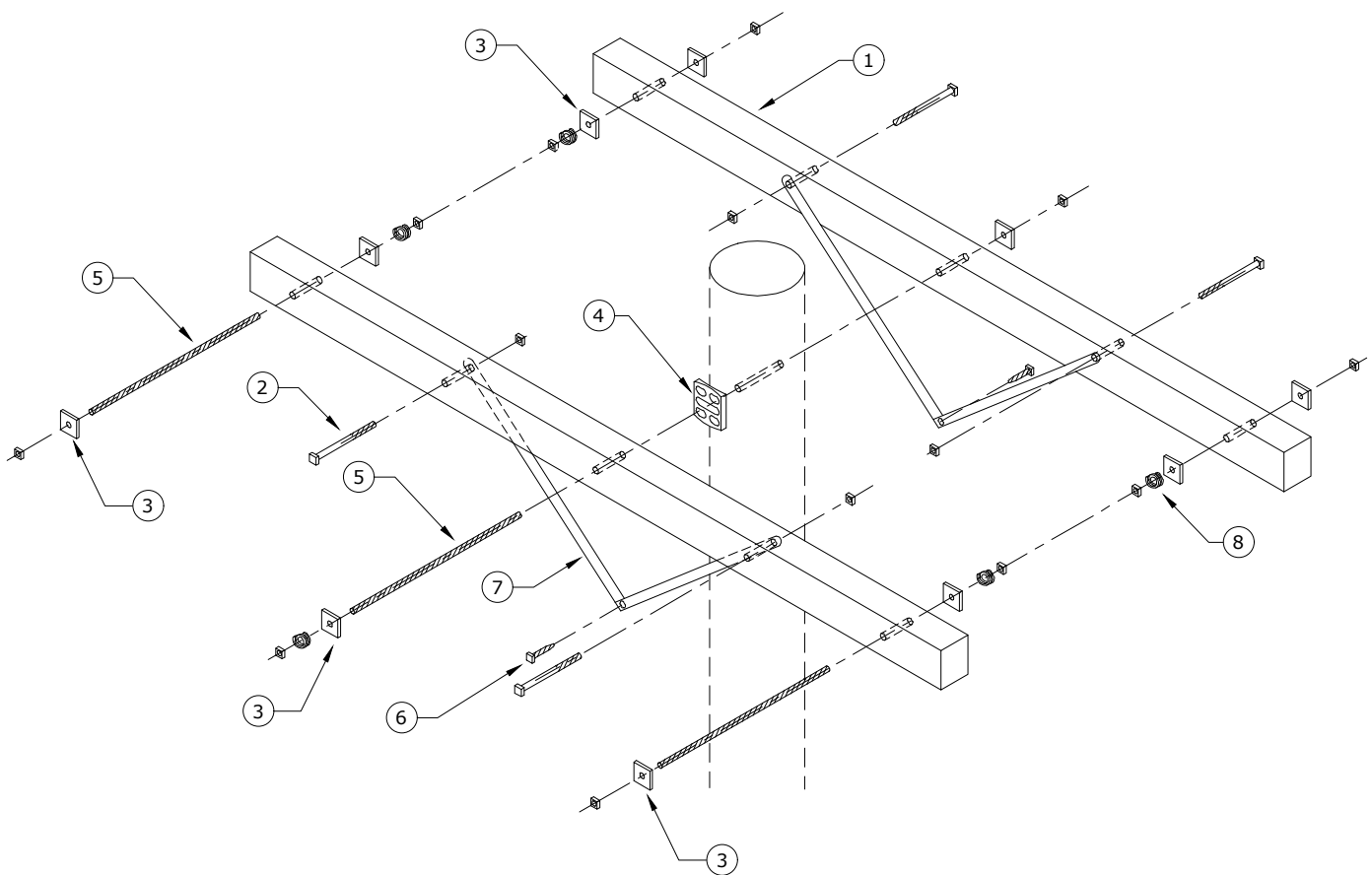
BASIC UNITS  
SINGLE 8' CROSSARM  
FLAT BRACE

PAGE:  
1 of 1

**CR20A**

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CR20

REVISIONS											
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2	2/23/00	HWH	MA								
3	10/7/05	LB	AH								
4	2/24/16	KJP									
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APP:	ELM	SECTION									
DATE:	1/31/80	<b>200</b>									



(FLAT BRACES)

Rev. 5 - Updated material.

ITEM NO.	DESCRIPTION	CR21A	
		QTY.	S/N
1	Arm, Cross (Distr.), 8' x 3 3/4" x 4 3/4"	2	25
2	Bolt, Carriage, 3/8" x 5", Galv., 4,250 lbs Ultimate Tensile *	4	78
3	Washer, Square, Flat 5/8", 2 1/4" x 2 1/4"	10	1412
4	Gain, Pole Plastic	1	709
5	Bolt, Double Arm, 5/8" x 20", Galv., 12,400 lbs Ultimate Tensile *	3	83
6	Screw, Lag 1/2" x 4 1/2", Twist Drive, Drive Point *	2	1132
7	Brace, Crossarm 28", Galv. Stl. *	4	205
8	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	5	2217



## CONSTRUCTION STANDARDS

BASIC UNITS  
DOUBLE 8' CROSSARM  
FLAT BRACES

PAGE:  
1 of 1

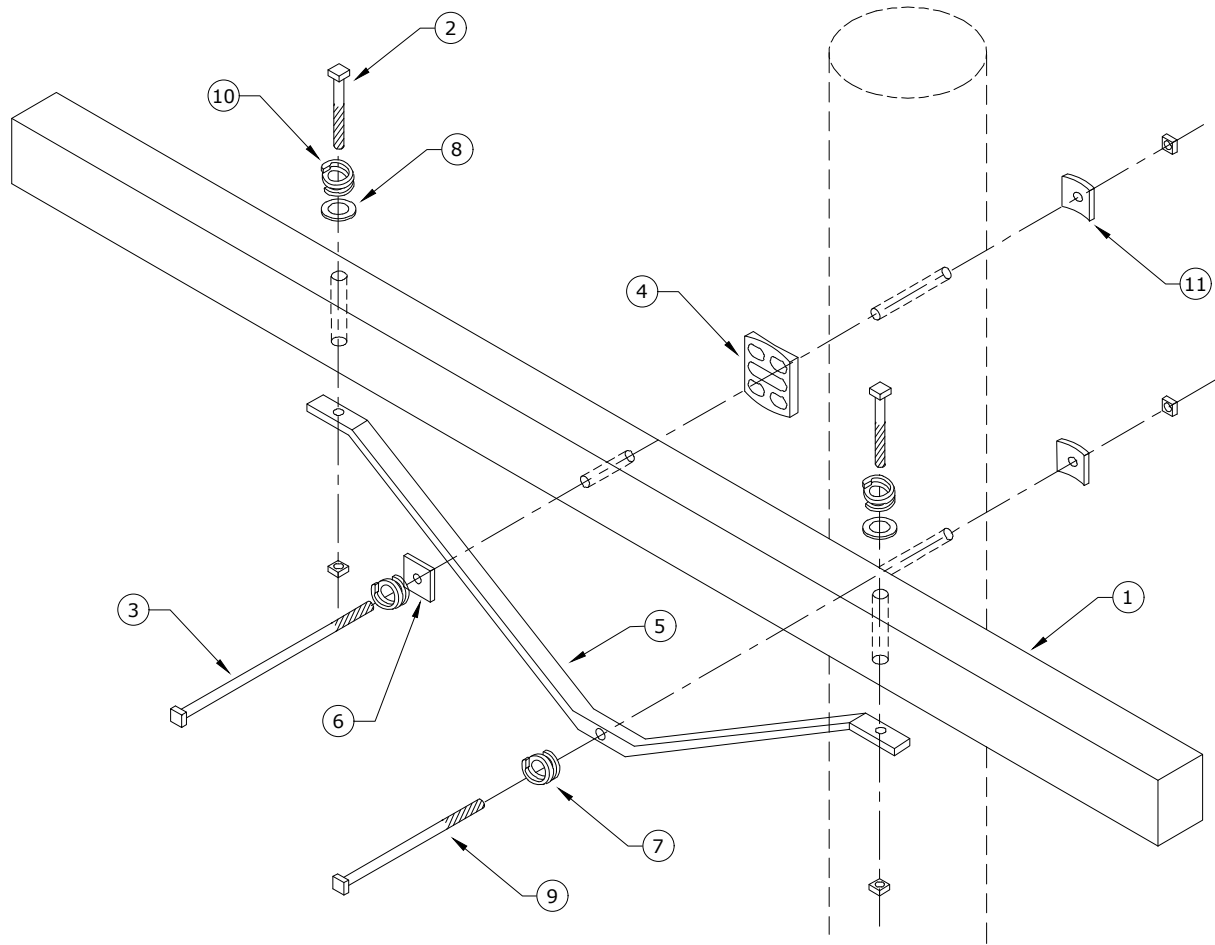
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CR21

### REVISIONS

REV	DATE	ENGR	OPS
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3	3/12/02	JEH	
4	9/19/05	LB	AH
5	2/24/16	KJP	

APP: ELM	SECTION
DATE: 1/31/80	200



(ANGLE BRACE)

Rev. 4 - Updated material.

ITEM NO.	DESCRIPTION	8'Arm		10'Arm	
		CR23A		CR23B	
		QTY.	S/N	QTY.	S/N
1	Arm, Cross (Distr.), 3 3/4" x 4 3/4"	1	25	1	26
2	Bolt, Machine, 1/2" x 7", Galv., 7800 lbs Ultimate Tensile *	2	143	2	143
3	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile *	1	157	1	157
4	Gain, Pole Plastic	1	709	1	709
5	Brace, Angle (60" or 72")	1	203	1	204
6	Washer, Square, Flat 5/8", 2 1/4" x 2 1/4"	1	1412	1	1412
7	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	2	2217	2	2217
8	Washer, Flat, Round, Galv., 1/2"	2	1394	2	1394
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile *	1	155	1	155
10	Washer, Lock, Spring, Double Coil, Galv., 1/2" *	2	2216	2	2216
11	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392



**CONSTRUCTION STANDARDS**

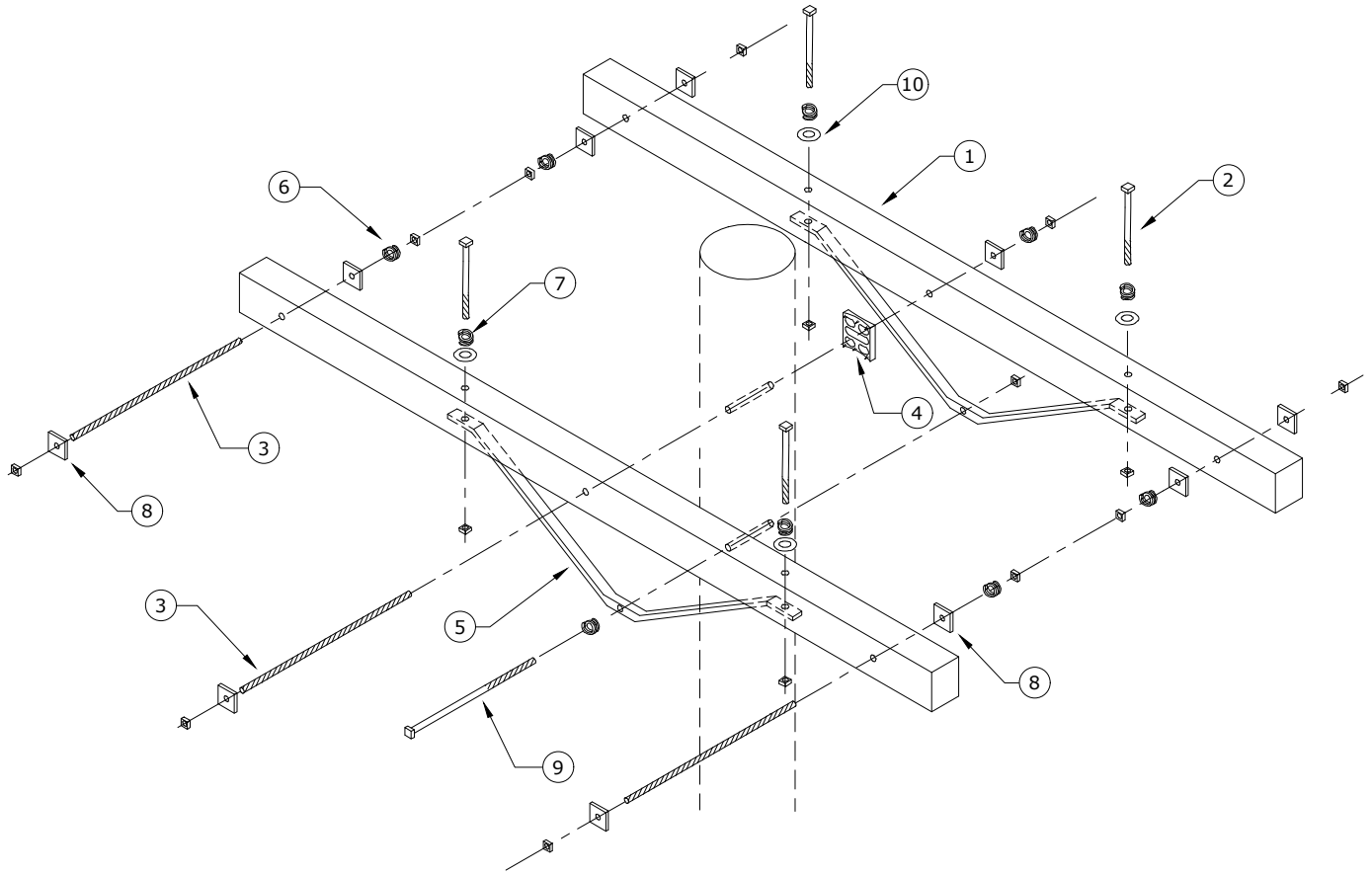
BASIC UNITS  
SINGLE CROSSARM  
ANGLE BRACE

PAGE:  
1 of 1

**CR23A, CR23B**

CAD FILE:  
CR23

REVISIONS											
REV	DATE	ENGR	OPS								
2	2/23/00	HWH	MA								
3	10/7/05	LB	AH								
4	2/24/16	KJP									
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DATE:	1/31/80	200									



(ANGLE BRACES)

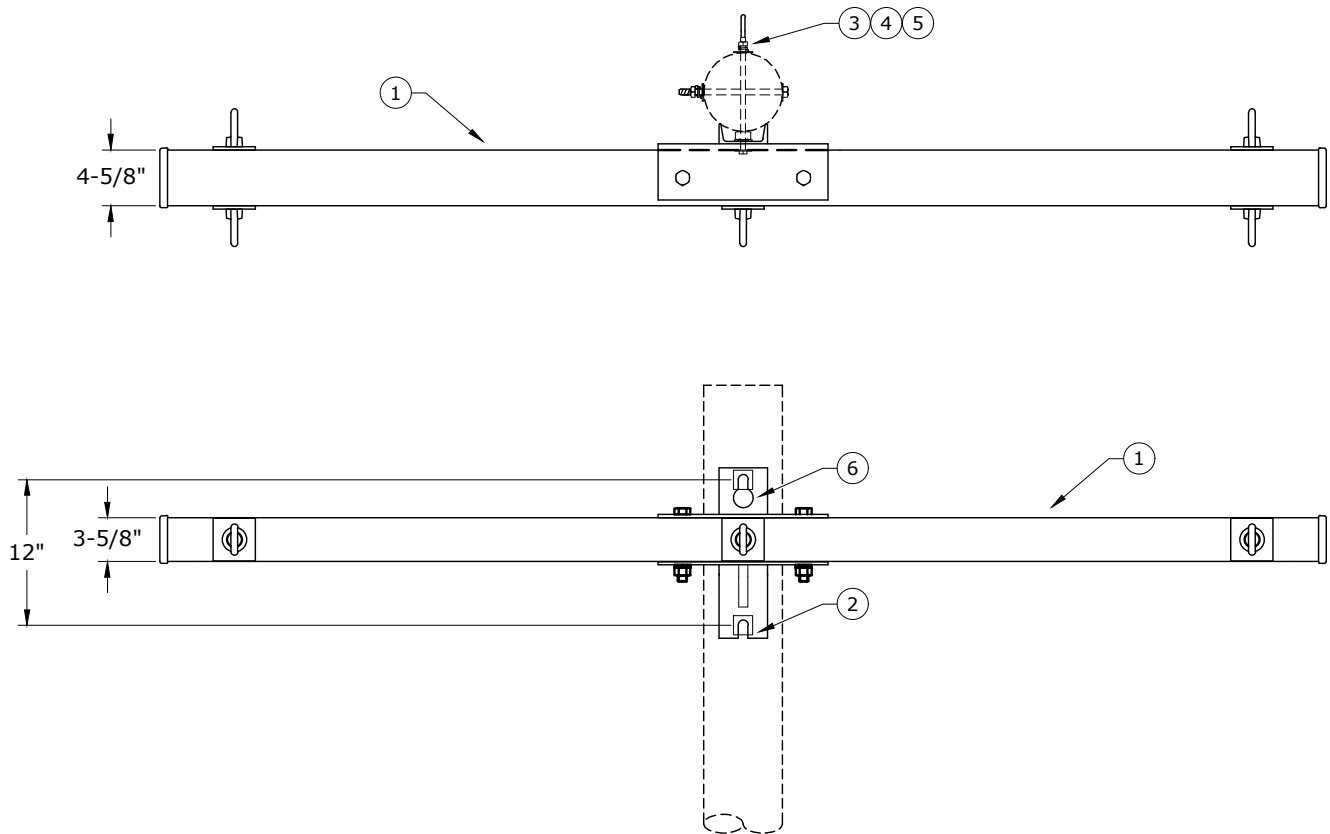
Rev. 5 - Updated material.

ITEM NO.	DESCRIPTION	8'Arm		10'Arm	
		CR24A		CR24B	
		QTY.	S/N	QTY.	S/N
1	Arm, Cross (Distr.), 3 3/4" x 4 3/4"	2	25	2	26
2	Bolt, Machine, 1/2" x 7", Galv., 7800 lbs Ultimate Tensile *	4	143	4	143
3	Bolt, Double, Arm, 5/8" x 20", Galv., 12,400 lbs Ultimate Tensile *	3	83	3	83
4	Gain, Pole Plastic	1	709	1	709
5	Brace, Angle (60" or 72")	2	203	2	204
6	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	6	2217	6	2217
7	Washer, Lock, Spring, Double Coil, Galv., 1/2" *	4	2216	4	2216
8	Washer, Square, Flat 5/8", 2 1/4" x 2 1/4"	10	1412	10	1412
9	Bolt Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile *	1	155	1	155
10	Washer, Flat, Round, Galv., 1/2"	4	1394	4	1394



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 DOUBLE CROSSARM  
 ANGLE BRACES

REVISIONS			
Δ	DATE	ENGR	OPS
2	2/23/00	HWH	MA
3	3/12/02	JEH	
4	5/3/06	LB	AH
5	2/24/16	KJP	



**ULTIMATE DEADEND STRENGTH** 8' and 10' 3-Position 7,120 lbs/position

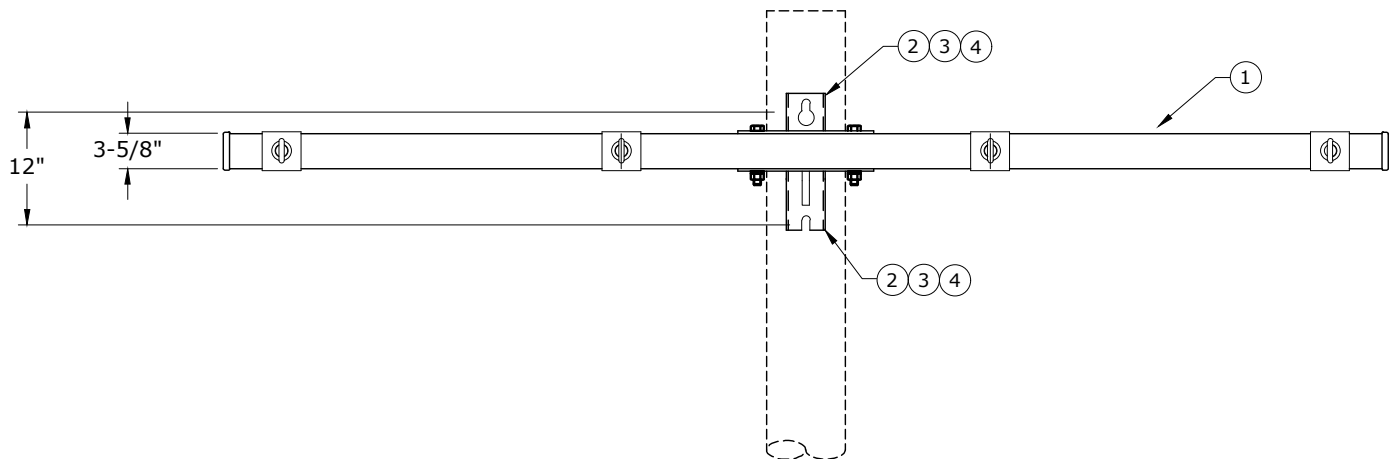
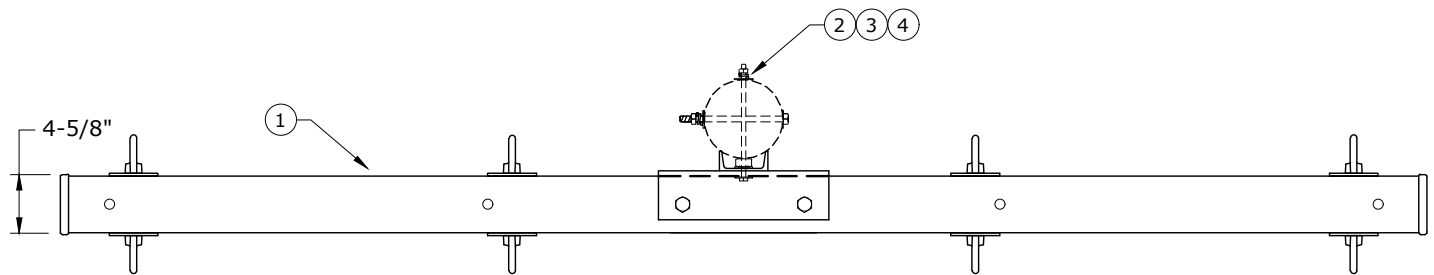
Rev. 6 - Updated materials.

ITEM NO.	DESCRIPTION	8'Arm		10'Arm	
		CR26A		CR26B	
		QTY.	S/N	QTY.	S/N
1	Arm, Deadend Assembly, 3-position, 397 Max	1	2508	1	2680
2	Bolt, Machine, 3/4" x 14", Galv., 18,350 lbs Ultimate Tensile *	1	174	1	174
3	Washer, Lock, Spring, Double Coil, Galv., 3/4"	2	2218	2	2218
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
5	Nut, Eye Oval 3/4"	1	914	1	914
6	Bolt, Machine, 3/4" x 16", Galv., 18,350 lbs Ultimate Tensile *	1	175	1	175



**CONSTRUCTION STANDARDS**  
 BASIC UNITS, PRE-ASSEMBLED DEADEND  
 8' AND 10', 3-POSITION  
 397 AAC MAX WIRE

REVISIONS			
DATE	ENGR	OPS	
3/12/02	JEH		
10/18/07	LB	AH	
7/23/10	KJP		
2/24/16	KJP		



**ULTIMATE DEADEND STRENGTH** 10' 4-Position 13,900 lbs/position

Rev. 6 - Updated materials.

ITEM NO.	DESCRIPTION	CR27B	
		QTY.	S/N
1	Arm, Deadend Assembly, 10', 4-position, 397 Max	1	2555
2	Bolt, Machine, 3/4" x 14", Galv., 18,350 lbs Ultimate Tensile *	2	174
3	Washer, Lock, Spring, Double Coil, Galv., 3/4"	2	2218
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 PRE-ASSEMBLED DEADEND, 10', 4-POSITION  
 397 AAC MAX WIRE

REVISIONS			
DATE	ENGR	OPS	
3/12/02	JEH		
10/18/07	LB	AH	
7/23/10	KJP		
2/24/16	KJP		

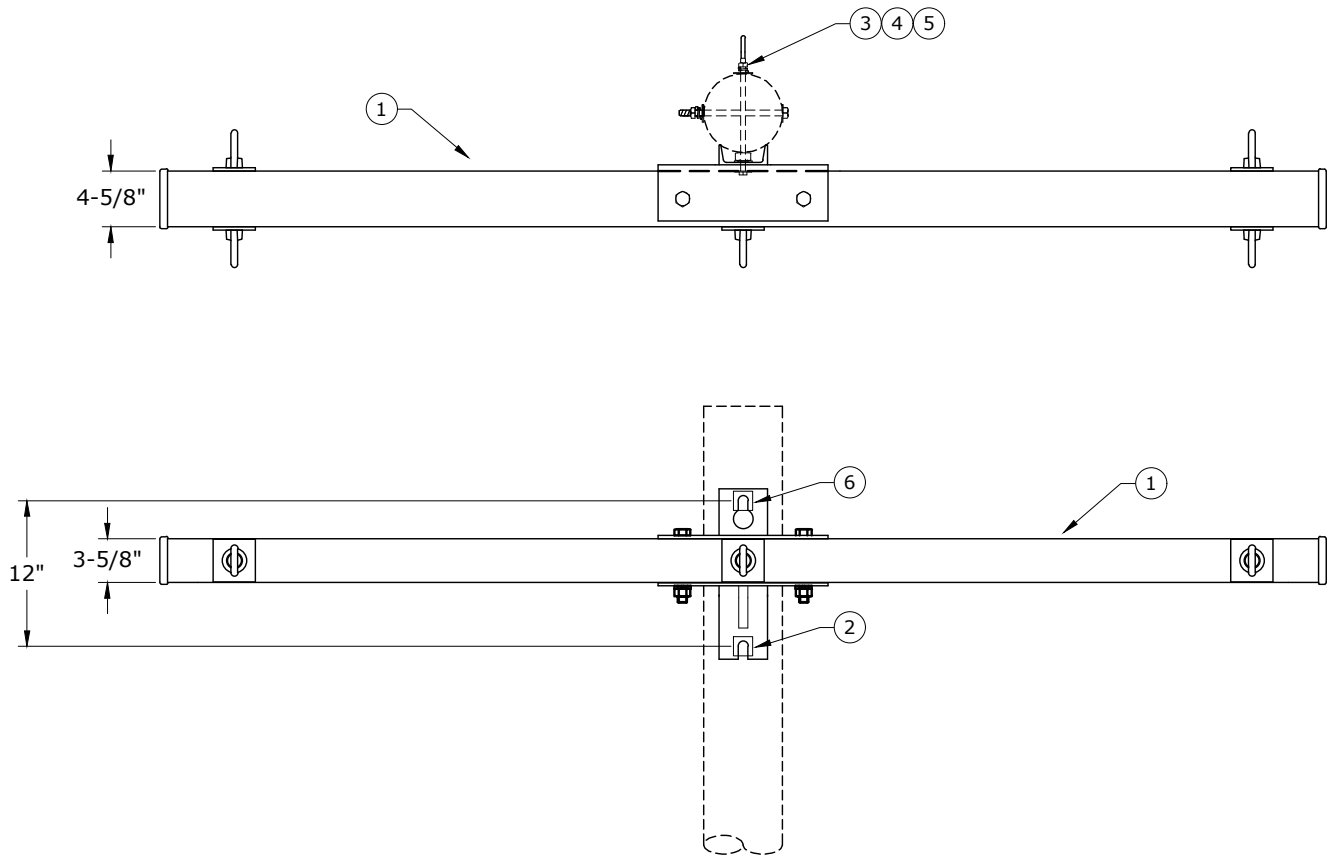
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**CR27B**

CAD FILE:  
CR27

APP: ELM  
DATE: 1/31/80

SECTION  
**200**



**ULTIMATE DEADEND STRENGTH** 8' and 10' 3-Position 13,900 lbs/position

Rev. 2 - Updated materials.

ITEM NO.	DESCRIPTION	8'Arm		10'Arm	
		CR28A		CR28B	
		QTY.	S/N	QTY.	S/N
1	Arm, Deadend Assembly, 3-position, 336 & 795	1	2509	1	2681
2	Bolt, Machine, 3/4" x 14", Galv., 18,350 lbs Ultimate Tensile *	1	174	1	174
3	Washer, Lock, Spring, Double Coil, Galv., 3/4"	2	2218	2	2218
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
5	Nut, Eye Oval 3/4", Galv.	1	914	1	914
6	Bolt, Machine, 3/4" x 16", Galv., 18,350 lbs Ultimate Tensile *	1	175	1	175



**CONSTRUCTION STANDARDS**  
 BASIC UNITS, PRE-ASSEMBLED DEADEND  
 8' AND 10', 3-POSITION  
 795 AAC MAX WIRE

PAGE:  
1 of 1

**CR28A, CR28B**

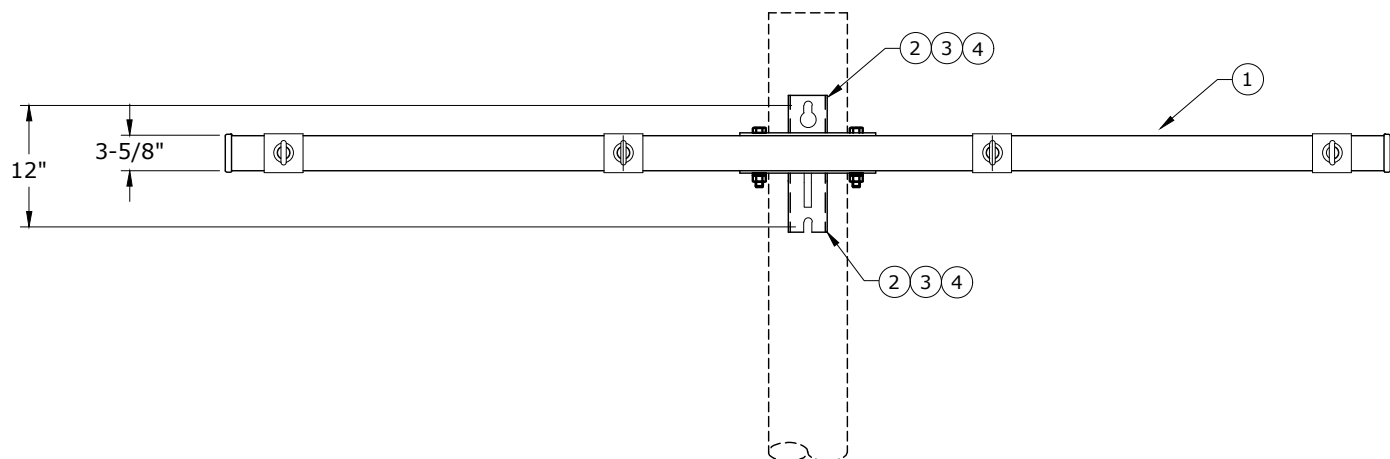
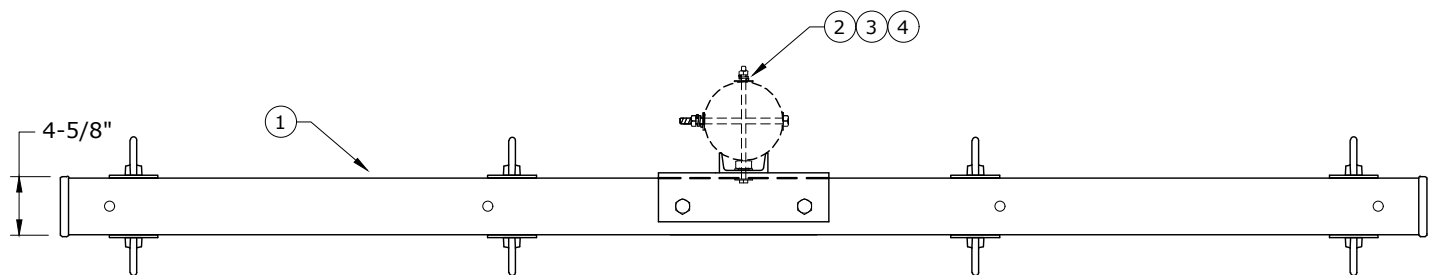
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REVISIONS			
DATE	ENGR	OPS	
7/23/10	KJP		
2/24/16	KJP		

APP:	LB/AH	SECTION
DATE:	10/18/07	<b>200</b>





**ULTIMATE DEADEND STRENGTH** 10' 4-Position 13,900 lbs/position

Rev. 2 - Updated materials.

ITEM NO.	DESCRIPTION	CR29B	
		QTY.	S/N
1	Arm, Deadend Assembly, 10', 4-position, 336 & 795	1	2668
2	Bolt, Machine, 3/4" x 14", Galv., 18,350 lbs Ultimate Tensile *	2	174
3	Washer, Lock, Spring, Double Coil, Galv., 3/4"	2	2218
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 PRE-ASSEMBLED DEADEND, 10', 4-POSITION  
 795 AAC MAX WIRE

REVISIONS			
DATE	ENGR	OPS	
7/23/10	KJP		
2/24/16	KJP		

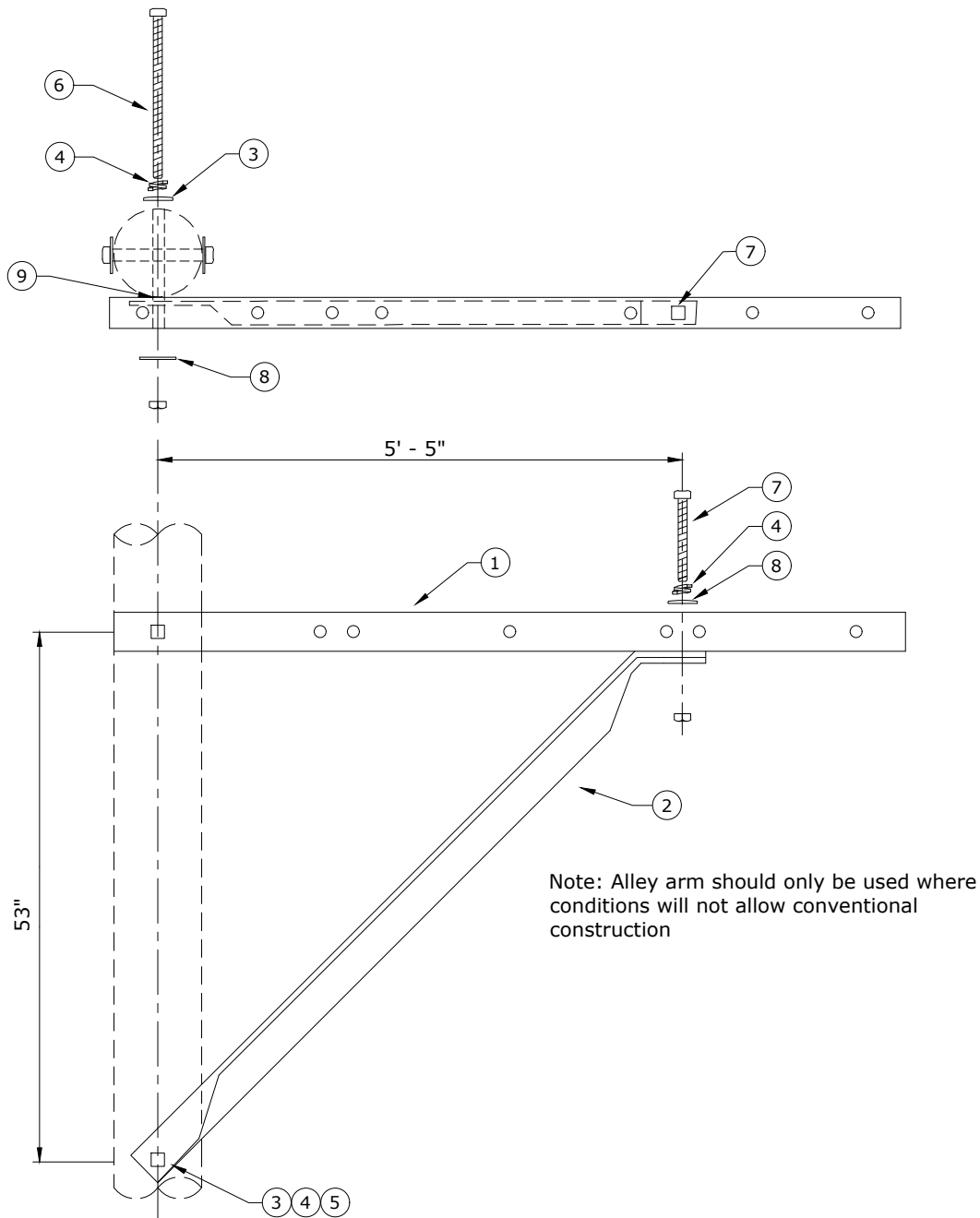
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1 of 1

**CR29B**

CAD FILE:  
CR29

APP: LB/AH  
DATE: 10/18/07

SECTION  
**200**



Rev. 4 - Updated material.

ITEM NO.	DESCRIPTION	8' Arm		10' Arm	
		CRA50A		CRA50B	
		QTY.	S/N	QTY.	S/N
1	Arm, Cross (Distr.), 3-3/4" x 4-3/4"	1	25	1	26
2	Brace, Alley Arm, (6'-11" or 10'), Galv. Steel *	1	200	1	201
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole *	2	1392	2	1392
4	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	3	2217	3	2217
5	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile *	1	155	1	155
6	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile *	1	157	1	157
7	Bolt, Machine, 5/8" x 7", Galv., 12,400 lbs Ultimate Tensile *	1	2606	1	2606
8	Washer, Square, Flat, 2 1/4" x 2 1/4" x 5/8"	2	1412	2	1412
9	Gain, Pole Plastic	1	709	1	709



## CONSTRUCTION STANDARDS

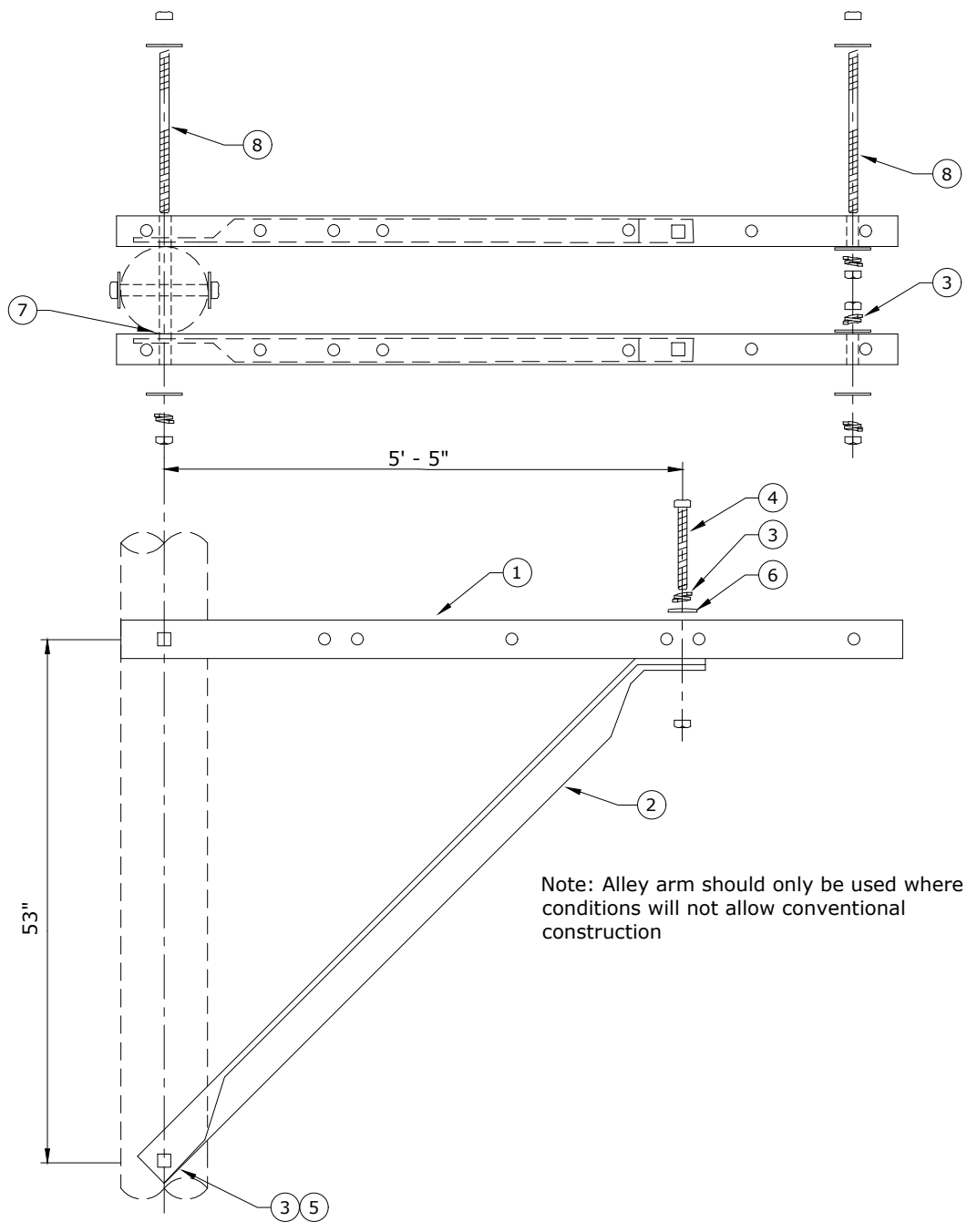
BASIC UNITS  
SINGLE CROSSARM  
ALLEY ARM

PAGE:  
1 of 1

**CRA50A, CRA50B**

CAD FILE:  
CRA50

REVISIONS											
REV	DATE	ENGR	OPS								
2	2/23/00	HWH	MA								
3	5/3/06	LB	AH								
4	2/24/16	KJP									
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DATE:	1/31/80	200									



Note: Alley arm should only be used where conditions will not allow conventional construction

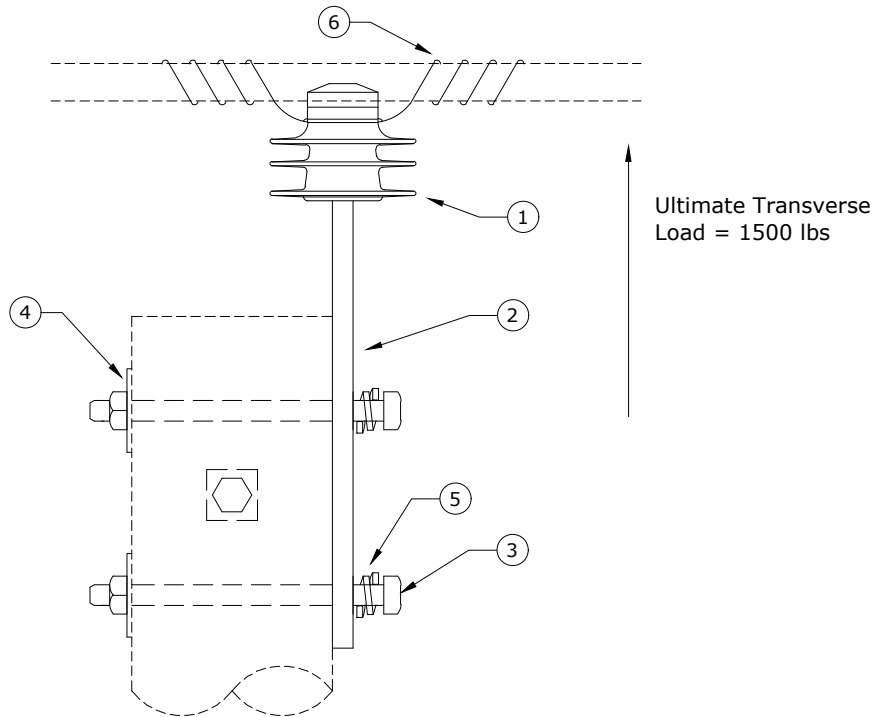
Rev. 4 - Updated material.

ITEM NO.	DESCRIPTION	8' Arm		10' Arm	
		CRA52A		CRA52B	
		QTY.	S/N	QTY.	S/N
1	Arm, Cross (Distr.), 3-3/4" x 4-3/4"	2	25	2	26
2	Brace, Alley Arm, (6'-11" or 10'), Galv. Steel	2	200	2	201
3	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	6	2217	6	2217
4	Bolt, Machine, 5/8" x 7", Galv., 12,400 lbs Ultimate Tensile *	2	2606	2	2606
5	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile *	1	155	1	155
6	Washer, Square, Flat, 2 1/4" x 2 1/4" x 5/8"	8 *	1412	8 *	1412
7	Gain, Pole Plastic	1	709	1	709
8	Bolt, Double Arm, 5/8" x 20", Galv., 12,400 lbs Ultimate Tensile *	2	83	2	83



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 DOUBLE CROSSARM  
 ALLEY ARM

REVISIONS											
NO.	DATE	ENGR	OPS								
2	2/23/00	HWH	MA								
3	5/3/06	LB	AH								
4	2/24/16	KJP									
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APP:	ELM	SECTION									
DATE:	1/31/80	200									



PR1 - for bare wire - use bare tie wire  
PR1TREE - for tree wire - use covered tie wire

- Notes:**
1. See Std TI4 - Conductor Tying Guide - Section 400.
  2. Ultimate Transverse Load=1,500 lbs. Ultimate Longitudinal Load=1,200 lbs.

Rev. 5 - Eliminated porcelain insulator and added tie wire notes.

ITEM NO.	DESCRIPTION	PR1TREE		PR1	
		QTY.	S/N	QTY.	S/N
1	Insulator, Pin, C Neck, Polymer	1	1968	1	1968 *
2	Pin, Pole Top	1	962	1	962
3	Bolt, Machine, 5/8" x 12" Galv., 12,400 lbs Ultimate Tensile	2	155	2	155
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
5	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
6	Wire, Tie, AL Annealed #4 SD	11*	3012	10	1421



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 POLE-TOP PIN  
 SINGLE INSULATOR

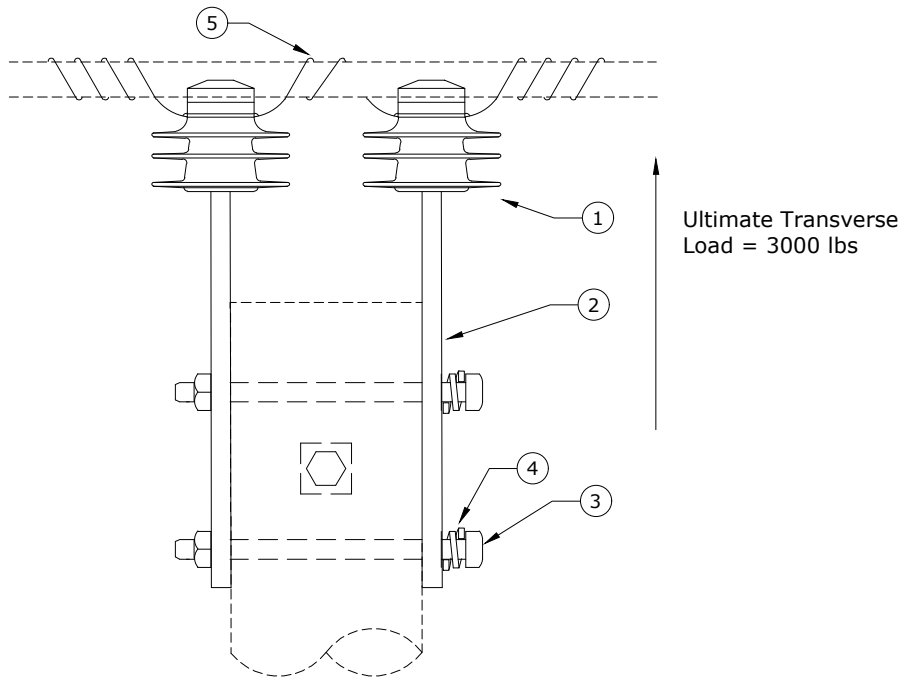
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1 of 1

**PR1, PR1TREE**

CAD FILE:  
PR1

REVISIONS			
DATE	ENGR	OPS	
2/23/00	HWH	MA	
5/3/06	LB	AH	
12/22/16	CM	DK	

APP: ELM	SECTION
DATE: 1/31/80	200



PR2 - for bare wire - use bare tie wire  
PR2TREE - for tree wire - use covered tie wire

- Notes:**
1. See Std T15 - Conductor Tying Guide - Section 400.
  2. Ultimate Transverse Load=3,000 lbs. Ultimate Longitudinal Load=2,400 lbs.

Rev. 5 - Eliminated porcelain insulator and added tie wire notes.

ITEM NO.	DESCRIPTION	PR2TREE		PR2	
		QTY.	S/N	QTY.	S/N
1	Insulator, Pin, C Neck, Polymer	2	1968	2	1968 *
2	Pin, Pole Top	2	962	2	962
3	Bolt, Machine, 5/8" x 14" Galv., 12,400 lbs Ultimate Tensile	2	156	2	156
4	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
5	Wire, Tie, AL Annealed #4 SD	22*	3012	20	1421



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 POLE-TOP PIN  
 DOUBLE INSULATORS

REVISIONS			
DATE	ENGR	OPS	
2/23/00	HWH	MA	
2/13/06	LB	AH	
12/22/16	CM	DK	

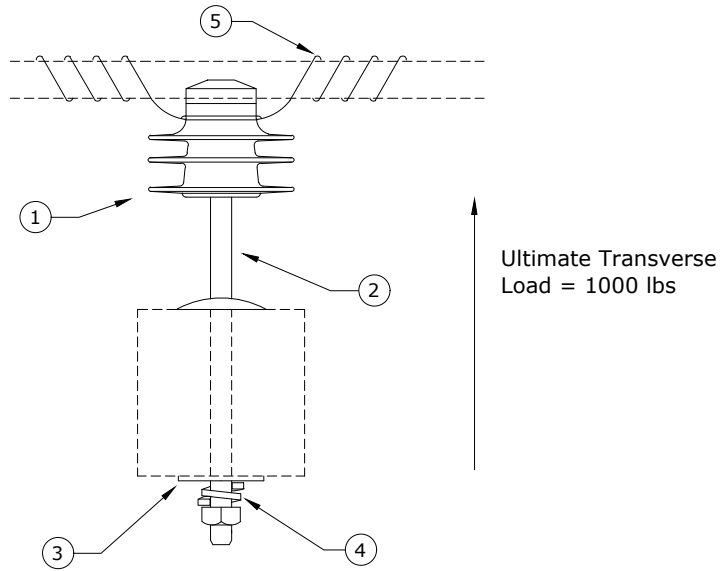
PAGE:  
1 of 1

**PR2, PR2TREE**

CAD FILE:  
PR2

APP: ELM  
DATE: 1/31/80

SECTION  
**200**



PR4 - for bare wire - use bare tie wire  
PR4TREE - for tree wire - use covered tie wire

- Notes:**
1. See Std TI4 - Conductor Tying Guide - Section 400.
  2. Ultimate Cantilever Load=1,000 lbs.

Rev. 5 - Eliminated porcelain insulator and added tie wire notes.

ITEM NO.	DESCRIPTION	PR4TREE		PR4	
		QTY.	S/N	QTY.	S/N
1	Insulator, Pin, C Neck, Polymer	1	1968	1	1968 *
2	Pin, Crossarm	1	961	1	961
3	Washer, Square Flat 5/8", 2 1/4" x 2 1/4"	1	1412	1	1412
4	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
5	Wire, Tie, AL Annealed #4 SD	11*	3012	10	1421



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 SINGLE CROSSARM PIN

REVISIONS			
DATE	ENGR	OPS	
2/23/00	HWH	MA	
5/3/06	LB	AH	
12/22/16	CM	DK	

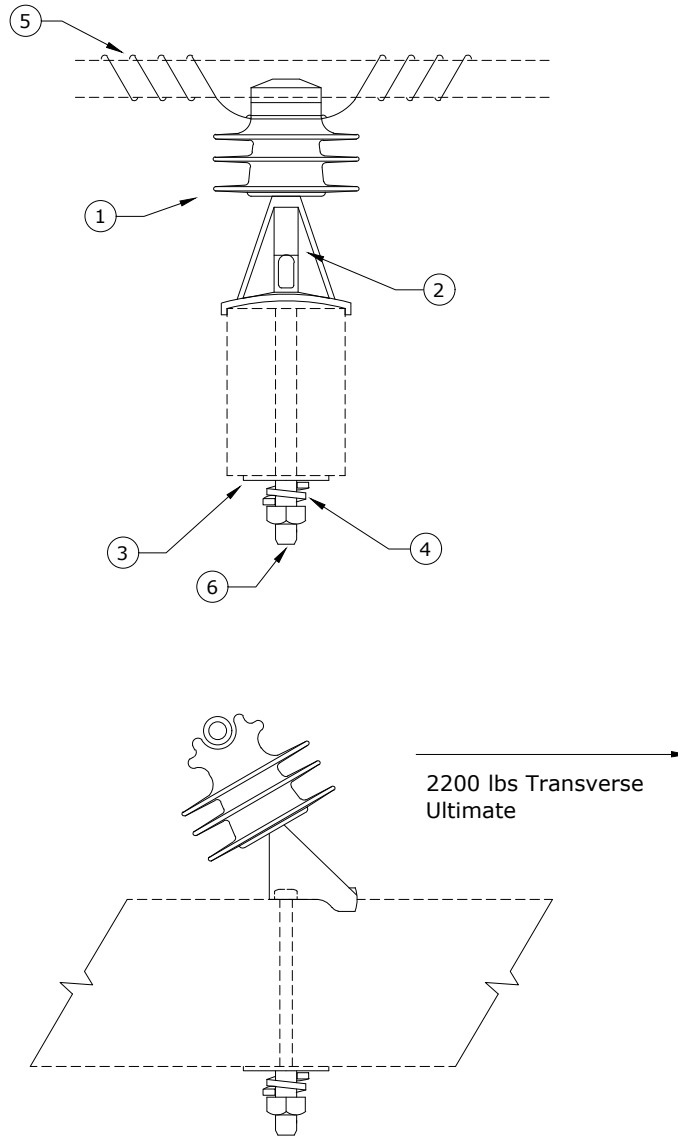
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1 of 1

**PR4, PR4TREE**

CAD FILE:  
PR4

APP: ELM  
DATE: 1/31/80

SECTION  
**200**



PR5 - for bare wire - use bare tie wire  
PR5TREE - for tree wire - use covered tie wire

Note: See Std T14 - Conductor Tying Guide - Section 400.

Rev. 1 - Eliminated porcelain insulator and added tie wire notes.

ITEM NO.	DESCRIPTION	PR5TREE		PR5	
		QTY.	S/N	QTY.	S/N
1	Insulator, Pin, C Neck, Polymer	1	1968	1	1968 *
2	Pin, Angle, Crossarm	1	2658	1	2658
3	Washer, Square Flat 5/8", 2 1/4" x 2 1/4"	1	1412	1	1412
4	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
5	Wire, Tie, AL Annealed #4 SD	11*	3012	10	1421
6	Bolt, Machine, 5/8" x 7" Galv., 12,400 lbs Ultimate Tensile	1	2606	1	2606 *



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 SINGLE CROSSARM ANGLE PIN

REVISIONS			
DATE	ENGR	OPS	
12/22/16	CM	DK	

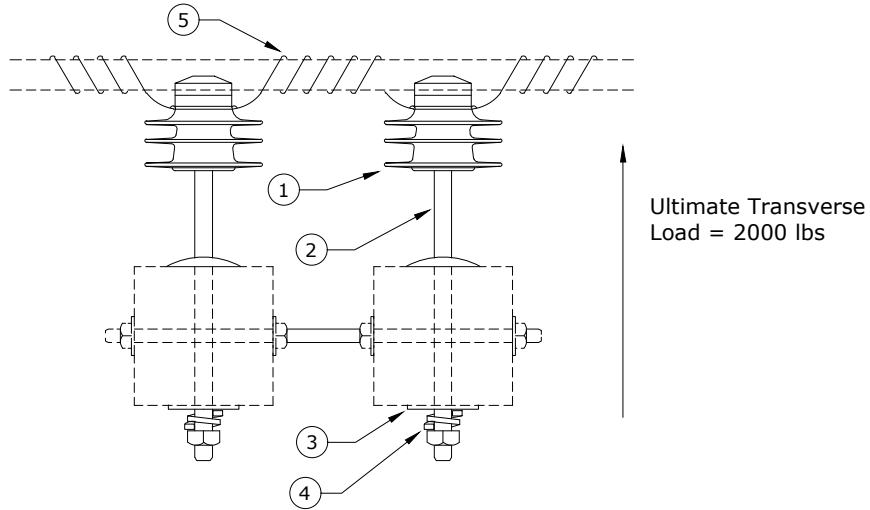
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1 of 1

**PR5, PR5TREE**

CAD FILE:  
PR5

APP: LB/AH  
DATE: 5/03/06

SECTION  
**200**



PR19 - for bare wire - use bare tie wire  
PR19TREE - for tree wire - use covered tie wire

- Notes:**
1. See Std T15 - Conductor Tying Guide - Section 400.
  2. Ultimate Cantilever Load=2,000 lbs.

Rev. 5 - Eliminated porcelain insulator and added tie wire notes.

ITEM NO.	DESCRIPTION	PR19TREE		PR19	
		QTY.	S/N	QTY.	S/N
1	Insulator, Pin, C Neck, Polymer	2	1968	2	1968 *
2	Pin, Crossarm	2	961	2	961
3	Washer, Square Flat, 5/8", 2 1/4" x 2 1/4"	2	1412	2	1412
4	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
5	Wire, Tie, AL Annealed #4 SD	22*	3012	20	1421



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 DOUBLE CROSSARM PIN

REVISIONS			
DATE	ENGR	OPS	
2/23/00	HWH	MA	
5/03/06	LB	AH	
12/22/16	CM	DK	

PAGE:  
1 of 1

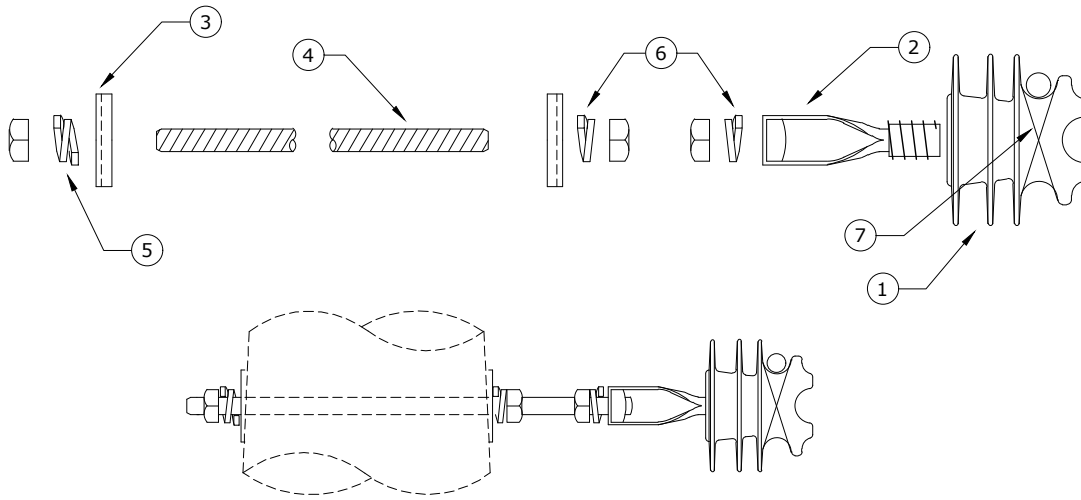
**PR19,PR19TREE**

CAD FILE:  
PR19

APP: ELM  
DATE: 1/31/80

SECTION  
**200**





PR20 - for bare wire- use bare tie wire  
PR20TREE - for tree wire- use covered tie wire

Note: See Std TI4 - Section 400 - Conductor Tying Guide.

Rev. 5 - Eliminated porcelain insulator and added tie wire notes.

ITEM NO.	DESCRIPTION	PR20TREE		PR20	
		QTY.	S/N	QTY.	S/N
1	Insulator, Pin, C Neck, Polymer	1	1968	1	1968 *
2	Pin, Adapter	1	959	1	959
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
4	Bolt, Double Arm, 5/8" x 16" Galv., 12,400 lbs Ultimate Tensile *	1	81	1	81
5	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
6	Washer, Lock, Spring, Single Coil, Galv., 5/8"	2	1403	2	1403
7	Wire, Tie, AL Annealed #4 SD	11*	3012	10	1421



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 HORIZONTAL JUMPER SUPPORT

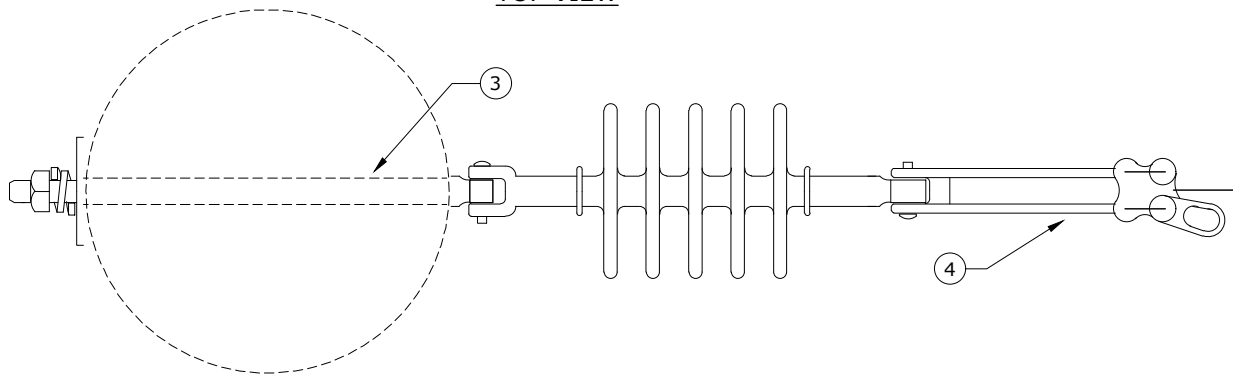
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4	5/3/06	LB	AH
5	12/22/16	CM	DK
Δ			
APP:	ELM	SECTION	
DATE:	1/31/80	200	

PAGE:  
1 of 1

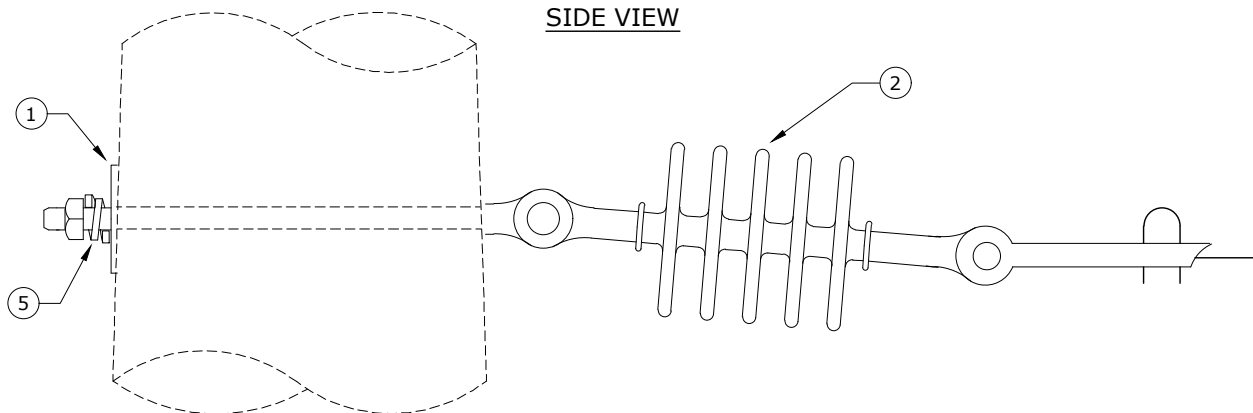
**PR20,PR20TREE**

CAD FILE:  
PR20

TOP VIEW



SIDE VIEW



Rev. 4 - Updated material.

ITEM NO.	DESCRIPTION	PR21	
		QTY.	S/N
1	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
2	Insulator, Susp. 15kV Clevis - Tongue, Polymer *	1	1967
3	Bolt, Eye, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	1	108
4	Clamp, Strain, Distribution, #2 to 397.5 MCM	1	302
5	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 DEADEND WITH EYEBOLT

REVISIONS			
DATE	ENGR	OPS	
2/23/00	HWH	MA	
5/15/06	LB	AH	
2/24/16	KJP		

PAGE:  
1 of 1

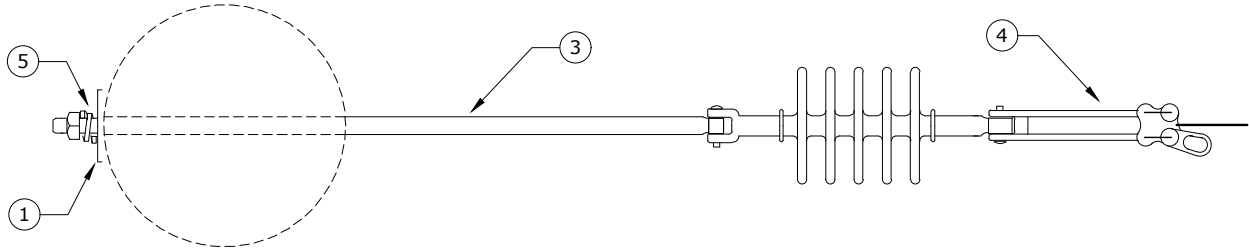
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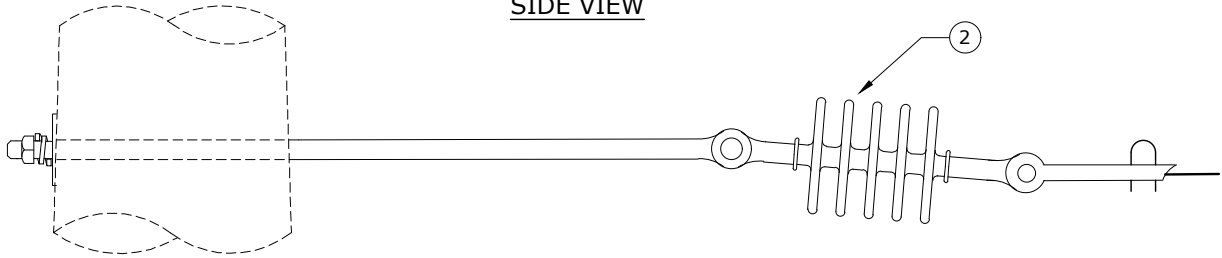
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SECTION  
**200**

TOP VIEW



SIDE VIEW



Rev. 4 - Updated material.

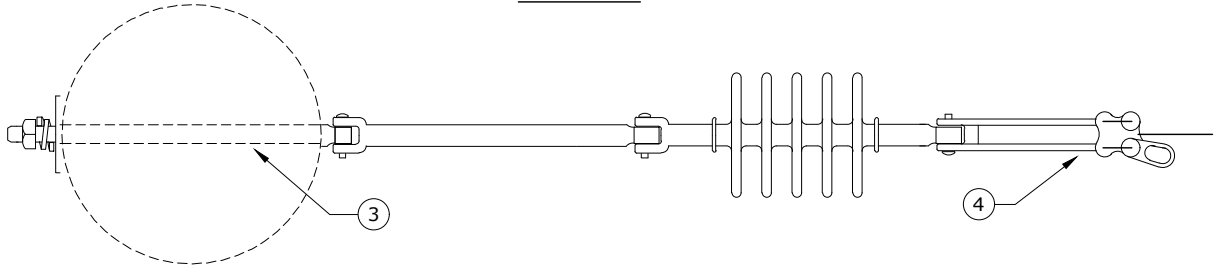
ITEM NO.	DESCRIPTION	PR22	
		QTY.	S/N
1	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
2	Insulator, Susp. 15kV Clevis-Tongue, Polymer *	1	1967
3	Bolt, Eye, 5/8" x 28", Galv., 12,400 lbs Ultimate Tensile *	1	113
4	Clamp, Strain, Distribution, #2 to 397.5 MCM	1	302
5	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217



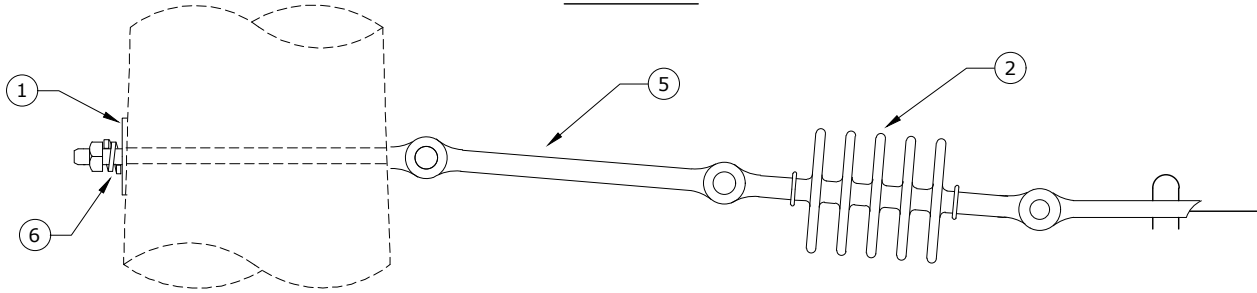
**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 DEADEND WITH  
 LONG EYEBOLT

REVISIONS											
DATE	ENGR	OPS									
2/23/00	HWH	MA									
5/15/06	LB	AH									
2/24/16	KJP										
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APP:	ELM	SECTION									
DATE:	1/31/80	200									

TOP VIEW



SIDE VIEW



Rev. 4 - Updated material.

ITEM NO.	DESCRIPTION	PR23	
		QTY.	S/N
1	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
2	Insulator, Susp. 15kV Clevis-Tongue, Polymer *	1	1967
3	Bolt, Eye, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	1	108
4	Clamp, Strain, Distribution, #2 to 397.5 MCM	1	302
5	Insulator, Guy Strain, Fiberglass, 20"	1	2909 *
6	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217



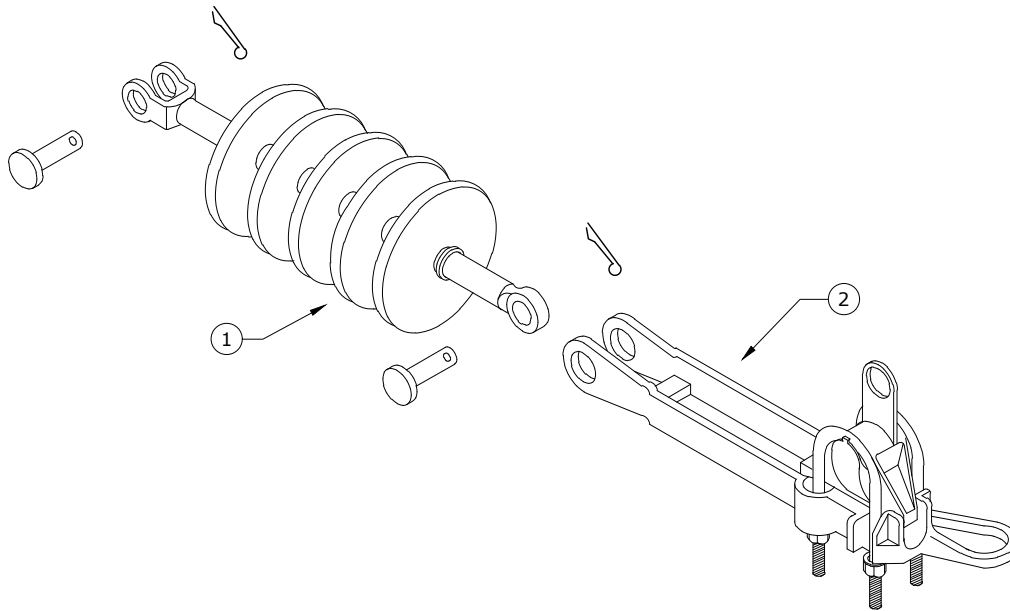
**CONSTRUCTION STANDARDS**  
BASIC UNITS  
DEADEND WITH EXTENSION

PAGE:  
1 of 1

**PR23**

CAD FILE:  
PR23

REVISIONS			
DATE	ENGR	OPS	
2/23/00	HWH	MA	
5/15/06	LB	AH	
2/24/16	KJP		
APP: ELM			
DATE: 1/31/80		SECTION <b>200</b>	



Rev. 4 - Updated material.

ITEM NO.	DESCRIPTION	PR24	
		QTY.	S/N
1	Insulator, Susp. 15 kV Clevis-Tongue, Polymer ✱	1	1967
2	Clamp, Strain, Distribution, #2 to 397.5 MCM	1	302



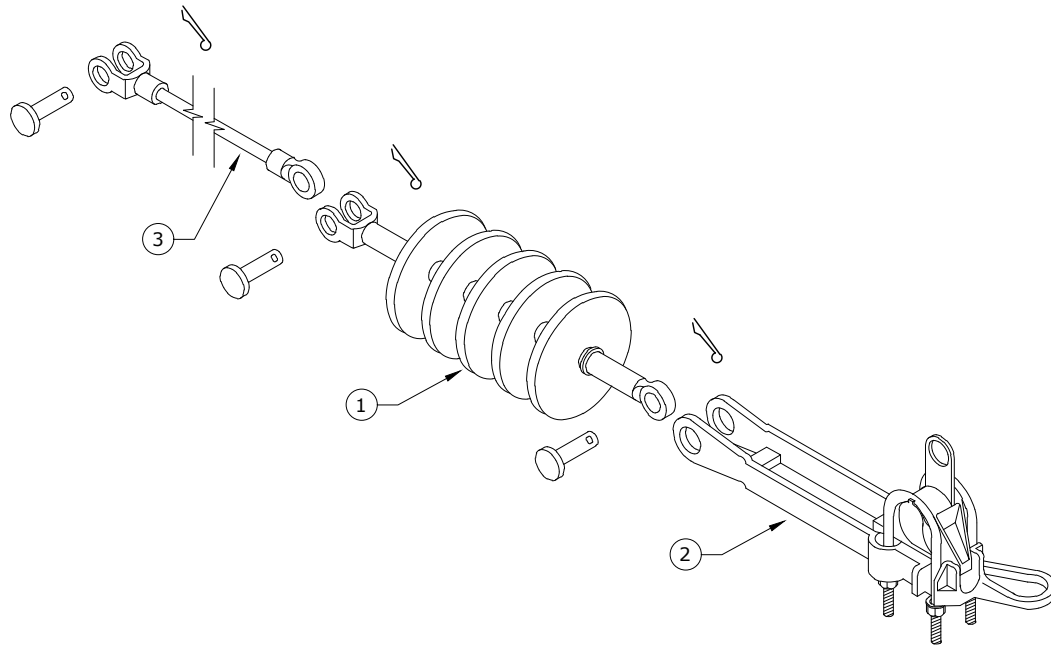
**CONSTRUCTION STANDARDS**  
BASIC UNITS  
DEADEND

REVISIONS			
△	DATE	ENGR	OPS
2	2/23/00	HWH	MA
3	5/15/06	LB	AH
4	2/14/16	KJP	
△			
APP:	ELM	SECTION	
DATE:	1/31/80	200	

PAGE:  
1 of 1

**PR24**

CAD FILE:  
PR24



Rev. 4 - Updated material.

ITEM NO.	DESCRIPTION	PR25	
		QTY.	S/N
1	Insulator, Susp. 15 kV Clevis-Toungue, Polymer ✱	1	1967
2	Clamp, Strain, Distribution, #2 to 397.5 MCM	1	302
3	Insulator, Guy Strain, Fiberglass, 20"	1	2909 ✱



**CONSTRUCTION STANDARDS**  
BASIC UNITS  
DEADEND WITH EXTENSION

REVISIONS			
△	DATE	ENGR	OPS
2	2/23/00	HWH	MA
3	5/15/06	LB	AH
4	2/24/16	KJP	
△			
APP:	ELM	SECTION	
DATE:	1/31/80	200	

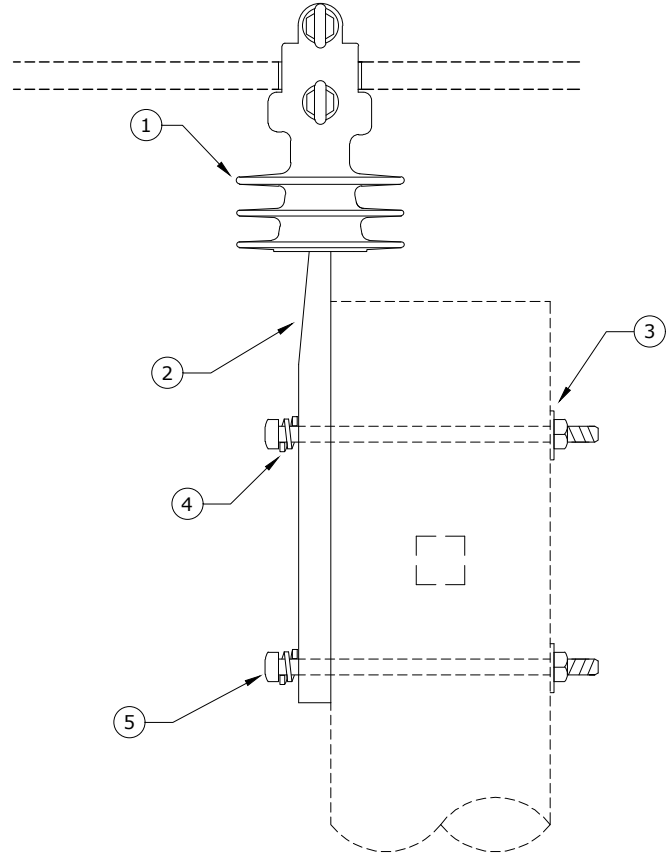
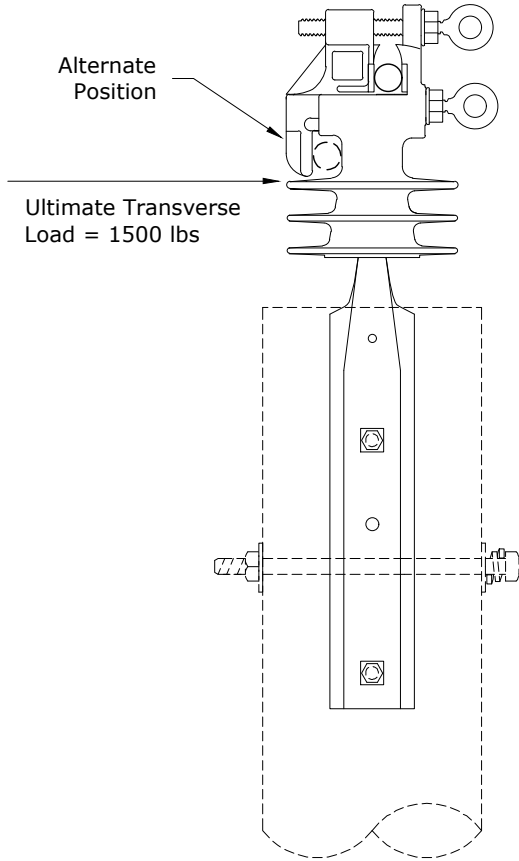
PAGE:  
1 of 1

**PR25**

CAD FILE:  
PR25

**Installation:**

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off



- Notes:**
1. Ultimate transverse load = 1,500 lbs. Ultimate longitudinal load = 1,200 lbs.
  2. Replacement vise-top insulator bolts S/N 2888.

Rev. 6 - Changed insulator to vise-top and updated material issue.

ITEM NO.	DESCRIPTION	PR40	
		QTY.	S/N
1	Insulator, Vise-Top, Polymer ✱	1	2439
2	Pin, Pole Top ✱	1	962
3	Washer, Curved, Square, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
4	Washer, Lock, Spring, Double Coil, Galv., 5/8" ✱	2	2217
5	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs. Ultimate Tensile ✱	2	155



**CONSTRUCTION STANDARDS**

BASIC UNITS  
POLE-TOP PIN  
SINGLE VISE-TOP INSULATOR

PAGE:  
1 of 1

**PR40**

CAD FILE:  
PR40

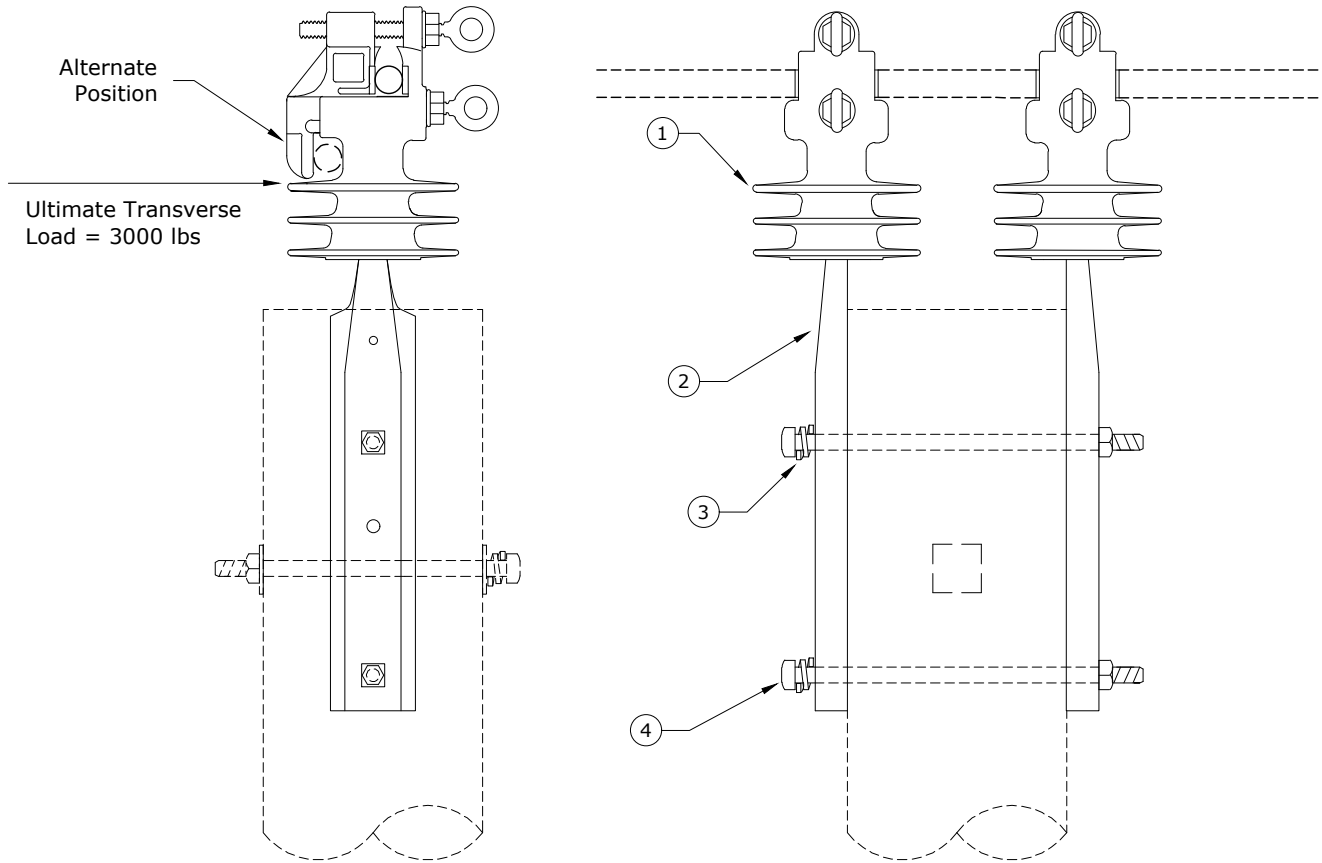
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2/23/00	HWH	MA	
3/12/02	JEH		
5/15/06	LB	AH	
12/22/16	CM	DK	

APP: ELM	SECTION
DATE: 1/31/80	<b>200</b>

**Installation:**

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off



- Notes:**
1. Ultimate transverse load = 3,000 lbs. Ultimate longitudinal load = 2,400 lbs.
  2. Replacement vise-top insulator bolts S/N 2888.

Rev. 6 - Changed insulator to vise-top and updated material issue.

ITEM NO.	DESCRIPTION	PR41	
		QTY.	S/N
1	Insulator, Vise-Top, Polymer ✱	2	2439
2	Pin, Pole Top ✱	2	962
3	Washer, Lock, Spring, Double Coil, Galv., 5/8" ✱	2	2217
4	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs. Ultimate Tensile ✱	2	156



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 POLE-TOP PIN  
 DOUBLE VISE-TOP INSULATOR

PAGE:  
1 of 1

**PR41**

CAD FILE:  
PR41

REVISIONS			
DATE	ENGR	OPS	
2/23/00	HWH	MA	
3/12/02	JEH		
5/15/06	LB	AH	
12/22/16	CM	DK	

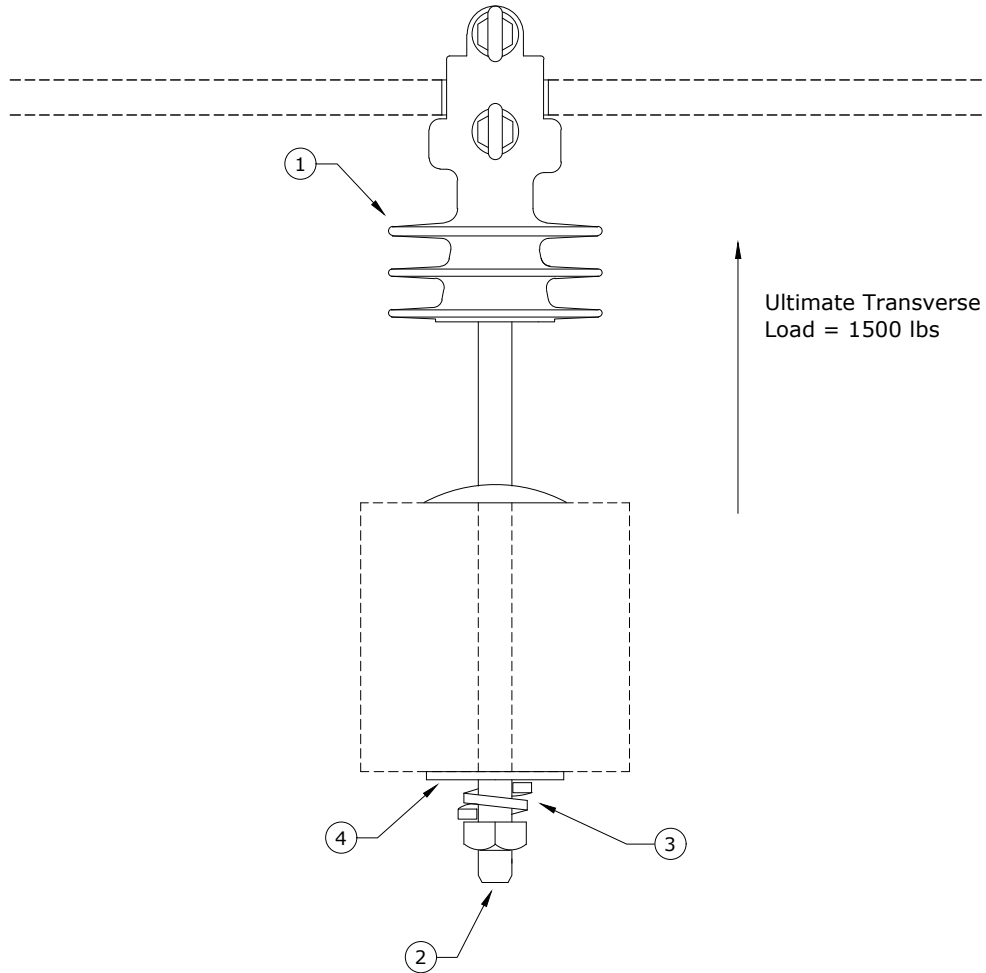
  

APP: ELM	SECTION
DATE: 1/31/80	<b>200</b>



**Installation:**

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off



- Notes:**
1. Ultimate longitudinal load = 1,000 lbs.
  2. Replacement vise-top insulator bolts S/N 2888.

Rev. 5 - Changed insulator to vise-top and updated material issue.

ITEM NO.	DESCRIPTION	PR42	
		QTY.	S/N
1	Insulator, Vise-Top, Polymer *	1	2439
2	Pin, Crossarm *	1	961
3	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217
4	Washer, Square Flat, 5/8", 2 1/4" x 2 1/4"	1	1412

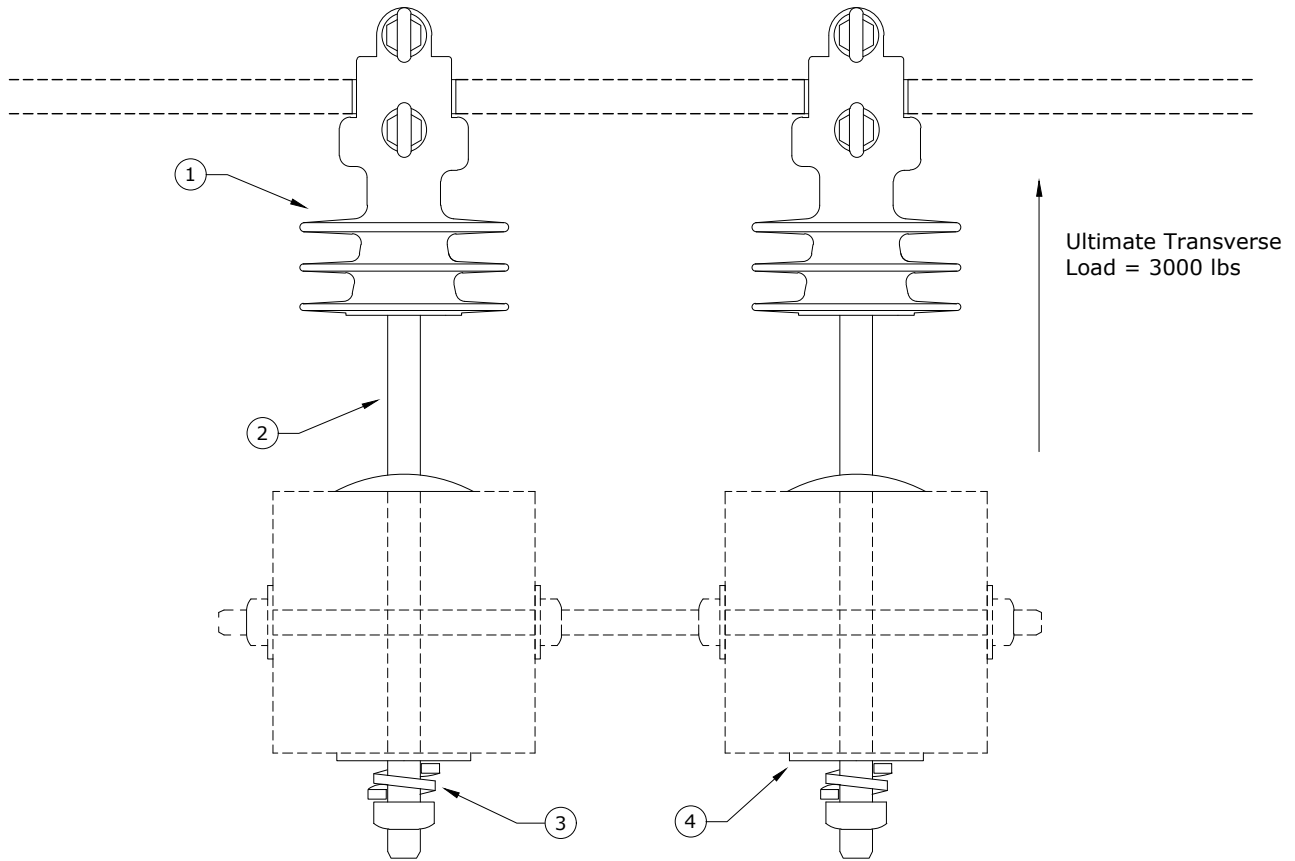


**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 SINGLE VISE-TOP  
 INSULATOR ON CROSSARM

REVISIONS											
DATE	ENGR	OPS									
2/23/00	HWH	MA									
5/15/06	LB	AH									
12/22/16	CM	DK									
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APP:	ELM	SECTION									
DATE:	1/31/80	200									

**Installation:**

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off



- Notes:**
1. Ultimate longitudinal load = 2,000 lbs.
  2. Replacement vise-top insulator bolts S/N 2888.

Rev. 5 - Changed insulators to vise-top and updated material issue.

ITEM NO.	DESCRIPTION	PR43	
		QTY.	S/N
1	Insulator, Vise-Top, Polymer *	2	2439
2	Pin, Crossarm *	2	961
3	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	2	2217
4	Washer, Square Flat, 5/8", 2 1/4" x 2 1/4"	2	1412



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 DOUBLE VISE-TOP  
 INSULATORS ON CROSSARMS

PAGE:  
1 of 1

**PR43**

CAD FILE:  
PR43

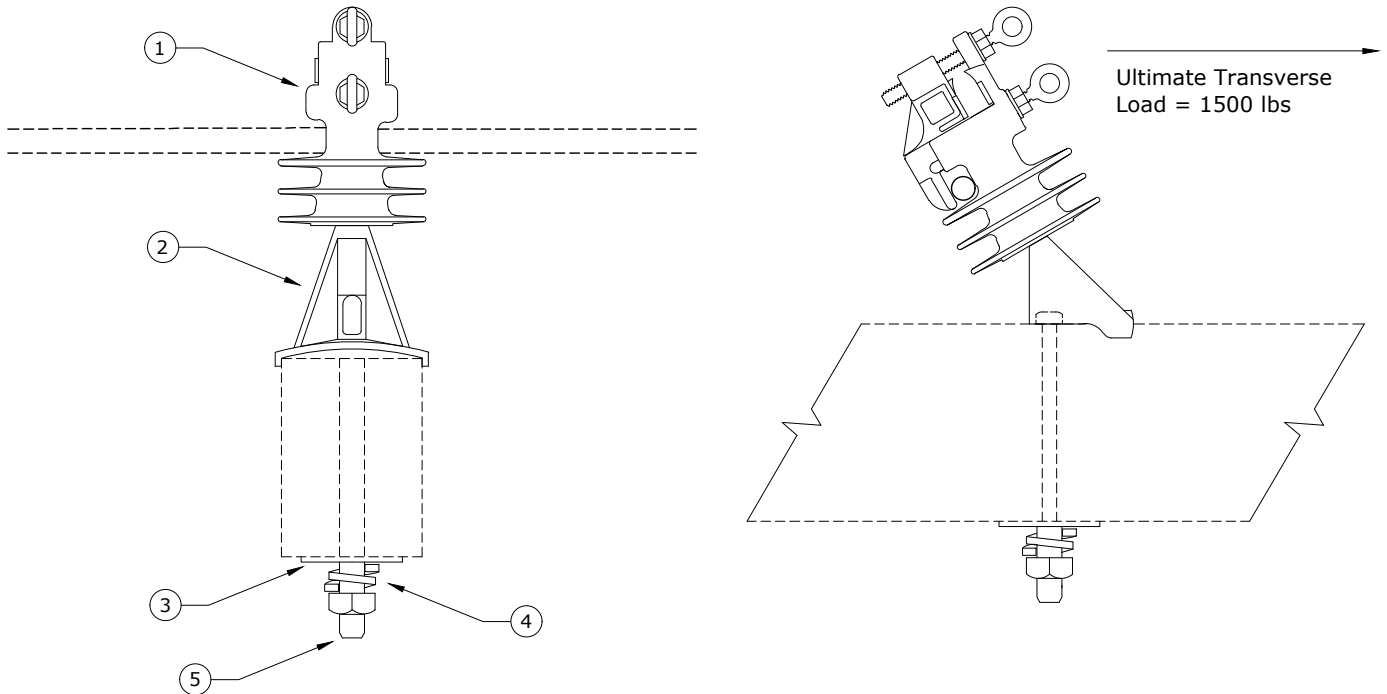
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2/23/00	HWH	MA	
5/15/06	LB	AH	
12/22/16	CM	DK	

APP: ELM	SECTION
DATE: 1/31/80	<b>200</b>

**Installation:**

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off



- Notes:**
1. Ultimate transverse load = 1,500 lbs.
  2. Replacement vise-top insulator bolts S/N 2888.

Rev. 5 - Changed insulator to vise-top and updated material issue.

ITEM NO.	DESCRIPTION	PR44	
		QTY.	S/N
1	Insulator, Vise-Top, Polymer *	1	2439
2	Pin, Angle, Crossarm *	1	2658
3	Washer, Square Flat 5/8", 2 1/4" x 2 1/4"	1	1412
4	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217
5	Bolt, Machine, 5/8" x 7" Galv., 12,400 lbs. Ultimate Tensile *	1	2606



**CONSTRUCTION STANDARDS**

BASIC UNITS  
SINGLE ANGLE VISE-TOP  
INSULATOR ON CROSSARM

REVISIONS

REV	DATE	ENGR	OPS
3	2/23/00	HWH	MA
4	5/15/06	LB	AH
5	12/22/16	CM	DK

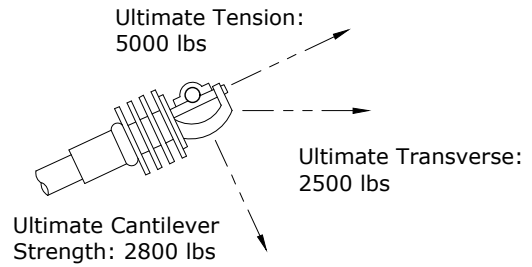
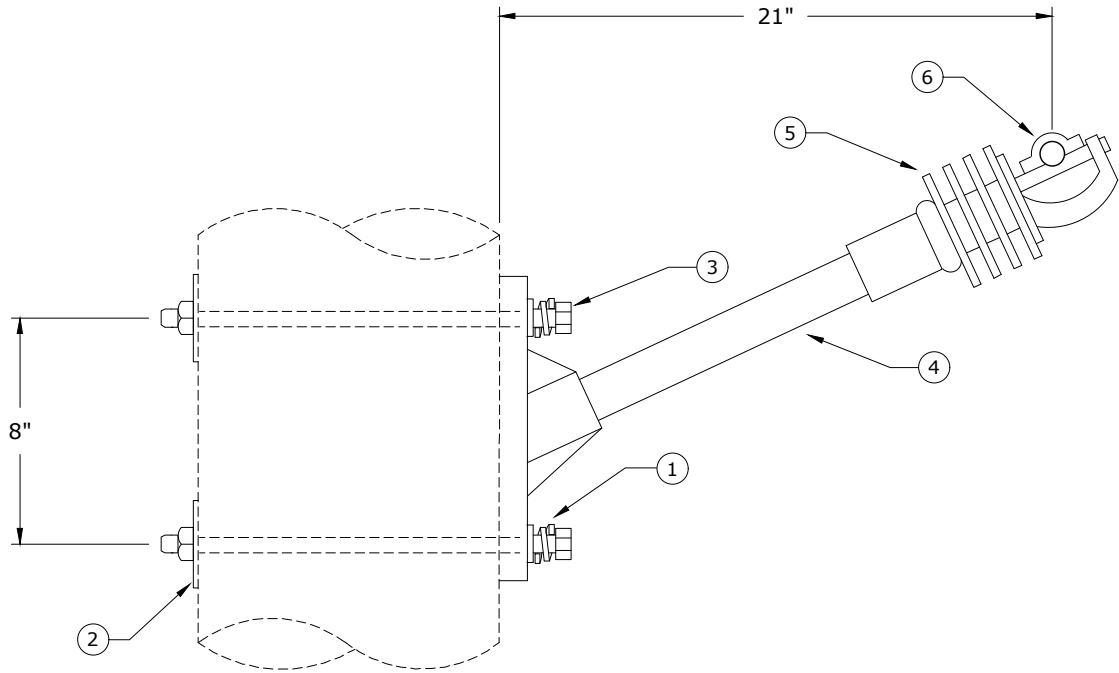
PAGE:  
1 of 1

**PR44**

CAD FILE:  
PR44

APP: ELM  
DATE: 1/31/80

SECTION  
**200**



**Note:** Use only when uplift needs to be considered.

Rev. 4 - Updated material.

ITEM NO.	DESCRIPTION	PR56	
		QTY.	S/N
1	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	2	2217
2	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
3	Bolt, Machine 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	2	156
4	Arm, Epoxy 21" 2500 lbs	1	40
5	Insulator, Clamp-Top 15 kV	1	760
6	Clamp, Wire, Insulated, 336 - 795 MCM	1	316



## CONSTRUCTION STANDARDS

BASIC UNITS  
SINGLE CLAMP-TOP  
TWIGGY ARM 21"

PAGE:  
1 of 1

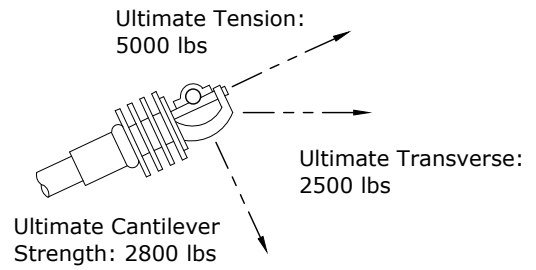
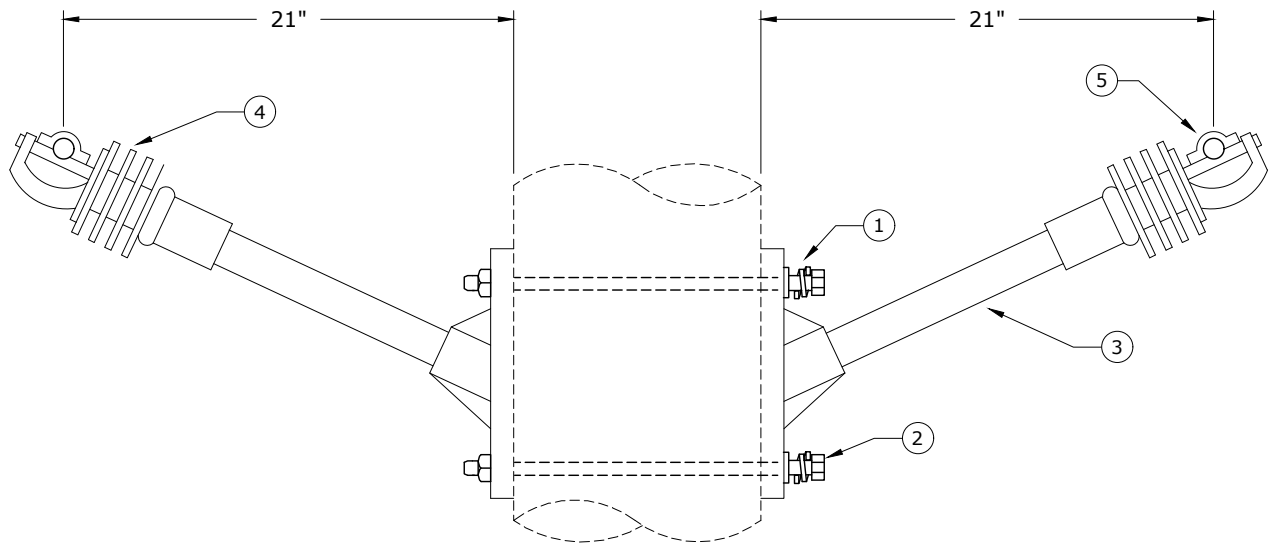
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CAD FILE:  
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REVISIONS			
DATE	ENGR	OPS	
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10/7/05	LB	AH	
2/24/16	KJP		

APP: ELM	SECTION
DATE: 1/31/80	<b>200</b>



**Note:** Use only when uplift needs to be considered.

Rev. 4 - Updated material.

ITEM NO.	DESCRIPTION	PR57	
		QTY.	S/N
1	Washer, Lock Spring Double Coil, Galv., 5/8" ✱	2	2217
2	Bolt, Machine 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile ✱	2	157
3	Arm, Epoxy 21" 2500 lbs	2	40
4	Insulator, Clamp-Top 15 kV	2	760
5	Clamp, Wire, Insulated, 336 - 795 MCM	2	316



## CONSTRUCTION STANDARDS

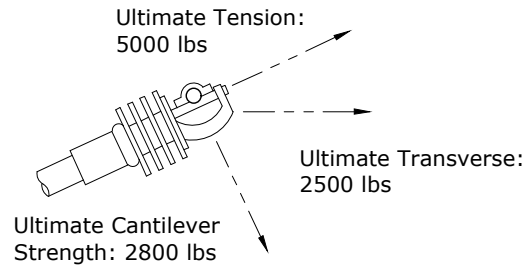
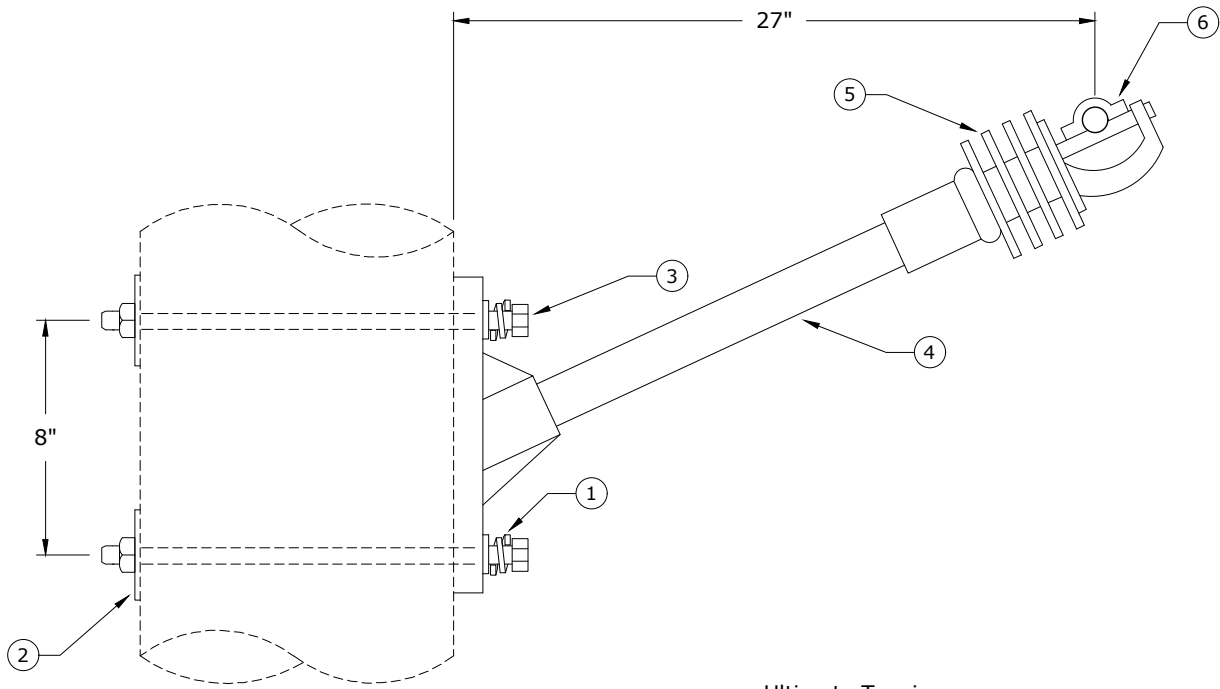
BASIC UNITS  
DOUBLE CLAMP-TOP  
TWIGGY ARM 21"

PAGE:  
1 of 1

**PR57**

CAD FILE:  
PR57

REVISIONS									
DATE	ENGR	OPS							
2/23/00	HWH	MA							
10/7/05	LB	AH							
2/24/16	KJP								
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APP:	ELM	SECTION							
DATE: 1/31/80		<b>200</b>							



**Note:** Use only when uplift needs to be considered.

Rev. 4 - Updated material.

ITEM NO.	DESCRIPTION	PR58	
		QTY.	S/N
1	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	2	2217
2	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
3	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	2	156
4	Arm, Epoxy 27" 2500 lbs	1	42
5	Insulator, Clamp-Top 15 kV	1	760
6	Clamp, Wire, Insulated, 336 - 795 MCM	1	316



## CONSTRUCTION STANDARDS

BASIC UNITS  
SINGLE CLAMP-TOP  
TWIGGY ARM 27"

PAGE:  
1 of 1

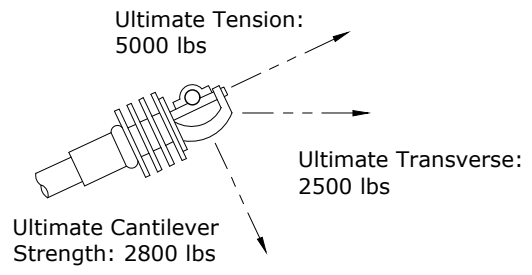
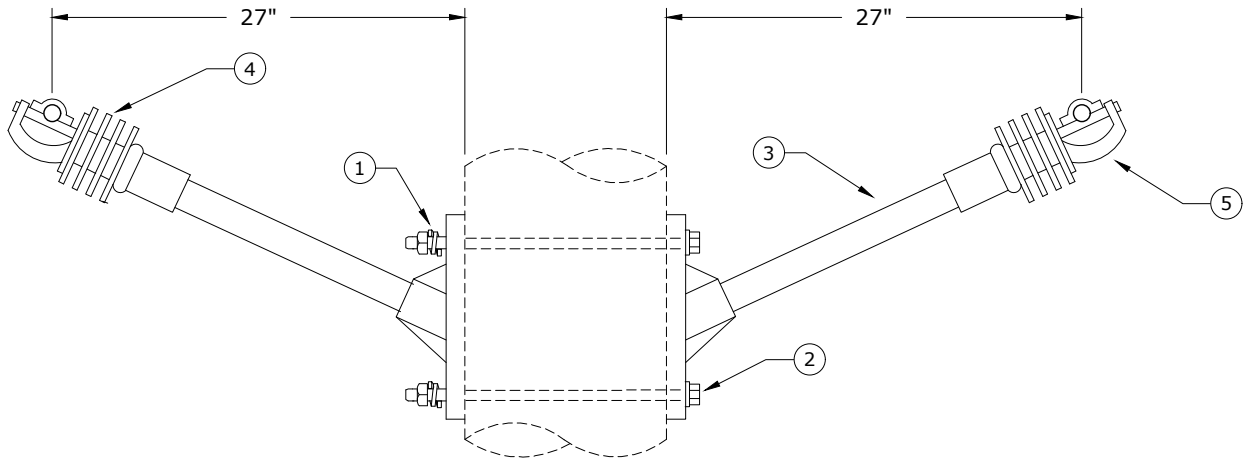
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CAD FILE:  
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### REVISIONS

REV	DATE	ENGR	OPS
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3	10/7/05	LB	AH
4	2/14/16	KJP	

APP:	ELM	SECTION
DATE:	1/31/80	<b>200</b>



**Note:** Use only when uplift needs to be considered.

Rev. 4 - Updated material.

ITEM NO.	DESCRIPTION	PR59	
		QTY.	S/N
1	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	2	2217
2	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile *	2	157 *
3	Arm, Epoxy 27" 2500 lbs	2	42
4	Insulator, Clamp-Top 15 kV	2	760
5	Clamp, Wire, Insulated, 336 - 795 MCM	2	316



### CONSTRUCTION STANDARDS

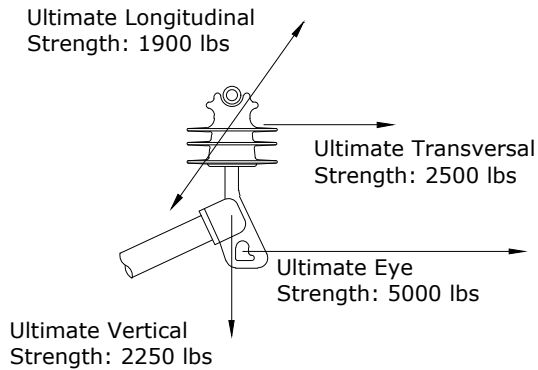
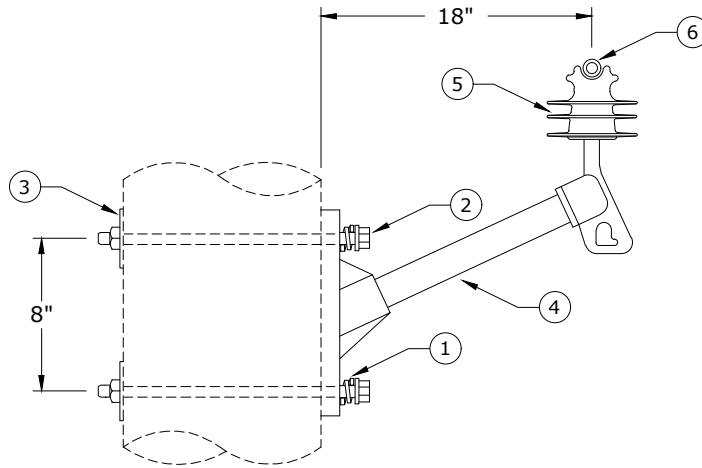
BASIC UNITS  
DOUBLE CLAMP-TOP  
TWIGGY ARM 27"

PAGE:  
1 of 1

**PR59**

CAD FILE:  
PR59

REVISIONS											
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10/7/05	LB	AH									
2/24/16	KJP										
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APP:	ELM	SECTION									
DATE:	1/31/80	<b>200</b>									



PR60 - for bare wire - use bare tie wire  
PR60TREE - for tree wire - use covered tie wire

Note: See Std TI4 - Conductor Tying Guide - Section 400.

Rev. 5 - Eliminated porcelain insulator and added tie wire notes.

ITEM NO.	DESCRIPTION	PR60TREE		PR60	
		QTY.	S/N	QTY.	S/N
1	Washer, Lock, Spring Double Coil, Galv., 5/8"	2	2217	2	2217
2	Bolt, Machine, 5/8" x 16" Galv., 12,400 lbs Ultimate Tensile	2	157	2	157
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
4	Arm, Epoxy 18" 2500 lbs	1	2504	1	2504
5	Insulator, Pin C Neck, Polymer	1	1968	1	1968 *
6	Wire, Tie, AL Annealed #4 SD	11*	3012	10	1421



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 SINGLE TWIGGY ARM 18"

REVISIONS			
△	DATE	ENGR	OPS
3		REDRAWN	IN CAD
4	10/7/05	LB	AH
5	12/22/16	CM	DK
△			

PAGE:  
1 of 1

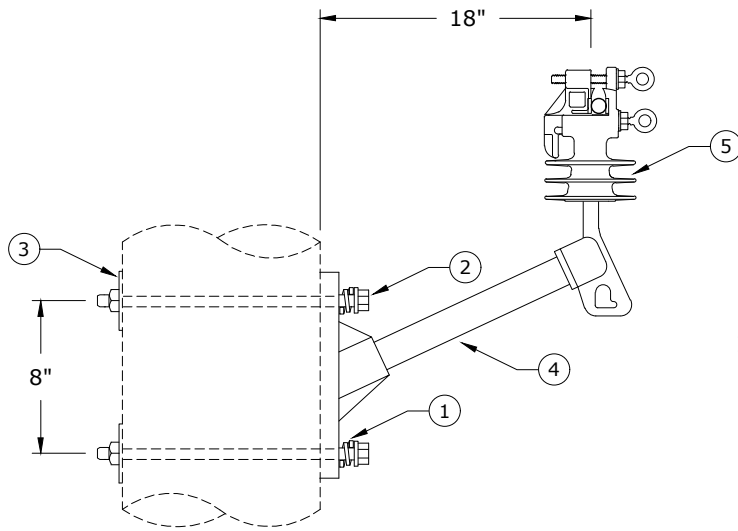
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CAD FILE:  
PR60

APP:  
DATE: 2/16/01

SECTION  
**200**

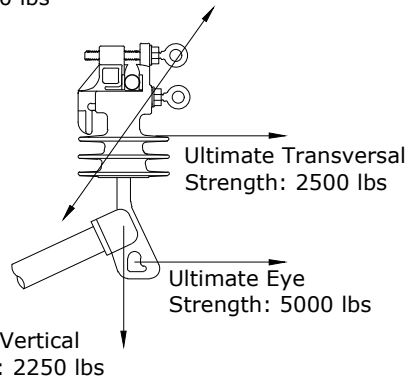




**Installation:**

- 1st tighten the bottom bolt until eye breaks off
- 2nd tighten the top bolt until eye breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off

Ultimate Longitudinal Strength: 1900 lbs



Note: Replacement vise-top insulator bolts S/N 2888.

ITEM NO.	DESCRIPTION	PR60V	
		QTY.	S/N
1	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217
2	Bolt, Machine, 5/8" x 16" Galv., 12,400 lbs. Ultimate Tensile	2	157
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
4	Arm, Epoxy 18" 2500 lbs	1	2504
5	Insulator, Vise-Top, Polymer	1	2439



**CONSTRUCTION STANDARDS**

BASIC UNITS  
SINGLE TWIGGY ARM 18"  
VISE-TOP INSULATOR

PAGE:  
1 of 1

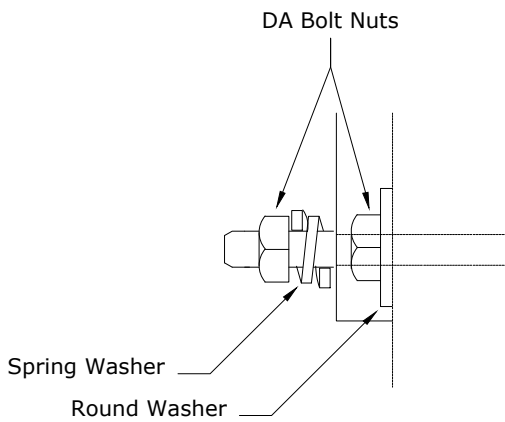
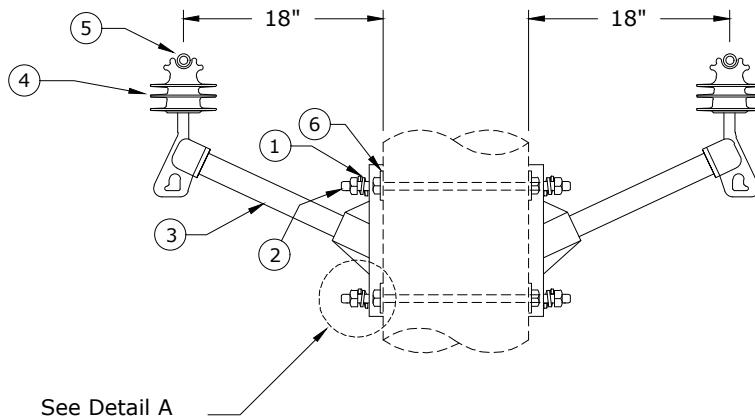
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PR60V

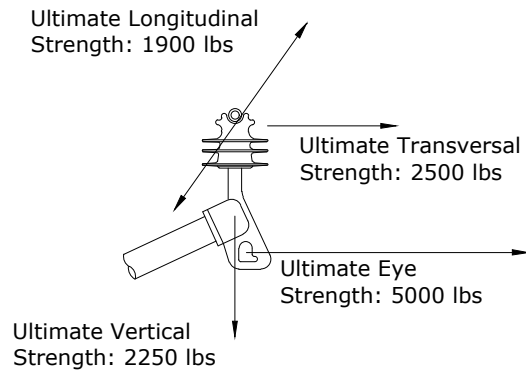
REVISIONS			
DATE	ENGR	OPS	

APP:	CM/DK	SECTION
DATE:	12/22/16	<b>200</b>



Detail A



PR61 - for bare wire - use bare tie wire  
PR61TREE - for tree wire - use covered tie wire

Note: See Std TI4 - Conductor Tying Guide - Section 400.

Rev. 5 - Eliminated porcelain insulator, added tie wire notes, and changed machine bolt to DA bolt.

ITEM NO.	DESCRIPTION	PR61TREE		PR61	
		QTY.	S/N	QTY.	S/N
1	Washer, Lock, Spring Double Coil, Galv., 5/8"	4 *	2217	4 *	2217
2	Bolt, Double Arm, 5/8" x 18" Galv, 12,400 lbs Ultimate Tensile	2 *	82 *	2 *	82 *
3	Arm, Epoxy 18" 2500 lbs	2	2504	2	2504
4	Insulator, Pin, C Neck, Polymer	2	1968	2	1968 *
5	Wire, Tie, AL Annealed #4 SD	22 *	3012	20	1421
6	Washer, Flat Round Galv., 5/8"	4	1395	4 *	1395



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 DOUBLE TWIGGY  
 ARM 18"

REVISIONS			
NO.	DATE	ENGR	OPS
3		REDRAWN	IN CAD
4	10/7/05	LB	AH
5	12/22/16	CM	DK

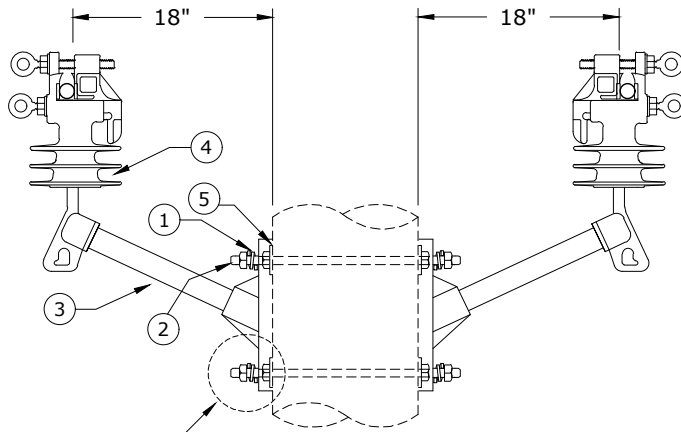
PAGE:  
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**PR61,PR61TREE**

CAD FILE:  
PR61

APP:  
DATE: 2/16/01

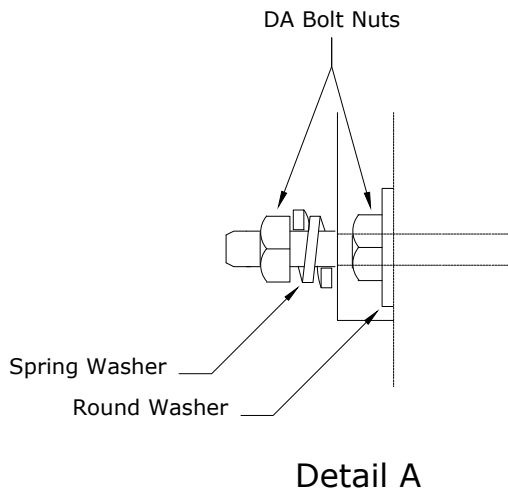
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**200**



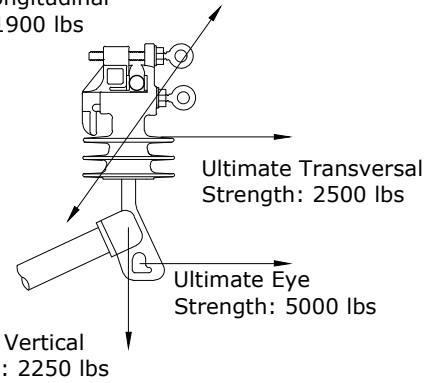
See Detail A

**Installation:**

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off



Ultimate Longitudinal Strength: 1900 lbs



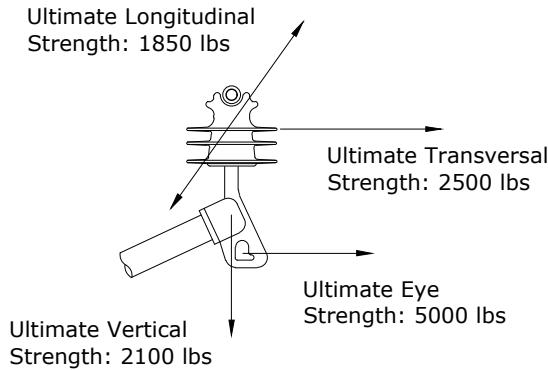
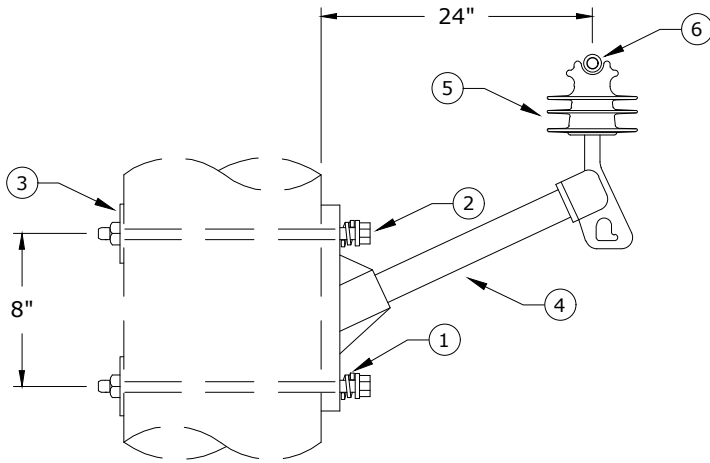
**Note:** Replacement vise-top insulator bolts S/N 2888.

ITEM NO.	DESCRIPTION	PR61V	
		QTY.	S/N
1	Washer, Lock, Spring, Double Coil, Galv., 5/8"	4	2217
2	Bolt, Double Arm, 5/8" x 18" Galv., 12,400 lbs Ultimate Tensile	2	82
3	Arm, Epoxy 18" 2500 lbs	2	2504
4	Insulator, Vise-Top, Polymer	2	2439
5	Washer, Flat Round Galv., 5/8"	4	1395



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 DOUBLE TWIGGY ARM 18"  
 VISE-TOP INSULATOR

REVISIONS			
DATE	ENGR	OPS	



PR62 - for bare wire - use bare tie wire  
PR62TREE - for tree wire - use covered tie wire

Note: See Std TI4 - Conductor Tying Guide - Section 400.

Rev. 2 - Corrected bolt spacing to 8".

ITEM NO.	DESCRIPTION	PR62TREE		PR62	
		QTY.	S/N	QTY.	S/N
1	Washer, Lock, Spring Double Coil, Galv., 5/8"	2	2217	2	2217
2	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile	2	157	2	157
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
4	Arm, Epoxy 24" 2500 lbs	1	2605	1	2605
5	Insulator, Pin, C Neck, Polymer	1	1968	1	1968 *
6	Wire, Tie, AL Annealed #4 SD	11*	3012	10	1421



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 SINGLE TWIGGY  
 ARM 24"

REVISIONS			
Δ	DATE	ENGR	OPS
1	12/22/16	CM	DK
2	1/24/22	JDK	

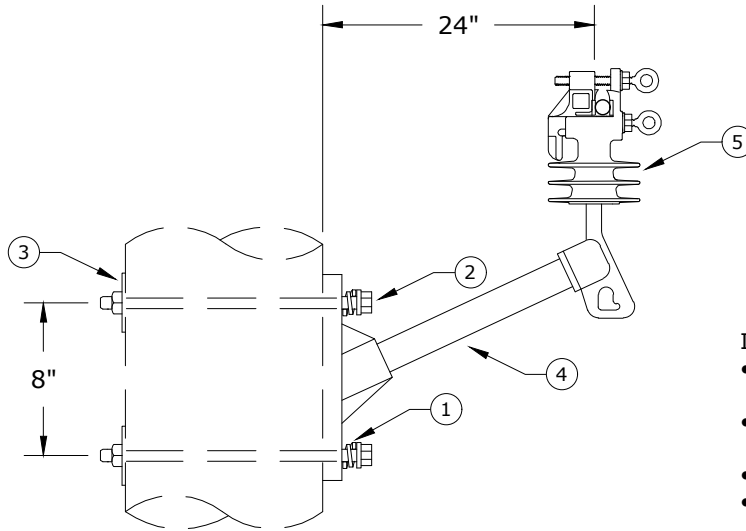
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1 of 1

**PR62,PR62TREE**

CAD FILE:  
PR62

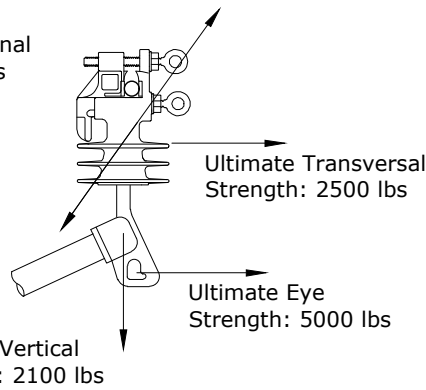
APP: LB/AH  
DATE: 10/7/05

SECTION  
**200**



- Installation:
- 1st tighten the bottom bolt until ring breaks off
  - 2nd tighten the top bolt until ring breaks off
  - Remove bolts with socket stick
  - Do not reuse bolts after rings have broken off

Ultimate Longitudinal Strength: 1850 lbs



**Note:** Replacement visé-top insulator bolts S/N 2888.

ITEM NO.	DESCRIPTION	PR62V	
		QTY.	S/N
1	Washer, Lock, Spring Double Coil, Galv., 5/8"	2	2217
2	Bolt, Machine, 5/8" x 16" Galv., 12,400 lbs Ultimate Tensile	2	157
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
4	Arm, Epoxy 24" 2500 lbs	1	2605
5	Insulator, Visé-Top, Polymer	1	2439



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 SINGLE TWIGGY ARM 24"  
 VISE-TOP INSULATOR

PAGE:  
1 of 1

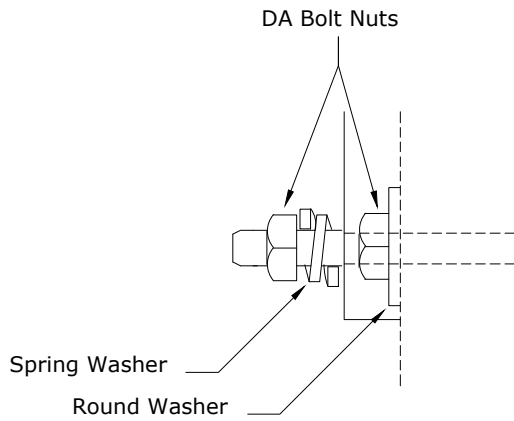
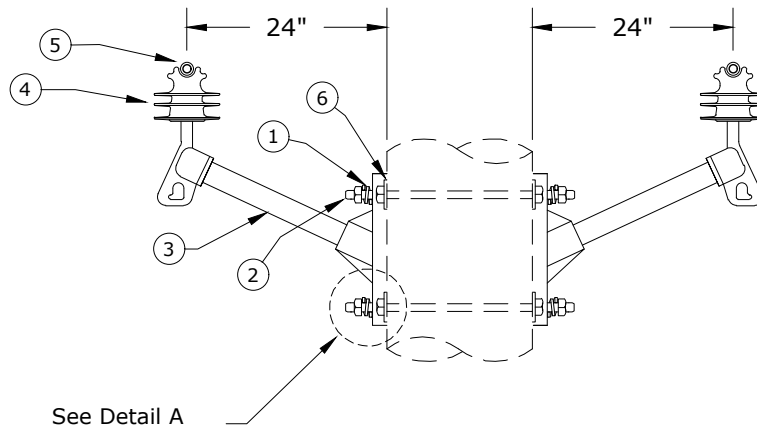
**PR62V**

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PR62V

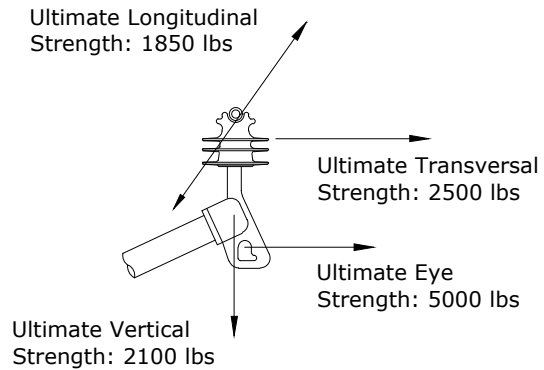
REVISIONS			
DATE	ENGR	OPS	

APP: CM/DK  
DATE: 12/22/16

SECTION  
**200**



Detail A



**PR63** - for bare wire - use bare tie wire  
**PR63TREE** - for tree wire - use covered tie wire

**Note:** See Std TI4 - Conductor Tying Guide - Section 400.

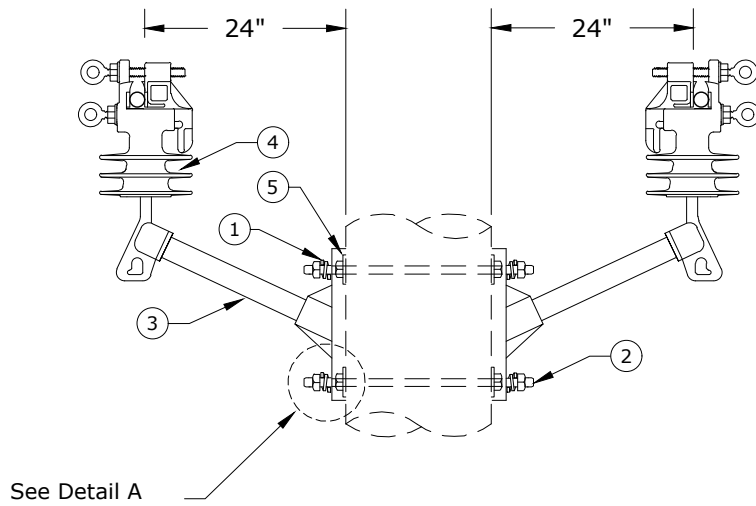
Rev. 1 - Eliminated porcelain insulator, added tie wire notes, and changed machine bolt to DA bolt.

ITEM NO.	DESCRIPTION	PR63TREE		PR63	
		QTY.	S/N	QTY.	S/N
1	Washer, Lock, Spring Double Coil, Galv., 5/8"	4 *	2217	4 *	2217
2	Bolt, Double Arm, 5/8" x 18" Galv., 12,400 lbs Ultimate Tensile	2 *	82 *	2 *	82 *
3	Arm, Epoxy 24" 2500 lbs	2	2605	2	2605
4	Insulator, Pin C Neck, Polymer	2	1968	2	1968 *
5	Wire, Tie, AL Annealed #4 SD	22 *	3012	20	1421
6	Washer, Flat Round Galv., 5/8"	4 *	1395	4 *	1395



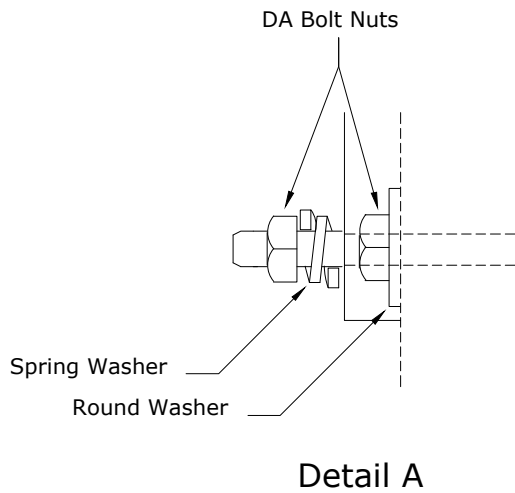
**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 DOUBLE TWIGGY  
 ARM 24"

REVISIONS				
DATE	ENGR	OPS		
12/22/16	CM	DK		

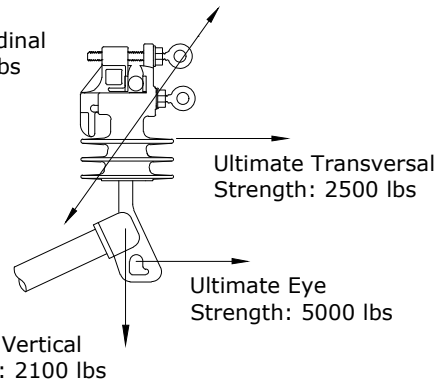


**Installation:**

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off



Ultimate Longitudinal Strength: 1850 lbs



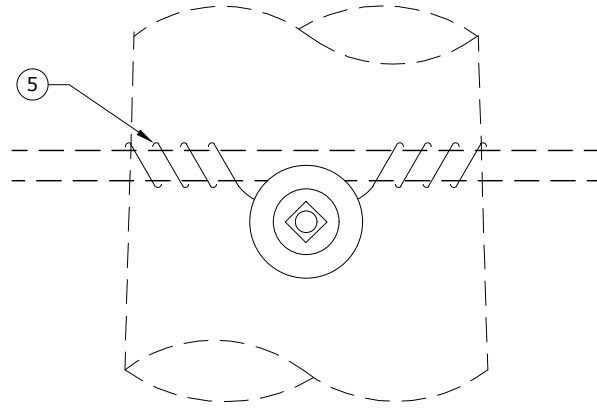
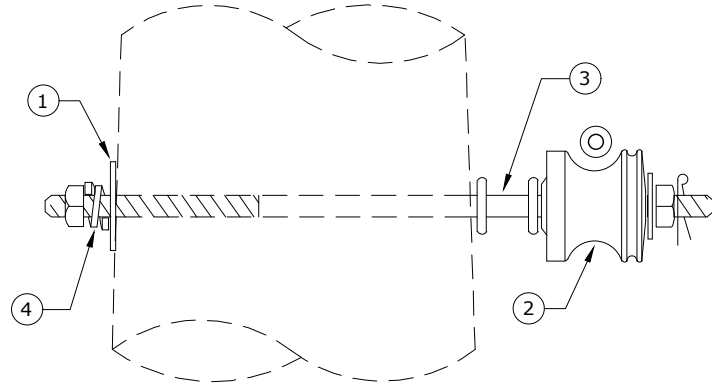
**Note:** Replacement vise-top insulator bolts S/N 2888.

ITEM NO.	DESCRIPTION	PR63V	
		QTY.	S/N
1	Washer, Lock, Spring, Double Coil, Galv., 5/8"	4	2217
2	Bolt, Double Arm, 5/8" x 18" Galv., 12,400 lbs Ultimate Tensile	2	82
3	Arm, Epoxy 24" 2500 lbs	2	2605
4	Insulator, Vise-Top, Polymer	2	2439
5	Washer, Flat Round Galv., 5/8"	4	1395



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 DOUBLE TWIGGY ARM 24"  
 VISE-TOP INSULATORS

REVISIONS			
△	DATE	ENGR	OPS



**Note:** See Std TI4 - Conductor Tying Guide - Section 400.

Rev. 6 - Updated material.

ITEM NO.	DESCRIPTION	S1	
		QTY.	S/N
1	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
2	Insulator, Spool Clevis, Small, ANSI 53-2 Class	1	773
3	Bolt, Dble. Upset 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	1	1580
4	Washer, Lock, Spring Double Coil, Galv., 5/8" *	1	2217
5	Wire, Tie, AL Annealed #4 SD	10	1421



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 NEUTRAL  
 TANGENT SPOOL

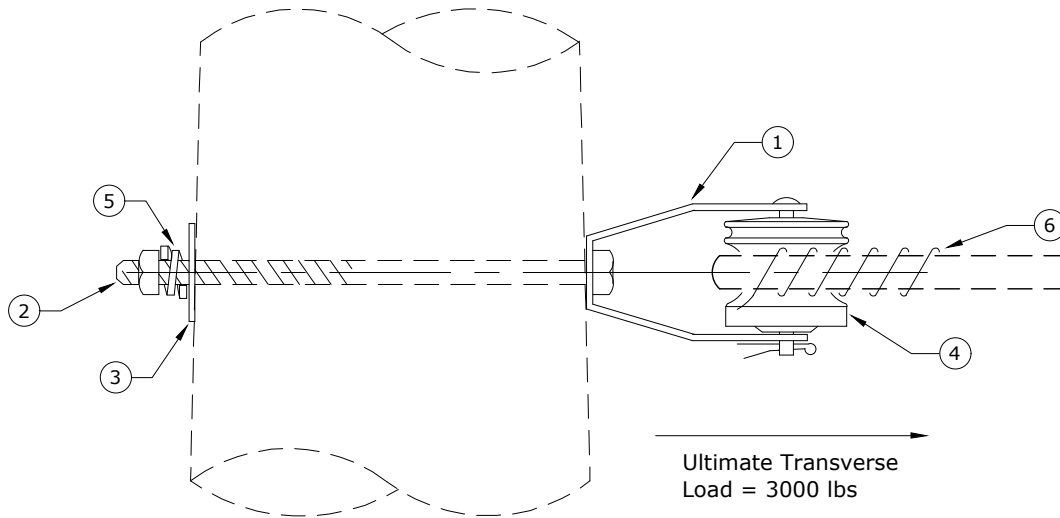
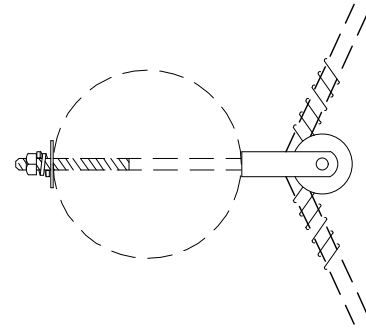
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1 of 1

**S1**

CAD FILE:  
S1

REVISIONS			
DATE	ENGR	OPS	
2/23/00	HWH	MA	
8/2/05	LB	AH	
6/7/06	LB	AH	
2/24/16	KJP		
APP: ELM			
DATE: 1/31/80		SECTION <b>200</b>	





Rev. 6 - Updated material.

ITEM NO.	DESCRIPTION	S2	
		QTY.	S/N
1	Clevis, D.E. Insulator 1340	1	335
2	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	1	156
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
4	Insulator, Spool Clevis, Small, ANSI 53-2 Class	1	773
5	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217
6	Wire, Tie, AL Annealed #4 SD	10	1421



## CONSTRUCTION STANDARDS

BASIC UNITS  
NEUTRAL  
ANGLE SPOOL

### REVISIONS

REV	DATE	ENGR	OPS
3	2/23/00	HWH	MA
4	8/2/05	LB	AH
5	6/7/06	LB	AH
6	2/24/16	KJP	

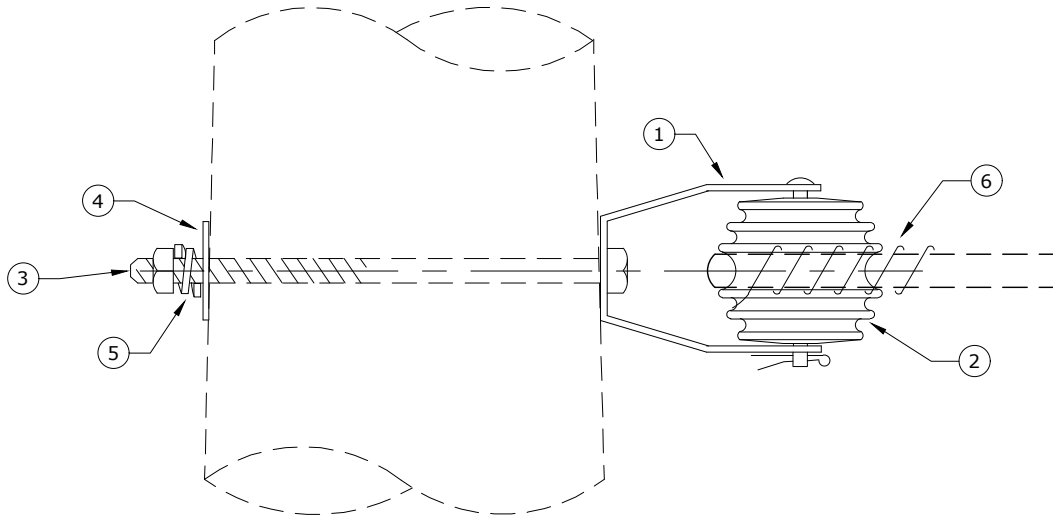
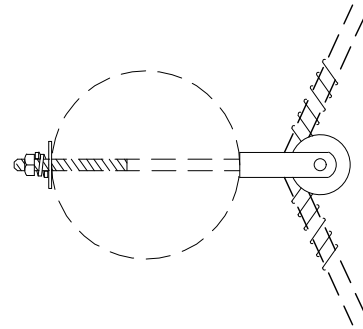
PAGE:  
1 of 1

**S2**

CAD FILE:  
S2

APP: ELM  
DATE: 1/31/80

SECTION  
**200**



**Note:** For use with 397 and 795 neutral from 6° to 15° angle.

Rev. 1 - Updated material.

ITEM NO.	DESCRIPTION	S3	
		QTY.	S/N
1	Clevis, D.E. Insulator 1344	1	336
2	Insulator, Spool Clevis Large, ANSI 53-5 Class	1	774
3	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	1	156
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
5	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217
6	Wire, Tie, AL Annealed #4 SD	10	1421



## CONSTRUCTION STANDARDS

BASIC UNITS  
HEAVY NEUTRAL  
ANGLE SPOOL

PAGE:  
1 of 1

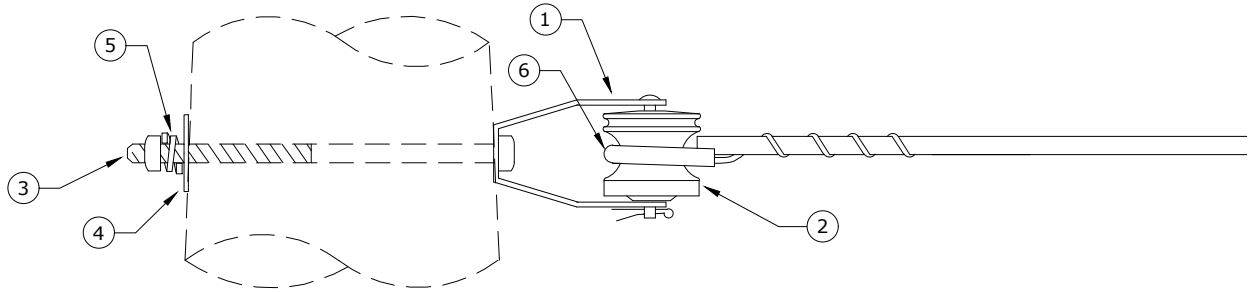
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CAD FILE:  
S3

REVISIONS			
DATE	ENGR	OPS	
2/24/16	KJP		

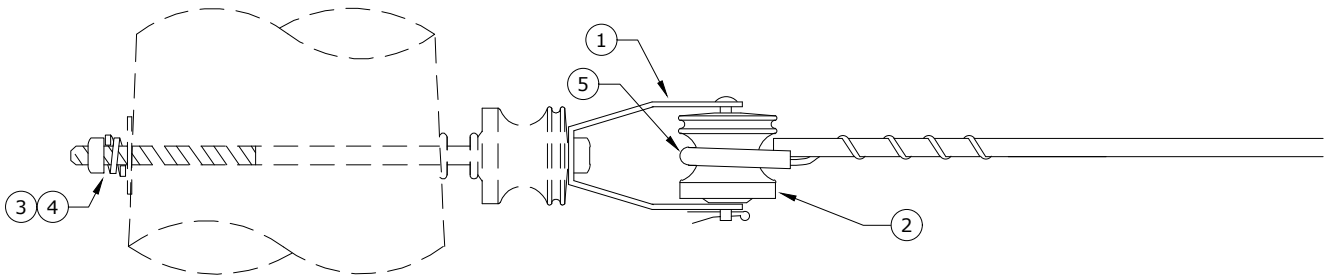
APP:	LB/AH	SECTION
DATE:	1/21/08	200



(SPOOL & CLEVIS)

Note: Preformed deadend rated for 1,000 lbs. max tension.

ITEM NO.	DESCRIPTION	S4	
		QTY.	S/N
1	Clevis, D.E. Insulator 1340	1	335
2	Insulator, Spool Clevis, Small, ANSI 53-2 Class	1	773
3	Bolt, Machine 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	1	156
4	Washer, Curved, 3" x 3" X 3/8" Thick x 13/16" Hole	1	1392
5	Washer, Lock Spring, Double Coil, Galv., 5/8" *	1	2217
6	Preformed Slack Span Deadend #2 ACSR	1	2241



(SPOOL & CLEVIS WITH EXISTING S1)

Note: Preformed deadend rated for 1,000 lbs. max tension.

Rev. 5 - Updated material.

ITEM NO.	DESCRIPTION	S4A	
		QTY.	S/N
1	Clevis, D.E. Insulator 1340	1	335
2	Insulator, Spool Clevis, Small, ANSI 53-2 Class	1	773
3	Washer, Lock, Spring, Single Coil 5/8" Galv.	1	1403
4	Bolt, Double Upset, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	1	1580 *
5	Preformed Slack Span Deadend #2 ACSR	1	2241



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 SLACK NEUTRAL  
 CONDUCTOR DEADENDS

PAGE:  
1 of 1

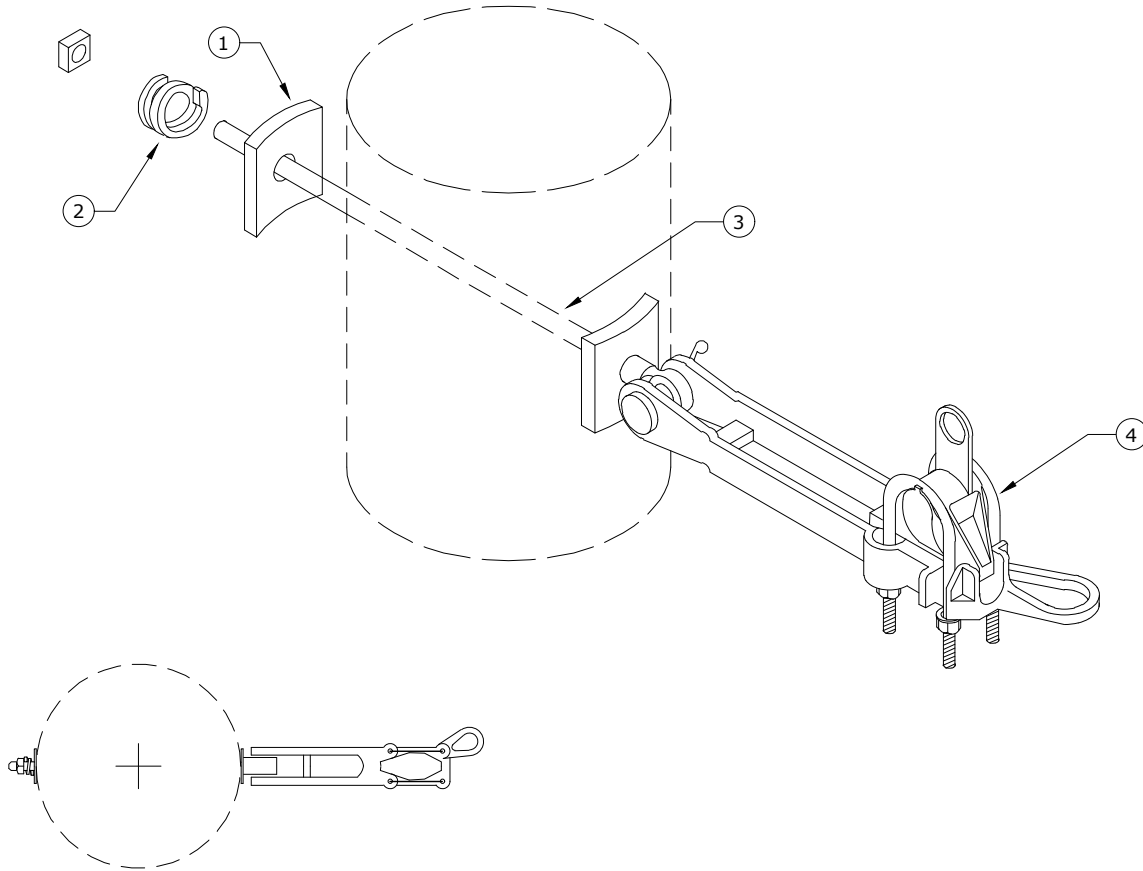
**S4, S4A**

CAD FILE:  
S4

REVISIONS			
DATE	ENGR	OPS	
2/23/00	HWH	MA	
6/7/06	LB	AH	
5/31/12	KJP		
2/24/16	KJP		

APP: ELM	SECTION
DATE: 1/31/80	200



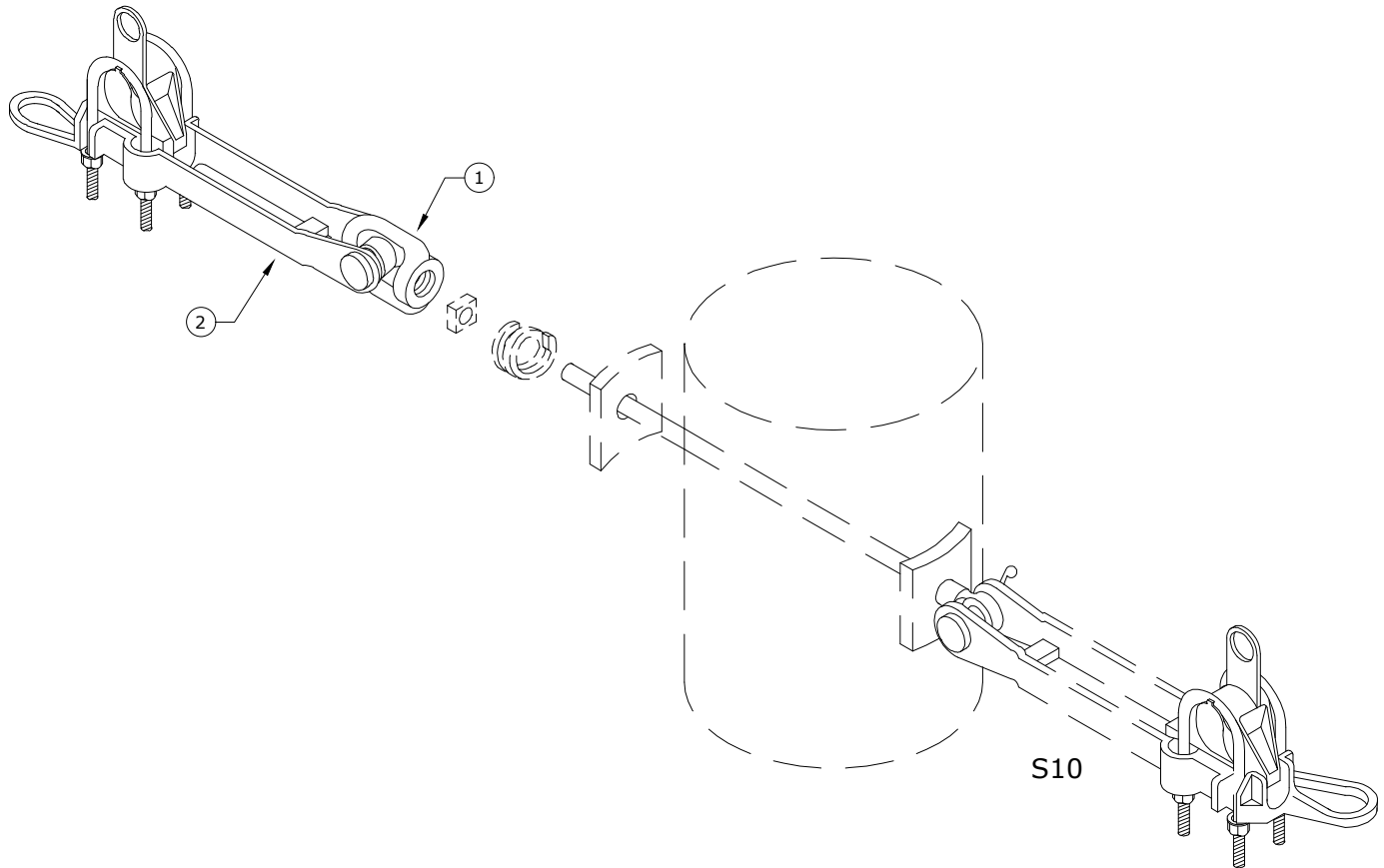
Rev. 4 - Updated material.

ITEM NO.	DESCRIPTION	S10	
		QTY.	S/N
1	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
2	Washer, Lock, Spring, Double Coil, Galv., 5/8" ✱	1	2217
3	Bolt, Eye, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile ✱	1	108
4	Clamp, Strain Distribution, #2 - 397.5 MCM	1	302



**CONSTRUCTION STANDARDS**  
BASIC UNITS  
NEUTRAL DEADEND

REVISIONS			
Δ	DATE	ENGR	OPS
2	2/23/00	HWH	MA
3	10/7/05	LB	AH
4	2/24/16	KJP	
Δ			
APP:	ELM	SECTION	
DATE:	1/31/80	200	



Rev. 4 - Updated material and drawing.

ITEM NO.	DESCRIPTION	S11	
		QTY.	S/N
1	Nut, Eye Oval 5/8" Galv.	1	913
2	Clamp, Strain, Distribution, #2 - 397.5 MCM	1	302



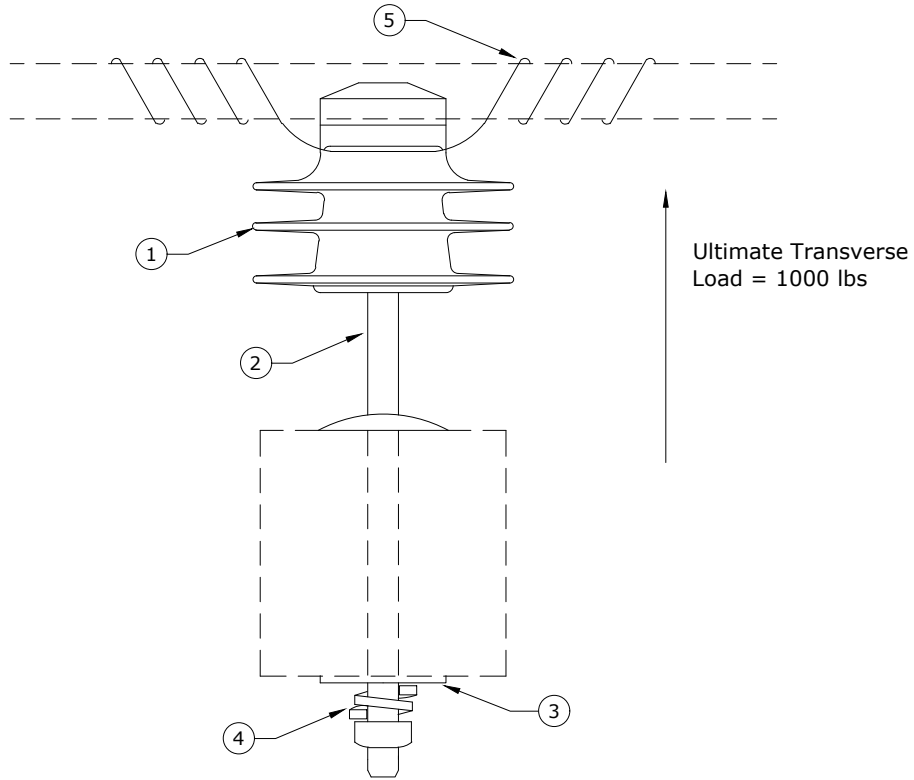
**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 NEUTRAL DOUBLE DEADEND

REVISIONS			
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3	10/7/05	LB	AH
4	2/24/16	KJP	
Δ			
APP:	ELM	SECTION	
DATE:	1/31/80	200	

PAGE:  
1 of 1

**S11**


CAD FILE:  
S11

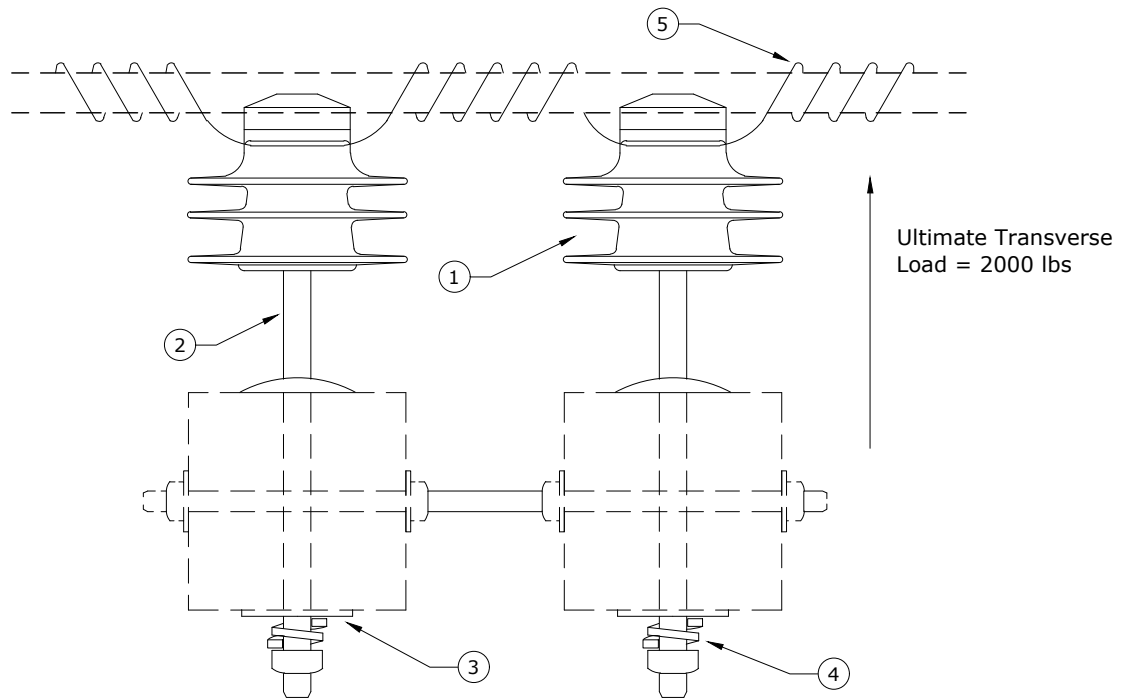


- Notes:**
1. See Std TI4 - Section 400 - Conductor Tying Guide.
  2. Ultimate Cantilever Load=1,000 lbs.

Rev. 5 - Changed to white polymer insulator.

ITEM NO.	DESCRIPTION	S12	
		QTY.	S/N
1	Insulator, Pin, C Neck, White Polymer	1	2656
2	Pin, Crossarm	1	961
3	Washer, Square Flat, 5/8", 2 1/4" x 2 1/4"	1	1412
4	Washer, Lock, Spring Double Coil, Galv., 5/8"	1	2217
5	Wire, Tie, Bare, AL Annealed #4 SD	10	1421

	<b>CONSTRUCTION STANDARDS</b>		REVISIONS				
	BASIC UNITS SINGLE WHITE NEUTRAL INSULATOR ON CROSSARM		DATE	ENGR	OPS		
	3	2/23/00	HWH	MA			
	4	6/7/06	LB	AH			
	5	12/22/16	CM	DK			
PAGE: 1 of 1		<b>S12</b>		CAD FILE: S12		SECTION <b>200</b>	
				APP: ELM			
				DATE: 1/31/80			



- Notes:**
1. See Std TI5 Section 400 - Conductor Tying Guide.
  2. Ultimate Cantilever Load=2,000 lbs.

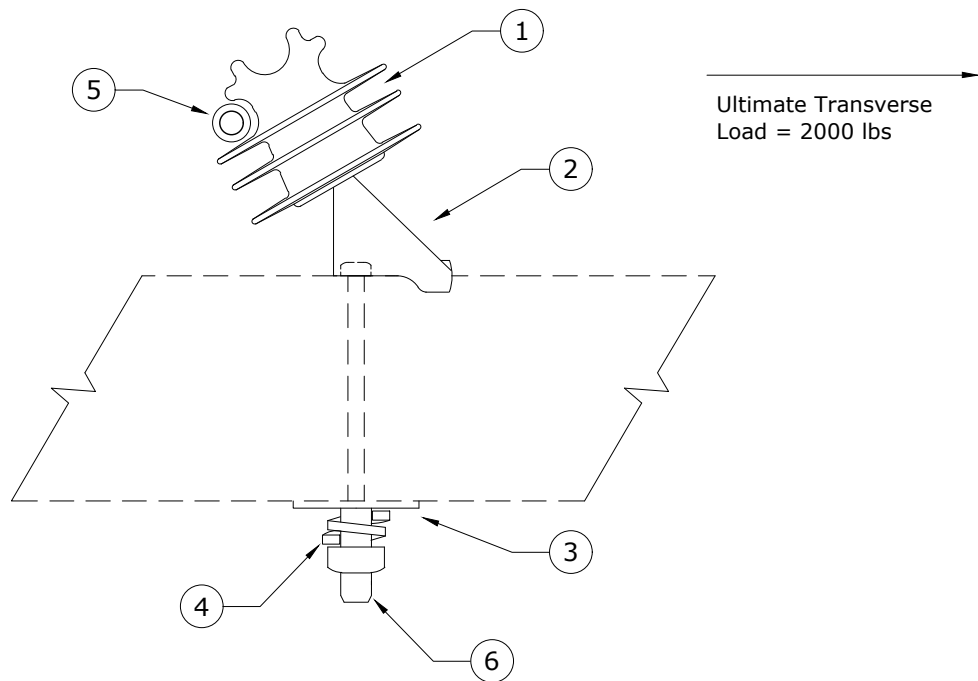
Rev. 5 - Changed to white polymer insulator.

ITEM NO.	DESCRIPTION	S13	
		QTY.	S/N
1	Insulator, Pin, C Neck, White Polymer	2	2656
2	Pin, Crossarm	2	961
3	Washer, Square Flat, 5/8", 2 1/4" x 2 1/4"	2	1412
4	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217
5	Wire, Tie, Bare, AL Annealed #4 SD	20	1421



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 DOUBLE WHITE NEUTRAL INSULATORS  
 ON CROSSARMS

REVISIONS											
DATE	ENGR	OPS									
2/23/00	HWH	MA									
6/7/06	LB	AH									
12/22/16	CM	DK									
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APP:	ELM	SECTION									
DATE:	1/31/80	200									



**Note:** See Std TI4 - Section 400 - Conductor Tying Guide.

Rev. 1 - Changed to white polymer insulator.

ITEM NO.	DESCRIPTION	S14	
		QTY.	S/N
1	Insulator, Pin, C Neck, White Polymer	1	2656
2	Pin, Angle Crossarm	1	2658
3	Washer, Square Flat, 5/8", 2 1/4" x 2 1/4"	1	1412
4	Washer, Lock, Spring Double Coil, Galv., 5/8"	1	2217
5	Wire, Tie, Bare, AL Annealed #4 SD	10	1421
6	Bolt, Machine, 5/8" x 7" Galv., 12,400 lbs Ultimate Tensile	1	2606 *



**CONSTRUCTION STANDARDS**  
 BASIC UNITS  
 SINGLE ANGLED WHITE NEUTRAL INSULATOR  
 ON CROSSARM

REVISIONS			
DATE	ENGR	OPS	
12/22/16	CM	DK	

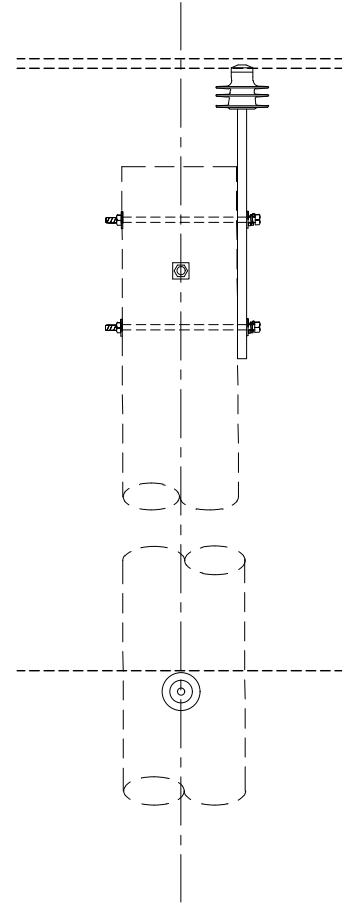
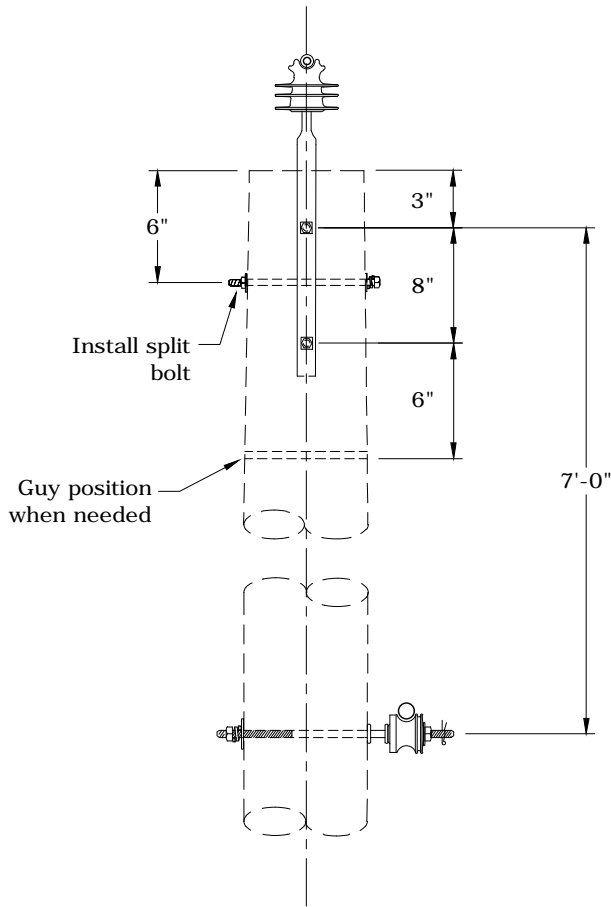


**310**  
**1Ø DISTRIBUTION**  
**UP TO 2/0 ACSR**

6/13/2017

<b>C</b>	A1,-TREE	1Ø Tangent Pole - 0° to 5°
<b>C</b>	A2,-TREE	1Ø Angle Pole - 6° to 30°
<b>C</b>	A4A,-TREE	1Ø 8' Crossarm - High Neutral - 0° to 5°
<b>C</b>	A5A,-TREE	1Ø 8' Double Crossarm - High Neutral - 6° to 30°
<b>C</b>	A41	1Ø Vertical Deadend
<b>C</b>	A42	1Ø Vertical Deadend w/ Extension Link
<b>C</b>	A47,-TREE	1Ø Vertical Double Deadend
<b>C</b>	A48A	8' Pre-assembled Deadend - High Neutral
<b>C</b>	A49A,-TREE	8' Pre-assembled Double Deadend - High Neutral

**N** New Standard  
**R** Redrawn Standard  
**C** Changed Standard  
**~** No Change



### Avian Safe

Note: Maximum line angle calculated for 2,000 lbs. MWT and 250-ft ruling span.

Rev. 3 - Eliminated porcelain pin insulator and added avian note.



## CONSTRUCTION STANDARDS

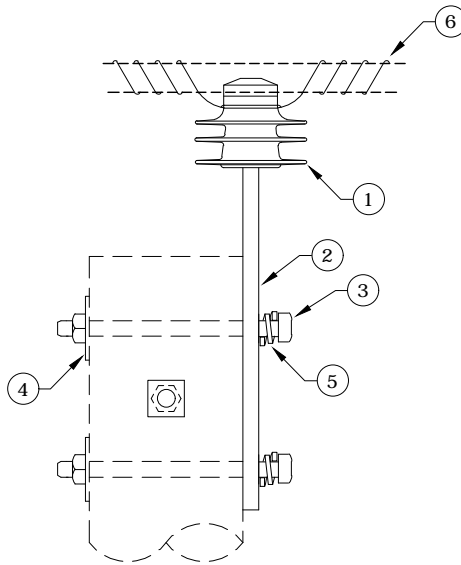
1Ø TANGENT POLE  
0° TO 5°  
2/0 ACSR MAX WIRE

PAGE:  
1 of 2

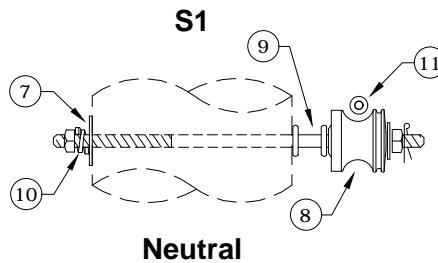
**A1, A1TREE**

CAD FILE:  
A1

REVISIONS											
NO.	DATE	ENGR	OPS								
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2	3/20/08	CM	AH								
3	6/13/17	CM	DK								
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APP:	ELM	SECTION									
DATE:	1/31/80	<b>310</b>									



**PR1,PR1TREE**



**Neutral**

Note: Maximum line angle calculated for 2,000 lbs. MWT and 250-ft ruling span.

Rev. 3 - Eliminated porcelain pin insulator and added avian note.

ITEM NO.	DESCRIPTION	A1TREE		A1	
		QTY.	S/N	QTY.	S/N
1	Insulator, Pin, C Neck, Polymer	1	1968	1	1968 *
2	Pin, Pole Top	1	962	1	962
3	Bolt, Machine, 5/8" x 12" Galv., 12,400 lbs Ultimate Tensile	2	155	2	155
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
5	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
6	Wire, Tie, AL Annealed #4 SD	11	3012	10	1421

ITEM NO.	DESCRIPTION	S1		S1	
		QTY.	S/N	QTY.	S/N
7	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
8	Insulator, Spool Clevis, Small, ANSI 53-2 Class *	1	773	1	773
9	Bolt, Double Upset, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	1580	1	1580
10	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
11	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



**CONSTRUCTION STANDARDS**

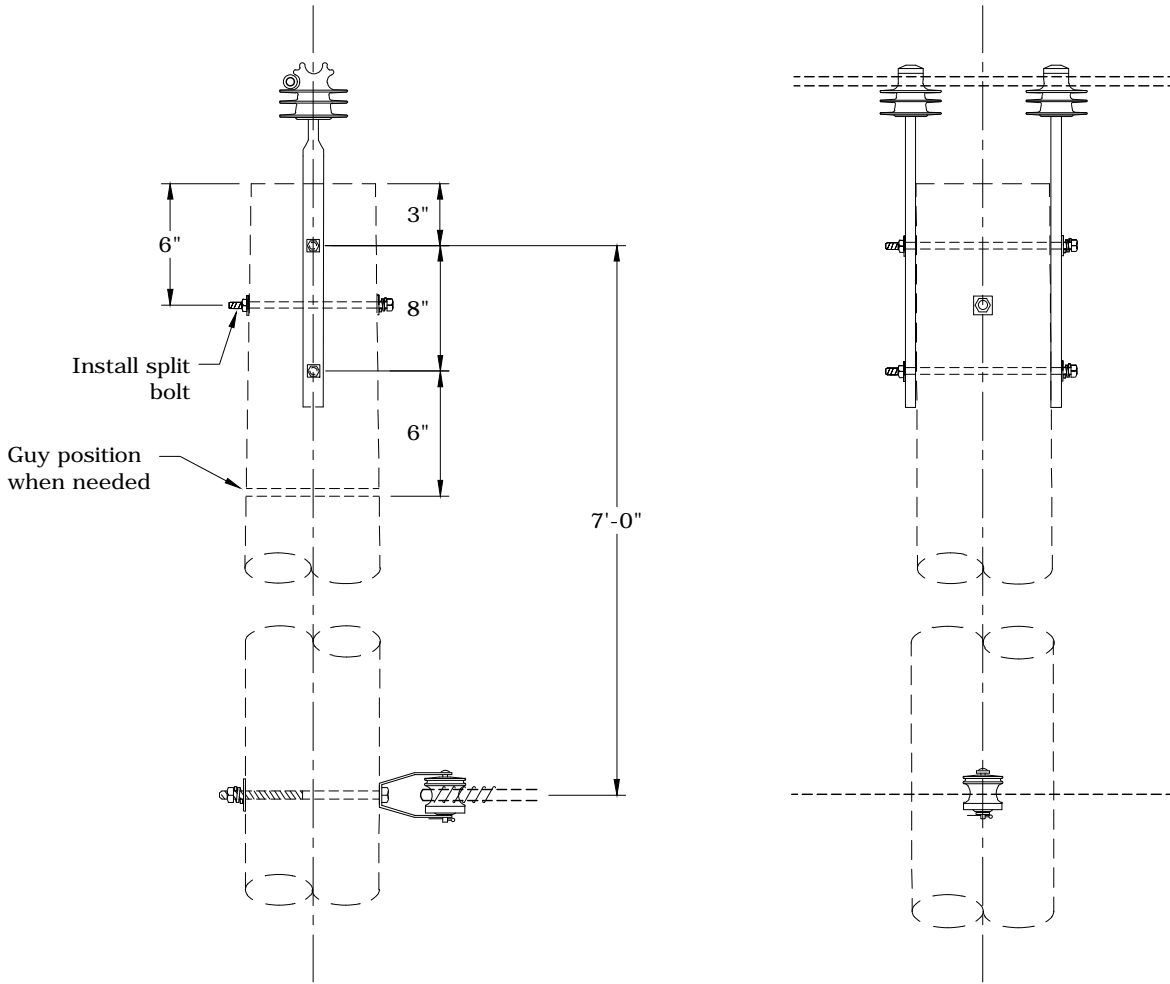
1Ø TANGENT POLE  
0° TO 5°  
2/0 ACSR MAX WIRE

PAGE:  
2 of 2

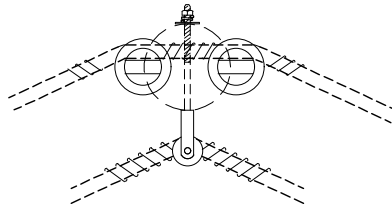
**A1,A1TREE**

CAD FILE:  
A1

REVISIONS			
Δ	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	3/20/08	CM	AH
3	6/13/17	CM	DK
Δ			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>310</b>	



**TOP VIEW**



**Avian Safe**

Note: Maximum line angle calculated for 2,000 lbs. MWT and 250-ft ruling span.

Rev. 3 - Eliminated porcelain pin insulators and added avian note.



**CONSTRUCTION STANDARDS**

1Ø ANGLE POLE  
6° TO 30°  
2/0 ACSR MAX WIRE

PAGE:  
1 of 2

**A2, A2TREE**

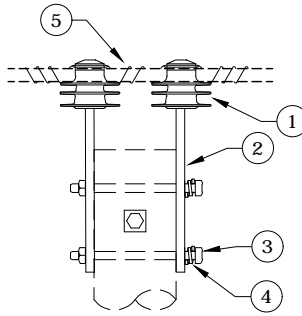
CAD FILE:  
A2

**REVISIONS**

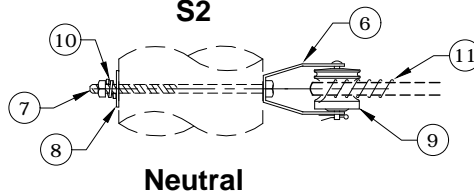
REV	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	3/20/08	CM	AH
3	6/13/17	CM	DK

APP:	ELM	SECTION
DATE:	1/31/80	<b>310</b>

**PR2,PR2TREE**



**S2**



**Neutral**

Rev. 3 - Eliminated porcelain pin insulators and added avian note.

ITEM NO.	DESCRIPTION	A2TREE		A2	
		PR2TREE		PR2	
		QTY.	S/N	QTY.	S/N
1	Insulator, Pin, C Neck, Polymer	2	1968	2	1968 *
2	Pin, Pole Top	2	962	2	962
3	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs. Ultimate Tensile	2	156	2	156
4	Washer, Lock, Spring, Double Coil., Galv., 5/8"	2	2217	2	2217
5	Wire, Tie, AL Annealed #4 SD	22*	3012	20	1421

ITEM NO.	DESCRIPTION	S2		S2	
		QTY.	S/N	QTY.	S/N
		6	Clevis, D.E. Insulator 1340	1	335
7	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs. Ultimate Tensile	1	156	1	156
8	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
9	Insulator, Spool Clevis, Small, ANSI 53-2 Class *	1	773	1	773
10	Washer, Lock, Spring, Double Coil., Galv., 5/8"	1	2217	1	2217
11	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



**CONSTRUCTION STANDARDS**

1Ø ANGLE POLE  
6° TO 30°  
2/0 ACSR MAX WIRE

**REVISIONS**

REV	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	3/20/08	CM	AH
3	6/13/17	CM	DK

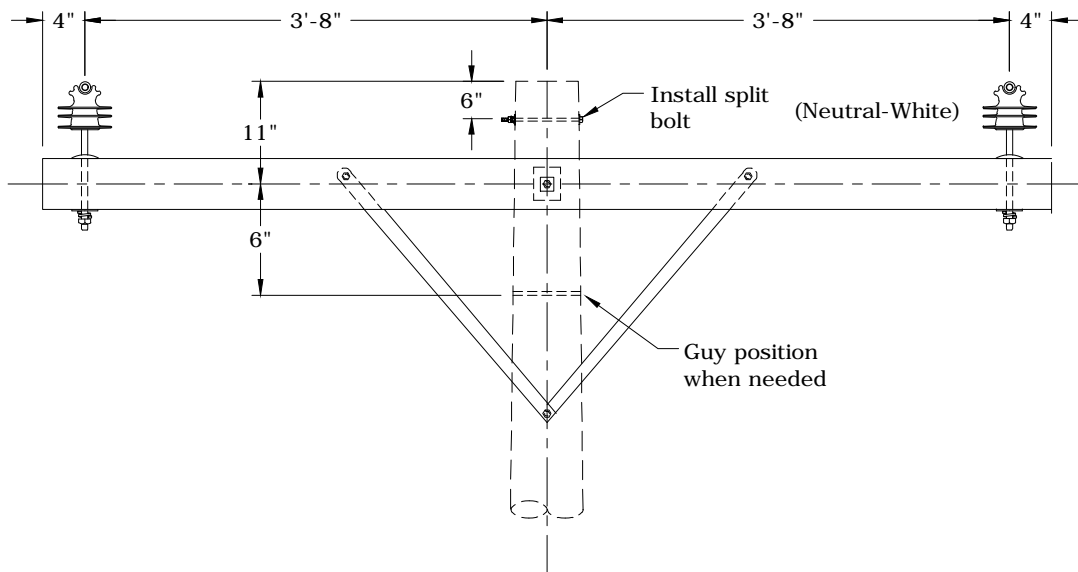
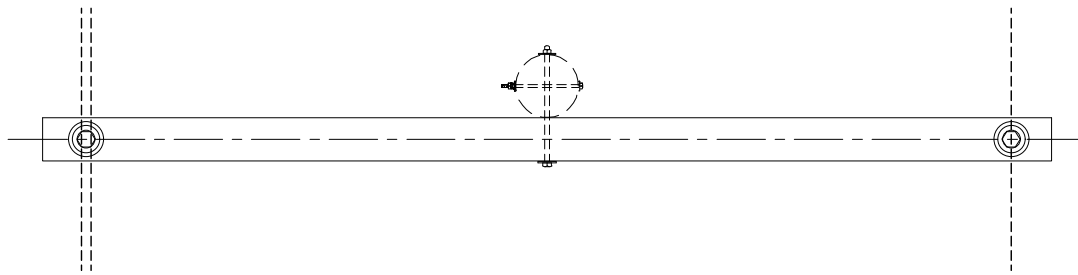
PAGE:  
2 of 2

**A2, A2TREE**

CAD FILE:  
A2

APP: ELM  
DATE: 1/31/80


SECTION  
**310**

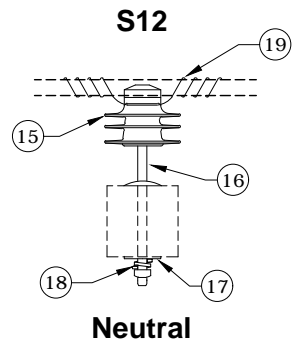
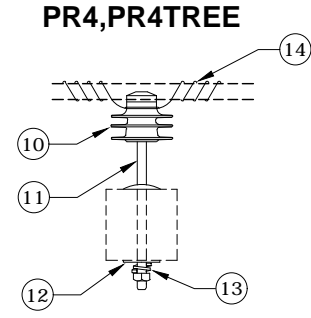
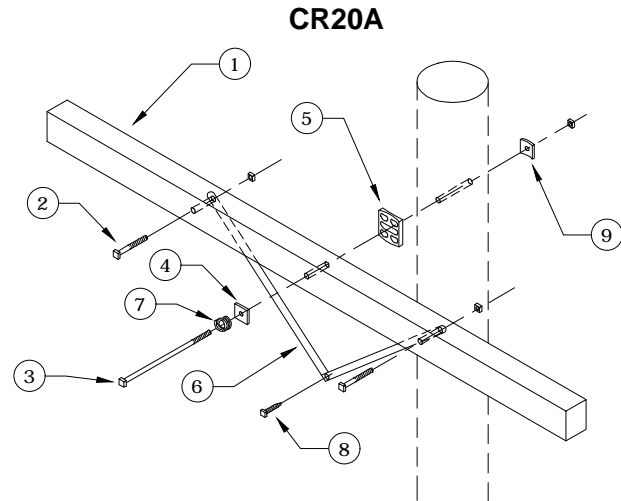


### Avian Safe

- Notes:**
1. Maximum line angle calculated for 2,000 lbs. MWT and 250-ft ruling span.
  2. This framing is for clearance limited situations only.

Rev. 3 - Eliminated porcelain pin insulators and added avian note.

	<b>CONSTRUCTION STANDARDS</b>			<b>REVISIONS</b>			
	1Ø 8' CROSSARM HIGH NEUTRAL-0° TO 5° 2/0 ACSR MAX WIRE			DATE 3/02	ENGR REDRAWN	OPS IN CAD	
	<b>A4A, A4ATREE</b>			APP: ELM		SECTION <b>310</b>	
				DATE: 1/31/80			
PAGE: 1 of 2	CAD FILE: A4A						



Rev. 3 - Eliminated porcelain pin insulators and added avian note.

ITEM NO.	DESCRIPTION	A4ATREE		A4A	
		QTY.	S/N	QTY.	S/N
1	Arm, Cross (Distr.) 8' x 3 3/4" x 4 3/4"	1	25	1	25
2	Bolt, Carriage, 3/8" x 5", Galv., 4250 lbs Ultimate Tensile *	2	78	2	78
3	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile	1	157	1	157
4	Washer, Sq. Flat 5/8", 2 1/4" x 2 1/4"	1	1412	1	1412
5	Gain, Pole Plastic	1	709	1	709
6	Brace, Crossarm 28", Galv., Stl. *	2	205	2	205
7	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
8	Screw, Lag 1/2" x 4 1/2", Twist Drive, Drive Point *	1	1132	1	1132
9	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
ITEM NO.	DESCRIPTION	PR4TREE		PR4	
		QTY.	S/N	QTY.	S/N
10	Insulator, Pin, C Neck, Polymer	1	1968	1	1968 *
11	Pin, Crossarm	1	961	1	961
12	Washer, Square Flat 5/8", 2 1/4" x 2 1/4"	1	1412	1	1412
13	Washer, Lock, Spring, Double Coil., Galv. 5/8"	1	2217	1	2217
14	Wire, Tie, AL Annealed #4 SD	11*	3012	10	1421
ITEM NO.	DESCRIPTION	S12		S12	
		QTY.	S/N	QTY.	S/N
15	Insulator, Pin, C Neck, White Polymer	1	2656	1	2656
16	Pin, Crossarm	1	961	1	961
17	Washer, Square Flat 5/8", 2 1/4" x 2 1/4"	1	1412	1	1412
18	Washer, Lock, Spring, Double Coil., Galv. 5/8"	1	2217	1	2217
19	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



### CONSTRUCTION STANDARDS

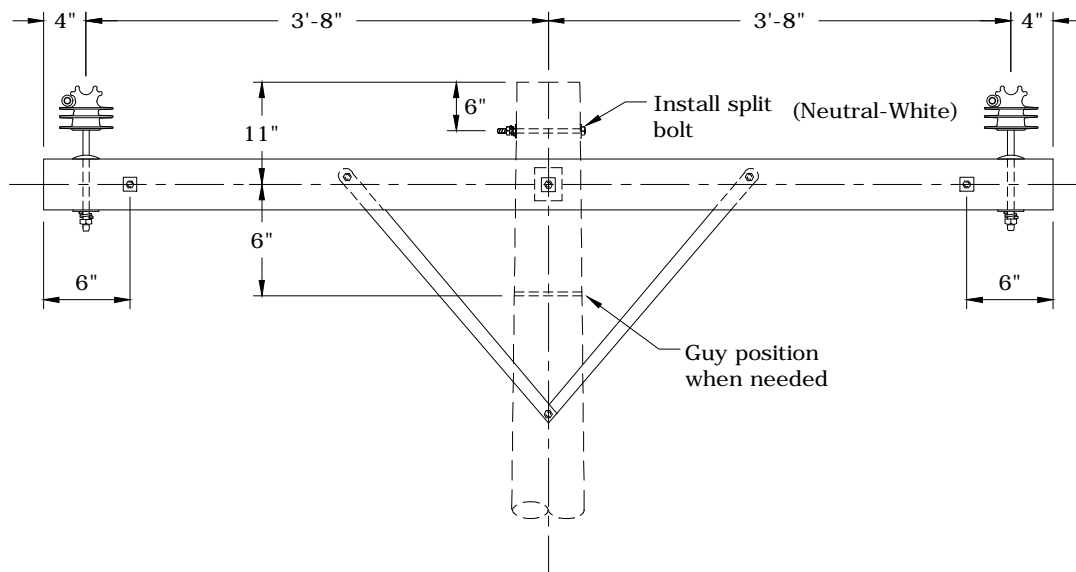
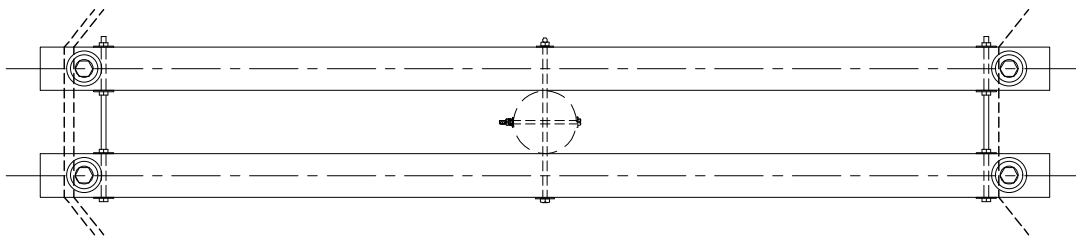
1Ø 8' CROSSARM  
HIGH NEUTRAL-0° TO 5°  
2/0 ACSR MAX WIRE

PAGE:  
2 of 2

**A4A, A4ATREE**

CAD FILE:  
A4A

REVISIONS			
REV	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	3/20/08	CM	AH
3	6/13/17	CM	DK
△			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>310</b>	



### Avian Safe

- Notes:**
1. Maximum line angle calculated for 2,000 lbs. MWT and 250-ft ruling span.
  2. This framing is for clearance limited situations only.

Rev. 3 - Eliminated porcelain pin insulators and added avian note.



## CONSTRUCTION STANDARDS

1Ø 8' DOUBLE CROSSARM  
 HIGH NEUTRAL-6° TO 30°  
 2/0 ACSR MAX WIRE

PAGE:  
1 of 2

**A5A, A5ATREE**

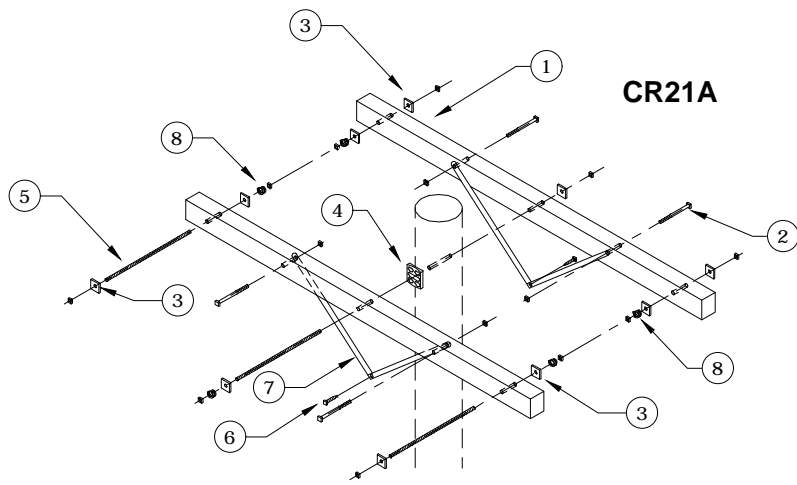
CAD FILE:  
A5A

#### REVISIONS

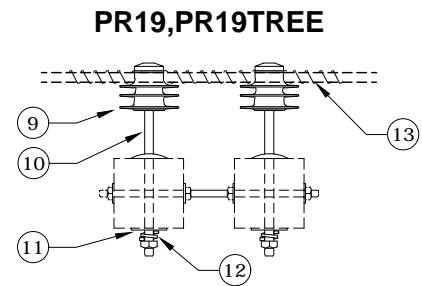
REV	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	3/20/08	CM	AH
3	6/13/17	CM	DK

APP:	ELM	SECTION
DATE:	1/31/80	<b>310</b>

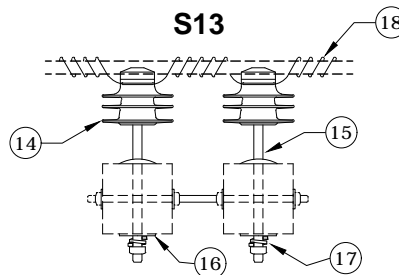




**CR21A**



**PR19,PR19TREE**



**S13**

**Neutral**

Rev. 3 - Eliminated porcelain pin insulators and added avian note.

ITEM NO.	DESCRIPTION	A5ATREE		A5A	
		QTY.	S/N	QTY.	S/N
1	Arm, Cross (Distr.) 8' x 3 3/4" x 4 3/4"	2	25	2	25
2	Bolt, Carriage, 3/8" x 5", Galv., 4200 lbs Ultimate Tensile *	4	78	4	78
3	Washer, Square Flat 5/8", 2 1/4" x 2 1/4"	10	1412	10	1412
4	Gain, Pole Plastic	1	709	1	709
5	Bolt, Double Arm, 5/8" x 20" Galv., 12,400 lbs Ultimate Tensile	3	83	3	83
6	Screw, Lag 1/2" x 4 1/2", Twist Drive, Drive Point *	2	1132	2	1132
7	Brace, Crossarm 28", Galv., Stl. *	4	205	4	205
8	Washer, Lock Spring Double Coil, 5/8"	5	2217	5	2217
ITEM NO.	DESCRIPTION	PR19TREE		PR19	
		QTY.	S/N	QTY.	S/N
9	Insulator, Pin, C Neck, Polymer	2	1968	2	1968 *
10	Pin, Crossarm	2	961	2	961
11	Washer, Square Flat, 5/8", 2 1/4" x 2 1/4"	2	1412	2	1412
12	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
13	Wire, Tie, AL Annealed #4 SD	22*	3012	20	1421
ITEM NO.	DESCRIPTION	S13		S13	
		QTY.	S/N	QTY.	S/N
14	Insulator, Pin, C Neck, White Polymer	2	2656	2	2656
15	Pin, Crossarm	2	961	2	961
16	Washer, Square Flat, 5/8", 2 1/4" x 2 1/4"	2	1412	2	1412
17	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
18	Wire, Tie, AL Annealed #4 SD	20	1421	20	1421



**CONSTRUCTION STANDARDS**

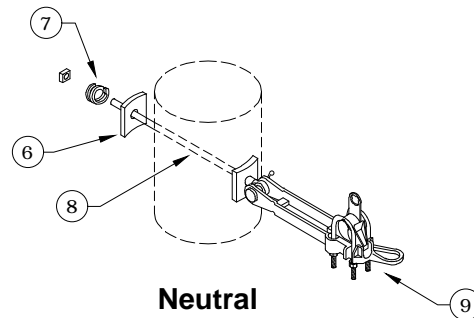
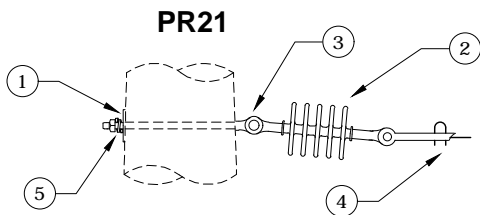
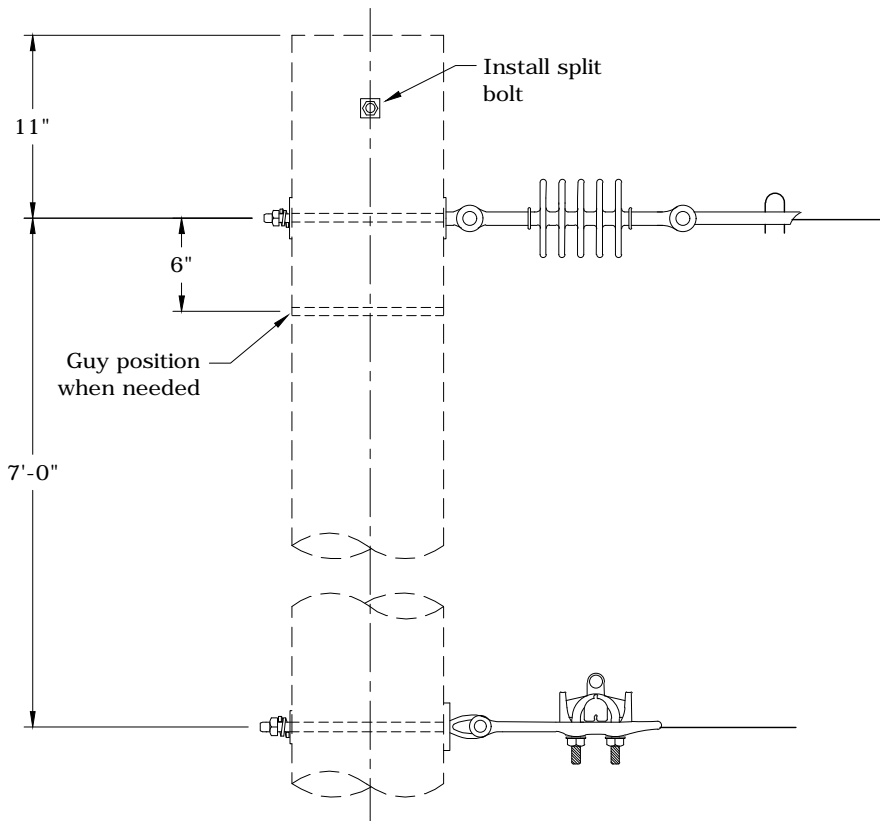
1Ø 8' DOUBLE CROSSARM  
HIGH NEUTRAL-6° TO 30°  
2/0 ACSR MAX WIRE

PAGE:  
2 of 2

**A5A, A5ATREE**

CAD FILE:  
A5A

REVISIONS			
△	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	3/20/08	CM	AH
3	6/13/17	CM	DK
△			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>310</b>	



### Avian Safe

Rev. 4 - Added avian note.

ITEM NO.	DESCRIPTION	A41	
		PR21	
		QTY.	S/N
1	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
2	Insulator, Susp. 15 kV Clevis-Tongue, Polymer *	1	1967
3	Bolt, Eye, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	1	108
4	Clamp, Strain, Distribution, #2 to 397.5 MCM	1	302
5	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217
ITEM NO.	DESCRIPTION	ADDITIONAL MATERIALS	
		QTY.	S/N
6	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
7	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217
8	Bolt, Eye, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	1	108
9	Clamp, Strain #2	1	300

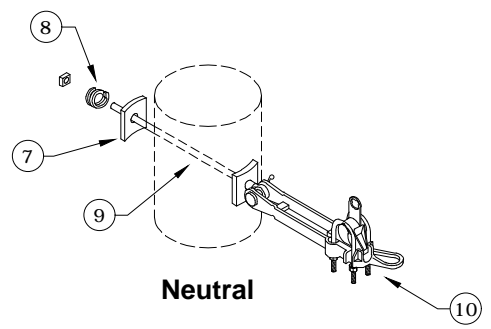
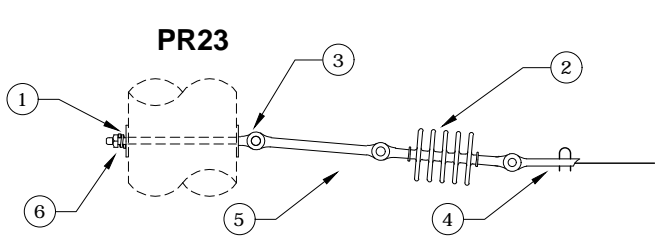
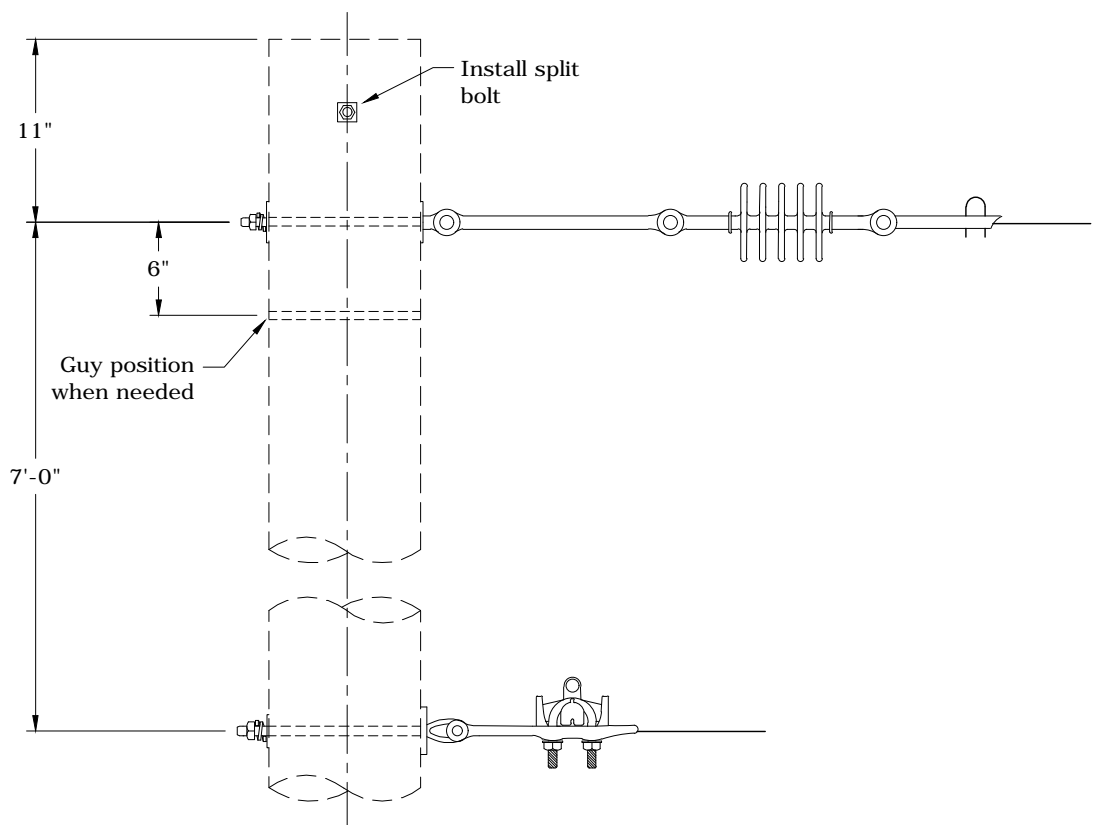


## CONSTRUCTION STANDARDS

1Ø VERTICAL DEADEND  
2/0 ACSR MAX WIRE

#### REVISIONS

REV	DATE	ENGR	OPS
1	2/11/81	GGW	
2	3/02	REDRAWN	IN CAD
3	3/20/08	CM	AH
4	6/13/17	CM	DK



**Avian Safe**

Rev. 1 - Added avian note.

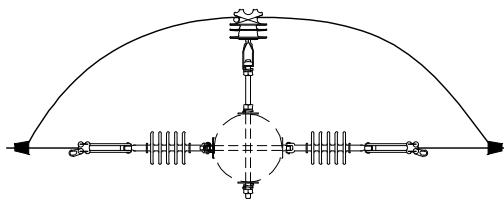
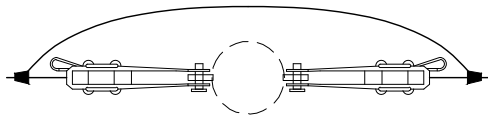
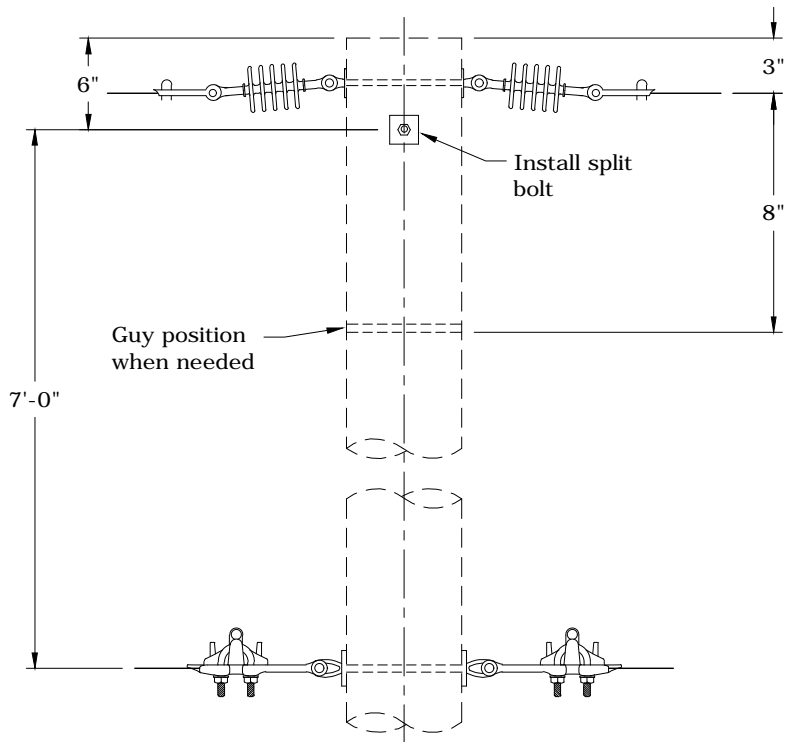
ITEM NO.	DESCRIPTION	A42	
		PR23	
		QTY.	S/N
1	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
2	Insulator, Susp. 15 kV Clevis-Tongue, Polymer *	1	1967
3	Bolt, Eye, 5/8" x 14" Galv., 12,400 lbs Ultimate Tensile	1	108
4	Clamp, Strain, Distribution, #2 to 397.5 MCM	1	302
5	Insulator, Guy Strain, Fiberglass, 20"	1	2909 *
6	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217
ITEM NO.	DESCRIPTION	ADDITIONAL MATERIALS	
		QTY.	S/N
7	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
8	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217
9	Bolt, Eye, 5/8" x 14" Galv., 12,400 lbs Ultimate Tensile	1	108
10	Clamp, Strain #2	1	300



**CONSTRUCTION STANDARDS**

1Ø VERTICAL DEADEND  
W/ EXTENSION LINK  
2/0 ACSR MAX WIRE

REVISIONS			
Δ	DATE	ENGR	OPS
1	6/13/17	CM	DK
Δ	APP:	CM/AH	SECTION
	DATE:	3/20/08	<b>310</b>



**Avian Safe**

Rev. 3 - Eliminated porcelain pin insulator and added avian note.



**CONSTRUCTION STANDARDS**  
 1Ø VERTICAL DOUBLE DEADEND  
 2/0 ACSR MAX WIRE

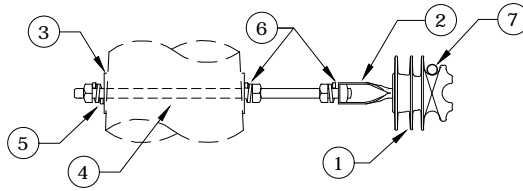
REVISIONS			
△	DATE	ENGR	OPS
2	3/02	REDRAWN	IN CAD
3	3/20/08	CM	AH
4	7/29/10	KJP	
5	6/13/17	CM	DK
△			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>310</b>	

PAGE:  
1 of 2

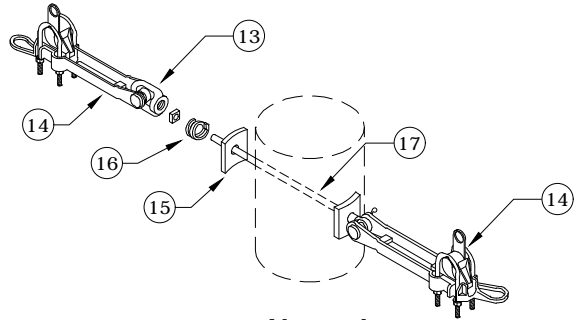
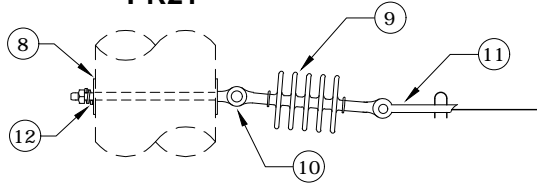
**A47, A47TREE**

CAD FILE:  
A47

**PR20,PR20TREE**



**PR21**



**Neutral**

Rev. 5 - Eliminated porcelain pin insulator and added avian note.

ITEM NO.	DESCRIPTION	A47TREE		A47	
		PR20TREE		PR20	
		QTY.	S/N	QTY.	S/N
1	Insulator Pin, C Neck, Polymer	1	1968	1	1968 *
2	Pin, Adapter	1	959	1	959
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
4	Bolt, Double Arm, 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile	1	81	1	81
5	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
6	Washer, Lock, Spring, Single Coil, Galv., 5/8"	2	1403	2	1403
7	Wire, Tie, AL Annealed #4 SD	11*	3012	10	1421
ITEM NO.	DESCRIPTION	PR21 (2)		PR21 (2)	
		QTY.	S/N	QTY.	S/N
8	Washer, Curved, Square, Cast, 5/8", 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
9	Insulator, Susp. 15 kV Clevis-Tongue, Polymer	2	1967	2	1967
10	Bolt, Eye, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	2	108	2	108
11	Clamp, Strain, Distribution, #2 to 397.5 MCM	2	302	2	302
12	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
ITEM NO.	DESCRIPTION	ADDITIONAL MATERIAL			
		QTY.	S/N	QTY.	S/N
13	Nut, Eye Oval 5/8"	1	913	1	913
14	Clamp, Strain #2	2	300	2	300
15	Washer, Curved, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
16	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
17	Bolt, Eye, 5/8" X 14", Galv., 12,400 lbs Ultimate Tensile	1	108	1	108

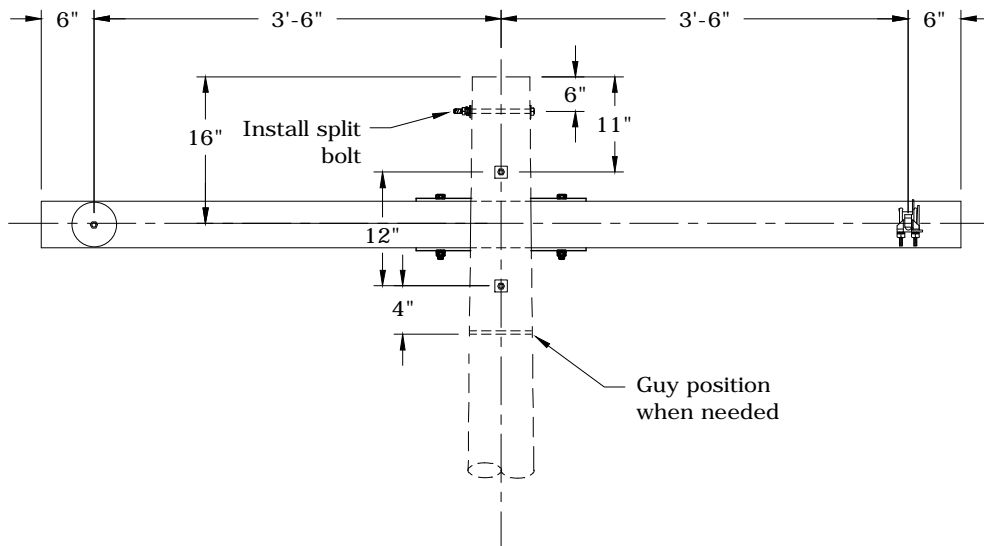


**CONSTRUCTION STANDARDS**

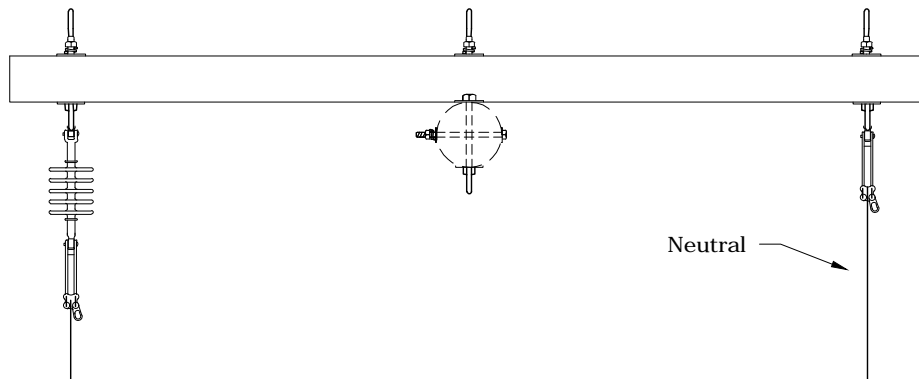
1Ø VERTICAL DOUBLE DEADEND  
2/0 ACSR MAX WIRE

REVISIONS			
Δ	DATE	ENGR	OPS
2	3/02	REDRAWN	IN CAD
3	3/20/08	CM	AH
4	7/29/10	KJP	
5	6/13/17	CM	DK

**FRONT VIEW**



**TOP VIEW**



**Avian Safe**

Note: This framing is for clearance limited situations only.

Rev. 1 - Added avian note.



**CONSTRUCTION STANDARDS**  
 8' PRE-ASSEMBLED DEADEND  
 HIGH NEUTRAL  
 2/0 ACSR MAX WIRE

PAGE:  
1 of 2

**A48A**

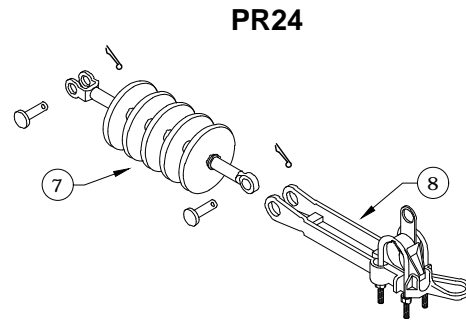
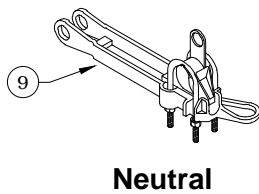
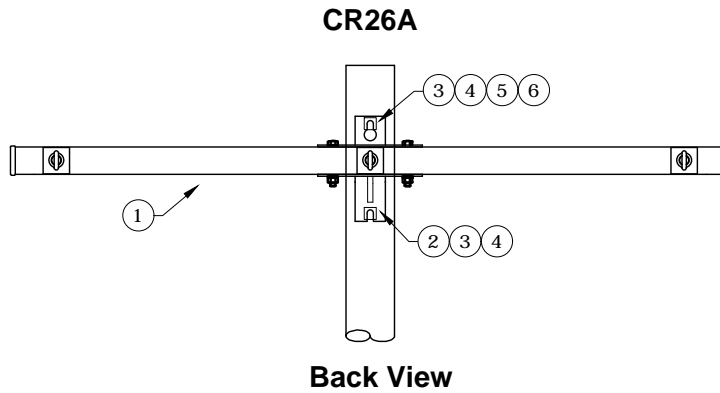
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**REVISIONS**

REVISION	DATE	ENGR	OPS
1	6/13/17	CM	DK

APP:	CM/AH	SECTION
DATE:	3/20/08	<b>310</b>



Rev. 1 - Added avian note.

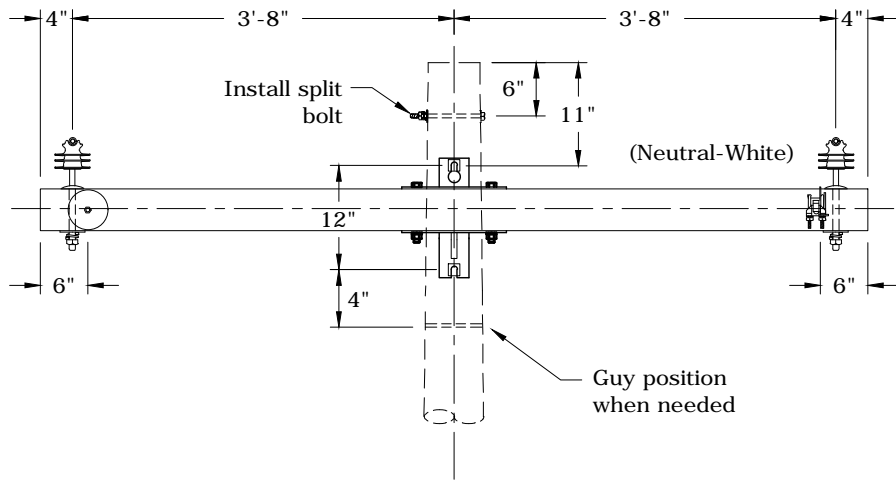
ITEM NO.	DESCRIPTION	A48A	
		QTY.	S/N
1	Arm, Deadend Assembly, 8', 3-Position, 397 Max	1	2508
2	Bolt, Machine, 3/4" x 14" Galv., 18,350 lbs Ultimate Tensile	1	174
3	Washer, Lock, Spring, Double Coil, Galv., 3/4"	2	2218
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
5	Nut, Eye Oval 3/4"	1	914
6	Bolt, Machine, 3/4" x 16" Galv., 18,350 lbs Ultimate Tensile	1	175
ITEM NO.	DESCRIPTION	PR24	
		QTY.	S/N
7	Insulator, Susp. 15 kV Clevis-Tongue, Polymer ✱	1	1967
8	Clamp, Strain, Distribution, #2 to 397.5 MCM	1	302
ITEM NO.	DESCRIPTION	ADDITIONAL MATERIAL	
		QTY.	S/N
9	Clamp, Strain, #2	1	300



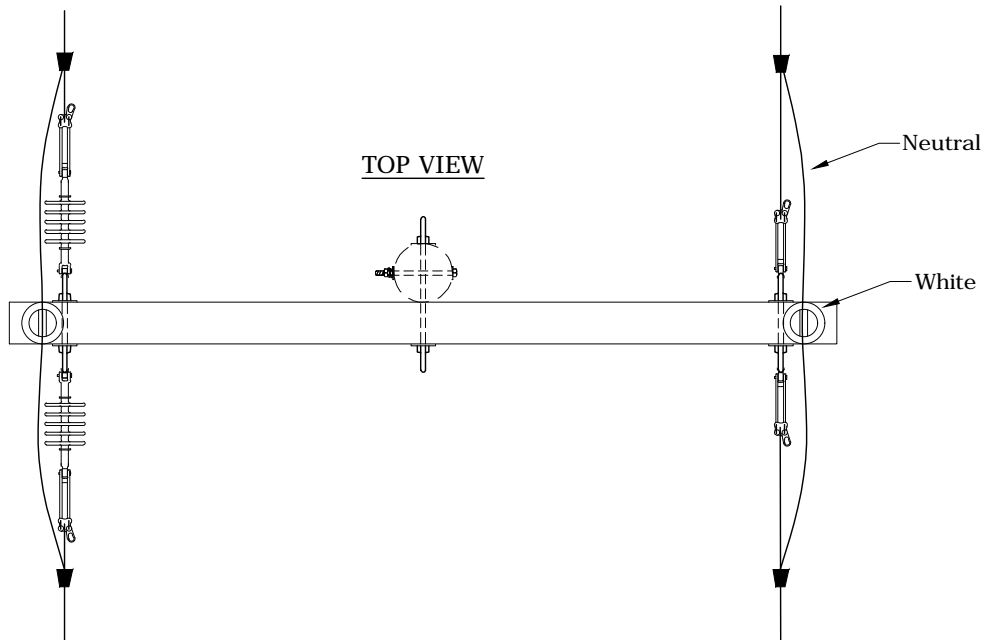
**CONSTRUCTION STANDARDS**  
 8' PRE-ASSEMBLED DEADEND  
 HIGH NEUTRAL  
 2/0 ACSR MAX WIRE

REVISIONS			
DATE	ENGR	OPS	
6/13/17	CM	DK	

**FRONT VIEW**



**TOP VIEW**



**Avian Safe**

Rev. 2 - Eliminated porcelain pin insulators and added avian note.



**CONSTRUCTION STANDARDS**  
 8' PRE-ASSEMBLED DOUBLE DEADEND  
 HIGH NEUTRAL  
 2/0 ACSR MAX WIRE

PAGE:  
1 of 2

**A49A, A49ATREE**

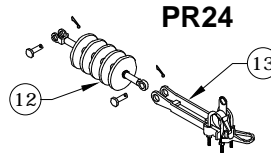
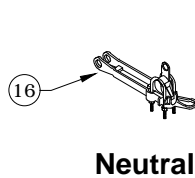
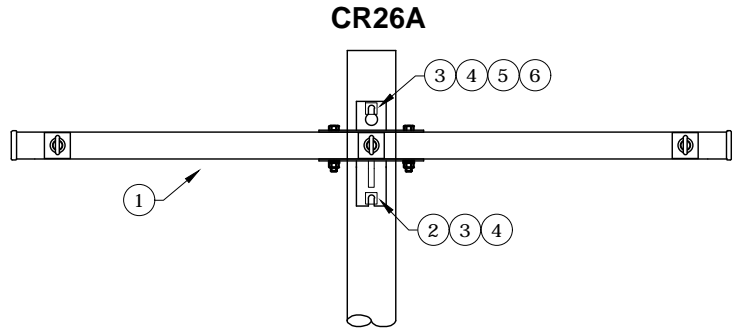
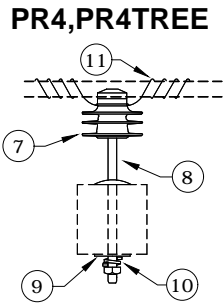
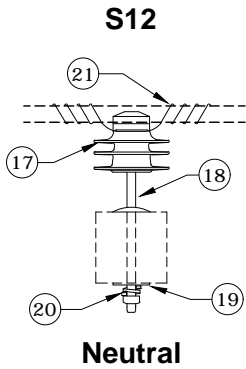
CAD FILE:  
A49A

**REVISIONS**

NO.	DATE	ENGR	OPS
1	7/29/10	KJP	
2	6/13/17	CM	DK

APP:	CM/AH	SECTION
DATE:	3/20/08	<b>310</b>





Rev. 2 - Eliminated porcelain pin insulators and added avian note.

ITEM NO.	DESCRIPTION	A49ATREE		A49A	
		QTY.	S/N	QTY.	S/N
1	Arm, Deadend Assembly, 8', 3-Position, 397 Max	1	2508	1	2508
2	Bolt, Machine, 3/4" x 14", Galv., 18,350 lbs Ultimate Tensile	1	174	1	174
3	Washer, Lock, Spring, Double Coil, Galv., 3/4"	2	2218	2	2218
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
5	Nut, Eye Oval 3/4"	1	914	1	914
6	Bolt, Machine, 3/4" x 16" Galv., 18,350 lbs Ultimate Tensile	1	175	1	175
ITEM NO.	DESCRIPTION	PR4TREE		PR4	
		QTY.	S/N	QTY.	S/N
7	Insulator, Pin, C Neck Polymer	1	1968	1	1968 *
8	Pin, Crossarm	1	961	1	961
9	Washer, Square Flat 5/8", 2 1/4" x 2 1/4"	1	1412	1	1412
10	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
11	Wire, Tie, AL Annealed #4 SD	11*	3012	10	1421
ITEM NO.	DESCRIPTION	PR24 (2)		PR24 (2)	
		QTY.	S/N	QTY.	S/N
12	Insulator, Susp. 15 kV Clevis-Tongue, Polymer *	2	1967	2	1967
13	Clamp, Strain, Distribution, #2 to 397.5 MCM	2	302	2	302
ITEM NO.	DESCRIPTION	ADDITIONAL MATERIAL			
		QTY.	S/N	QTY.	S/N
14	Connector, Tap, Wedge 2/0 to 2/0	2	2559	2	2559
15	Connector, Tap, Wedge #2 to #2	2	2688 *	2	2688 *
16	Clamp, Strain #2	2	300	2	300
ITEM NO.	DESCRIPTION	S12		S12	
		QTY.	S/N	QTY.	S/N
17	Insulator, Pin, C Neck, White Polymer	1	2656	1	2656
18	Pin, Crossarm	1	961	1	961
19	Washer, Square Flat, 5/8", 2 1/4" x 2 1/4"	1	1412	1	1412
20	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
21	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



**CONSTRUCTION STANDARDS**  
 8' PRE-ASSEMBLED DOUBLE DEADEND  
 HIGH NEUTRAL  
 2/0 ACSR MAX WIRE

PAGE:  
2 of 2

**A49A, A49ATREE**

CAD FILE:  
A49A

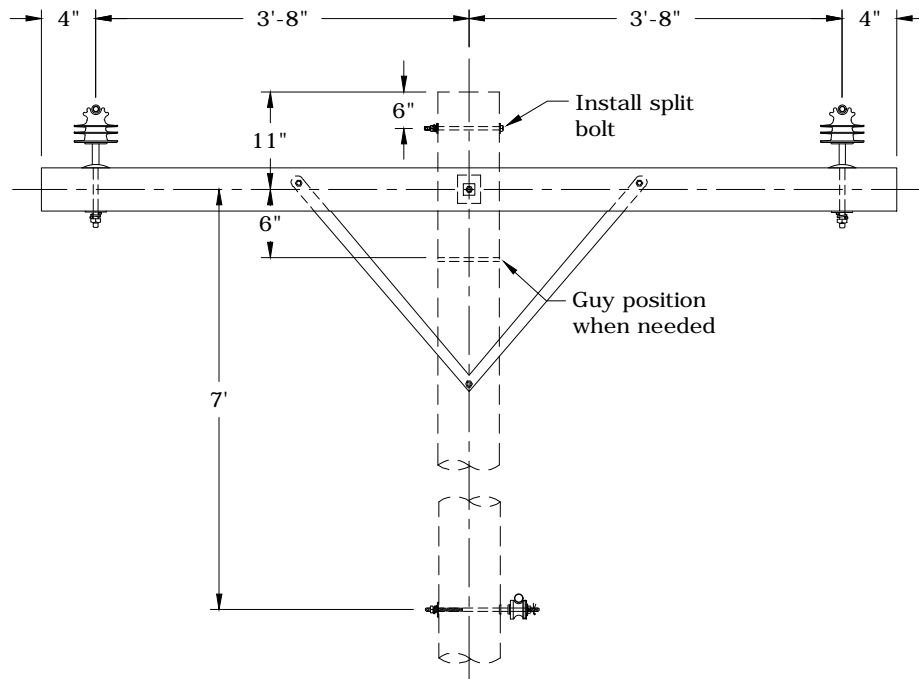
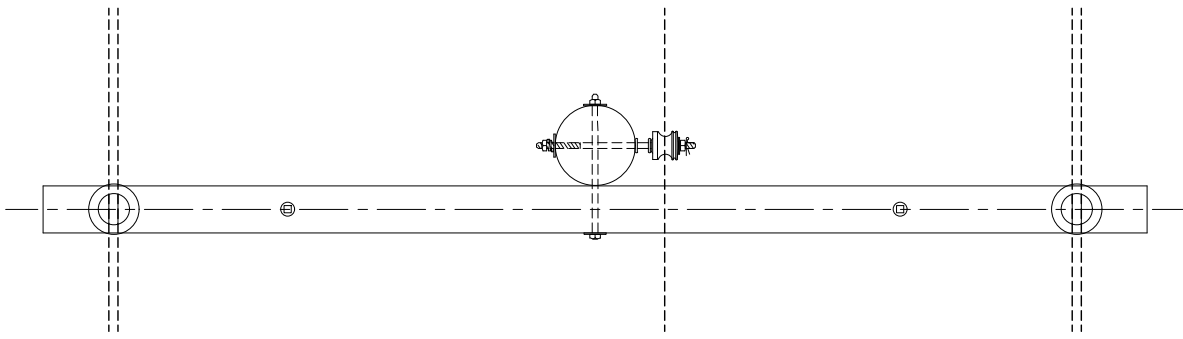
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2	6/13/17	CM	DK								
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APP:	CM/AH	SECTION									
DATE:	3/20/08	<b>310</b>									

**320**  
**2Ø DISTRIBUTION**  
**UP TO 2/0 ACSR**

11/15/2017

<b>C</b>	B1A,-TREE	2Ø Single 8' Crossarm - 0° to 5°
<b>C</b>	B2A,-TREE	2Ø Double 8' Crossarm - 6° to 30°
<b>C</b>	B4A,-TREE	2Ø Single 8' Crossarm - High Neutral, 0° to 5°
<b>C</b>	B5A,-TREE	2Ø Double 8' Crossarm - High Neutral, 6° to 30°
<b>C</b>	B13,-TREE	2Ø Vertical w/ Pole Top - 0° to 5°
<b>C</b>	B14,-TREE	2Ø Vertical w/ Double Pole Top - 6° to 30°
<b>C</b>	B48A	8' Pre-assembled Deadend - High Neutral
<b>C</b>	B49A,-TREE	8' Pre-assembled Double Deadend - High Neutral
<b>C</b>	B50A	8' Pre-assembled Deadend
<b>C</b>	B51A,-TREE	8' Pre-assembled Double Deadend

**N** New Standard  
**R** Redrawn Standard  
**C** Changed Standard  
**~** No Change



**Avian Safe**

Note: Maximum line angle calculated for 2,000 lbs. MWT and 250-ft ruling span.

Rev. 3 - Eliminated porcelain pin insulators and added avian note.



**CONSTRUCTION STANDARDS**

2Ø SINGLE 8' CROSSARM  
0° TO 5°  
2/0 ACSR MAX WIRE

PAGE:  
1 of 2

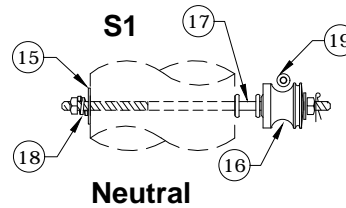
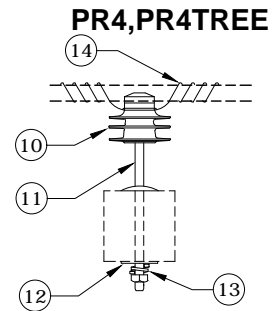
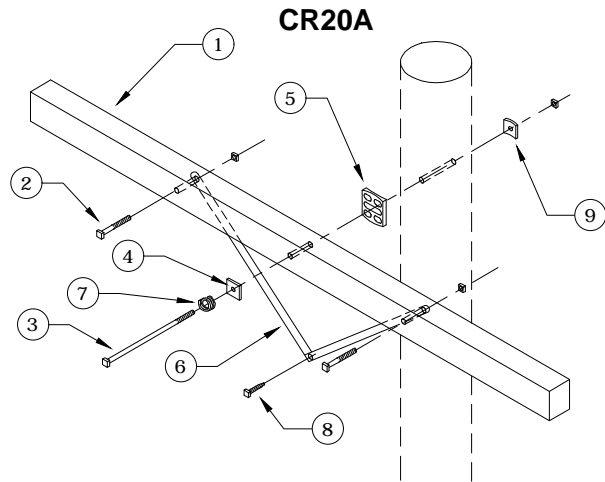
**B1A, B1ATREE**

CAD FILE:  
B1A

**REVISIONS**

△	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	3/5/08	LB	AH
3	11/15/17	CM	DK

△	APP: ELM	SECTION
	DATE: 1/31/80	<b>320</b>



Rev. 3 - Eliminated porcelain pin insulators and added avian note.

ITEM NO.	DESCRIPTION	B1ATREE		B1A	
		QTY.	S/N	QTY.	S/N
1	Arm, Cross (Distr.) 3 3/4" x 4 3/4" x 8'	1	25	1	25
2	Bolt, Carriage 3/8" x 5", Galv., 4250 lbs Ultimate Tensile	2	78	2	78
3	Bolt, Machine 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile	1	157	1	157 *
4	Washer, Square Flat 5/8", 2 1/4" x 2 1/4"	1	1412	1	1412
5	Gain, Pole Plastic	1	709	1	709
6	Brace, Crossarm 28", Galv. Stl. *	2	205	2	205
7	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
8	Screw, Lag 1/2" x 4 1/2", Twist Drive, Drive Point *	1	1132	1	1132
9	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
ITEM NO.	DESCRIPTION	PR4TREE (2)		PR4 (2)	
		QTY.	S/N	QTY.	S/N
10	Insulator, Pin, C Neck, Polymer	2	1968	2	1968 *
11	Pin, Crossarm	2	961	2	961
12	Washer, Square Flat 5/8", 2 1/4" x 2 1/4"	2	1412	2	1412
13	Washer, Lock, Spring Double Coil, Galv., 5/8"	2	2217	2	2217
14	Wire, Tie, AL Annealed #4 SD	* 22	3012	20	1421
ITEM NO.	DESCRIPTION	S1		S1	
		QTY.	S/N	QTY.	S/N
15	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
16	Insulator, Spool Clevis, Small, ANSI 53-2 Class	1	773	1	773
17	Bolt, Double Upset 5/8" x 14", Galv., 12,400 lbs Ultimate	1	1580	1	1580
18	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
19	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



### CONSTRUCTION STANDARDS

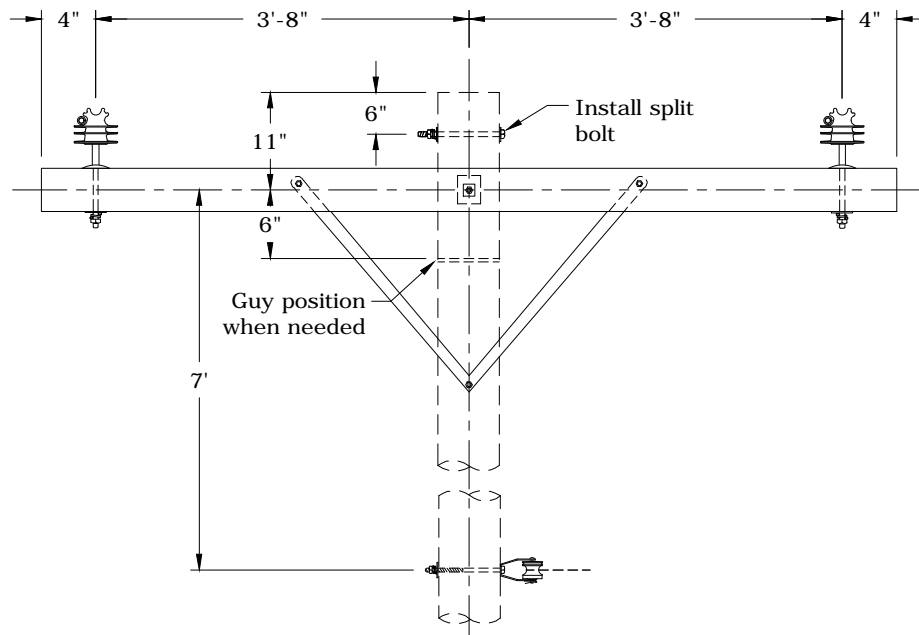
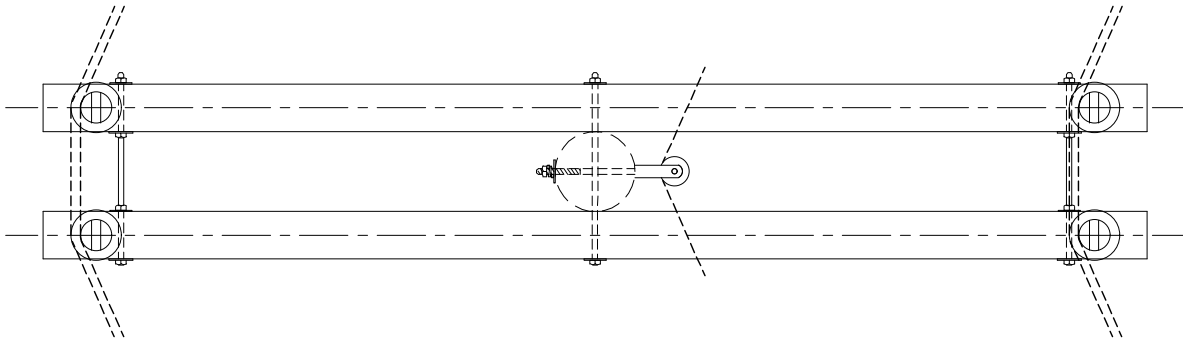
2Ø SINGLE 8' CROSSARM  
0° TO 5°  
2/0 ACSR MAX WIRE

PAGE:  
2 of 2

**B1A, B1ATREE**

CAD FILE:  
B1A

REVISIONS			
NO.	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	3/5/08	LB	AH
3	11/15/17	CM	DK
APP: ELM			
DATE: 1/31/80			SECTION <b>320</b>



**Avian Safe**

Note: Maximum line angle calculated for 2,000 lbs. MWT and 250-ft ruling span.

Rev. 3 - Eliminated porcelain pin insulators and added avian note.



**CONSTRUCTION STANDARDS**

2Ø DOUBLE 8' CROSSARM  
6° TO 30°  
2/0 ACSR MAX WIRE

PAGE:  
1 of 2

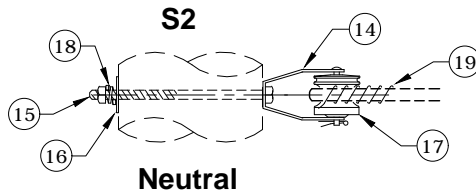
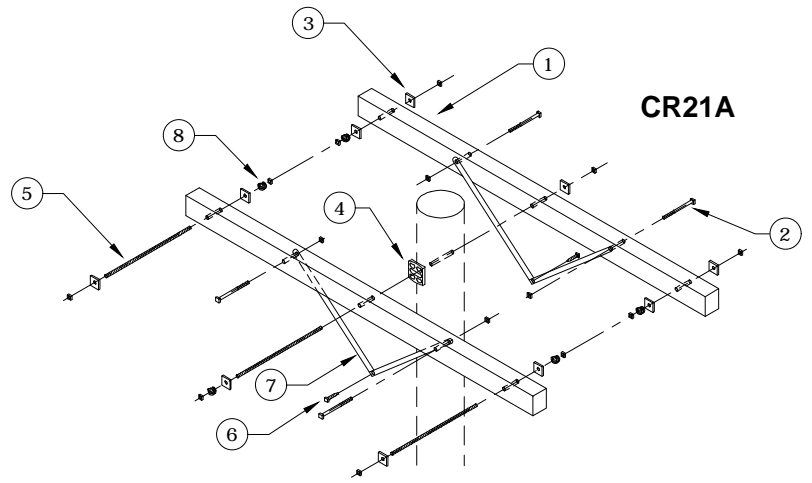
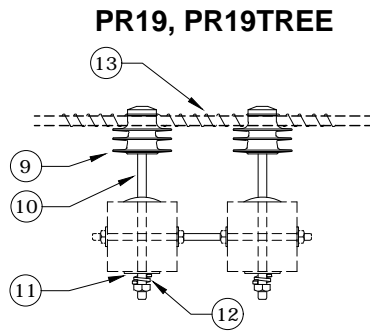
**B2A, B2ATREE**

CAD FILE:  
B2A

**REVISIONS**

△	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	3/5/08	LB	AH
3	11/15/17	CM	DK

△	APP:	ELM	SECTION
	DATE:	1/31/80	<b>320</b>



Rev. 3 - Eliminated porcelain pin insulators and added avian note.

ITEM NO.	DESCRIPTION	B2ATREE		B2A	
		QTY.	S/N	QTY.	S/N
1	Arm, Cross (Distr.) 3 3/4" x 4 3/4" x 8'	2	25	2	25
2	Bolt, Carriage 3/8" x 5", Galv., 4250 lbs Ultimate Tensile	4	78	4	78
3	Washer, Square Flat 5/8", 2 1/4" x 2 1/4"	10	1412	10	1412
4	Gain, Pole Plastic	1	709	1	709
5	Bolt, Double Arm 5/8" x 20", Galv., 12,400 lbs Ultimate Tensile	3	83	3	83
6	Screw, Lag 1/2" x 4 1/2", Twist Drive, Drive Point	2	1132	2	1132
7	Brace, Crossarm 28", Galv. Stl.	4	205	4	205
8	Washer, Lock, Spring, Double Coil, Galv., 5/8"	5	2217	5	2217
ITEM NO.	DESCRIPTION	PR19TREE (2)		PR19 (2)	
		QTY.	S/N	QTY.	S/N
9	Insulator, Pin, C Neck, Polymer	4	1968	4	1968 *
10	Pin, Crossarm	4	961	4	961
11	Washer, Square Flat, 5/8", 2 1/4" x 2 1/4"	4	1412	4	1412
12	Washer, Lock, Spring, Double Coil, Galv., 5/8"	4	2217	4	2217
13	Wire, Tie, AL Annealed #4 SD	44 *	3012	40	1421
ITEM NO.	DESCRIPTION	S2		S2	
		QTY.	S/N	QTY.	S/N
14	Clevis, D.E. Insulator 1340	1	335	1	335
15	Bolt, Machine 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	156	1	156
16	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
17	Insulator, Spool Clevis, Small, ANSI 53-2 Class	1	773	1	773
18	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
19	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



**CONSTRUCTION STANDARDS**  
 2Ø DOUBLE 8' CROSSARM  
 6° TO 30°  
 2/0 ACSR MAX WIRE

REVISIONS			
NO.	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	3/5/08	LB	AH
3	11/15/17	CM	DK

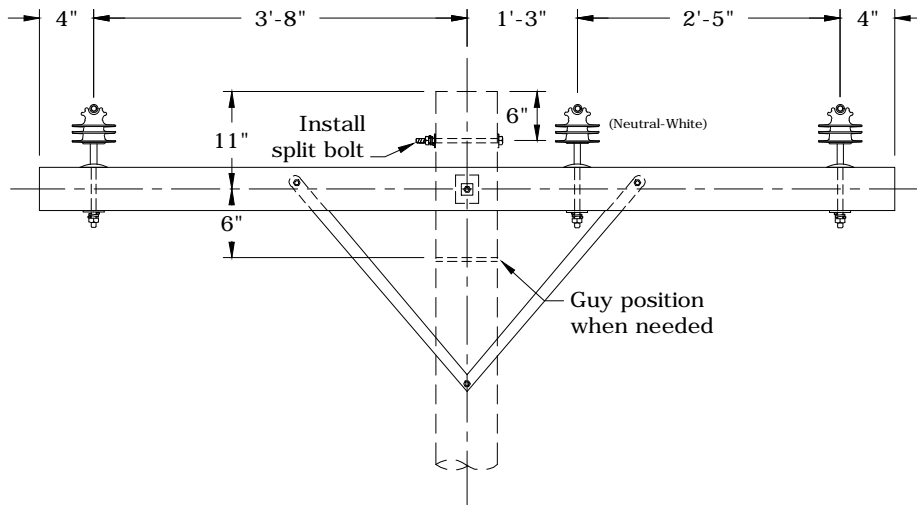
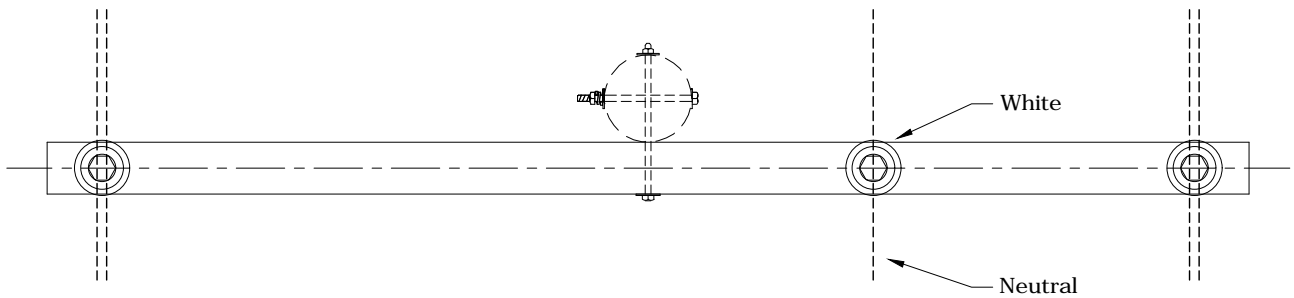
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2 of 2

**B2A, B2ATREE**

CAD FILE:  
B2A

APP: ELM  
DATE: 1/31/80

SECTION  
**320**



## B4ATREE - Avian Safe

**Notes:**

1. Maximum line angle calculated for 2,000 lbs. MWT and 250-ft ruling span.
2. This framing is for clearance limited situations only.
3. See Std AC - Avian Covers - Section 400 if needed. Covers only required on neutral.

Rev. 3 - Eliminated porcelain pin insulators and added avian notes.



### CONSTRUCTION STANDARDS

2Ø SINGLE 8' CROSSARM  
 HIGH NEUTRAL, 0° TO 5°  
 2/0 ACSR MAX WIRE

PAGE:  
1 of 2

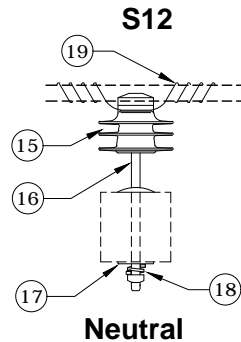
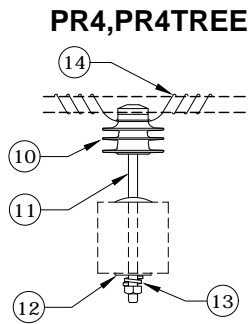
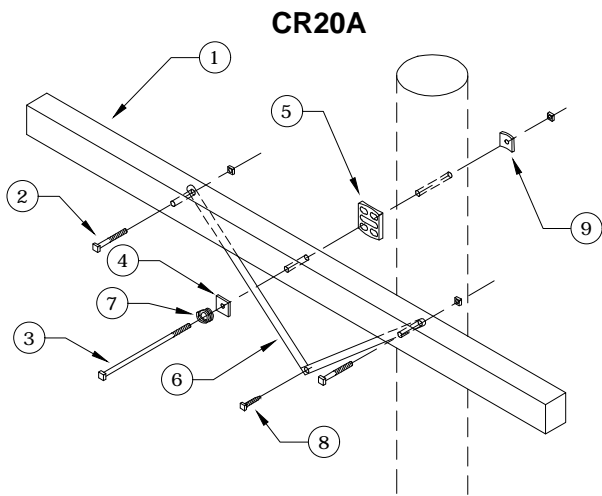
**B4A, B4ATREE**

CAD FILE:  
B4A

#### REVISIONS

REV	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	3/5/08	LB	AH
3	11/15/17	CM	DK

APP:	ELM	SECTION
DATE:	1/31/80	<b>320</b>



Rev. 3 - Eliminated porcelain pin insulators and added avian notes.

ITEM NO.	DESCRIPTION	B4ATREE		B4A	
		CR20A		CR20A	
		QTY.	S/N	QTY.	S/N
1	Arm, Cross (Distr.) 3 3/4" x 4 3/4" x 8'	1	25	1	25
2	Bolt, Carriage 3/8" x 5", Galv., 4250 lbs Ultimate Tensile	2	78	2	78
3	Bolt, Machine 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile	1	157	1	157*
4	Washer, Square, Flat 5/8", 2 1/4" x 2 1/4"	1	1412	1	1412
5	Gain, Pole Plastic	1	709	1	709
6	Brace, Crossarm 28", Galv. Stl.	2	205	2	205
7	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
8	Screw, Lag 1/2" x 4 1/2", Twist Drive, Drive Point	1	1132	1	1132
9	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
ITEM NO.	DESCRIPTION	PR4TREE (2)		PR4 (2)	
		QTY.	S/N	QTY.	S/N
10	Insulator, Pin, C Neck, Polymer	2	1968	2	1968 *
11	Pin, Crossarm	2	961	2	961
12	Washer, Square, Flat 5/8", 2 1/4" x 2 1/4"	2	1412	2	1412
13	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
14	Wire, Tie, AL Annealed #4 SD	22*	3012	20	1421
ITEM NO.	DESCRIPTION	S12		S12	
		QTY.	S/N	QTY.	S/N
15	Insulator, Pin, C Neck, White Polymer	1	2656	1	2656 *
16	Pin, Crossarm	1	961	1	961
17	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	1	1412	1	1412
18	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
19	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



**CONSTRUCTION STANDARDS**  
 2Ø SINGLE 8' CROSSARM  
 HIGH NEUTRAL, 0° TO 5°  
 2/0 ACSR MAX WIRE

REVISIONS			
Δ	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	3/5/08	LB	AH
3	11/15/17	CM	DK
Δ			

PAGE:  
2 of 2

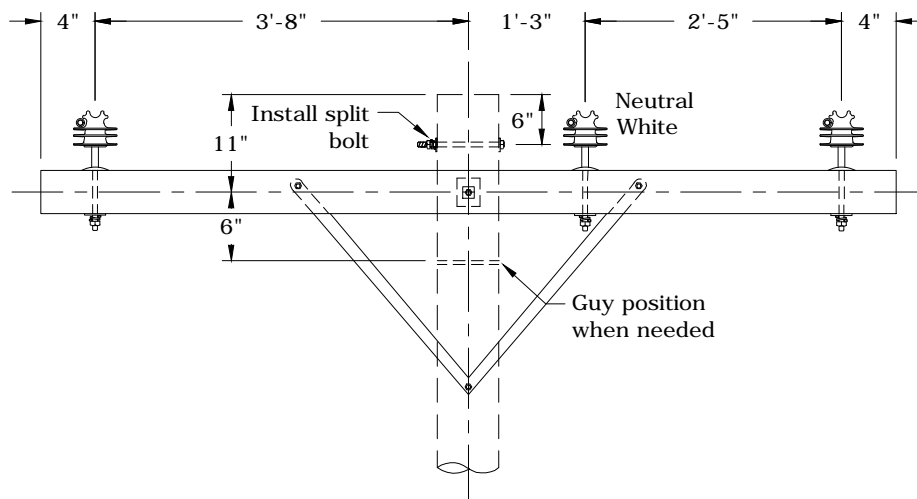
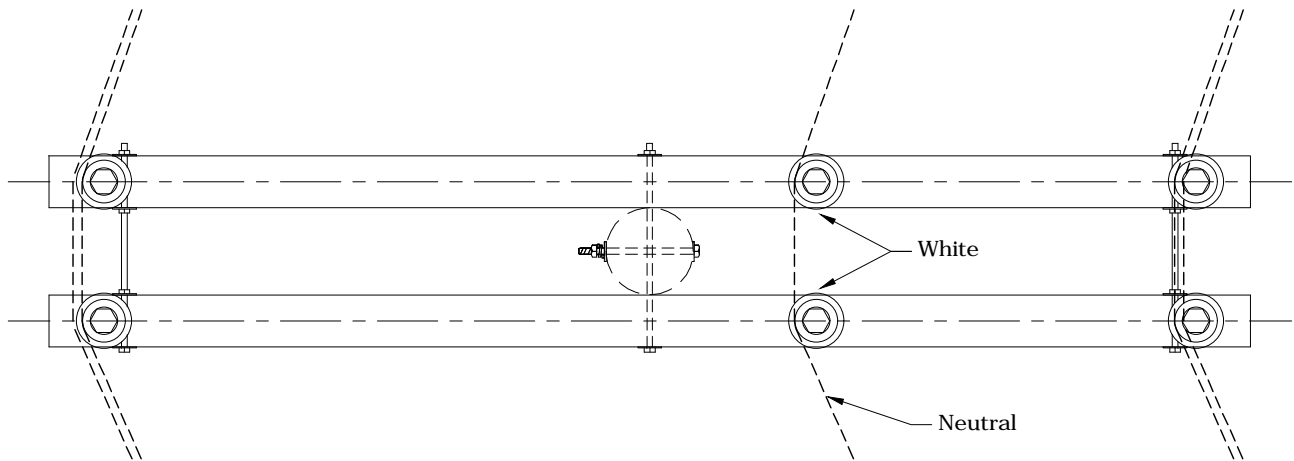
**B4A, B4ATREE**

CAD FILE:  
B4A

APP: ELM  
DATE: 1/31/80

SECTION  
**320**





## B5ATREE - Avian Safe

**Notes:**

1. Maximum line angle calculated for 2,000 lbs. MWT and 250-ft ruling span.
2. This framing is for clearance limited situations only.
3. See Std AC - Avian Covers - Section 400 if needed. Covers only required on neutral.

Rev. 3 - Eliminated porcelain pin insulators and added avian notes.



### CONSTRUCTION STANDARDS

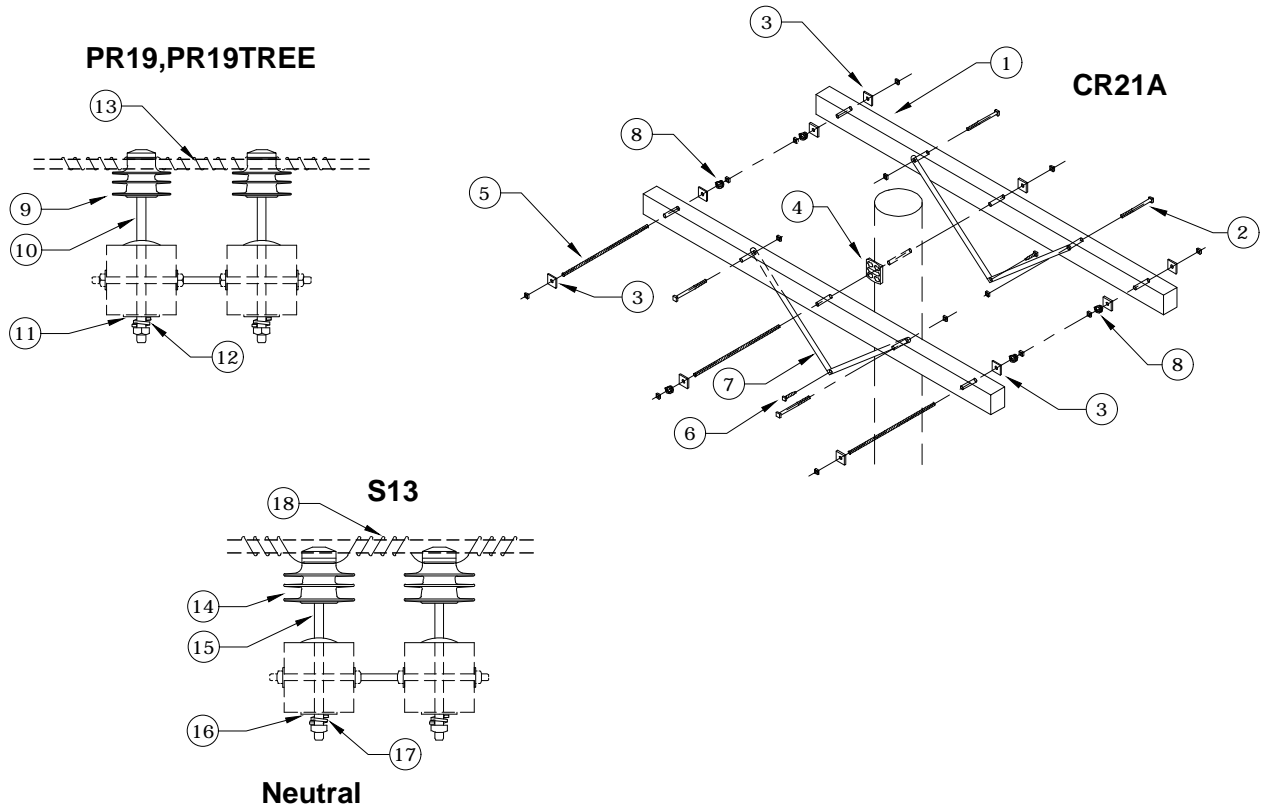
2Ø DOUBLE 8' CROSSARM  
HIGH NEUTRAL, 6° TO 30°  
2/0 ACSR MAX WIRE

PAGE:  
1 of 2

**B5A, B5ATREE**

CAD FILE:  
B5A

REVISIONS											
NO.	DATE	ENGR	OPS								
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2	3/5/08	LB	AH								
3	11/15/17	CM	DK								
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APP:	ELM	SECTION									
DATE:	1/31/80	320									



Rev. 3 - Eliminated porcelain pin insulators and added avian notes.

ITEM NO.	DESCRIPTION	B5ATREE		B5A	
		QTY.	S/N	QTY.	S/N
1	Arm, Cross (Distr.) 3 3/4" x 4 3/4" x 8'	2	25	2	25
2	Bolt, Carriage 3/8" x 5", Galv., 4250 lbs Ultimate Tensile	4	78	4	78
3	Washer, Square, Flat 5/8", 2 1/4" x 2 1/4"	10	1412	10	1412
4	Gain, Pole Plastic	1	709	1	709
5	Bolt, Double Arm 5/8" x 20", Galv., 12,400 lbs Ultimate Tensile	3	83	3	83
6	Screw, Lag 1/2" x 4 1/2", Twist Drive, Drive Point	2	1132	2	1132
7	Brace, Crossarm 28", Galv. Stl.	4	205	4	205
8	Washer, Lock, Spring, Double Coil, Galv., 5/8"	5	2217	5	2217
ITEM NO.	DESCRIPTION	PR19TREE (2)		PR19 (2)	
		QTY.	S/N	QTY.	S/N
9	Insulator, Pin, C Neck, Polymer	4	1968	4	1968*
10	Pin, Crossarm	4	961	4	961
11	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	4	1412	4	1412
12	Washer, Lock, Spring, Double Coil, Galv., 5/8"	4	2217	4	2217
13	Wire, Tie, AL Annealed #4 SD	44*	3012	40	1421
ITEM NO.	DESCRIPTION	S13		S13	
		QTY.	S/N	QTY.	S/N
14	Insulator, Pin, C Neck, White Polymer	2	2656	2	2656*
15	Pin, Crossarm	2	961	2	961
16	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	2	1412	2	1412
17	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
18	Wire, Tie, AL Annealed #4 SD	20	1421	20	1421



**CONSTRUCTION STANDARDS**

2Ø DOUBLE 8' CROSSARM  
HIGH NEUTRAL, 6° TO 30°  
2/0 ACSR MAX WIRE

REVISIONS			
NO.	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	3/5/08	LB	AH
3	11/15/17	CM	DK

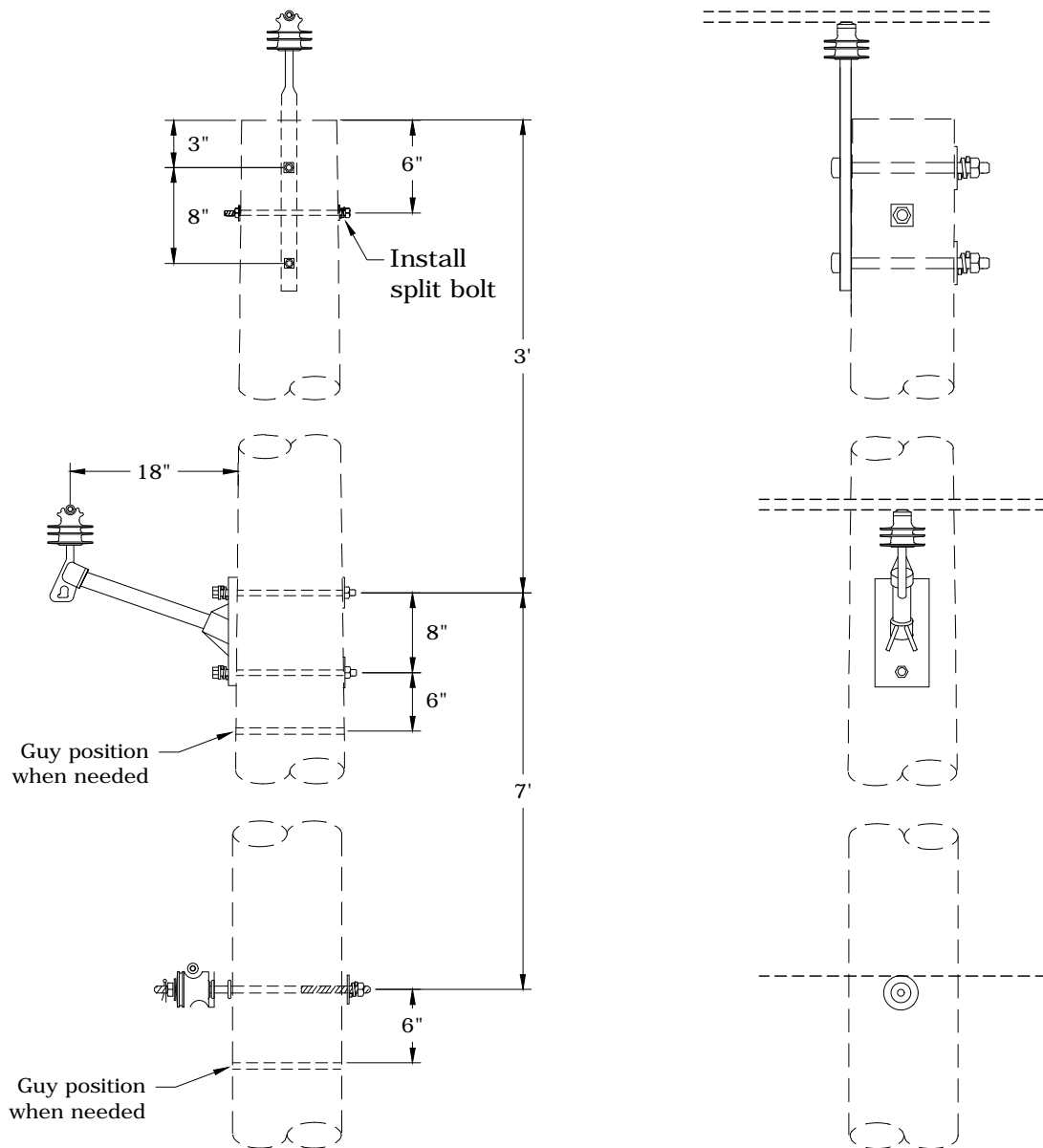
PAGE:  
2 of 2

**B5A, B5ATREE**

CAD FILE:  
B5A

APP: ELM  
DATE: 1/31/80

SECTION  
**320**



### B13TREE - Avian Safe

- Notes:**
1. Maximum line angle calculated for 2,000 lbs. MWT and 250-ft ruling span.
  2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on one phase.

Rev. 1 - Eliminated porcelain pin insulators and added avian notes.



### CONSTRUCTION STANDARDS

2Ø VERTICAL W/ POLE TOP  
0° TO 5°  
2/0 ACSR MAX WIRE

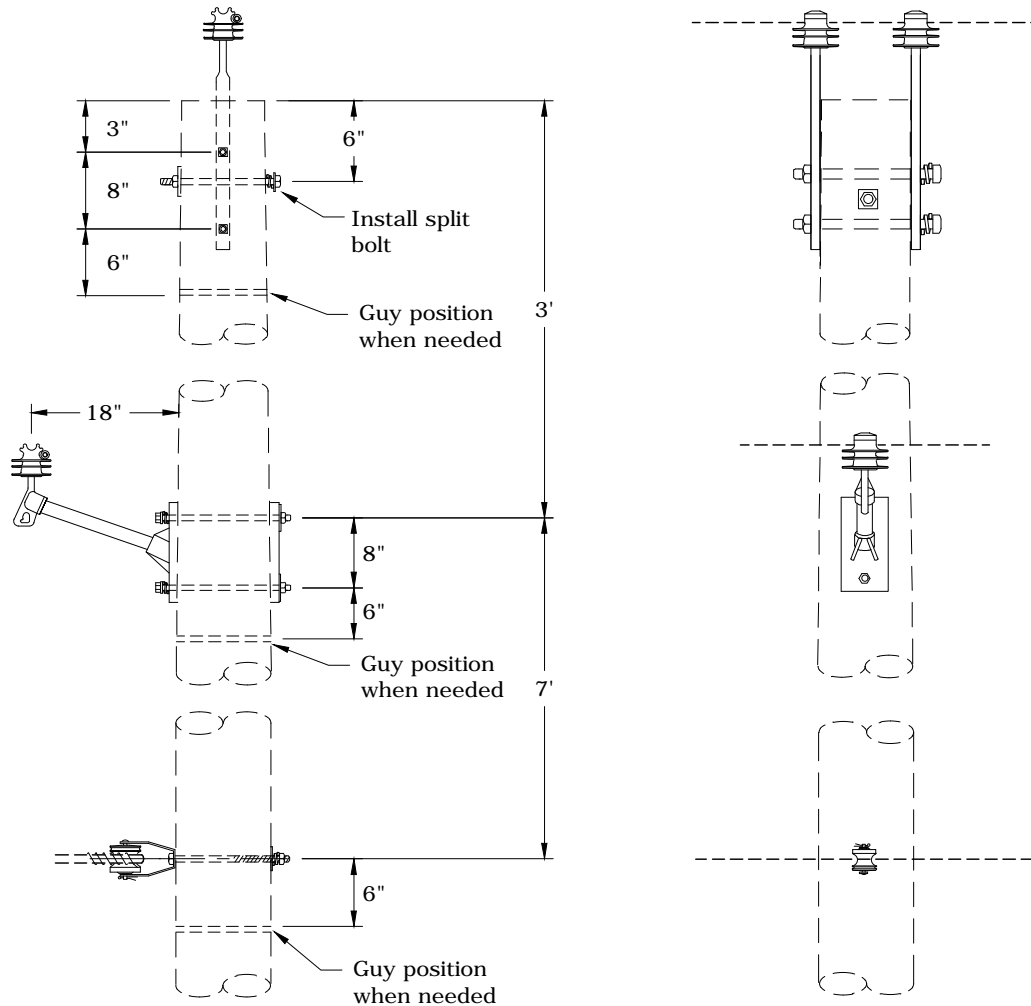
REVISIONS			
△	DATE	ENGR	OPS
1	11/15/17	CM	DK
△			
APP:	LB/AH	SECTION	
DATE:	3/5/08	320	

PAGE:  
1 of 2

**B13, B13TREE**

CAD FILE:  
B13




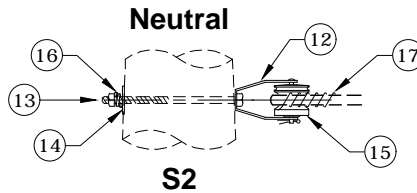
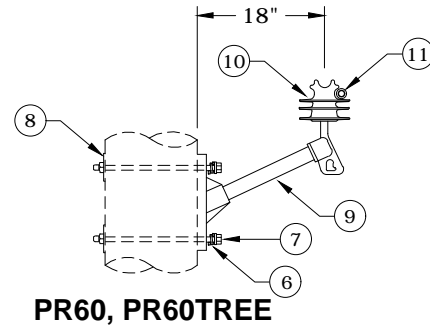
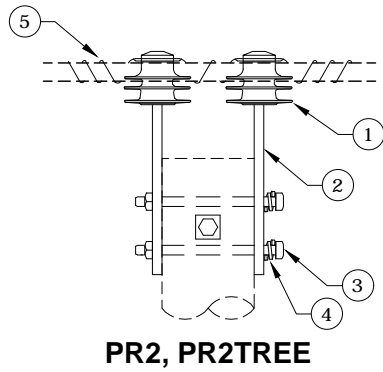


## B14TREE - Avian Safe

- Notes:**
1. Maximum line angle calculated for 2,000 lbs. MWT and 250-ft ruling span.
  2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on one phase.

Rev. 1 - Eliminated porcelain pin insulators and added avian notes.

	<b>CONSTRUCTION STANDARDS</b> 2Ø VERTICAL W/ DOUBLE POLE TOP 6° TO 30° 2/0 ACSR MAX WIRE			REVISIONS			
		△	DATE	ENGR	OPS		
	1	11/15/17	CM	DK			
PAGE: 1 of 2	<b>B14, B14TREE</b>			CAD FILE: B14	APP: DATE:	LB/AH 3/5/08	SECTION <b>320</b>



Rev. 1 - Eliminated porcelain pin insulators and added avian notes.

ITEM NO.	DESCRIPTION	B14TREE		B14	
		QTY.	S/N	QTY.	S/N
1	Insulator, Pin, C Neck, Polymer	2	1968	2	1968 *
2	Pin, Pole Top	2	962	2	962
3	Bolt, Machine 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile*	2	156	2	156
4	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
5	Wire, Tie, AL Annealed #4 SD	22 *	3012	20	1421

ITEM NO.	DESCRIPTION	PR60TREE		PR60	
		QTY.	S/N	QTY.	S/N
6	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
7	Bolt, Machine 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile*	2	157	2	157
8	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
9	Arm, Epoxy 18" 2500 lbs	1	2504	1	2504
10	Insulator, Pin, C Neck, Polymer	1	1968	1	1968 *
11	Wire, Tie, AL Annealed #4 SD	11*	3012	10	1421

ITEM NO.	DESCRIPTION	S2		S2	
		QTY.	S/N	QTY.	S/N
12	Clevis, D.E. Insulator 1340	1	335	1	335
13	Bolt, Machine 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	1	156	1	156
14	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
15	Insulator, Spool, Clevis, Small, ANSI 53-2 Class	1	773	1	773
16	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217	1	2217
17	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



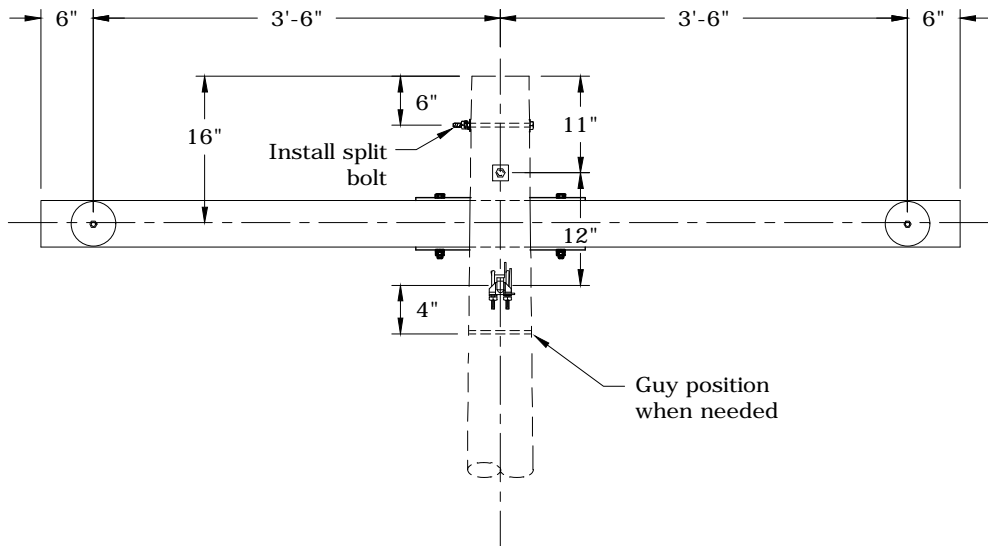
**CONSTRUCTION STANDARDS**  
 2Ø VERTICAL W/ DOUBLE POLE TOP  
 6° TO 30°  
 2/0 ACSR MAX WIRE

REVISIONS			
REV	DATE	ENGR	OPS
1	11/15/17	CM	DK

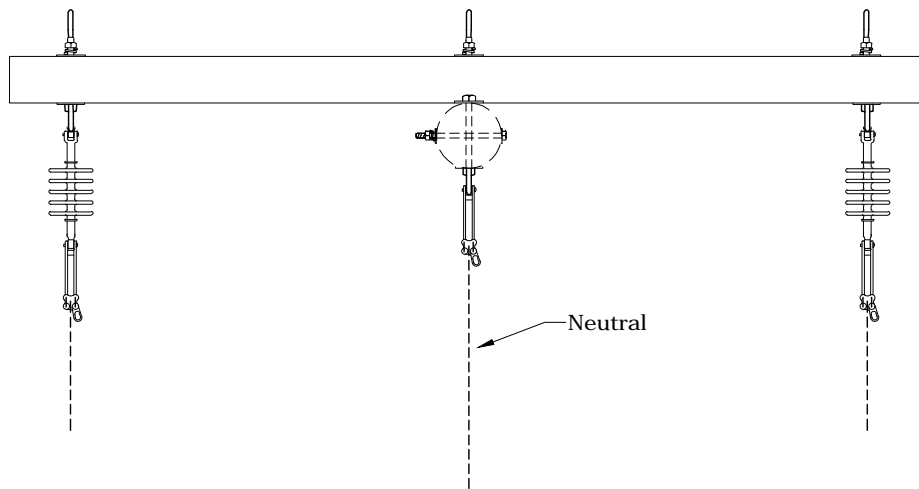
  

APP:	LB/AH	SECTION
DATE:	3/5/08	320

**FRONT VIEW**



**TOP VIEW**



- Notes:**
1. This framing is for clearance limited situations only.
  2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on neutral.

Rev. 1 - Updated material list and added avian notes.



**CONSTRUCTION STANDARDS**  
 8' PRE-ASSEMBLED DEADEND  
 HIGH NEUTRAL  
 2/0 ACSR MAX WIRE

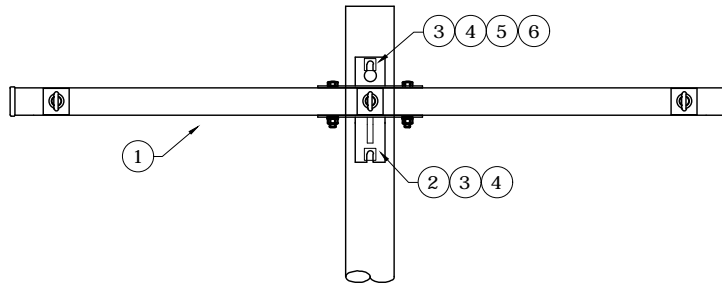
PAGE:  
1 of 2

**B48A**

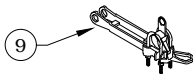
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B48A

REVISIONS			
NO.	DATE	ENGR	OPS
1	11/15/17	CM	DK
APP:		LB/AH	SECTION
DATE:		3/5/08	<b>320</b>

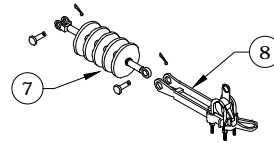
**CR26A**



**PR24**



**Neutral**



**Road & Field Phases**

Rev. 1 - Updated material list and added avian notes.

ITEM NO.	DESCRIPTION	B48A	
		CR26A	
		QTY.	S/N
1	Arm, Deadend Assembly, 8', 3-position, 397 Max	1	2508
2	Bolt, Machine, 3/4" x 14", Galv., 18,350 lbs Ultimate Tensile	1	174
3	Washer, Lock, Spring, Double Coil, Galv., 3/4"	2	2218
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
5	Nut, Eye Oval 3/4"	1	914
6	Bolt, Machine 3/4" x 16", Galv., 18,350 lbs Ultimate Tensile	1	175
ITEM NO.	DESCRIPTION	PR24 (2)	
		QTY.	S/N
7	Insulator, Suspension 15 kV Clevis-Tongue, Polymer	2	1967
8	Clamp, Strain, Distribution #2 to 397.5	2	302
ITEM NO.	DESCRIPTION	ADDITIONAL MATERIAL	
		QTY.	S/N
9	Clamp, Strain #2	1	300



**CONSTRUCTION STANDARDS**

8' PRE-ASSEMBLED DEADEND  
HIGH NEUTRAL  
2/0 ACSR MAX WIRE

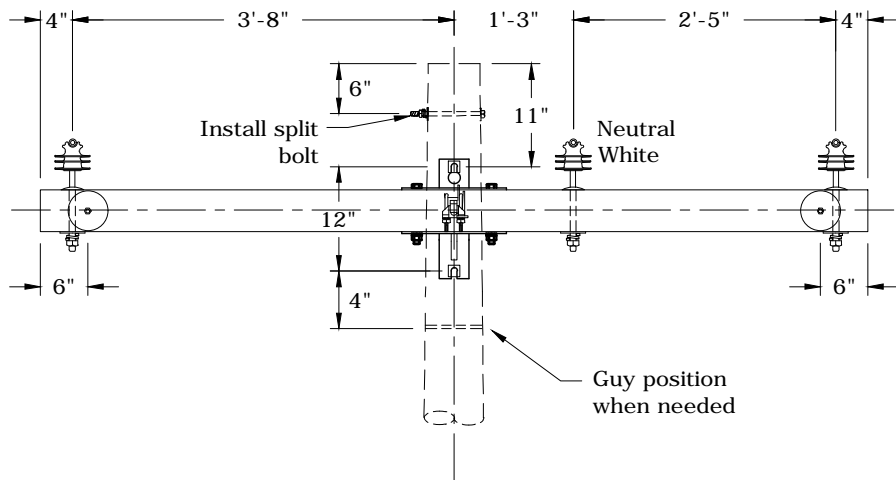
REVISIONS			
DATE	ENGR	OPS	
11/15/17	CM	DK	

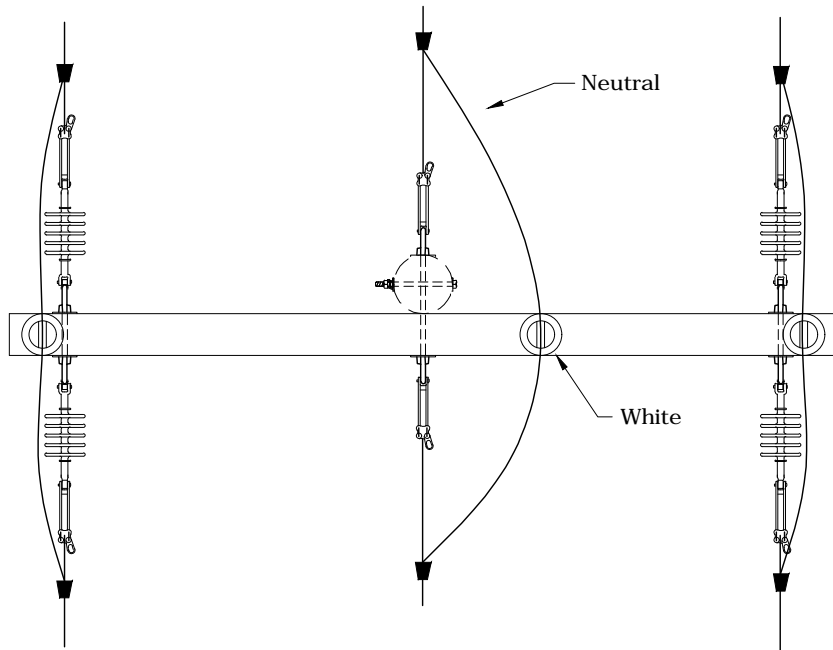
APP:	LB/AH	SECTION
DATE:	3/5/08	<b>320</b>



**FRONT VIEW**



**TOP VIEW**



**Notes:**

1. This framing is for clearance limited situations only.
2. See Std AC - Avian Covers - Section 400 if needed. Covers and covered jumper only required on neutral.

Rev. 5 - Eliminated porcelain pin insulators and added avian notes.



**CONSTRUCTION STANDARDS**  
 8' PRE-ASSEMBLED DOUBLE DEADEND  
 HIGH NEUTRAL  
 2/0 ACSR MAX WIRE

PAGE:  
1 of 2

**B49A, B49ATREE**

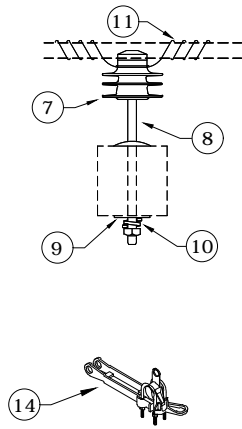
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B49A

**REVISIONS**

NO.	DATE	ENGR	OPS
2	3/02	REDRAWN	IN CAD
3	3/5/08	LB	AH
4	7/29/10	KJP	
5	11/15/17	CM	DK

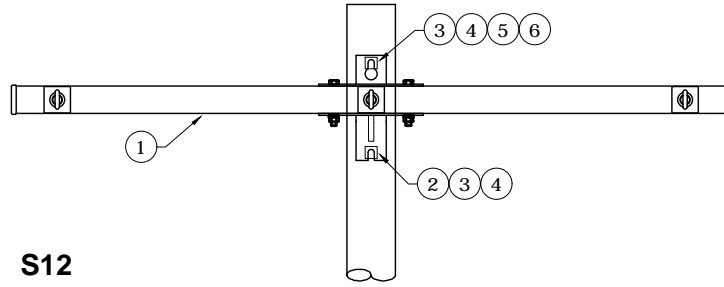
APP:	ELM	SECTION
DATE:	1/31/80	<b>320</b>

**PR4,PR4TREE**

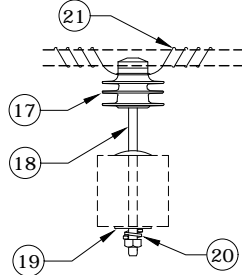


**Neutral**

**CR26A**

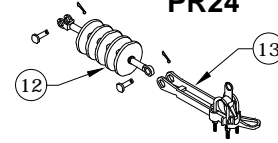


**S12**



**Neutral**

**PR24**



**Road & Field Phases**

Rev. 5 - Eliminated porcelain pin insulators and added avian notes.

ITEM NO.	DESCRIPTION	B49ATREE		B49A	
		QTY.	S/N	QTY.	S/N
1	Arm, Deadend Assembly, 8', 3-position, 397 Max	1	2508	1	2508
2	Bolt, Machine 3/4" x 14", Galv., 18,350 lbs Ultimate Tensile	1	174	1	174
3	Washer, Lock, Spring, Double Coil, Galv., 3/4"	2	2218	2	2218
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
5	Nut, Eye Oval 3/4"	1	914	1	914
6	Bolt, Machine 3/4" x 16", Galv., 18,350 lbs Ultimate Tensile	1	175	1	175
ITEM NO.	DESCRIPTION	PR4TREE (2)		PR4 (2)	
		QTY.	S/N	QTY.	S/N
7	Insulator, Pin, C Neck, Polymer	2	1968	2	1968 *
8	Pin, Crossarm	2	961	2	961
9	Washer, Square, Flat 5/8", 2 1/4" x 2 1/4"	2	1412	2	1412
10	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
11	Wire, Tie, AL Annealed #4 SD	22 *	3012	20	1421
ITEM NO.	DESCRIPTION	PR24 (4)		PR24 (4)	
		QTY.	S/N	QTY.	S/N
12	Insulator, Suspension 15 kV Clevis-Tongue, Polymer	4	1967	4	1967
13	Clamp, Strain, Distribution #2 to 397.5	4	302	4	302
ITEM NO.	DESCRIPTION	ADDITIONAL MATERIAL			
		QTY.	S/N	QTY.	S/N
14	Clamp, Strain #2	2	300	2	300
15	Connector, Tap, Wedge 2/0 to 2/0	4	2559	4	2559
16	Connector, Tap, Wedge #2 to #2	2	2688	2	2688
ITEM NO.	DESCRIPTION	S12		S12	
		QTY.	S/N	QTY.	S/N
17	Insulator, Pin, C Neck, White Polymer	1	2656	1	2656 *
18	Pin, Crossarm	1	961	1	961
19	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	1	1412	1	1412
20	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
21	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



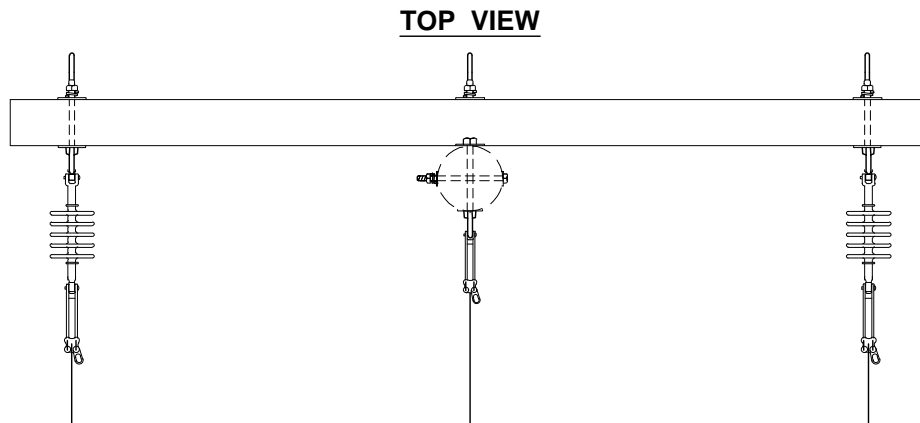
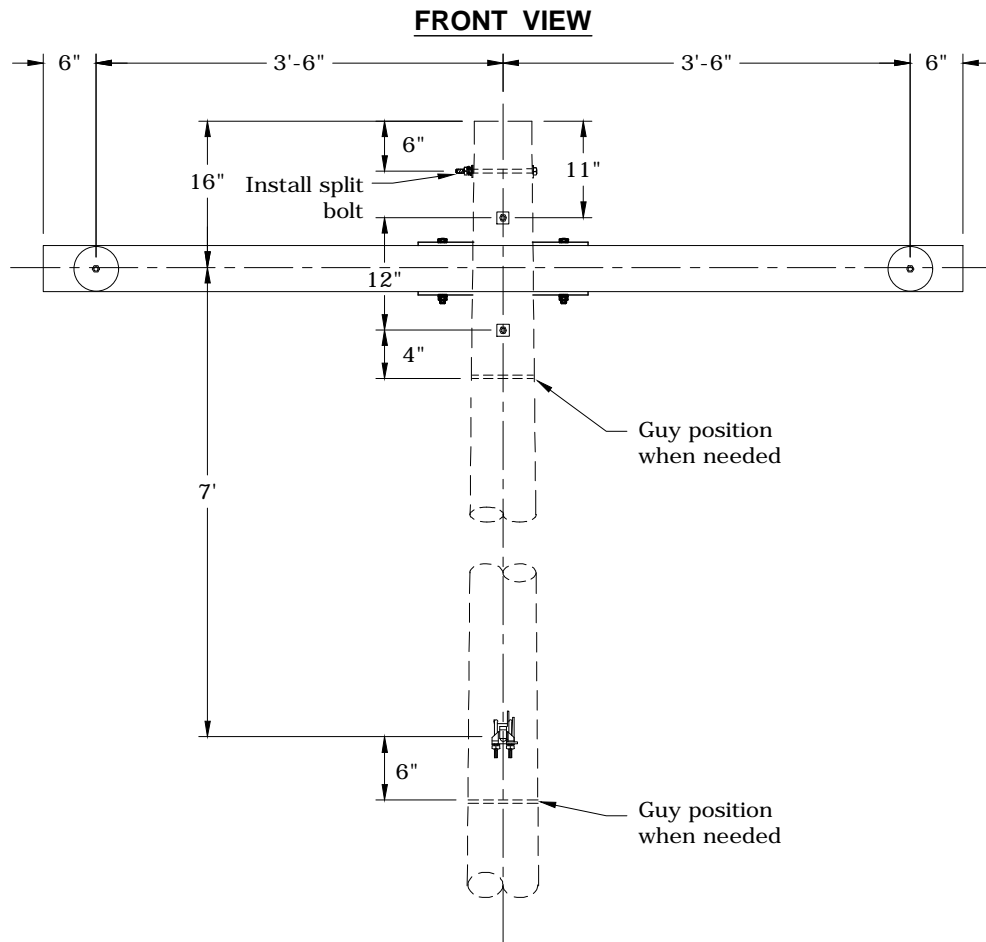
**CONSTRUCTION STANDARDS**  
 8' PRE-ASSEMBLED DOUBLE DEADEND  
 HIGH NEUTRAL  
 2/0 ACSR MAX WIRE

PAGE:  
2 of 2

**B49A, B49ATREE**

CAD FILE:  
B49A

REVISIONS			
REV	DATE	ENGR	OPS
2	3/02	REDRAWN	IN CAD
3	3/5/08	LB	AH
4	7/29/10	KJP	
5	11/15/17	CM	DK
APP: ELM			
DATE: 1/31/80		SECTION: 320	



**Avian Safe**

Rev. 5 - Added avian note.



**CONSTRUCTION STANDARDS**  
 8' PRE-ASSEMBLED DEADEND  
 2/0 ACSR MAX WIRE

REVISIONS			
NO.	DATE	ENGR	OPS
2	3/02	REDRAWN	IN CAD
3	3/5/08	LB	AH
4	7/29/10	KJP	
5	11/15/17	CM	DK

APP: ELM	SECTION
DATE: 1/31/80	<b>320</b>

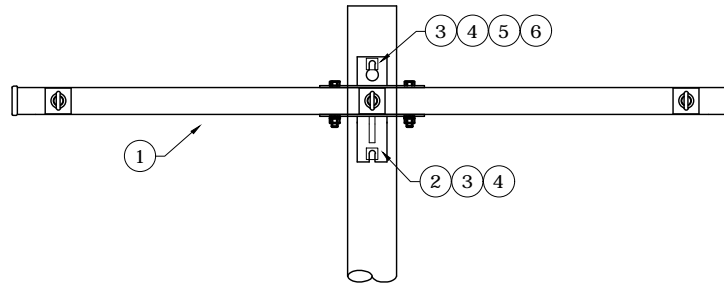
PAGE:  
1 of 2

**B50A**

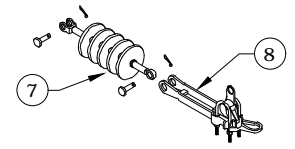
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B50A

**BACK VIEW**

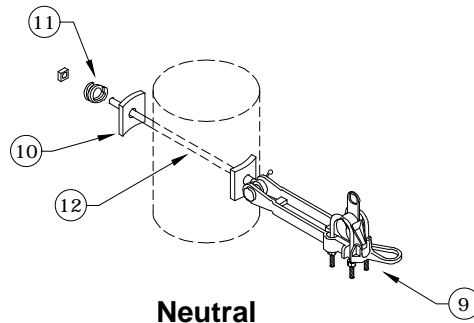
**CR26A**



**PR24**



**Road & Field Phases**



**Neutral**

Rev. 5 - Added avian note.

ITEM NO.	DESCRIPTION	B50A	
		QTY.	S/N
1	Arm, Deadend Assembly, 8', 3-position, 397 Max	1	2508
2	Bolt, Machine 3/4" x 14", Galv., 18,350 lbs Ultimate Tensile	1	174
3	Washer, Lock, Spring, Double Coil, Galv., 3/4"	2	2218
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
5	Nut, Eye Oval 3/4"	1	914
6	Bolt, Machine 3/4" x 16", Galv., 18,350 lbs Ultimate Tensile	1	175
ITEM NO.	DESCRIPTION	PR24 (2)	
		QTY.	S/N
7	Insulator, Suspension 15 kV Clevis-Tongue, Polymer	2	1967
8	Clamp, Strain, Distribution #2 to 397.5	2	302
ITEM NO.	DESCRIPTION	ADDITIONAL MATERIAL	
		QTY.	S/N
9	Clamp, Strain #2	1	300
10	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
11	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217
12	Bolt, Eye 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	108



**CONSTRUCTION STANDARDS**

8' PRE-ASSEMBLED DEADEND  
2/0 ACSR MAX WIRE

REVISIONS			
REV	DATE	ENGR	OPS
2	3/02	REDRAWN	IN CAD
3	3/5/08	LB	AH
4	7/29/10	KJP	
5	11/15/17	CM	DK

PAGE:  
2 of 2

**B50A**

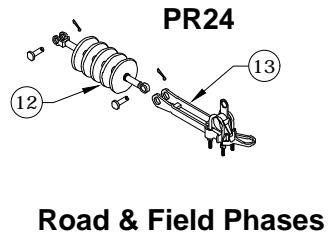
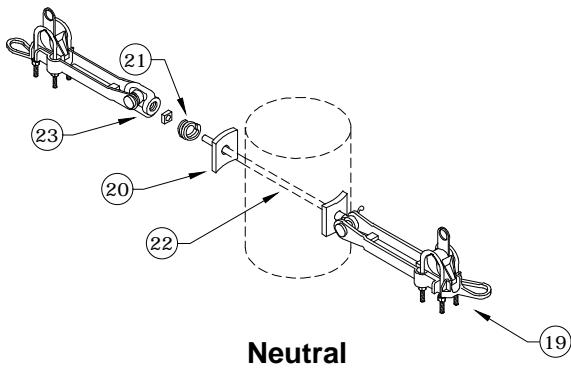
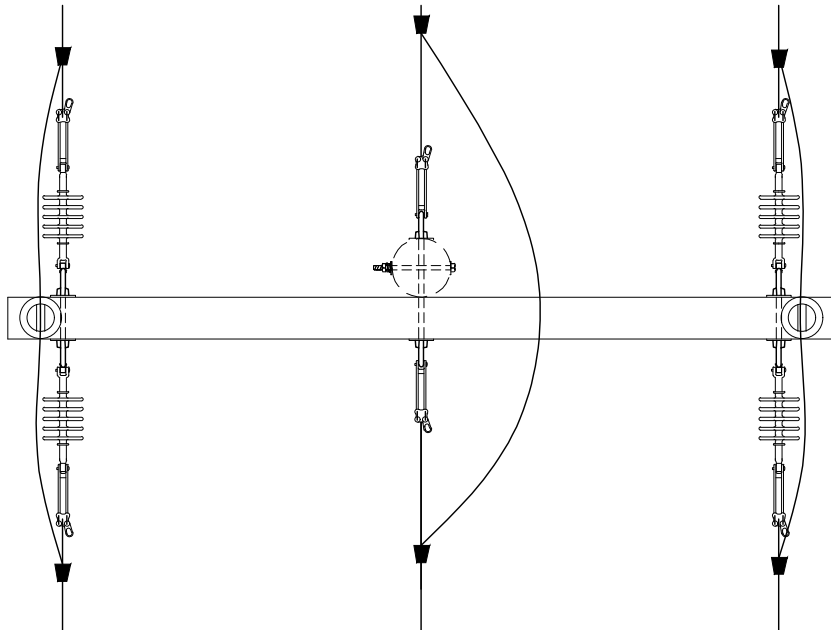
CAD FILE:  
B50A

APP: ELM  
DATE: 1/31/80

SECTION  
**320**



**TOP VIEW**



Rev. 5 - Eliminated porcelain pin insulators and added avian notes.



**CONSTRUCTION STANDARDS**  
 8' PRE-ASSEMBLED DOUBLE DEADEND  
 2/0 ACSR MAX WIRE

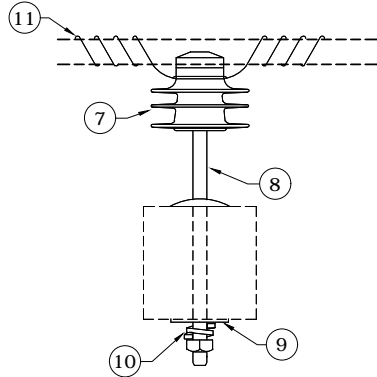
REVISIONS			
△	DATE	ENGR	OPS
2	3/02	REDRAWN	IN CAD
3	3/5/08	LB	AH
4	7/29/10	KJP	
5	11/15/17	CM	DK
△			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>320</b>	

PAGE:  
2 of 3

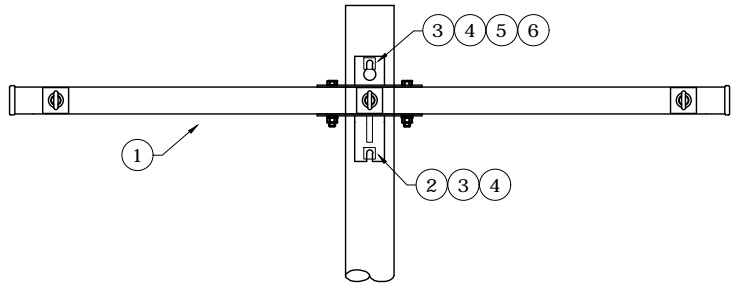
**B51A, B51ATREE**

CAD FILE:  
B51A

**PR4,PR4TREE**



**CR26A**



Rev. 5 - Eliminated porcelain pin insulators and added avian notes.

ITEM NO.	DESCRIPTION	B51ATREE		B51A	
		QTY.	S/N	QTY.	S/N
1	Arm, Deadend Assembly, 8', 3-position, 397 Max	1	2508	1	2508
2	Bolt, Machine 3/4" x 14", Galv., 18,350 lbs Ultimate Tensile	1	174	1	174
3	Washer, Lock, Spring, Double Coil, Galv., 3/4"	2	2218	2	2218
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
5	Nut, Eye Oval 3/4"	1	914	1	914
6	Bolt, Machine 3/4" x 16", Galv., 18,350 lbs Ultimate Tensile	1	175	1	175
ITEM NO.	DESCRIPTION	PR4TREE (2)		PR4 (2)	
		QTY.	S/N	QTY.	S/N
7	Insulator, Pin, C Neck, Polymer	2	1968	2	1968 *
8	Pin, Crossarm	2	961	2	961
9	Washer, Square, Flat 5/8", 2 1/4" x 2 1/4"	2	1412	2	1412
10	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
11	Wire, Tie, AL Annealed #4 SD	22 *	3012	20	1421
ITEM NO.	DESCRIPTION	PR24 (4)		PR24 (4)	
		QTY.	S/N	QTY.	S/N
12	Insulator, Suspension 15 kV Clevis-Tongue, Polymer	4	1967	4	1967
13	Clamp, Strain, Distribution #2 to 397.5	4	302	4	302
ITEM NO.	DESCRIPTION	ADDITIONAL MATERIAL			
		QTY.	S/N	QTY.	S/N
17	Connector, Tap, Wedge, 2/0 to 2/0	4	2559	4	2559
18	Connector, Tap, Wedge, #2 to #2	2	2688	2	2688
19	Clevis, Strain #2	2	300	2	300
20	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
21	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
22	Bolt, Eye 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	108	1	108
23	Nut, Eye Oval 5/8"	1	913	1	913



**CONSTRUCTION STANDARDS**  
 8' PRE-ASSEMBLED DOUBLE DEADEND  
 2/0 ACSR MAX WIRE

REVISIONS			
NO.	DATE	ENGR	OPS
2	3/02	REDRAWN	IN CAD
3	3/5/08	LB	AH
4	7/29/10	KJP	
5	11/15/17	CM	DK

PAGE:	CAD FILE:	APP:	SECTION
3 of 3	B51A, B51ATREE	ELM	320
	B51A	DATE: 1/31/80	

# 330

## 3Ø DISTRIBUTION

### UP TO 397MCM AAC

8/9/19

<b>C</b>	C1B, -TREE	3Ø Single 10' Crossarm - 0° to 5°
<b>C</b>	C2B, -TREE	3Ø Double 10' Crossarm - 6° to 15°
<b>C</b>	C3B, -TREE	3Ø Double 10' Crossarm w/ Angle Pins - 16° to 30°
<b>C</b>	C4B, -TREE	3Ø Single 10' Crossarm - High Neutral, 0° to 5°
<b>C</b>	C5B, -TREE	3Ø Double 10' Crossarm - High Neutral, 6° to 15°
<b>C</b>	C6B, -TREE	3Ø Double 10' Crossarm - High Neutral, 16° to 30°
<b>C</b>	C7A, -TREE	3Ø Single 8' Crossarm w/ Pole Top - 0° to 5°
<b>N</b>	C7AVIAN	3Ø Single 10' Crossarm w/ Pole Top - 0° to 5° - Avian Retrofit
<b>C</b>	C8A, -TREE	3Ø Double 8' Crossarm w/ Pole Top - 6° to 15°
<b>N</b>	C8AVIAN	3Ø Double 10' Crossarm w/ Pole Top - 6° to 15° - Avian Retrofit
<b>C</b>	C9A, -TREE	3Ø Double 8' Crossarm w/ Double Pole Top - 16° to 30°
<b>N</b>	C9AVIAN	3Ø Double 10' Crossarm w/Double Pole Top - 16° to 30° - Avian Retrofit
<b>C</b>	C10, -TREE	3Ø Twiggy w/ Pole Top - 0° to 5°
<b>C</b>	C11, -TREE	3Ø Twiggy w/ Pole Top - 6° to 15°
<b>C</b>	C12, -TREE	3Ø Twiggy - 16° to 30°
<b>C</b>	C13, -TREE	3Ø Vertical w/ Pole Top - 0° to 5°
<b>C</b>	C14, -TREE	3Ø Vertical w/ Double Pole Top - 6° to 15°
<b>C</b>	C15, -TREE	3Ø Vertical - 16° to 30°
<b>C</b>	C16, -TREE	3Ø Double Twiggy Circuit - 0° to 5°
<b>C</b>	C17, -TREE	3Ø Double Twiggy Circuit - 6° to 30°
<b>C</b>	C19B, -TREE	3Ø Single 10' Crossarm - Double Circuit - 0° to 5°
<b>C</b>	C20B, -TREE	3Ø Double 10' Crossarm - Double Circuit - 6° to 15°
<b>N</b>	C22, -TREE	3Ø Twiggy Transmission Underbuild - 0° to 5°
<b>N</b>	C23, -TREE	3Ø Twiggy Transmission Underbuild - 6° to 30°
<b>N</b>	New Standard	
<b>R</b>	Redrawn Standard	
<b>C</b>	Changed Standard	
<b>~</b>	No Change	

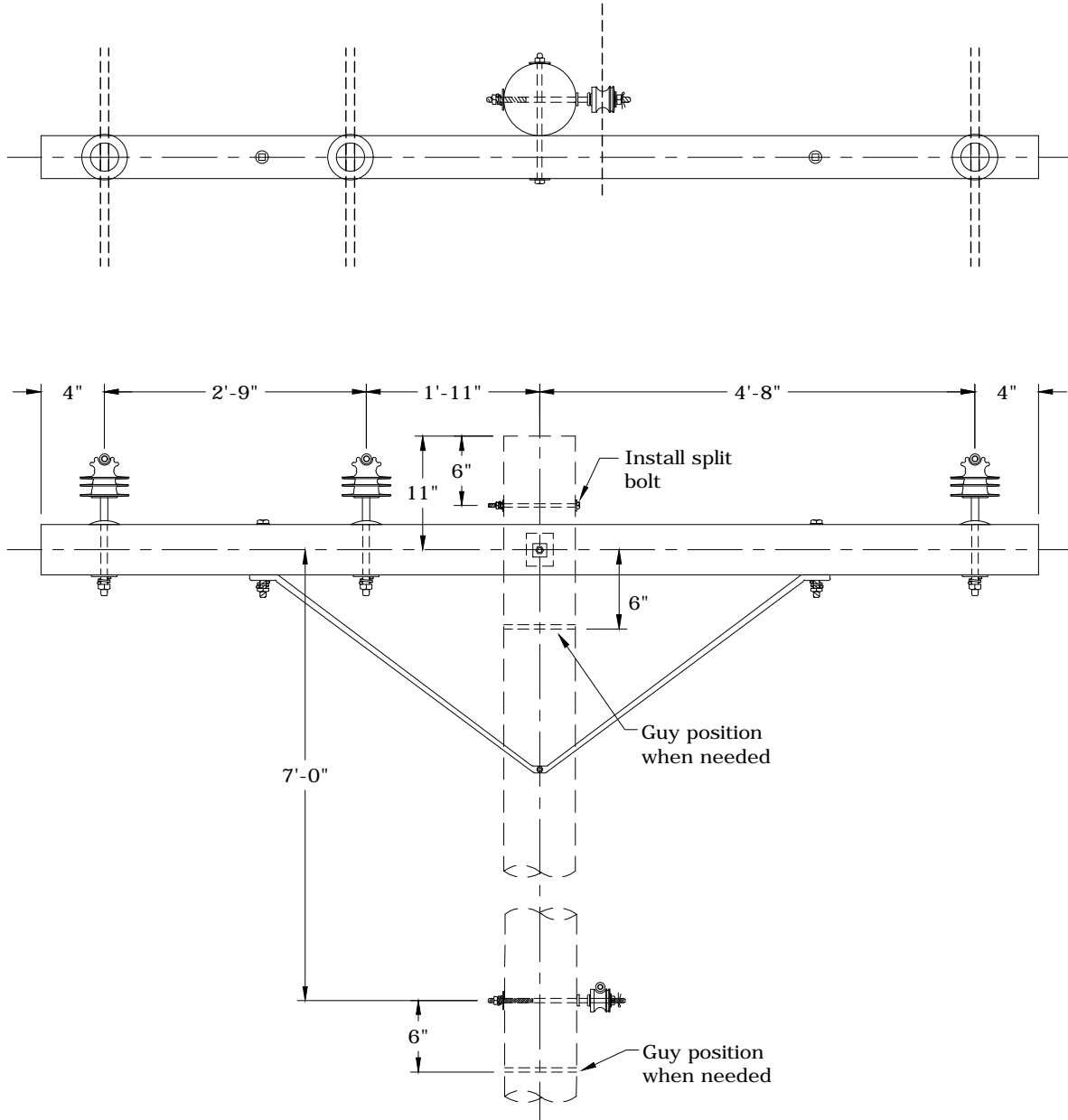


**330 (CONTINUED)**  
**3Ø DISTRIBUTION**  
**UP TO 397MCM AAC**

8/9/19

- C** C48B 10' Pre-assembled Deadend - High Neutral
- C** C49B, -TREE 10' Pre-assembled Double Deadend - High Neutral
- C** C50A 8' Pre-assembled Deadend
- C** C51A, -TREE 8' Pre-assembled Double Deadend
- C** C52B 10' Pre-assembled Deadend
- C** C53B, -TREE 10' Pre-assembled Double Deadend

- N** New Standard
- R** Redrawn Standard
- C** Changed Standard
- ~** No Change



## C1BTREE - Avian Safe

**Notes:**

1. Maximum line angle calculated for 3,000 lbs. MWT and 250-ft ruling span.
2. Std C7A,C7ATREE is preferred for crossarm construction. Use this standard for underbuild or other special installations.
3. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase.

Rev. 1 - Eliminated porcelain pin insulators and added avian notes.



### CONSTRUCTION STANDARDS

3Ø SINGLE 10' CROSSARM  
0° TO 5°  
397 AAC MAX WIRE

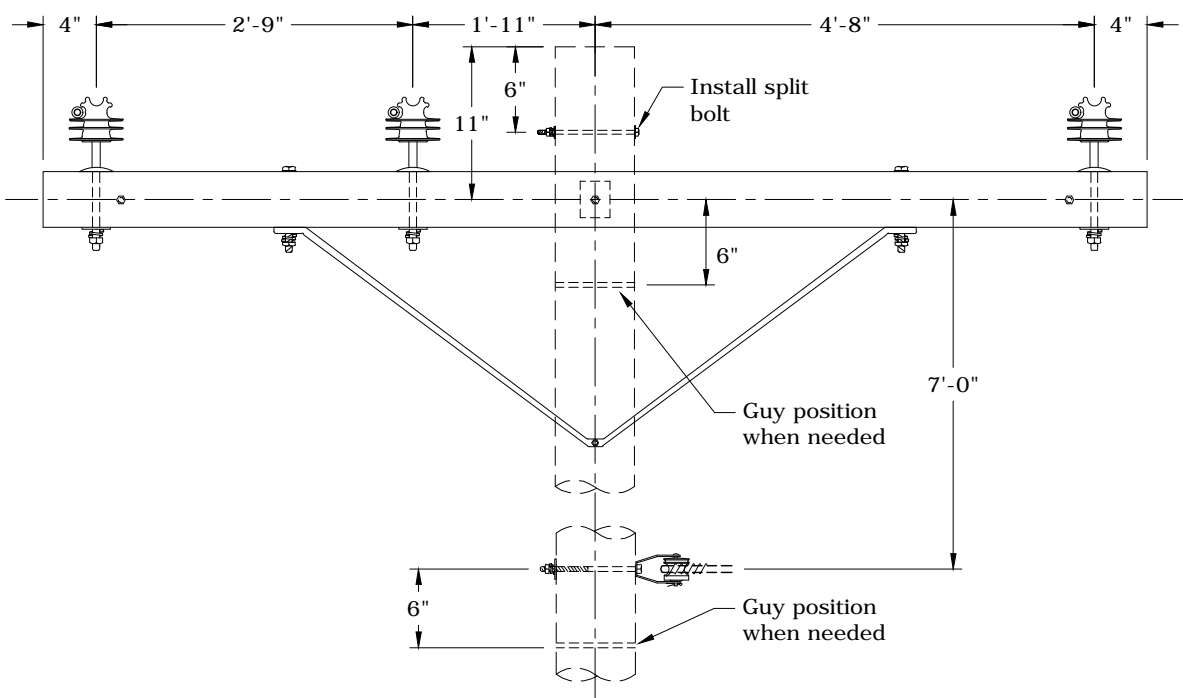
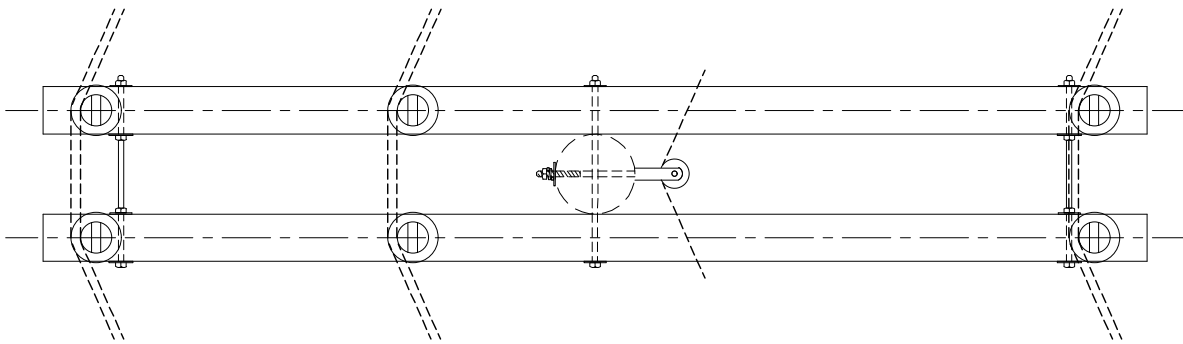
PAGE:  
1 of 2

**C1B, C1BTREE**

CAD FILE:  
C1B

REVISIONS			
Δ	DATE	ENGR	OPS
1	12/4/17	CM	DK
Δ			
APP:	LB/AH	SECTION	
DATE:	10/18/07	<b>330</b>	




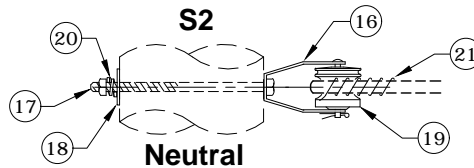
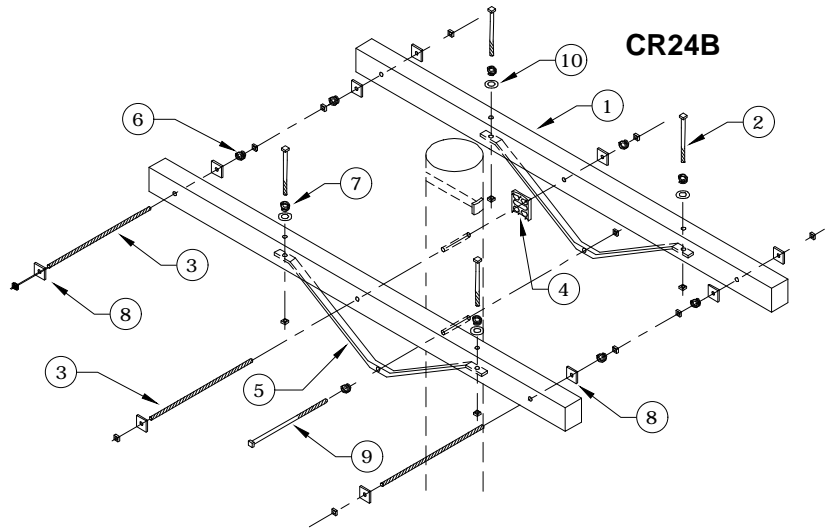
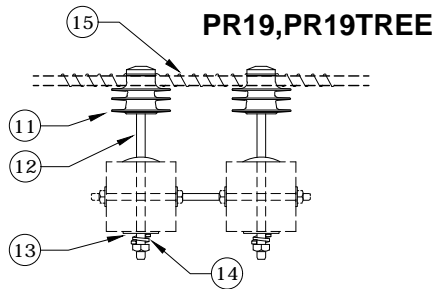


### C2BTREE - Avian Safe

- Notes:**
1. Maximum line angle calculated for 3,000 lbs. MWT and 250-ft ruling span.
  2. Std C8A, C8ATREE is preferred for crossarm construction. Use this standard for underbuild or other special installations.
  3. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase.

Rev. 3 - Eliminated porcelain pin insulators and added avian notes.

	<b>CONSTRUCTION STANDARDS</b>			<b>REVISIONS</b>																			
	3Ø DOUBLE 10' CROSSARM 6° TO 15° 397 AAC MAX WIRE			<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>DATE</th> <th>ENGR</th> <th>OPS</th> </tr> </thead> <tbody> <tr> <td>3/02</td> <td>REDRAWN</td> <td>IN CAD</td> </tr> <tr> <td>1/21/08</td> <td>LB</td> <td>AH</td> </tr> <tr> <td>12/4/17</td> <td>CM</td> <td>DK</td> </tr> </tbody> </table>	DATE	ENGR	OPS	3/02	REDRAWN	IN CAD	1/21/08	LB	AH	12/4/17	CM	DK	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>APP:</th> <th>LB/AH</th> <th>SECTION</th> </tr> </thead> <tbody> <tr> <td>DATE:</td> <td>10/18/07</td> <td><b>330</b></td> </tr> </tbody> </table>	APP:	LB/AH	SECTION	DATE:	10/18/07	<b>330</b>
	DATE	ENGR	OPS																				
3/02	REDRAWN	IN CAD																					
1/21/08	LB	AH																					
12/4/17	CM	DK																					
APP:	LB/AH	SECTION																					
DATE:	10/18/07	<b>330</b>																					
PAGE: 1 of 2	<b>C2B, C2BTREE</b>			CAD FILE: C2B																			



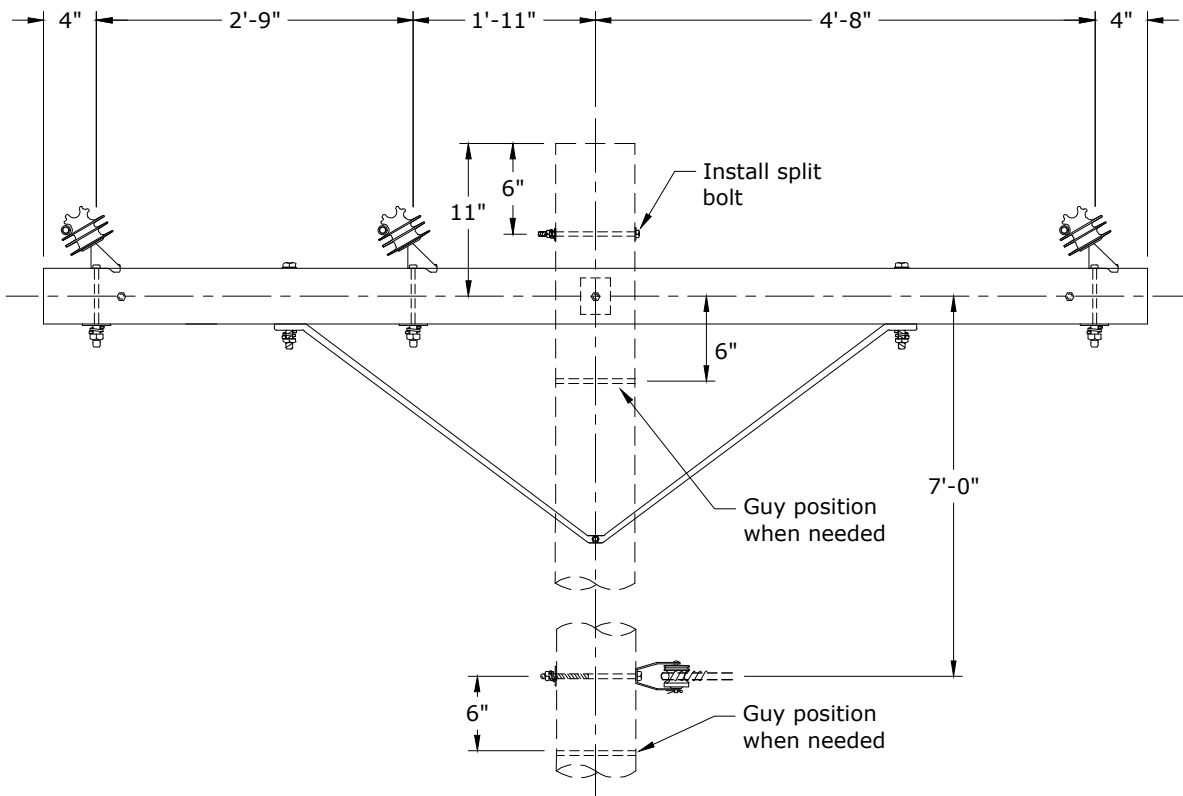
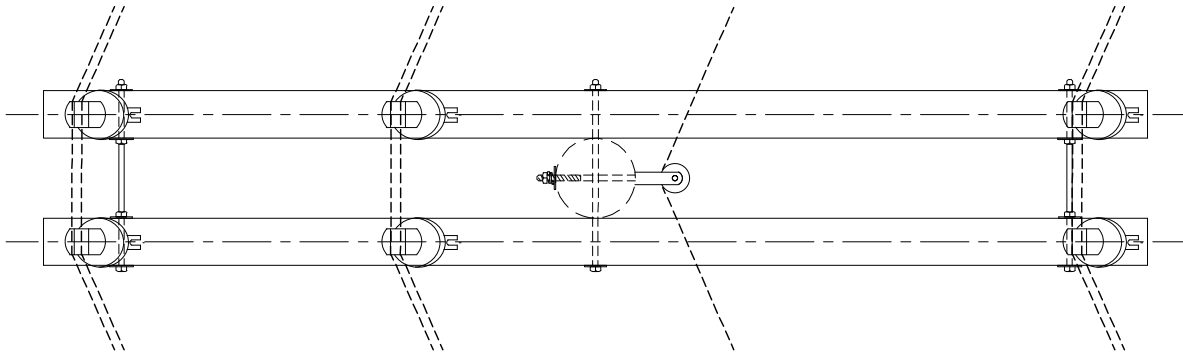
Rev. 3 - Eliminated porcelain pin insulators and added avian notes.

ITEM NO.	DESCRIPTION	C2BTREE		C2B	
		QTY.	S/N	QTY.	S/N
1	Arm, Cross (Distr.), 10' x 3 3/4" x 4 3/4"	2	26	2	26
2	Bolt, Machine, 1/2" x 7", Galv., 7800 lbs Ultimate Tensile	4	143	4	143
3	Bolt, Double Arm, 5/8" x 20", Galv., 12,400 lbs Ultimate Tensile	3	83	3	83
4	Gain, Pole Plastic	1	709	1	709
5	Brace, Angle, 72"	2	204	2	204
6	Washer, Lock, Spring, Double Coil, Galv., 5/8"	6	2217	6	2217
7	Washer, Lock, Spring, Double Coil, Galv., 1/2"	4	2216	4	2216
8	Washer, Square, Flat 5/8", 2 1/4" x 2 1/4"	10	1412	10	1412
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile	1	155	1	155
10	Washer, Flat, Round, Galv., 1/2"	4	1394	4	1394
ITEM NO.	DESCRIPTION	PR19TREE(3)		PR19 (3)	
		QTY.	S/N	QTY.	S/N
11	Insulator, Pin, C Neck, Polymer	6	1968	6	1968 *
12	Pin, Crossarm	6	961	6	961
13	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	6	1412	6	1412
14	Washer, Lock, Spring, Double Coil, Galv., 5/8"	6	2217	6	2217
15	Wire, Tie, AL Annealed #4 SD	66*	3012	60	1421
ITEM NO.	DESCRIPTION	S2		S2	
		QTY.	S/N	QTY.	S/N
16	Clevis, D.E. Insulator 1340	1	335	1	335
17	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	156	1	156
18	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
19	Insulator, Spool Clevis, Small, ANSI 53-2 Class	1	773	1	773
20	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
21	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



**CONSTRUCTION STANDARDS**  
 3Ø DOUBLE 10' CROSSARM  
 6° TO 15°  
 397 AAC MAX WIRE

REVISIONS			
REV	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	1/21/08	LB	AH
3	12/4/17	CM	DK
△			
APP:	LB/AH	SECTION	
DATE:	10/18/07	330	



### C3BTREE - Avian Safe

**Notes:**

1. Maximum line angle calculated for 3,000 lbs. MWT and 250-ft ruling span.
2. Std C9A,C9ATREE is preferred for crossarm construction. Use this standard for underbuild or other special installations.
3. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase.

Rev. 2 - Moved conductor to side of insulators.



**CONSTRUCTION STANDARDS**  
 3Ø DOUBLE 10' CROSSARM W/ ANGLE PINS  
 16° TO 30°  
 397 AAC MAX WIRE

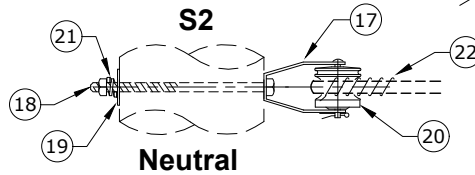
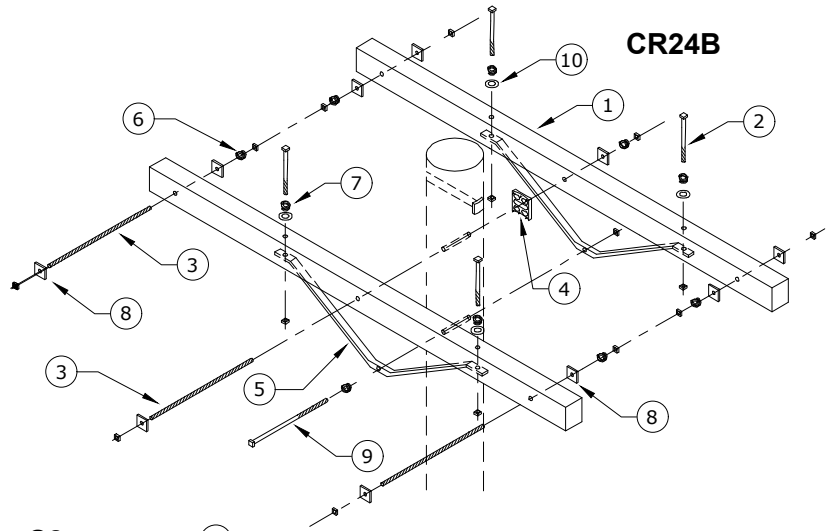
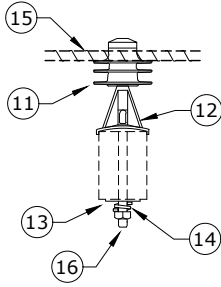
PAGE:  
1 of 2

**C3B,C3BTREE**

CAD FILE:  
C3B

REVISIONS			
△	DATE	ENGR	OPS
1	12/4/17	CM	DK
2	8/9/19	JDK	
△			
APP:	LB/AH	SECTION	
DATE:	10/18/07	<b>330</b>	

**PR5,PR5TREE**



Rev. 2 - Moved conductor to side of insulators.

ITEM NO.	DESCRIPTION	C3BTREE		C3B	
		QTY.	S/N	QTY.	S/N
1	Arm, Cross (Distr.), 10' x 3 3/4" x 4 3/4"	2	26	2	26
2	Bolt, Machine, 1/2" x 7", Galv., 7800 lbs Ultimate Tensile	4	143	4	143
3	Bolt, Double Arm, 5/8" x 20", Galv., 12,400 lbs Ultimate Tensile	3	83	3	83
4	Gain, Pole Plastic	1	709	1	709
5	Brace, Angle, 72"	2	204	2	204
6	Washer, Lock, Spring, Double Coil, Galv., 5/8"	6	2217	6	2217
7	Washer, Lock, Spring, Double Coil, Galv., 1/2"	4	2216	4	2216
8	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	10	1412	10	1412
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile	1	155	1	155
10	Washer, Flat, Round, Galv., 1/2"	4	1394	4	1394
ITEM NO.	DESCRIPTION	PR5TREE(6)		PR5 (6)	
		QTY.	S/N	QTY.	S/N
11	Insulator, Pin, C Neck, Polymer	6	1968	6	1968 *
12	Pin, Angle, Crossarm	6	2658	6	2658
13	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	6	1412	6	1412
14	Washer, Lock, Spring, Double Coil, Galv., 5/8"	6	2217	6	2217
15	Wire, Tie, AL Annealed #4 SD	66*	3012	60	1421
16	Bolt, Machine, 5/8" x 7", Galv., 12,400 lbs Ultimate Tensile	6	2606	6	2606 *
ITEM NO.	DESCRIPTION	S2		S2	
		QTY.	S/N	QTY.	S/N
17	Clevis, D.E. Insulator 1340	1	335	1	335
18	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	156	1	156
19	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
20	Insulator, Spool Clevis, Small, ANSI 53-2 Class	1	773	1	773
21	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
22	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



**CONSTRUCTION STANDARDS**  
 3Ø DOUBLE 10' CROSSARM W/ ANGLE PINS  
 16° TO 30°  
 397 AAC MAX WIRE

PAGE:  
2 of 2

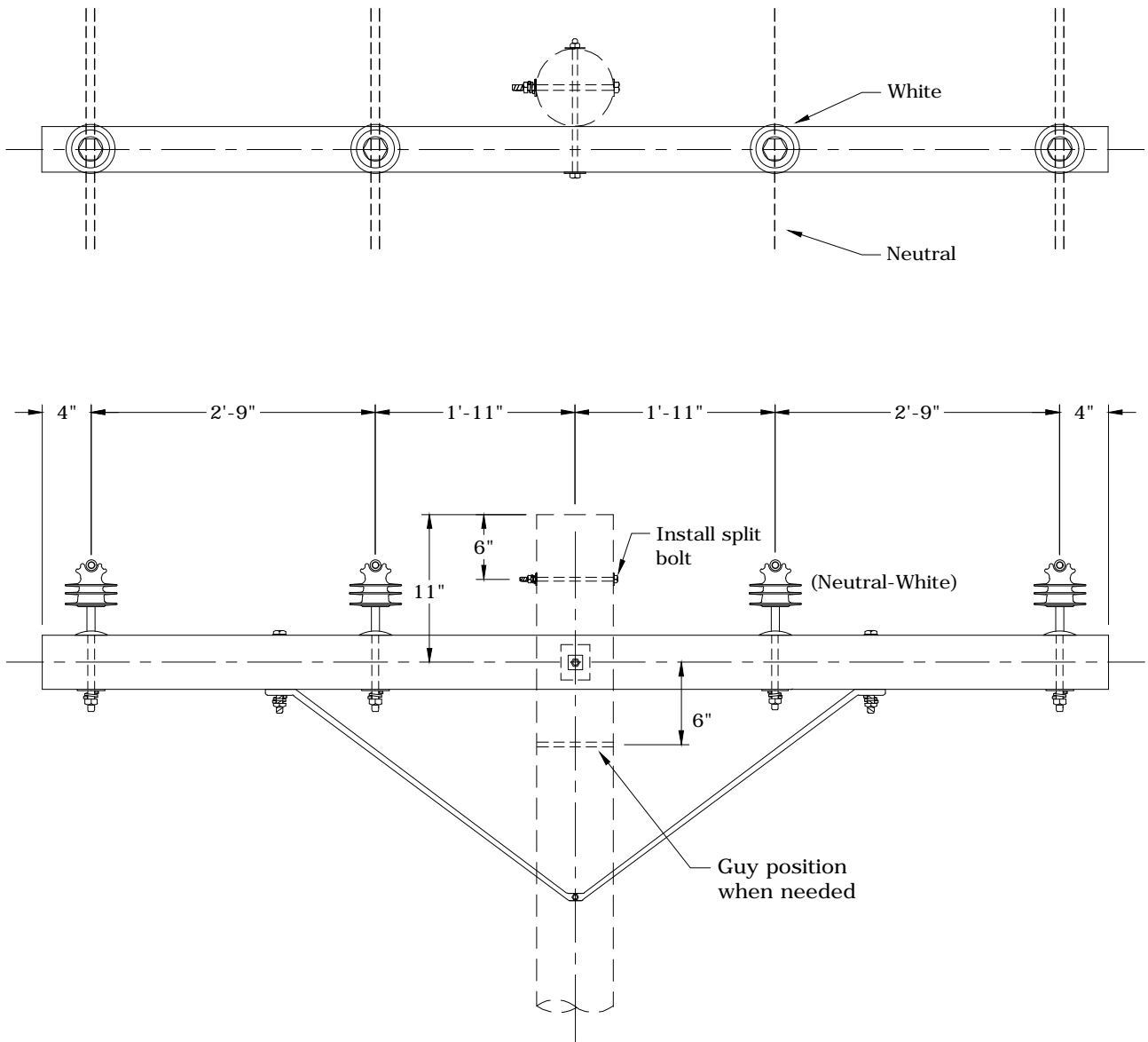
**C3B,C3BTREE**

CAD FILE:  
C3B

REVISIONS			
NO.	DATE	ENGR	OPS
1	12/4/17	CM	DK
2	8/9/19	JDK	

APP:	LB/AH	SECTION
DATE:	10/18/07	<b>330</b>



## C4BTREE - Avian Safe

**Notes:**

1. Maximum line angle calculated for 3,000 lbs. MWT and 250-ft ruling span.
2. This framing is for clearance limited situations only.
3. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase and neutral.

Rev. 3 - Eliminated porcelain pin insulators and added avian notes.



### CONSTRUCTION STANDARDS

3Ø SINGLE 10' CROSSARM  
HIGH NEUTRAL, 0° TO 5°  
397 AAC MAX WIRE

PAGE:  
1 of 2

**C4B, C4BTREE**

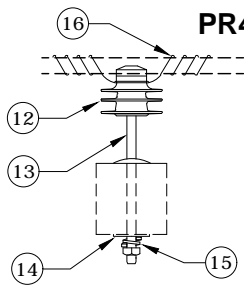
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REVISIONS

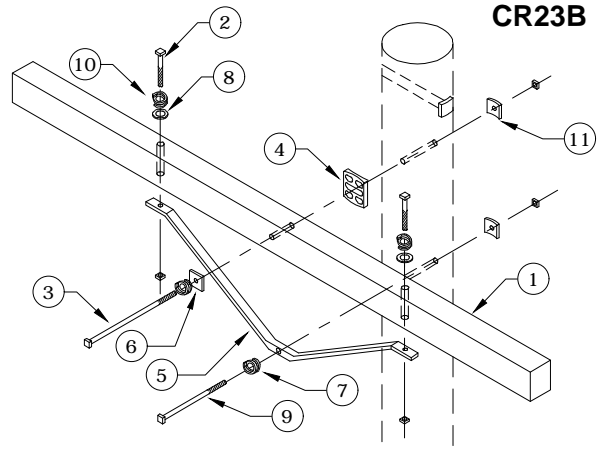
Δ	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	10/18/07	LB	AH
3	12/4/17	CM	DK

APP:	ELM	SECTION
DATE:	1/31/80	<b>330</b>

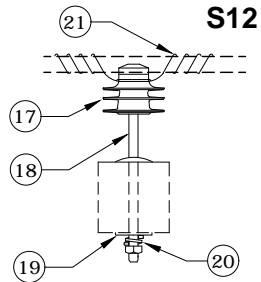




**PR4, PR4TREE**



**CR23B**



**S12**

**Neutral-White**

Rev. 3 - Eliminated porcelain pin insulators and added avian notes.

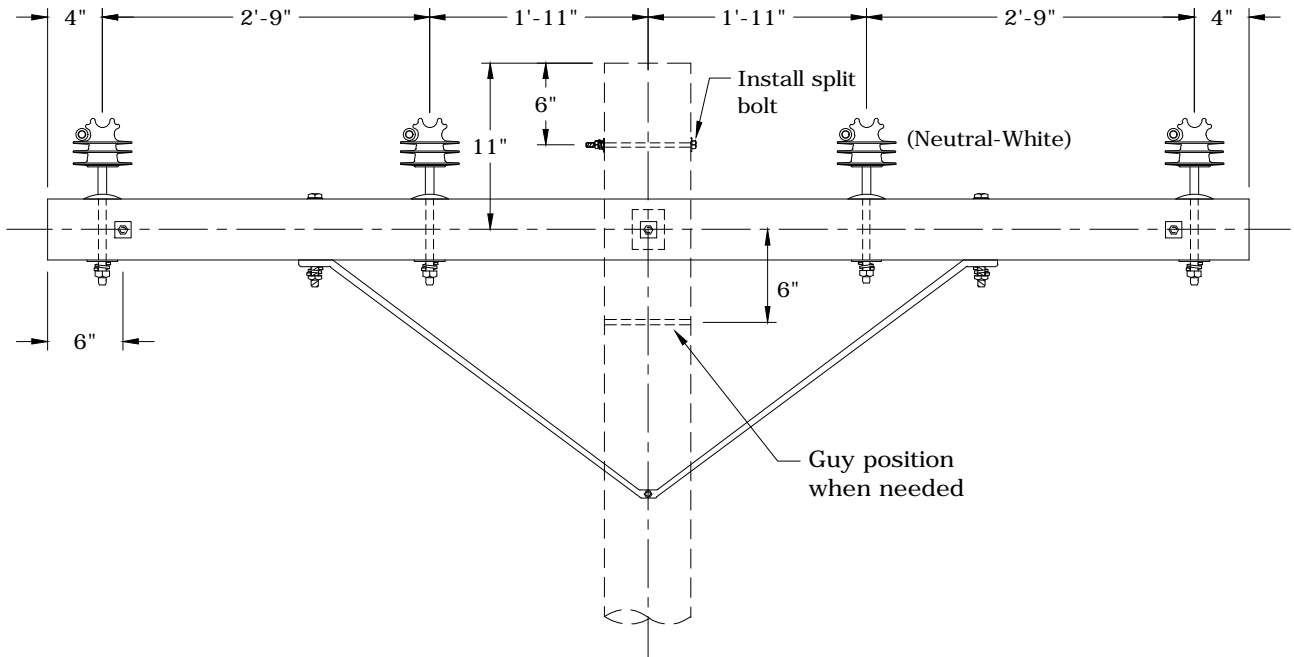
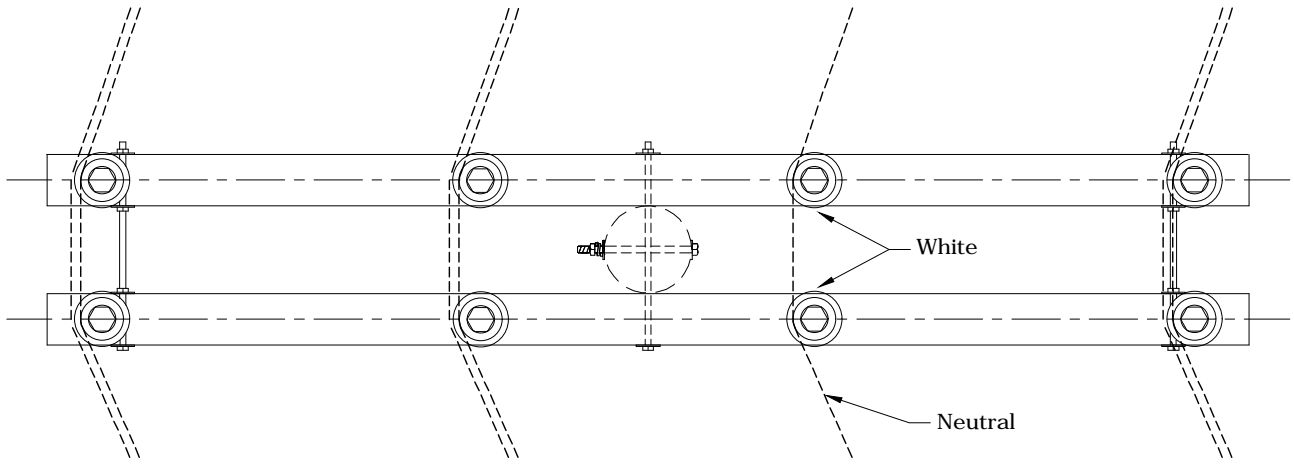
ITEM NO.	DESCRIPTION	C4BTREE		C4B	
		CR23B		CR23B	
		QTY.	S/N	QTY.	S/N
1	Arm, Cross (Distr.) 10' x 3 3/4" x 4 3/4"	1	26	1	26
2	Bolt, Machine, 1/2" x 7", Galv., 7,800 lbs Ultimate Tensile	2	143	2	143
3	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile	1	157	1	157
4	Gain, Pole Plastic	1	709	1	709
5	Brace, Angle, 72"	1	204	1	204
6	Washer, Square, Flat 5/8", 2 1/4" x 2 1/4"	1	1412	1	1412
7	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
8	Washer, Flat, Round, Galv., 1/2"	2	1394	2	1394
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile	1	155	1	155
10	Washer, Lock, Spring, Double Coil, Galv., 1/2"	2	2216	2	2216
11	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
ITEM NO.	DESCRIPTION	PR4TREE (3)		PR4 (3)	
		QTY.	S/N	QTY.	S/N
12	Insulator, Pin, C Neck, Polymer	3	1968	3	1968 *
13	Pin, Crossarm	3	961	3	961
14	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	3	1412	3	1412
15	Washer, Lock, Spring, Double Coil, Galv., 5/8"	3	2217	3	2217
16	Wire, Tie, AL Annealed #4 SD	33*	3012	30	1421
ITEM NO.	DESCRIPTION	S12		S12	
		QTY.	S/N	QTY.	S/N
17	Insulator, Pin, C Neck, White Polymer	1	2656	1	2656
18	Pin, Crossarm	1	961	1	961
19	Washer, Square Flat, 5/8", 2 1/4" x 2 1/4"	1	1412	1	1412
20	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
21	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



**CONSTRUCTION STANDARDS**

3Ø SINGLE 10' CROSSARM  
HIGH NEUTRAL, 0° TO 5°  
397 AAC MAX WIRE

REVISIONS			
Δ	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	10/18/07	LB	AH
3	12/4/17	CM	DK
Δ			
APP:	ELM	SECTION	
DATE:	1/31/80	330	



### C5BTREE - Avian Safe

**Notes:**

1. Maximum line angle calculated for 3,000 lbs. MWT and 250-ft ruling span.
2. This framing is for clearance limited situations only.
3. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase and neutral.

Rev. 3 - Eliminated porcelain pin insulators and added avian notes.



## CONSTRUCTION STANDARDS

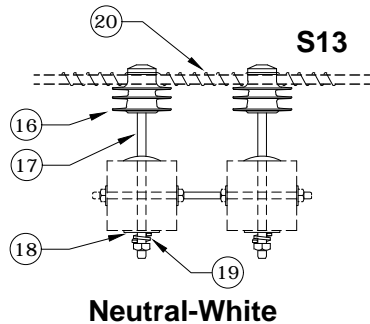
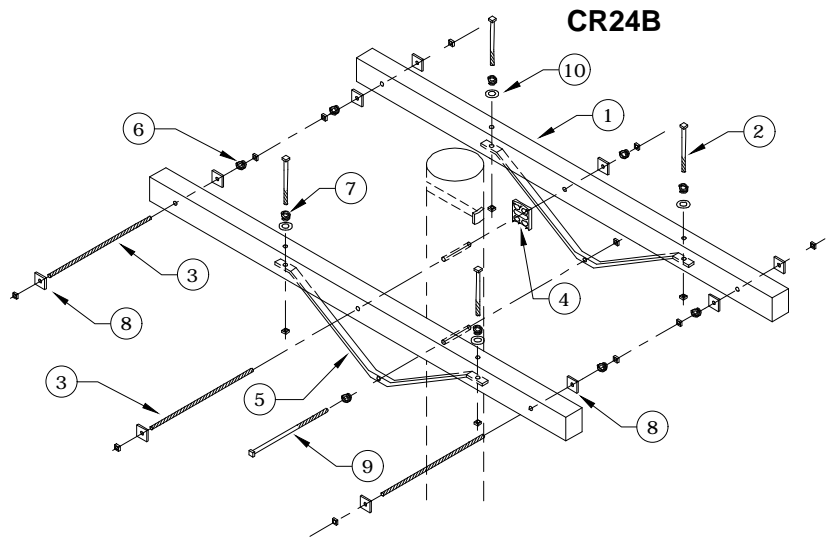
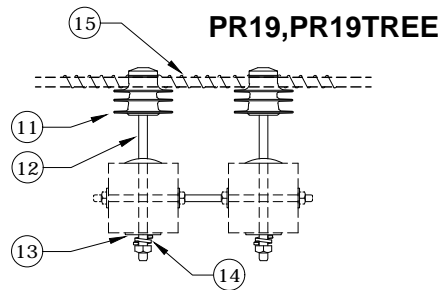
3Ø DOUBLE 10' CROSSARM  
 HIGH NEUTRAL, 6° TO 15°  
 397 AAC MAX WIRE

PAGE:  
1 of 2

**C5B, C5BTREE**

CAD FILE:  
C5B

REVISIONS											
NO.	DATE	ENGR	OPS								
1	3/02	REDRAWN	IN CAD								
2	10/18/07	LB	AH								
3	12/4/17	CM	DK								
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DATE:	1/31/80	330									



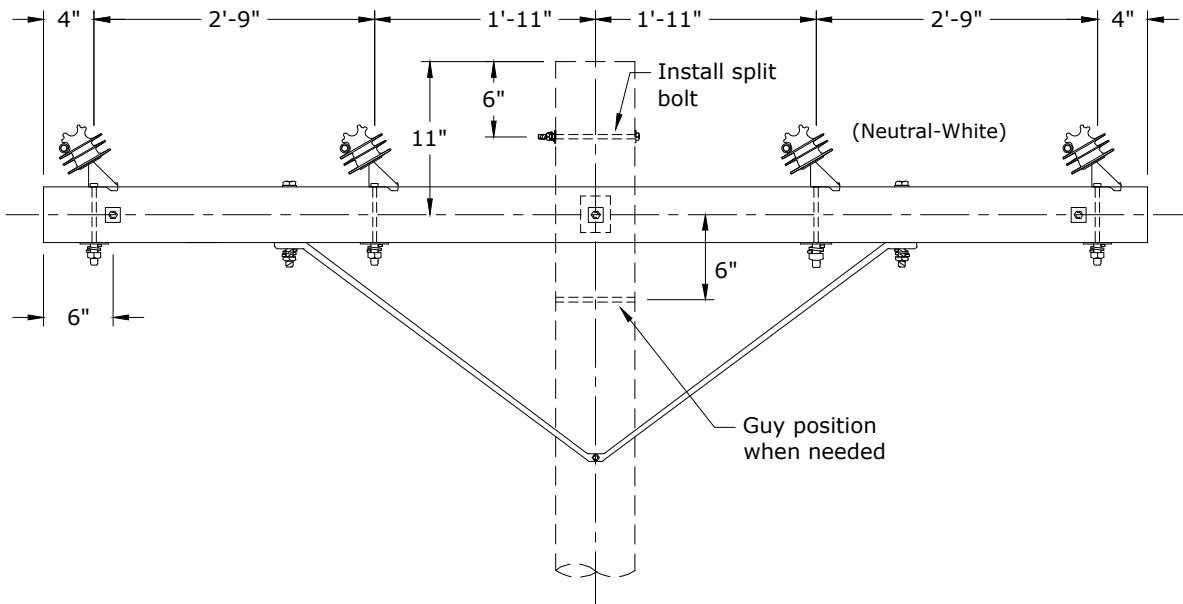
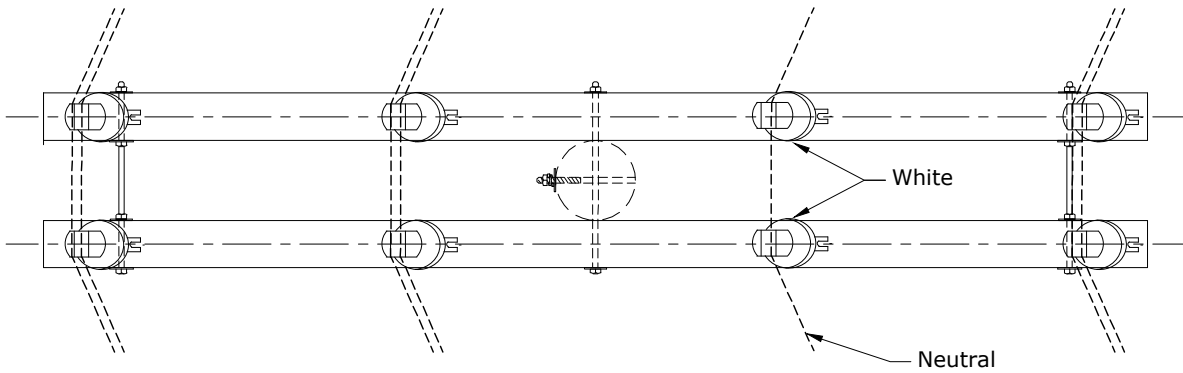
Rev. 3 - Eliminated porcelain pin insulators and added avian notes.

ITEM NO.	DESCRIPTION	C5BTREE		C5B	
		QTY.	S/N	QTY.	S/N
1	Arm, Cross (Distr.), 10' x 3 3/4" x 4 3/4"	2	26	2	26
2	Bolt, Machine, 1/2" x 7", Galv., 7,800 lbs Ultimate Tensile	4	143	4	143
3	Bolt, Double Arm, 5/8" x 20" Galv., 12,400 lbs Ultimate Tensile	3	83	3	83
4	Gain, Pole Plastic	1	709	1	709
5	Brace, Angle, 72"	2	204	2	204
6	Washer, Lock, Spring, Double Coil, Galv., 5/8"	6	2217	6	2217
7	Washer, Lock, Spring, Double Coil, Galv., 1/2"	4	2216	4	2216
8	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	10	1412	10	1412
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile	1	155	1	155
10	Washer, Flat, Round, Galv., 1/2"	4	1394	4	1394
ITEM NO.	DESCRIPTION	PR19TREE(3)		PR19 (3)	
		QTY.	S/N	QTY.	S/N
11	Insulator, Pin, C Neck, Polymer	6	1968	6	1968 *
12	Pin, Crossarm	6	961	6	961
13	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	6	1412	6	1412
14	Washer, Lock, Spring, Double Coil, Galv., 5/8"	6	2217	6	2217
15	Wire, Tie, AL Annealed #4 SD	66*	3012	60	1421
ITEM NO.	DESCRIPTION	S13		S13	
		QTY.	S/N	QTY.	S/N
16	Insulator, Pin, C Neck, White, Polymer	2	2656	2	2656
17	Pin, Crossarm	2	961	2	961
18	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	2	1412	2	1412
19	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
20	Wire, Tie, AL Annealed #4 SD	20	1421	20	1421



**CONSTRUCTION STANDARDS**  
 3Ø DOUBLE 10' CROSSARM  
 HIGH NEUTRAL, 6° TO 15°  
 397 AAC MAX WIRE

REVISIONS											
NO.	DATE	ENGR	OPS								
1	3/02	REDRAWN	IN CAD								
2	10/18/07	LB	AH								
3	12/4/17	CM	DK								
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APP:	ELM	SECTION									
DATE:	1/31/80	330									



### C6BTREE - Avian Safe

**Notes:**

1. Maximum line angle calculated for 3,000 lbs. MWT and 250-ft ruling span.
2. This framing is for clearance limited situations only.
3. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase and neutral.

Rev. 2 - Moved conductor to side of insulators.



## CONSTRUCTION STANDARDS

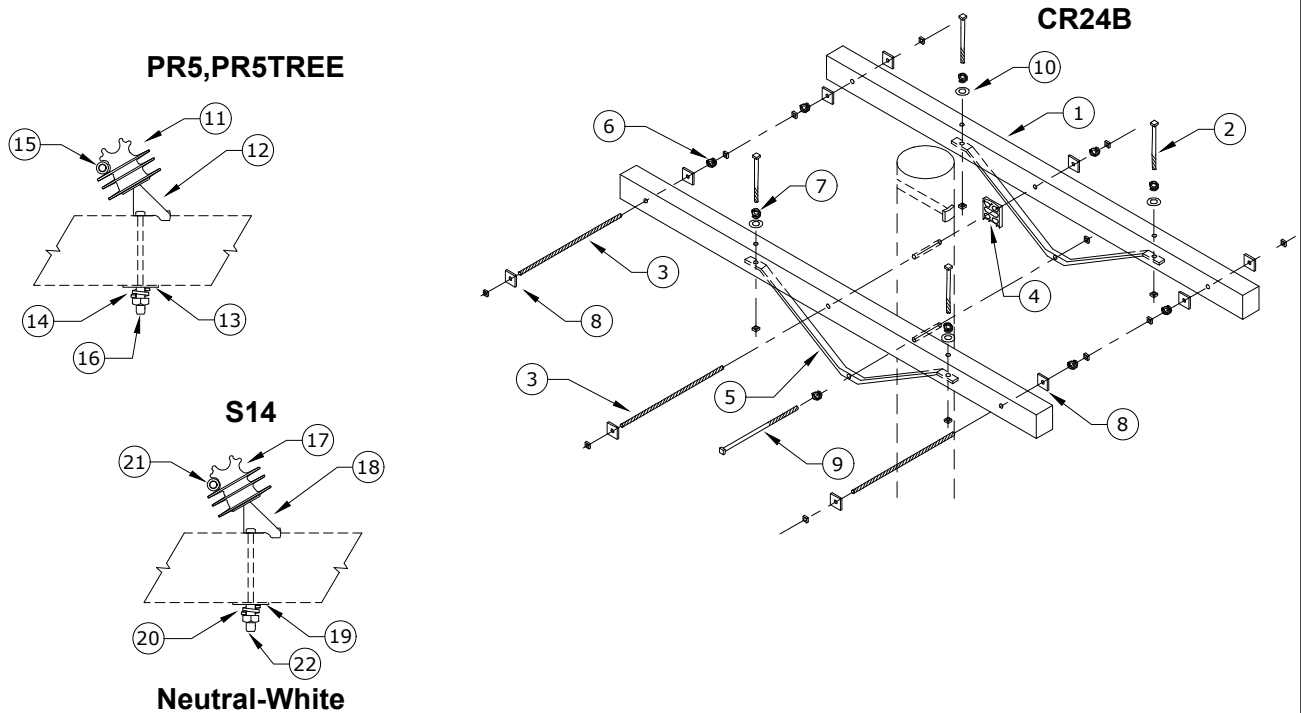
3Ø DOUBLE 10' CROSSARM  
 HIGH NEUTRAL, 16° TO 30°  
 397 AAC MAX WIRE

PAGE:  
1 of 2

**C6B,C6BTREE**

CAD FILE:  
C6B

REVISIONS			
Δ	DATE	ENGR	OPS
1	12/4/17	CM	DK
2	8/9/19	JDK	
Δ	APP:	LB/AH	SECTION
	DATE:	10/18/07	<b>330</b>



Rev. 2 - Moved conductor to side of insulators.

ITEM NO.	DESCRIPTION	C6BTREE		C6B	
		QTY.	S/N	QTY.	S/N
1	Arm, Cross (Distr.), 10' x 3 3/4" x 4 3/4"	2	26	2	26
2	Bolt, Machine, 1/2" x 7", Galv., 7,800 lbs Ultimate Tensile	4	143	4	143
3	Bolt, Double Arm, 5/8" x 20", Galv., 12,400 lbs Ultimate Tensile	3	83	3	83
4	Gain, Pole Plastic	1	709	1	709
5	Brace, Angle, 72"	2	204	2	204
6	Washer, Lock, Spring, Double Coil, Galv., 5/8"	6	2217	6	2217
7	Washer, Lock, Spring, Double Coil, Galv., 1/2"	4	2216	4	2216
8	Washer, Square Flat, 5/8", 2 1/4" x 2 1/4"	10	1412	10	1412
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile	1	155	1	155
10	Washer, Flat, Round, Galv., 1/2"	4	1394	4	1394
ITEM NO.	DESCRIPTION	PR5TREE(6)		PR5 (6)	
		QTY.	S/N	QTY.	S/N
11	Insulator, Pin, C Neck, Polymer	6	1968	6	1968 *
12	Pin, Angle, Crossarm	6	2658	6	2658
13	Washer, Square Flat, 5/8", 2 1/4" x 2 1/4"	6	1412	6	1412
14	Washer, Lock, Spring, Double Coil, Galv., 5/8"	6	2217	6	2217
15	Wire, Tie, AL Annealed #4 SD	66*	3012	60	1421
16	Bolt, Machine, 5/8" x 7", Galv., 12,400 lbs Ultimate Tensile	6	2606	6	2606 *
ITEM NO.	DESCRIPTION	S14(2)		S14(2)	
		QTY.	S/N	QTY.	S/N
17	Insulator, Pin, C Neck, White, Polymer	2	2656	2	2656
18	Pin, Angle, Crossarm	2	2658	2	2658
19	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	2	1412	2	1412
20	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
21	Wire, Tie, AL Annealed #4 SD	20	1421	20	1421
22	Bolt, Machine, 5/8" x 7", Galv., 12,400 lbs Ultimate Tensile	2	2606	2	2606 *

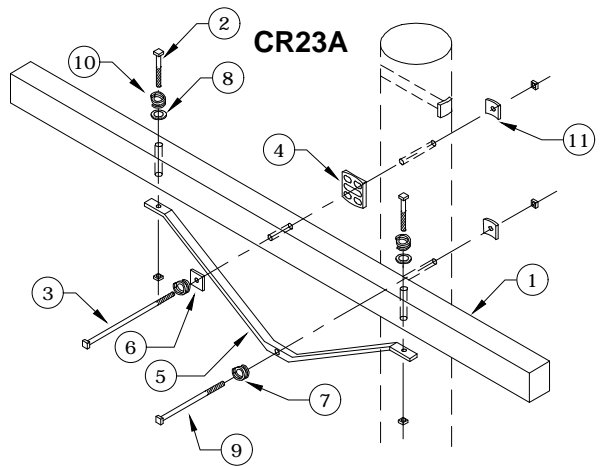
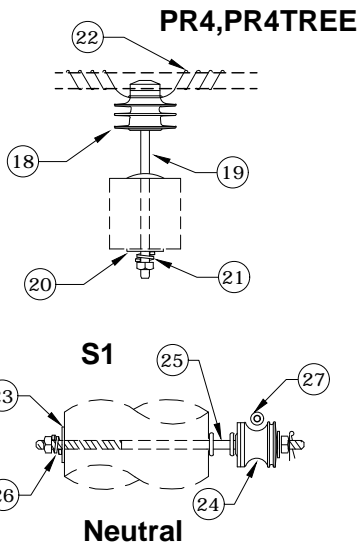
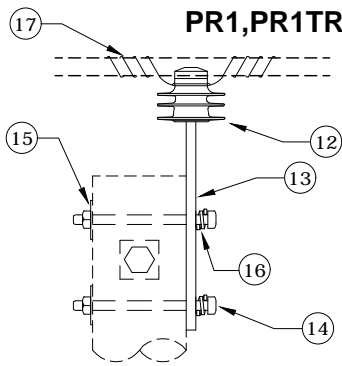


### CONSTRUCTION STANDARDS

3Ø DOUBLE 10' CROSSARM  
HIGH NEUTRAL, 16° TO 30°  
397 AAC MAX WIRE

REVISIONS			
NO.	DATE	ENGR	OPS
1	12/4/17	CM	DK
2	8/9/19	JDK	





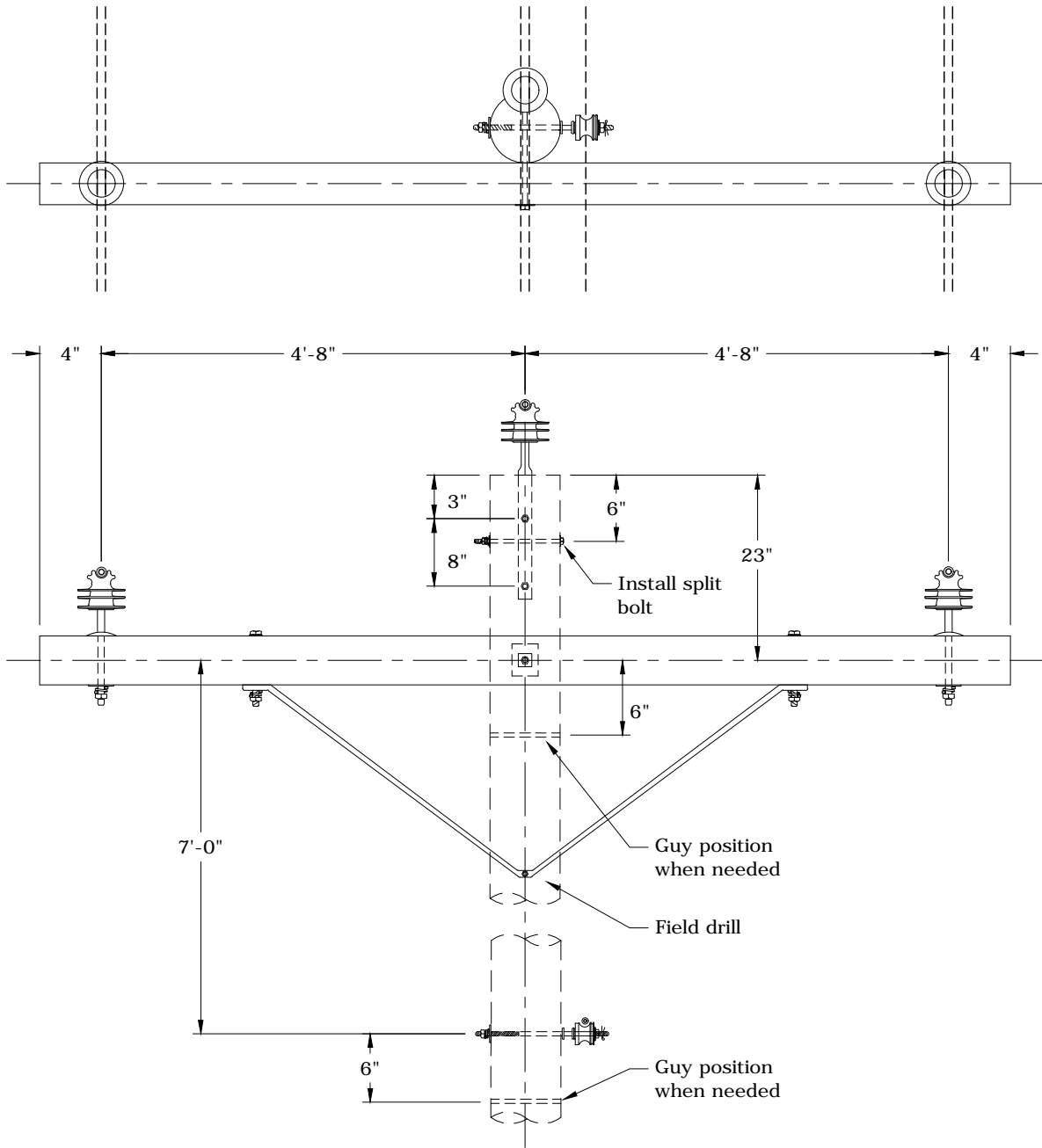
Rev. 3 - Eliminated porcelain pin insulators and added avian notes.

ITEM NO.	DESCRIPTION	C7ATREE		C7A	
		QTY.	S/N	QTY.	S/N
1	Arm, Cross (Distr.), 8' x 3 3/4" x 4 3/4"	1	25	1	25
2	Bolt, Machine, 1/2" x 7", Galv., 7800 lbs Ultimate Tensile	2	143	2	143
3	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile	1	157	1	157
4	Gain, Pole Plastic	1	709	1	709
5	Brace, Angle, 60"	1	203	1	203
6	Washer, Square, Flat 5/8", 2 1/4" x 2 1/4"	1	1412	1	1412
7	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
8	Washer, Flat, Round, Galv., 1/2"	2	1394	2	1394
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile	1	155	1	155
10	Washer, Lock, Spring, Double Coil, Galv., 1/2"	2	2216	2	2216
11	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
ITEM NO.	DESCRIPTION	PR1TREE		PR1	
		QTY.	S/N	QTY.	S/N
12	Insulator, Pin, C Neck, Polymer	1	1968	1	1968 *
13	Pin, Pole Top	1	962	1	962
14	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile	2	155	2	155
15	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
16	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
17	Wire, Tie, AL Annealed #4 SD	11*	3012	10	1421
ITEM NO.	DESCRIPTION	PR4TREE(2)		PR4 (2)	
		QTY.	S/N	QTY.	S/N
18	Insulator, Pin, C Neck, Polymer	2	1968	2	1968 *
19	Pin, Crossarm	2	961	2	961
20	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	2	1412	2	1412
21	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
22	Wire, Tie, AL Annealed #4 SD	22*	3012	20	1421
ITEM NO.	DESCRIPTION	S1		S1	
		QTY.	S/N	QTY.	S/N
23	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
24	Insulator, Spool Clevis, Small, ANSI 53-2 Class	1	773	1	773
25	Bolt, Double Upset, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	1580	1	1580
26	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
27	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



**CONSTRUCTION STANDARDS**  
 3Ø SINGLE 8' CROSSARM W/ POLE TOP  
 0° TO 5°  
 397 AAC MAX WIRE

REVISIONS			
NO.	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	10/18/07	LB	AH
3	12/4/17	CM	DK
APP: ELM SECTION			
DATE: 1/31/80		330	



## Avian Safe

**Notes:**

1. Maximum line angle calculated for 3,000 lbs. MWT and 250-ft ruling span.
2. Changing Std C7A to a 10' crossarm and lowering the crossarm 5" makes it avian safe.



### CONSTRUCTION STANDARDS

3Ø SINGLE 10' CROSSARM W/ POLE TOP  
 0° TO 5° - FOR AVIAN RETROFIT  
 397 AAC MAX WIRE

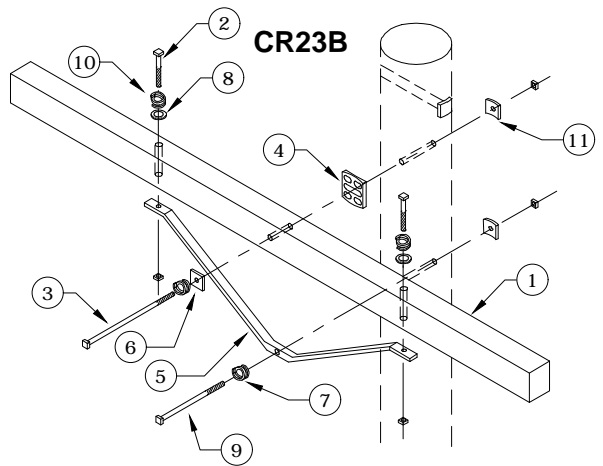
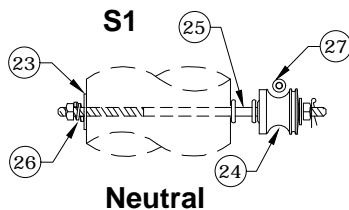
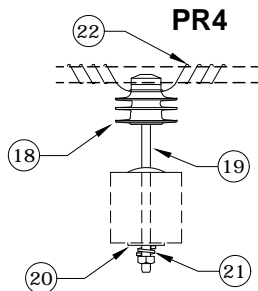
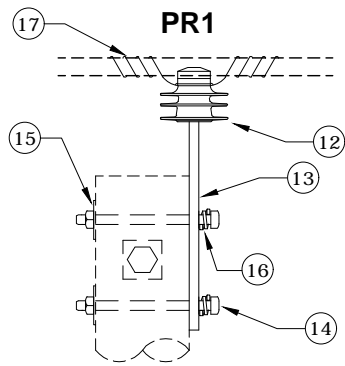
PAGE:  
1 of 2

**C7AVIAN**

CAD FILE:  
C7AVIAN

REVISIONS			
△	DATE	ENGR	OPS
△			
APP:	CM/DK	SECTION	
DATE:	12/4/17	<b>330</b>	



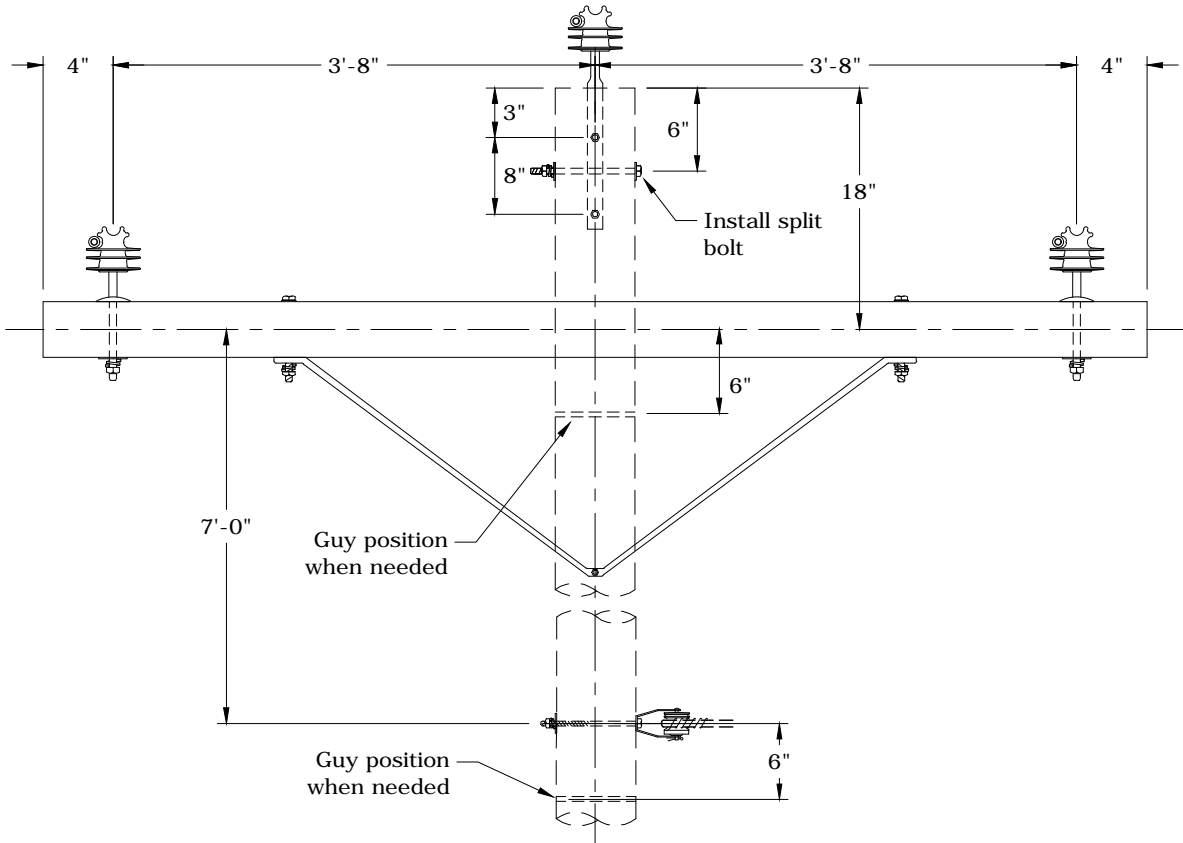
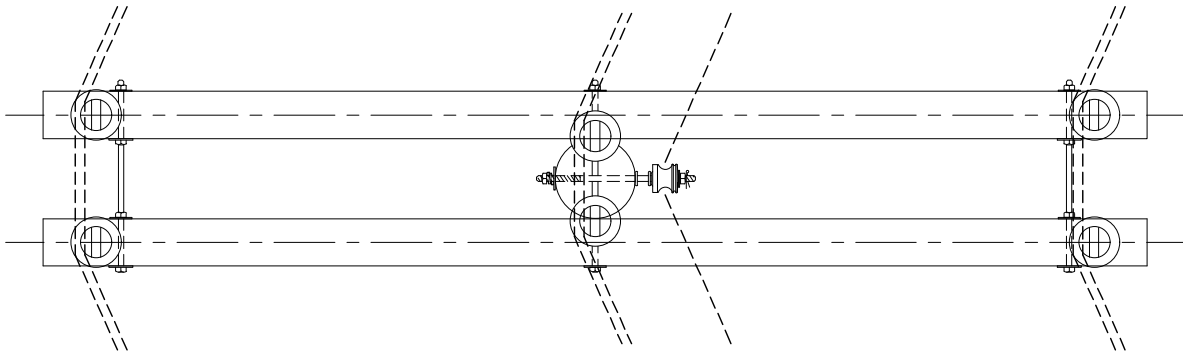


ITEM NO.	DESCRIPTION	C7Avian	
		CR23B	
		QTY.	S/N
1	Arm, Cross (Distr.), 10' x 3 3/4" x 4 3/4"	1	26
2	Bolt, Machine, 1/2" x 7", Galv., 7800 lbs Ultimate Tensile	2	143
3	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile	1	157
4	Gain, Pole Plastic	1	709
5	Brace, Angle, 72"	1	204
6	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	1	1412
7	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217
8	Washer, Flat, Round, Galv., 1/2"	2	1394
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile	1	155
10	Washer, Lock, Spring, Double Coil, Galv., 1/2"	2	2216
11	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
ITEM NO.	DESCRIPTION	PR1	
		QTY.	S/N
12	Insulator, Pin, C Neck, Polymer	1	1968
13	Pin, Pole Top	1	962
14	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile	2	155
15	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
16	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217
17	Wire, Tie, AL Annealed #4 SD	10	1421
ITEM NO.	DESCRIPTION	PR4 (2)	
		QTY.	S/N
18	Insulator, Pin, C Neck, Polymer	2	1968
19	Pin, Crossarm	2	961
20	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	2	1412
21	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217
22	Wire, Tie, AL Annealed #4 SD	20	1421
ITEM NO.	DESCRIPTION	S1	
		QTY.	S/N
23	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
24	Insulator, Spool Clevis, Small, ANSI 53-2 Class	1	773
25	Bolt, Double Upset, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	1580
26	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217
27	Wire, Tie, AL Annealed #4 SD	10	1421



**CONSTRUCTION STANDARDS**  
 3Ø SINGLE 10' CROSSARM W/ POLE TOP  
 0° TO 5° - FOR AVIAN RETROFIT  
 397 AAC MAX WIRE

REVISIONS			
Δ	DATE	ENGR	OPS



### C8ATREE - Avian Safe

**Notes:**

1. Maximum line angle calculated for 3,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase.

Rev. 3 - Eliminated porcelain pin insulators and added avian notes.



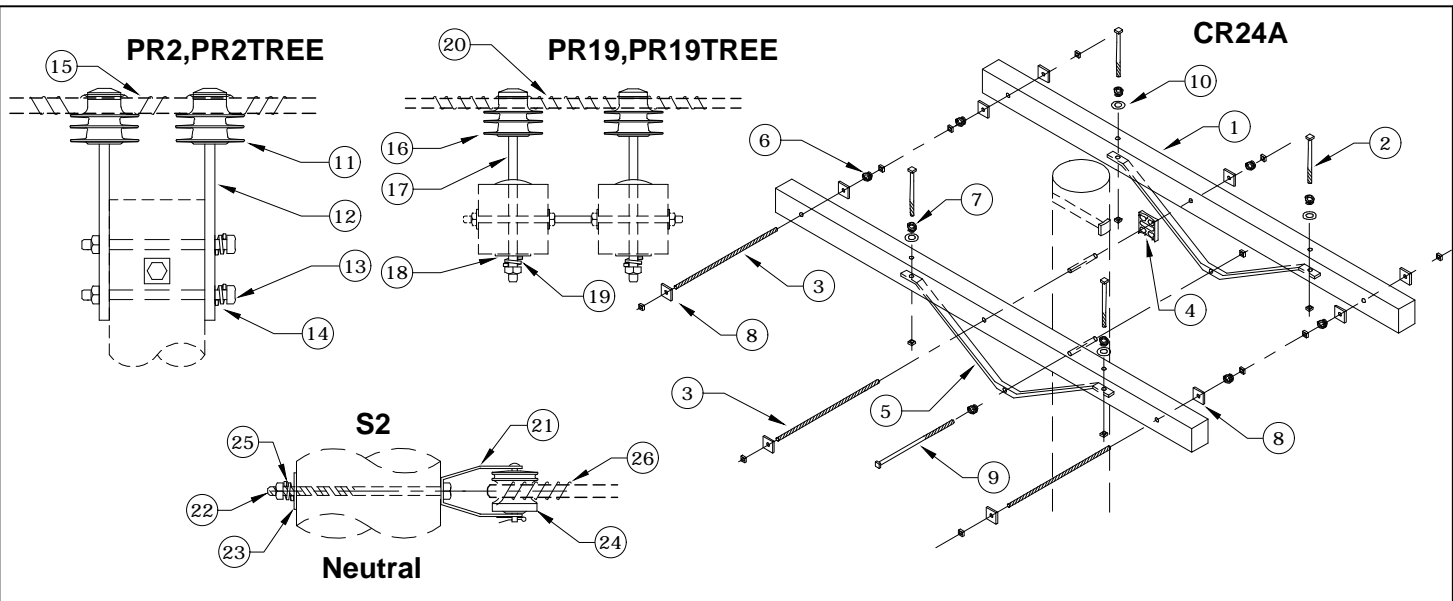
**CONSTRUCTION STANDARDS**  
 3Ø DOUBLE 8' CROSSARM W/ POLE TOP  
 6° TO 15°  
 397 AAC MAX WIRE

PAGE:  
1 of 2

**C8A, C8ATREE**

CAD FILE:  
C8A

REVISIONS			
△	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	10/18/07	LB	AH
3	12/4/17	CM	DK
△			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>330</b>	



Rev. 3 - Eliminated porcelain pin insulators and added avian notes.

ITEM NO.	DESCRIPTION	C8ATREE		C8A	
		QTY.	S/N	QTY.	S/N
1	Arm, Cross (Distr.), 8' x 3 3/4" x 4 3/4"	2	25	2	25
2	Bolt, Machine, 1/2" x 7", Galv., 7,800 lbs Ultimate Tensile	4	143	4	143
3	Bolt, Double Arm, 5/8" x 20", Galv., 12,400 lbs Ultimate Tensile	3	83	3	83
4	Gain, Pole Plastic	1	709	1	709
5	Brace, Angle, 60"	2	203	2	203
6	Washer, Lock, Spring, Double Coil, Galv., 5/8"	6	2217	6	2217
7	Washer, Lock, Spring, Double Coil, Galv., 1/2"	4	2216	4	2216
8	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	10	1412	10	1412
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile	1	155	1	155
10	Washer, Flat, Round, Galv., 1/2"	4	1394	4	1394
ITEM NO.	DESCRIPTION	PR2TREE		PR2	
		QTY.	S/N	QTY.	S/N
11	Insulator, Pin, C Neck, Polymer	2	1968	2	1968 *
12	Pin, Pole Top	2	962	2	962
13	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	2	156	2	156
14	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
16	Wire, Tie, AL Annealed #4 SD	22*	3012	20	1421
ITEM NO.	DESCRIPTION	PR19TREE(2)		PR19 (2)	
		QTY.	S/N	QTY.	S/N
16	Insulator, Pin, C Neck, Polymer	4	1968	4	1968 *
17	Pin, Crossarm	4	961	4	961
18	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	4	1412	4	1412
19	Washer, Lock, Spring, Double Coil, Galv., 5/8"	4	2217	4	2217
20	Wire, Tie, AL Annealed #4 SD	44*	3012	40	1421
ITEM NO.	DESCRIPTION	S2		S2	
		QTY.	S/N	QTY.	S/N
21	Clevis, D.E. Insulator 1340	1	335	1	335
22	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	156	1	156
23	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
24	Insulator, Spool Clevis, Small, ANSI 53-2 Class	1	773	1	773
25	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
26	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



### CONSTRUCTION STANDARDS

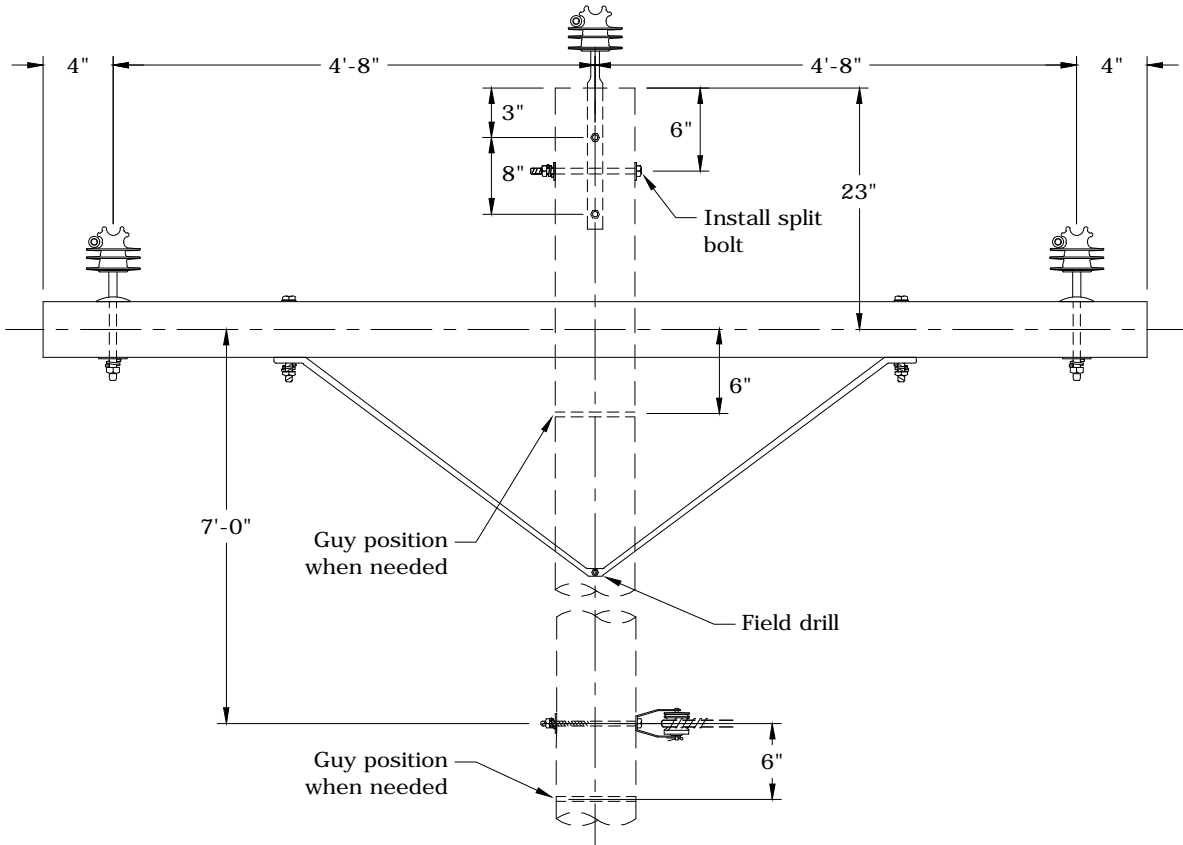
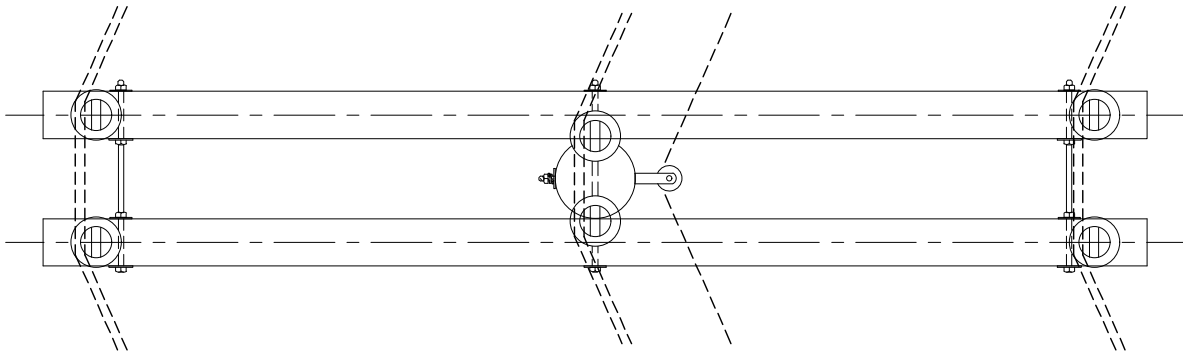
3Ø DOUBLE 8' CROSSARM W/ POLE TOP  
6° TO 15°  
397 AAC MAX WIRE

PAGE:  
2 of 2

**C8A, C8ATREE**

CAD FILE:  
C8A

REVISIONS			
Δ	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	10/18/07	LB	AH
3	12/4/17	CM	DK
APP: ELM SECTION DATE: 1/31/80 330			



### Avian Safe

- Notes:**
1. Maximum line angle calculated for 3,000 lbs. MWT and 250-ft ruling span.
  2. Changing Std C8A to a 10' crossarm and lowering the crossarm 5" makes it avian safe.



## CONSTRUCTION STANDARDS

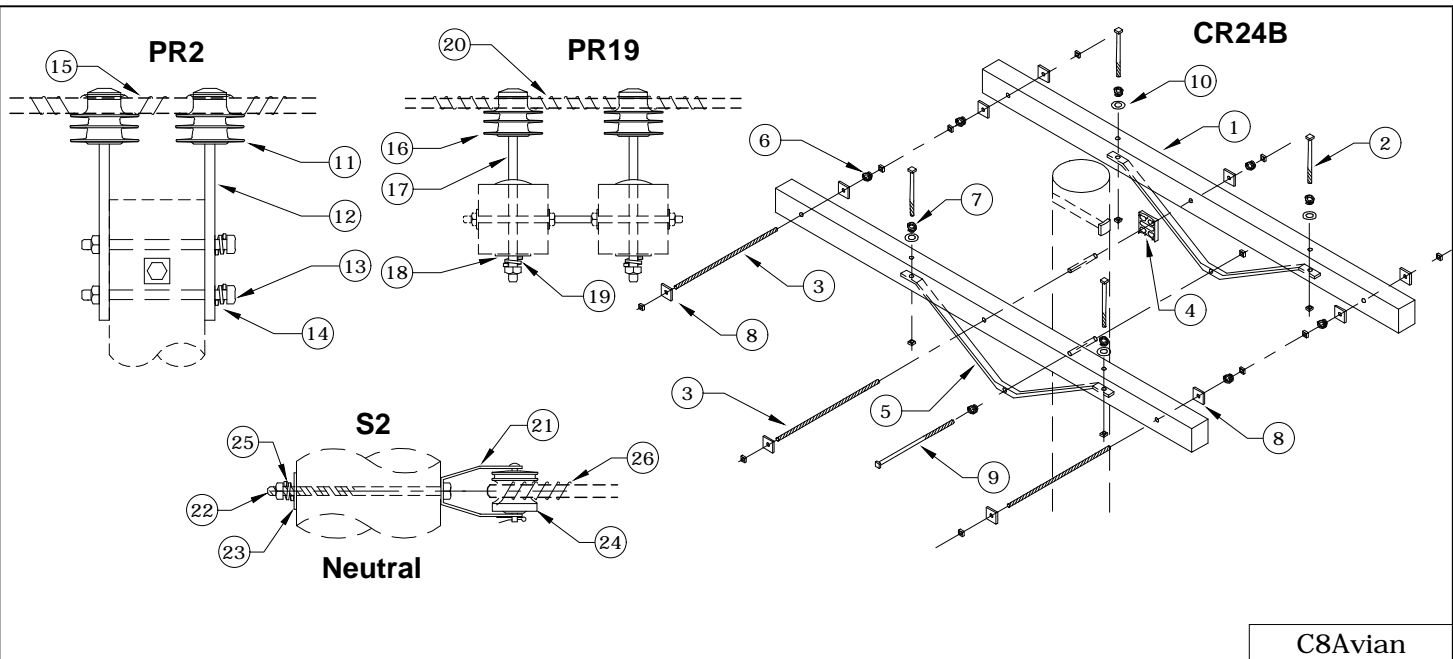
3Ø DOUBLE 10' CROSSARM W/ POLE TOP  
6° TO 15° - FOR AVIAN RETROFIT  
397 AAC MAX WIRE

PAGE:  
1 of 2

**C8AVIAN**

CAD FILE:  
C8AVIAN

REVISIONS			
△	DATE	ENGR	OPS
△			
APP:	CM/DK	SECTION	
DATE:	12/4/17	<b>330</b>	



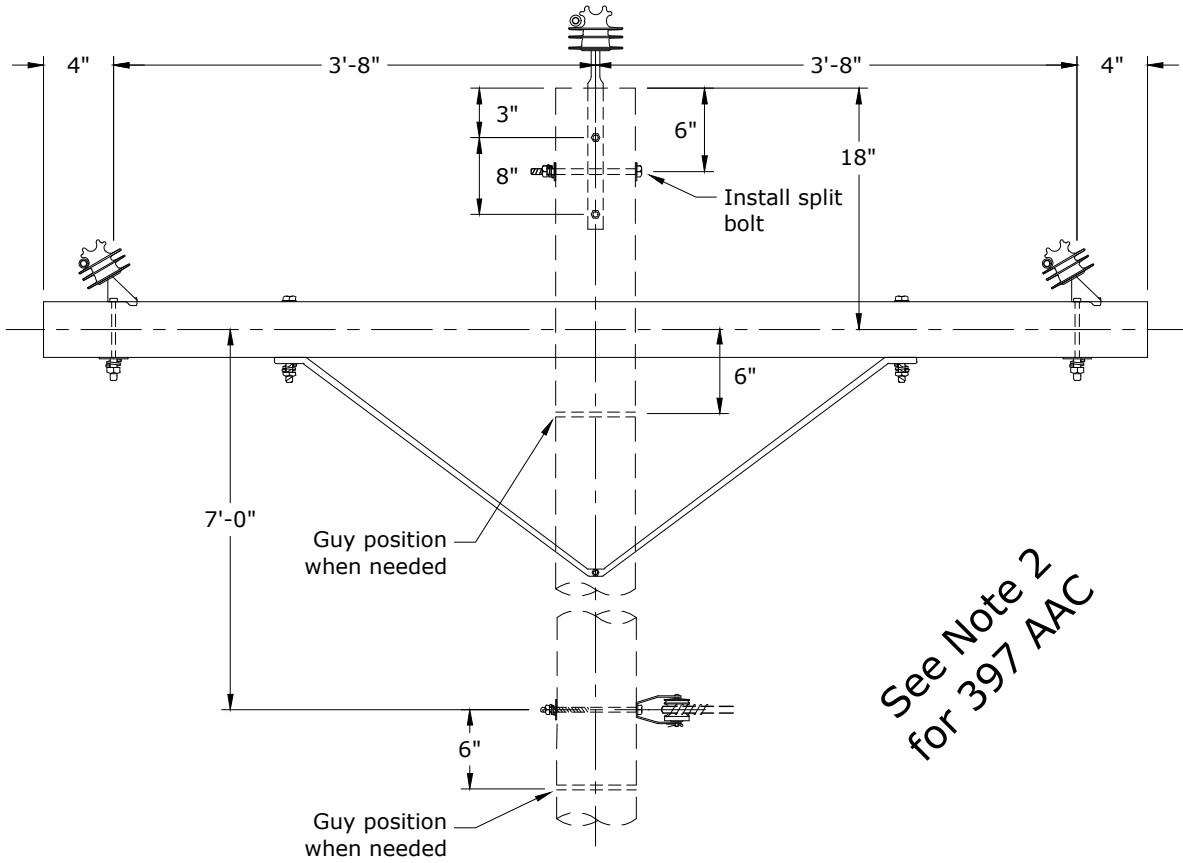
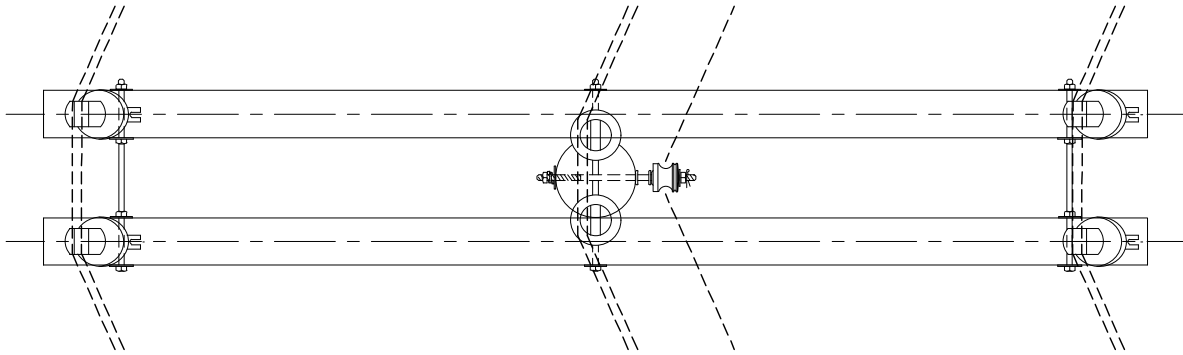
ITEM NO.	DESCRIPTION	C8Avian CR24B	
		QTY.	S/N
1	Arm, Cross (Distr.), 10' x 3 3/4" x 4 3/4"	2	26
2	Bolt, Machine, 1/2" x 7", Galv., 7,800 lbs Ultimate Tensile	4	143
3	Bolt, Double Arm, 5/8" x 20", Galv., 12,400 lbs Ultimate Tensile	3	83
4	Gain, Pole Plastic	1	709
5	Brace, Angle, 72"	2	204
6	Washer, Lock, Spring, Double Coil, Galv., 5/8"	6	2217
7	Washer, Lock, Spring, Double Coil, Galv., 1/2"	4	2216
8	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	10	1412
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile	1	155
10	Washer, Flat, Round, Galv., 1/2"	4	1394
ITEM NO.	DESCRIPTION	PR2	
		QTY.	S/N
11	Insulator, Pin, C Neck, Polymer	2	1968
12	Pin, Pole Top	2	962
13	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	2	156
14	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217
15	Wire, Tie, AL Annealed #4 SD	20	1421
ITEM NO.	DESCRIPTION	PR19 (2)	
		QTY.	S/N
16	Insulator, Pin, C Neck, Polymer	4	1968
17	Pin, Crossarm	4	961
18	Washer, Square Flat, 5/8", 2 1/4" x 2 1/4"	4	1412
19	Washer, Lock, Spring, Double Coil, Galv., 5/8"	4	2217
20	Wire, Tie, AL Annealed #4 SD	40	1421
ITEM NO.	DESCRIPTION	S2	
		QTY.	S/N
21	Clevis, D.E. Insulator 1340	1	335
22	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	156
23	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
24	Insulator, Spool Clevis, Small, ANSI 53-2 Class	1	773
25	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217
26	Wire, Tie, AL Annealed #4 SD	10	1421



### CONSTRUCTION STANDARDS

3Ø DOUBLE 10' CROSSARM W/ POLE TOP  
6° TO 15° - FOR AVIAN RETROFIT  
397 AAC MAX WIRE

REVISIONS			
DATE	ENGR	OPS	



See Note 2  
for 397 AAC

### C9ATREE - Avian Safe

**Notes:**

1. Maximum line angle calculated for 2/0 at 2,000 lbs. MWT and 250-ft ruling span.
2. For 397 AAC at 16°-30° use Std C3B,C3BTREE.
3. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase.

Rev. 2 - Moved conductor to side of insulators.



## CONSTRUCTION STANDARDS

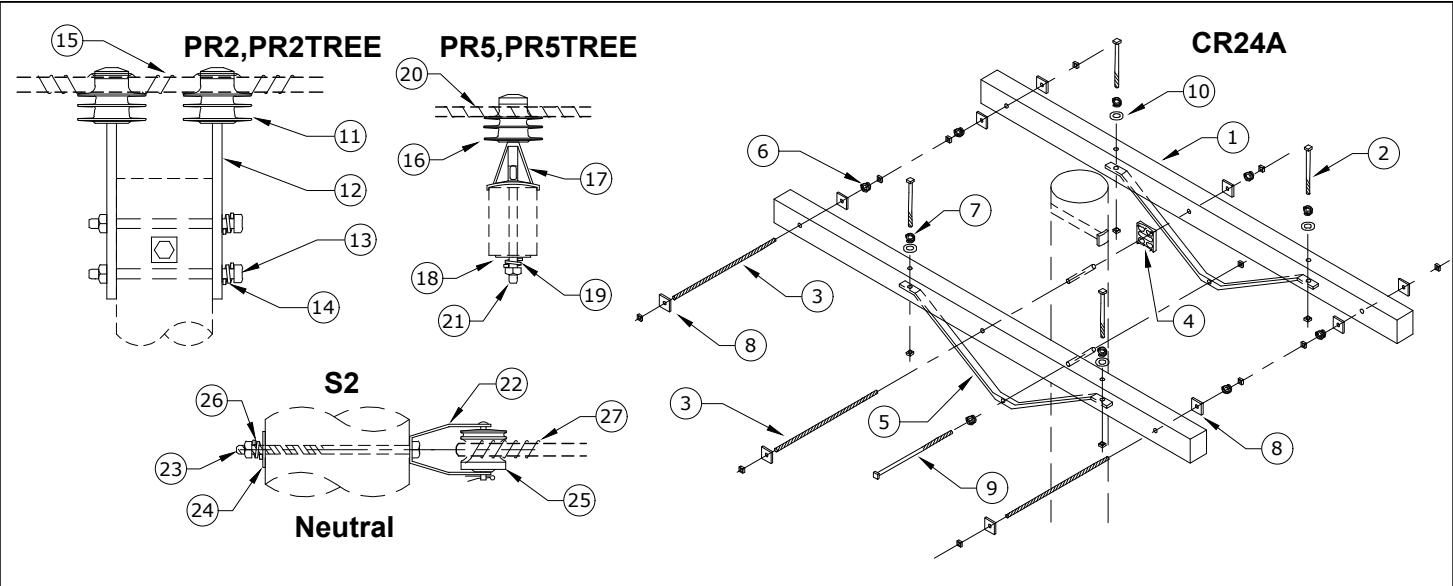
3Ø DOUBLE 8' CROSSARM W/ DOUBLE  
POLE TOP - 16° TO 30°  
2/0 ACSR MAX WIRE

PAGE:  
1 of 2

C9A,C9ATREE

CAD FILE:  
C9A

REVISIONS			
Δ	DATE	ENGR	OPS
1	12/4/17	CM	DK
2	8/9/19	JDK	
APP: LB/AH		SECTION	
DATE: 10/18/07		330	



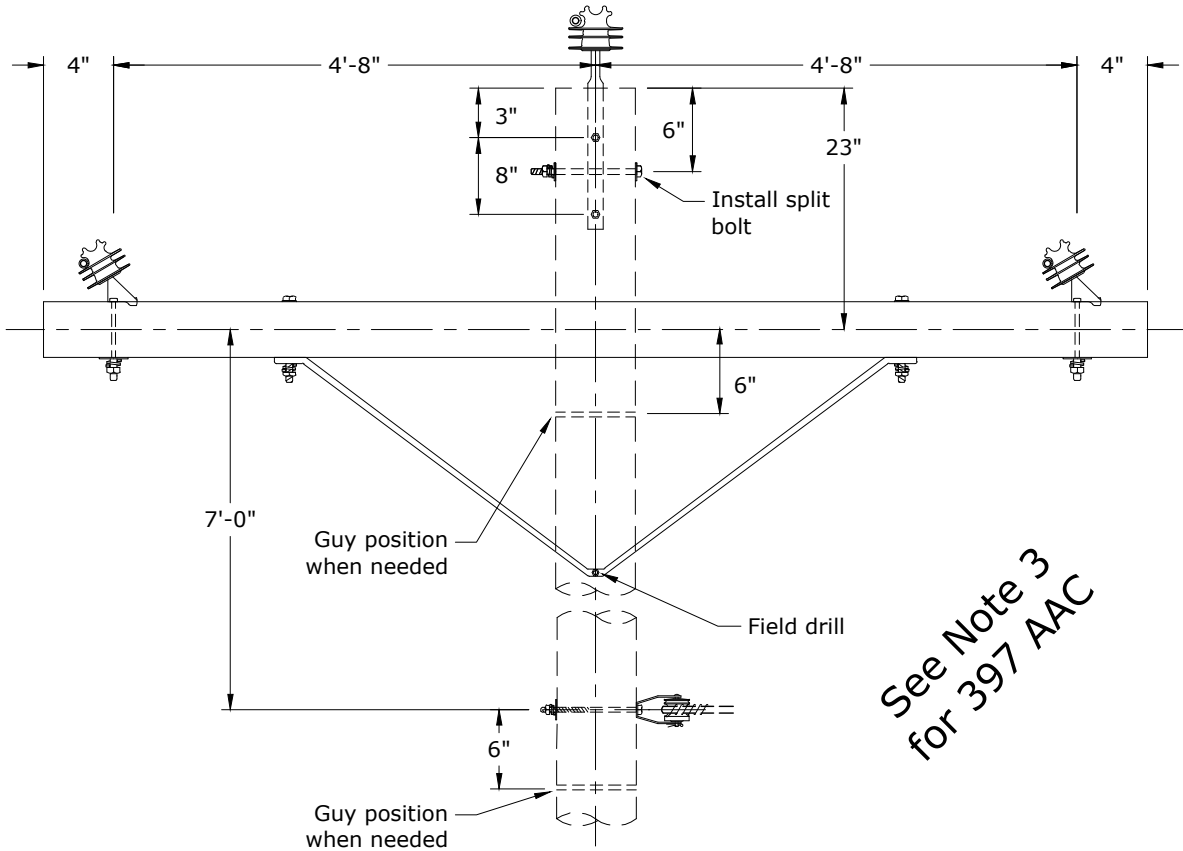
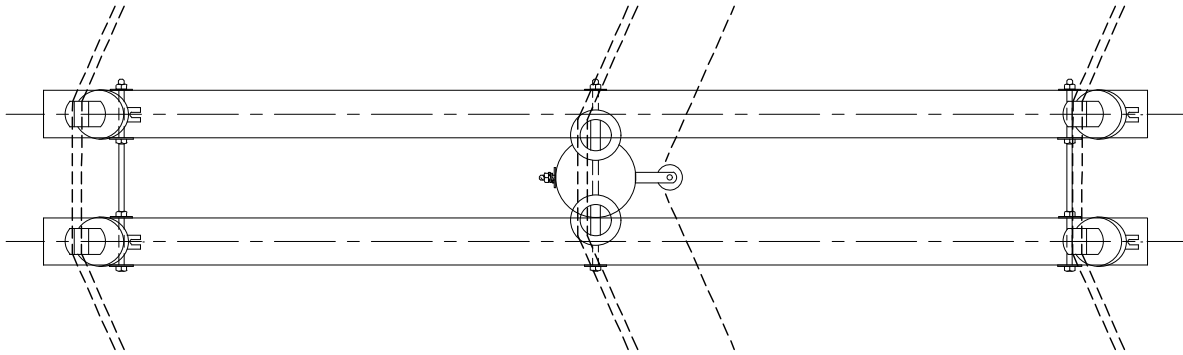
Rev. 2 - Moved conductor to side of insulators.

ITEM NO.	DESCRIPTION	C9ATREE		C9A	
		QTY.	S/N	QTY.	S/N
1	Arm, Cross (Distr.), 8' x 3 3/4" x 4 3/4"	2	25	2	25
2	Bolt, Machine, 1/2" x 7" Galv., 7,800 lbs Ultimate Tensile	4	143	4	143
3	Bolt, Double Arm, 5/8" x 20" Galv., 12,400 lbs Ultimate Tensile	3	83	3	83
4	Gain, Pole Plastic	1	709	1	709
5	Brace, Angle, 60"	2	203	2	203
6	Washer, Lock, Spring, Double Coil, Galv., 5/8"	6	2217	6	2217
7	Washer, Lock, Spring, Double Coil, Galv., 1/2"	4	2216	4	2216
8	Washer, Square Flat 5/8", 2 1/4" x 2 1/4"	10	1412	10	1412
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile	1	155	1	155
10	Washer, Flat, Round, Galv., 1/2"	4	1394	4	1394
ITEM NO.	DESCRIPTION	PR2TREE		PR2	
		QTY.	S/N	QTY.	S/N
11	Insulator, Pin, C Neck, Polymer	2	1968	2	1968 *
12	Pin, Pole Top	2	962	2	962
13	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	2	156	2	156
14	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
15	Wire, Tie, AL Annealed #4 SD	22*	3012	20	1421
ITEM NO.	DESCRIPTION	PR5TREE(4)		PR5(4)	
		QTY.	S/N	QTY.	S/N
16	Insulator, Pin, C Neck, Polymer	4	1968	4	1968 *
17	Pin, Angle, Crossarm	4	2658	4	2658
18	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	4	1412	4	1412
19	Washer, Lock, Spring, Double Coil, Galv., 5/8"	4	2217	4	2217
20	Wire, Tie, AL Annealed #4 SD	44*	3012	40	1421
21	Bolt, Machine, 5/8" x 7", Galv., 12,400 lbs Ultimate Tensile	4	2606	4	2606 *
ITEM NO.	DESCRIPTION	S2		S2	
		QTY.	S/N	QTY.	S/N
22	Clevis, D.E. Insulator 1340	1	335	1	335
23	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	156	1	156
24	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
25	Insulator, Spool Clevis, Small, ANSI 53-2 Class	1	773	1	773
26	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
27	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



**CONSTRUCTION STANDARDS**  
 3Ø DOUBLE 8' CROSSARM W/ DOUBLE  
 POLE TOP - 16° TO 30°  
 2/0 ACSR MAX WIRE

REVISIONS			
NO.	DATE	ENGR	OPS
1	12/4/17	CM	DK
2	8/9/19	JDK	
APP: LB/AH		SECTION	
DATE: 10/18/07	330		



### Avian Safe

**Notes:**

1. Maximum line angle calculated for 2,000 lbs. MWT and 250-ft ruling span.
2. Changing C9A to a 10' crossarm and lowering the crossarm 5" makes it avian safe.
3. This angle is too great for skypins with 397 AAC. Use buckarm with cover for 16°-30° in avian areas.

Rev. 1 - Moved conductor to side of insulators.



## CONSTRUCTION STANDARDS

3Ø DOUBLE 10' CROSSARM W/ DOUBLE POLE  
 TOP - 16° TO 30° - FOR AVIAN RETROFIT  
 2/0 ACSR MAX WIRE

PAGE:  
1 of 2

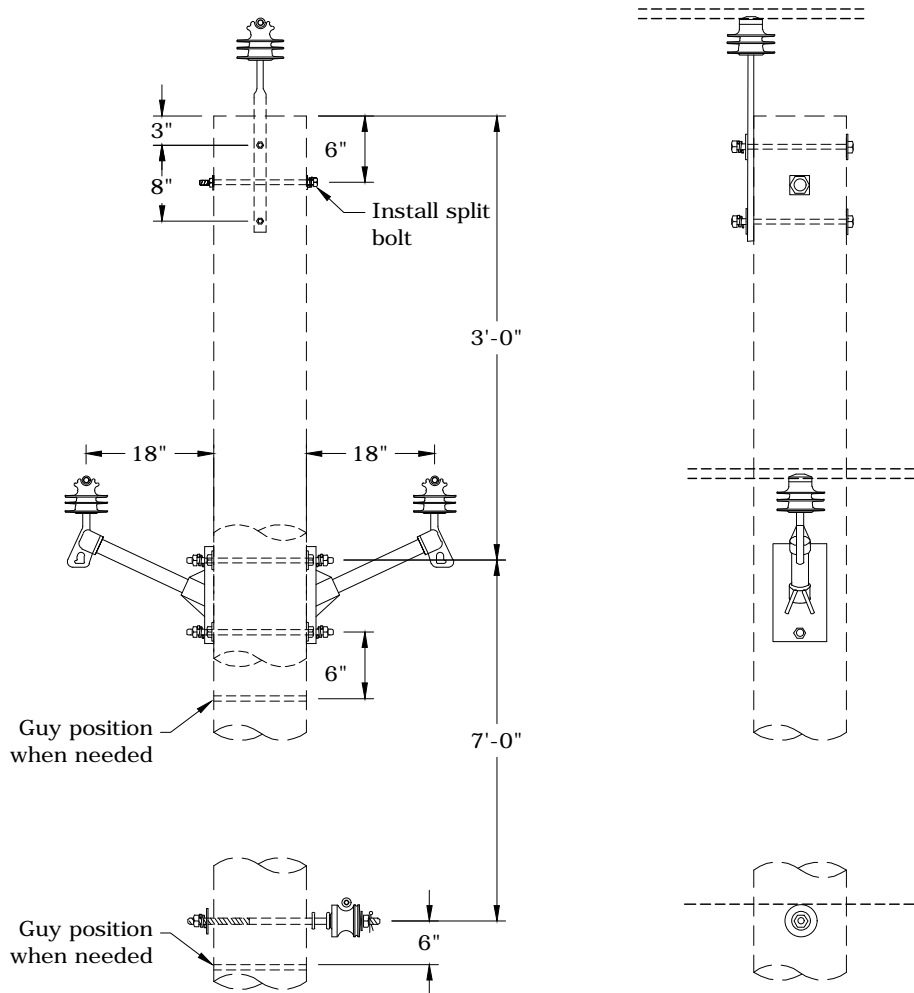
**C9AVIAN**

CAD FILE:  
C9AVIAN

REVISIONS			
△	DATE	ENGR	OPS
1	8/9/19	JDK	
△	APP:	CM/DK	SECTION
	DATE:	12/4/17	<b>330</b>







### C10TREE - Avian Safe

**Notes:**

1. Maximum line angle calculated for 3,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase and one of the outside phases.

Rev. 3 - Eliminated porcelain pin insulators and added avian notes.



## CONSTRUCTION STANDARDS

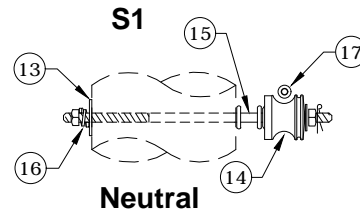
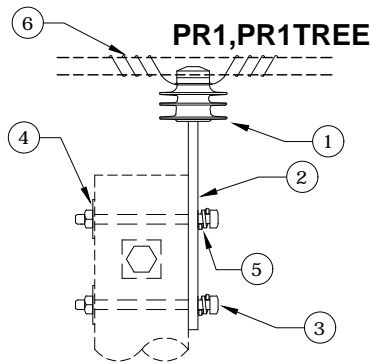
3Ø TWIGGY W/ POLE TOP  
0° TO 5°  
397 AAC MAX WIRE

PAGE:  
1 of 2

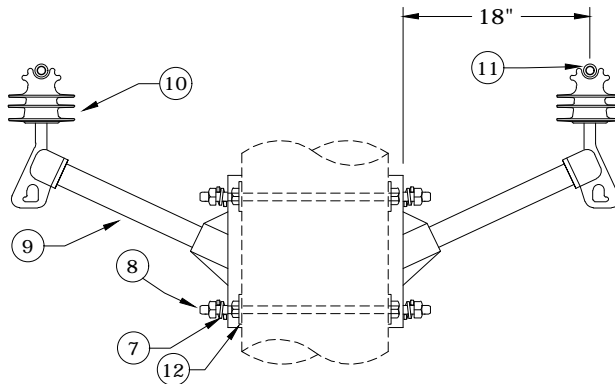
**C10, C10TREE**

CAD FILE:  
C10

REVISIONS			
△	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	10/18/07	LB	AH
3	12/4/17	CM	DK
△			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>330</b>	



**PR61, PR61TREE**



Rev. 3 - Eliminated porcelain pin insulators and added avian notes.

ITEM NO.	DESCRIPTION	C10TREE		C10	
		QTY.	S/N	QTY.	S/N
1	Insulator, Pin, C Neck, Polymer	1	1968	1	1968 *
2	Pin, Pole Top	1	962	1	962
3	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile	2	155	2	155
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
5	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
6	Wire, Tie, AL Annealed #4 SD	11*	3012	10	1421

ITEM NO.	DESCRIPTION	PR61TREE		PR61	
		QTY.	S/N	QTY.	S/N
7	Washer, Lock, Spring, Double Coil, Galv., 5/8"	4*	2217	4*	2217
8	Bolt, Double Arm, 5/8" x 18", Galv., 12,400 lbs Ultimate Tensile	2*	82*	2*	82*
9	Arm, Epoxy 18" 2500 lbs	2	2504	2	2504
10	Insulator, Pin, C Neck, Polymer	2	1968	2	1968 *
11	Wire, Tie, AL Annealed #4 SD	22*	3012	20	1421
12	Washer, Flat Round Galv., 5/8"	4*	1395	4*	1395

ITEM NO.	DESCRIPTION	S1		S1	
		QTY.	S/N	QTY.	S/N
13	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
14	Insulator, Spool Clevis, Small, ANSI 53-2 Class	1	773	1	773
15	Bolt, Double Upset, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	1580	1	1580
16	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
17	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421

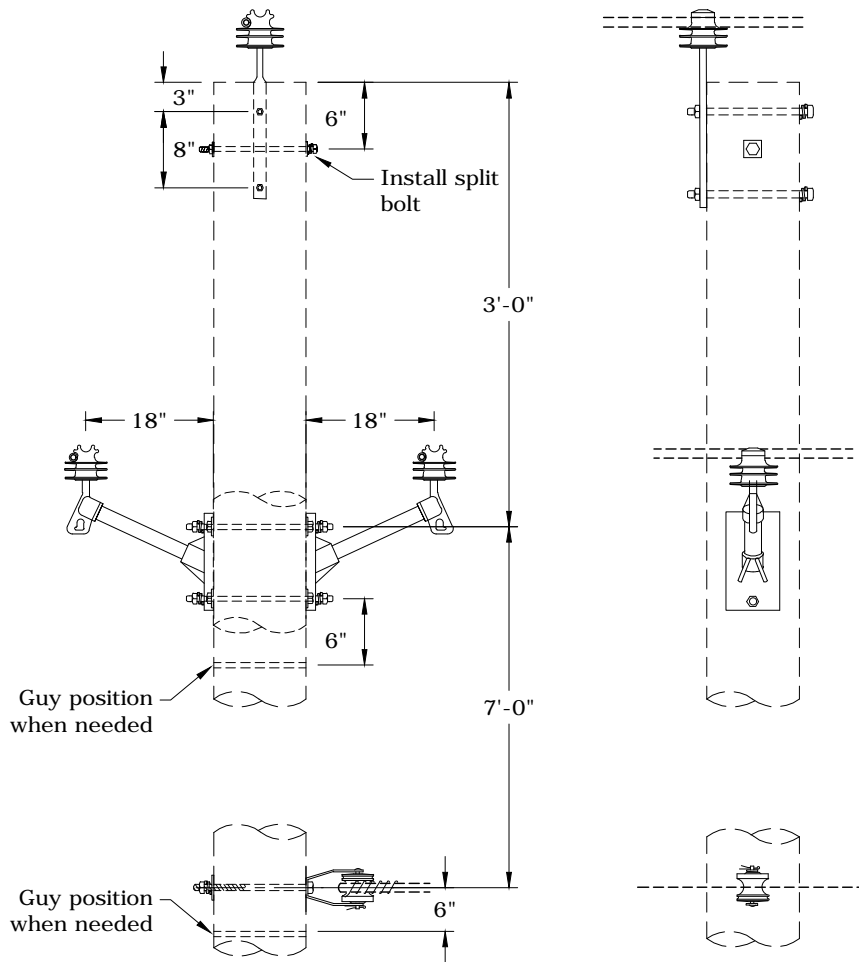


**CONSTRUCTION STANDARDS**  
 3Ø TWIGGY W/ POLE TOP  
 0° TO 5°  
 397 AAC MAX WIRE

REVISIONS			
REV	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	10/18/07	LB	AH
3	12/4/17	CM	DK

PAGE: 2 of 2	<b>C10, C10TREE</b>	CAD FILE: C10	APP: ELM	SECTION: 330
			DATE: 1/31/80	



## C11TREE - Avian Safe

**Notes:**

1. Maximum line angle calculated for 3,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase and one of the outside phases.

Rev. 1 - Eliminated porcelain pin insulators and added avian notes.



### CONSTRUCTION STANDARDS

3Ø TWIGGY W/ POLE TOP  
6° TO 15°  
397 AAC MAX WIRE

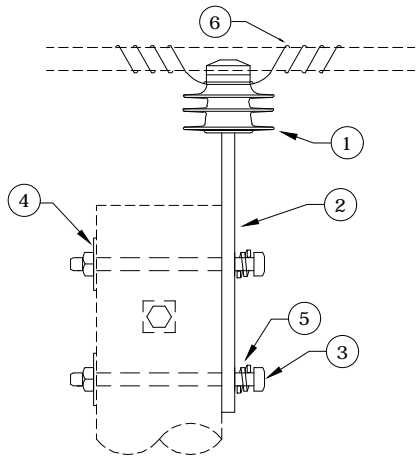
PAGE:  
1 of 2

**C11, C11TREE**

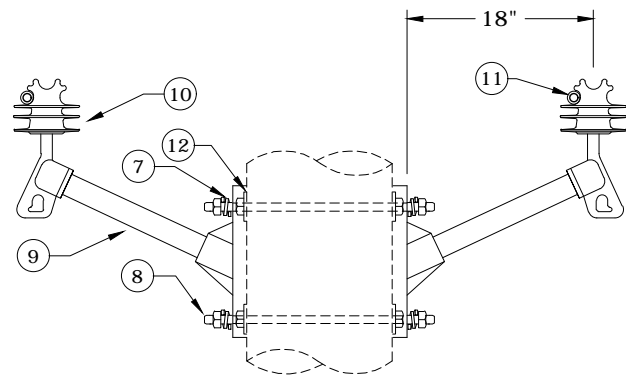
CAD FILE:  
C11

REVISIONS			
△	DATE	ENGR	OPS
1	12/4/17	CM	DK
△			
APP:	LB/AH	SECTION	
DATE:	10/18/07	<b>330</b>	

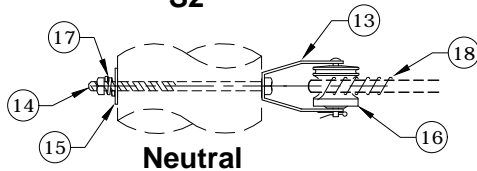
**PR1,PR1TREE**



**PR61,PR61TREE**



**S2**



Rev. 1 - Eliminated porcelain pin insulators and added avian notes.

ITEM NO.	DESCRIPTION	C11TREE		C11	
		QTY.	S/N	QTY.	S/N
1	Insulator, Pin, C Neck, Polymer	1	1968	1	1968 *
2	Pin, Pole Top	1	962	1	962
3	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile	2	155 *	2	155*
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392 *	2	1392 *
5	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
6	Wire, Tie, AL Annealed #4 SD	11*	3012	10	1421

ITEM NO.	DESCRIPTION	PR61TREE		PR61	
		QTY.	S/N	QTY.	S/N
7	Washer, Lock, Spring, Double Coil, Galv., 5/8"	4 *	2217	4 *	2217
8	Bolt, Double Arm, 5/8" x 18", Galv., 12,400 lbs Ultimate Tensile	2 *	82 *	2 *	82 *
9	Arm, Epoxy 18" 2500 lbs	2	2504	2	2504
10	Insulator, Pin, C Neck, Polymer	2	1968	2	1968 *
11	Wire, Tie, AL Annealed #4 SD	22*	3012	20	1421
12	Washer, Flat Round Galv., 5/8"	4 *	1395	4 *	1395

ITEM NO.	DESCRIPTION	S2		S2	
		QTY.	S/N	QTY.	S/N
13	Clevis, D.E. Insulator 1340	1	335	1	335
14	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	156	1	156
15	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
16	Insulator, Spool Clevis, Small, ANSI 53-2 Class	1	773	1	773
17	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
18	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421

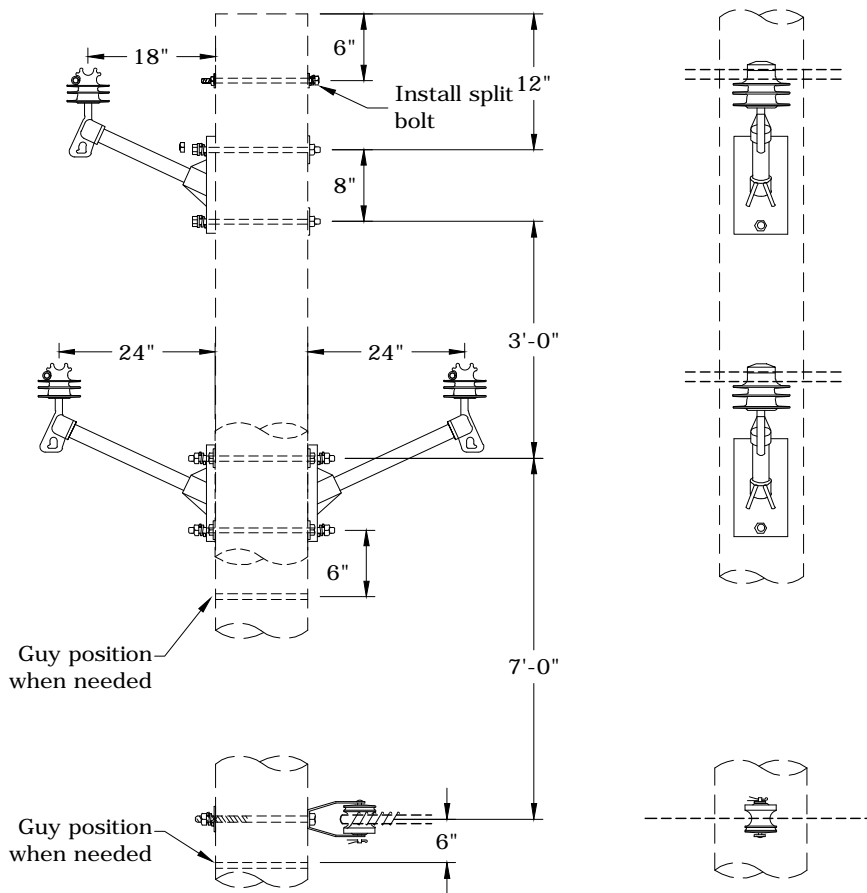


**CONSTRUCTION STANDARDS**

3Ø TWIGGY W/ POLE TOP  
6° TO 15°  
397 AAC MAX WIRE

REVISIONS

REV	DATE	ENGR	OPS
1	12/4/17	CM	DK




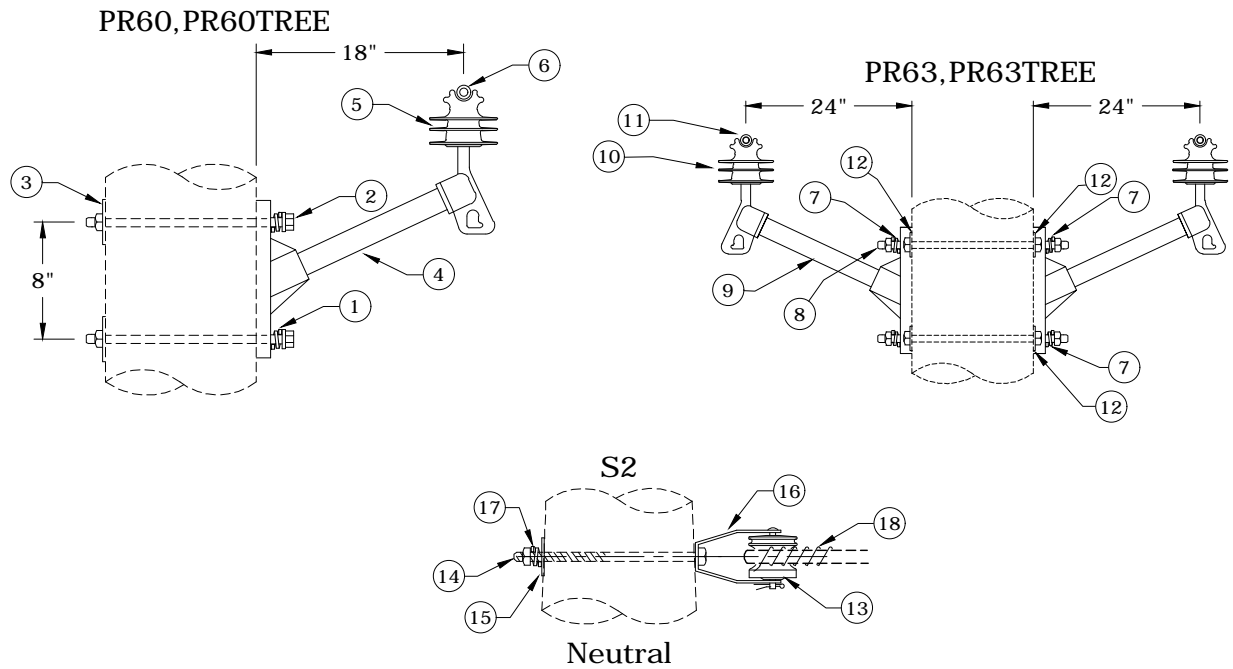
## C12TREE - Avian Safe

**Notes:**

1. Maximum line angle calculated for 3,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on top phase and one of the bottom phases.

Rev. 1 - Eliminated porcelain pin insulators, added avian notes, and changed double pole top to twiggy for angle.

	<b>CONSTRUCTION STANDARDS</b>			REVISIONS			
	3Ø TWIGGY 16° TO 30° 397 AAC MAX WIRE			DATE	ENGR	OPS	
	PAGE: 1 of 2			12/4/17	CM	DK	
	<b>C12, C12TREE</b>			CAD FILE: C12	APP:	LB/AH	SECTION <b>330</b>
			DATE:	10/18/07			



Rev. 1 - Eliminated porcelain pin insulators, added avian notes, and changed double pole top to twiggy for angle.

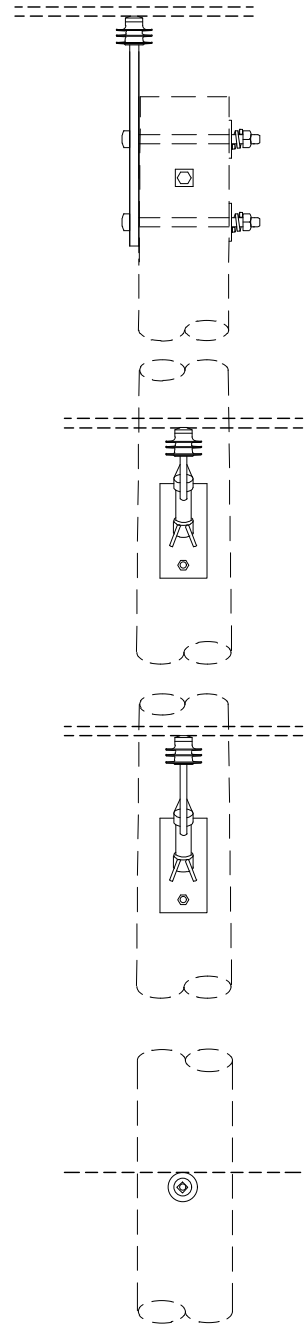
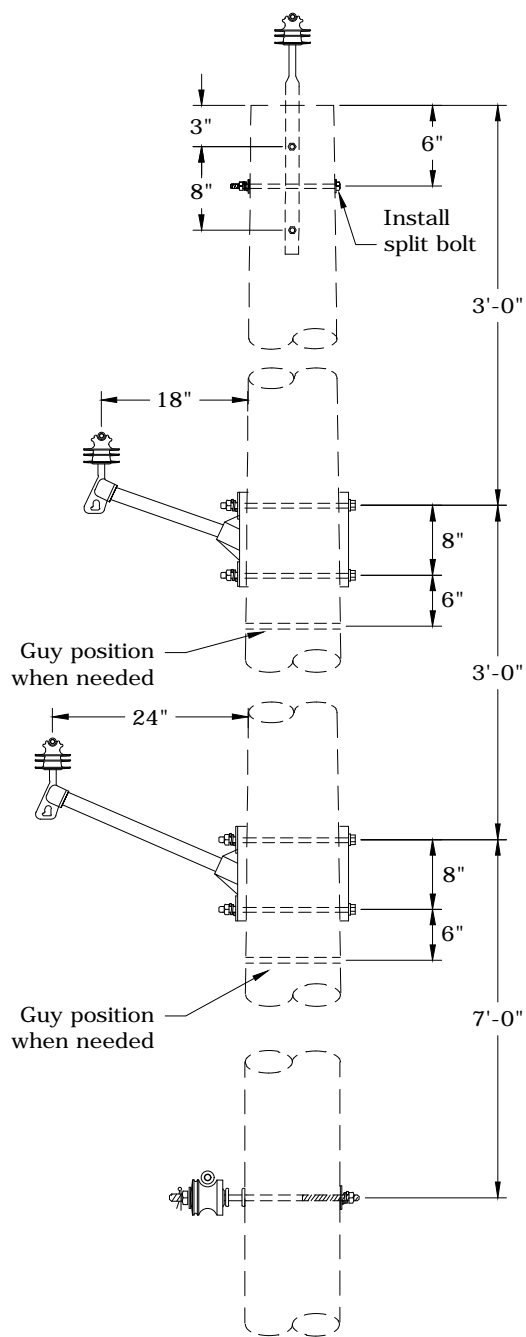
ITEM NO.	DESCRIPTION	C12TREE		C12	
		QTY.	S/N	QTY.	S/N
1	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
2	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile	2	157	2	157
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
4	Arm, Epoxy 18" 2500 lbs	1	2504	1	2504
5	Insulator, Pin C Neck, Polymer	1	1968	1	1968 *
6	Wire, Tie, AL Annealed #4 SD	11*	3012	10	1421
ITEM NO.	DESCRIPTION	PR63TREE		PR63	
		QTY.	S/N	QTY.	S/N
7	Washer, Lock, Spring, Double Coil, Galv., 5/8"	4 *	2217	4 *	2217
8	Bolt, Double Arm, 5/8" x 18", Galv., 12,400 lbs Ultimate Tensile	2 *	82 *	2 *	82 *
9	Arm, Epoxy 24" 2500 lbs	2	2605	2	2605
10	Insulator, Pin, C Neck, Polymer	2	1968	2	1968 *
11	Wire, Tie, AL Annealed #4 SD	22 *	3012	20	1421
12	Washer, Flat Round Galv., 5/8"	4 *	1395	4 *	1395
ITEM NO.	DESCRIPTION	S2		S2	
		QTY.	S/N	QTY.	S/N
13	Clevis, D.E. Insulator 1340	1	335	1	335
14	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	156	1	156
15	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
16	Insulator, Spool Clevis, Small, ANSI 53-2 Class	1	773	1	773
17	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
18	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



### CONSTRUCTION STANDARDS

3Ø TWIGGY  
16° TO 30°  
397 AAC MAX WIRE

REVISIONS			
NO.	DATE	ENGR	OPS
1	12/4/17	CM	DK




### C13TREE - Avian Safe

**Notes:**

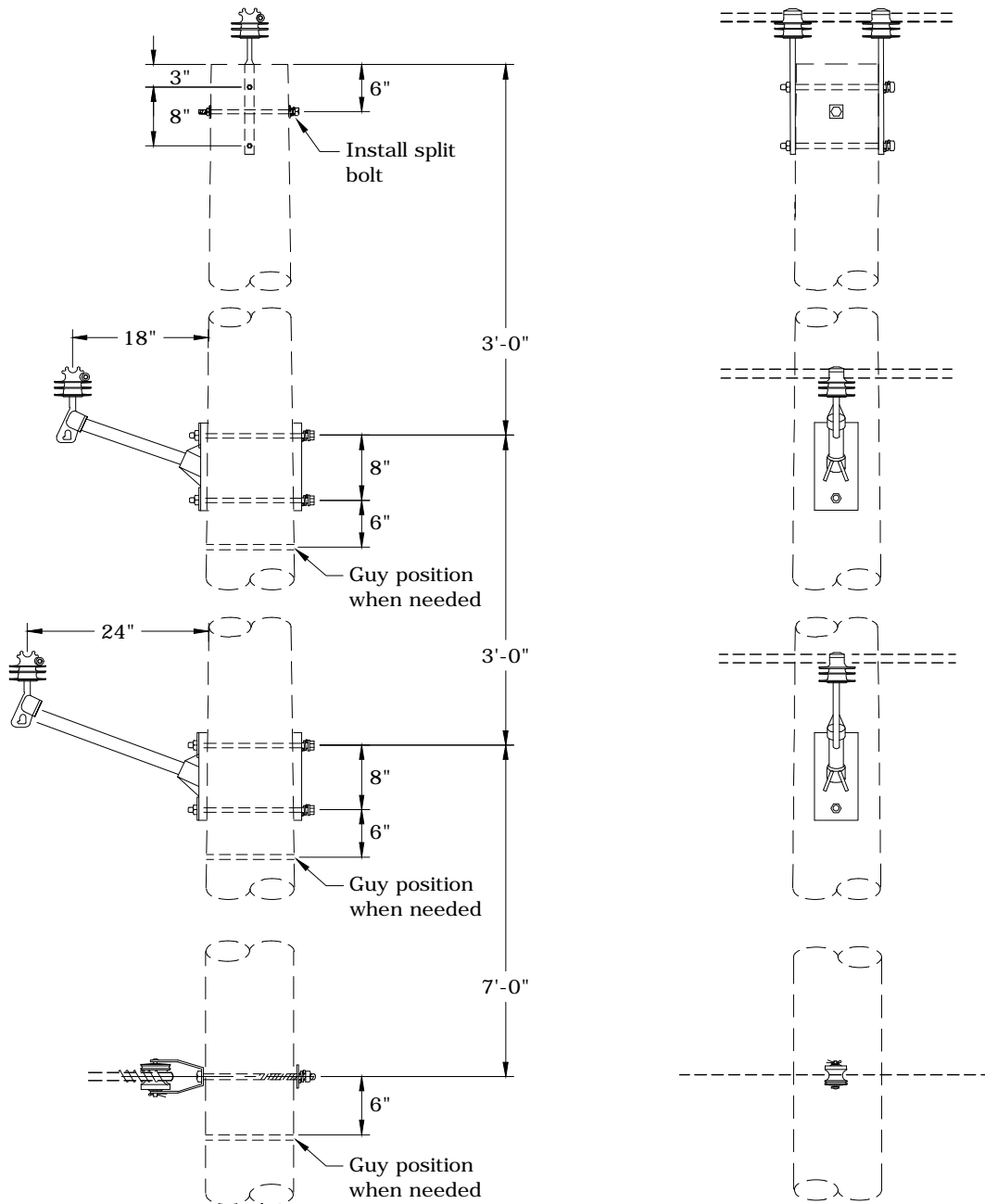
1. Maximum line angle calculated for 3,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase.

Rev. 1 - Eliminated porcelain pin insulators and added avian notes.

	<b>CONSTRUCTION STANDARDS</b>			REVISIONS				
	3Ø VERTICAL W/ POLE TOP 0° TO 5° 397 AAC MAX WIRE			DATE	ENGR	OPS		
	PAGE: 1 of 2			12/4/17	CM	DK		
<b>C13, C13TREE</b>			CAD FILE: C13	APP:	LB/AH	SECTION		
			DATE:	9/06	<b>330</b>			







## C14TREE - Avian Safe

**Notes:**

1. Maximum line angle calculated for 3,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase.

Rev. 1 - Eliminated porcelain pin insulators, added avian notes, and changed single top to double.



### CONSTRUCTION STANDARDS

3Ø VERTICAL W/ DOUBLE POLE TOP  
6° TO 15°  
397 AAC MAX WIRE

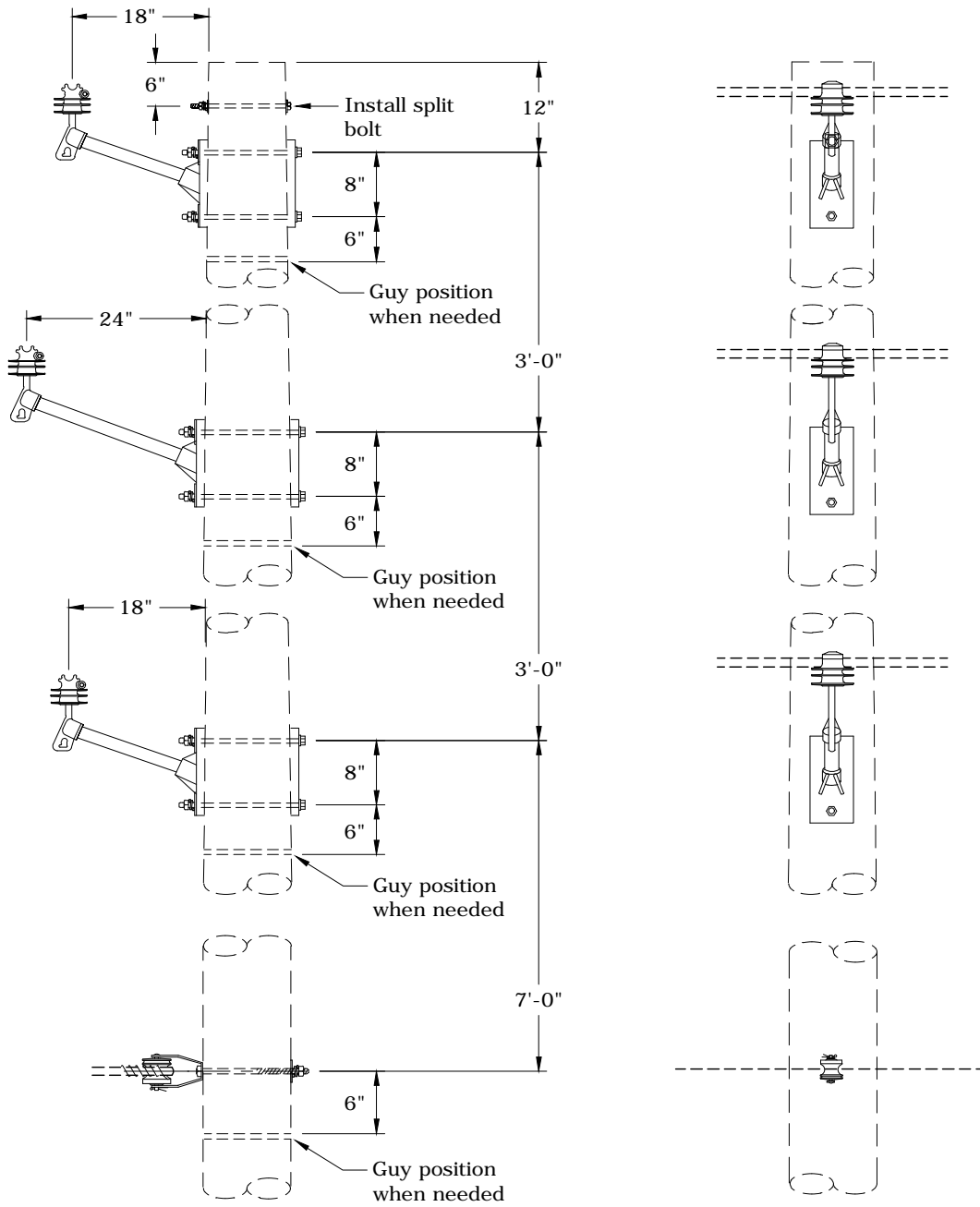
PAGE:  
1 of 2

**C14, C14TREE**

CAD FILE:  
C14

REVISIONS			
△	DATE	ENGR	OPS
1	12/4/17	CM	DK
△			
APP:	LB/AH	SECTION	
DATE:	12/19/07	<b>330</b>	





## C15TREE - Avian Safe

**Notes:**

1. Maximum line angle calculated for 3,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase.

Rev. 1 - Eliminated porcelain pin insulators, added avian notes, and changed double pole top to twiggy for angle.



### CONSTRUCTION STANDARDS

3Ø VERTICAL  
16° TO 30°  
397 AAC MAX WIRE

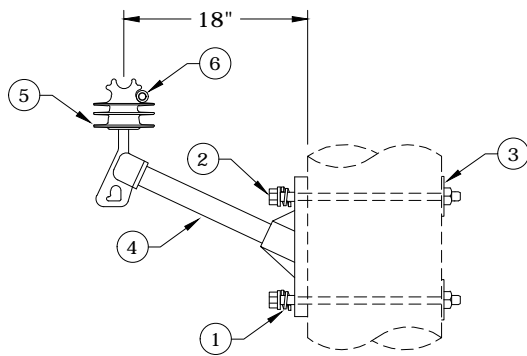
PAGE:  
1 of 2

**C15, C15TREE**

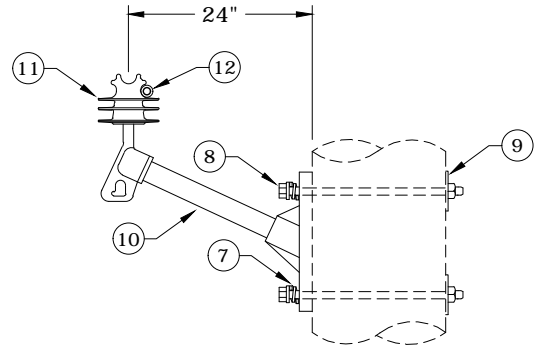
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C15

REVISIONS			
△	DATE	ENGR	OPS
1	12/4/17	CM	DK
△			
APP:	LB/AH	SECTION	
DATE:	12/19/07	<b>330</b>	

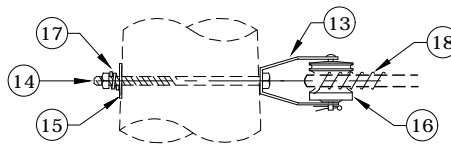
**PR60,PR60TREE**



**PR62,PR62TREE**



**S2**



**Neutral**

Rev. 1 - Eliminated porcelain pin insulators, added avian notes, and changed double pole top to twiggy for angle.

ITEM NO.	DESCRIPTION	C15TREE		C15	
		PR60TREE(2)		PR60 (2)	
1	Washer, Lock, Spring, Double Coil, Galv., 5/8"	4	2217	4	2217
2	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile	4	157	4	157
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	4	1392	4	1392
4	Arm, Epoxy 18" 2500 lbs	2	2504	2	2504
5	Insulator, Pin, C Neck, Polymer	2	1968	2	1968*
6	Wire, Tie, AL Annealed #4 SD	22*	3012	20	1421
ITEM NO.	DESCRIPTION	PR62TREE		PR62	
		QTY.	S/N	QTY.	S/N
7	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
8	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile	2	157	2	157
9	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
10	Arm, Epoxy 24" 2500 lbs	1	2605	1	2605
11	Insulator, Pin, C Neck, Polymer	1	1968	1	1968 *
12	Wire, Tie, AL Annealed #4 SD	11*	3012	10	1421
ITEM NO.	DESCRIPTION	S2		S2	
		QTY.	S/N	QTY.	S/N
13	Clevis, D.E. Insulator 1340	1	335	1	335
14	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	156	1	156
15	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
16	Insulator, Spool Clevis, Small, ANSI 53-2 Class	1	773	1	773
17	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
18	Wire, Tie, Bare, AL Annealed #4 SD	10	1421	10	1421



**CONSTRUCTION STANDARDS**

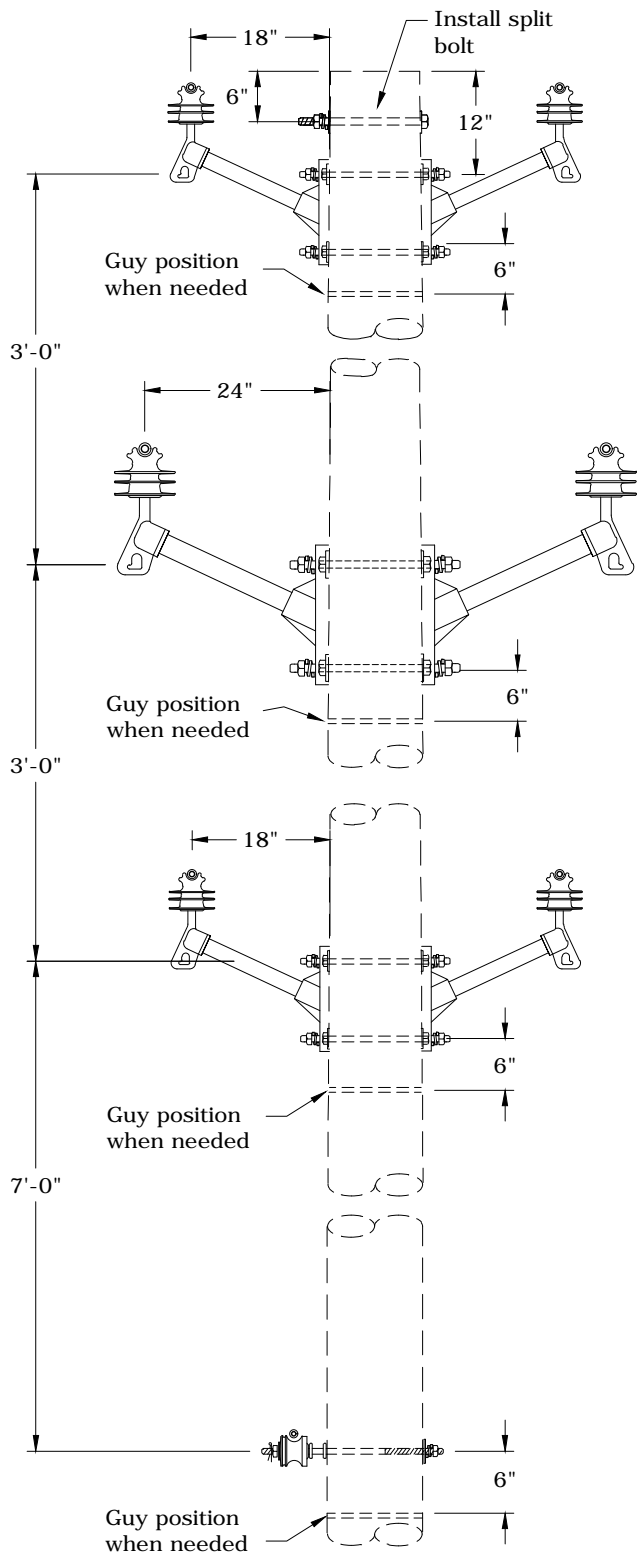
3Ø VERTICAL  
16° TO 30°  
397 AAC MAX WIRE

PAGE:  
2 of 2

**C15,C15TREE**

CAD FILE:  
C15

REVISIONS			
Δ	DATE	ENGR	OPS
1	12/4/17	CM	DK
Δ			
APP:	LB/AH	SECTION	
DATE: 12/19/07		<b>330</b>	



**C16TREE - Avian Safe**

- Notes:**
1. Maximum line angle calculated for 3,000 lbs. MWT and 250-ft ruling span.
  2. See Std AC - Avian Covers - Section 400 if needed. Covers required on all three phases on one side of pole and center phase on opposite side.

Rev. 1 - Eliminated porcelain pin insulators and added avian notes.



**CONSTRUCTION STANDARDS**

3Ø DOUBLE TWIGGY CIRCUIT  
0° TO 5°  
397 AAC MAX WIRE

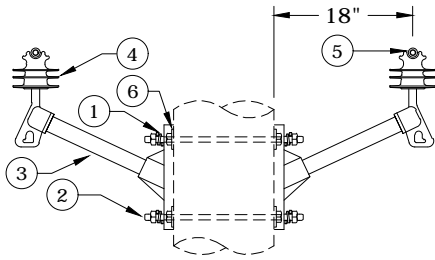
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△	DATE	ENGR	OPS
1	12/4/17	CM	DK
△			
APP:	LB/AH	SECTION	
DATE:	12/19/07	330	

PAGE:  
1 of 2

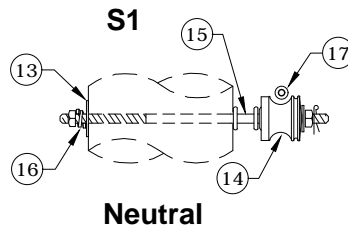
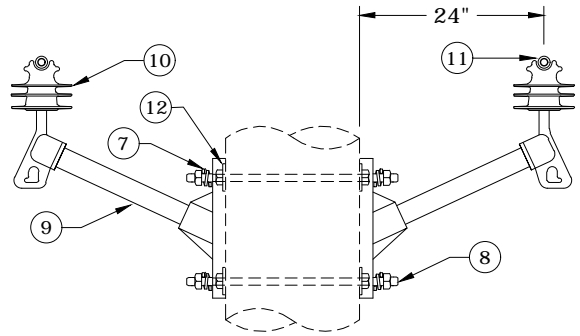
**C16, C16TREE**

CAD FILE:  
C16

**PR61, PR61TREE**



**PR63, PR63TREE**



Rev. 1 - Eliminated porcelain pin insulators and added avian notes.

ITEM NO.	DESCRIPTION	C16TREE		C16	
		PR61TREE (2)		PR61(2)	
		QTY.	S/N	QTY.	S/N
1	Washer, Lock, Spring Double Coil, Galv., 5/8"	8 *	2217	8 *	2217
2	Bolt, Double Arm, 5/8" x 18", Galv., 12,400 lbs Ultimate Tensile	4 *	82 *	4 *	82 *
3	Arm, Epoxy 18" 2500 lbs	4	2504	4	2504
4	Insulator, Pin, C Neck, Polymer	4	1968	4	1968 *
5	Wire, Tie, AL Annealed #4 SD	44 *	3012	40	1421
6	Washer, Flat Round Galv., 5/8"	8 *	1395	8 *	1395
		PR63TREE		PR63	
		QTY.	S/N	QTY.	S/N
7	Washer, Lock, Spring Double Coil, Galv., 5/8"	4 *	2217	4 *	2217
8	Bolt, Double Arm, 5/8" x 18", Galv., 12,400 lbs Ultimate Tensile	2 *	82 *	2 *	82 *
9	Arm, Epoxy 24" 2500 lbs	2	2605	2	2605
10	Insulator, Pin, C Neck, Polymer	2	1968	2	1968 *
11	Wire, Tie, AL Annealed #4 SD	22 *	3012	20	1421
12	Washer, Flat Round Galv., 5/8"	4 *	1395	4 *	1395
		S1		S1	
		QTY.	S/N	QTY.	S/N
13	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
14	Insulator, Spool Clevis, Small, ANSI 53-2 Class	1	773	1	773
15	Bolt, Double Upset, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile*	1	1580	1	1580
16	Washer, Lock, Spring Double Coil, Galv., 5/8" *	1	2217	1	2217
17	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



**CONSTRUCTION STANDARDS**

3Ø DOUBLE TWIGGY CIRCUIT  
0° TO 5°  
397 AAC MAX WIRE

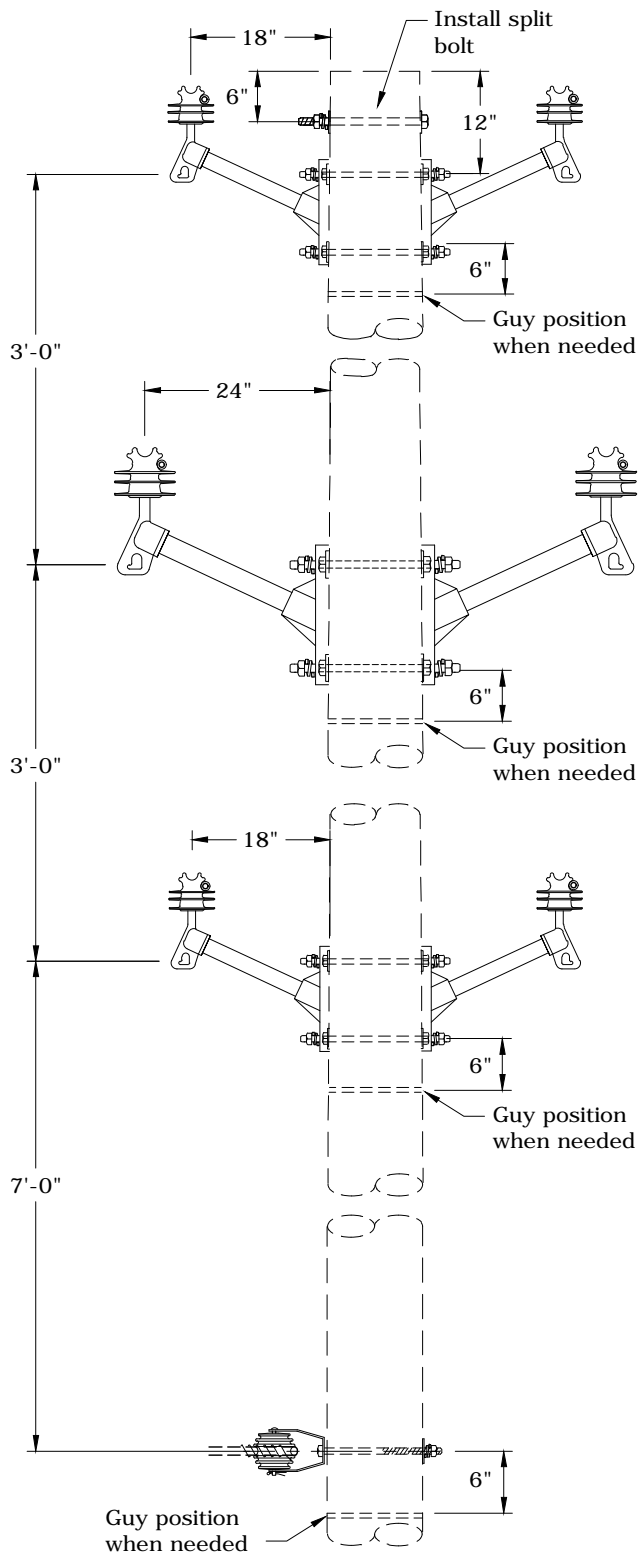
REVISIONS			
Δ	DATE	ENGR	OPS
1	12/4/17	CM	DK
Δ	APP:	LB/AH	SECTION

PAGE:  
2 of 2

**C16, C16TREE**

CAD FILE:  
C16

DATE: 12/19/07  
**330**



### C17TREE - Avian Safe

**Notes:**

1. Maximum line angle calculated for 3,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers required on all three phases on one side of pole and center phase on opposite side.

Rev. 1 - Eliminated porcelain pin insulators and added avian notes.



## CONSTRUCTION STANDARDS

3Ø DOUBLE TWIGGY CIRCUIT  
6° TO 30°  
397 AAC MAX WIRE

PAGE:  
1 of 2

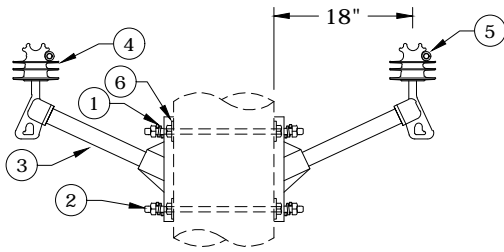
# C17, C17TREE

CAD FILE:  
C17

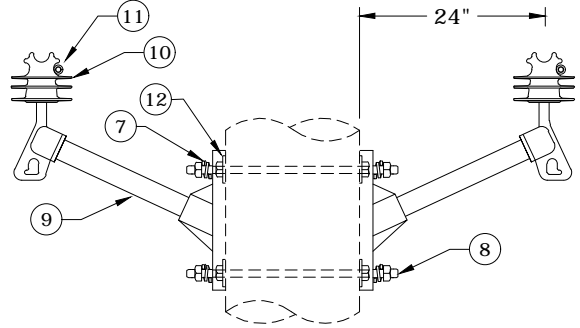
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NO.	DATE	ENGR	OPS
1	12/4/17	CM	DK
APP: LB/AH		SECTION	
DATE: 12/19/07		330	



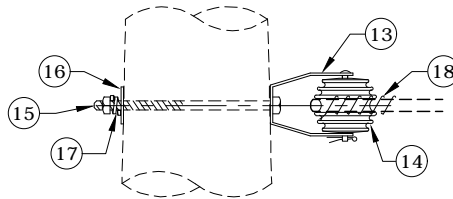
**PR61,PR61TREE**



**PR63,PR63TREE**



**S3**



**Neutral**

Rev. 1 - Eliminated porcelain pin insulators and added avian notes.

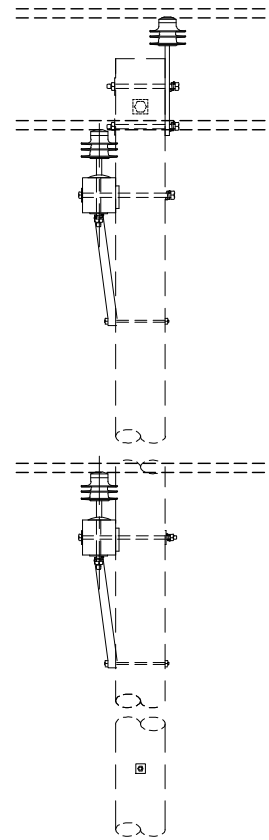
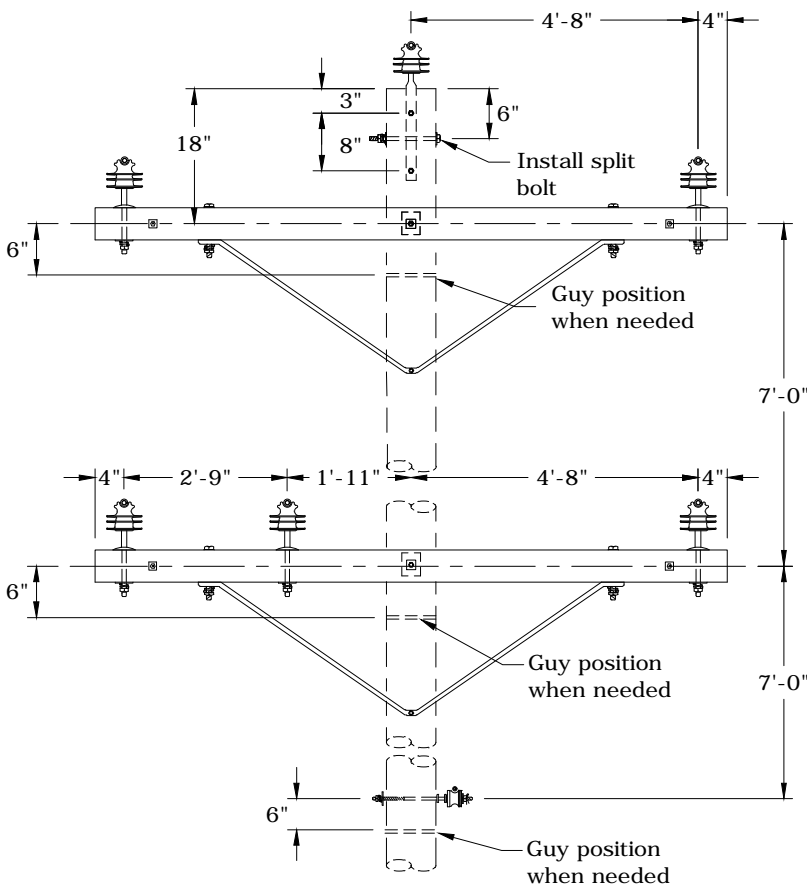
ITEM NO.	DESCRIPTION	C17TREE		C17	
		PR61TREE(2)		PR61(2)	
		QTY.	S/N	QTY.	S/N
1	Washer, Lock, Spring, Double Coil, Galv., 5/8"	8 *	2217	8 *	2217
2	Bolt, Double Arm, 5/8" x 18", Galv., 12,400 lbs Ultimate Tensile	4 *	82 *	4 *	82 *
3	Arm, Epoxy 18" 2500 lbs	4	2504	4	2504
4	Insulator, Pin, C Neck, Polymer	4	1968	4	1968 *
5	Wire, Tie, AL Annealed #4 SD	44 *	3012	40	1421
6	Washer, Flat Round Galv., 5/8"	8 *	1395	8 *	1395
ITEM NO.	DESCRIPTION	PR63TREE		PR63	
		QTY.	S/N	QTY.	S/N
7	Washer, Lock, Spring Double Coil, Galv., 5/8"	4 *	2217	4 *	2217
8	Bolt, Double Arm, 5/8" x 18", Galv., 12,400 lbs Ultimate Tensile	2 *	82 *	2 *	82 *
9	Arm, Epoxy 24" 2500 lbs	2	2605	2	2605
10	Insulator, Pin, C Neck, Polymer	2	1968	2	1968 *
11	Wire, Tie, AL Annealed #4 SD	22*	3012	20	1421
12	Washer, Flat Round Galv., 5/8"	4 *	1395	4 *	1395
ITEM NO.	DESCRIPTION	S3		S3	
		QTY.	S/N	QTY.	S/N
13	Clevis, D.E. Insulator 1344	1	336*	1	336*
14	Insulator, Spool Clevis, Large, ANSI 53-5 Class	1	774*	1	774*
15	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	156	1	156
16	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
17	Washer, Lock, Spring Double Coil, Galv., 5/8"	1	2217	1	2217
18	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



**CONSTRUCTION STANDARDS**

3Ø DOUBLE TWIGGY CIRCUIT  
6° TO 30°  
397 AAC MAX WIRE

REVISIONS			
NO.	DATE	ENGR	OPS
1	12/4/17	CM	DK
APP: LB/AH		SECTION	
DATE: 12/19/07	330		



### C19BTREE - Avian Safe

**Notes:**

1. Maximum line angle calculated for 3,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phases.

Rev. 1 - Eliminated porcelain pin insulators and added avian notes.



## CONSTRUCTION STANDARDS

3Ø SINGLE 10' CROSSARM  
 DOUBLE CIRCUIT - 0° TO 5°  
 397 AAC MAX WIRE

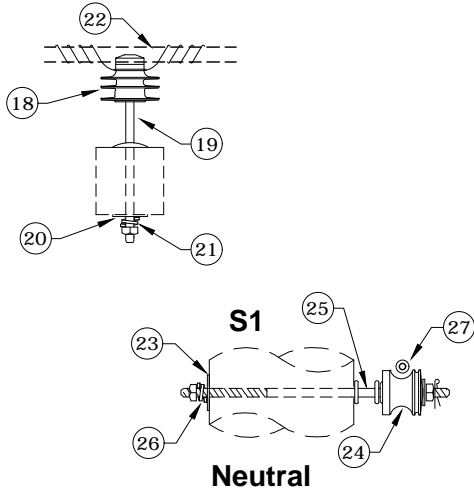
PAGE:  
1 of 2

**C19B, C19BTREE**

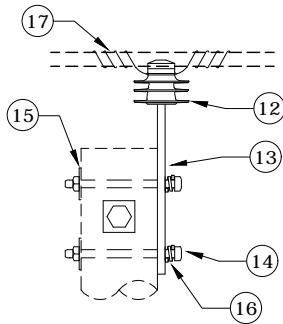
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C19B

REVISIONS			
NO.	DATE	ENGR	OPS
1	12/4/17	CM	DK
APP: LB/AH		SECTION	
DATE: 12/19/07		330	

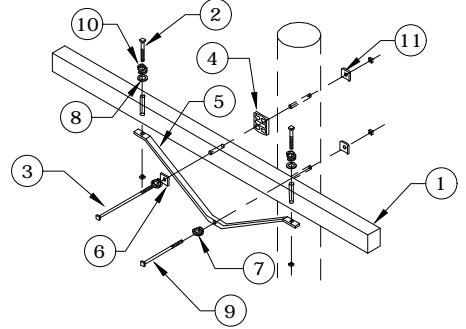
**PR4,PR4TREE**



**PR1,PR1TREE**



**CR23B**



Rev. 1 - Eliminated porcelain pin insulators and added avian notes.

ITEM NO.	DESCRIPTION	C19BTREE		C19B	
		QTY.	S/N	QTY.	S/N
1	Arm, Cross (Distr.), 10' x 3 3/4" x 4 3/4"	2	26	2	26
2	Bolt, Machine, 1/2" x 7", Galv., 7800 lbs Ultimate Tensile	4	143	4	143
3	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile	2	157	2	157
4	Gain, Pole Plastic	2	709	2	709
5	Brace, Angle, 72"	2	204	2	204
6	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	2	1412	2	1412
7	Washer, Lock, Spring, Double Coil, Galv., 5/8"	4	2217	4	2217
8	Washer, Flat, Round, Galv., 1/2"	4	1394	4	1394
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile	2	155	2	155
10	Washer, Lock, Spring, Double Coil, Galv., 1/2"	4	2216	4	2216
11	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	4	1392	4	1392
ITEM NO.	DESCRIPTION	PR1TREE		PR1	
		QTY.	S/N	QTY.	S/N
12	Insulator, Pin, C Neck, Polymer	1	1968	1	1968 *
13	Pin, Pole Top	1	962	1	962
14	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile	2	155	2	155
15	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
16	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
17	Wire, Tie, AL Annealed #4 SD	11*	3012	10	1421
ITEM NO.	DESCRIPTION	PR4TREE (5)		PR4 (5)	
		QTY.	S/N	QTY.	S/N
18	Insulator, Pin, C Neck, Polymer	5	1968	5	1968 *
19	Pin, Crossarm	5	961	5	961
20	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	5	1412	5	1412
21	Washer, Lock, Spring, Double Coil, Galv., 5/8"	5	2217	5	2217
22	Wire, Tie, AL Annealed #4 SD	55*	3012	50	1421
ITEM NO.	DESCRIPTION	S1		S1	
		QTY.	S/N	QTY.	S/N
23	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
24	Insulator, Spool Clevis, Small, ANSI 53-2 Class	1	773	1	773
25	Bolt, Double Upset, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	1580	1	1580
26	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
27	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



**CONSTRUCTION STANDARDS**

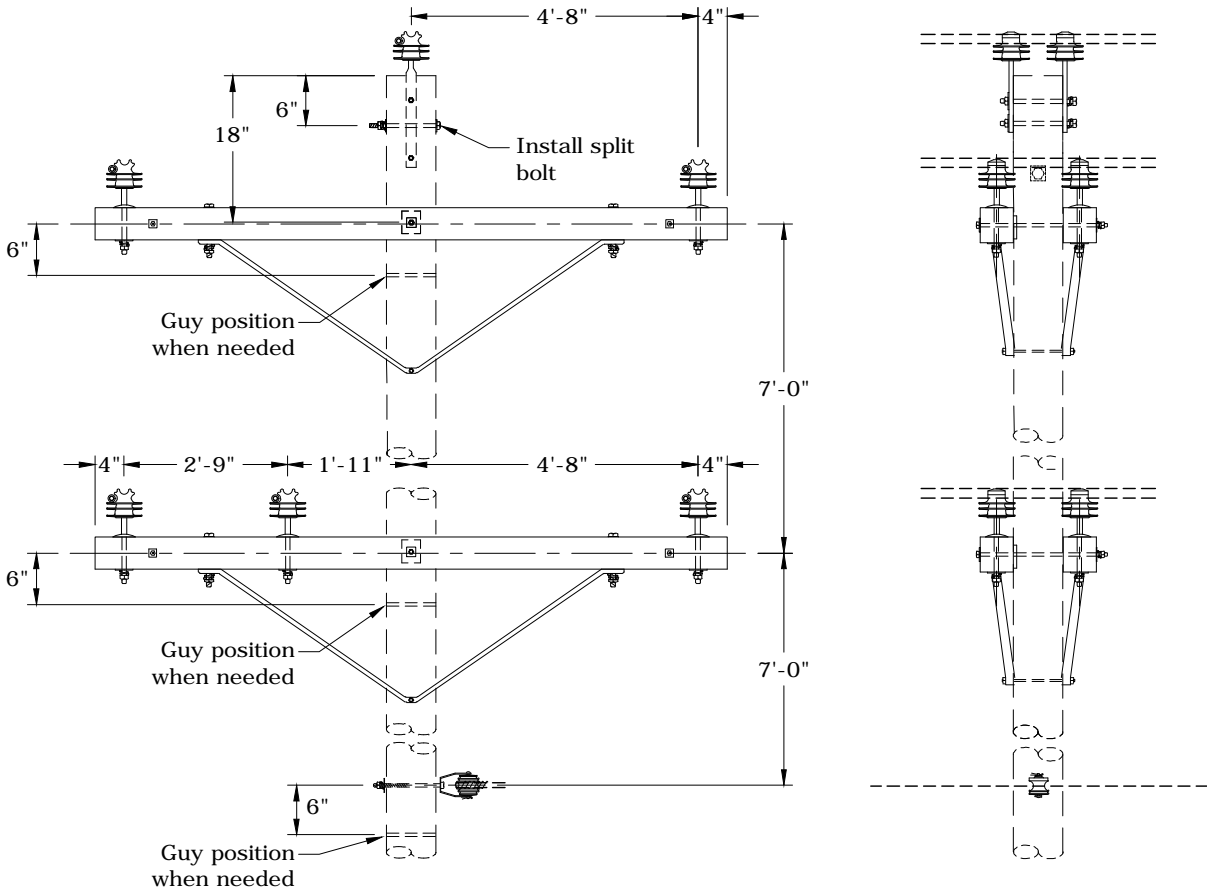
3Ø SINGLE 10' CROSSARM  
 DOUBLE CIRCUIT - 0° TO 5°  
 397 AAC MAX WIRE

PAGE:  
2 of 2

**C19B,C19BTREE**

CAD FILE:  
C19B

REVISIONS			
△	DATE	ENGR	OPS
1	12/4/17	CM	DK
APP:		SECTION	
DATE:	12/19/07	330	



### C20BTREE - Avian Safe

**Notes:**

1. Maximum line angle calculated for 3,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phases.

Rev. 1 - Eliminated porcelain pin insulators and added avian notes.



### CONSTRUCTION STANDARDS

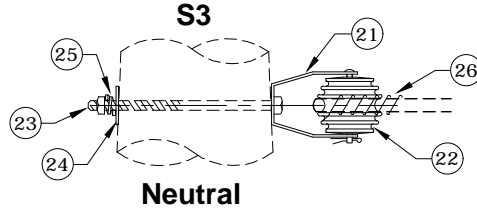
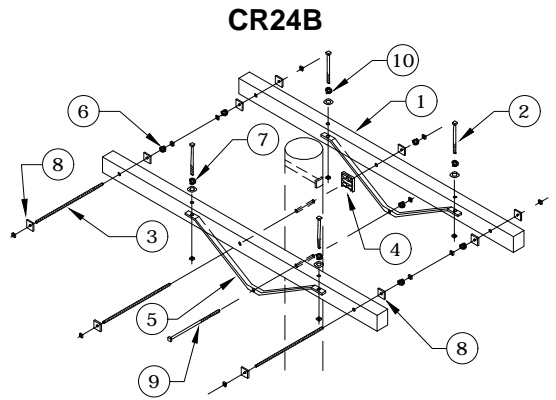
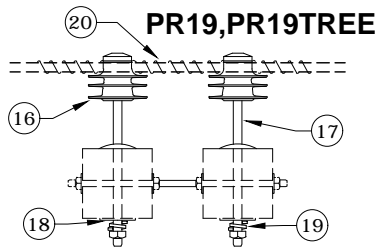
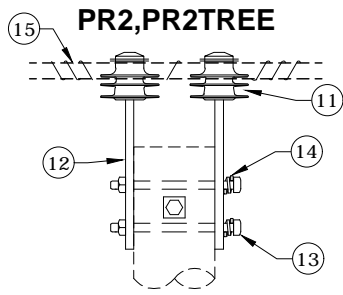
3Ø DOUBLE 10' CROSSARM  
 DOUBLE CIRCUIT- 6° TO 15°  
 397 AAC MAX WIRE

PAGE:  
1 of 2

**C20B, C20BTREE**

CAD FILE:  
C20B

REVISIONS			
△	DATE	ENGR	OPS
1	12/4/17	CM	DK
△			
APP:	LB/AH	SECTION	
DATE:	12/19/07	<b>330</b>	



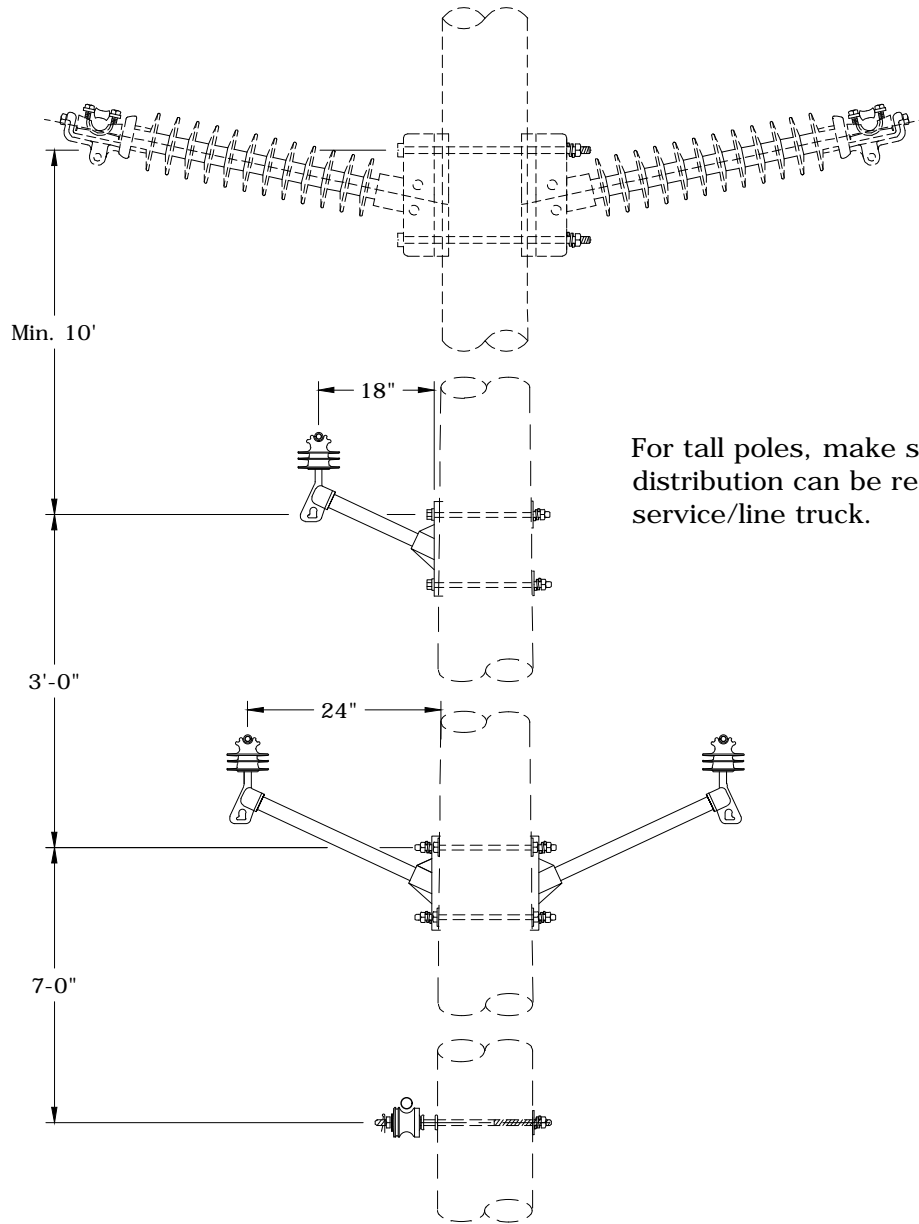
Rev. 1 - Eliminated porcelain pin insulators and added avian notes.

ITEM NO.	DESCRIPTION	C20BTREE		C20B	
		QTY.	S/N	QTY.	S/N
1	Arm, Cross (Distr.), 10' x 3 3/4" x 4 3/4"	4	26	4	26
2	Bolt, Machine, 1/2" x 7", Galv., 7800 lbs Ultimate Tensile	8	143	8	143
3	Bolt, Double Arm, 5/8" x 20" Galv., 12,400 lbs Ultimate Tensile	6	83	6	83
4	Gain, Pole Plastic	2	709	2	709
5	Brace, Angle, 72"	4	204	4	204
6	Washer, Lock, Spring, Double Coil, Galv., 5/8"	12	2217	12	2217
7	Washer, Lock, Spring, Double Coil, Galv., 1/2"	8	2216	8	2216
8	Washer, Square, Flat 5/8", 2 1/4" x 2 1/4"	20	1412	20	1412
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile	2	155	2	155
10	Washer, Flat, Round, Galv., 1/2"	8	1394	8	1394
ITEM NO.	DESCRIPTION	PR2TREE		PR2	
		QTY.	S/N	QTY.	S/N
11	Insulator, Pin, C Neck, Polymer	2	1968	2	1968 *
12	Pin, Pole Top	2	962	2	962
13	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	2	156	2	156
14	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
15	Wire, Tie, AL Annealed #4 SD	22*	3012	20	1421
ITEM NO.	DESCRIPTION	PR19TREE (5)		PR19 (5)	
		QTY.	S/N	QTY.	S/N
16	Insulator, Pin, C Neck, Polymer	10	1968	10	1968 *
17	Pin, Crossarm	10	961	10	961
18	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	10	1412	10	1412
19	Washer, Lock, Spring, Double Coil, Galv., 5/8"	10	2217	10	2217
20	Wire, Tie, AL Annealed #4 SD	110*	3012	100	1421
ITEM NO.	DESCRIPTION	S3		S3	
		QTY.	S/N	QTY.	S/N
21	Clevis, D.E. Insulator 1344	1	336*	1	336*
22	Insulator, Spool Clevis, Large, ANSI 53-5 Class	1	774*	1	774*
23	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	156	1	156
24	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
25	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
26	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



**CONSTRUCTION STANDARDS**  
 3Ø DOUBLE 10' CROSSARM  
 DOUBLE CIRCUIT- 6° TO 15°  
 397 AAC MAX WIRE

REVISIONS			
△	DATE	ENGR	OPS
1	12/4/17	CM	DK
△			
APP:	LB/AH	SECTION	
DATE: 12/19/07		330	



For tall poles, make sure the distribution can be reached by a service/line truck.

**Notes:**

1. Maximum line angle calculated for 3,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on top phase and one of the bottom phases of the distribution.



**CONSTRUCTION STANDARDS**  
 3Ø TWIGGY TRANSMISSION UNDERBUILD  
 0° TO 5°  
 397 AAC MAX WIRE

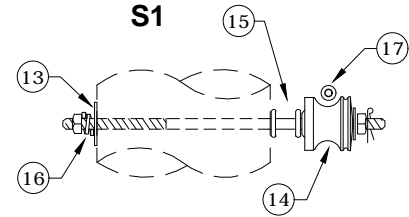
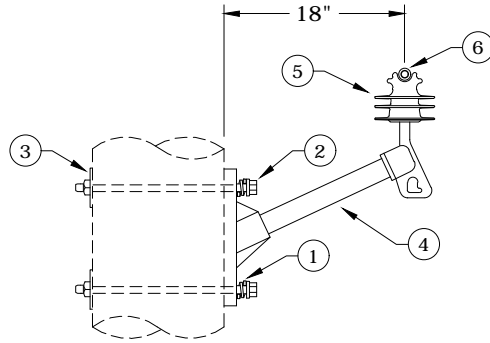
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1 of 2

**C22, C22TREE**

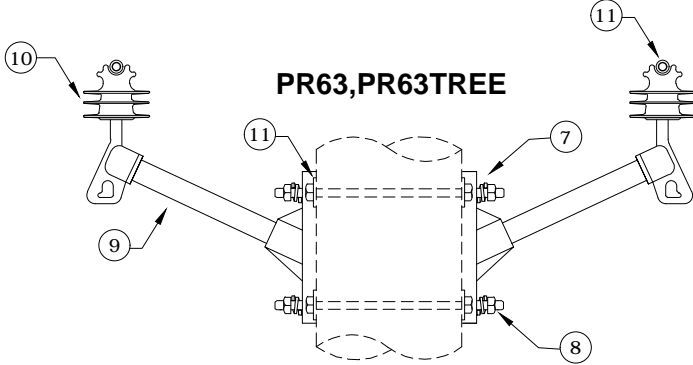
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C22

REVISIONS			
△	DATE	ENGR	OPS
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APP:	CM/AH	SECTION	
DATE:	12/4/17	<b>330</b>	

**PR60,PR60TREE**



**PR63,PR63TREE**

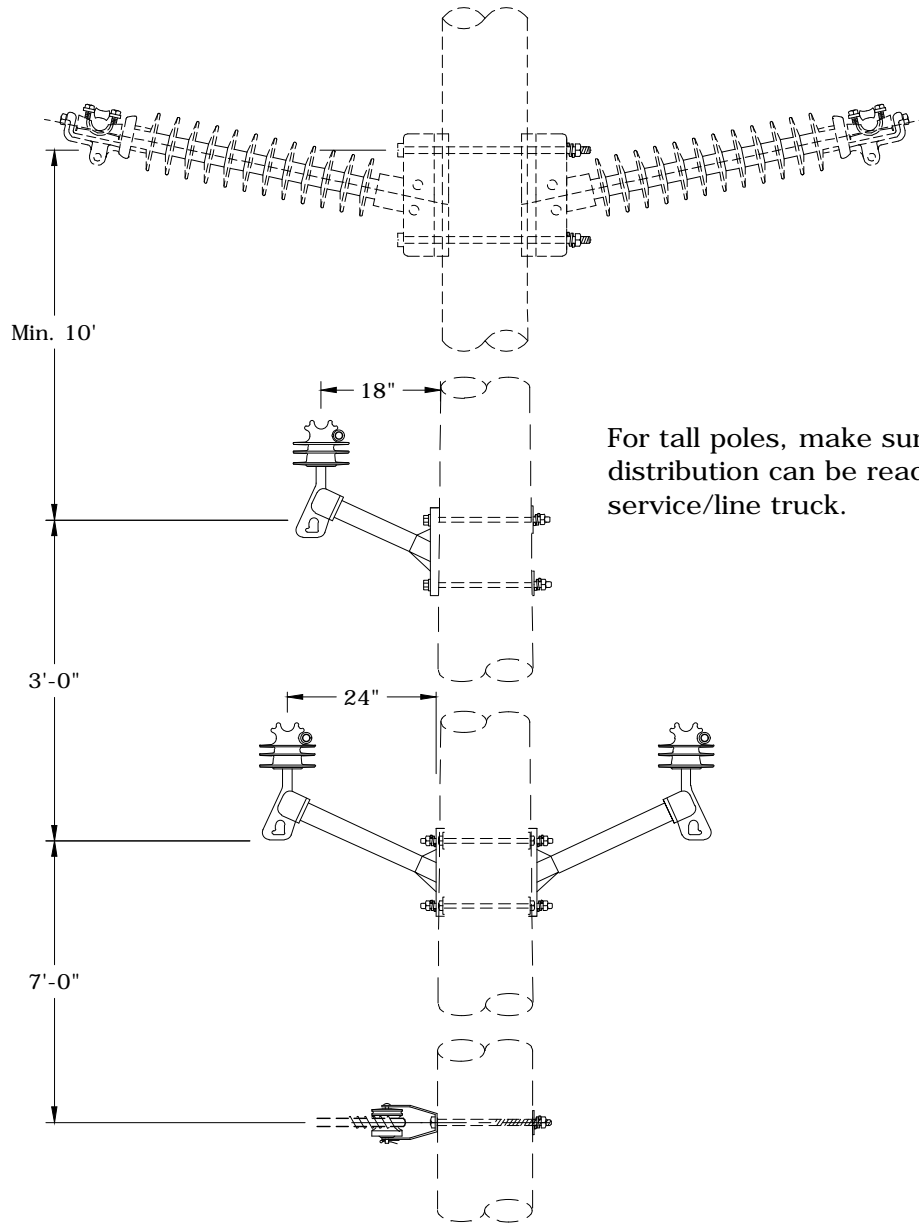


ITEM NO.	DESCRIPTION	C22TREE		C22	
		PR60TREE		PR60	
		QTY.	S/N	QTY.	S/N
1	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
2	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs. Ultimate Tensile	2	157	2	157
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
4	Arm, Epoxy 18" 2500 lbs	1	2504	1	2504
5	Insulator, Pin, C Neck, Polymer	1	1968	1	1968
6	Wire, Tie, AL Annealed #4 SD	11*	3012	10	1421
ITEM NO.	DESCRIPTION	PR63TREE		PR63	
		QTY.	S/N	QTY.	S/N
7	Washer, Lock, Spring, Double Coil, Galv., 5/8"	4*	2217	4*	2217
8	Bolt, Double Arm, 5/8" x 18", Galv., 12,400 lbs Ultimate Tensile	2*	82 *	2*	82 *
9	Arm, Epoxy 24" 2500 lbs	2	2605	2	2605
10	Insulator, Pin, C Neck, Polymer	2	1968	2	1968 *
11	Wire, Tie, AL Annealed #4 SD	22 *	3012	20	1421
12	Washer, Flat, Round, Galv., 5/8"	4 *	1395	4 *	1395
ITEM NO.	DESCRIPTION	S1		S1	
		QTY.	S/N	QTY.	S/N
13	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
14	Insulator, Spool, Clevis, Small, ANSI 53-2 Class	1	773	1	773
15	Bolt, Double Upset, 5/8" x 14", Galv., 12,400 lbs. Ultimate Tensile	1	1580	1	1580
16	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
17	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



**CONSTRUCTION STANDARDS**  
 3Ø TWIGGY TRANSMISSION UNDERBUILD  
 0° TO 5°  
 397 AAC MAX WIRE

REVISIONS			
Δ	DATE	ENGR	OPS



For tall poles, make sure the distribution can be reached by a service/line truck.

**Notes:**

1. Maximum line angle calculated for 3,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on top phase and one of the bottom phases of the distribution.



**CONSTRUCTION STANDARDS**  
 3Ø TWIGGY TRANSMISSION UNDERBUILD  
 6° TO 30°  
 397 AAC MAX WIRE

PAGE:  
1 of 2

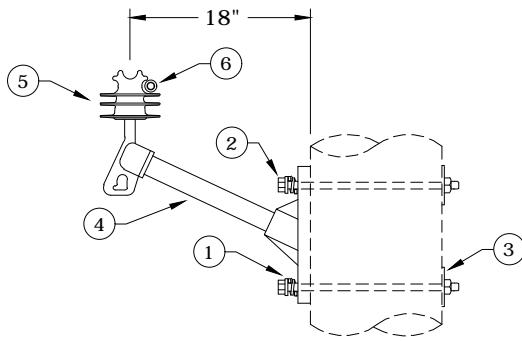
**C23, C23TREE**

CAD FILE:  
C23

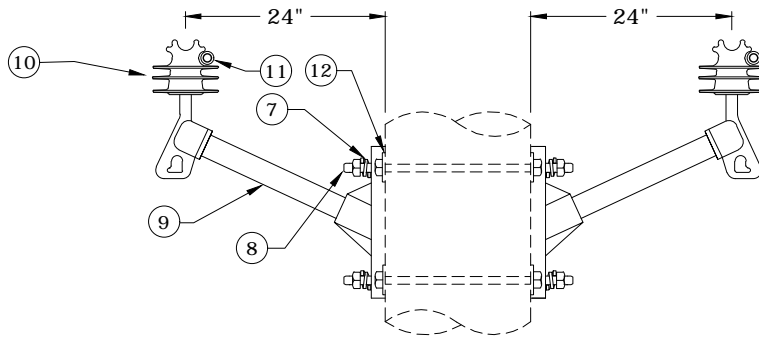
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△	DATE	ENGR	OPS
△			
APP:	CM/AH	SECTION	
DATE:	12/4/17	<b>330</b>	



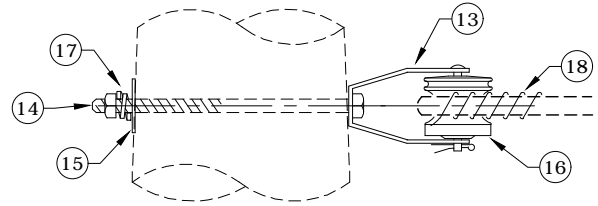
**PR60,PR60TREE**



**PR63,PR63TREE**



**S2**



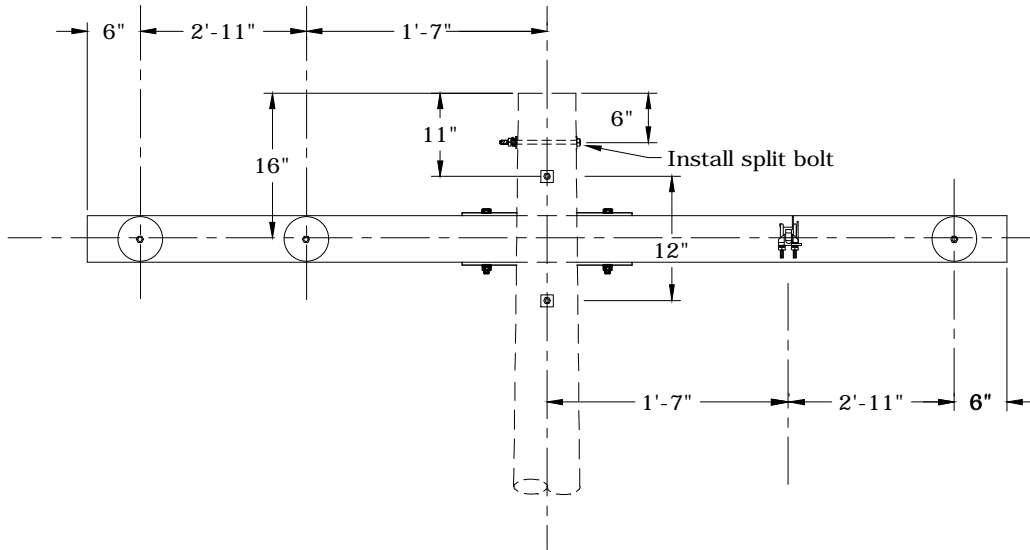
ITEM NO.	DESCRIPTION	C23TREE		C23	
		PR60TREE	PR60	PR63TREE	PR63
		QTY.	S/N	QTY.	S/N
1	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217	2	2217
2	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs. Ultimate Tensile	2	157	2	157
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
4	Arm, Epoxy 18" 2500 lbs	1	2504	1	2504
5	Insulator, Pin, C Neck, Polymer	1	1968	1	1968
6	Wire, Tie, AL Annealed #4 SD	11*	3012	10	1421
ITEM NO.	DESCRIPTION	PR63TREE		PR63	
		QTY.	S/N	QTY.	S/N
7	Washer, Lock, Spring, Double Coil, Galv., 5/8"	4*	2217	4*	2217
8	Bolt, Double Arm, 5/8" x 18" Galv., 12,400 lbs Ultimate Tensile	2*	82*	2*	82*
9	Arm, Epoxy 24" 2500 lbs	2	2605	2	2605
10	Insulator, Pin, C Neck, Polymer	2	1968	2	1968*
11	Wire, Tie, AL Annealed #4 SD	22*	3012	20	1421
12	Washer, Flat, Round Galv., 5/8"	4*	1395	4*	1395
ITEM NO.	DESCRIPTION	S2		S2	
		QTY.	S/N	QTY.	S/N
13	Clevis, D.E. Insulator 1340	1	335	1	335
14	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs. Ultimate Tensile	1	156	1	156
15	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
16	Insulator, Spool, Clevis, Small, ANSI 53-2 Class	1	773	1	773
17	Washer, Lock, Spring, Double Coil Galv., 5/8"	1	2217	1	2217
18	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



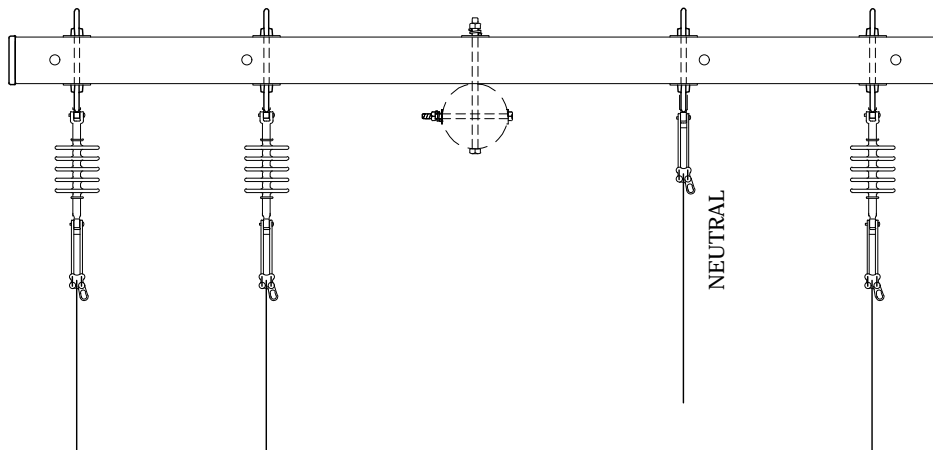
**CONSTRUCTION STANDARDS**  
 3Ø TWIGGY TRANSMISSION UNDERBUILD  
 6° TO 30°  
 397 AAC MAX WIRE

REVISIONS			
DATE	ENGR	OPS	

**FRONT VIEW**



**TOP VIEW**



**Notes:**

1. This framing is for clearance limited situations only.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase and phase on neutral side.

Rev. 1 - Added avian note.



**CONSTRUCTION STANDARDS**  
 10' PRE-ASSEMBLED DEADEND  
 HIGH NEUTRAL  
 397 AAC MAX WIRE

PAGE:  
1 of 2

**C48B**

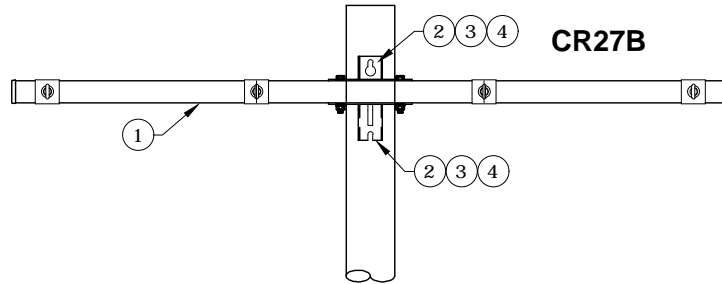
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**REVISIONS**

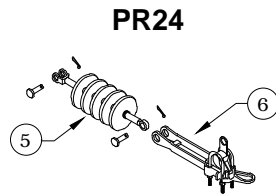
REV	DATE	ENGR	OPS
1	12/4/17	CM	DK

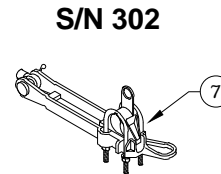
APP:	LB/AH	SECTION
DATE: 12/19/07		<b>330</b>



**Back View**



**Phases**



**Neutral**

Rev. 1 - Added avian note.

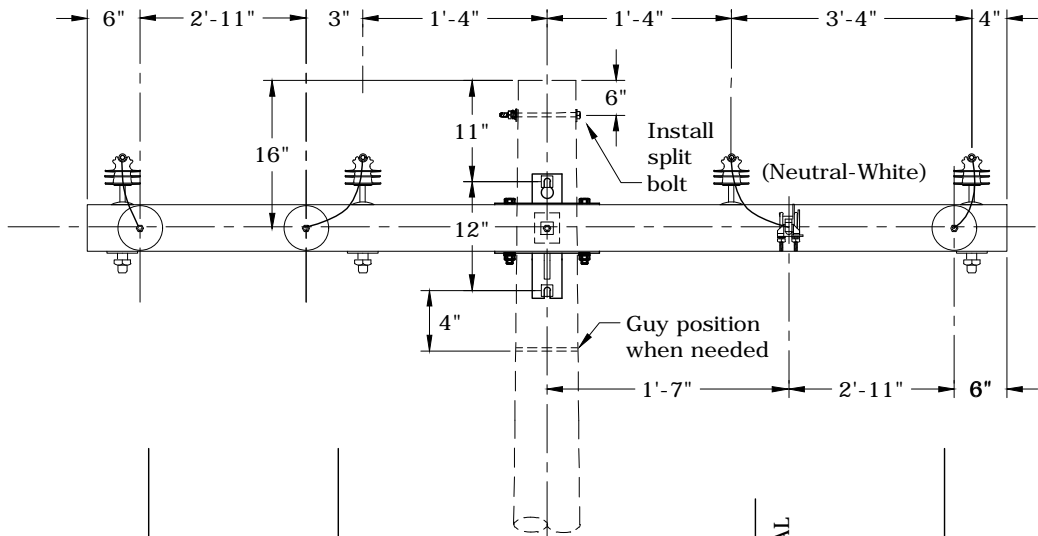
ITEM NO.	DESCRIPTION	C48B	
		QTY.	S/N
1	Arm, Deadend Assembly, 10', 4-position, 397 Max	1	2555
2	Bolt, Machine, 3/4" x 14", Galv., 18,350 lbs Ultimate Tensile	2	174
3	Washer, Lock, Spring, Double Coil, Galv., 3/4"	2	2218
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
ITEM NO.	DESCRIPTION	PR24 (3)	
		QTY.	S/N
5	Insulator, Suspension, 15 kV Clevis-Tongue, Polymer Type	3	1967
6	Clamp, Strain, Distribution, #2 to 397.5	3	302
ITEM NO.	DESCRIPTION	Additional Material	
		QTY.	S/N
7	Clamp, Strain, Distribution, #2 - 397.5	1	302



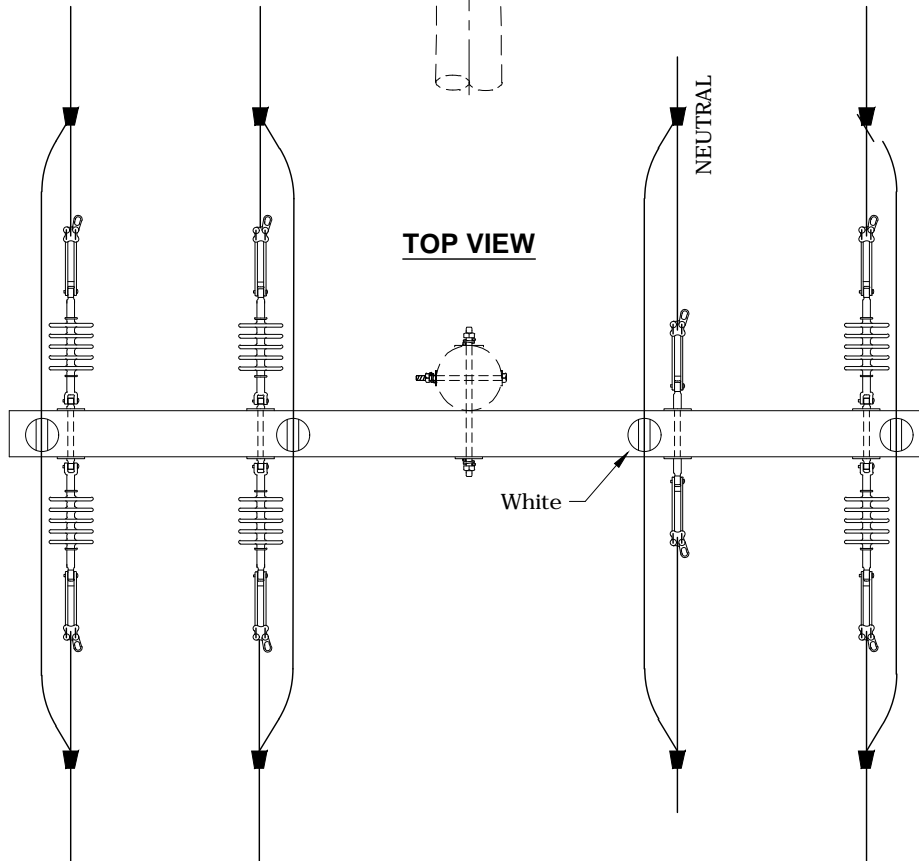
**CONSTRUCTION STANDARDS**  
 10' PRE-ASSEMBLED DEADEND  
 HIGH NEUTRAL  
 397 AAC MAX WIRE

REVISIONS			
DATE	ENGR	OPS	
12/4/17	CM	DK	

**FRONT VIEW**



**TOP VIEW**



**Notes:**

1. This framing is for clearance limited situations only.
2. See Std AC - Avian Covers - Section 400 if needed. Covers and tree wire jumpers only required on center phase and phase on neutral side.

Rev. 5 - Eliminated porcelain pin insulators and added avian notes.



**CONSTRUCTION STANDARDS**  
 10' PRE-ASSEMBLED DOUBLE DEADEND  
 HIGH NEUTRAL  
 397 AAC MAX WIRE

PAGE:  
1 of 3

**C49B, C49BTREE**

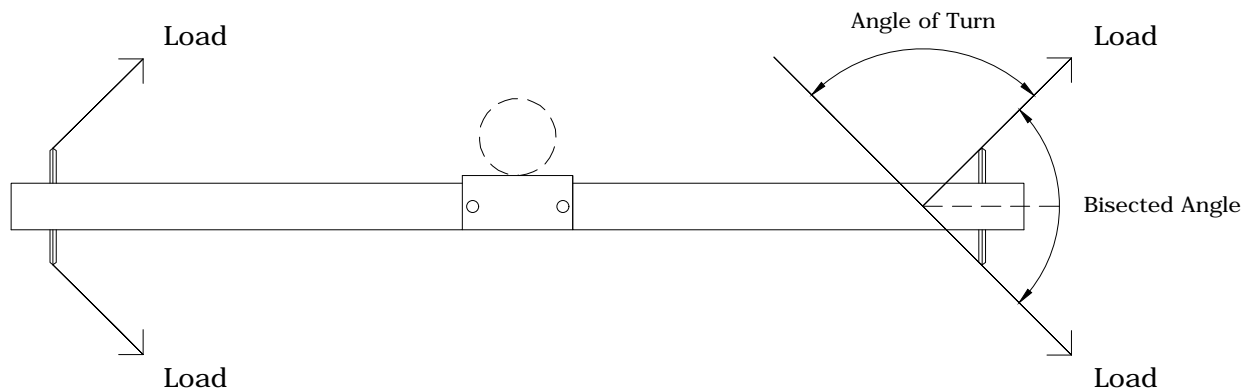
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**REVISIONS**

NO.	DATE	ENGR	OPS
2	3/02	REDRAWN	IN CAD
3	12/19/07	LB	AH
4	7/23/10	KJP	
5	12/4/17	CM	DK


APP:	ELM	SECTION
DATE:	1/31/80	<b>330</b>

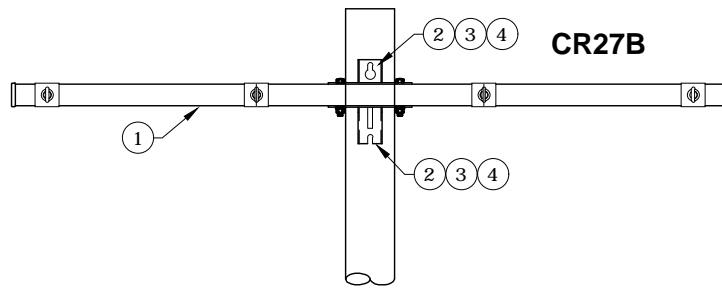
### DEADEND FOR ANGLED SPANS



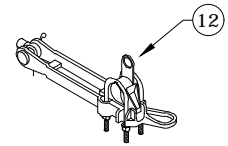
- Notes:
1. Maximum angle with 397 is 60°, limited by the 3/4" machine bolt.
  2. Angle must be bisected so that each eye-nut has half the angle.

Rev. 5 - Eliminated porcelain pin insulators and added avian notes.

	<b>CONSTRUCTION STANDARDS</b>			<b>REVISIONS</b>						
	10' PRE-ASSEMBLED DOUBLE DEADEND HIGH NEUTRAL 397 AAC MAX WIRE						△	DATE	ENGR	OPS
							2	3/02	REDRAWN	IN CAD
							3	12/19/07	LB	AH
							4	7/23/10	KJP	
						5	12/4/17	CM	DK	
						△				
PAGE: 2 of 3		<b>C49B, C49BTREE</b>				CAD FILE: C49B		APP: ELM		SECTION
						DATE: 1/31/80		<b>330</b>		

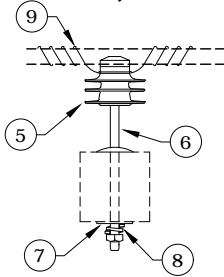


S/N 302

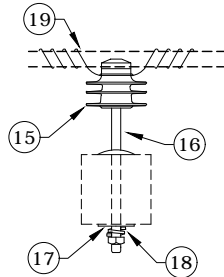


Neutral

PR4,PR4TREE

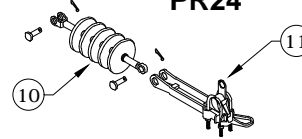


S12



Neutral-White

PR24



Phases

Rev. 5 - Eliminated porcelain pin insulators and added avian notes.

ITEM NO.	DESCRIPTION	C49BTREE		C49B	
		QTY.	S/N	QTY.	S/N
1	Arm, Deadend Assembly, 10', 4-position, 397 Max	1	2555	1	2555
2	Bolt, Machine, 3/4" x 14", Galv., 18,350 lbs Ultimate Tensile	2	174	2	174
3	Washer, Lock, Spring, Double Coil, Galv., 3/4"	2	2218	2	2218
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
ITEM NO.	DESCRIPTION	PR4TREE (3)		PR4 (3)	
		QTY.	S/N	QTY.	S/N
5	Insulator, Pin, C Neck, Polymer	3	1968	3	1968 *
6	Pin, Crossarm	3	961	3	961
7	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	3	1412	3	1412
8	Washer, Lock, Spring, Double Coil, Galv., 5/8"	3	2217	3	2217
9	Wire, Tie, AL Annealed #4 SD	33*	3012	30	1421
ITEM NO.	DESCRIPTION	PR24 (6)		PR24 (6)	
		QTY.	S/N	QTY.	S/N
10	Insulator, Suspension, 15 kV Clevis-Tongue, Polymer Type	6	1967	6	1967
11	Clamp, Strain, Distribution, #2 to 397.5	6	302	6	302
ITEM NO.	DESCRIPTION	Additional Material			
		QTY.	S/N	QTY.	S/N
12	Clamp, Strain, Distribution, #2 - 397.5	2	302	2	302
13	Connector, Tap, Wedge, 397 to 397	6	2501	6	2501
14	Connector, Tap, Wedge, 2/0 to 2/0	2	2559	2	2559
ITEM NO.	DESCRIPTION	S12		S12	
		QTY.	S/N	QTY.	S/N
15	Insulator, Pin, C Neck, White, Polymer	1	2656	1	2656
16	Pin, Crossarm	1	961	1	961
17	Washer, Square Flat, 5/8", 2 1/4" x 2 1/4"	1	1412	1	1412
18	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
19	Wire, Tie, AL Annealed #4 SD	10	1421	10	1421



**CONSTRUCTION STANDARDS**

10' PRE-ASSEMBLED DOUBLE DEADEND  
HIGH NEUTRAL  
397 AAC MAX WIRE

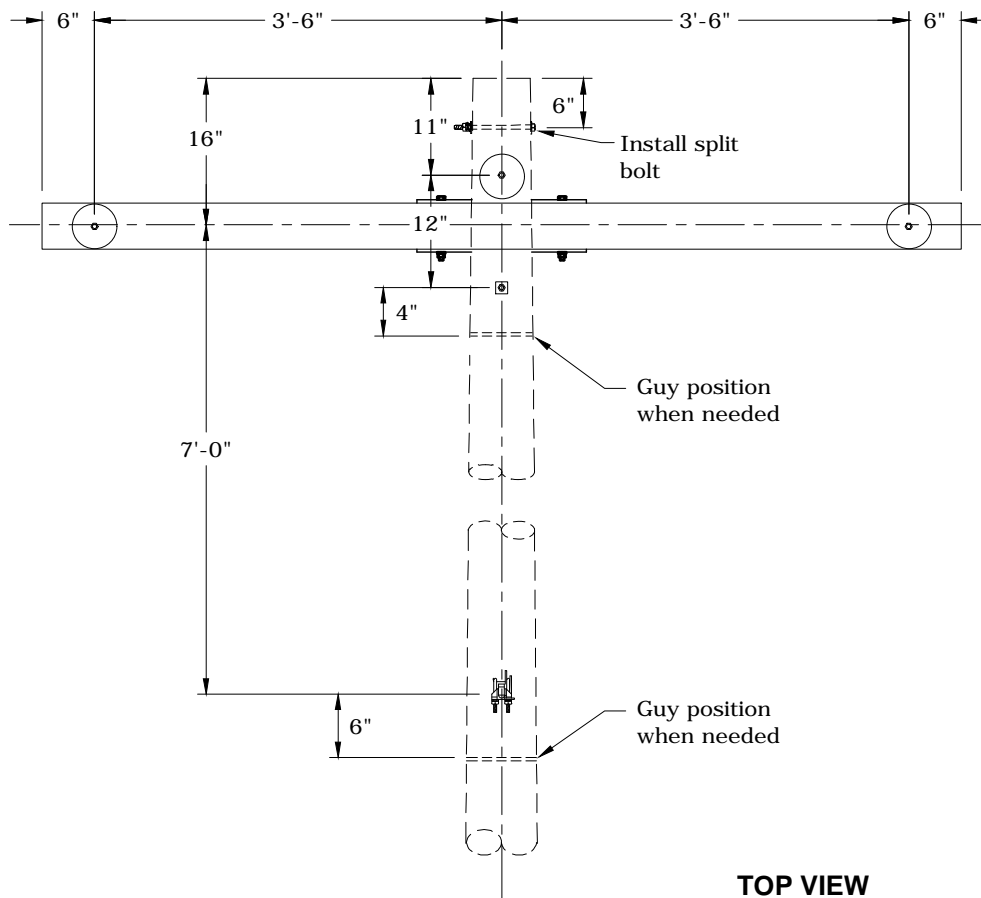
PAGE:  
3 of 3

**C49B, C49BTREE**

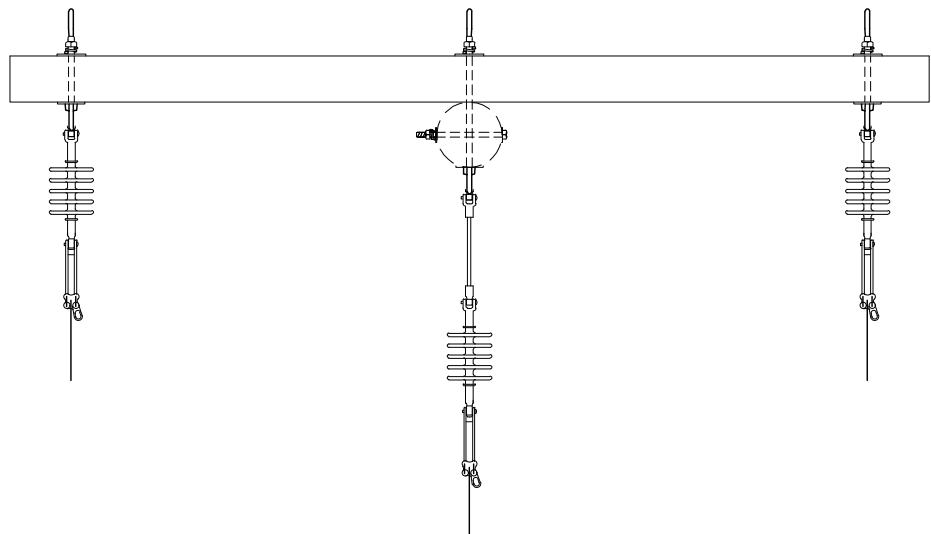
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REVISIONS			
REV	DATE	ENGR	OPS
2	3/02	REDRAWN	IN CAD
3	12/19/07	LB	AH
3	7/23/10	KJP	
5	12/4/17	CM	DK
APP: ELM			
DATE: 1/31/80		SECTION: 330	

**FRONT VIEW**



**TOP VIEW**



**Avian Safe**

Rev. 4 - Added avian note.



**CONSTRUCTION STANDARDS**  
 8' PRE-ASSEMBLED DEADEND  
 397 AAC MAX WIRE

**REVISIONS**

NO.	DATE	ENGR	OPS
1	2/11/81	GGW	
2	3/02	REDRAWN	IN CAD
3	12/19/07	LB	AH
4	12/4/17	CM	DK

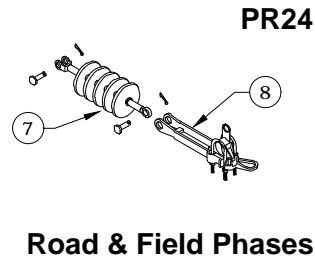
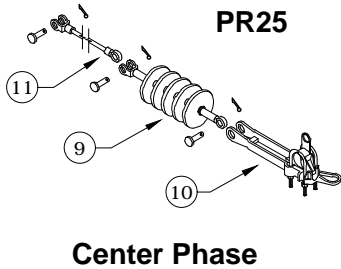
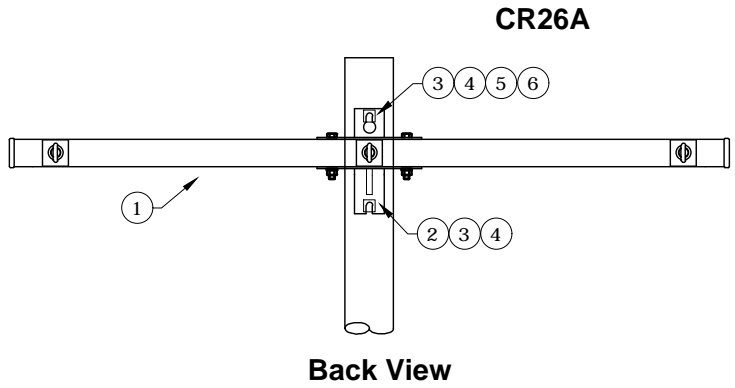
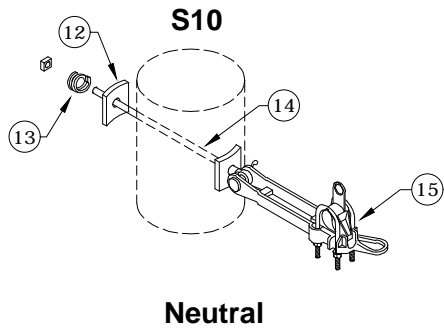
PAGE:  
1 of 2

**C50A**

CAD FILE:  
C50A

APP: ELM  
DATE: 1/31/80

SECTION  
**330**



Rev. 4 - Added avian note.

ITEM NO.	DESCRIPTION	C50A	
		QTY.	S/N
1	Arm, Deadend Assembly, 8', 3-position, 397 Max	1	2508
2	Bolt, Machine, 3/4" x 14", Galv., 18,350 lbs Ultimate Tensile	1	174
3	Washer, Lock, Spring, Double Coil, Galv., 3/4"	2	2218
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
5	Nut, Eye Oval 3/4", Galv.	1	914
6	Bolt, Machine, 3/4" x 16", Galv., 18,350 lbs Ultimate Tensile	1	175
ITEM NO.	DESCRIPTION	PR24 (2)	
		QTY.	S/N
7	Insulator, Suspension, 15 kV Clevis-Tongue, Polymer Type	2	1967
8	Clamp, Strain, Distribution, #2 to 397.5	2	302
ITEM NO.	DESCRIPTION	PR25	
		QTY.	S/N
9	Insulator, Suspension, 15 kV Clevis-Tongue, Polymer Type	1	1967
10	Clamp, Strain, Distribution, #2 to 397.5	1	302
11	Insulator, Guy Strain, Fiberglass, 20"	1	2909
ITEM NO.	DESCRIPTION	S10	
		QTY.	S/N
12	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
13	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217
14	Bolt, Eye, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	108
15	Clamp, Strain, Distribution, #2 - 397.5	1	302

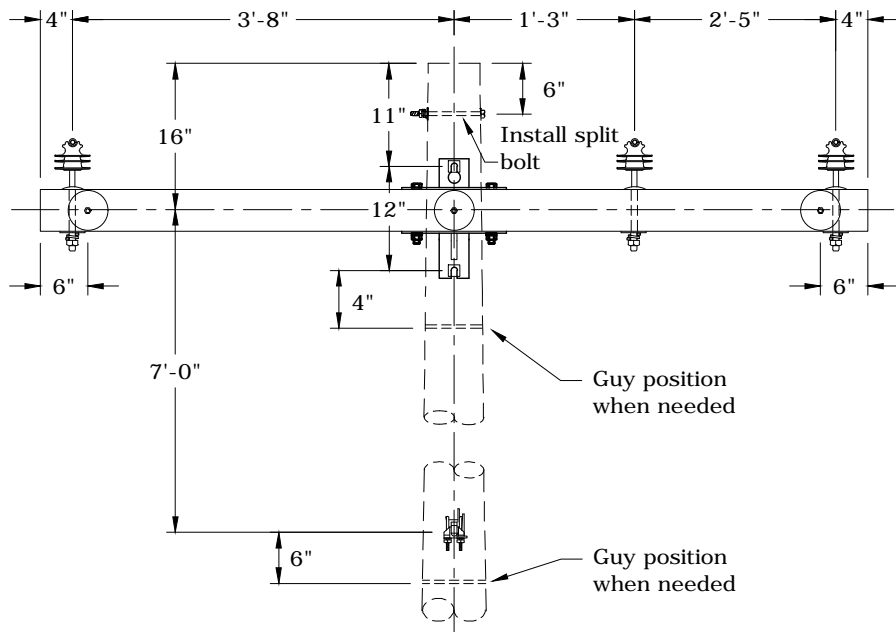


**CONSTRUCTION STANDARDS**  
8' PRE-ASSEMBLED DEADEND  
397 AAC MAX WIRE

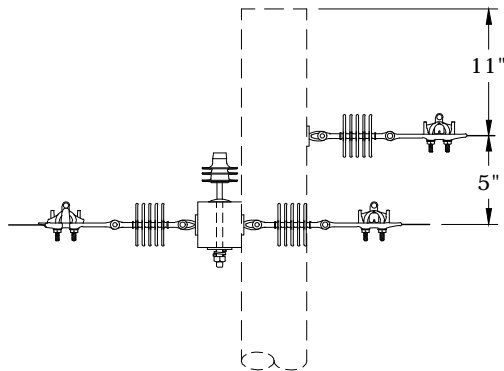
REVISIONS											
NO.	DATE	ENGR	OPS								
1	2/11/81	GGW									
2	3/02	REDRAWN	IN CAD								
3	12/19/07	LB	AH								
4	12/4/17	CM	DK								
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APP:	ELM	SECTION									
DATE:	1/31/80	330									



**FRONT VIEW**



**SIDE VIEW**



**Note:** See Std AC - Avian Covers - Section 400 if needed. Covers and tree wire jumper only required on center phase.

Rev. 4 - Eliminated porcelain pin insulators and added avian notes.



**CONSTRUCTION STANDARDS**  
 8' PRE-ASSEMBLED DOUBLE DEADEND  
 397 AAC MAX WIRE

PAGE:  
1 of 4

**C51A, C51ATREE**

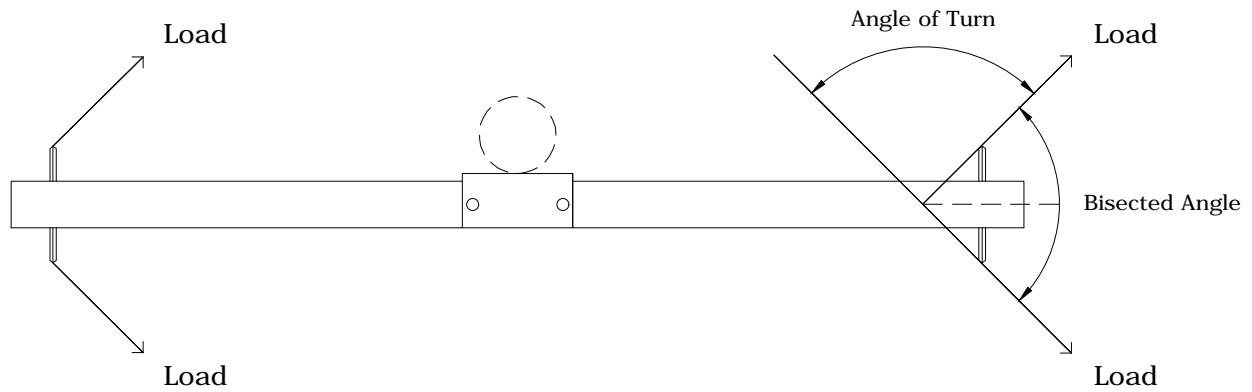
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C51A

REVISIONS			
NO.	DATE	ENGR	OPS
1	2/11/81	GGW	
2	3/02	REDRAWN	IN CAD
3	12/19/07	LB	AH
4	12/4/17	CM	DK

APP:	ELM	SECTION
DATE:	1/31/80	<b>330</b>

### DEADEND FOR ANGLED SPANS



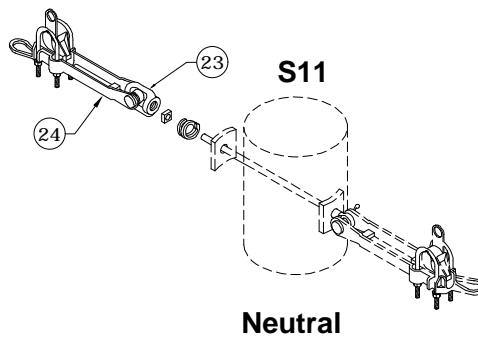
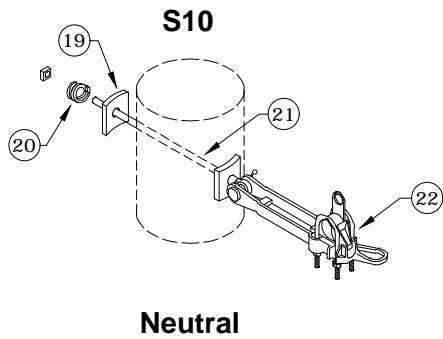
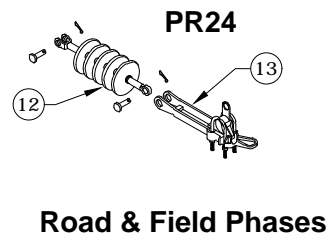
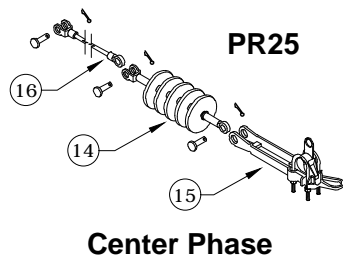
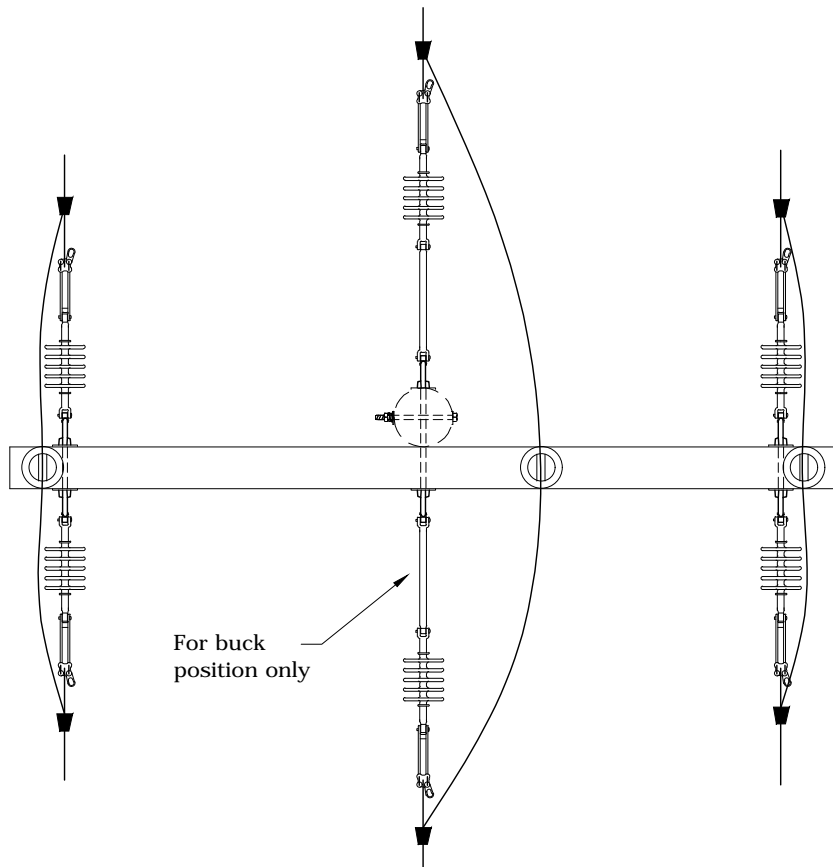
Notes:

1. Maximum angle with 397 is 60°, limited by the 3/4" machine bolt.
2. Angle must be bisected so that each eye-nut has half the angle.

Rev. 4 - Eliminated porcelain pin insulators and added avian notes.

	<b>CONSTRUCTION STANDARDS</b>			REVISIONS				
	8' PRE-ASSEMBLED DOUBLE DEADEND 397 AAC MAX WIRE			△	DATE	ENGR	OPS	
	1	2/11/81	GGW					
	2	3/02	REDRAWN	LB	CM	AH	DK	
	3	12/19/07	CM	DK				
4	12/4/17							
△								
PAGE: 2 of 4	<b>C51A, C51ATREE</b>		CAD FILE: C51A	APP: ELM	SECTION <b>330</b>			
				DATE: 1/31/80				

**TOP VIEW**



Rev. 4 - Eliminated porcelain pin insulators and added avian notes.



**CONSTRUCTION STANDARDS**  
 8' PRE-ASSEMBLED DOUBLE DEADEND  
 397 AAC MAX WIRE

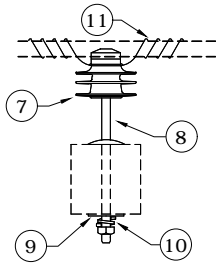
REVISIONS			
△	DATE	ENGR	OPS
1	2/11/81	GGW	
2	3/02	REDRAWN	IN CAD
3	12/19/07	LB	AH
4	12/4/17	CM	DK
△			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>330</b>	

PAGE:  
3 of 4

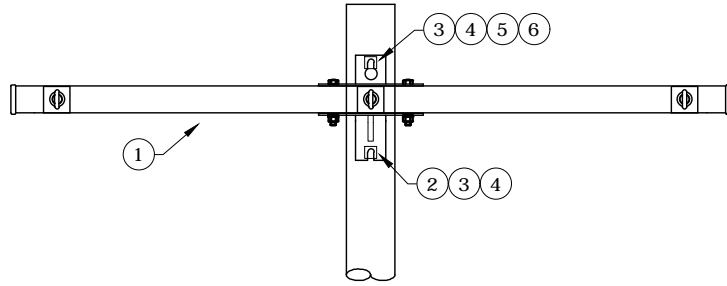
**C51A, C51ATREE**

CAD FILE:  
C51A

**PR4,PR4TREE**



**CR26A**



**Front View**

Rev. 4 - Eliminated porcelain pin insulators and added avian notes.

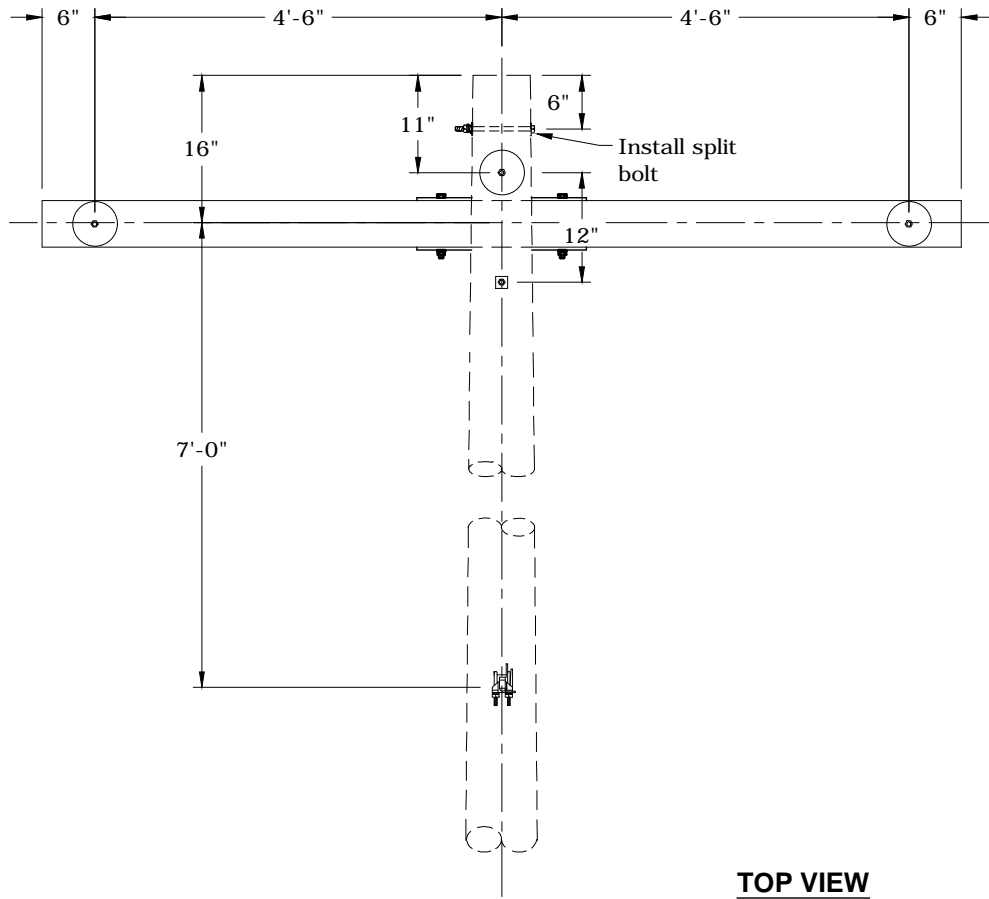
ITEM NO.	DESCRIPTION	C51ATREE		C51A	
		CR26A		CR26A	
		QTY.	S/N	QTY.	S/N
1	Arm, Deadend Assembly, 8', 3-position, 397 Max	1	2508	1	2508
2	Bolt, Machine, 3/4" x 14", Galv., 18,350 lbs Ultimate Tensile	1	174	1	174
3	Washer, Lock, Spring, Double Coil, Galv., 3/4"	2	2218	2	2218
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
5	Nut, Eye Oval 3/4"	1	914	1	914
6	Bolt, Machine, 3/4" x 16", Galv., 18,350 lbs Ultimate Tensile	1	175	1	175
ITEM NO.	DESCRIPTION	PR4TREE (3)		PR4 (3)	
		QTY.	S/N	QTY.	S/N
7	Insulator, Pin, C Neck, Polymer	3	1968	3	1968 *
8	Pin, Crossarm	3	961	3	961
9	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	3	1412	3	1412
10	Washer, Lock, Spring, Double Coil, Galv., 5/8"	3	2217	3	2217
11	Wire, Tie, AL Annealed #4 SD	33*	3012	30	1421
ITEM NO.	DESCRIPTION	PR24 (4)		PR24 (4)	
		QTY.	S/N	QTY.	S/N
12	Insulator, Suspension, 15 kV Clevis-Tongue, Polymer Type	4	1967	4	1967
13	Clamp, Strain, Distribution, #2 to 397.5	4	302	4	302
ITEM NO.	DESCRIPTION	PR25 (2)		PR25 (2)	
		QTY.	S/N	QTY.	S/N
14	Insulator, Suspension, 15 kV Clevis-Tongue, Polymer Type	2	1967	2	1967
15	Clamp, Strain, Distribution, #2 to 397.5	2	302	2	302
16	Insulator, Guy Strain, Fiberglass 20"	2	2909	2	2909
ITEM NO.	DESCRIPTION	Additional Material			
		QTY.	S/N	QTY.	S/N
17	Connector, Tap, Wedge, 397 to 397	6	2501	6	2501
18	Connector, Tap, Wedge, 2/0 to 2/0	2	2559	2	2559
ITEM NO.	DESCRIPTION	S10		S10	
		QTY.	S/N	QTY.	S/N
19	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
20	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217	1	2217
21	Bolt, Eye, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	108	1	108
22	Clamp, Strain, Distribution, #2 - 397.5	1	302	1	302
ITEM NO.	DESCRIPTION	S11		S11	
		QTY.	S/N	QTY.	S/N
23	Nut, Eye Oval 5/8"	1	913	1	913
24	Clamp, Strain, Distribution, #2 - 397.5	1	302	1	302



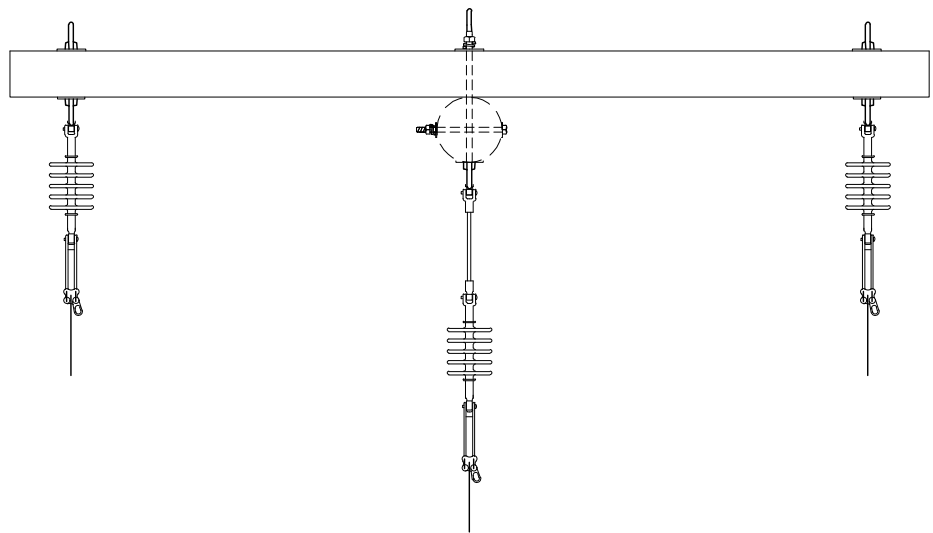
**CONSTRUCTION STANDARDS**  
8' PRE-ASSEMBLED DOUBLE DEADEND  
397 AAC MAX WIRE

REVISIONS			
Δ	DATE	ENGR	OPS
1	2/11/81	GGW	
2	3/02	REDRAWN	IN CAD
3	12/19/07	LB	AH
4	12/4/17	CM	DK
Δ			
APP:	ELM	SECTION	
DATE:	1/31/80	330	

**FRONT VIEW**



**TOP VIEW**



**Avian Safe**

Rev. 4 - Added avian note.



**CONSTRUCTION STANDARDS**  
 10' PRE-ASSEMBLED DEADEND  
 397 AAC MAX WIRE

**REVISIONS**

NO.	DATE	ENGR	OPS
1	2/11/81	GGW	
2	3/02	REDRAWN	IN CAD
3	12/19/07	LB	AH
4	12/4/17	CM	DK

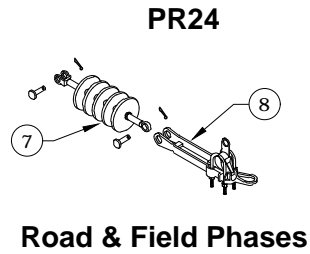
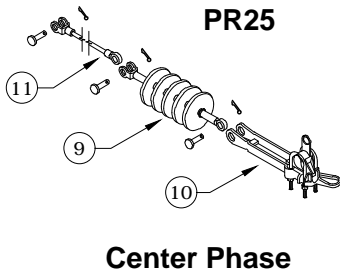
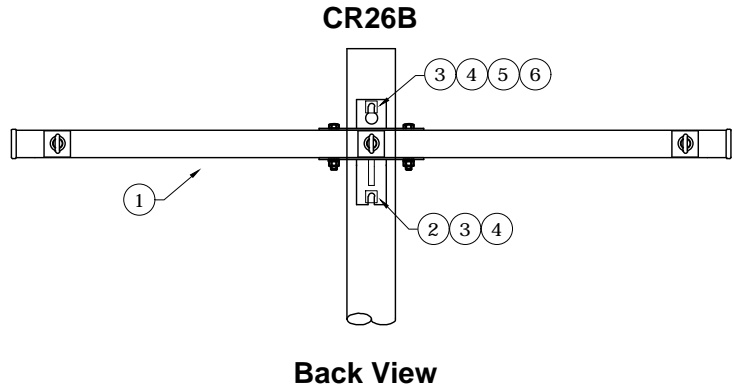
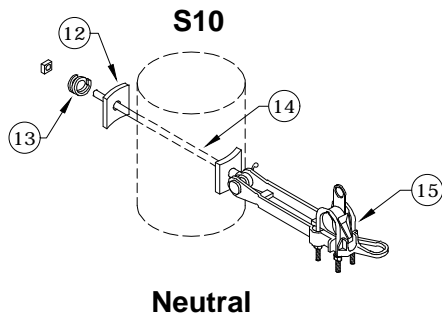
PAGE:  
1 of 2

**C52B**

CAD FILE:  
C52B

APP: ELM  
DATE: 1/31/80

SECTION  
**330**



Rev. 4 - Added avian note.

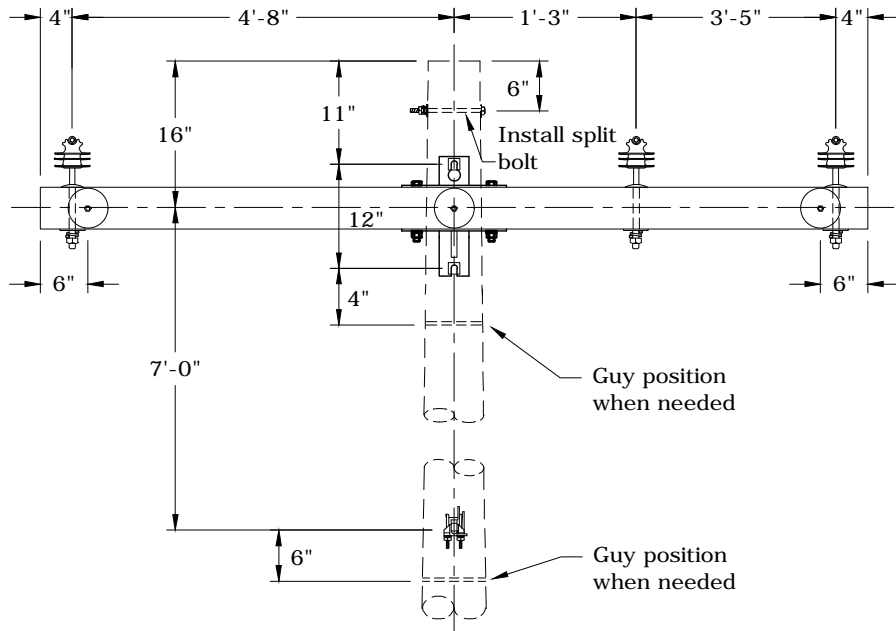
ITEM NO.	DESCRIPTION	C52B	
		QTY.	S/N
1	Arm, Deadend Assembly, 3-position, 397 Max	1	2680
2	Bolt, Machine, 3/4" x 14", Galv., 18,350 lbs Ultimate Tensile	1	174
3	Washer, Lock, Spring, Double Coil, Galv., 3/4"	2	2218
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
5	Nut, Eye Oval 3/4"	1	914
6	Bolt, Machine, 3/4" x 16", Galv., 18,350 lbs Ultimate Tensile	1	175
ITEM NO.	DESCRIPTION	PR24 (2)	
		QTY.	S/N
7	Insulator, Suspension, 15 KV Clevis-Tongue, Polymer Type	2	1967
8	Clamp, Strain, Distribution, #2 - 397.5	2	302
ITEM NO.	DESCRIPTION	PR25	
		QTY.	S/N
9	Insulator, Suspension, 15 kV Clevis-Tongue, Polymer Type	1	1967
10	Clamp, Strain, Distribution, #2 to 397.5 MCM	1	302
11	Insulator, Guy Strain, Fiberglass, 20"	1	2909
ITEM NO.	DESCRIPTION	S10	
		QTY.	S/N
12	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
13	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217
14	Bolt, Eye, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	108
15	Clamp, Strain, Distribution, #2 - 397.5 KCM	1	302



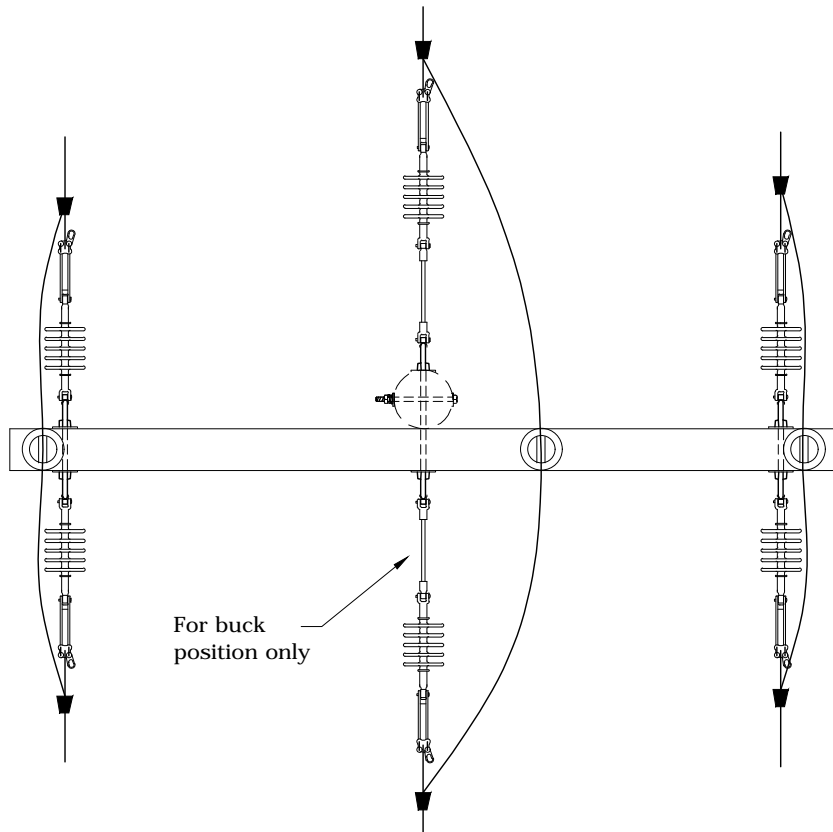
**CONSTRUCTION STANDARDS**  
10' PRE-ASSEMBLED DEADEND  
397 AAC MAX WIRE

REVISIONS			
NO.	DATE	ENGR	OPS
1	2/11/81	GGW	
2	3/02	REDRAWN	IN CAD
3	12/19/07	LB	AH
4	12/4/17	CM	DK

**FRONT VIEW**



**TOP VIEW**



**Note:** See Std AC - Avian Covers - Section 400 if needed. Covers and tree wire jumper only required on center phase.

Rev. 1 - Eliminated porcelain pin insulators and added avian note.



**CONSTRUCTION STANDARDS**  
 10' PRE-ASSEMBLED DOUBLE DEADEND  
 397 AAC MAX WIRE

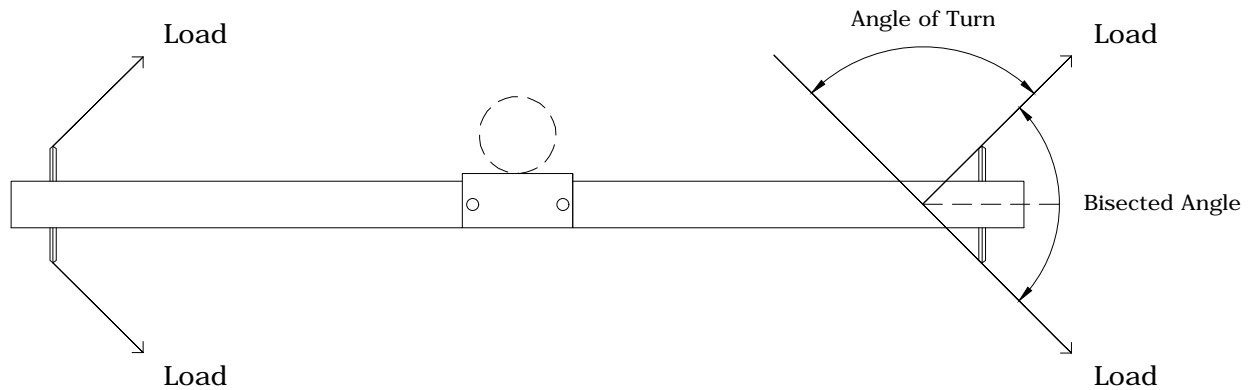
PAGE:  
1 of 4

**C53B, C53BTREE**

CAD FILE:  
C53B

REVISIONS			
DATE	ENGR	OPS	
12/4/17	CM	DK	
APP: LB/AH		SECTION	
DATE: 12/19/07	330		


### DEADEND FOR ANGLED SPANS



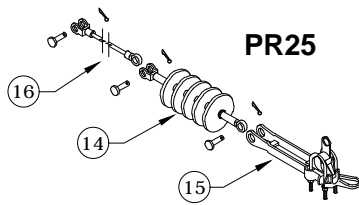
Notes:

1. Maximum angle with 397 is 60°, limited by the 3/4" machine bolt.
2. Angle must be bisected so that each eye-nut has half the angle.

Rev. 1 - Eliminated porcelain pin insulators and added avian note.

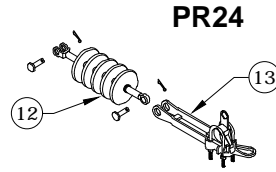
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	△	DATE	ENGR	OPS				
	1	12/4/17	CM	DK				
PAGE: 2 of 4		<b>C53B, C53BTREE</b>		CAD FILE: C53B		APP: LB/AH	SECTION	
				DATE: 12/19/07		<b>330</b>		





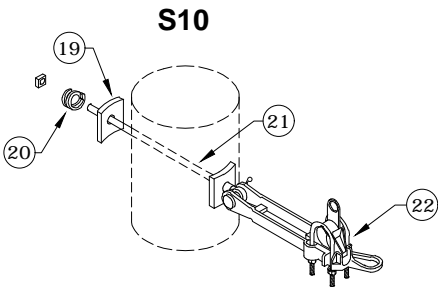
**PR25**

**Center Phase**



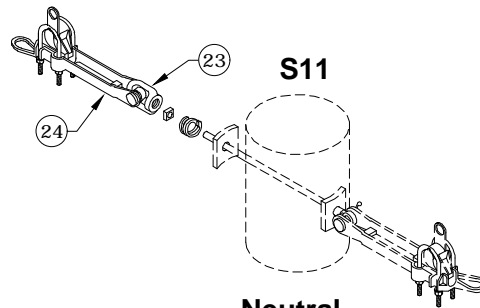
**PR24**

**Road & Field Phases**



**S10**

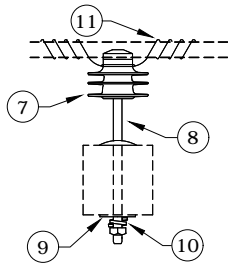
**Neutral**



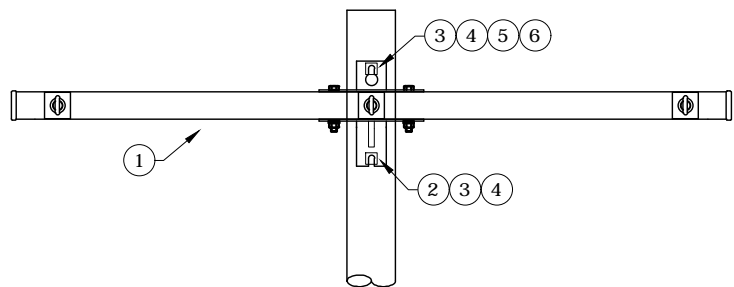
**S11**

**Neutral**

**PR4, PR4TREE**



**CR26B**



Rev. 1 - Eliminated porcelain pin insulators and added avian note.



**CONSTRUCTION STANDARDS**  
 10' PRE-ASSEMBLED DOUBLE DEADEND  
 397 AAC MAX WIRE

PAGE:  
3 of 4

**C53B, C53BTREE**

CAD FILE:  
C53B

REVISIONS			
△	DATE	ENGR	OPS
1	12/4/17	CM	DK
△			
APP:	LB/AH	SECTION	
DATE:	12/19/07	<b>330</b>	

Rev. 1 - Eliminated porcelain pin insulators and added avian note.

ITEM NO.	DESCRIPTION	C53BTREE		C53B	
		CR26B		CR26B	
		QTY.	S/N	QTY.	S/N
1	Arm, Deadend Assembly, 3-Position, 397 Max	1	2680	1	2680
2	Bolt, Machine, 3/4" x 14", Galv., 18,350 lbs Ultimate Tensile	1	174	1	174
3	Washer, Lock, Spring, Double Coil, Galv., 3/4"	2	2218	2	2218
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
5	Nut, Eye Oval 3/4"	1	914	1	914 *
6	Bolt, Machine, 3/4" x 16" Galv., 18,350 lbs Ultimate Tensile	1	175	1	175
ITEM NO.	DESCRIPTION	PR4TREE (3)		PR4 (3)	
		QTY.	S/N	QTY.	S/N
7	Insulator, Pin, C Neck, Polymer	3	1968	3	1968
8	Pin, Crossarm	3	961	3	961
9	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	3	1412	3	1412
10	Washer, Lock, Spring, Double Coil, Galv., 5/8"	3	2217	3	2217
11	Wire, Tie, AL Annealed #4 SD	33*	3012	30	1421
ITEM NO.	DESCRIPTION	PR24 (4)		PR24(4)	
		QTY.	S/N	QTY.	S/N
12	Insulator, Suspension, 15 KV Clevis-Tongue, Polymer Type	4	1967	4	1967
13	Clamp, Strain, Distribution, #2 - 397.5	4	302	4	302
ITEM NO.	DESCRIPTION	PR25 (2)		PR25 (2)	
		QTY.	S/N	QTY.	S/N
14	Insulator, Suspension, 15 kV Clevis	2	1967	2	1967
15	Clamp, Strain, Distribution, #2 to 397.5	2	302	2	302
16	Insulator, Guy Strain, Fiberglass, 20"	2	2909	2	2909
ITEM NO.	DESCRIPTION	Additional Material			
		QTY.	S/N	QTY.	S/N
17	Connector, Tap, Wedge, 397 to 397	6	2501	6	2501
18	Connector, Tap, Wedge, 2/0 to 2/0	2	2559	2	2559
ITEM NO.	DESCRIPTION	S10		S10	
		QTY.	S/N	QTY.	S/N
19	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392	2	1392
20	Washer, Lock, Spring, Double Coil, Galv. 5/8"	1	2217	1	2217
21	Bolt, Eye, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	108	1	108
22	Clamp, Strain, Distribution, #2 - 397.5	1	302	1	302
ITEM NO.	DESCRIPTION	S11		S11	
		QTY.	S/N	QTY.	S/N
23	Nut, Eye Oval 5/8"	1	913	1	913
24	Clamp, Strain, Distribution, #2 - 397.5	1	302	1	302



**CONSTRUCTION STANDARDS**  
 10' PRE-ASSEMBLED DOUBLE DEADEND  
 397 AAC MAX WIRE

REVISIONS			
NO.	DATE	ENGR	OPS
1	12/4/17	CM	DK

# **340**

## **3Ø HEAVY DISTRIBUTION**

### **795MCM AAC & 336 MCM ACSR**

1/4/2018

<b>C</b>	D1B	3Ø Single 10' Crossarm - 0° to 5°
<b>C</b>	D2B	3Ø Double 10' Crossarm - 6° to 15°
<b>C</b>	D3B	3Ø Double 10' Crossarm w/ Angle Vise-Tops - 16° to 30°
<b>C</b>	D4B	3Ø Single 10' Crossarm - High Neutral - 0° to 5°
<b>C</b>	D5B	3Ø Double 10' Crossarm - High Neutral - 6° to 15°
<b>C</b>	D6B	3Ø Double 10' Crossarm w/ Angle Vise-Tops - High Neutral, 16° to 30°
<b>C</b>	D7A	3Ø Single 8' Crossarm w/ Pole Top - 0° to 5°
<b>C</b>	D8A	3Ø Double 8' Crossarm w/ Double Pole Top - 6° to 15°
<b>C</b>	D10	3Ø Twiggy - 0° to 5°
<b>C</b>	D11	3Ø Twiggy - 6° to 15°
<b>C</b>	D13	3Ø Vertical w/ Pole Top - 0° to 5°
<b>C</b>	D14	3Ø Vertical w/ Double Pole Top - 6° to 15°
<b>C</b>	D16	3Ø Double Twiggy Circuit - 0° to 5°
<b>C</b>	D17	3Ø Double Twiggy Circuit - 6° to 15°
<b>C</b>	D19B	3Ø Single 10' Crossarm - Double Circuit - 0° to 5°
<b>C</b>	D20B	3Ø Double 10' Crossarm - Double Circuit - 6° to 15°
<b>N</b>	D22	3Ø Twiggy Transmission Underbuild - 0° to 5°
<b>N</b>	D23	3Ø Twiggy Transmission Underbuild - 6° to 15°
<b>C</b>	D48B	10' Pre-assembled Deadend - High Neutral
<b>C</b>	D49B	10' Pre-assembled Double Deadend - High Neutral
<b>C</b>	D50A	8' Pre-assembled Deadend
<b>C</b>	D51A	8' Pre-assembled Double Deadend

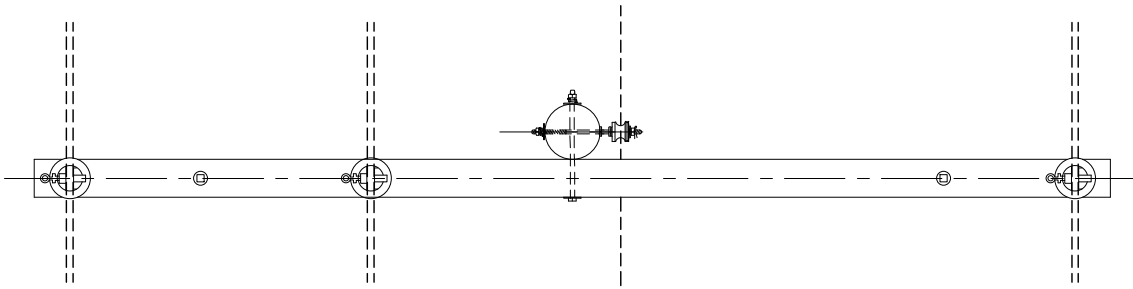
**N** New Standard  
**R** Redrawn Standard  
**C** Changed Standard  
**~** No Change

**340 (CONTINUED)**  
**3Ø HEAVY DISTRIBUTION**  
**795MCM AAC & 336 MCM ACSR**

1/4/2018

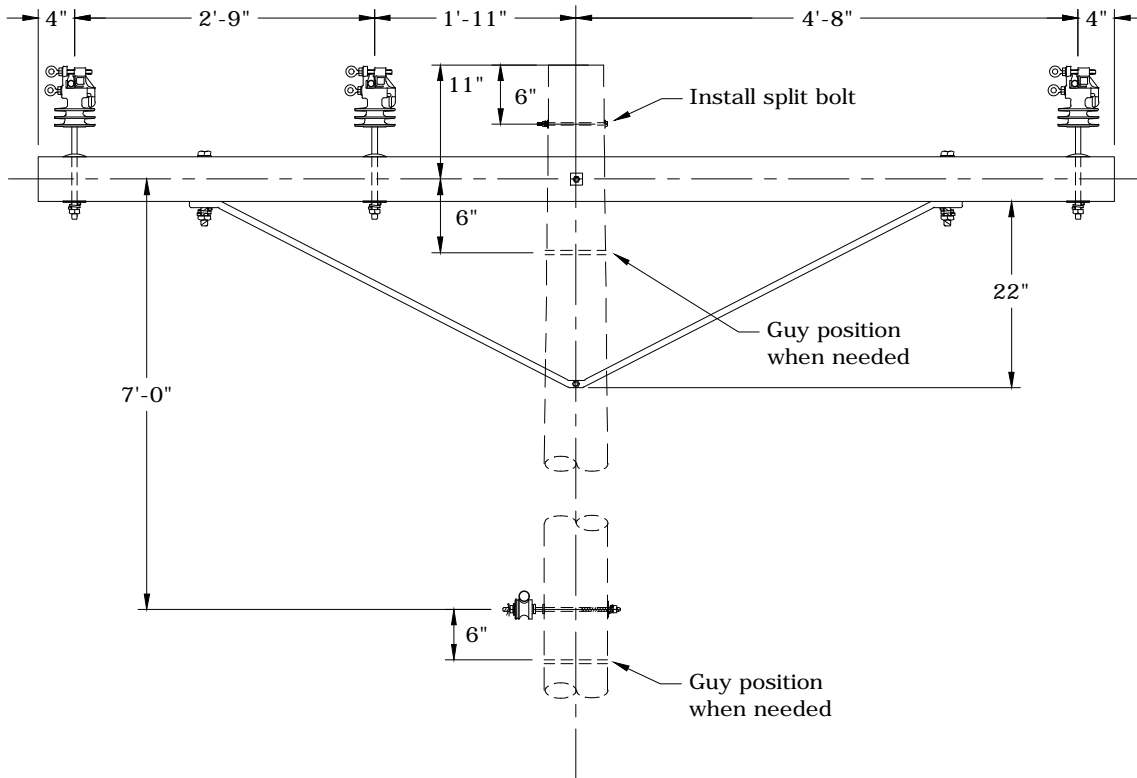
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|----------|------|----------------------------------|
| <b>C</b> | D52B | 10' Pre-assembled Deadend        |
| <b>C</b> | D53B | 10' Pre-assembled Double Deadend |

- |          |                  |
|----------|------------------|
| <b>N</b> | New Standard     |
| <b>R</b> | Redrawn Standard |
| <b>C</b> | Changed Standard |
| <b>~</b> | No Change        |



**Vise-Top Installation:**

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off



- Notes:**
1. Maximum line angle calculated for 5,000 lbs. MWT and 250-ft ruling span.
  2. Std D7A is preferred for crossarm construction. Use this standard for underbuild or other special installations.
  3. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase.

Rev. 3 - Changed post insulators to vise-top, added avian note, and updated material list.



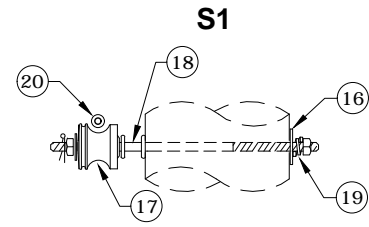
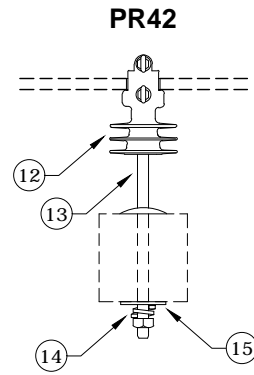
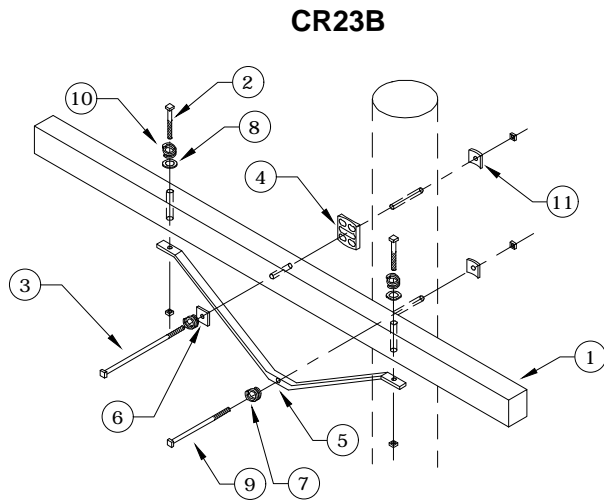
**CONSTRUCTION STANDARDS**  
 3Ø SINGLE 10' CROSSARM  
 0° TO 5°  
 795 AAC MAX WIRE

PAGE:  
1 of 2

**D1B**

CAD FILE:  
D1B

REVISIONS			
△	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	6/7/06	LB	AH
3	1/4/18	CM	DK
△			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>340</b>	



Neutral

Rev. 3 - Changed post insulators to vise-top, added avian note, and updated material list.

ITEM NO.	DESCRIPTION	D1B	
		CR23B	
		QTY.	S/N
1	Arm, Cross (Distr.), 3 3/4" x 4 3/4" x 10'	1	26
2	Bolt, Machine, 1/2" x 7", Galv., 7800 lbs Ultimate Tensile *	2	143
3	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile *	1	157
4	Gain, Pole Plastic	1	709
5	Brace, Angle, 72"	1	204
6	Washer, Square, Flat 5/8", 2 1/4" x 2 1/4"	1	1412
7	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	2	2217
8	Washer, Flat, Round, Galv., 1/2"	2	1394
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile *	1	155
10	Washer, Lock, Spring, Double Coil, Galv., 1/2" *	2	2216
11	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
ITEM NO.	DESCRIPTION	PR42 (3)	
		QTY.	S/N
12	Insulator, Vise-Top, Polymer *	3	2439
13	Pin, Crossarm *	3	961
14	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	3	2217
15	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	3	1412
ITEM NO.	DESCRIPTION	S1	
		QTY.	S/N
16	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
17	Insulator, Spool, Clevis, Small, ANSI 53-2 Class	1	773
18	Bolt, Double Upset 5/8" x 14" Galv., 12,400 lbs Ultimate Tensile *	1	1580
19	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217
20	Wire, Tie, AL Annealed #4 SD	10	1421



### CONSTRUCTION STANDARDS

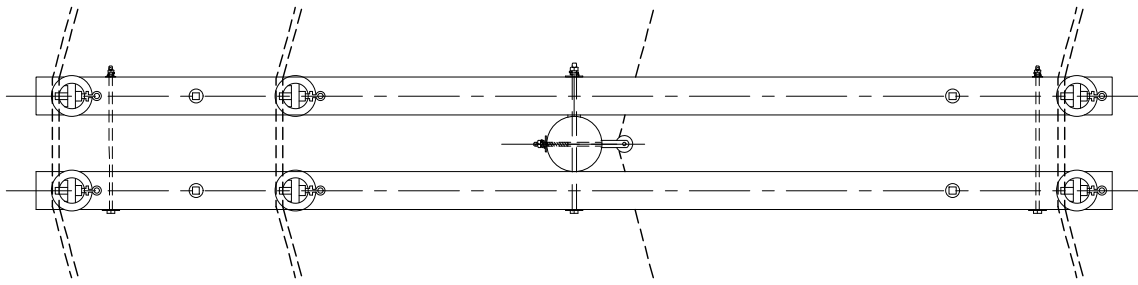
3Ø SINGLE 10' CROSSARM  
0° TO 5°  
795 AAC MAX WIRE

PAGE:  
2 of 2

**D1B**

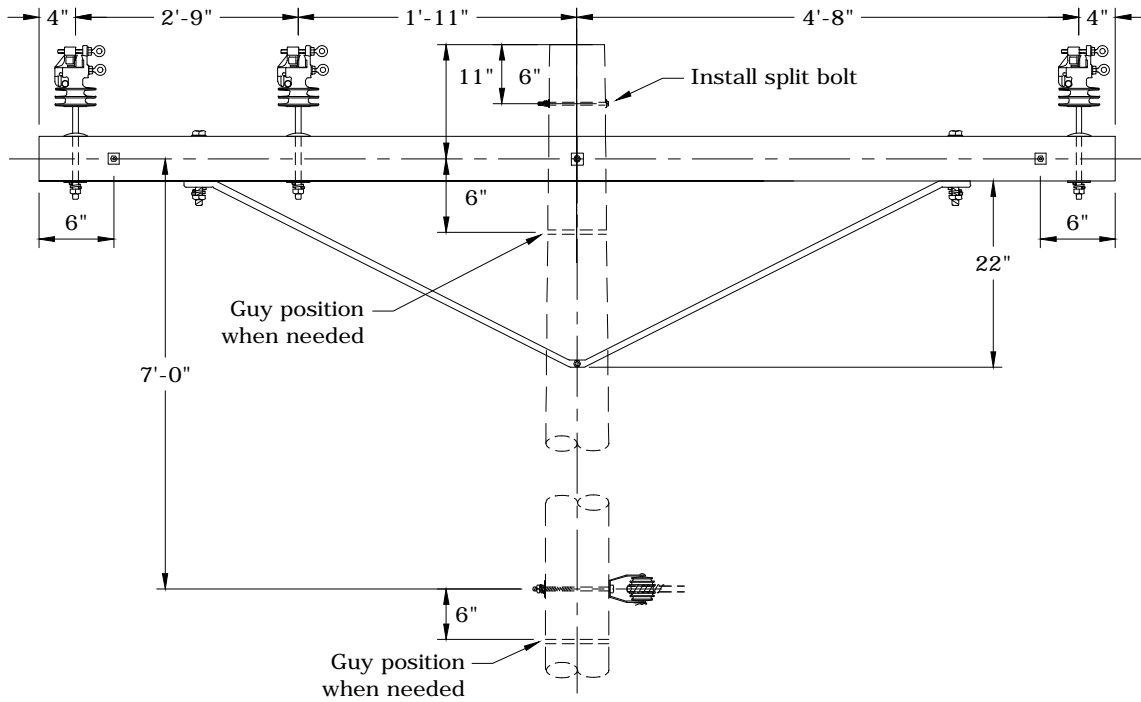
CAD FILE:  
D1B

REVISIONS											
REV	DATE	ENGR	OPS								
1	3/02	REDRAWN	IN CAD								
2	6/7/06	LB	AH								
3	1/4/18	CM	DK								
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APP:	ELM	SECTION									
DATE:	1/31/80	<b>340</b>									



**Vise-Top Installation:**

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off



**Notes:**

1. Maximum line angle calculated for 5,000 lbs. MWT and 250-ft ruling span.
2. Std D8A is preferred for crossarm construction. Use this standard for underbuild or other special installations.
3. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase.

Rev. 3 - Changed post insulators to vise-top, added avian note, and updated material list.



**CONSTRUCTION STANDARDS**

30 DOUBLE 10' CROSSARM  
6° TO 15°  
795 AAC MAX WIRE

PAGE:  
1 of 2

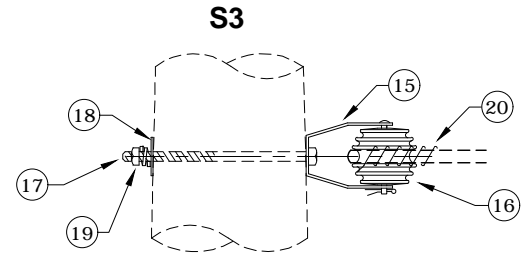
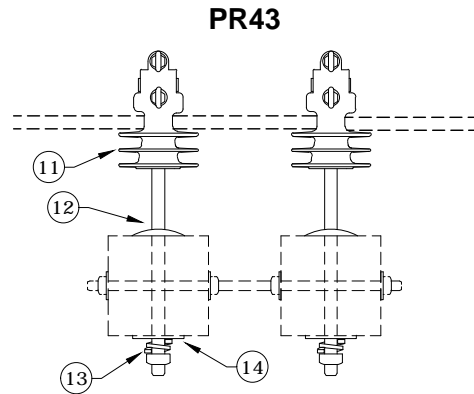
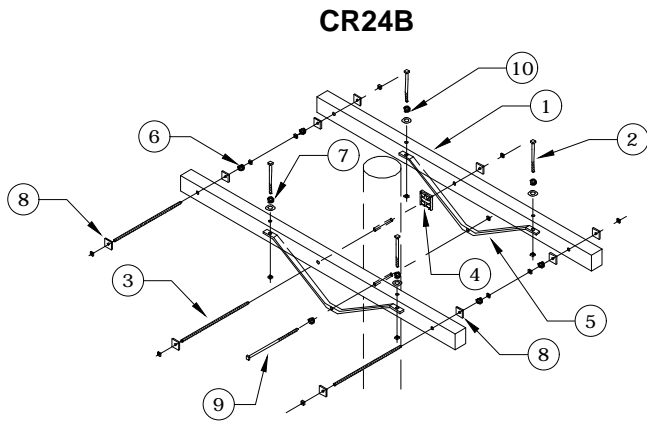
**D2B**

CAD FILE:  
D2B

**REVISIONS**

REV	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	6/7/06	LB	AH
3	1/4/18	CM	DK

APP:	ELM	SECTION
DATE:	1/31/80	<b>340</b>



Neutral

Rev. 3 - Changed post insulators to vise-top, added avian note, and updated material list.

ITEM NO.	DESCRIPTION	D2B	
		CR24B	
		QTY.	S/N
1	Arm, Cross (Distr.), 3 3/4" x 4 3/4" x 10'	2	26
2	Bolt, Machine, 1/2" x 7", Galv., 7800 lbs Ultimate Tensile*	4	143
3	Bolt, Double Arm, 5/8" x 20", Galv., 12,400 lbs Ultimate Tensile*	3	83
4	Gain, Pole Plastic	1	709
5	Brace, Angle, 72"	2	204
6	Washer, Lock, Spring, Double Coil, Galv., 5/8"*	6	2217
7	Washer, Lock, Spring, Double Coil, Galv., 1/2"*	4	2216
8	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	10	1412
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile*	1	155
10	Washer, Round, Galv., Flat, 1/2"	4	1394
ITEM NO.	DESCRIPTION	PR43 (3)	
		QTY.	S/N
11	Insulator, Vise-Top, Polymer*	6	2439
12	Pin, Crossarm*	6	961
13	Washer, Lock, Spring, Double Coil, Galv., 5/8"*	6	2217
14	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	6	1412
ITEM NO.	DESCRIPTION	S3	
		QTY.	S/N
15	Clevis, DE Insulator 1344	1	336
16	Insulator, Spool Clevis, Large, ANSI 53-5 Class	1	774
17	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile*	1	156
18	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
19	Washer, Lock, Spring, Double Coil, Galv., 5/8"*	1	2217
20	Wire, Tie, AL Annealed #4 SD	10	1421



### CONSTRUCTION STANDARDS

3Ø DOUBLE 10' CROSSARM  
6° TO 15°  
795 AAC MAX WIRE

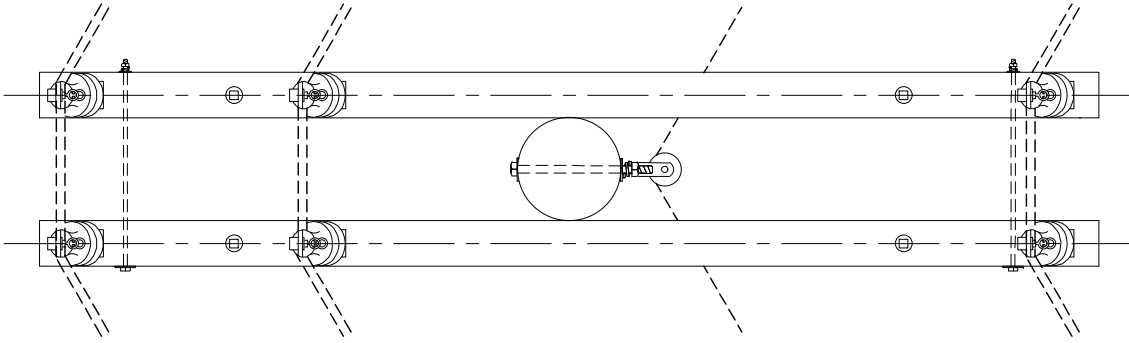
PAGE:  
2 of 2

**D2B**

CAD FILE:  
D2B

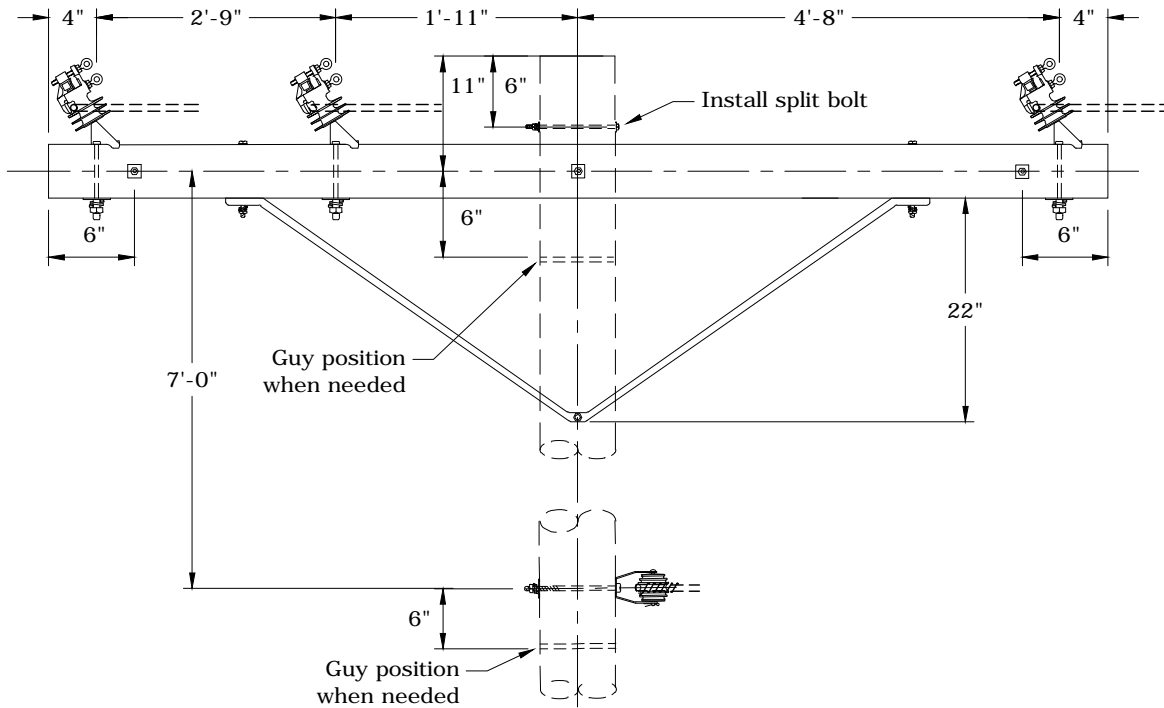
REVISIONS			
Δ	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	6/7/06	LB	AH
3	1/4/18	CM	DK
APP: ELM SECTION			
DATE: 1/31/80		<b>340</b>	





**Vise-Top Installation:**

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off



**Notes:**

1. Maximum line angle calculated for 5,000 lbs. MWT and 250-ft ruling span.
2. Use this standard for underbuild or other special installations.
3. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase.

Rev. 3 - Changed post insulators to vise-top, added avian note, and updated material list.



**CONSTRUCTION STANDARDS**

3Ø DOUBLE 10' CROSSARM W/ ANGLE VISE-TOPS  
16° TO 30°  
795 AAC MAX WIRE

PAGE:  
1 of 2

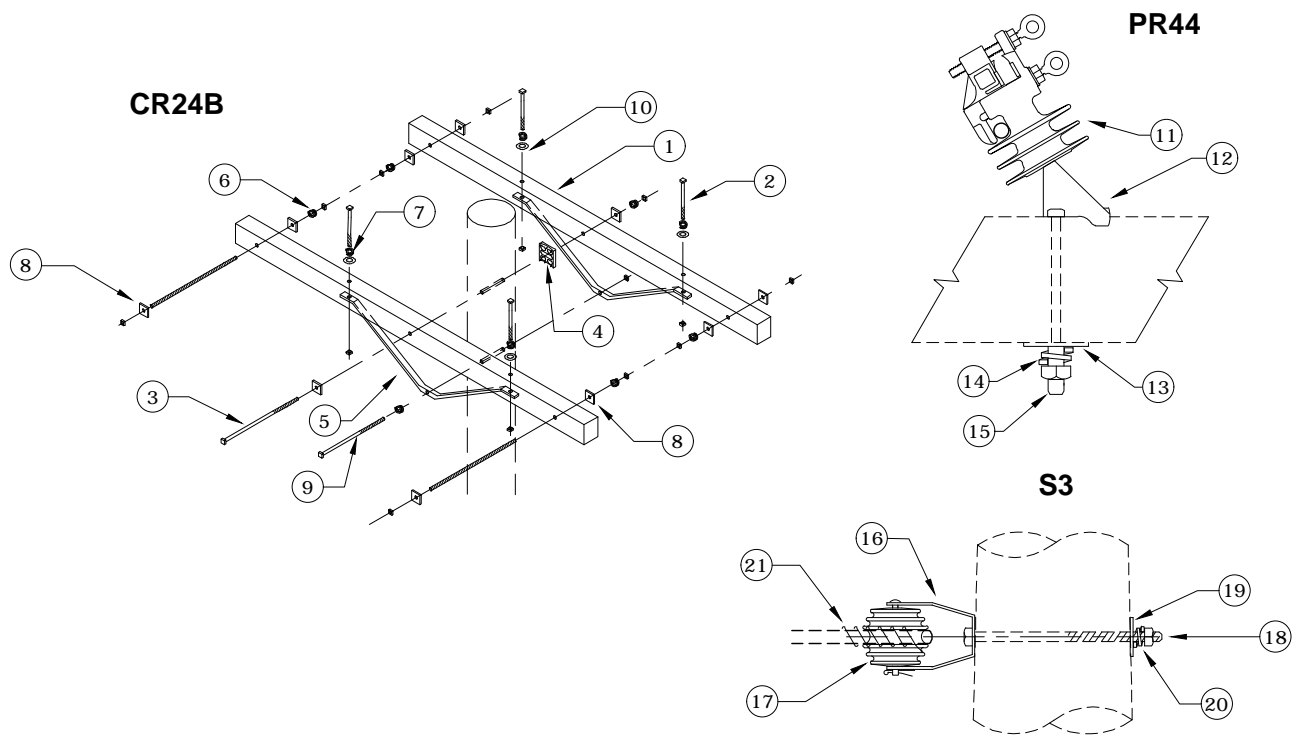
**D3B**

CAD FILE:  
D3B

**REVISIONS**

NO.	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	6/7/06	LB	AH
3	1/4/18	CM	DK

APP:	ELM	SECTION
DATE:	1/31/80	<b>340</b>



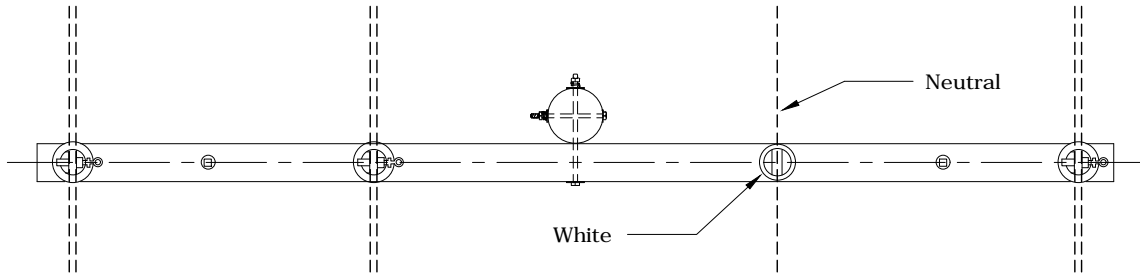
Rev. 3 - Changed post insulators to vise-top, added avian note, and updated material list.

ITEM NO.	DESCRIPTION	D3B	
		CR24B	
		QTY.	S/N
1	Arm, Cross (Distr.), 3 3/4" x 4 3/4" x 10'	2	26
2	Bolt, Machine, 1/2" x 7", Galv., 7800 lbs Ultimate Tensile*	4	143
3	Bolt, Double Arm, 5/8" x 20", Galv., 12,400 lbs Ultimate Tensile *	3	83
4	Gain, Pole Plastic	1	709
5	Brace, Angle, 72"	2	204
6	Washer, Lock, Spring, Double Coil, Galv., 5/8"*	6	2217
7	Washer, Lock, Spring, Double Coil, Galv., 1/2"*	4	2216
8	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	10	1412
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile*	1	155
10	Washer, Flat, Round, Galv., 1/2"	4	1394
ITEM NO.	DESCRIPTION	PR44 (6)	
		QTY.	S/N
11	Insulator, Vise-Top, Polymer *	6	2439
12	Pin, Angle, Crossarm *	6	2658
13	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	6	1412
14	Washer, Lock, Spring, Double Coil, Galv., 5/8"*	6	2217
15	Bolt, Machine, 5/8" x 7", Galv., 12,400 lbs Ultimate Tensile*	6	2606
ITEM NO.	DESCRIPTION	S3	
		QTY.	S/N
16	Clevis, DE Insulator 1344	1	336
17	Insulator, Spool, Clevis, Large, ANSI 53-5 Class	1	774
18	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	156
19	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
20	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217
21	Wire, Tie, AL Annealed #4 SD	10	1421



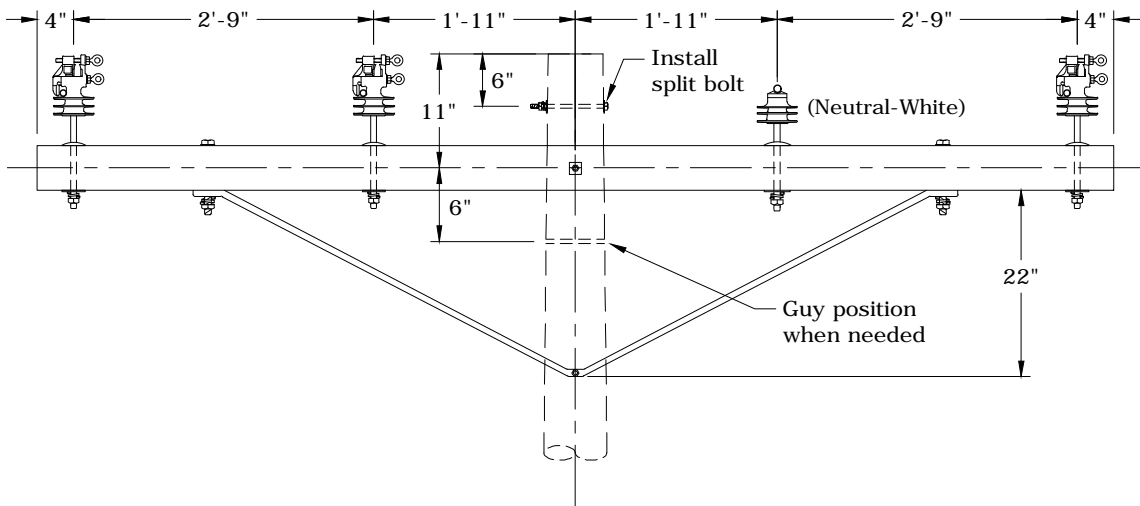
**CONSTRUCTION STANDARDS**  
 3Ø DOUBLE 10' CROSSARM W/ ANGLE VISE-TOPS  
 16° TO 30°  
 795 AAC MAX WIRE

REVISIONS			
NO.	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	6/7/06	LB	AH
3	1/4/18	CM	DK
APP: ELM SECTION			
DATE: 1/31/80	340		



**Vise-Top Installation:**

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off



- Notes:**
1. Maximum line angle calculated for 5,000 lbs. MWT and 250-ft ruling span.
  2. This framing is for clearance limited situations only.
  3. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase and neutral.

Rev. 3 - Changed post insulators to vise-top, added avian note, and updated material list.



**CONSTRUCTION STANDARDS**  
 3Ø SINGLE 10' CROSSARM-HIGH NEUTRAL  
 0° TO 5°  
 795 AAC MAX WIRE

PAGE:  
1 of 2

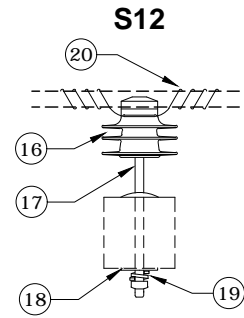
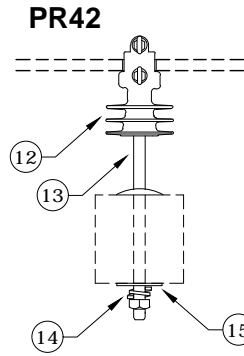
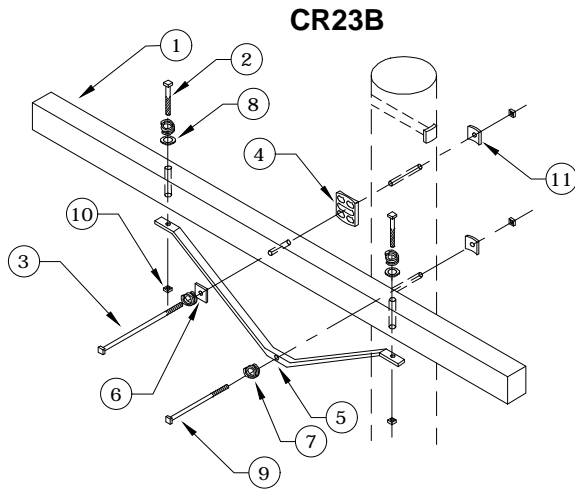
**D4B**

CAD FILE:  
D4B

**REVISIONS**

REV	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	6/7/06	LB	AH
3	1/4/18	CM	DK

APP:	ELM	SECTION
DATE:	1/31/80	<b>340</b>



Neutral

Rev. 3 - Changed post insulators to vise-top, added avian note, and updated material list.

ITEM NO.	DESCRIPTION	D4B	
		CR23B	
		QTY.	S/N
1	Arm, Cross (Distr.), 3 3/4" x 4 3/4" x 10'	1	26
2	Bolt, Machine, 1/2" x7", Galv., 7800 lbs Ultimate Tensile *	2	143
3	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile *	1	157
4	Gain, Pole Plastic	1	709
5	Brace, Angle, 72"	1	204
6	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	1	1412
7	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	2	2217
8	Washer, Flat, Round, Galv., 1/2"	2	1394
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile *	1	155
10	Washer, Lock, Spring, Double Coil, Galv., 1/2" *	2	2216
11	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
ITEM NO.	DESCRIPTION	PR42 (3)	
		QTY.	S/N
12	Insulator, Vise-Top, Polymer *	3	2439
13	Pin, Crossarm *	3	961
14	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	3	2217
15	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	3	1412
ITEM NO.	DESCRIPTION	S12	
		QTY.	S/N
16	Insulator, Pin, C Neck, White Polymer *	1	2656
17	Pin, Crossarm	1	961
18	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	1	1412
19	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217
20	Wire, Tie, AL Annealed #4 SD	10	1421



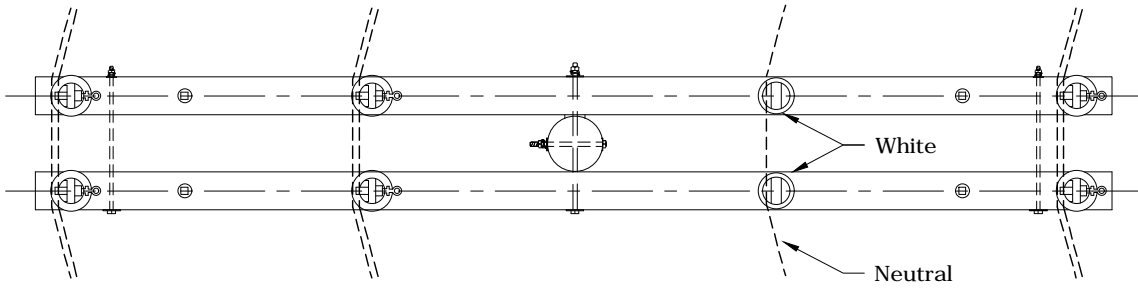
**CONSTRUCTION STANDARDS**  
 3Ø SINGLE 10' CROSSARM-HIGH NEUTRAL  
 0° TO 5°  
 795 AAC MAX WIRE

PAGE:  
2 of 2

**D4B**

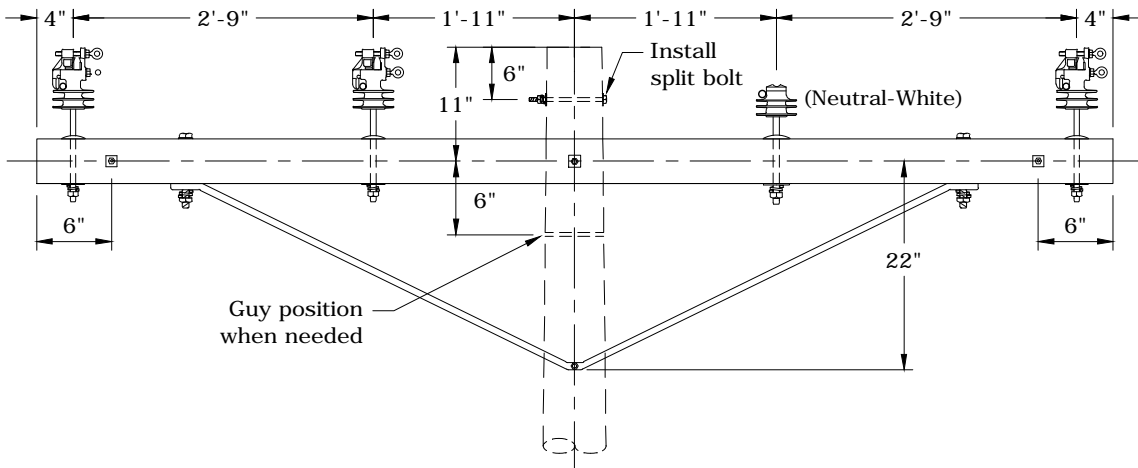
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D4B

REVISIONS			
REV	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	6/7/06	LB	AH
3	1/4/18	CM	DK
APP: ELM SECTION			
DATE: 1/31/80	340		



**Vise-Top Installation:**

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off



**Notes:**

1. Maximum line angle calculated for 5,000 lbs. MWT and 250-ft ruling span.
2. This framing is for clearance limited situations only.
3. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase and neutral.

Rev. 3 - Changed post insulators to vise-top, added avian note, and updated material list.



**CONSTRUCTION STANDARDS**

3Ø DOUBLE 10' CROSSARM-HIGH NEUTRAL  
6° TO 15°  
795 AAC MAX WIRE

PAGE:  
1 of 2

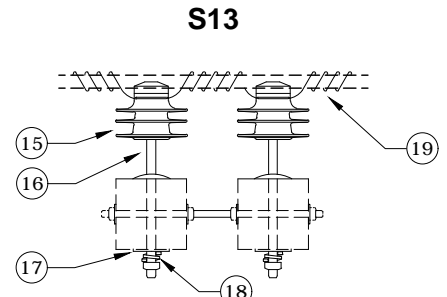
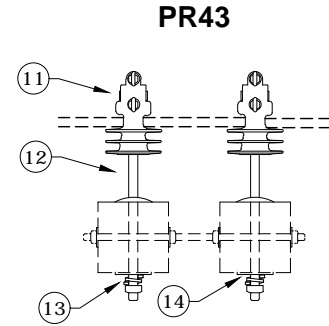
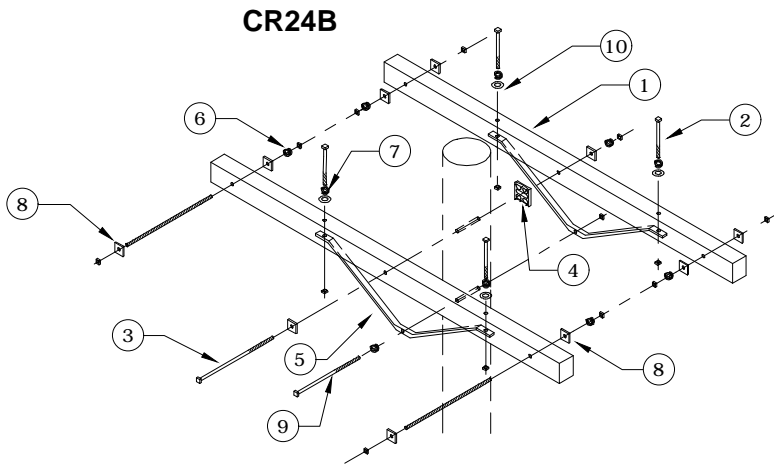
**D5B**

CAD FILE:  
D5B

**REVISIONS**

REV	DATE	ENGR	OPS
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3	1/4/18	CM	DK

APP: ELM	SECTION
DATE: 1/31/80	<b>340</b>



**Neutral**

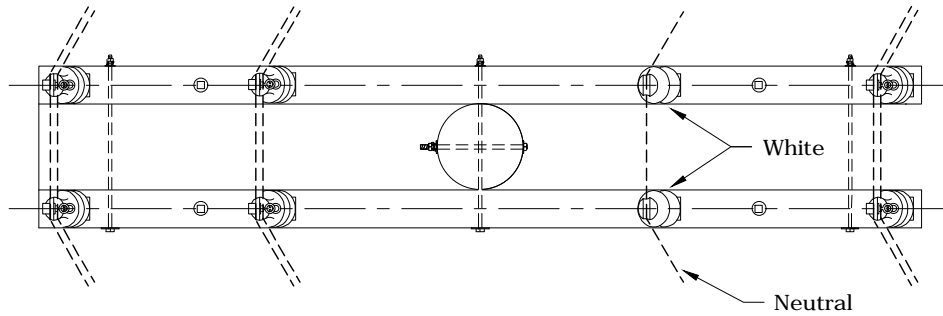
Rev. 3 - Changed post insulators to vise-top, added avian note, and updated material list.

ITEM NO.	DESCRIPTION	D5B	
		CR24B	
ITEM NO.	DESCRIPTION	QTY.	S/N
1	Arm, Cross (Distr.), 3 3/4" x 4 3/4" x 10'	2	26
2	Bolt, Machine, 1/2" x 7", Galv., 7800 lbs Ultimate Tensile *	4	143
3	Bolt, Double Arm, 5/8" x 20", Galv., 12,400 lbs Ultimate Tensile	3	83
4	Gain, Pole Plastic	1	709
5	Brace, Angle, 72"	2	204
6	Washer, Lock, Spring, Double Coil, Galv., 5/8"*	6	2217
7	Washer, Lock, Spring, Double Coil, Galv., 1/2"*	4	2216
8	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	10	1412
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile	1	155
10	Washer, Flat, Round, Galv., 1/2"	4	1394
ITEM NO.	DESCRIPTION	PR43 (3)	
ITEM NO.	DESCRIPTION	QTY.	S/N
11	Insulator, Vise-Top, Polymer *	6	2439
12	Pin, Crossarm *	6	961
13	Washer, Lock, Spring, Double Coil, Galv., 5/8"*	6	2217
14	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	6	1412
ITEM NO.	DESCRIPTION	S13	
ITEM NO.	DESCRIPTION	QTY.	S/N
15	Insulator, Pin, C Neck, White Polymer*	2	2656
16	Pin, Crossarm	2	961
17	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	2	1412
18	Washer, Lock, Spring, Double Coil, Galv., 5/8"*	2	2217
19	Wire, Tie, AL Annealed #4 SD	20	1421



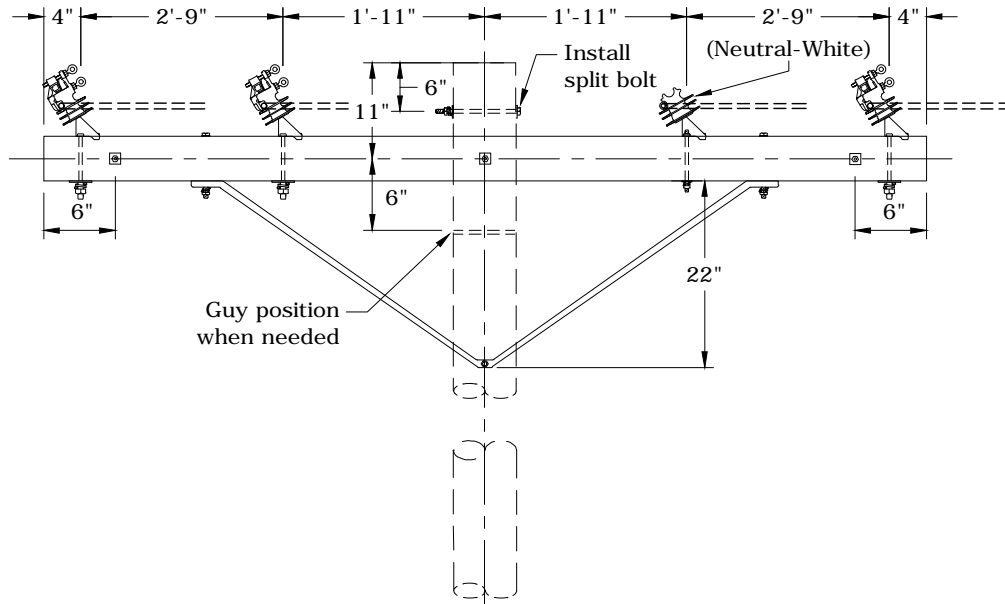
**CONSTRUCTION STANDARDS**  
 3Ø DOUBLE 10' CROSSARM-HIGH NEUTRAL  
 6° TO 15°  
 795 AAC MAX WIRE

REVISIONS			
Δ	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	6/7/06	LB	AH
3	1/4/18	CM	DK
Δ			
APP:	ELM	SECTION	
DATE:	1/31/80	340	



**Vise-Top Installation:**

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off



**Notes:**

1. Maximum line angle calculated for 5,000 lbs. MWT and 250-ft ruling span.
2. This framing is for clearance limited situations only.
3. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase and neutral.

Rev. 3 - Changed post insulators to vise-top, added avian note, and updated material list.



**CONSTRUCTION STANDARDS**

3Ø DOUBLE 10' CROSSARM W/ ANGLE VISE-TOPS  
HIGH NEUTRAL, 16° TO 30°  
795 AAC MAX WIRE

PAGE:  
1 of 2

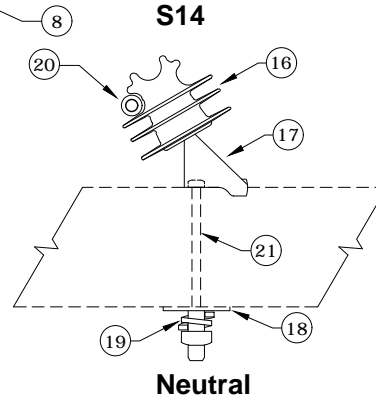
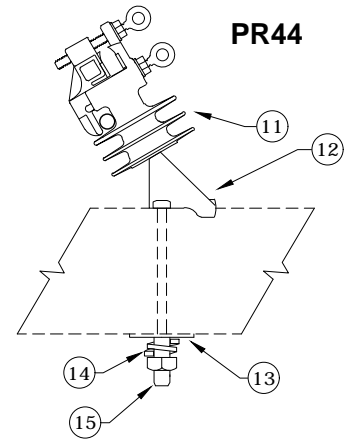
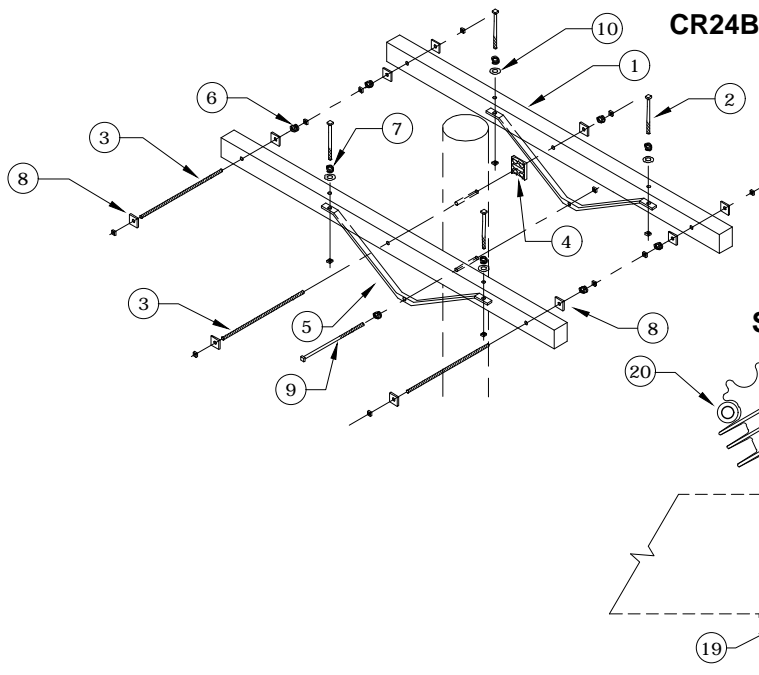
**D6B**

CAD FILE:  
D6B

**REVISIONS**

REV	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	6/7/06	LB	AH
3	1/4/18	CM	DK

APP:	ELM	SECTION
DATE:	1/31/80	<b>340</b>



Rev. 3 - Changed post insulators to vise-top, added avian note, and updated material list.

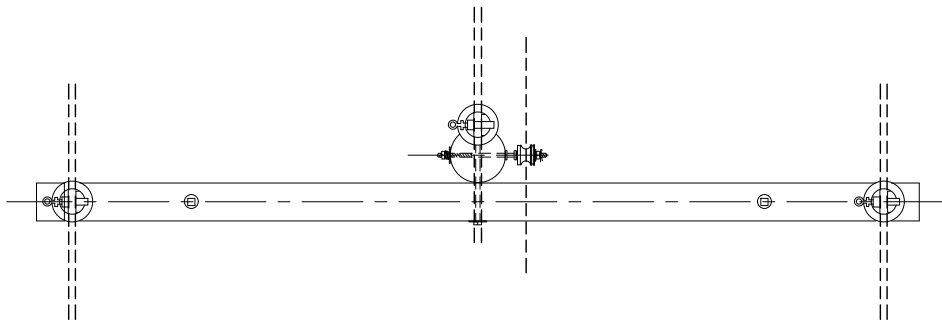
ITEM NO.	DESCRIPTION	D6B	
		CR24B	
ITEM NO.	DESCRIPTION	QTY.	S/N
1	Arm, Cross (Distr.), 3 3/4" x 4 3/4" x 10'	2	26
2	Bolt, Machine, 1/2" x 7", Galv., 7800 lbs Ultimate Tensile *	4	143
3	Bolt, Double Arm, 5/8" x 20", Galv., 12,400 lbs Ultimate Tensile *	3	83
4	Gain, Pole Plastic	1	709
5	Brace, Angle, 72"	2	204
6	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	6	2217
7	Washer, Lock, Spring, Double Coil, Galv., 1/2" *	4	2216
8	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	10	1412
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile *	1	155
10	Washer, Flat, Round, Galv., 1/2"	4	1394
ITEM NO.	DESCRIPTION	PR44 (6)	
ITEM NO.	DESCRIPTION	QTY.	S/N
11	Insulator, Vise-Top, Polymer *	6	2439
12	Pin, Angle, Crossarm *	6	2658
13	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	6	1412
14	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	6	2217
15	Bolt, Machine, 5/8" x 7", Galv., 12,400 lbs Ultimate Tensile *	6	2606
ITEM NO.	DESCRIPTION	S14 (2)	
ITEM NO.	DESCRIPTION	QTY.	S/N
16	Insulator, Pin, C Neck, White Polymer	2	2656
17	Pin, Angle, Crossarm	2	2658
18	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	2	1412
19	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	2	2217
20	Wire, Tie, AL Annealed #4 SD	20	1421
21	Bolt, Machine, 5/8" x 7", Galv., 12,400 lbs Ultimate Tensile *	2	2606



**CONSTRUCTION STANDARDS**  
 3Ø DOUBLE 10' CROSSARM W/ ANGLE VISE-TOPS  
 HIGH NEUTRAL, 16° TO 30°  
 795 AAC MAX WIRE

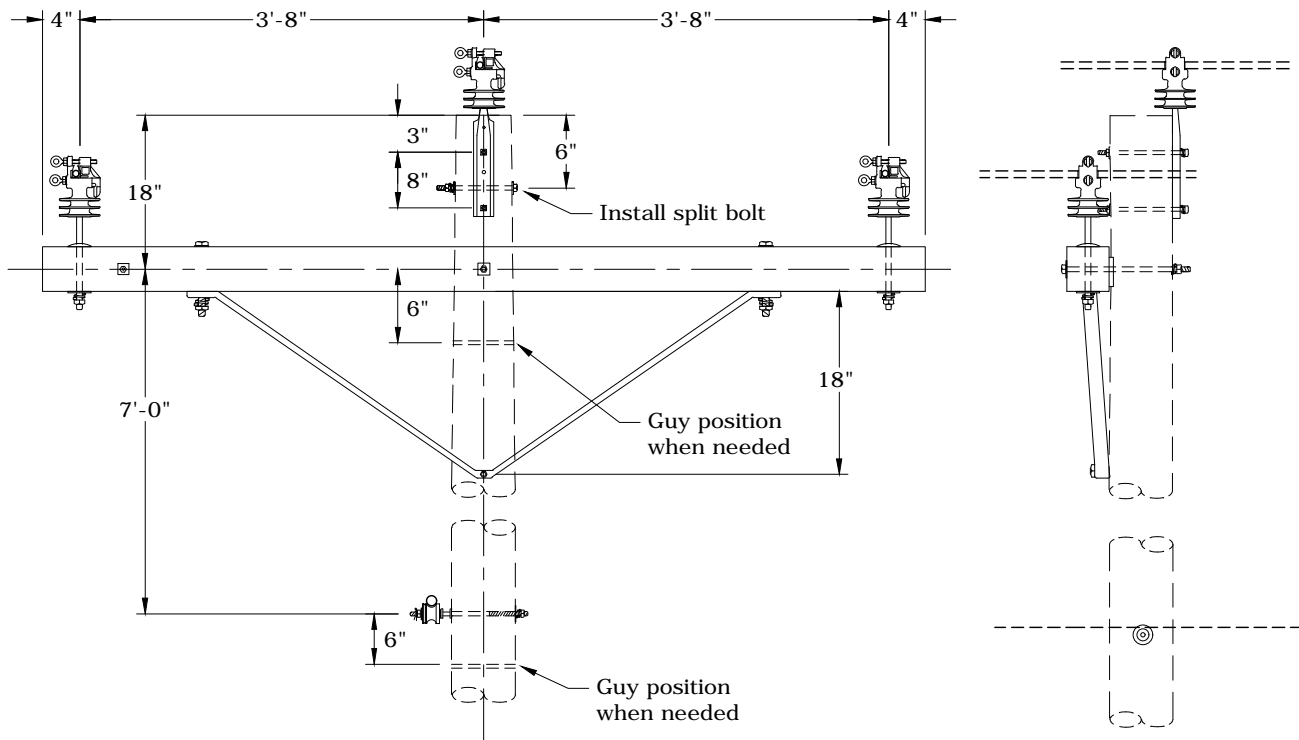
REVISIONS			
Δ	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	6/7/06	LB	AH
3	1/4/18	CM	DK
Δ			
APP:	ELM	SECTION	
DATE:	1/31/80	340	





**Vise-Top Installation:**

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off



**Notes:**

1. Maximum line angle calculated for 5,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase.

Rev. 3 - Changed post insulators to vise-top, added avian note, and updated material list.



**CONSTRUCTION STANDARDS**

3Ø SINGLE 8' CROSSARM W/ POLE TOP  
0° TO 5°  
795 AAC MAX WIRE

PAGE:  
1 of 2

**D7A**

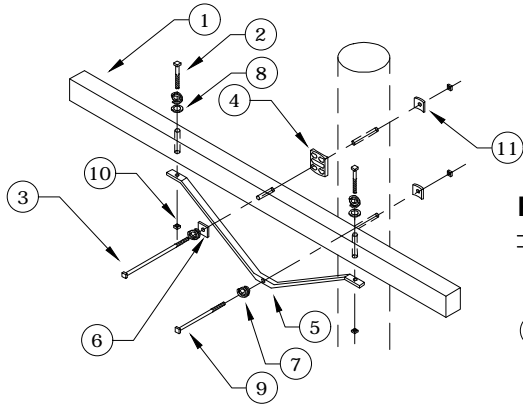
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**REVISIONS**

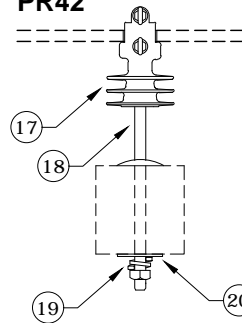
REV	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	6/7/06	LB	AH
3	1/4/18	CM	DK

APP:	ELM	SECTION
DATE:	1/31/80	<b>340</b>

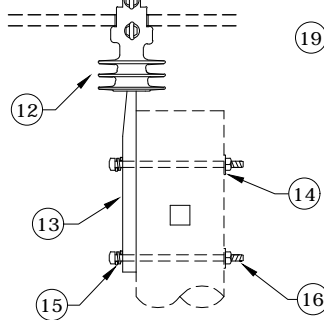
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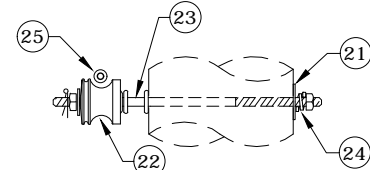
**PR42**



**PR40**



**S1**



**Neutral**

Rev. 3 - Changed post insulators to vise-top, added avian note, and updated material list.

ITEM NO.	DESCRIPTION	D7A	
		CR23A	
		QTY.	S/N
1	Arm, Cross (Distr.), 3 3/4" x 4 3/4" x 8'	1	25
2	Bolt, Machine, 1/2" x 7", Galv., 7800 lbs Ultimate Tensile *	2	143
3	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile *	1	157
4	Gain, Pole Plastic	1	709
5	Brace, Angle, 60"	1	203
6	Washer, Square, Flat 5/8", 2 1/4" x 2 1/4"	1	1412
7	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	2	2217
8	Washer, Flat, Round, Galv., 1/2"	2	1394
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile *	1	155
10	Washer, Lock, Spring, Double Coil, Galv., 1/2" *	2	2216
11	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
ITEM NO.	DESCRIPTION	PR40	
		QTY.	S/N
12	Insulator, Vise-Top, Polymer *	1	2439
13	Pin, Pole Top *	1	962
14	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
15	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	2	2217
16	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile *	2	155
ITEM NO.	DESCRIPTION	PR42 (2)	
		QTY.	S/N
17	Insulator, Vise-Top, Polymer *	2	2439
18	Pin, Crossarm *	2	961
19	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	2	2217
20	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	2	1412
ITEM NO.	DESCRIPTION	S1	
		QTY.	S/N
21	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
22	Insulator, Spool, Clevis, Small, ANSI 53-2 Class	1	773
23	Bolt, Double Upset, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	1	1580
24	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217
25	Wire, Tie, AL Annealed #4 SD	10	1421



**CONSTRUCTION STANDARDS**

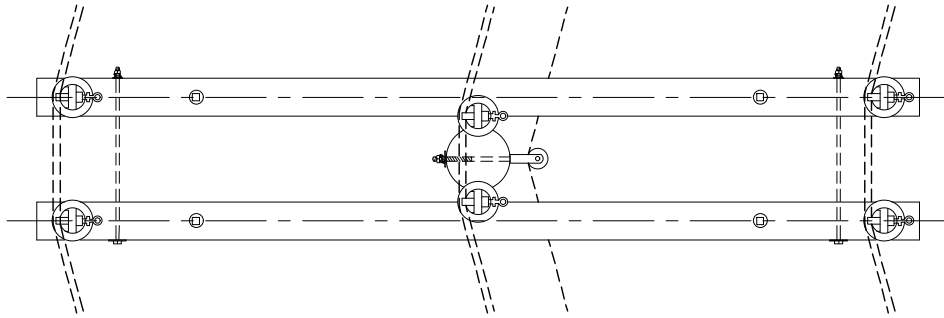
3Ø SINGLE 8' CROSSARM W/ POLE TOP  
0° TO 5°  
795 AAC MAX WIRE

PAGE:  
2 of 2

**D7A**

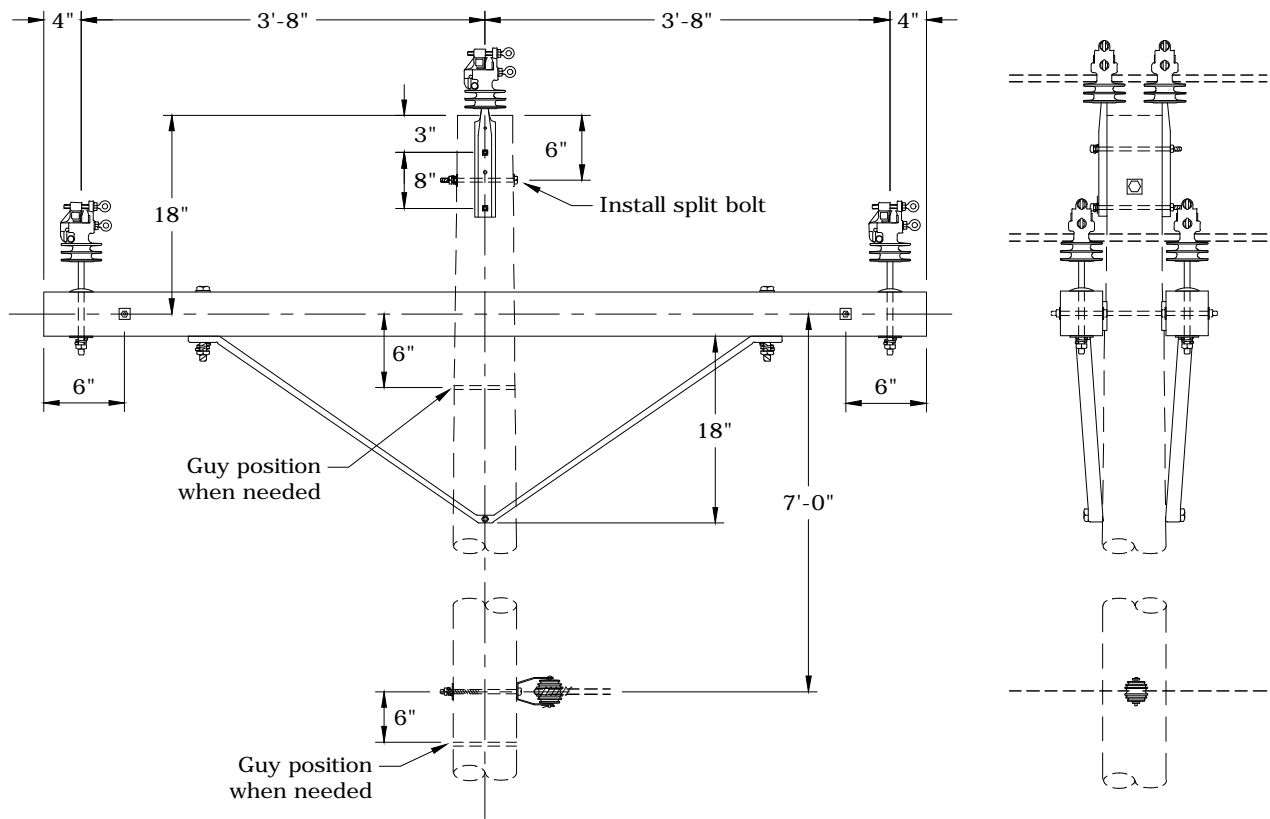
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D7A

REVISIONS			
Δ	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	6/7/06	LB	AH
3	1/4/18	CM	DK
Δ			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>340</b>	



**Vise-Top Installation:**

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off



**Notes:**

1. Maximum line angle calculated for 5,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase.

Rev. 3 - Changed post insulators to vise-top, added avian note, and updated material list.



**CONSTRUCTION STANDARDS**  
 3Ø DOUBLE 8' CROSSARM W/ DOUBLE POLE  
 TOP - 6° TO 15°  
 795 AAC MAX WIRE

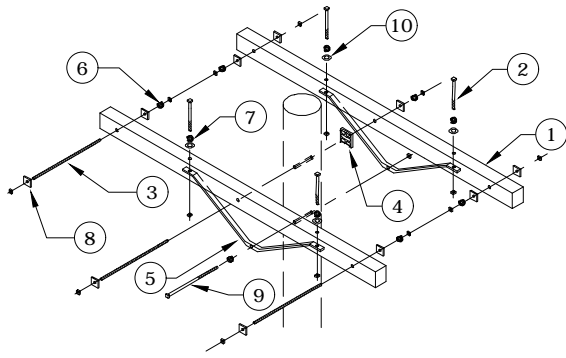
PAGE:  
1 of 2

**D8A**

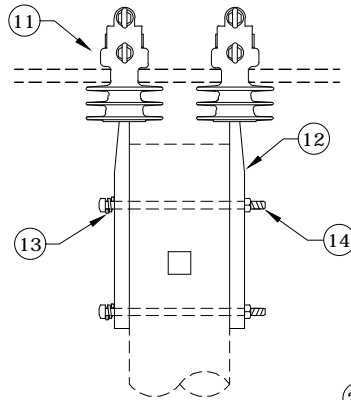
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D8A

REVISIONS			
△	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	6/7/06	LB	AH
3	1/4/18	CM	DK
△			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>340</b>	

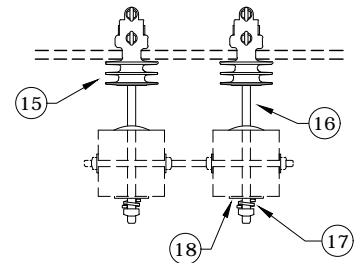
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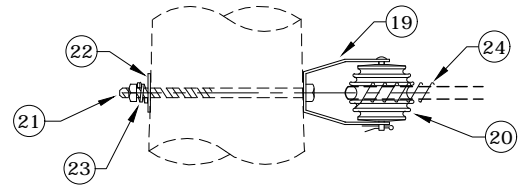
**PR41**



**PR43**



**S3**



**Neutral**

Rev. 3 - Changed post insulators to vise-top, added avian note, and updated material list.

ITEM NO.	DESCRIPTION	D8A	
		CR24A	
		QTY.	S/N
1	Arm, Cross (Distr.), 3 3/4" x 4 3/4" x 8'	2	25
2	Bolt, Machine, 1/2" x 7", Galv., 7800 lbs Ultimate Tensile	4	143
3	Bolt, Double Arm, 5/8" x 20", Galv., 12,400 lbs Ultimate Tensile	3	83
4	Gain, Pole Plastic	1	709
5	Brace, Angle, 60"	2	203
6	Washer, Spring, Lock, Double Coil, Galv., 5/8"	6	2217
7	Washer, Spring, Lock, Double Coil, Galv., 1/2"	4	2216
8	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	10	1412
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile	1	155
10	Washer, Flat, Round, Galv., 1/2"	4	1394
ITEM NO.	DESCRIPTION	PR41	
		QTY.	S/N
11	Insulator, Vise-Top, Polymer ✱	2	2439
12	Pin, Pole Top ✱	2	962
13	Washer, Lock, Spring, Double Coil, Galv., 5/8" ✱	2	2217
14	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile ✱	2	156
ITEM NO.	DESCRIPTION	PR43 (2)	
		QTY.	S/N
15	Insulator, Vise-Top, Polymer ✱	4	2439
16	Pin, Crossarm ✱	4	961
17	Washer, Lock, Spring, Double Coil, Galv., 5/8" ✱	4	2217
18	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	4	1412
ITEM NO.	DESCRIPTION	S3	
		QTY.	S/N
19	Clevis, DE Insulator 1344	1	336
20	Insulator, Spool, Large, ANSI 53-5 Class	1	774
21	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	156
22	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
23	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217
24	Wire, Tie, AL Annealed #4 SD	10	1421

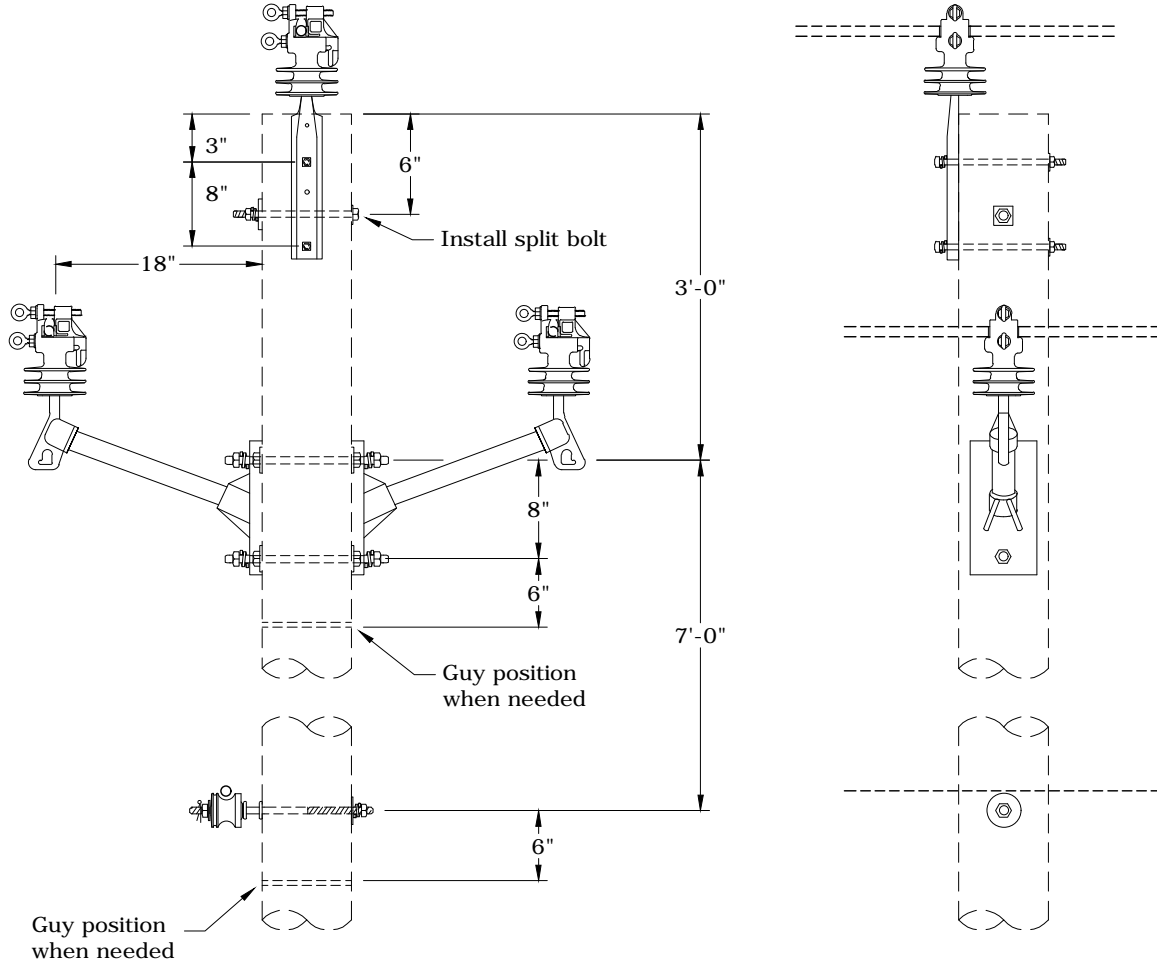


**CONSTRUCTION STANDARDS**  
 3Ø DOUBLE 8' CROSSARM W/ DOUBLE POLE  
 TOP - 6° TO 15°  
 795 AAC MAX WIRE

REVISIONS			
Δ	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	6/7/06	LB	AH
3	1/4/18	CM	DK
Δ			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>340</b>	

Vise-Top Installation:

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off



Notes:

1. Maximum line angle calculated for 5,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase and one of the outside phases.

Rev. 3 - Changed all insulators to vise-top, added avian note, and updated material list.



CONSTRUCTION STANDARDS

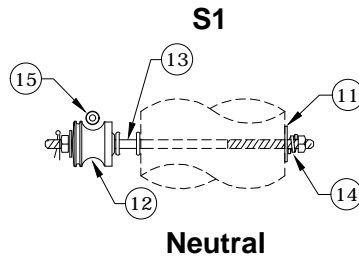
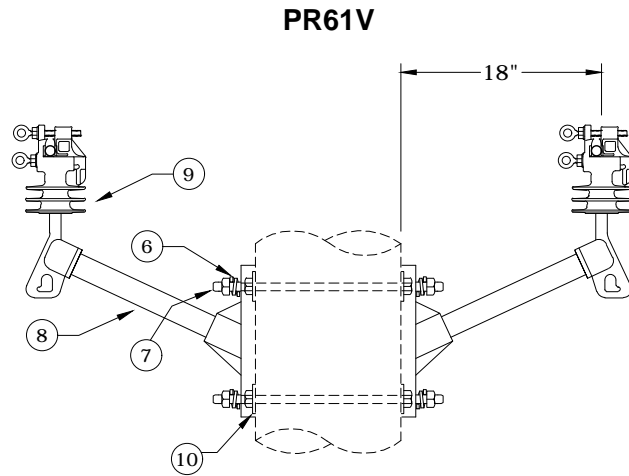
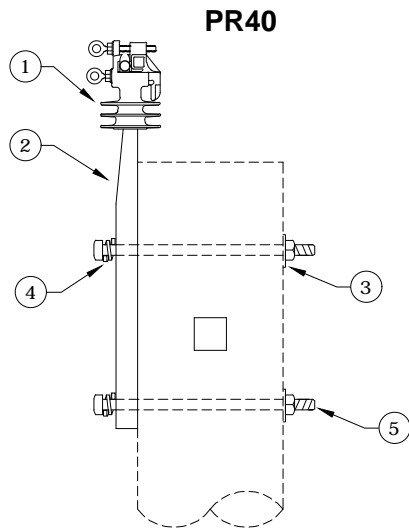
3Ø TWIGGY  
0° TO 5°  
795 AAC MAX WIRE

PAGE:  
1 of 2

D10

CAD FILE:  
D10

REVISIONS											
NO.	DATE	ENGR	OPS								
1	3/28/02	HWH	DLK								
2	8/10/06	LB	AH								
3	1/4/18	CM	DK								
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APP:	SECTION										
DATE:	340										



Rev. 3 - Changed all insulators to vise-top, added avian note, and updated material list.

ITEM NO.	DESCRIPTION	D10	
		QTY.	S/N
1	Insulator, Vise-Top, Polymer *	1	2439
2	Pin, Pole Top *	1	962
3	Washer, Curved, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
4	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	2	2217
5	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile*	2	155
ITEM NO.	DESCRIPTION	PR61V	
		QTY.	S/N
6	Washer, Lock, Spring, Double Coil, Galv., 5/8"	4	2217
7	Bolt, Double Arm, 5/8" x 18", Galv., 12,400 lbs Ultimate Tensile	2	82
8	Arm, Epoxy 18" 2500 lbs	2	2504
9	Insulator, Vise-Top, Polymer	2	2439
10	Washer, Flat, Round, Galv., 5/8"	4	1395
ITEM NO.	DESCRIPTION	S1	
		QTY.	S/N
11	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
12	Insulator, Spool, Clevis, Small, ANSI 53-2 Class	1	773
13	Bolt, Double Upset, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	1	1580
14	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217
15	Wire, Tie, AL Annealed #4 SD	10	1421



### CONSTRUCTION STANDARDS

3Ø TWIGGY  
0° TO 5°  
795 AAC MAX WIRE

PAGE:  
2 of 2

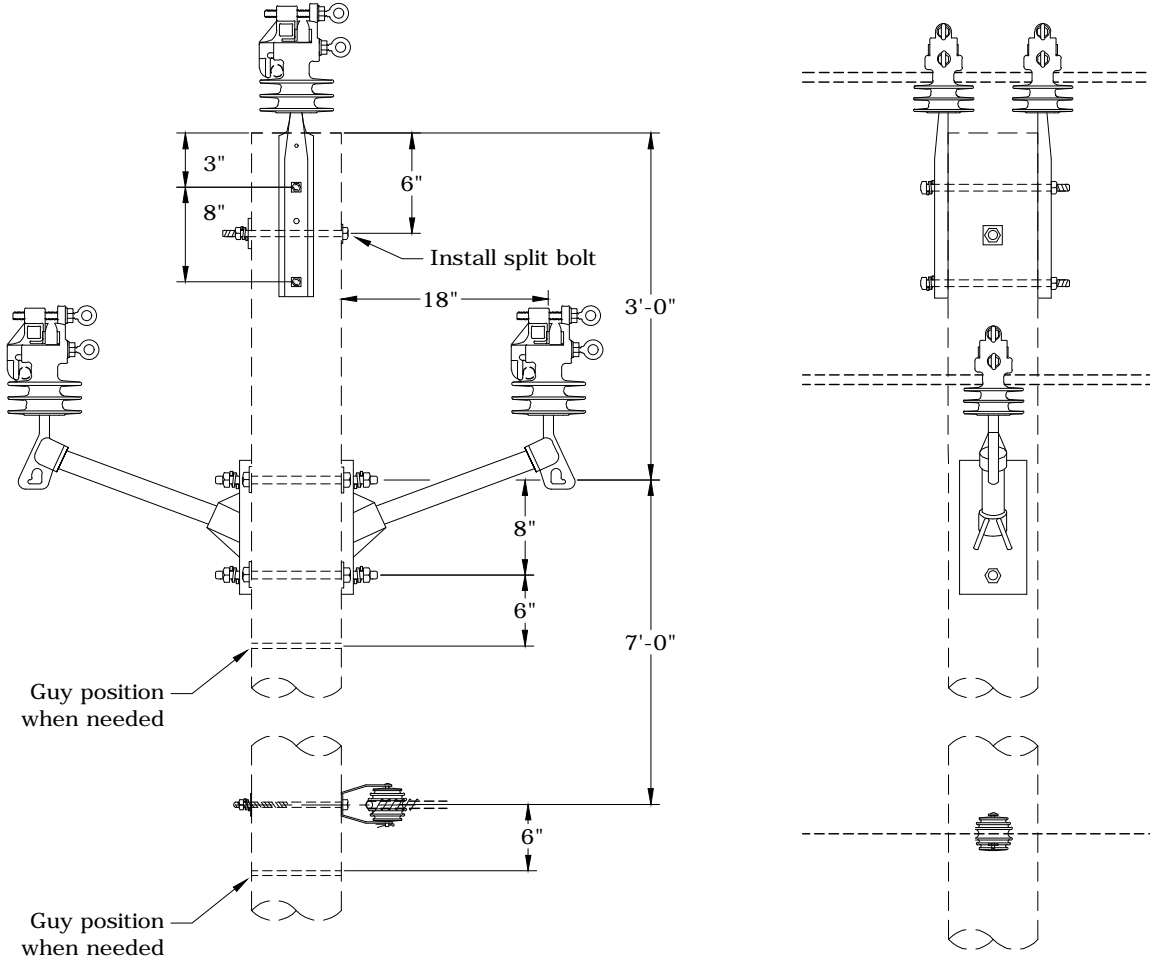
**D10**

CAD FILE:  
D10

REVISIONS			
Δ	DATE	ENGR	OPS
1	3/28/02	HWH	DLK
2	8/10/06	LB	AH
3	1/4/18	CM	DK
Δ			
APP:	SECTION		
DATE:	<b>340</b>		

Vise-Top Installation:

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off

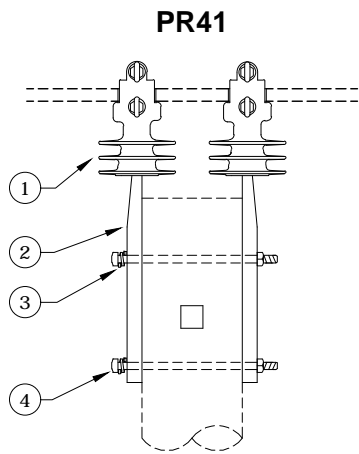


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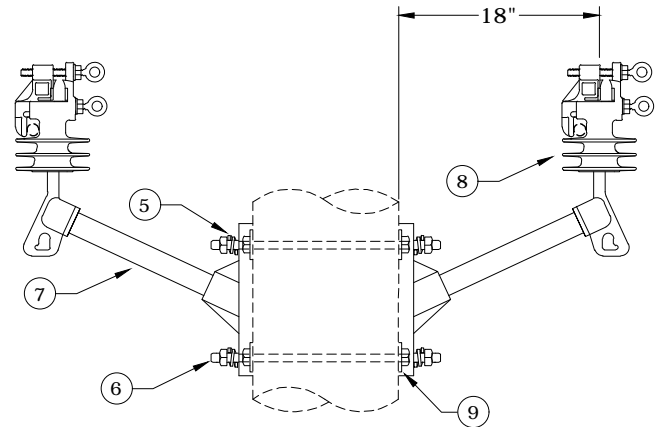
1. Maximum line angle calculated for 5,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase and one of the outside phases.

Rev. 3 - Changed all insulators to vise-top, added avian note, and updated material list.

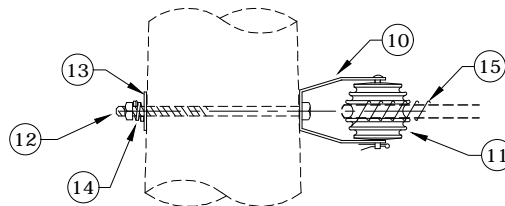
	<b>CONSTRUCTION STANDARDS</b>			<b>REVISIONS</b>				
	3Ø TWIGGY 6° TO 15° 795 AAC MAX WIRE			DATE	ENGR	OPS		
				1	3/28/02	HWH	DLK	
				2	8/10/06	LB	AH	
			3	1/4/18	CM	DK		
							SECTION	
PAGE: 1 of 2			<b>D11</b>			APP: DATE:		<b>340</b>
			CAD FILE: D11					



**PR61V**



**S3**



**Neutral**

Rev. 3 - Changed all insulators to vise-top, added avian note, and updated material list.

ITEM NO.	DESCRIPTION	D11	
		PR41	
		QTY.	S/N
1	Insulator, Vise-Top, Polymer *	2	2439
2	Pin, Pole Top *	2	962
3	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	2	2217
4	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	2	156
ITEM NO.	DESCRIPTION	PR61V	
		QTY.	S/N
5	Washer, Lock, Spring, Double Coil, Galv., 5/8"	4	2217
6	Bolt, Double Arm, 5/8" x 18", Galv., 12,400 lbs Ultimate Tensile	2	82
7	Arm, Epoxy 18" 2500 lb	2	2504
8	Insulator, Vise-Top, Polymer	2	2439
9	Washer, Flat, Round, Galv., 5/8"	4	1395
ITEM NO.	DESCRIPTION	S3	
		QTY.	S/N
10	Clevis, DE Insulator 1344	1	336
11	Insulator, Spool, Clevis, Large, ANSI 53-5 Class	1	774
12	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	1	156
13	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
14	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217
15	Wire, Tie, AL Annealed #4 SD	10	1421



**CONSTRUCTION STANDARDS**

3Ø TWIGGY  
6° TO 15°  
795 AAC MAX WIRE

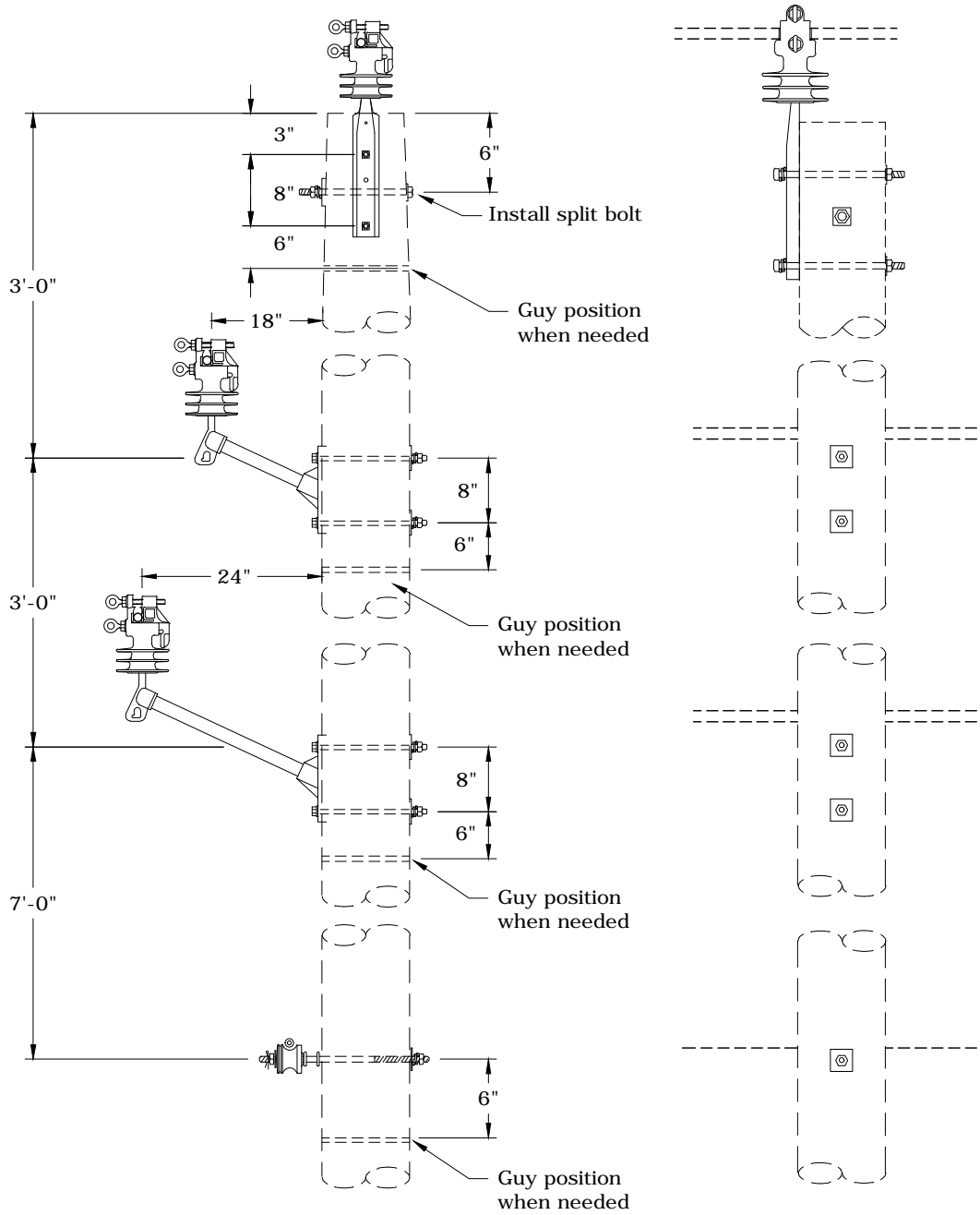
**REVISIONS**

NO.	DATE	ENGR	OPS
1	3/28/02	HWH	DLK
2	8/10/06	LB	AH
3	1/4/18	CM	DK



**Vise-Top Installation:**

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off



**Notes:**

1. Maximum line angle calculated for 5,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase.

Rev. 3 - Changed all insulators to vise-top, added avian note, and updated material list.



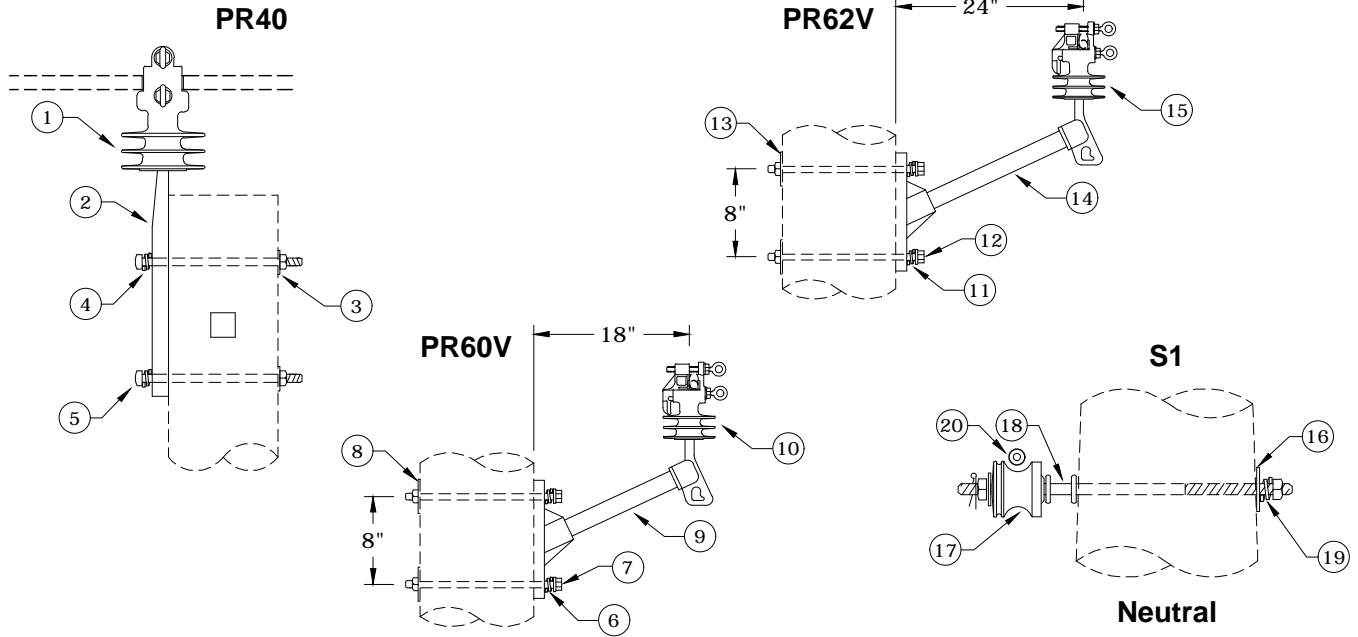
**CONSTRUCTION STANDARDS**  
 3Ø VERTICAL W/ POLE TOP  
 0° TO 5°  
 795 AAC MAX WIRE

PAGE:  
1 of 2

**D13**

CAD FILE:  
D13

REVISIONS			
△	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	8/10/06	LB	AH
3	1/4/18	CM	DK
△			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>340</b>	



Rev. 3 - Changed all insulators to vise-top, added avian note, and updated material list.

ITEM NO.	DESCRIPTION	D13	
		PR40	
		QTY.	S/N
1	Insulator, Vise-Top, Polymer ✱	1	2439
2	Pin, Pole Top ✱	1	962
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
4	Washer, Lock, Spring, Double Coil, Galv., 5/8" ✱	2	2217
5	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile ✱	2	155
ITEM NO.	DESCRIPTION	PR60V	
		QTY.	S/N
6	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217
7	Bolt, Machine, 5/8" x 16" Galv., 12,400 lbs Ultimate Tensile	2	157
8	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
9	Arm, Epoxy 18" 2500 lbs	1	2504
10	Insulator, Vise-Top, Polymer	1	2439
ITEM NO.	DESCRIPTION	PR62V	
		QTY.	S/N
11	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217
12	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile	2	157
13	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
14	Arm, Epoxy 24" 2500 lbs	1	2605
15	Insulator, Vise-Top, Polymer	1	2439
ITEM NO.	DESCRIPTION	S1	
		QTY.	S/N
16	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
17	Insulator, Spool, Clevis, Small, ANSI 53-2 Class	1	773
18	Bolt, Double Upset, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile ✱	1	1580
19	Washer, Lock, Spring, Double Coil, Galv., 5/8" ✱	1	2217
20	Wire, Tie, AL Annealed #4 SD	10	1421



## CONSTRUCTION STANDARDS

3Ø VERTICAL W/ POLE TOP  
0° TO 5°  
795 AAC MAX WIRE

PAGE:  
2 of 2

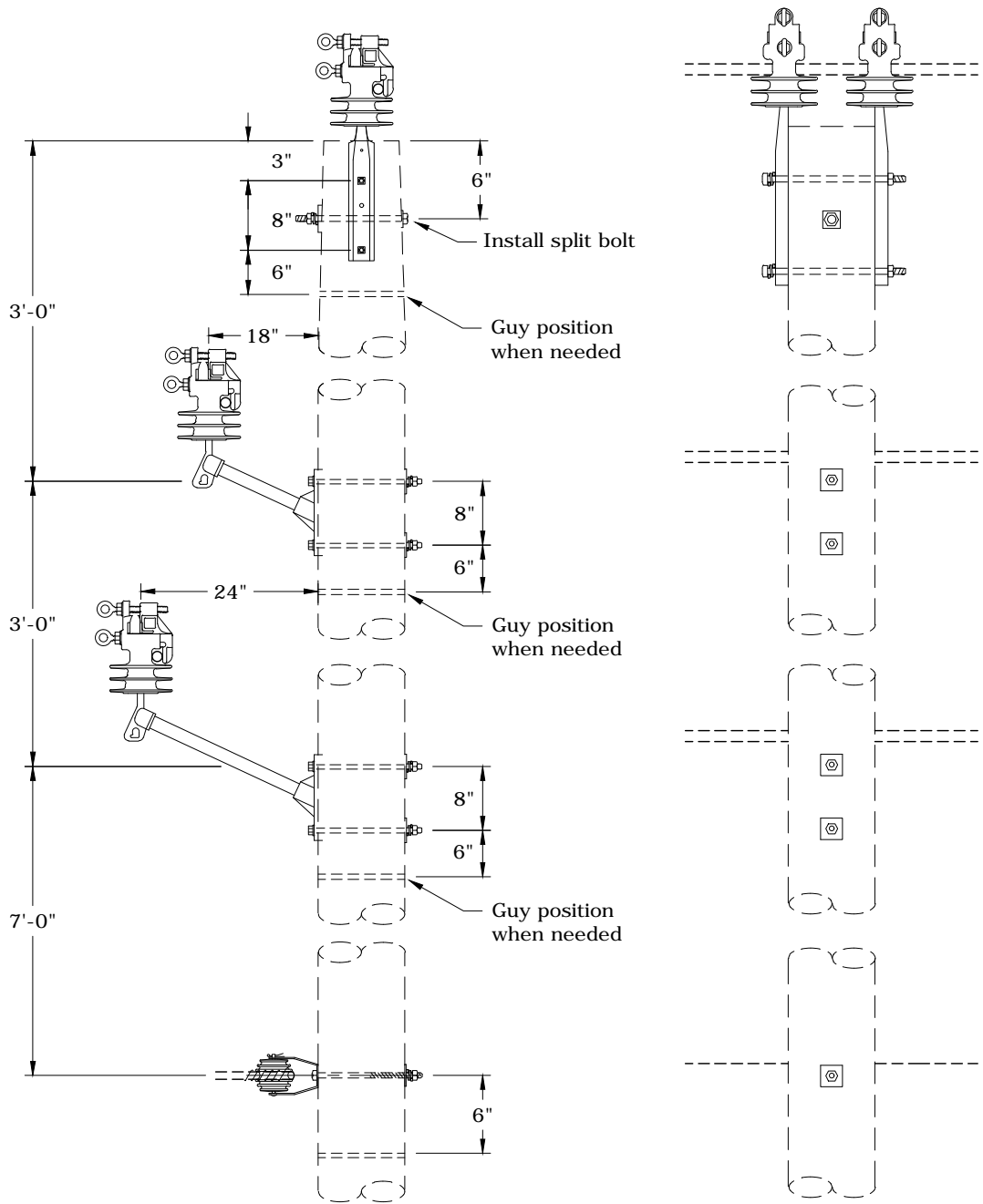
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CAD FILE:  
D13

REVISIONS											
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2	8/10/06	LB	AH								
3	1/4/18	CM	DK								
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APP:	ELM	SECTION									
DATE:	1/31/80	340									

**Vise-Top Installation:**

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off



**Notes:**

1. Maximum line angle calculated for 5,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase.

Rev. 3 - Changed all insulators to vise-top, added avian note, and updated material list.



**CONSTRUCTION STANDARDS**  
 3Ø VERTICAL W/ DOUBLE POLE TOP  
 6° TO 15°  
 795 AAC MAX WIRE

PAGE:  
1 of 2

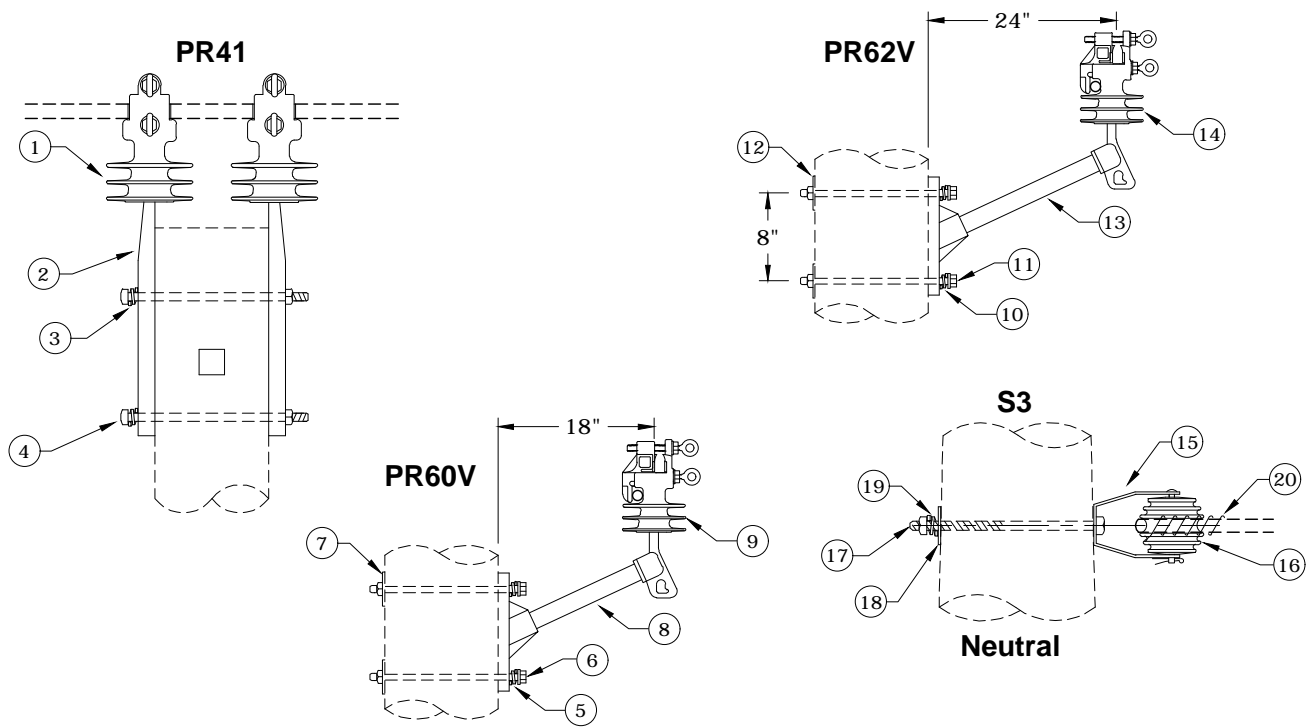
**D14**

CAD FILE:  
D14

**REVISIONS**

REV	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	8/10/06	LB	AH
3	1/4/18	CM	DK

APP:	ELM	SECTION
DATE:	1/31/80	<b>340</b>



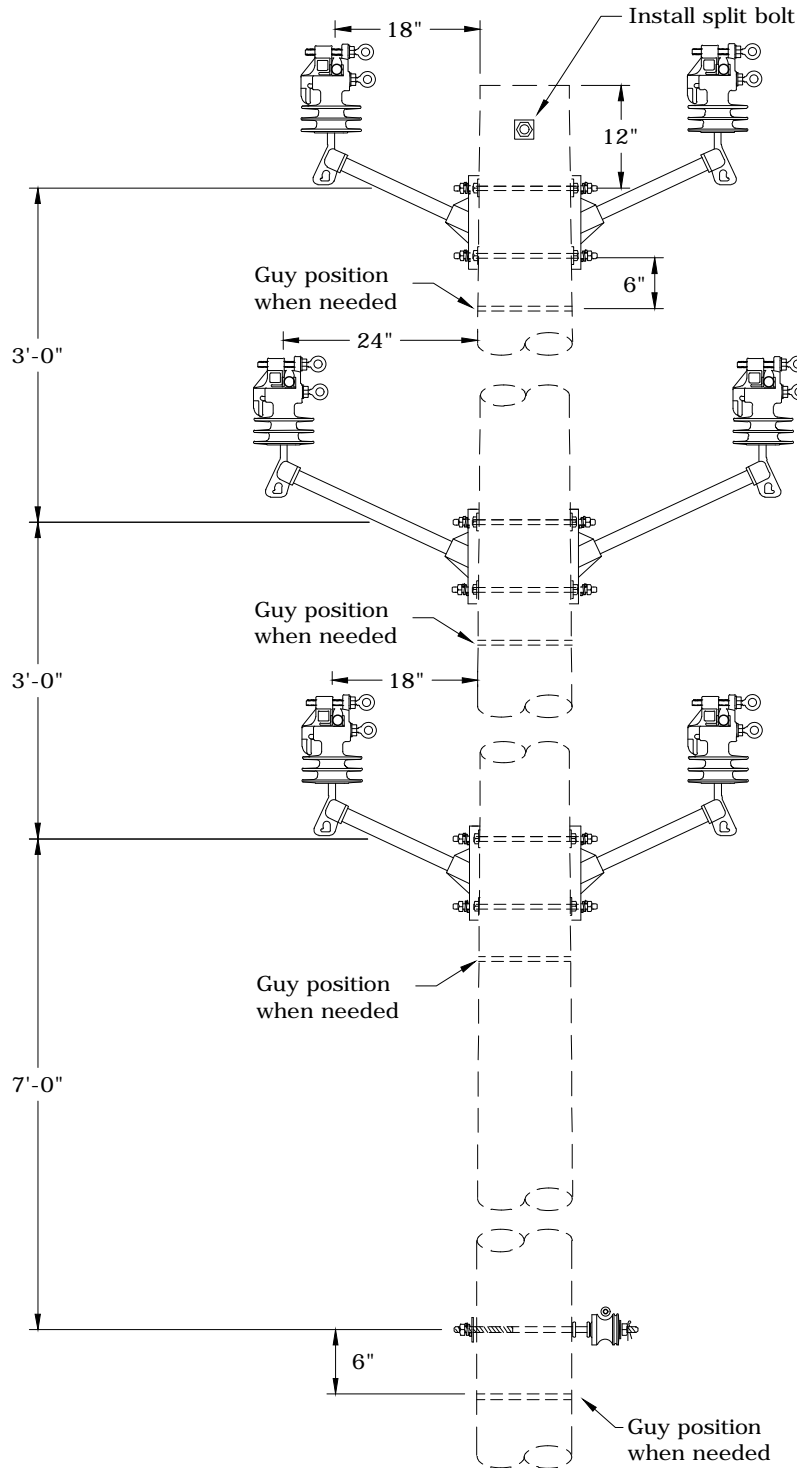
Rev. 3 - Changed all insulators to vise-top, added avian note, and updated material list.

ITEM NO.	DESCRIPTION	D14	
		PR41	
		QTY.	S/N
1	Insulator, Vise-Top, Polymer ✱	2	2439
2	Pin, Pole Top ✱	2	962
3	Washer, Lock, Spring, Double Coil, Galv., 5/8" ✱	2	2217
4	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile ✱	2	156
ITEM NO.	DESCRIPTION	PR60V	
		QTY.	S/N
5	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217
6	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile	2	157
7	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
8	Arm, Epoxy 18" 2500 lbs	1	2504
9	Insulator, Vise-Top, Polymer	1	2439
ITEM NO.	DESCRIPTION	PR62V	
		QTY.	S/N
10	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217
11	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile	2	157
12	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
13	Arm, Epoxy 24" 2500 lbs	1	2605
14	Insulator, Vise-Top, Polymer	1	2439
ITEM NO.	DESCRIPTION	S3	
		QTY.	S/N
15	Clevis, DE Insulator 1344	1	336
16	Insulator, Spool, Clevis, Large, ANSI 53-5 Class	1	774
17	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile ✱	1	156
18	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
19	Washer, Lock, Spring, Double Coil, Galv., 5/8" ✱	1	2217
20	Wire, Tie, AL Annealed #4 SD	10	1421



**CONSTRUCTION STANDARDS**  
 3Ø VERTICAL W/ DOUBLE POLE TOP  
 6° TO 15°  
 795 AAC MAX WIRE

REVISIONS			
△	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	8/10/06	LB	AH
3	1/4/18	CM	DK
△			
APP:	ELM	SECTION	
DATE:	1/31/80	340	



**Vise-Top Installation:**

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off

**Notes:**

1. Maximum line angle calculated for 5,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers required on all three phases on one side of pole and center phase on opposite side.

Rev. 3 - Added avian note and changed to vise-top insulators on twiggy arms.



**CONSTRUCTION STANDARDS**

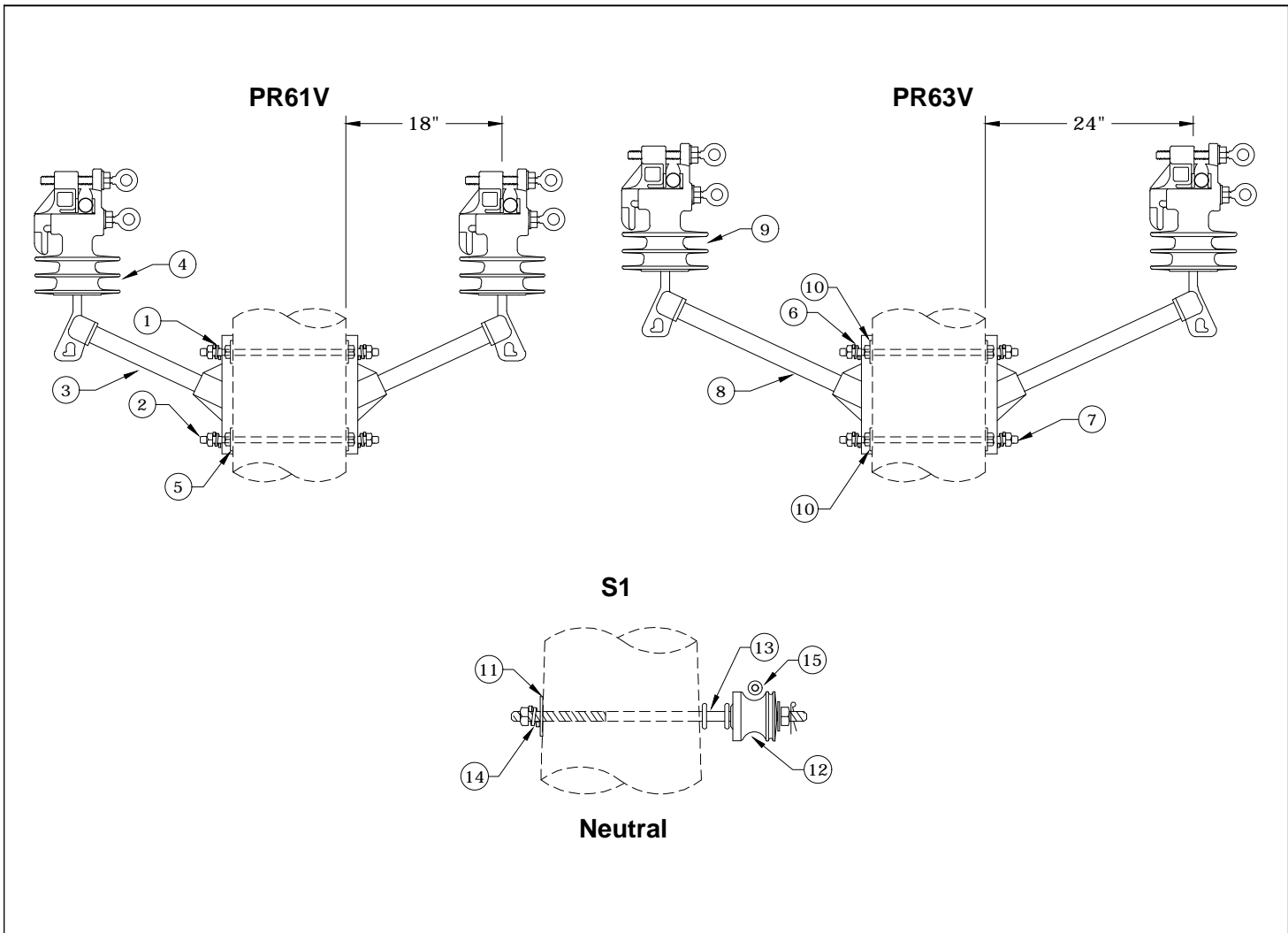
3Ø DOUBLE TWIGGY CIRCUIT  
0° TO 5°  
795 AAC MAX WIRE

PAGE:  
1 of 2

**D16**

CAD FILE:  
D16

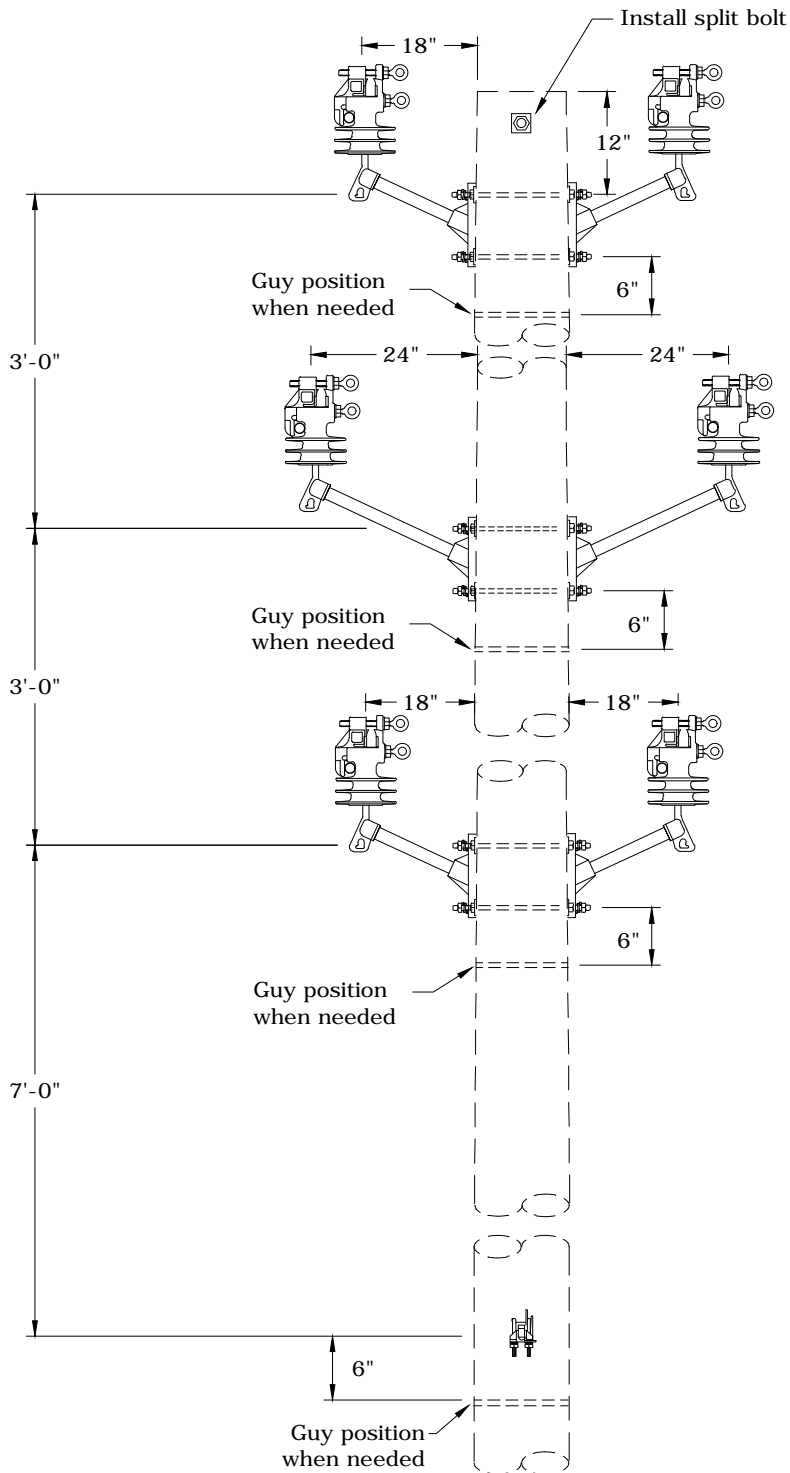
REVISIONS			
△	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	12/11/07	LB	AH
3	1/4/18	CM	DK
△			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>340</b>	



Rev. 3 - Added avian note and changed to vise-top insulators on twiggy arms.

		D16	
ITEM NO.	DESCRIPTION	PR61V (2)	
		QTY.	S/N
1	Washer, Lock, Spring, Double Coil, Galv., 5/8"	8	2217
2	Bolt, Double Arm, 5/8" x 18", Galv., 12,400 lbs Ultimate Tensile	4	82
3	Arm, Epoxy 18" 2500 lbs	4	2504
4	Insulator, Vise-Top, Polymer	4	2439
5	Washer, Flat, Round, Galv., 5/8"	8	1395
ITEM NO.	DESCRIPTION	PR63V	
		QTY.	S/N
6	Washer, Lock, Spring, Double Coil, Galv., 5/8"	4	2217
7	Bolt, Double Arm, 5/8" x 18", Galv., 12,400 lbs Ultimate Tensile	2	82
8	Arm, Epoxy 24" 2500 lbs	2	2605
9	Insulator, Vise-Top, Polymer	2	2439
10	Washer, Flat, Round, Galv., 5/8"	4	1395
ITEM NO.	DESCRIPTION	S1	
		QTY.	S/N
11	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
12	Insulator, Spool, Clevis, Small, ANSI 53-2 Class	1	773
13	Bolt, Double Upset, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	1	1580
14	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217
15	Wire, Tie, AL Annealed #4 SD	10	1421

	CONSTRUCTION STANDARDS		<b>REVISIONS</b> <table border="1" style="font-size: small;"> <thead> <tr> <th>DATE</th> <th>ENGR</th> <th>OPS</th> </tr> </thead> <tbody> <tr> <td>3/02</td> <td>REDRAWN</td> <td>IN CAD</td> </tr> <tr> <td>12/11/07</td> <td>LB</td> <td>AH</td> </tr> <tr> <td>1/4/18</td> <td>CM</td> <td>DK</td> </tr> </tbody> </table>				DATE	ENGR	OPS	3/02	REDRAWN	IN CAD	12/11/07	LB	AH	1/4/18	CM	DK
	DATE	ENGR	OPS															
	3/02	REDRAWN	IN CAD															
12/11/07	LB	AH																
1/4/18	CM	DK																
3Ø DOUBLE TWIGGY CIRCUIT																		
0° TO 5°																		
795 AAC MAX WIRE																		
PAGE:	CAD FILE:	APP:		SECTION														
2 of 2	D16	ELM		340														
	D16	DATE:		1/31/80														



**Vise-Top Installation:**

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off

**Notes:**

1. Maximum line angle calculated for 5,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers required on all three phases on one side of pole and center phase on opposite side of pole.

Rev. 3 - Added avian note and changed to vise-top insulators on twiggy arms.



**CONSTRUCTION STANDARDS**

3Ø DOUBLE TWIGGY CIRCUIT  
6° TO 15°  
795 AAC MAX WIRE

PAGE:  
1 of 2

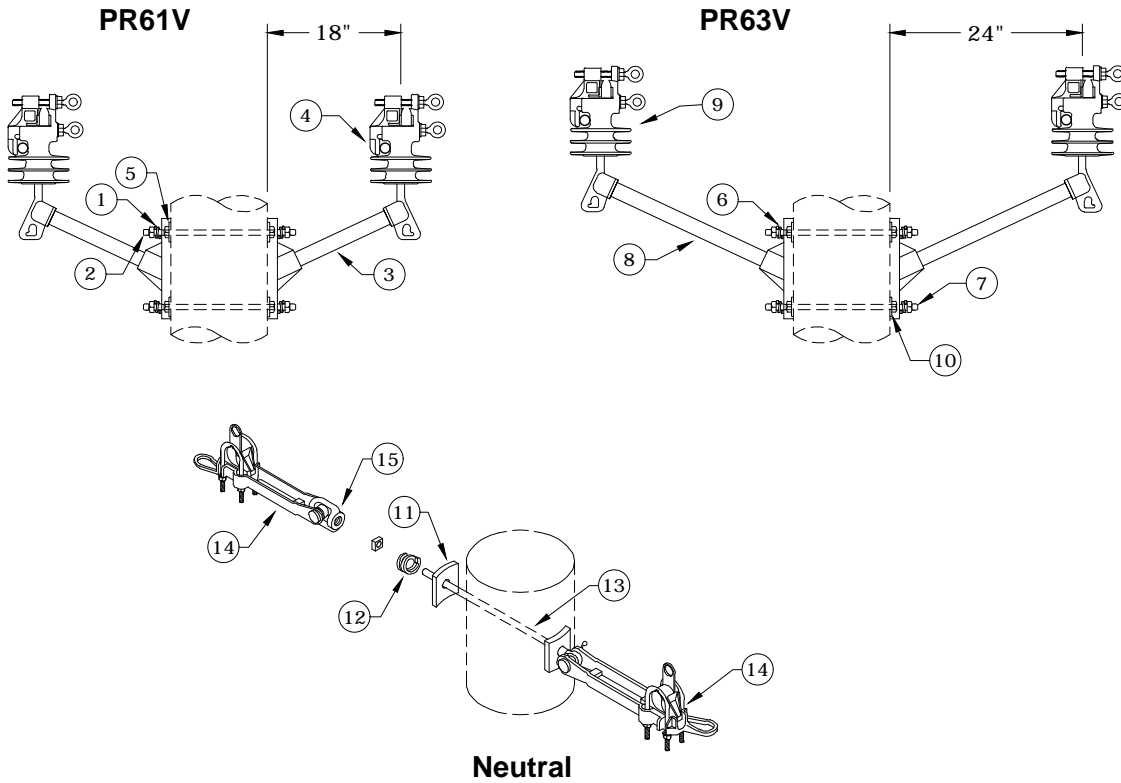
**D17**

CAD FILE:  
D17

**REVISIONS**

REV	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	8/10/06	LB	AH
3	1/4/18	CM	DK

APP:	ELM	SECTION
DATE:	1/31/80	<b>340</b>



Rev. 3 - Added avian note and changed to vise-top insulators on twiggy arms.

ITEM NO.	DESCRIPTION	D17	
		QTY.	S/N
1	Washer, Lock, Spring, Double Coil, Galv., 5/8"	8	2217
2	Bolt, Double Arm, 5/8" x 18", Galv., 12,400 lbs Ultimate Tensile	4	82
3	Arm, Epoxy 18" 2500 lbs	4	2504
4	Insulator, Vise-Top, Polymer	4	2439
5	Washer, Flat, Round, Galv., 5/8"	8	1395
ITEM NO.	DESCRIPTION	PR63V	
		QTY.	S/N
6	Washer, Lock, Spring, Double Coil, Galv., 5/8"	4	2217
7	Bolt, Double Arm, 5/8" x 18", Galv., 12,400 lbs Ultimate Tensile	2	82
8	Arm, Epoxy 24" 2500 lbs	2	2605
9	Insulator, Vise-Top, Polymer	2	2439
10	Washer, Flat, Round, Galv., 5/8"	4	1395
ITEM NO.	DESCRIPTION	Additional Material	
		QTY.	S/N
11	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
12	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217
13	Bolt, Eye, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	1	108
14	Clamp, Strain, Distribution, 795	2	303
15	Nut, Eye, Oval, Galv., 5/8" *	1	913



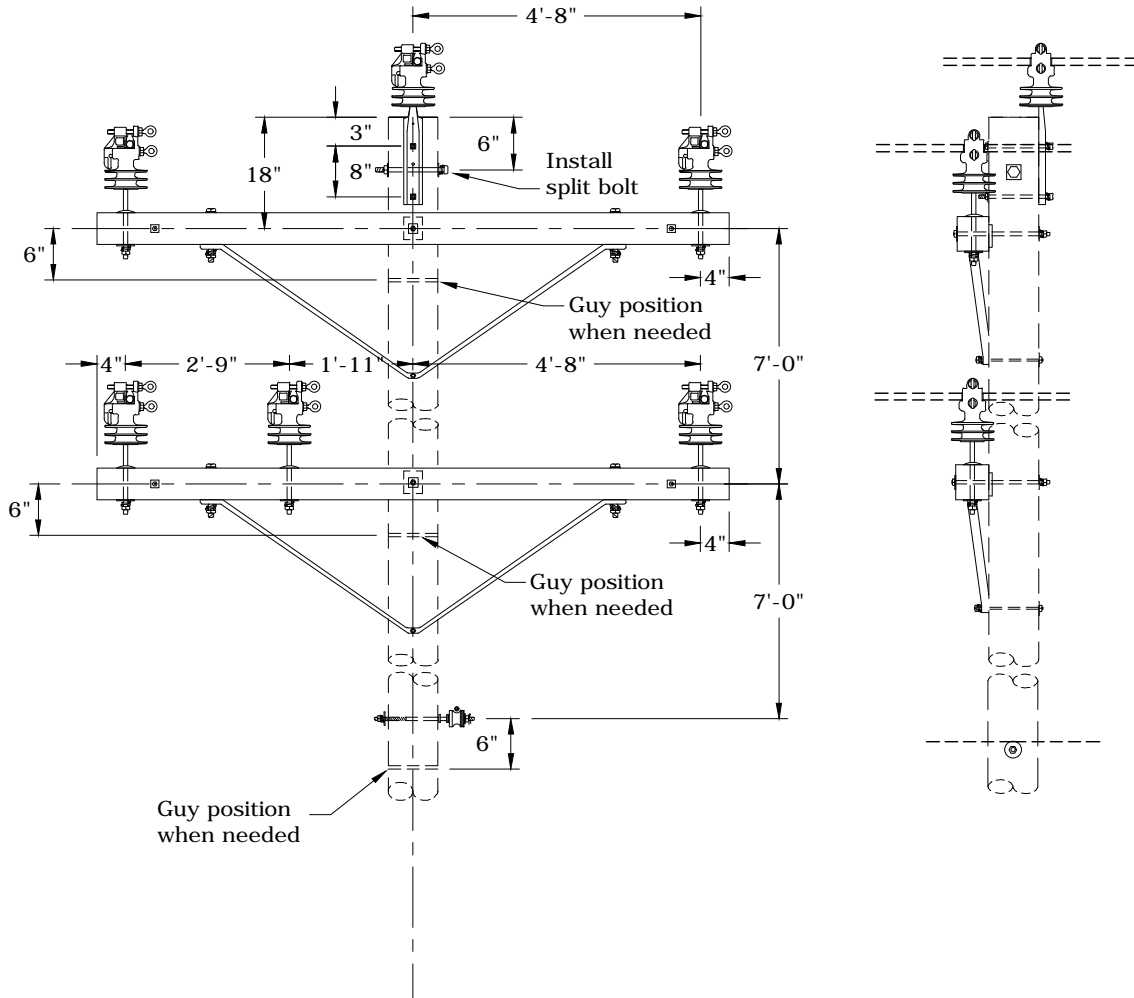
**CONSTRUCTION STANDARDS**  
 3Ø DOUBLE TWIGGY CIRCUIT  
 6° TO 15°  
 795 AAC MAX WIRE

REVISIONS			
Δ	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	8/10/06	LB	AH
3	1/4/18	CM	DK
Δ			
APP:	ELM	SECTION	
DATE:	1/31/80	340	



Vise-Top Installation:


- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off

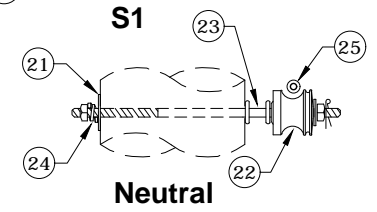
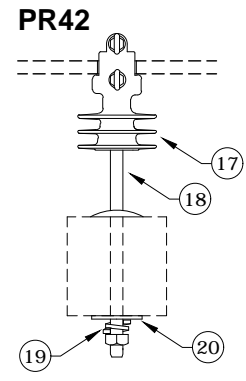
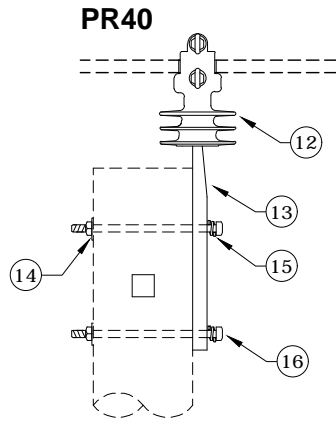
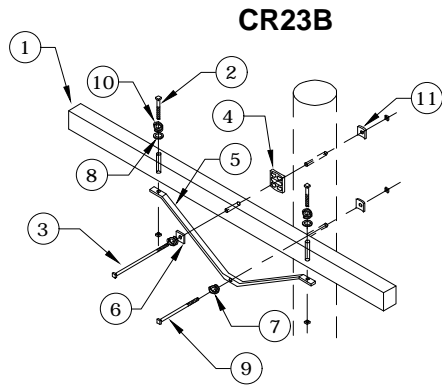


Notes:

1. Maximum line angle calculated for 5,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phases.

Rev. 4 - Changed post insulators to vise-top, added avian note, and updated material list.

	CONSTRUCTION STANDARDS		REVISIONS																											
	3Ø SINGLE 10' CROSSARM DOUBLE CIRCUIT- 0° TO 5° 795 AAC MAX WIRE		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">#</th> <th style="width: 20%;">DATE</th> <th style="width: 20%;">ENGR</th> <th style="width: 20%;">OPS</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>2/11/81</td> <td>GGW</td> <td></td> </tr> <tr> <td>2</td> <td>3/02</td> <td>REDRAWN</td> <td>IN CAD</td> </tr> <tr> <td>3</td> <td>12/11/07</td> <td>LB</td> <td>AH</td> </tr> <tr> <td>4</td> <td>1/4/18</td> <td>CM</td> <td>DK</td> </tr> </tbody> </table>	#	DATE	ENGR	OPS	1	2/11/81	GGW		2	3/02	REDRAWN	IN CAD	3	12/11/07	LB	AH	4	1/4/18	CM	DK	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">APP:</th> <th style="width: 20%;">ELM</th> <th style="width: 20%;">SECTION</th> </tr> </thead> <tbody> <tr> <td>DATE:</td> <td>1/31/80</td> <td style="font-size: 1.2em; font-weight: bold;">340</td> </tr> </tbody> </table>		APP:	ELM	SECTION	DATE:	1/31/80
#	DATE	ENGR	OPS																											
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3	12/11/07	LB	AH																											
4	1/4/18	CM	DK																											
APP:	ELM	SECTION																												
DATE:	1/31/80	340																												
PAGE: 1 of 2	D19B		CAD FILE: D19B																											



Rev. 4 - Changed post insulators to vise-top, added avian note, and updated material list.

ITEM NO.	DESCRIPTION	D19B	
		QTY.	S/N
1	Arm, Cross (Distr.), 3 3/4" x 4 3/4" x 10'	2	26
2	Bolt, Machine, 1/2" x 7", Galv., 7800 lbs Ultimate Tensile *	4	143
3	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs Ultimate Tensile *	2	157
4	Gain, Pole Plastic	2	709
5	Brace, Angle, 72"	2	204
6	Washer, Square, Cast, Flat, 5/8", 2 1/4" x 2 1/4"	2	1412
7	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	4	2217
8	Washer, Flat, Round, Galv., 1/2"	4	1394
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile *	2	155
10	Washer, Lock, Spring, Double Coil, Galv., 1/2" *	4	2216
11	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	4	1392
		PR40	
12	Insulator, Vise-Top, Polymer *	1	2439
13	Pin, Pole Top *	1	962
14	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
15	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	2	2217
16	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs. Ultimate Tensile *	2	155
		PR42 (5)	
17	Insulator, Vise-Top, Polymer *	5	2439
18	Pin, Crossarm *	5	961
19	Washer, Lock, Spring, Double Coil, Galv., 5/8"	5	2217
20	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4" *	5	1412
		S1	
21	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
22	Insulator, Spool, Clevis, Small, ANSI 53-2 Class	1	773
23	Bolt, Double Upset, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	1	1580
24	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217
25	Wire, Tie, AL Annealed #4 SD	10	1421



### CONSTRUCTION STANDARDS

3Ø SINGLE 10' CROSSARM  
 DOUBLE CIRCUIT- 0° TO 5°  
 795 AAC MAX WIRE

PAGE:  
2 of 2

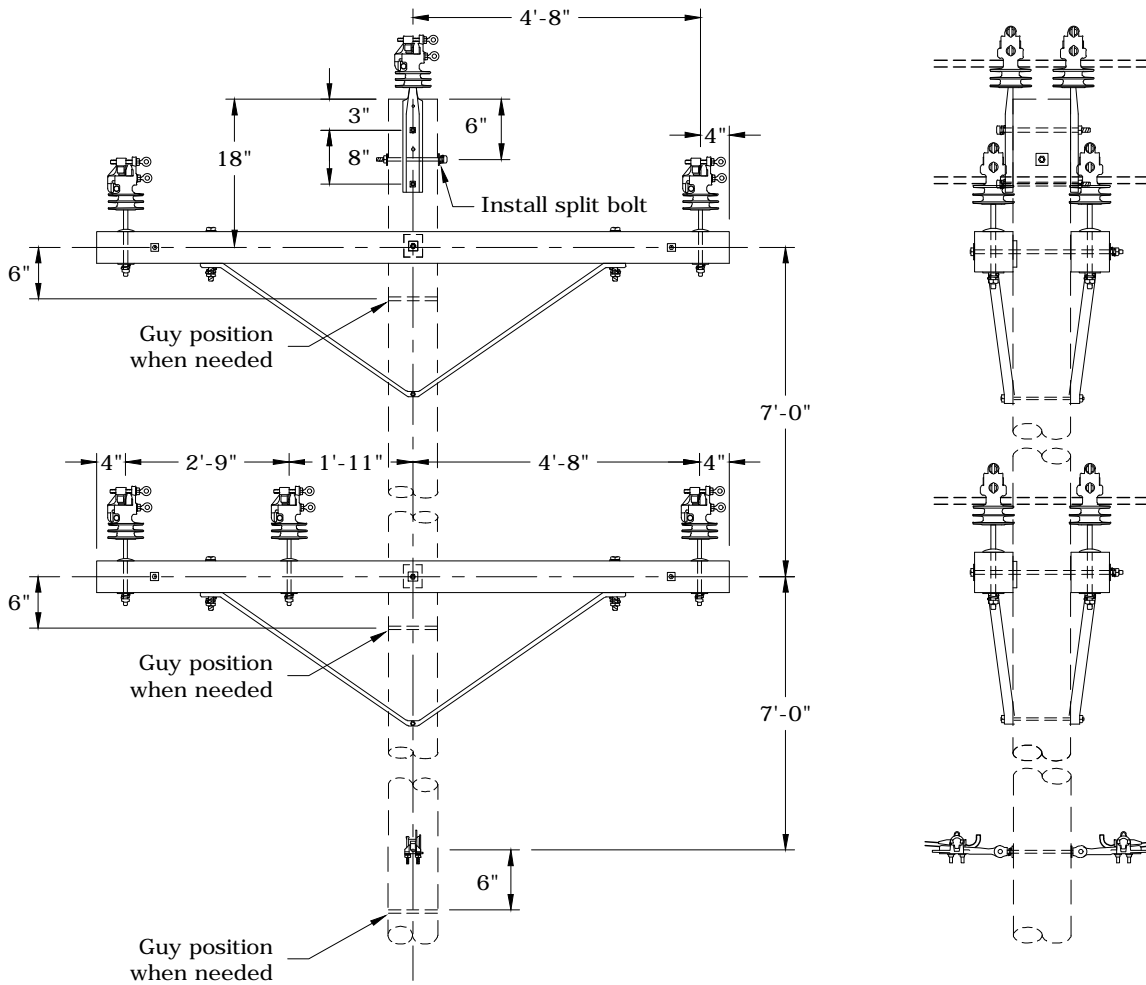
## D19B

CAD FILE:  
D19B

REVISIONS			
△	DATE	ENGR	OPS
1	2/11/81	GGW	
2	3/02	REDRAWN	IN CAD
3	12/11/07	LB	AH
4	1/4/18	CM	DK
△			
APP:	ELM	SECTION	
DATE:	1/31/80	340	

**Vise-Top Installation:**

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off



**Notes:**

1. Maximum line angle calculated for 5,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phases.

Rev. 4 - Changed post insulators to vise-top, added avian note, and updated material list.



**CONSTRUCTION STANDARDS**

3Ø DOUBLE 10' CROSSARM  
DOUBLE CIRCUIT- 6° TO 15°  
795 AAC MAX WIRE

PAGE:  
1 of 3

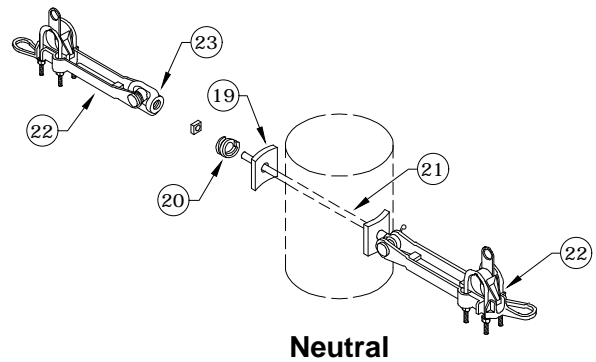
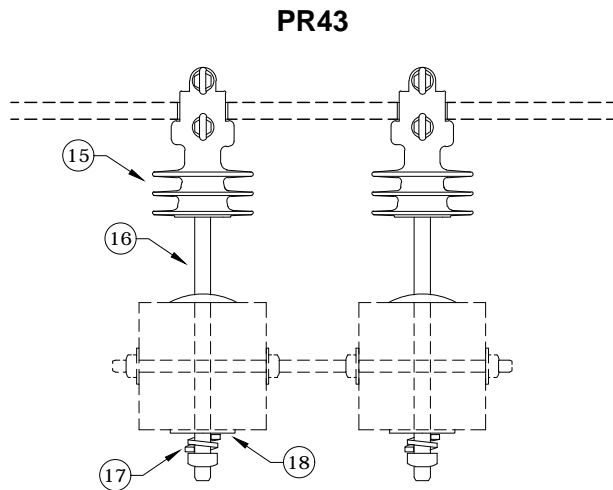
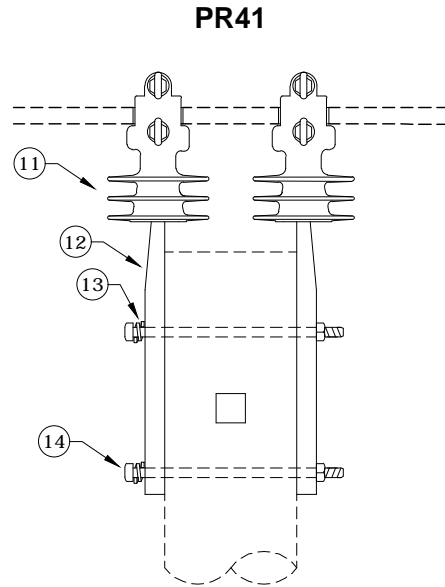
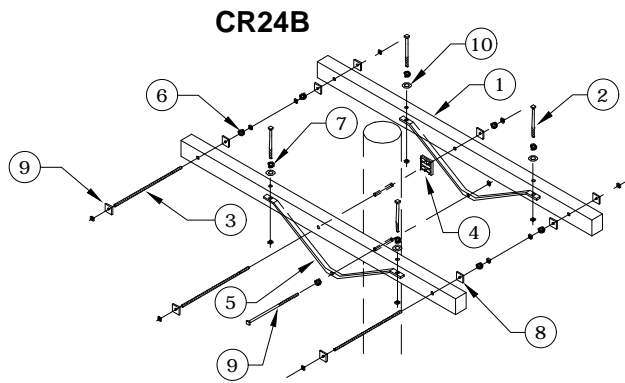
**D20B**

CAD FILE:  
D20B

REVISIONS			
△	DATE	ENGR	OPS
1	2/11/81	GGW	
2	3/02	REDRAWN	IN CAD
3	12/11/07	LB	AH
4	1/4/18	CM	DK

APP:	ELM	SECTION
DATE:	1/31/80	<b>340</b>



Rev. 4 - Changed post insulators to vise-top, added avian note, and updated material list.



### CONSTRUCTION STANDARDS

3Ø DOUBLE 10' CROSSARM  
 DOUBLE CIRCUIT- 6° TO 15°  
 795 AAC MAX WIRE

PAGE:  
2 of 3

## D20B

CAD FILE:  
D20B

REVISIONS			
△	DATE	ENGR	OPS
1	2/11/81	GGW	
2	3/02	REDRAWN	IN CAD
3	12/11/07	LB	AH
4	1/4/18	CM	DK
△			
APP:	ELM	SECTION	
DATE:	1/31/80	340	

Rev. 4 - Changed post insulators to vise-top, added avian note, and updated material list.

ITEM NO.	DESCRIPTION	D20B	
		CR24B (2)	
		QTY.	S/N
1	Arm, Cross (Distr.), 3 3/4" x 4 3/4" x 10'	4	26
2	Bolt, Machine, 1/2" x 7", Galv., 7800 lbs Ultimate Tensile ✱	8	143
3	Bolt, Double, Arm, 5/8" x 20", Galv., 12,400 lbs Ultimate Tensile ✱	6	83
4	Gain, Pole Plastic	2	709
5	Brace, Angle, 72"	4	204
6	Washer, Lock, Spring, Double Coil, Galv., 5/8" ✱	12	2217
7	Washer, Lock, Spring, Double Coil, Galv., 1/2" ✱	8	2216
8	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	20	1412
9	Bolt, Machine, 5/8" x 12", Galv., 12,400 lbs Ultimate Tensile ✱	2	155
10	Washer, Flat, Round, Galv., 1/2"	8	1394
ITEM NO.	DESCRIPTION	PR41	
		QTY.	S/N
		11	Insulator, Vise-Top, Polymer ✱
12	Pin, Pole Top ✱	2	962
13	Washer, Lock, Spring, Double Coil, Galv., 5/8" ✱	2	2217
14	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile ✱	2	156
ITEM NO.	DESCRIPTION	PR43 (5)	
		QTY.	S/N
		15	Insulator, Vise-Top, Polymer ✱
16	Pin, Crossarm ✱	10	961
17	Washer, Lock, Spring, Double Coil, Galv., 5/8" ✱	10	2217
18	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	10	1412
ITEM NO.	DESCRIPTION	Additional Material	
		QTY.	S/N
		19	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole
20	Washer, Lock, Spring, Double Coil, Galv., 5/8" ✱	1	2217
21	Bolt, Eye, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile ✱	1	108
22	Clamp, Strain Distribution, 795	2	303
23	Nut, Eye Oval 5/8" Galv. ✱	1	913

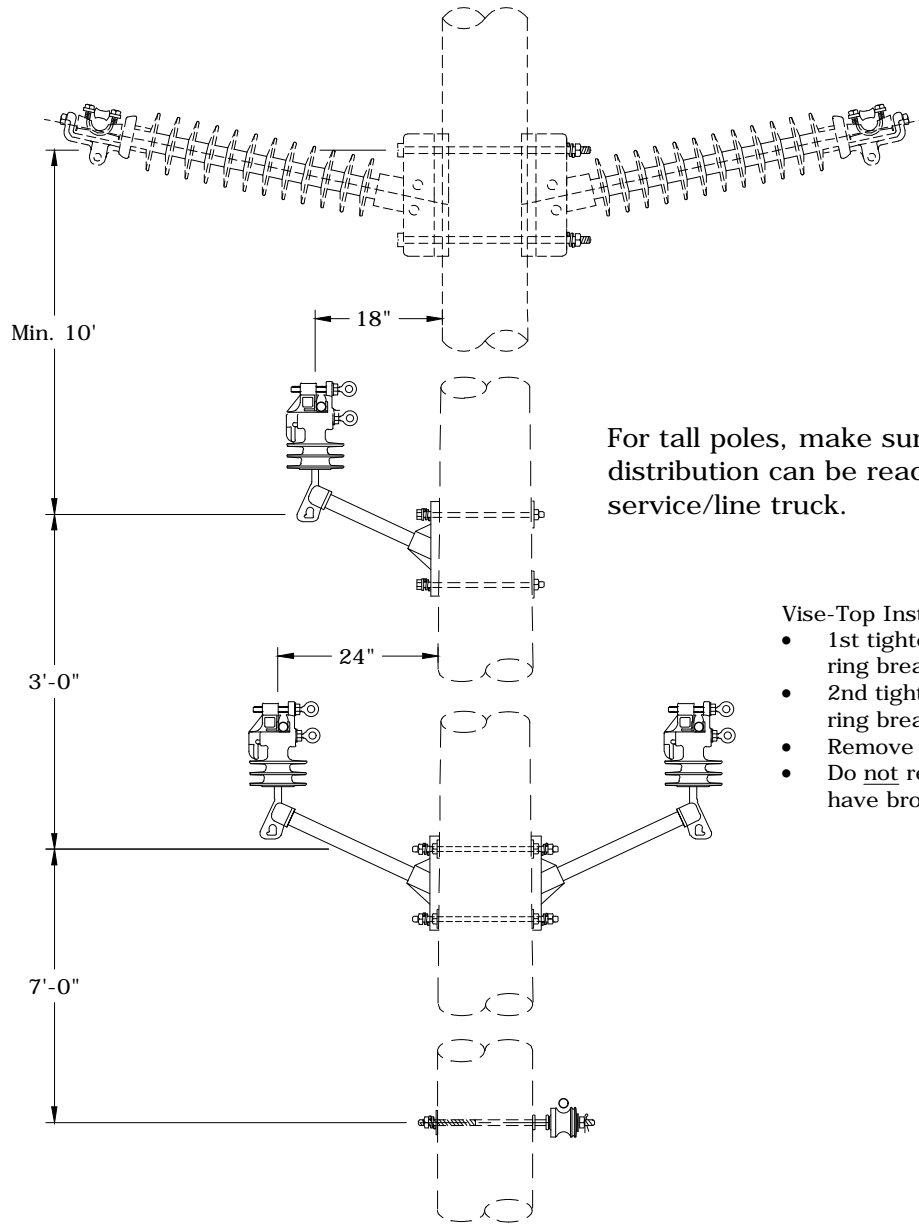


### CONSTRUCTION STANDARDS

3Ø DOUBLE 10' CROSSARM  
DOUBLE CIRCUIT- 6° TO 15°  
795 AAC MAX WIRE

#### REVISIONS

△	DATE	ENGR	OPS
1	2/11/81	GGW	
2	3/02	REDRAWN	IN CAD
3	12/11/07	LB	AH
4	1/4/18	CM	DK
△			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>340</b>	



For tall poles, make sure the distribution can be reached by a service/line truck.

**Vise-Top Installation:**

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off

**Notes:**

1. Maximum line angle calculated for 5,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on top phase and one of the bottom phases of the distribution.



**CONSTRUCTION STANDARDS**  
 3Ø TWIGGY TRANSMISSION UNDERBUILD  
 0° TO 5°  
 795 AAC MAX WIRE

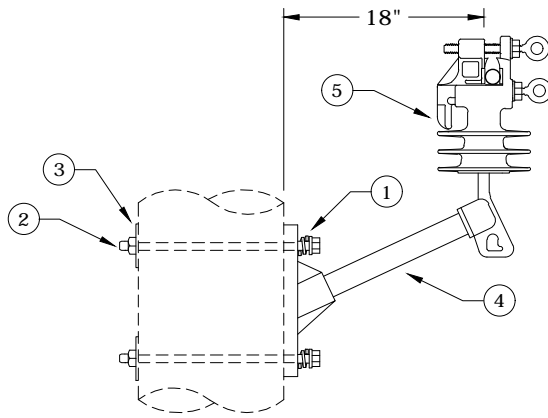
PAGE:  
1 of 2

**D22**

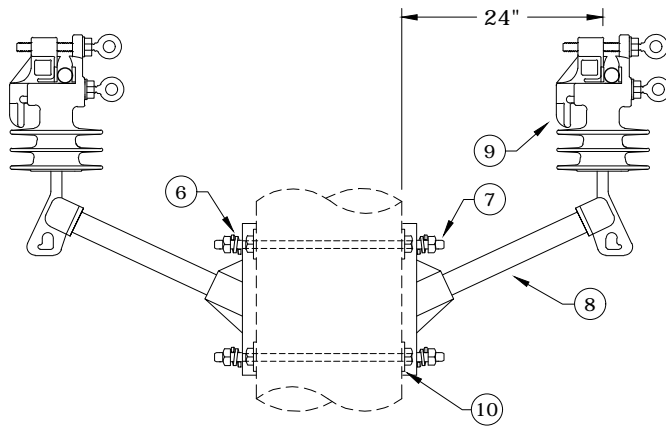
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D22

REVISIONS			
△	DATE	ENGR	OPS
△			
APP:	CM/DK	SECTION	
DATE:	1/4/18	<b>340</b>	

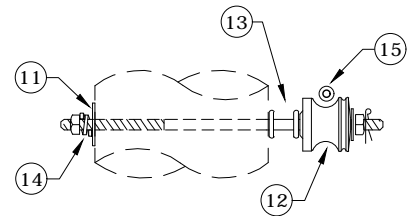
**PR60V**



**PR63V**



**S1**



ITEM NO.	DESCRIPTION	D22	
		QTY.	S/N
1	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217
2	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs. Ultimate Tensile	2	157
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
4	Arm, Epoxy 18" 2500 lbs	1	2504
5	Insulator, Vise-Top, Polymer	1	2439
ITEM NO.	DESCRIPTION	PR63V	
		QTY.	S/N
6	Washer, Lock, Spring, Double Coil, Galv., 5/8"	4	2217
7	Bolt, Double Arm, 5/8" x 18," Galv., 12,400 lbs Ultimate Tensile	2	82
8	Arm, Epoxy 24" 2500 lbs	2	2605
9	Insulator, Vise-Top, Polymer	2	2439
10	Washer, Flat, Round, Galv., 5/8"	4	1395
ITEM NO.	DESCRIPTION	S1	
		QTY.	S/N
11	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
12	Insulator, Spool, Clevis, Small, ANSI 53-2 Class	1	773
13	Bolt, Double Upset, 5/8" x 14", Galv., 12,400 lbs. Ultimate Tensile	1	1580
14	Washer, Lock, Spring, Double Coil, 5/8"	1	2217
15	Wire, Tie, AL Annealed #4 SD	10	1421



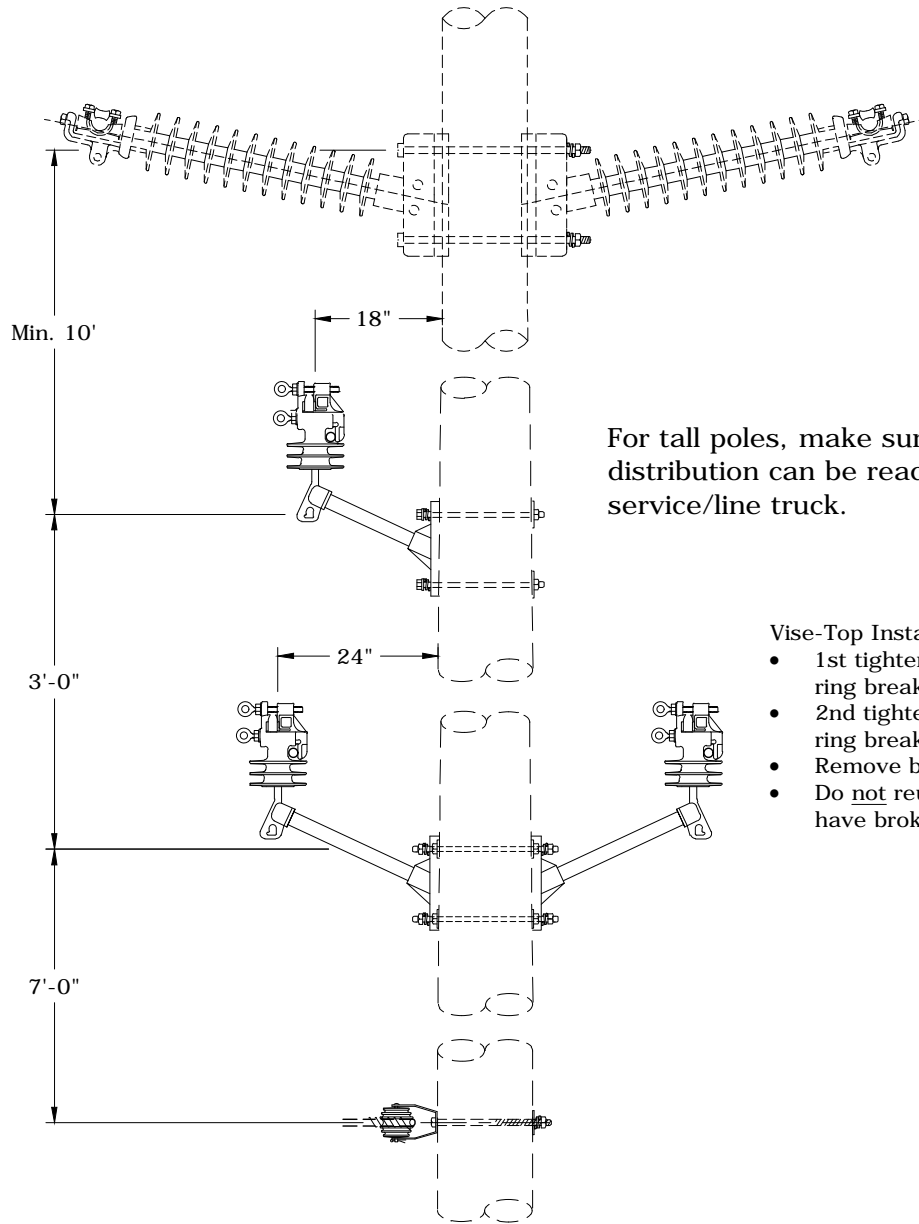
**CONSTRUCTION STANDARDS**  
 3Ø TWIGGY TRANSMISSION UNDERBUILD  
 0° TO 5°  
 795 AAC MAX WIRE

PAGE:  
2 of 2

**D22**

CAD FILE:  
D22

REVISIONS			
△	DATE	ENGR	OPS
△			
APP:	CM/DK	SECTION	
DATE:	1/4/18	<b>340</b>	



For tall poles, make sure the distribution can be reached by a service/line truck.

**Vise-Top Installation:**

- 1st tighten the bottom bolt until ring breaks off
- 2nd tighten the top bolt until ring breaks off
- Remove bolts with socket stick
- Do not reuse bolts after rings have broken off

**Notes:**

1. Maximum line angle calculated for 5,000 lbs. MWT and 250-ft ruling span.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on top phase and one of the bottom phases of the distribution.



**CONSTRUCTION STANDARDS**  
 3Ø TWIGGY TRANSMISSION UNDERBUILD  
 6° TO 15°  
 795 AAC MAX WIRE

PAGE:  
1 of 2

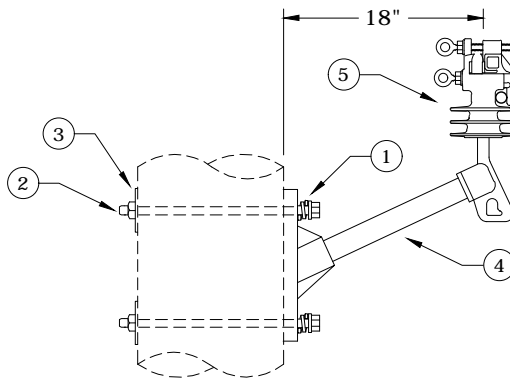
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CAD FILE:  
D23

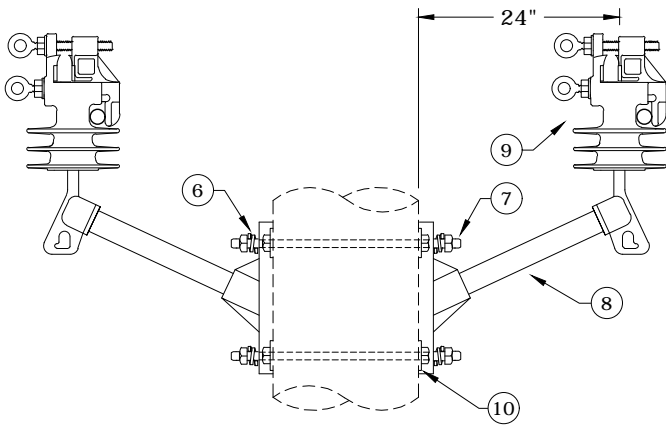
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△	DATE	ENGR	OPS
△			
APP:	CM/DK	SECTION	
DATE:	1/4/18	<b>340</b>	



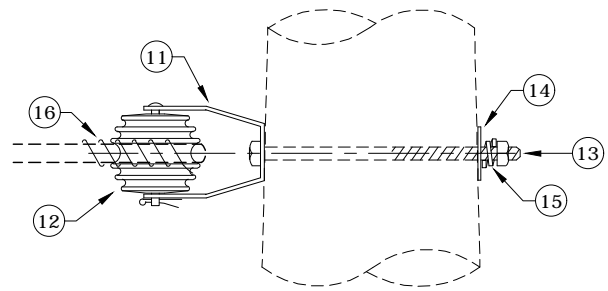
**PR60V**



**PR63V**



**S3**



ITEM NO.	DESCRIPTION	D23	
		QTY.	S/N
1	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217
2	Bolt, Machine, 5/8" x 16", Galv., 12,400 lbs. Ultimate Tensile	2	157
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
4	Arm, Epoxy 18" 2500 lbs	1	2504
5	Insulator, Vise-Top, Polymer	1	2439
ITEM NO.	DESCRIPTION	PR63V	
		QTY.	S/N
6	Washer, Lock, Spring, Double Coil, Galv., 5/8"	4	2217
7	Bolt, Double Arm, 5/8" x 18", Galv., 12,400 lbs Ultimate Tensile	2	82
8	Arm, Epoxy 24" 2500 lbs	2	2605
9	Insulator, Vise-Top, Polymer	2	2439
10	Washer, Flat, Round, Galv., 5/8"	4	1395
ITEM NO.	DESCRIPTION	S3	
		QTY.	S/N
11	Clevis, DE Insulator 1344	1	336
12	Insulator, Spool, Clevis, Large, ANSI 53-5 Class	1	774
13	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	1	156
14	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
15	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217
16	Wire, Tie, AL Annealed #4 SD	10	1421



**CONSTRUCTION STANDARDS**  
 3Ø TWIGGY TRANSMISSION UNDERBUILD  
 6° TO 15°  
 795 AAC MAX WIRE

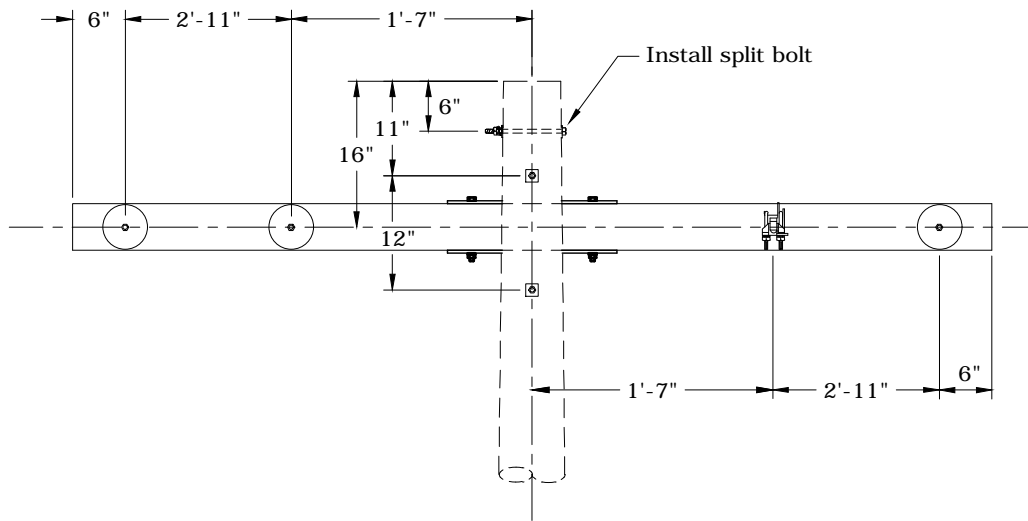
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2 of 2

**D23**

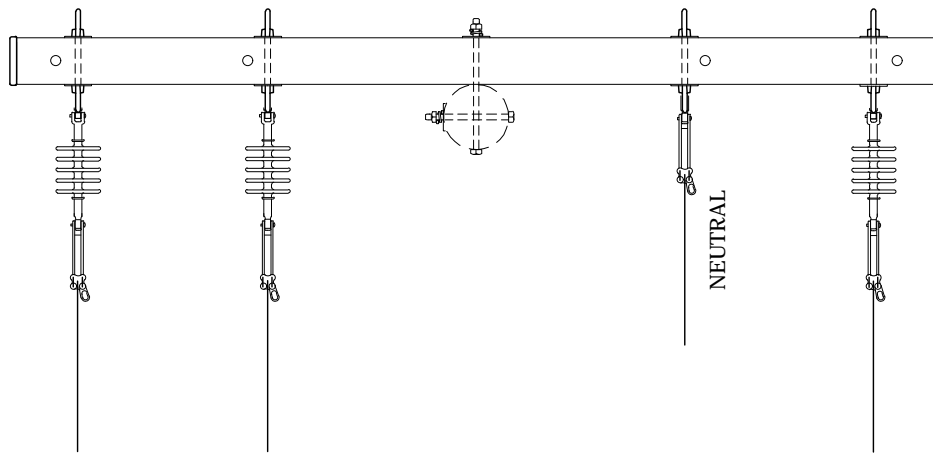
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D23

REVISIONS			
△	DATE	ENGR	OPS
△			
APP:	CM/DK	SECTION	
DATE:	1/4/18	<b>340</b>	

FRONT VIEW



TOP VIEW



Notes:

1. This framing is for clearance limited situations only.
2. See Std AC - Avian Covers - Section 400 if needed. Covers only required on center phase and phase on neutral side.

Rev. 1 - Added avian note and updated material list.



**CONSTRUCTION STANDARDS**  
 10' PRE-ASSEMBLED DEADEND  
 HIGH NEUTRAL  
 795 AAC MAX WIRE

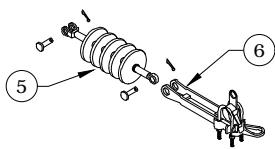
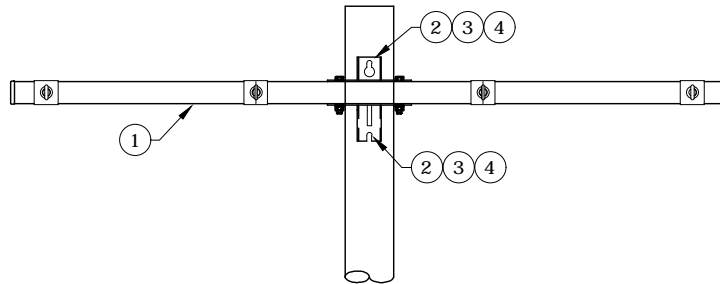
PAGE:  
1 of 2

**D48B**

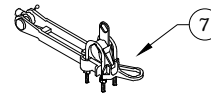
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REVISIONS			
NO.	DATE	ENGR	OPS
1	1/4/18	CM	DK
APP:		LB/AH	SECTION
DATE: 12/11/07			<b>340</b>

**CR29B**



**Phases**



**Neutral**

Rev. 1 - Added avian note and updated material list.

ITEM NO.	DESCRIPTION	D48B CR29B	
		QTY.	S/N
1	Arm, Deadend Assembly, 10', 4-position, 336 & 795	1	2668
2	Bolt, Machine, 3/4" x 14", Galv., 18,350 lbs Ultimate Tensile *	2	174
3	Washer, Lock, Spring, Double Coil, Galv., 3/4" *	2	2218
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
ITEM NO.	DESCRIPTION	Additional Material	
		QTY.	S/N
5	Insulator, Suspension, 15 kV Clevis-Tongue, Polymer *	3	1967
6	Clamp, Strain, Distribution 795 AAC	3	303
7	Clamp, Strain, Distribution #2 - 397.5	1	302



**CONSTRUCTION STANDARDS**

10' PRE-ASSEMBLED DEADEND  
HIGH NEUTRAL  
795 AAC MAX WIRE

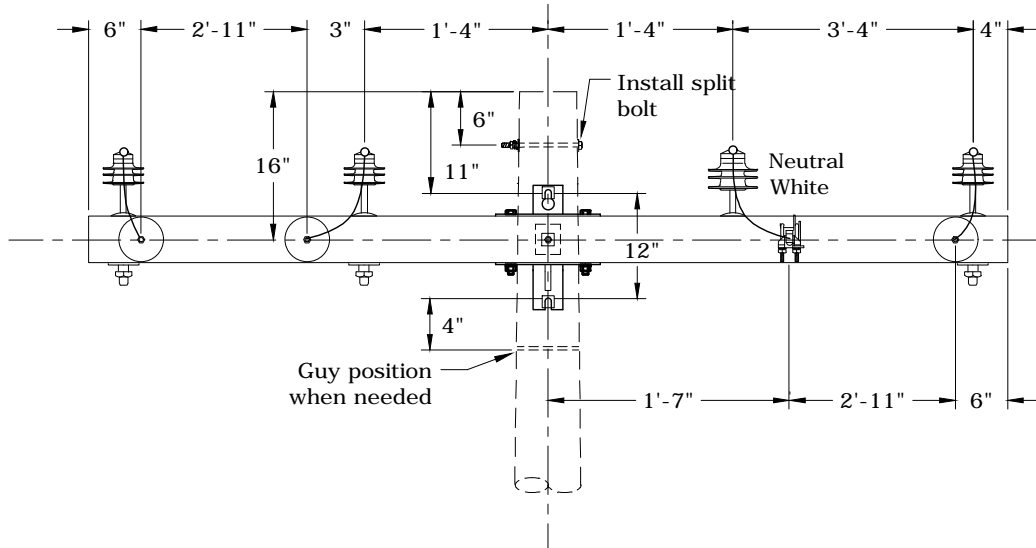
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2 of 2

**D48B**

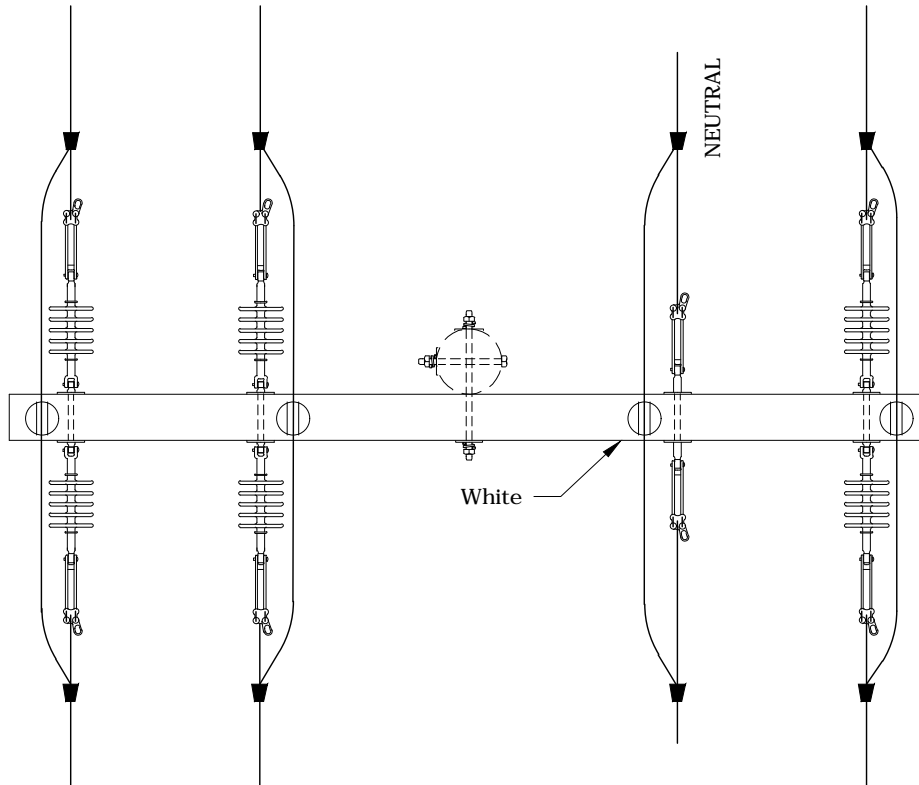
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REVISIONS			
REV	DATE	ENGR	OPS
1	1/4/18	CM	DK
APP:		LB/AH	SECTION
DATE: 12/11/07			<b>340</b>

**FRONT VIEW**



**TOP VIEW**



**Notes:**

1. This framing is for clearance limited situations only.
2. See Std AC - Avian Covers - Section 400 if needed. Covers and tree wire jumpers required on center phase and phase on neutral side.

Rev. 1 - Added avian note, changed from porcelain to polymer insulators, and updated material list.



**CONSTRUCTION STANDARDS**  
 10' PRE-ASSEMBLED DOUBLE DEADEND  
 HIGH NEUTRAL  
 795 AAC MAX WIRE

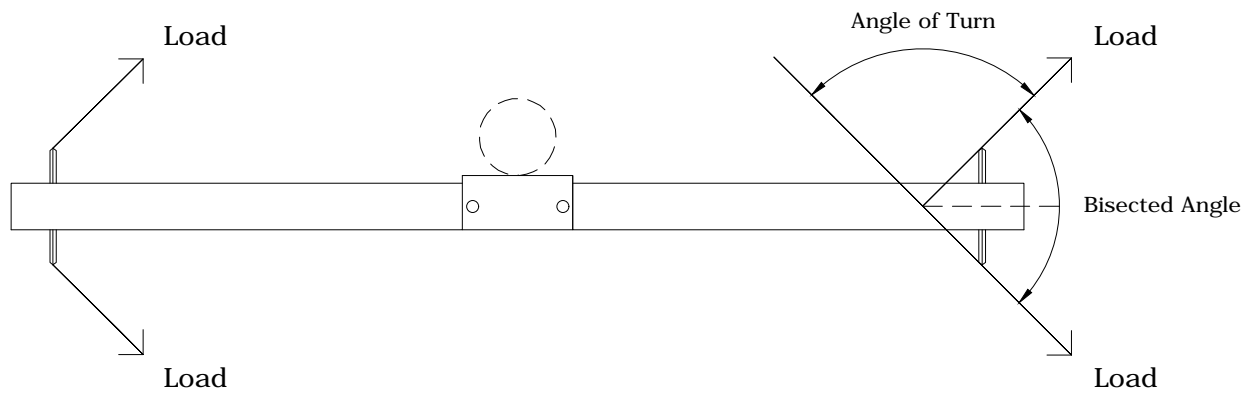
PAGE:  
1 of 3

**D49B**

CAD FILE:  
D49B

REVISIONS			
DATE	ENGR	OPS	
1/4/18	CM	DK	
APP: LB/AH		SECTION	
DATE: 12/11/07			<b>340</b>

### DEADEND FOR ANGLED SPANS



Notes:

1. Maximum angle with 795 is 30°, limited by the 3/4" machine bolt.
2. Angle must be bisected so that each eye-nut has half the angle.



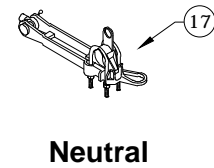
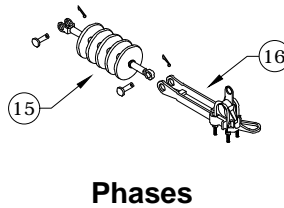
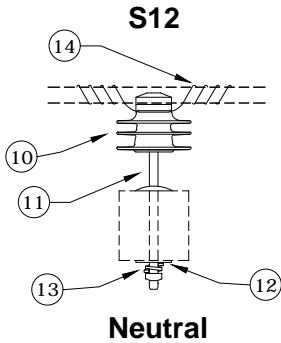
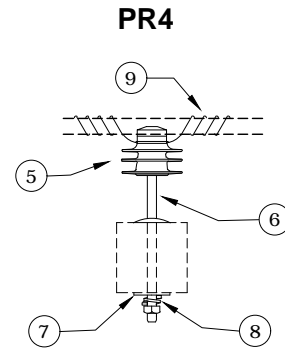
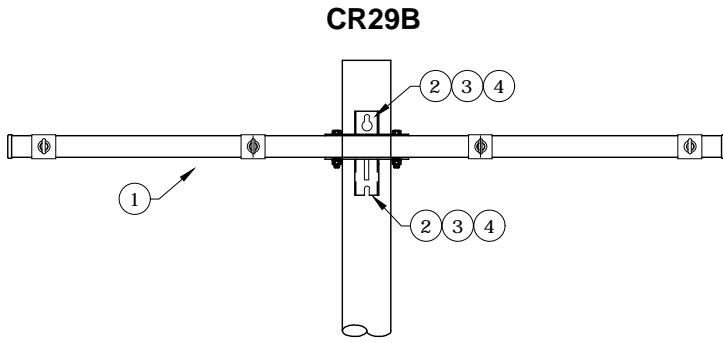
**CONSTRUCTION STANDARDS**  
 10' PRE-ASSEMBLED DOUBLE DEADEND  
 HIGH NEUTRAL  
 795 AAC MAX WIRE

PAGE:  
2 of 3

**D49B**

CAD FILE:  
D49B

REVISIONS			
△	DATE	ENGR	OPS
1	1/4/18	CM	DK
△			
APP:	LB/AH	SECTION	
DATE:	12/11/07	<b>340</b>	



Rev. 1 - Added avian note, changed from porcelain to polymer insulators, and updated material list.

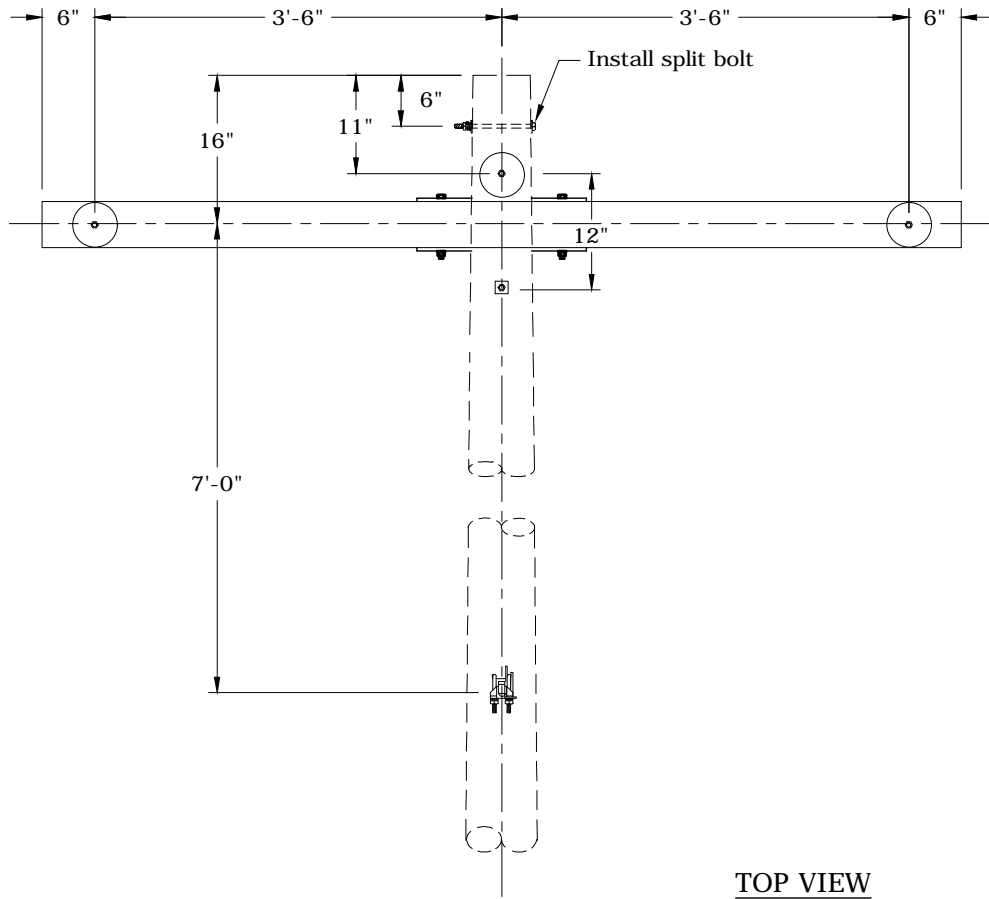
ITEM NO.	DESCRIPTION	D49B	
		QTY.	S/N
1	Arm, Deadend Assembly, 10', 4-position, 336 & 795	1	2668
2	Bolt, Machine, 3/4" x 14", Galv., 18,350 lbs Ultimate Tensile *	2	174
3	Washer, Lock, Spring, Double Coil, Galv., 3/4" *	2	2218
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
ITEM NO.	DESCRIPTION	PR4 (3)	
		QTY.	S/N
5	Insulator, Pin, C Neck, Polymer *	3	1968
6	Pin, Crossarm	3	961
7	Washer, Square, Flat 5/8", 2 1/4" x 2 1/4"	3	1412
8	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	3	2217
9	Wire, Tie, AL Annealed #4 SD	30	1421
ITEM NO.	DESCRIPTION	S12	
		QTY.	S/N
10	Insulator, Pin, C Neck, White Polymer *	1	2656
11	Pin, Crossarm	1	961
12	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	1	1412
13	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217
14	Wire, Tie, AL Annealed #4 SD	10	1421
ITEM NO.	DESCRIPTION	Additional Material	
		QTY.	S/N
15	Insulator, Suspension, 15 kV Clevis-Tongue, Polymer *	6	1967
16	Clamp, Strain, Distribution, 795	6	303
17	Clamp, Strain, Distribution, #2 - 397.5	2	302
18	Connector, Tap, Wedge, 795 to 795 *	6	2477
19	Connector, Tap, Wedge, 397 to 397 *	2	2501



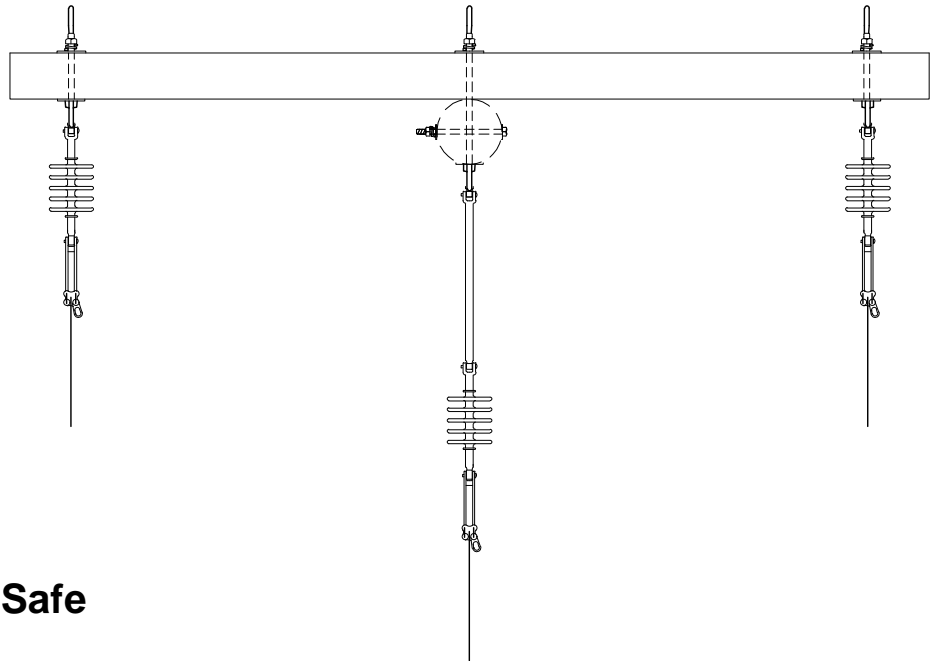
**CONSTRUCTION STANDARDS**  
 10' PRE-ASSEMBLED DOUBLE DEADEND  
 HIGH NEUTRAL  
 795 AAC MAX WIRE

REVISIONS			
DATE	ENGR	OPS	
1/4/18	CM	DK	

**FRONT VIEW**



**TOP VIEW**



**Avian Safe**

Rev. 4 - Added avian note and updated material list.



**CONSTRUCTION STANDARDS**  
 8' PRE-ASSEMBLED DEADEND  
 795 AAC MAX WIRE

**REVISIONS**

NO.	DATE	ENGR	OPS
1	2/11/81	GGW	
2	3/02	REDRAWN	IN CAD
3	12/11/07	LB	AH
4	1/4/18	CM	DK

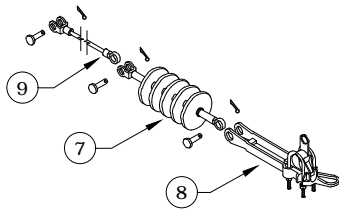
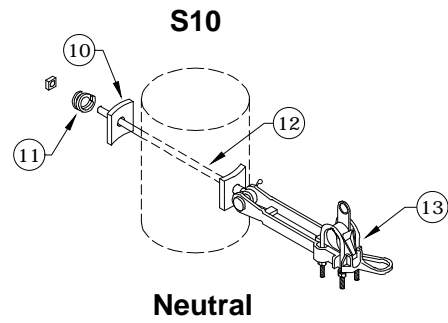
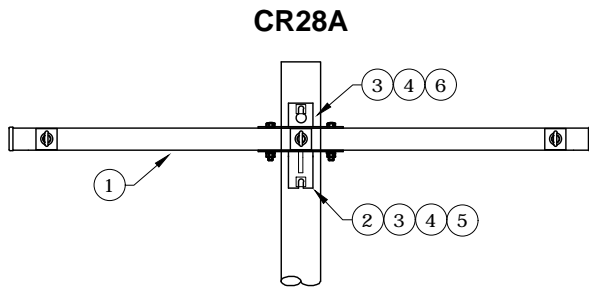
PAGE:  
1 of 2

**D50A**

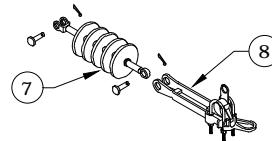
CAD FILE:  
D50A

APP: ELM  
DATE: 1/31/80

SECTION  
**340**



**Middle Phase**



**Outside Phases**

Rev. 4 - Added avian note and updated material list.

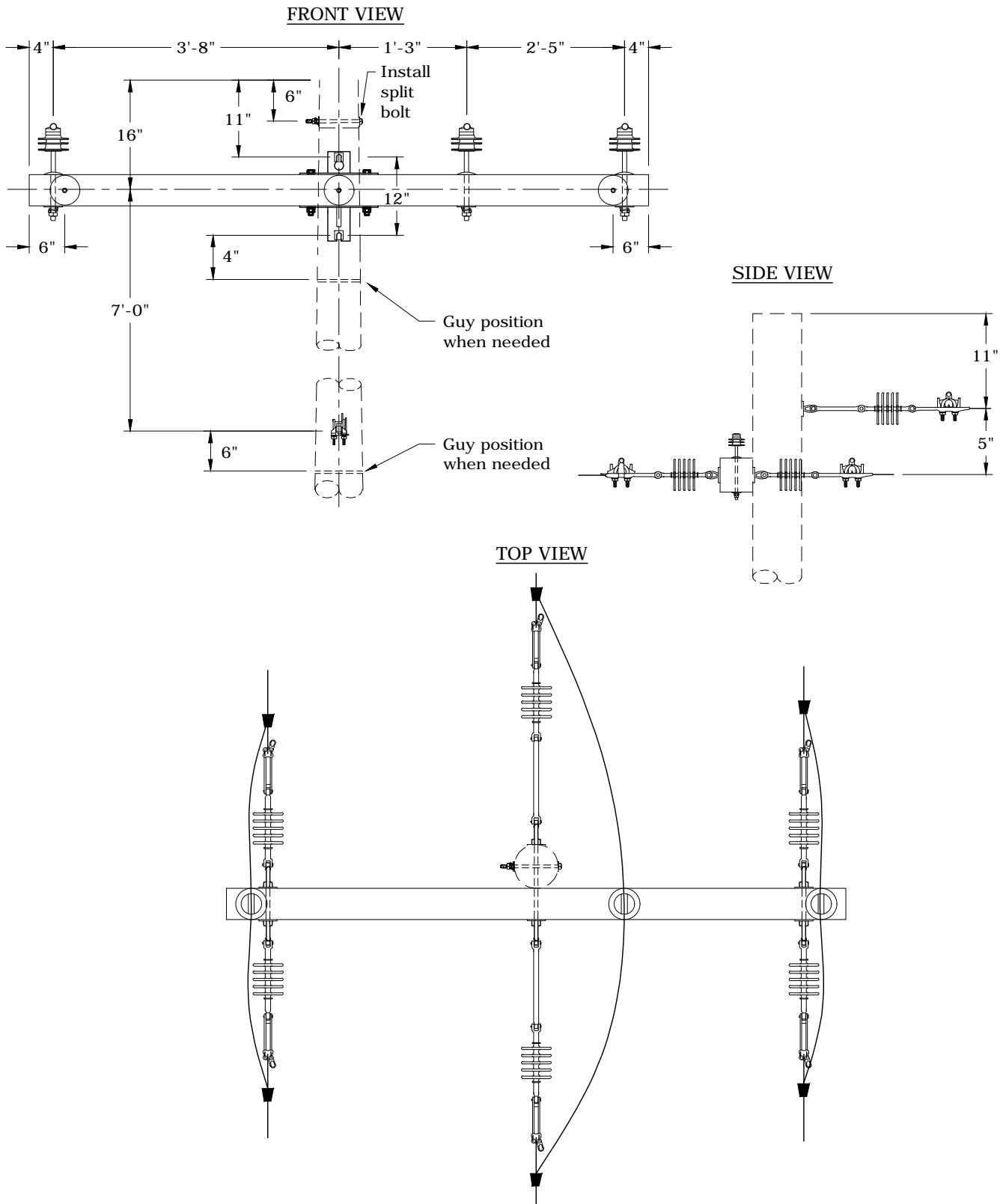
ITEM NO.	DESCRIPTION	D50A	
		QTY.	S/N
1	Arm, Deadend Assembly, 3-position, 336 & 795	1	2509
2	Bolt, Machine, 3/4" x 14", Galv., 18,350 lbs Ultimate Tensile *	1	174
3	Washer, Lock, Spring, Double Coil, Galv., 3/4" *	2	2218
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
5	Nut, Eye Oval 3/4", Galv.	1	914
6	Bolt, Machine, 3/4" x 16", Galv., 18,350 lbs Ultimate Tensile *	1	175
ITEM NO.	DESCRIPTION	Additional Material	
		QTY.	S/N
7	Insulator, Suspension, 15 KV Clevis-Tongue, Polymer *	3	1967
8	Clamp, Strain, Distribution, 795 AAC	3	303
9	Insulator, Guy Strain, Fiberglass, 20" *	1	2909 *
ITEM NO.	DESCRIPTION	S10	
		QTY.	S/N
10	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
11	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217
12	Bolt, Eye, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	1	108
13	Clamp, Strain, Distribution, #2 - 397.5	1	302



**CONSTRUCTION STANDARDS**  
8' PRE-ASSEMBLED DEADEND  
795 AAC MAX WIRE

REVISIONS			
REV	DATE	ENGR	OPS
1	2/11/81	GGW	
2	3/02	REDRAWN	IN CAD
3	12/11/07	LB	AH
4	1/4/18	CM	DK
APP: ELM			
DATE: 1/31/80			SECTION <b>340</b>





**Note:** See Std AC - Avian Covers - Section 400 if needed. Covers and tree wire jumper only required on center phase.

Rev. 4 - Added avian note, changed from porcelain to polymer insulators, and updated material list.



**CONSTRUCTION STANDARDS**  
 8' PRE-ASSEMBLED DOUBLE DEADEND  
 795 AAC MAX WIRE

REVISIONS			
NO.	DATE	ENGR	OPS
1	2/11/81	GGW	
2	3/02	REDRAWN	IN CAD
3	12/11/07	LB	AH
4	1/4/18	CM	DK

PAGE:  
1 of 4

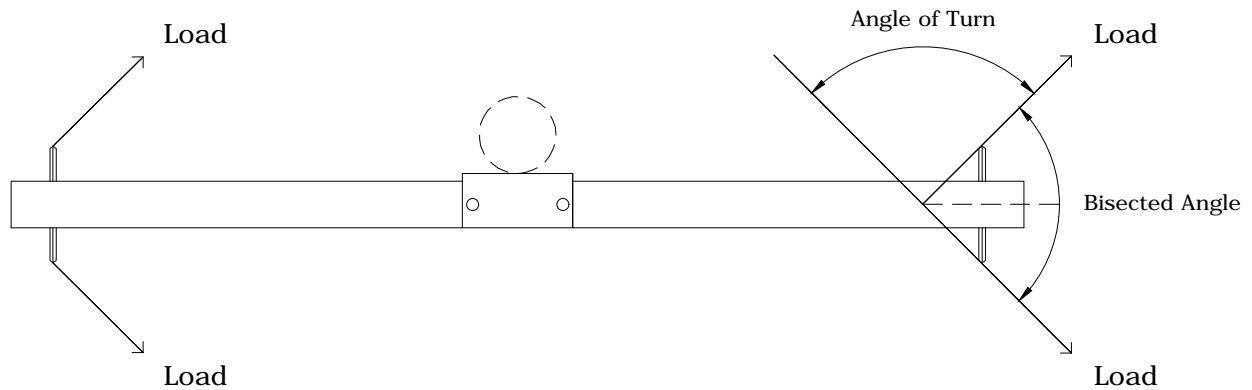
**D51A**

CAD FILE:  
D51A

APP: ELM  
DATE: 1/31/80

SECTION  
**340**


### DEADEND FOR ANGLED SPANS



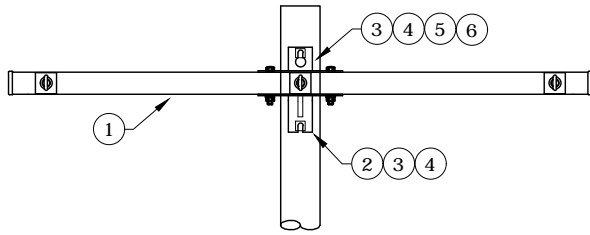
**Notes:**

1. Maximum angle with 795 is 30°, limited by the 3/4" machine bolt.
2. Angle must be bisected so that each eye-nut has half the angle.
3. Phase separation may limit the angle. Use shackle clevises (S/N 1625) for angles.

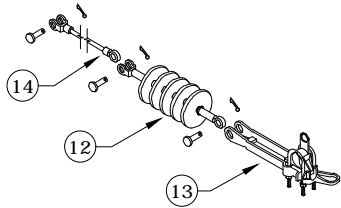
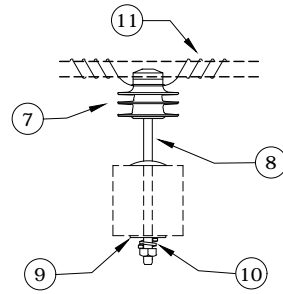
Rev. 4 - Added avian note, changed from porcelain to polymer insulators, and updated material list.

	<b>CONSTRUCTION STANDARDS</b>		<b>REVISIONS</b>			
	8' PRE-ASSEMBLED DOUBLE DEADEND 795 AAC MAX WIRE		△	DATE	ENGR	OPS
	1	2/11/81	GGW			
	2	3/02	REDRAWN	IN CAD		
	3	12/11/07	LB	AH		
4	1/4/18	CM	DK			
△						
PAGE: 2 of 4	<b>D51A</b>		APP: ELM	SECTION		
			DATE: 1/31/80	<b>340</b>		
			CAD FILE: D51A			

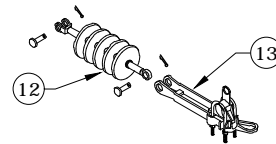
**CR28A**



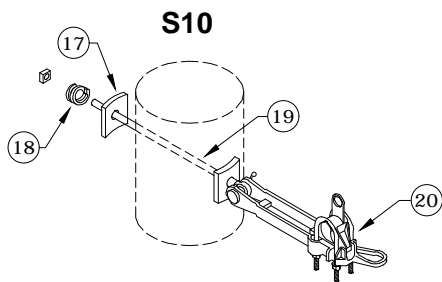
**PR4**



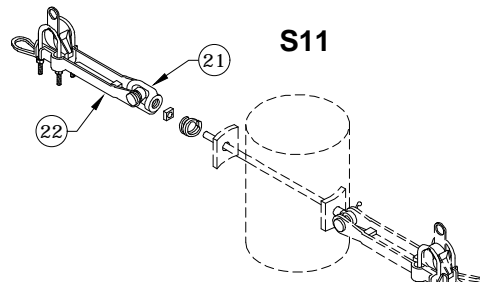
**Middle Phase**



**Outside Phases**



**Neutral**



**Neutral**

Rev. 4 - Added avian note, changed from porcelain to polymer insulators, and updated material list.



**CONSTRUCTION STANDARDS**  
 8' PRE-ASSEMBLED DOUBLE DEADEND  
 795 AAC MAX WIRE

PAGE:  
3 of 4

**D51A**

CAD FILE:  
D51A

REVISIONS			
△	DATE	ENGR	OPS
1	2/11/81	GGW	
2	3/02	REDRAWN	IN CAD
3	12/11/07	LB	AH
4	1/4/18	CM	DK
△			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>340</b>	

Rev. 4 - Added avian note, changed from porcelain to polymer insulators, and updated material list.

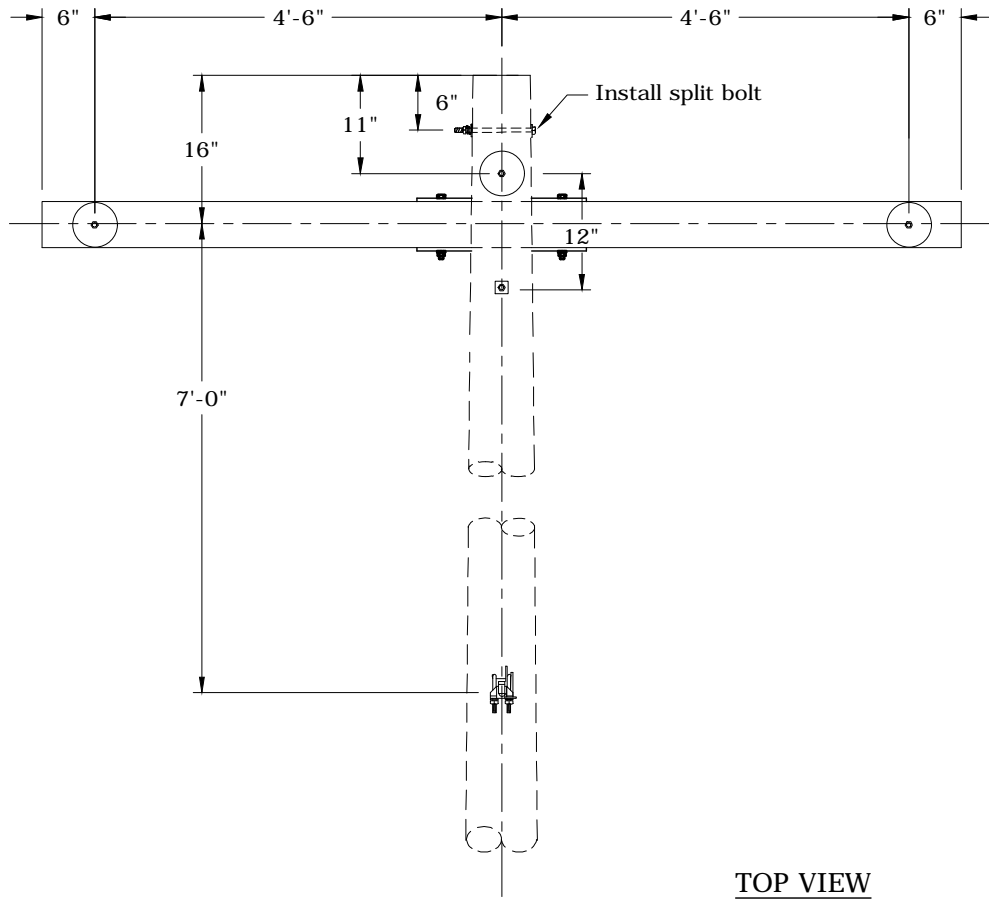
ITEM NO.	DESCRIPTION	D51A	
		QTY.	S/N
1	Arm, Deadend Assembly, 3-position, 336 & 795	1	2509
2	Bolt, Machine, 3/4" x 14", Galv., 18,350 lbs Ultimate Tensile ✱	1	174
3	Washer, Lock, Spring, Double Coil, Galv., 3/4" ✱	2	2218
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
5	Nut, Eye Oval 3/4", Galv.	1	914
6	Bolt, Machine, 3/4" x 16", Galv., 18,350 lbs Ultimate Tensile ✱	1	175
ITEM NO.	DESCRIPTION	CR28A	
		QTY.	S/N
7	Insulator, Pin, C Neck, Polymer ✱	3	1968
8	Pin, Crossarm	3	961
9	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	3	1412
10	Washer, Lock, Spring, Double Coil, Galv., 5/8" ✱	3	2217
11	Wire, Tie, AL Annealed #4 SD	30	1421
ITEM NO.	DESCRIPTION	PR4 (3)	
		QTY.	S/N
12	Insulator, Suspension, 15 kV Clevis-Tongue, Polymer ✱	6	1967
13	Clamp, Strain, Distribution, 795	6	303
14	Insulator, Guy Strain, Fiberglass, 20" ✱	2	2909 ✱
15	Connector, Tap, Wedge, 795 to 795 ✱	6	2477
16	Connector, Tap, Wedge, 397 to 397 ✱	2	2501
ITEM NO.	DESCRIPTION	Additional Material	
		QTY.	S/N
17	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
18	Washer, Lock, Spring, Double Coil, Galv., 5/8" ✱	1	2217
19	Bolt, Eye, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile ✱	1	108
20	Clamp, Strain, Distribution, #2 - 397.5	1	302
ITEM NO.	DESCRIPTION	S10	
		QTY.	S/N
21	Nut, Eye Oval 5/8", Galv.	1	913
22	Clamp, Strain, Distribution, #2 - 397.5	1	302
ITEM NO.	DESCRIPTION	S11	
		QTY.	S/N
21	Nut, Eye Oval 5/8", Galv.	1	913
22	Clamp, Strain, Distribution, #2 - 397.5	1	302



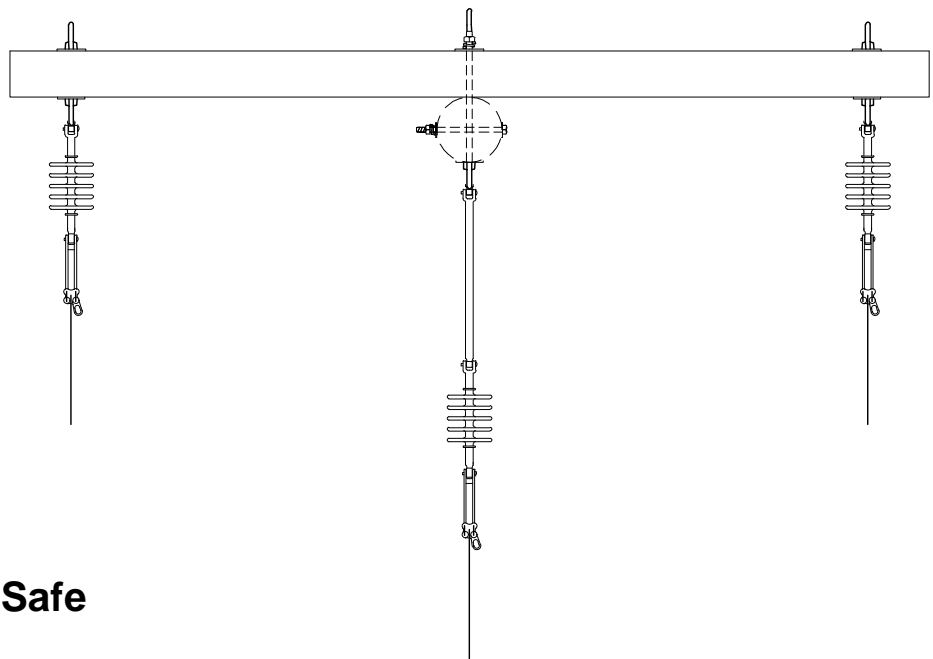
**CONSTRUCTION STANDARDS**  
**8' PRE-ASSEMBLED DOUBLE DEADEND**  
**795 AAC MAX WIRE**

REVISIONS			
△	DATE	ENGR	OPS
1	2/11/81	GGW	
2	3/02	REDRAWN	IN CAD
3	12/11/07	LB	AH
4	1/4/18	CM	DK
△			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>340</b>	

**FRONT VIEW**



**TOP VIEW**



**Avian Safe**

Rev. 4 - Added avian note and updated material list.



**CONSTRUCTION STANDARDS**  
 10' PRE-ASSEMBLED DEADEND  
 795 AAC MAX WIRE

**REVISIONS**

NO.	DATE	ENGR	OPS
1	2/11/81	GGW	
2	3/02	REDRAWN	IN CAD
3	12/11/07	LB	AH
4	1/4/18	CM	DK

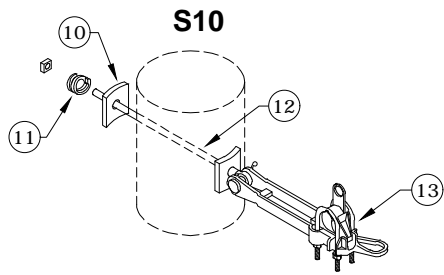
PAGE:  
1 of 2

**D52B**

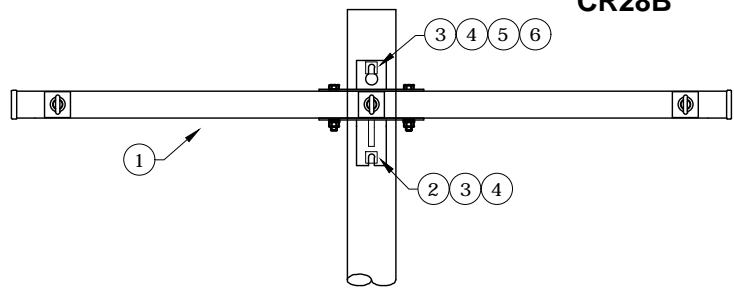
CAD FILE:  
D52B

APP: ELM  
DATE: 1/31/80

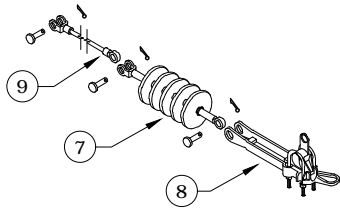
SECTION  
**340**



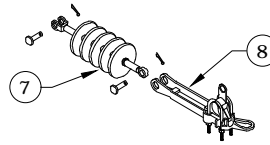
**Neutral**



**CR28B**



**Center Phase**



**Road & Field Phases**

Rev. 4 - Added avian note and updated material list.

ITEM NO.	DESCRIPTION	D52B	
		QTY.	S/N
1	Arm, Deadend Assembly, 3-position, 336 & 795	1	2681
2	Bolt, Machine, 3/4" x 14", Galv., 18,350 lbs Ultimate Tensile *	1	174
3	Washer, Lock, Spring, Double Coil, Galv., 3/4" *	2	2218
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
5	Nut, Eye Oval 3/4", Galv.	1	914
6	Bolt, Machine, 3/4" x 16", Galv., 18,350 lbs Ultimate Tensile *	1	175
ITEM NO.	DESCRIPTION	Additional Material	
		QTY.	S/N
7	Insulator, Suspension, 15 kV Clevis-Tongue, Polymer *	3	1967
8	Clamp, Strain, Distribution, 795	3	303
9	Insulator, Guy Strain, Fiberglass, 20" *	1	2909 *
ITEM NO.	DESCRIPTION	S10	
		QTY.	S/N
10	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
11	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217
12	Bolt, Eye, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	1	108
13	Clamp, Strain, Distribution, #2 - 397.5	1	302

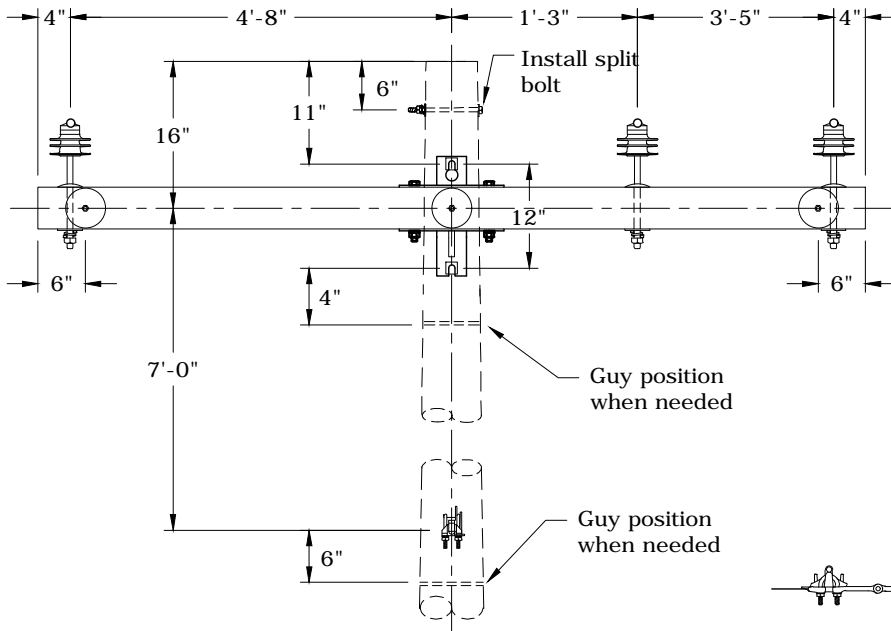


**CONSTRUCTION STANDARDS**

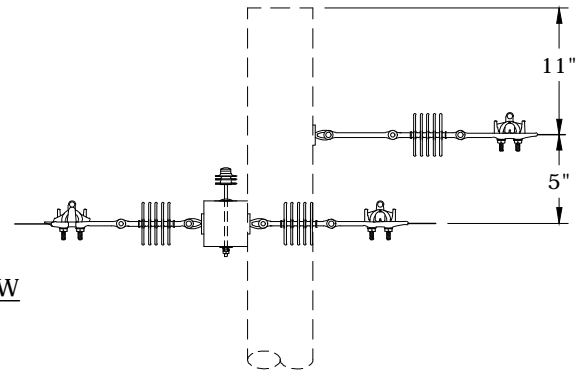
10' PRE-ASSEMBLED DEADEND  
795 AAC MAX WIRE

REVISIONS			
REV	DATE	ENGR	OPS
1	2/11/81	GGW	
2	3/02	REDRAWN	IN CAD
3	12/11/07	LB	AH
4	1/4/18	CM	DK
APP: ELM			
DATE: 1/31/80			SECTION <b>340</b>

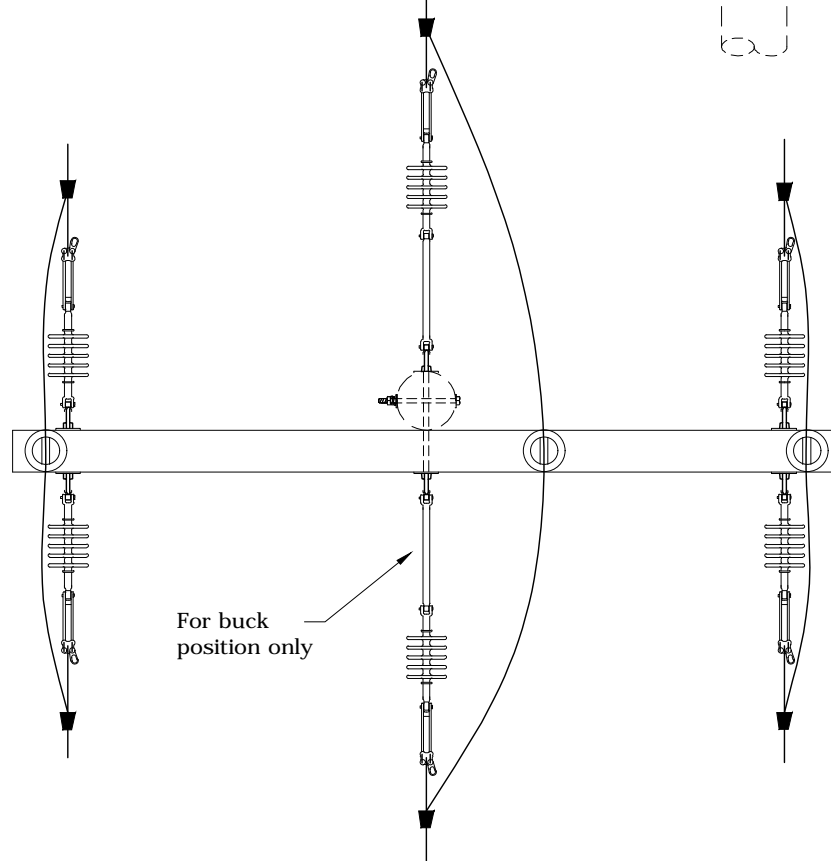
**FRONT VIEW**



**SIDE VIEW**



**TOP VIEW**



**Note:** See Std AC - Avian Covers - Section 400 if needed. Covers and tree wire jumper only required on center phase.

Rev. 4 - Added avian note and updated material list.



**CONSTRUCTION STANDARDS**  
 10' PRE-ASSEMBLED DOUBLE DEADEND  
 795 AAC MAX WIRE

PAGE:  
1 of 4

**D53B**

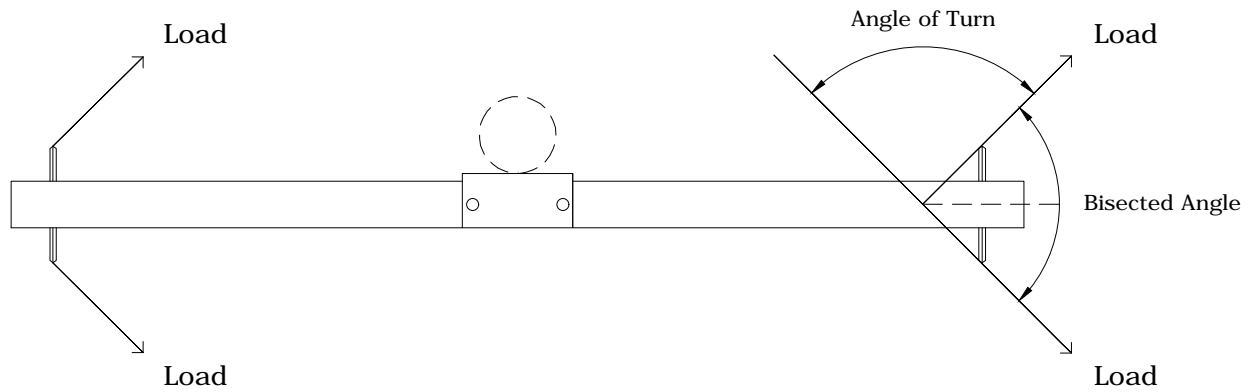
CAD FILE:  
D53B

**REVISIONS**

NO.	DATE	ENGR	OPS
1	2/11/81	GGW	
2	3/02	REDRAWN	IN CAD
3	12/11/07	LB	AH
4	1/4/18	CM	DK

APP: ELM	SECTION
DATE: 1/31/80	<b>340</b>


### DEADEND FOR ANGLED SPANS



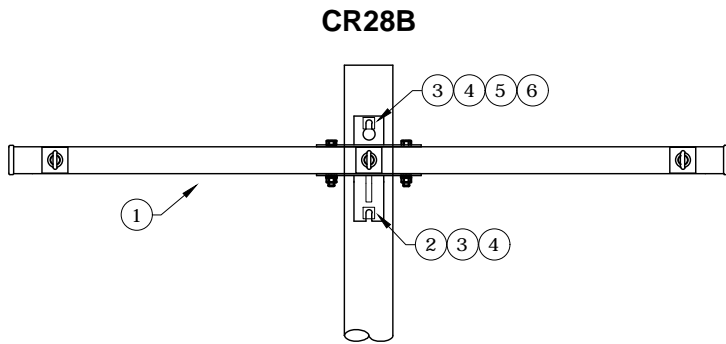
Notes:

1. Maximum angle with 795 is 30°, limited by the 3/4" machine bolt.
2. Angle must be bisected so that each eye-nut has half the angle.
3. Phase separation may limit the angle. Use shackle clevises (S/N 1625) for angles.

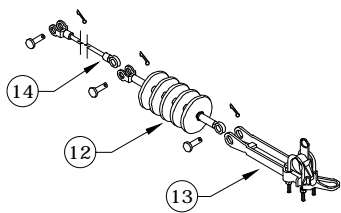
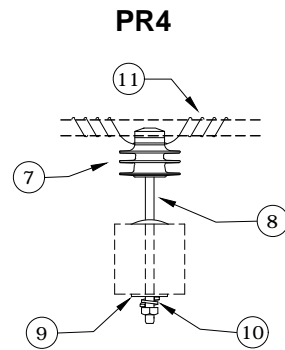
Rev. 4 - Added avian note and updated material list.

	<b>CONSTRUCTION STANDARDS</b>		<b>REVISIONS</b>			
	10' PRE-ASSEMBLED DOUBLE DEADEND 795 AAC MAX WIRE		△	DATE	ENGR	OPS
	1	2/11/81	GGW			
	2	3/02	REDRAWN	IN CAD		
	3	12/11/07	LB	AH		
			4	1/4/18	CM	DK
PAGE: 2 of 4	<b>D53B</b>		CAD FILE: D53B	APP: ELM	SECTION <b>340</b>	
			DATE: 1/31/80			

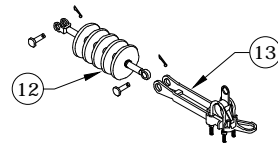




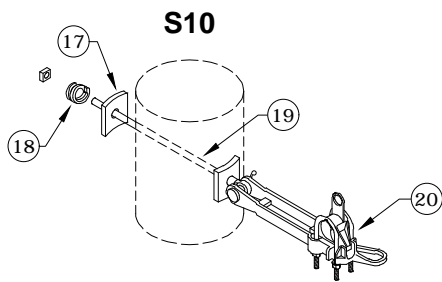
**Front View**



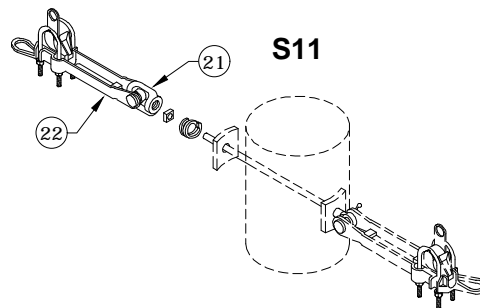
**Center Phase**



**Road & Field Phases**



**Neutral**



**Neutral**

Rev. 4 - Added avian note and updated material list.



**CONSTRUCTION STANDARDS**  
 10' PRE-ASSEMBLED DOUBLE DEADEND  
 795 AAC MAX WIRE

PAGE:  
3 of 4

**D53B**

CAD FILE:  
D53B

REVISIONS											
NO.	DATE	ENGR	OPS								
1	2/11/81	GGW									
2	3/02	REDRAWN	IN CAD								
3	12/11/07	LB	AH								
4	1/4/18	CM	DK								
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APP:	ELM	SECTION									
DATE:	1/31/80	<b>340</b>									

Rev. 4 - Added avian note and updated material list.

ITEM NO.	DESCRIPTION	D53B	
		QTY.	S/N
1	Arm, Deadend Assembly, 3-position, 336 & 795	1	2681
2	Bolt, Machine, 3/4" x 14", Galv., 18,350 lbs Ultimate Tensile *	1	174
3	Washer, Lock, Spring, Double Coil, Galv., 3/4"	2	2218
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
5	Nut, Eye Oval 3/4", Galv.	1	914
6	Bolt, Machine, 3/4" x 16", Galv., 18,350 lbs Ultimate Tensile *	1	175
ITEM NO.	DESCRIPTION	CR28B	
		QTY.	S/N
7	Insulator, Pin, C Neck, Polymer	1	1968
8	Pin, Crossarm	1	961
9	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	1	1412
10	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217
11	Wire, Tie, AL Annealed #4 SD	10	1421
ITEM NO.	DESCRIPTION	PR4 (3)	
		QTY.	S/N
12	Insulator, Suspension, 15 kV Clevis-Tongue, Polymer Type *	6	1967
13	Clamp, Strain, Distribution, 795	6	303
14	Insulator, Guy Strain, Fiberglass, 20" *	2	2909 *
15	Connector, Tap, Wedge, 795 to 795 *	6	2477
16	Connector, Tap, Wedge, 397 to 397 *	2	2501
ITEM NO.	DESCRIPTION	Additional Material	
		QTY.	S/N
17	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
18	Washer, Lock, Spring, Double Coil, Galv., 5/8" *	1	2217
19	Bolt, Eye, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile *	1	108
20	Clamp, Strain, Distribution, #2 - 397.5	1	302
ITEM NO.	DESCRIPTION	S10	
		QTY.	S/N
21	Nut, Eye Oval 5/8", Galv.	1	913
22	Clamp, Strain, Distribution, #2 - 397.5	1	302
ITEM NO.	DESCRIPTION	S11	
		QTY.	S/N



**CONSTRUCTION STANDARDS**  
 10' PRE-ASSEMBLED DOUBLE DEADEND  
 795 AAC MAX WIRE

REVISIONS			
△	DATE	ENGR	OPS
1	2/11/81	GGW	
2	3/02	REDRAWN	IN CAD
3	12/11/07	LB	AH
4	1/4/18	CM	DK
△			
APP:	ELM	SECTION	
DATE:	1/31/80	340	

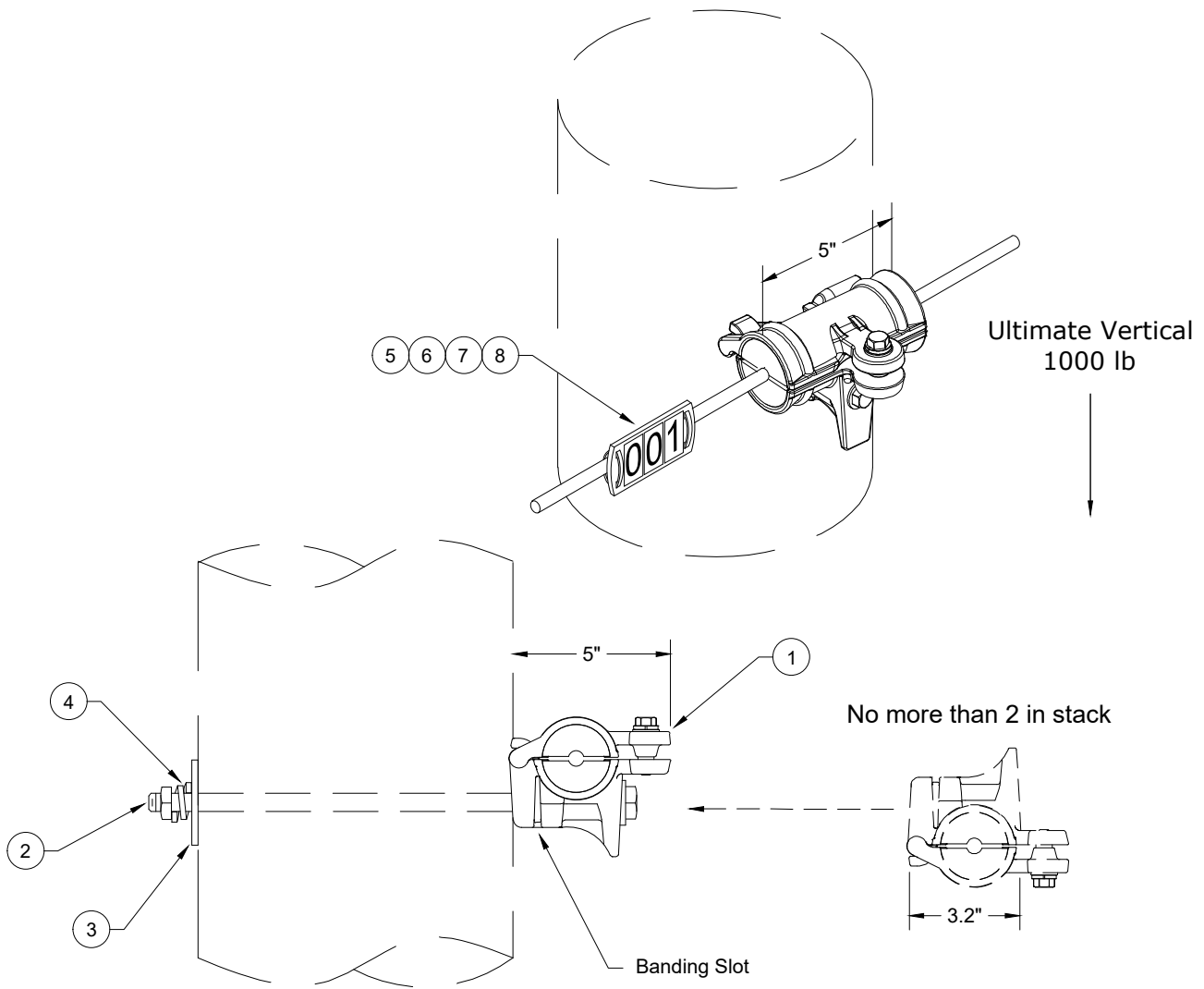
# 350

## OVERHEAD FIBER OPTIC

12/23/2022

~	FO1	Tangent – 0° to 20°
~	FO2	Angle – 20° to 30°
~	FO3	Tangent – Fiberglass Arm
~	FO21	Storage Loop
~	FO42	Double Deadend Tangent
<b>C</b>	FO43	Double Deadend Angled
~	FOR	Riser

**N** New Standard  
**R** Redrawn Standard  
**C** Changed Standard  
~ No Change



CPU fiber is top attachment in communication space

- Notes:**
1. Follow Joint Use Std JU2 - Pole Attachment Guidelines - Section 1910.
  2. Maximum span length is 450 feet.
  3. Call for additional support and 4" longer bolt when stacking.
  4. Banding slot is available for steel poles.
  5. Use Std FO1 for 48-count and Std FO1A for 96-count fiber.

5/8" Machine Bolt	
Length	S/N
16"	157
18"	158
20"	159
22"	160
24"	161

ITEM NO.	DESCRIPTION	48-Count		96-Count	
		FO1		FO1A	
		QTY.	S/N	QTY.	S/N
1	Support, Al, Thru-bolt, for ADSS fiber, 20° Max	1	3000	1	3001
2	Bolt, Machine, 5/8" x 14", Galv, 12,400 lb Ultimate Tensile	1	156	1	156
3	Washer, Curved, Square, Cast, Galv, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392	1	1392
4	Washer, Lock, Spring, Double Coil, Galv, 5/8"	1	2217	1	2217
5	Tag, "O" (& Zero), Character, 1"	2	2636	2	2636
6	Tag, "1", Character, 1"	1	2648	1	2648
7	Holder, Identification Tag, 4 Position	1	2588	1	2588
8	Wrap, Tie, Fluoropolymer, 7"	2	3022	2	3022



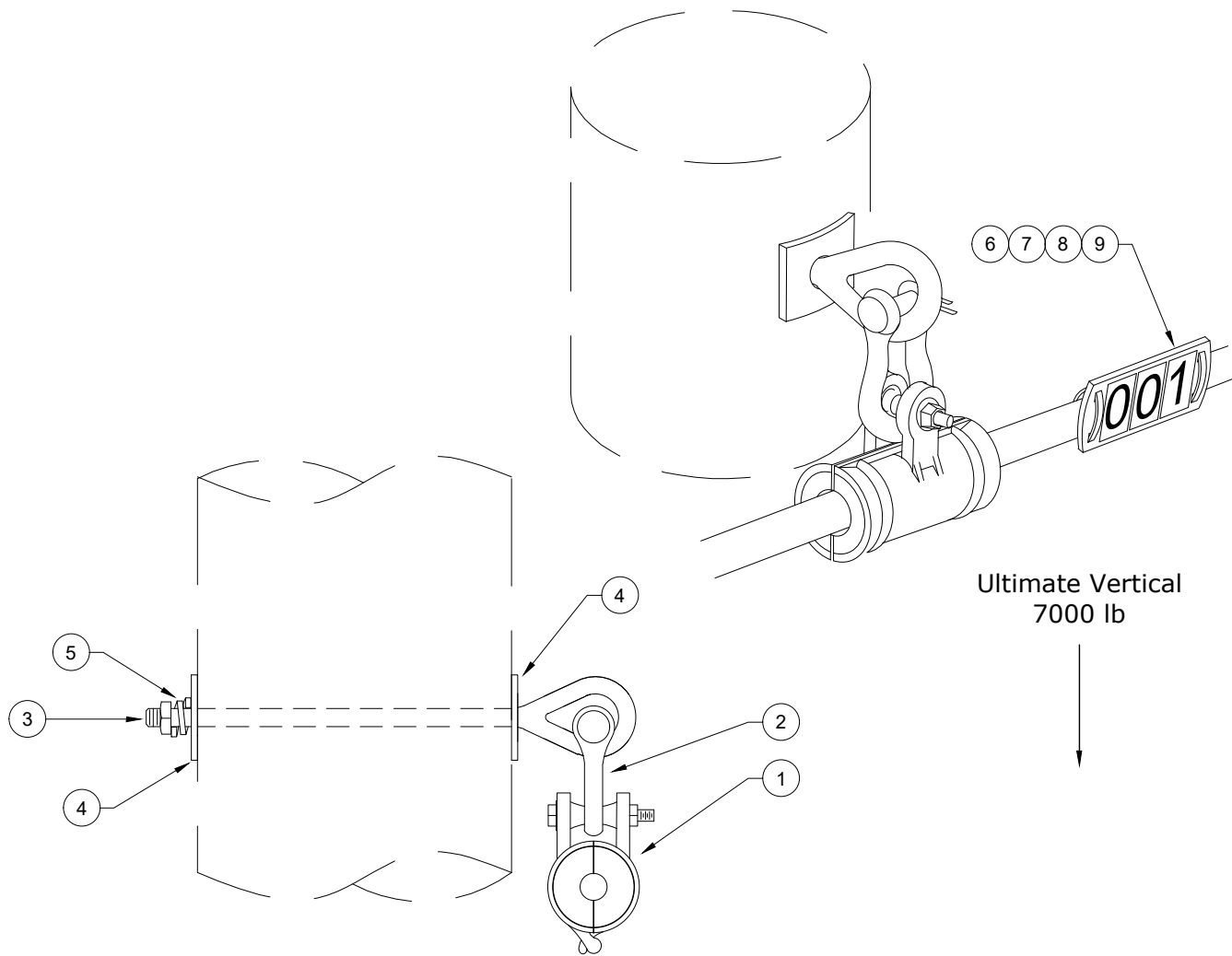
**CONSTRUCTION STANDARDS**  
 FIBER OPTIC STACKABLE TANGENT SUPPORT  
 0° to 20°  
 ADSS FIBER

PAGE:  
1 of 1

**FO1,FO1A**

CAD FILE:  
FO1

REVISIONS		
DATE	ENGR	OPS
APP: KJP/DRK	SECTION	
DATE: 8/11/21	350	



CPU fiber is top attachment in communication space

- Notes:**
1. Follow Joint Use Std JU2 - Pole Attachment Guidelines - Section 1910.
  2. Maximum span length is 450 feet.
  3. Banding attachment is available for steel poles.
  4. Use Std FO2 for 48-count and Std FO2A for 96-count fiber.

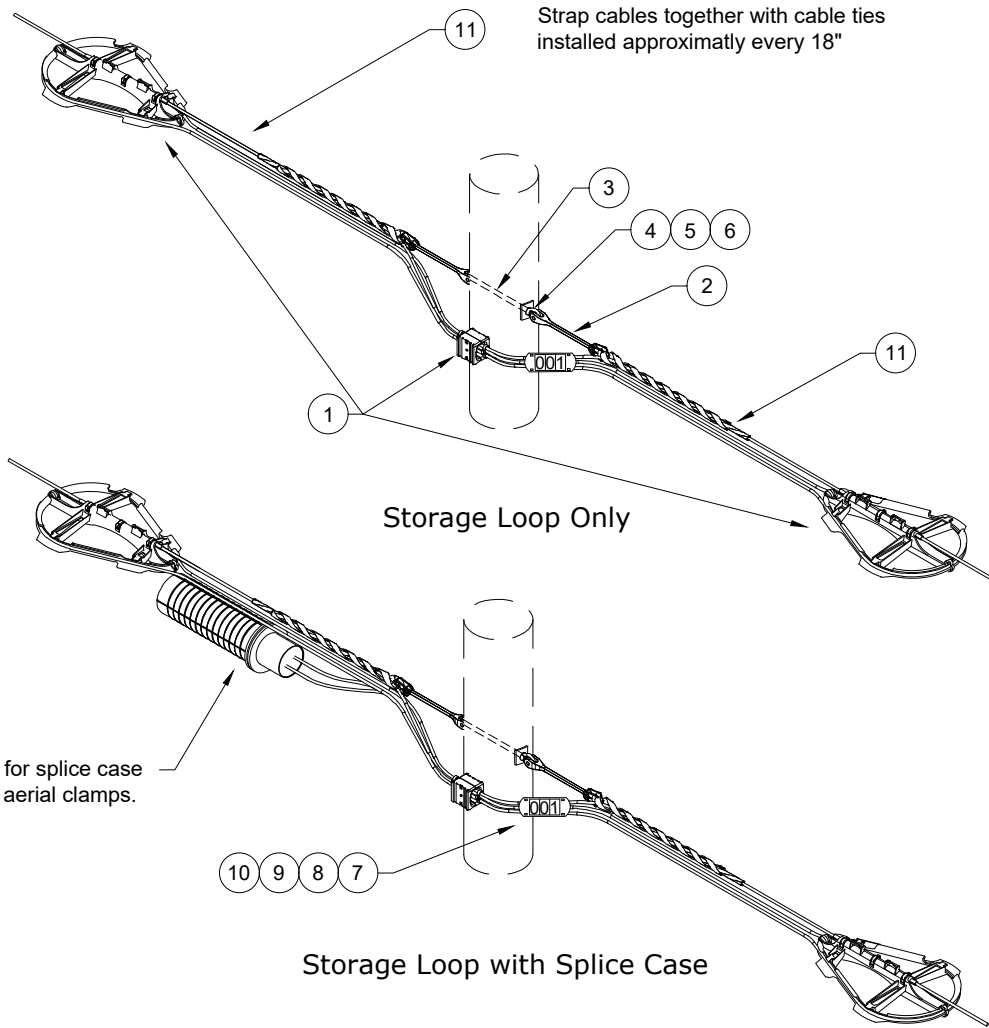
ITEM NO.	DESCRIPTION	48-Count FO2		96-Count FO2A	
		QTY.	S/N	QTY.	S/N
		1	Support, Al, Suspension, for ADSS fiber, 30° Max	1	3002
2	Shackle, Anchor, Galv, 25,000 lb	1	3007	1	3007
3	Bolt, Eye, 5/8" x 14", Galv, 12,400 lb Ultimate Tensile	1	108	1	108
4	Washer, Curved, Square, Cast, Galv, 3" x 3" x 3/8" Thick w/ 13/16" Hole	2	1392	2	1392
5	Washer, Lock, Spring, Double Coil, Galv, 5/8"	1	2217	1	2217
6	Tag, "0" (& Zero), Character, 1"	2	2636	2	2636
7	Tag, "1", Character, 1"	1	2648	1	2648
8	Holder, Identification Tag, 4 Position	1	2588	1	2588
9	Wrap, Tie, Fluoropolymer, 7"	2	3022	2	3022



**CONSTRUCTION STANDARDS**  
 FIBER OPTIC SUSPENSION SUPPORT  
 0° to 30°  
 ADSS FIBER

REVISIONS		
DATE	ENGR	OPS





Call for s/n 3013 for splice case and s/n 3020 for aerial clamps.

**CPU fiber is top attachment in communication space**

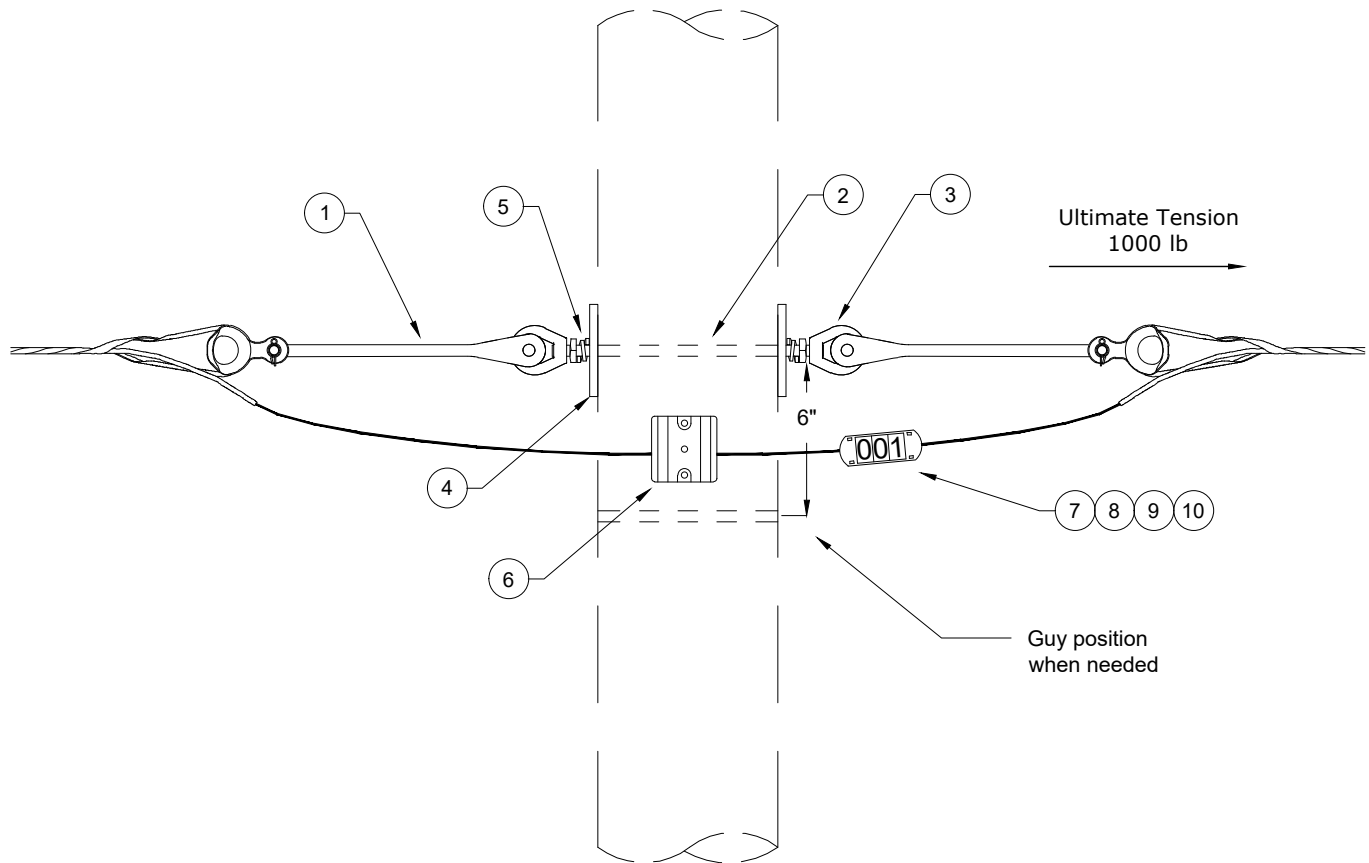
- Notes:**
1. Follow Joint Use Std JU2 - Pole Attachment Guidelines - Section 1910.
  2. Storage should be easily accessible by bucket truck.
  3. Length of fiber in storage to be at least 150 feet.
  4. Call separately for splice case (s/n 3013) and aerial clamps (s/n 3020).
  5. Use Std FO21 for 48-count and Std FO21A for 96-count fiber.

ITEM NO.	DESCRIPTION	48-Count		96-Count	
		FO21		FO21A	
		QTY.	S/N	QTY.	S/N
1	Storage Kit, Fiber, OH, includes 2 loop brackets, 1 cable guide	1	3011	1	3011
2	Deadend Assembly, for ADSS fiber	2	3009	2	3010
3	Bolt, Double Arm, 5/8" x 14", Galv, 12,000 lb Ultimate Tensile	1	2382	1	2382
4	Nut, Eye, Oval, 5/8", Galv	2	913	2	913
5	Washer, Curved, Square, Cast, Galv, 3" x 3" x 3/8" Thick w/ 13/16" Hole	2	1392	2	1392
6	Washer, Lock, Spring, Double Coil, Galv, 5/8"	2	2217	2	2217
7	Tag, "O" (& Zero), Character, 1"	2	2636	2	2636
8	Tag, "1", Character, 1"	1	2648	1	2648
9	Holder, Identification Tag, 4 Position	1	2588	1	2588
10	Wrap, Tie, Fluoropolymer, 7"	2	3022	2	3022
11	Wrap, Tie, Acetal, 13.5"	25	3023	25	3023



**CONSTRUCTION STANDARDS**  
**FIBER OPTIC STORAGE LOOP ADSS FIBER**

REVISIONS		
DATE	ENGR	OPS



CPU fiber is top attachment in communication space

- Notes:**
1. Follow joint use Std JU2 - Pole Attachment Guidelines - Section 1910.
  2. Maximum span length is 450 ft.
  3. Use Std FO42 for 48-count and Std FO42A for 96-count fiber.
  4. Call for guying separately if needed.

ITEM NO.	DESCRIPTION	48 Count		96 Count	
		FO42		FO42A	
		QTY.	S/N	QTY.	S/N
1	Deadend Assembly, for ADSS fiber	2	3009	2	3010
2	Bolt, Double Arm, 5/8" x 14", Galv, 12,000 lb Ultimate Tensile	1	2382	1	2382
3	Nut, Eye, Oval, 5/8", Galv	2	913	2	913
4	Washer, Curved, Square, Cast, Galv, 3" x 3" x 3/8" Thick w/ 13/16" Hole	2	1392	2	1392
5	Washer, Lock, Spring, Double Coil, Galv, 5/8"	2	2217	2	2217
6	Guide, Pole, for ADSS fiber	1	3021	1	3021
7	Tag, "O" (& Zero), Character, 1"	2	2636	2	2636
8	Tag, "1", Character, 1"	1	2648	1	2648
9	Holder, Identification Tag, 4 Position	1	2588	1	2588
10	Wrap, Tie, Fluoropolymer, 7"	2	3022	2	3022



## CONSTRUCTION STANDARDS

FIBER OPTIC  
TANGENT DOUBLE DEADEND  
ADSS FIBER

PAGE:  
1 of 1

**FO42,FO42A**

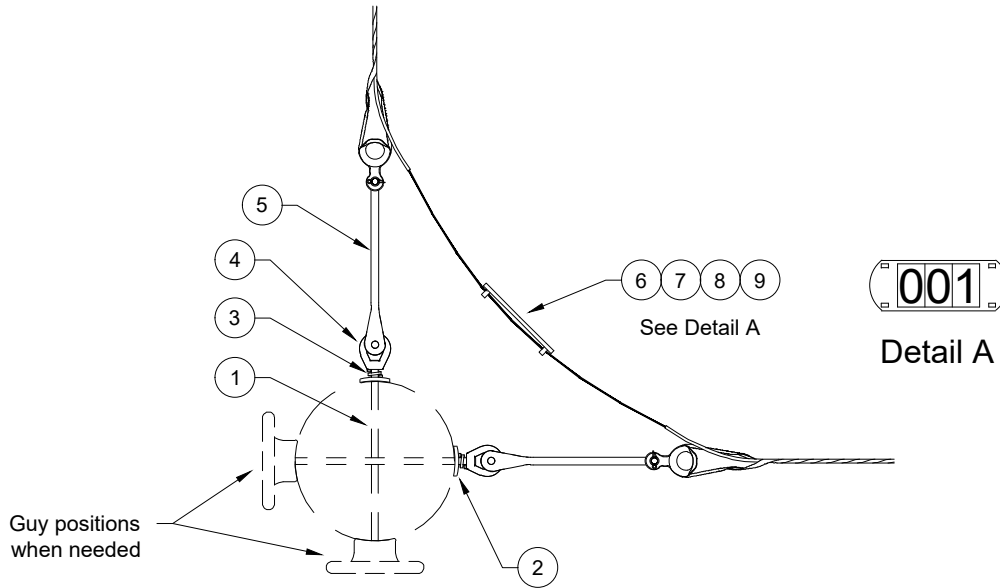
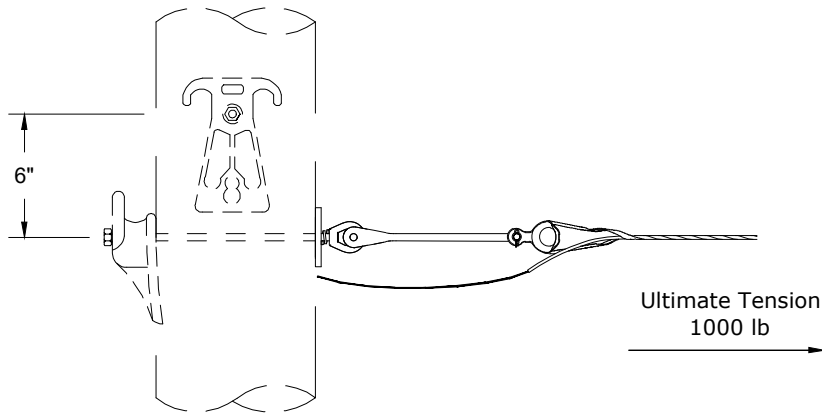
CAD FILE:  
FO42

REVISIONS		
DATE	ENGR	OPS

APP: KJP/DRK  
DATE: 8/11/21

SECTION  
**350**





CPU fiber is top attachment in communication space

- Notes:**
1. Follow Joint Use Std JU2 - Pole Attachment Guidelines - Section 1910.
  2. Maximum span length is 450 feet.
  3. Use Std FO43 for 48-count and Std FO43A for 96-count fiber.
  4. Call for Std G43, downguy, and anchor separately when guying is required.

Rev. 1 - Removed G43 from materials. Added notes to call for guying when needed.

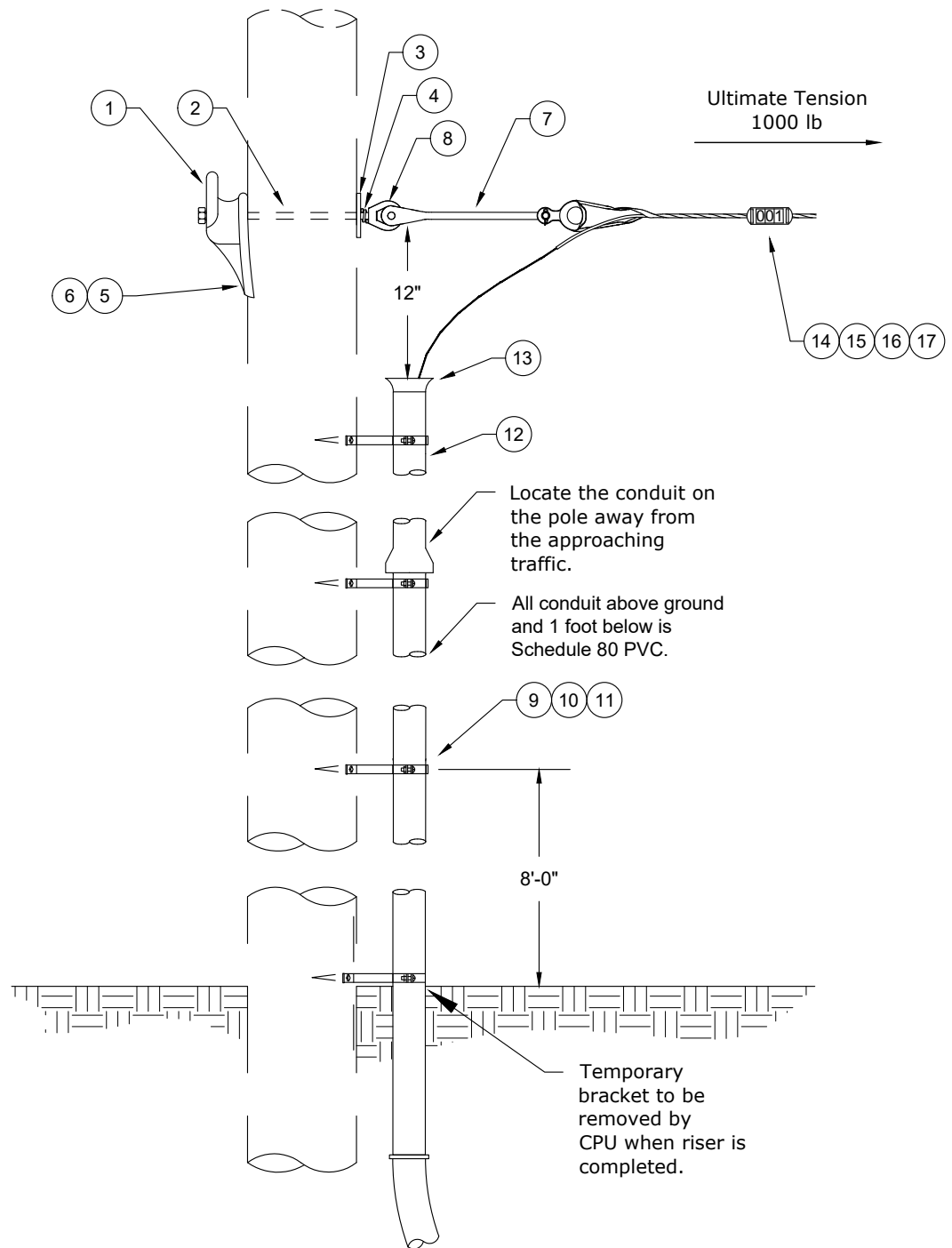
ITEM NO	DESCRIPTION	48-Count		96-Count	
		FO43		FO43A	
		QTY	S/N	QTY	S/N
1	Bolt, Machine 3/4" x 14", 18,350 lb Ultimate Tensile	2	174	2	174
2	Washer, Curved, Cast, 4" x 4" w/ 13/16" Hole	4	1910	4	1910
3	Washer, Lock, Spring, Double Coil, Galv, 3/4"	4	2218	4	2218
4	Nut, Eye, Oval, 3/4", Galv	2	914	2	914
5	Deadend Assembly, for ADSS fiber	2	3009	2	3010
6	Tag, "O" (& Zero), Character, 1"	2	2636	2	2636
7	Tag, "1", Character, 1"	1	2648	1	2648
8	Holder, Identification Tag, 4 Position	1	2588	1	2588
9	Wrap, Tie, Fluoropolymer, 7"	2	3022	2	3022



**CONSTRUCTION STANDARDS**

FIBER OPTIC  
90° DOUBLE DEADEND  
ADSS FIBER

REVISIONS			
	DATE	ENGR	OPS
1	10/21/21	DRK	
APP: KJP/DRK		SECTION	
DATE: 8/11/21		<b>350</b>	



CPU fiber is top attachment in communication space

- Notes:**
1. Follow joint use Std JU2 - Pole Attachment Guidelines - Section 1910.
  2. Maximum span length is 450 feet.
  3. Use Std FOR for 48-count and Std FORA for 96-count fiber.
  4. Call for downguy and anchor separately.



## CONSTRUCTION STANDARDS

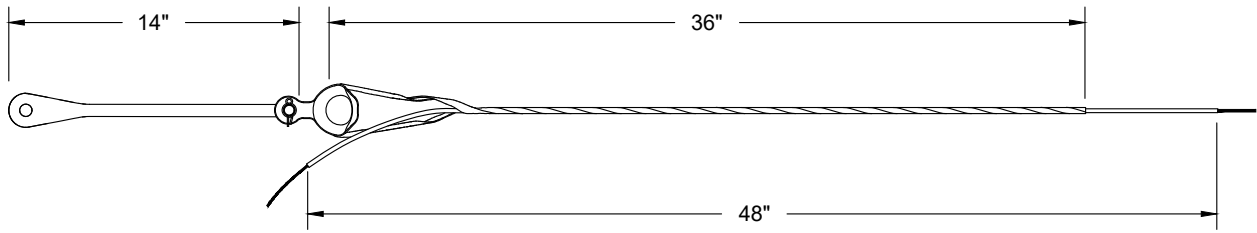
FIBER OPTIC  
RISER  
ADSS FIBER

PAGE:  
1 of 2

**FOR, FORA**

CAD FILE:  
FOR

REVISIONS		
DATE	ENGR	OPS
APP: KJP/DRK	SECTION	
DATE: 8/11/21	<b>350</b>	



Deadend Assembly Detail (Item #7)

ITEM NO.	DESCRIPTION	48 Count		96 Count	
		FOR G41		FORA G41	
		QTY.	S/N	QTY.	S/N
1	Hook, Guy, 25,400 lb Ultimate	1	753	1	753
2	Bolt, Machine 3/4" x 14", 18,350 lb Ultimate Tensile	1	174	1	174
3	Washer, Curved, Cast, 4" x 4" with 13/16" hole	1	1910	1	1910
4	Washer, Lock, Spring, Double Coil, Galv, 3/4"	1	2218	1	2218
5	Screw, Lag, 1/2" x 4 1/2", Twist Drive, Drive Point	1	1132	1	1132
6	Washer, Flat, Round, Galv, 1/2"	1	1394	1	1394
ITEM NO.	DESCRIPTION	Additional Material		Additional Material	
		QTY.	S/N	QTY.	S/N
7	Deadend Assembly, for ADSS fiber	1	3009	1	3010
8	Nut, Eye, Oval, 3/4", Galv	1	914	1	914
9	Screw, Lag, 1/2" x 3", Fetter Drive, Drive Point	6	1131	6	1131
10	Bracket, Standoff, 10 1/2", with Stop	3	226	3	226
11	Clamp, Standoff Bracket, 2" Conduit	3	295	3	295
12	Conduit, PVC, 2" X 10', Sch 80	30	2205	30	2205
13	End Bell, 2", Sch 40	1	2206	1	2206
14	Tag, "O" (& Zero), Character, 1"	2	2636	2	2636
15	Tag, "1", Character, 1"	1	2648	1	2648
16	Holder, Identification Tag, 4 Position	1	2588	1	2588
17	Wrap, Tie, Fluoropolymer, 7"	2	3022	2	3022



**CONSTRUCTION STANDARDS**  
 FIBER OPTIC  
 RISER  
 ADSS FIBER

REVISIONS			
DATE	ENGR	OPS	

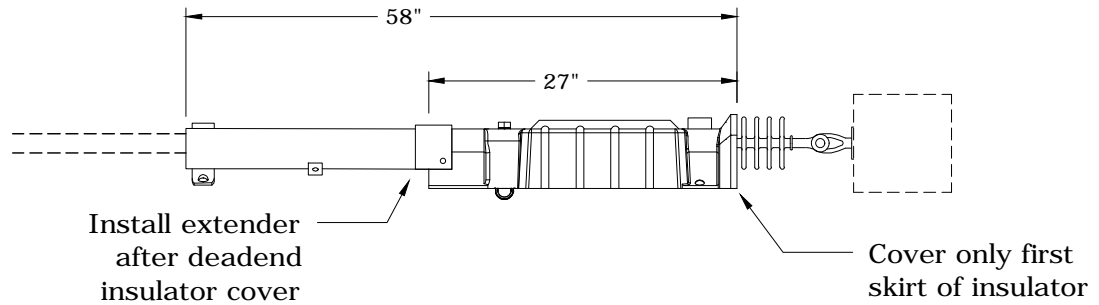
# 400 OVERHEAD CONDUCTOR

1/17/2019

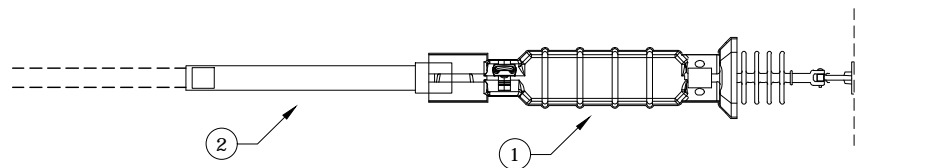
~	AC	Avian Covers
~	BFD	Bird Flight Diverters
~	L4	Splicing Guide, Compression Type Sleeves
~	L5	Splicing Guide, Automatic Type
~	L6, L7	Midspan Tap, Flying Tap
<b>C</b>	LA1, LA2	Lightning (Surge) Arrester
~	SE10	Mobile Home Trailer Connection
~	SS1	1Ø Slack Span - 2/0 ACSR Max Wire
~	SS2	2Ø Slack Span - 2/0 ACSR Max Wire
~	SS3	3Ø Slack Span - 2/0 ACSR Max Wire
~	TI2	Single Insulators Two-Piece Tie, Copper Type Conductors
~	TI3	Hot Line Tying Guide, Copper Type Conductors
~	TI4	Conductor Tying Guide, Single Insulator, ACSR or Aluminum
~	TI5	Conductor Tying Guide, Double Insulator, ACSR or Aluminum

<b>N</b>	New Standard
<b>R</b>	Redrawn Standard
<b>C</b>	Changed Standard
~	No Change

SIDE VIEW



TOP VIEW



**Note:** Covers required on center phase only if at least 60" horizontal separation between outside phases. For high neutral, cover middle phase and neutral.

ITEM NO.	DESCRIPTION	ACDE	
		QTY.	S/N
1	Avian, Cover, Deadend Insulator, #6-795	1	2897
2	Avian, Cover, Extender, #6-795	1	2914

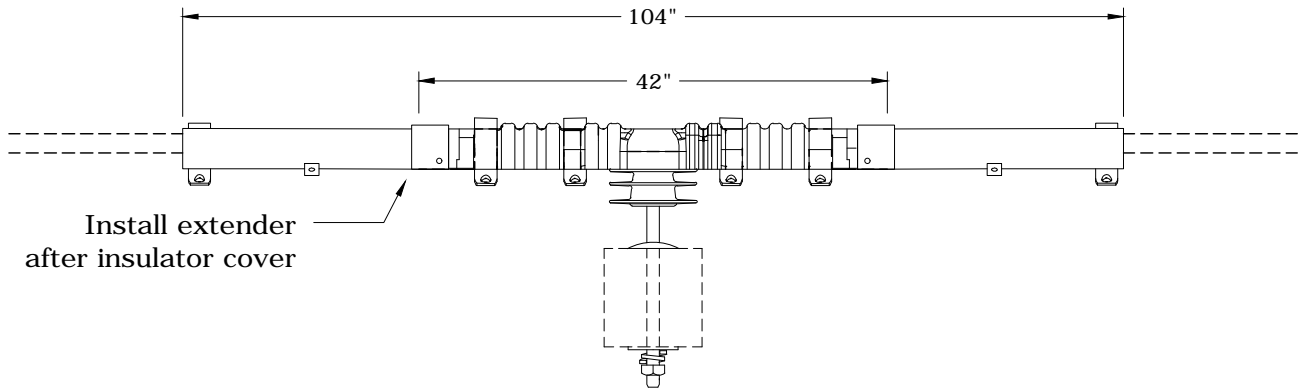


**CONSTRUCTION STANDARDS**  
AVIAN COVERS  
DEADEND

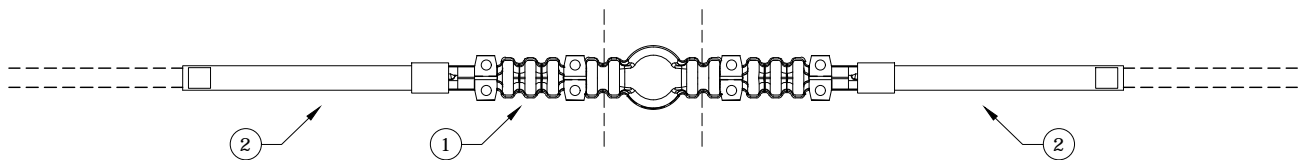
REVISIONS			
△	DATE	ENGR	OPS

PAGE: 1 of 3	<b>AC</b>	CAD FILE: AC	APP: CM/DK DATE: 10-18-17	SECTION <b>400</b>
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**SIDE VIEW**



**TOP VIEW**



**Notes:**

1. Covers required on center phase only if at least 60" horizontal separation between outside phases. For high neutral, cover middle phase and neutral.
2. Use Std ACS for pin insulators and use Std ACSL for line post and vise-top insulators.

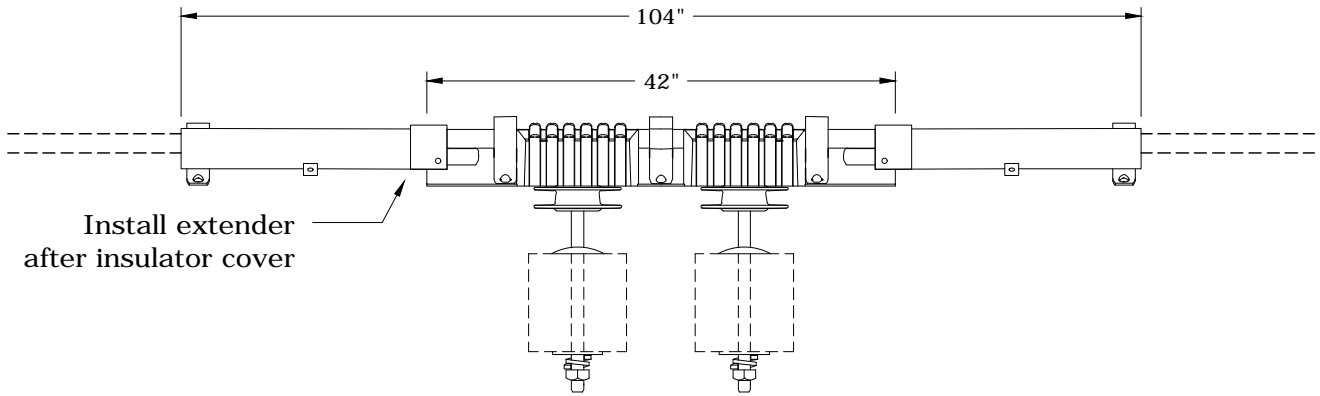
ITEM NO.	DESCRIPTION	ACS	
		QTY.	S/N
1	Avian, Cover, Single Pin Insulator, #6-795	1	2873
2	Avian, Cover, Extender, #6-795	2	2914
ITEM NO.	DESCRIPTION	ACSL	
		QTY.	S/N
1	Avian, Cover, Single Post Insulator, #6-795	1	2874
2	Avian, Cover, Extender, #6-795	2	2914



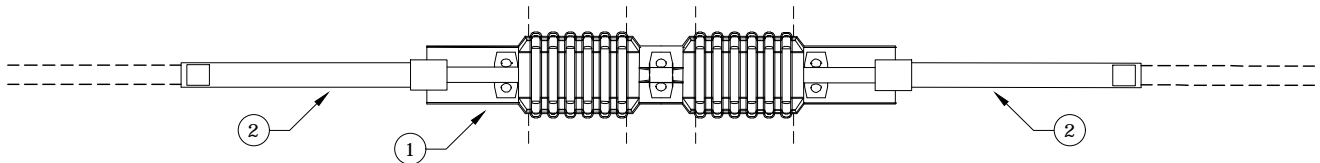
**CONSTRUCTION STANDARDS**  
 AVIAN COVERS  
 SINGLE INSULATOR

REVISIONS			
△	DATE	ENGR	OPS

**SIDE VIEW**



**TOP VIEW**



**Notes:**

1. Covers required on center phase only if at least 60" horizontal separation between outside phases. For high neutral, cover middle phase and neutral.
2. Use Std ACD for pin insulators and use Std ACDL for line post and vise-top insulators.

ITEM NO.	DESCRIPTION	ACD	
		QTY.	S/N
1	Avian, Cover, Double Pin Insulator, #6-795	1	2875
2	Avian, Cover, Extender, #6-795	2	2914
ITEM NO.	DESCRIPTION	ACDL	
		QTY.	S/N
1	Avian, Cover, Double Post Insulator, #6-795	1	2876
2	Avian, Cover, Extender, #6-795	2	2914



**CONSTRUCTION STANDARDS**  
 AVIAN COVERS  
 DOUBLE INSULATOR

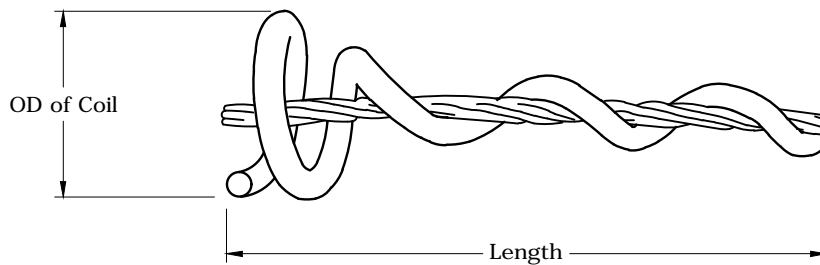
REVISIONS			
DATE	ENGR	OPS	

SCOPE

Bird Flight Diverters (BFDs) provide a visual image that helps birds avoid collisions with overhead power lines. When installed, the BFD increases the visible profile of the conductor.

MATERIAL

BFDs are made from rigid, high impact, UV stabilized PVC material. CPU has standardized on a gray-colored diverter. Studies have determined that color is not a determining factor of BFD effectiveness. They are designed to be used in ambient temperatures ranging from -40°F to 140°F with a maximum operating temperature of 257°F (125°C).



Wire Size	Stock Number	Wire Range (inches)*		Length (inches)	Coil (inches)
		MIN	MAX		
#6 Cu	N/A**				
#4 Cu	2883	0.175	0.249	7.00	2.25
#2 ACSR	2884	0.250	0.349	8.5	2.5
2/0 ACSR	2885	0.450	0.599	14.625	4.25
397 AAC***	2886	0.600	0.770	17.0	4.25
795 AAC***	2887	0.971	1.121	15.5	4.25

\* Range printed on BFDs

\*\* Not manufactured

\*\*\* Not kept in stock--let Purchasing know in advance so they can be ordered.

	CONSTRUCTION STANDARDS		REVISIONS			
	BIRD FLIGHT DIVERTERS		DATE	ENGR	OPS	
	PAGE: 1 of 7	BFD	CAD FILE: BFD	APP: DATE: 10-18-17	CM/DK	SECTION <b>400</b>



INSTALLATION

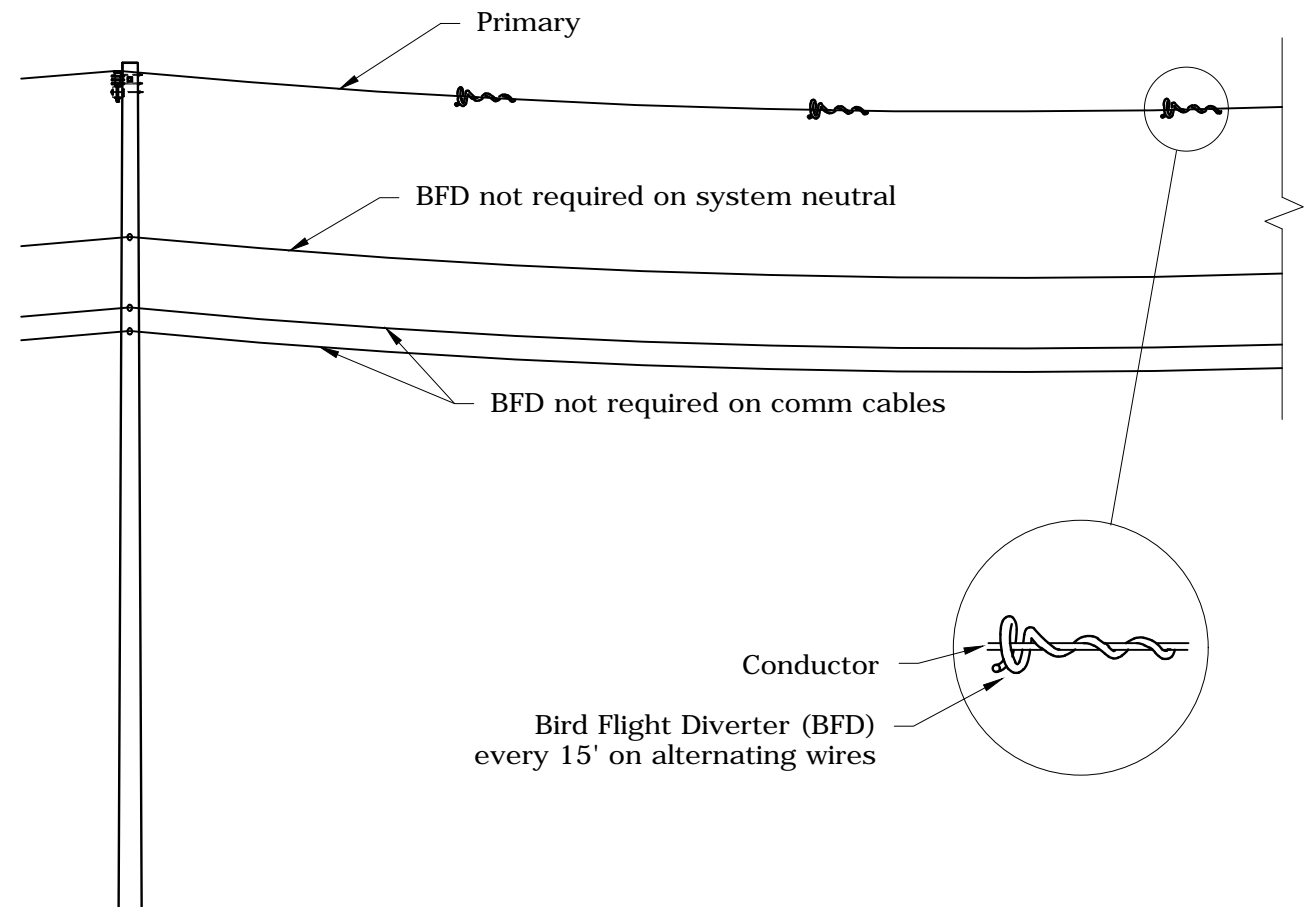
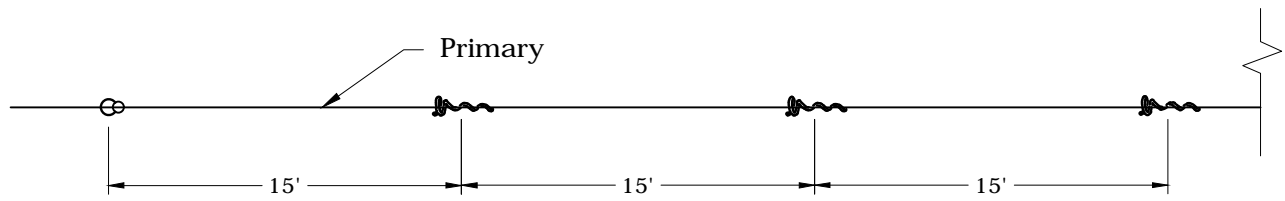
BFDs are installed on the topmost and outside primary conductors and can be installed on span guys, down guys and static wire. Most migratory birds will flare up and away to avoid collision with a visible conductor. BFDs are not required on lower conductors (neutral, secondary or communication cables).

The heliformed rod gripping section (the small end) of the BFD is sized to the diameter of the conductor and can be installed with a hotstick. The positive grip on the conductor ensures that the BFD remains in the applied position and cannot move along the span under aeolian vibration or other conditions. The larger helical end is designed to provide the birds a more visual reference of the line.

BFDs should be installed on alternating conductors at 15-foot intervals. See the following drawings for spacing on various framings.

All spans that have BFDs installed shall be documented on as-builts and sent to Mapping & Drafting.

	<p align="center"><b>CONSTRUCTION STANDARDS</b> BIRD FLIGHT DIVERTERS</p>		<p align="center">REVISIONS</p>						
			<p align="center">PAGE: 2 of 7</p>	<p align="center"><b>BFD</b></p>	<p>CAD FILE: BFD</p>	<table border="1"> <thead> <tr> <th>APP:</th> <th>CM/DK</th> <th>SECTION</th> </tr> </thead> <tbody> <tr> <td>DATE:</td> <td>10-18-17</td> <td><b>400</b></td> </tr> </tbody> </table>	APP:	CM/DK	SECTION
APP:	CM/DK	SECTION							
DATE:	10-18-17	<b>400</b>							

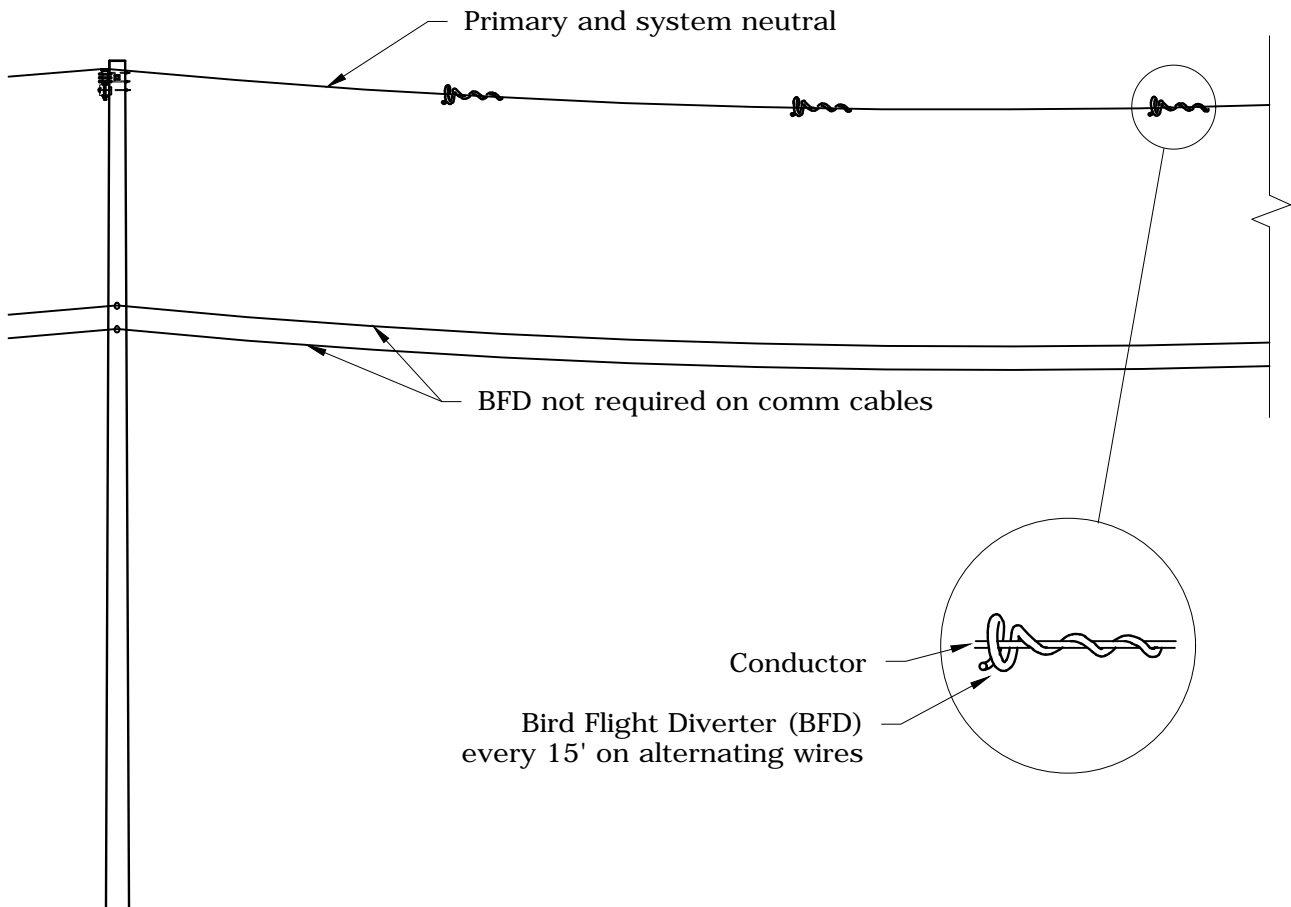
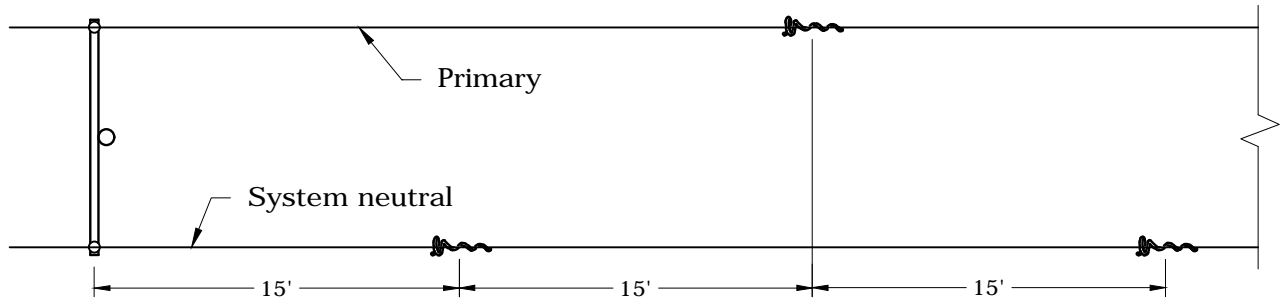


**Note:** All spans constructed with BFDs shall be documented by sending construction as-builts to Mapping.



**CONSTRUCTION STANDARDS**  
BIRD FLIGHT DIVERTERS  
1Ø

REVISIONS			
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1			
APP: CM/DK		SECTION	
DATE: 10-18-17		400	

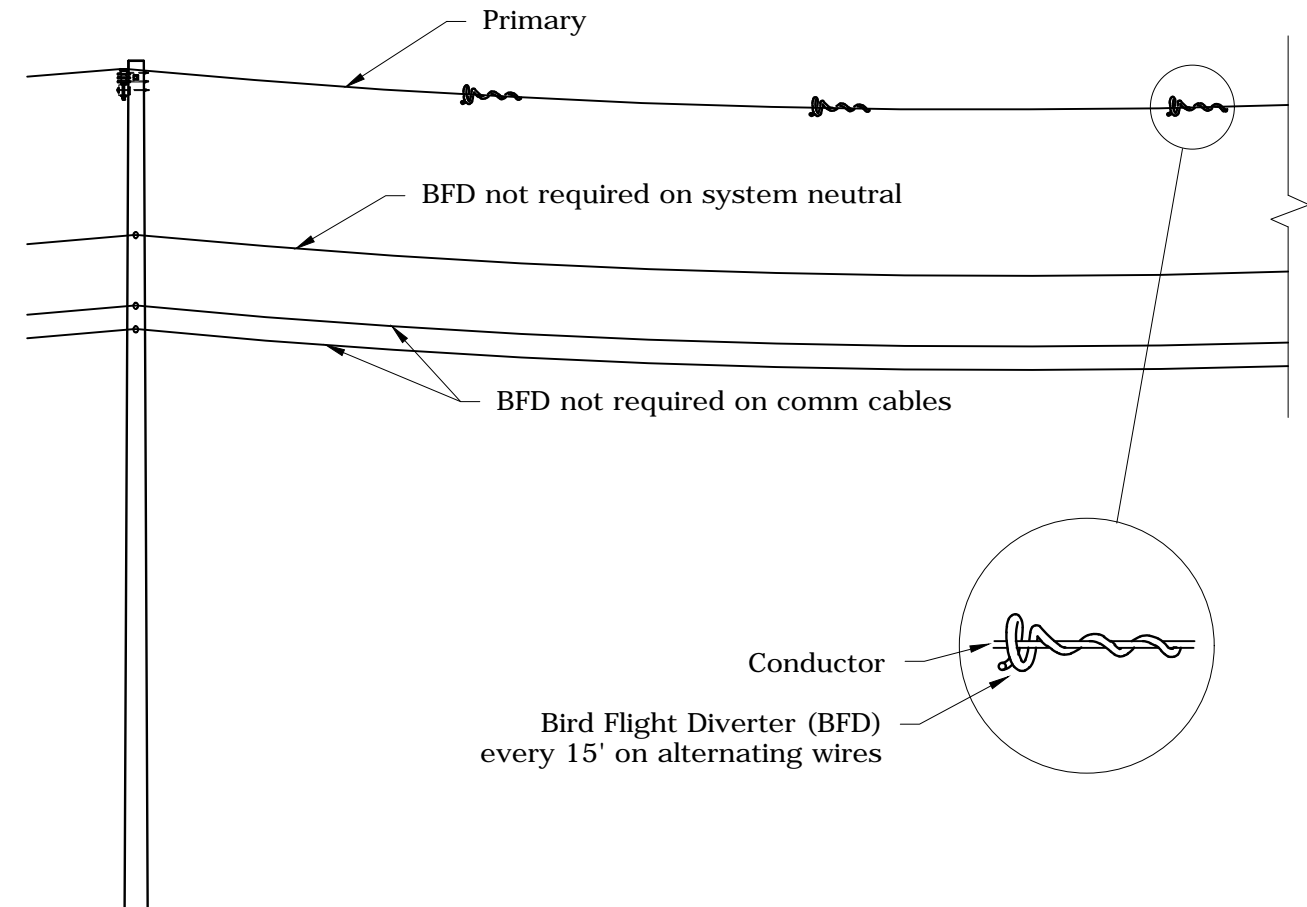
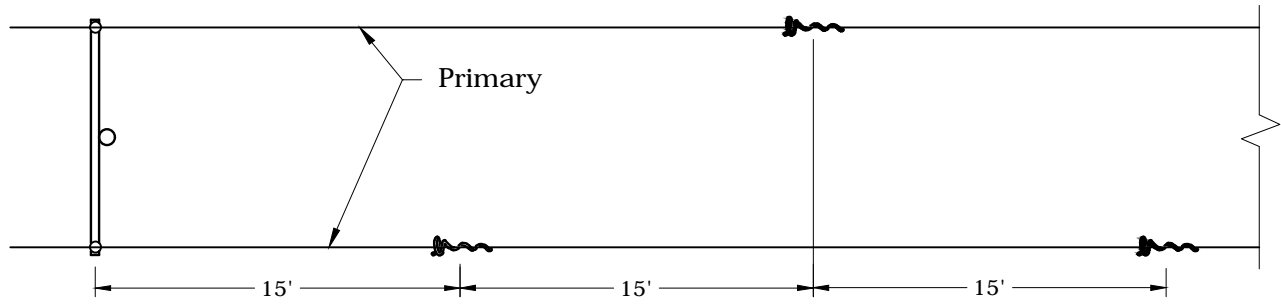


**Note:** All spans constructed with BFDs shall be documented by sending construction as-builts to Mapping.



**CONSTRUCTION STANDARDS**  
 BIRD FLIGHT DIVERTERS  
 1Ø WITH HIGH NEUTRAL

REVISIONS			
Δ	DATE	ENGR	OPS
1			
APP: CM/DK		SECTION	
DATE: 10-18-17		400	



**Note:** All spans constructed with BFDs shall be documented by sending construction as-builts to Mapping.



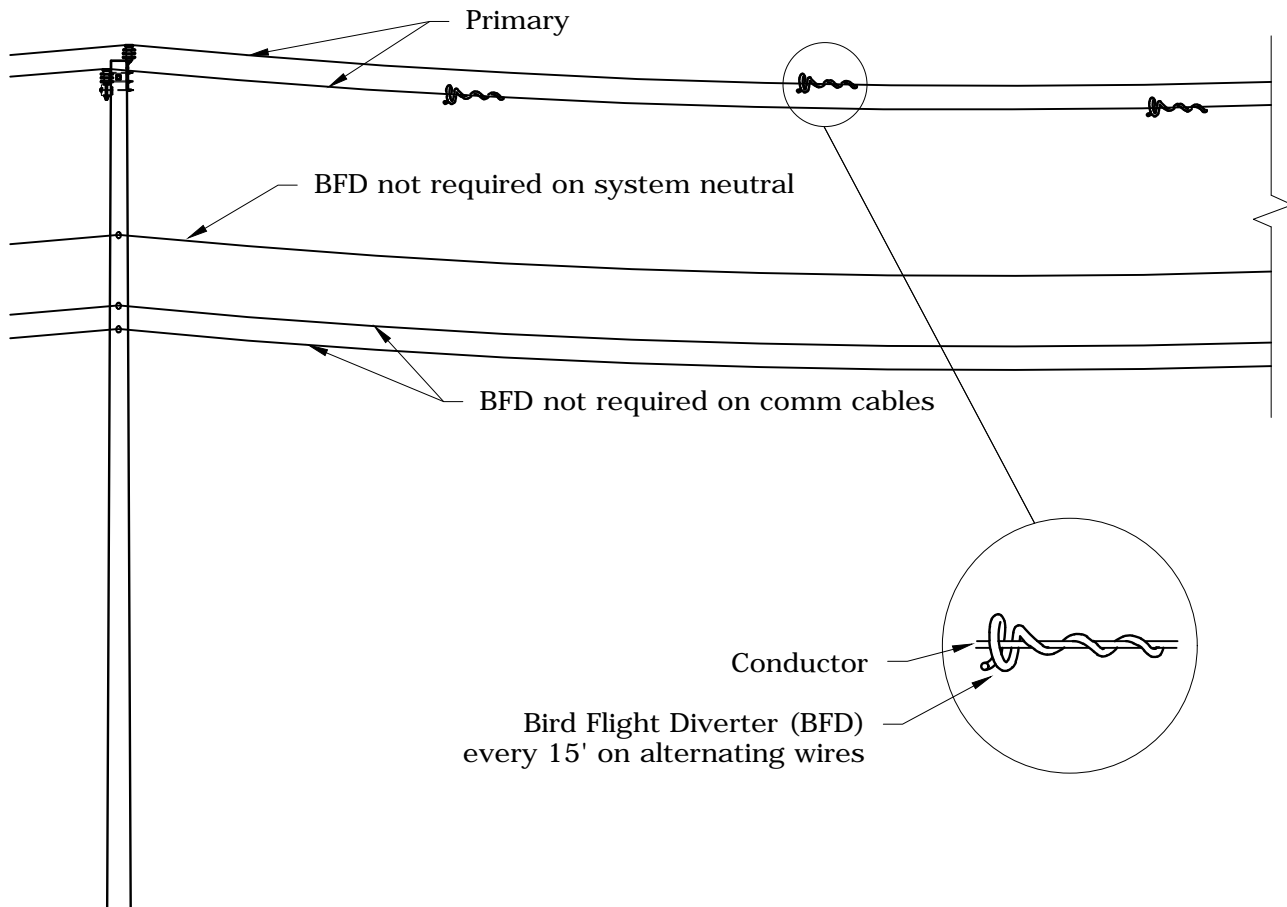
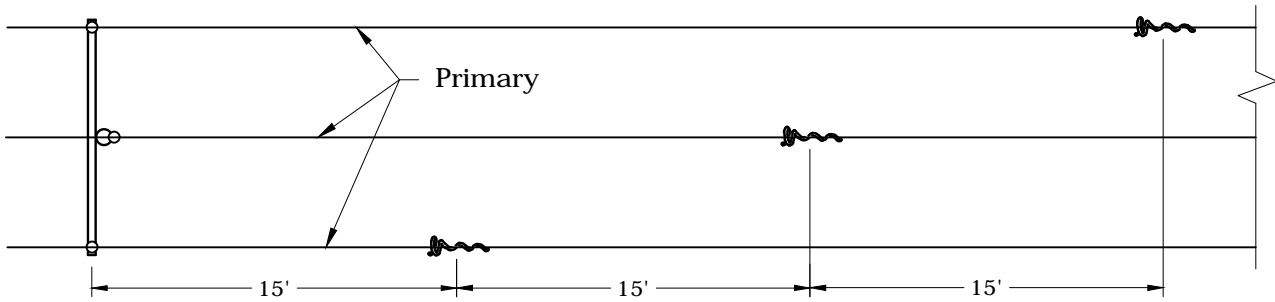
**CONSTRUCTION STANDARDS**  
**BIRD FLIGHT DIVERTERS**  
**2Ø CROSSARM OR TWIGGY**

PAGE:  
5 of 7

**BFD**

CAD FILE:  
BFD

REVISIONS			
△	DATE	ENGR	OPS
1			
△			
APP:	CM/DK	SECTION	
DATE:	10-18-17	<b>400</b>	



**Note:** All spans constructed with BFDs shall be documented by sending construction as-builts to Mapping.



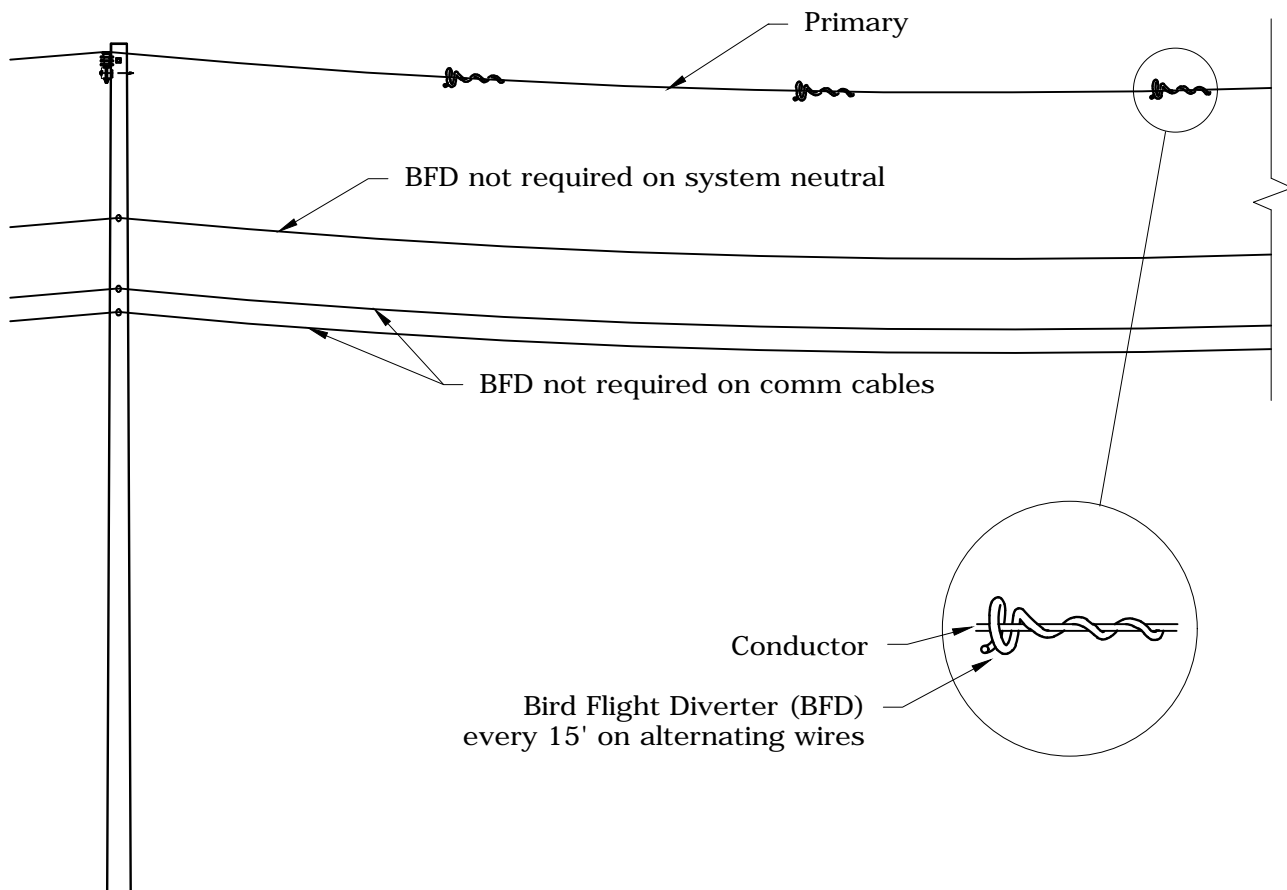
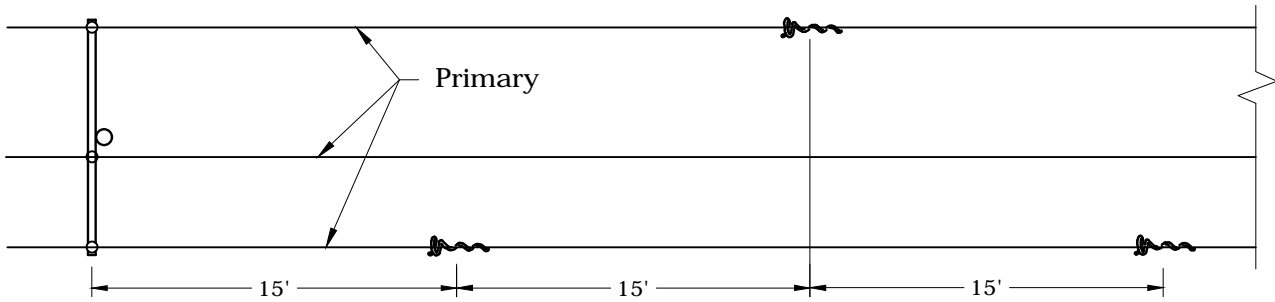
**CONSTRUCTION STANDARDS**  
 BIRD FLIGHT DIVERTERS  
 3Ø CROSSARM W/ TWIGGY  
 OR SKY PIN

PAGE:  
6 of 7

**BFD**

CAD FILE:  
BFD

REVISIONS			
Δ	DATE	ENGR	OPS
1			
Δ			
APP:	CM/DK	SECTION	
DATE:	10-18-17	400	



**Note:** All spans constructed with BFDs shall be documented by sending construction as-builts to Mapping.



**CONSTRUCTION STANDARDS**  
 BIRD FLIGHT DIVERTERS  
 3Ø CROSSARM W/O SKY PIN

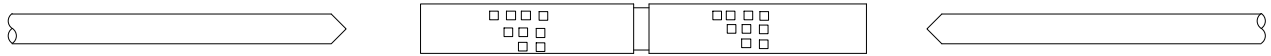
PAGE:  
7 of 7

**BFD**

CAD FILE:  
BFD

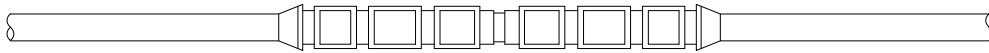
REVISIONS			
△	DATE	ENGR	OPS
1			
△			
APP:	CM/DK	SECTION	
DATE:	10-18-17	<b>400</b>	

Marking will vary according to sleeve.



COMPRESSION SLEEVE  
BEFORE SPLICING

Number of presses will vary with sleeve length.



COMPRESSION SPLICE COMPLETE

- Notes:**
1. Clean the wire before making the splice.
  2. Begin presses at center of sleeve and work toward ends, press entire length of sleeve.
  3. Groove letters printed on sleeves correspond to groove letters printed on tool.



**CONSTRUCTION STANDARDS**  
SPLICING GUIDE  
COMPRESSION TYPE SLEEVES

REVISIONS			
△	DATE	ENGR	OPS
△			

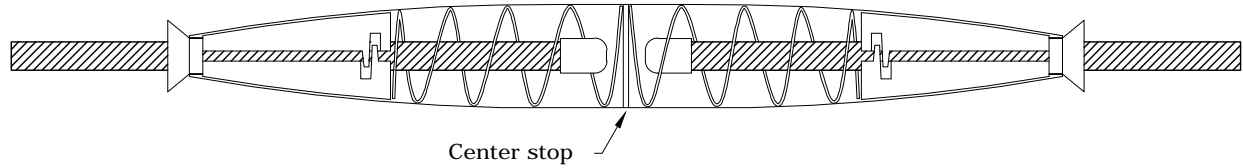
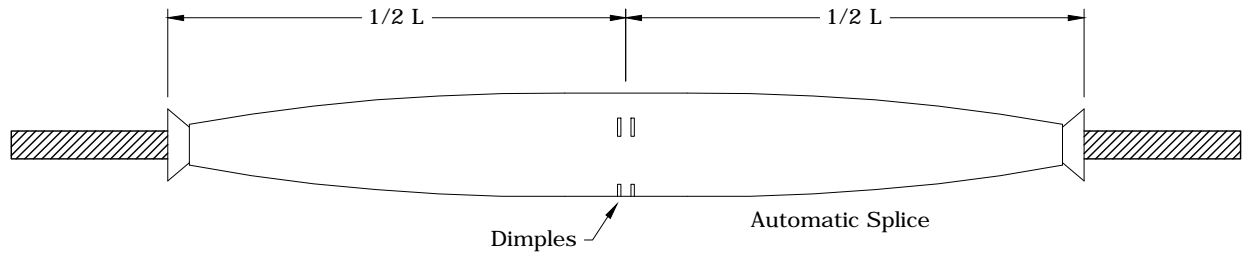
PAGE:  
1 of 1

**L4**

CAD FILE:  
L4

APP: ELM  
DATE: 1/31/80

SECTION  
**400**



Notes:

1. Clean the wire before making the splice.
2. Measure overall length of automatic splice.
3. Check that machined dimples are holding the center stop in the center of the splice. Reject any splice that is not centered.
4. Measure and mark the conductor at a length equal to  $1/2$  the splice length to ensure complete insertion.
5. Wire brush the conductor to ensure electrical and mechanical contact.
6. Insert the conductor to center stop. The clamping jaws should grab with  $1/2$ " to  $1$ " travel.
7. Reject and replace any automatic splice that does not adequately grip the conductor.
8. Automatic splices are rated for 90% of the conductor strength.



**CONSTRUCTION STANDARDS**

SPLICING GUIDE, AUTOMATIC TYPE

REVISIONS

△	DATE	ENGR	OPS

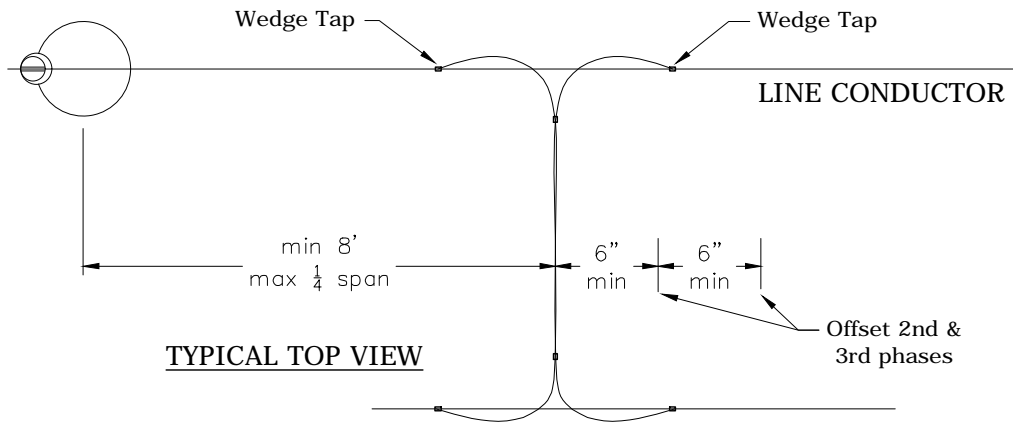
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	DATE: 1/31/80	<b>400</b>

PAGE:  
1 of 1

**L5**

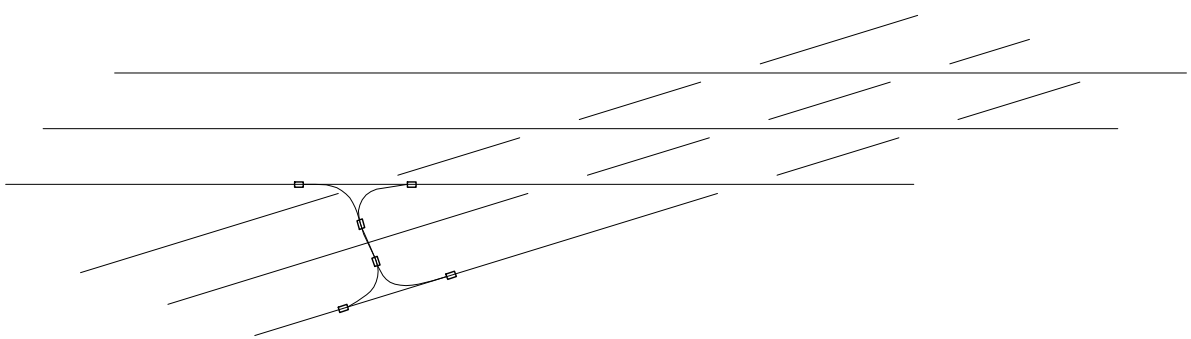
CAD FILE:  
L5





- Notes:**
1. Limit tap conductor "Maximum Working Tension" (MWT) to 15% of ultimate breaking strength of smallest conductor involved.
  2. Minimum of three (3) feet of vertical spacing between phase conductors for two & three phase installations.

SLACK SPAN TAP (L6)



- Notes:**
1. Minimum of four (4) feet of between circuits with five (5) foot normal spacing.
  2. Jumpers to be slack & same conductor as line conductor.

FLYING TAP (L7)

REV 1 - Redrawn in CAD



**CONSTRUCTION STANDARDS**

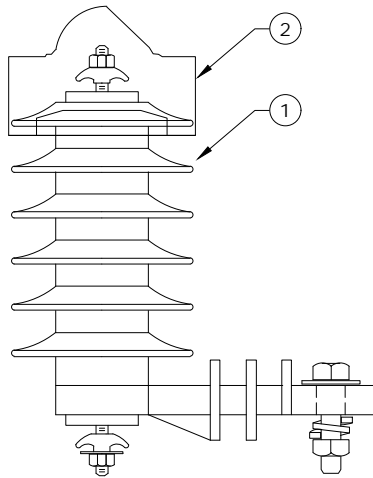
MIDSPAN TAPS  
DISTRIBUTION

PAGE:  
1 of 1

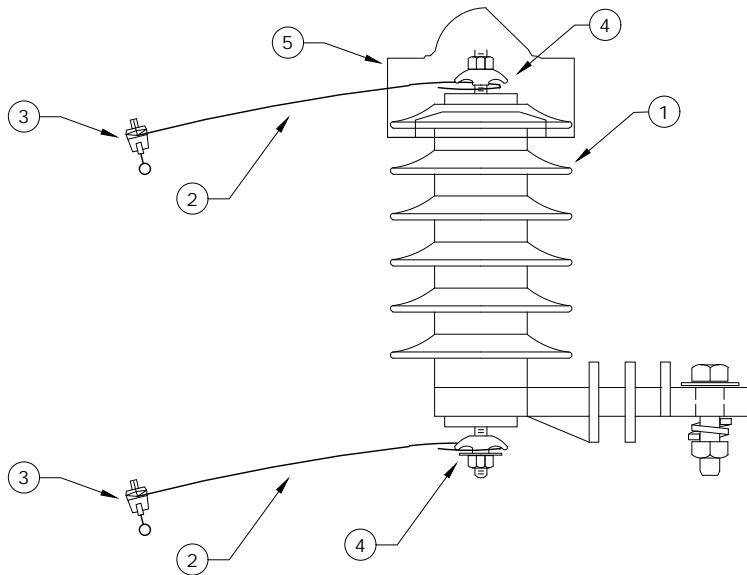
**L6, L7**

CAD FILE:  
L6

REVISIONS			
△	DATE	ENGR	OPS
1			
△ REDRAWN IN CAD			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>400</b>	



ITEM NO.	DESCRIPTION	LA1	
		QTY.	S/N
1	Arrester, Surge, 9kV, MOV, Riser Pole	1	58
2	Guard, Wildlife, Polymer Arrester	1	2583 ✱



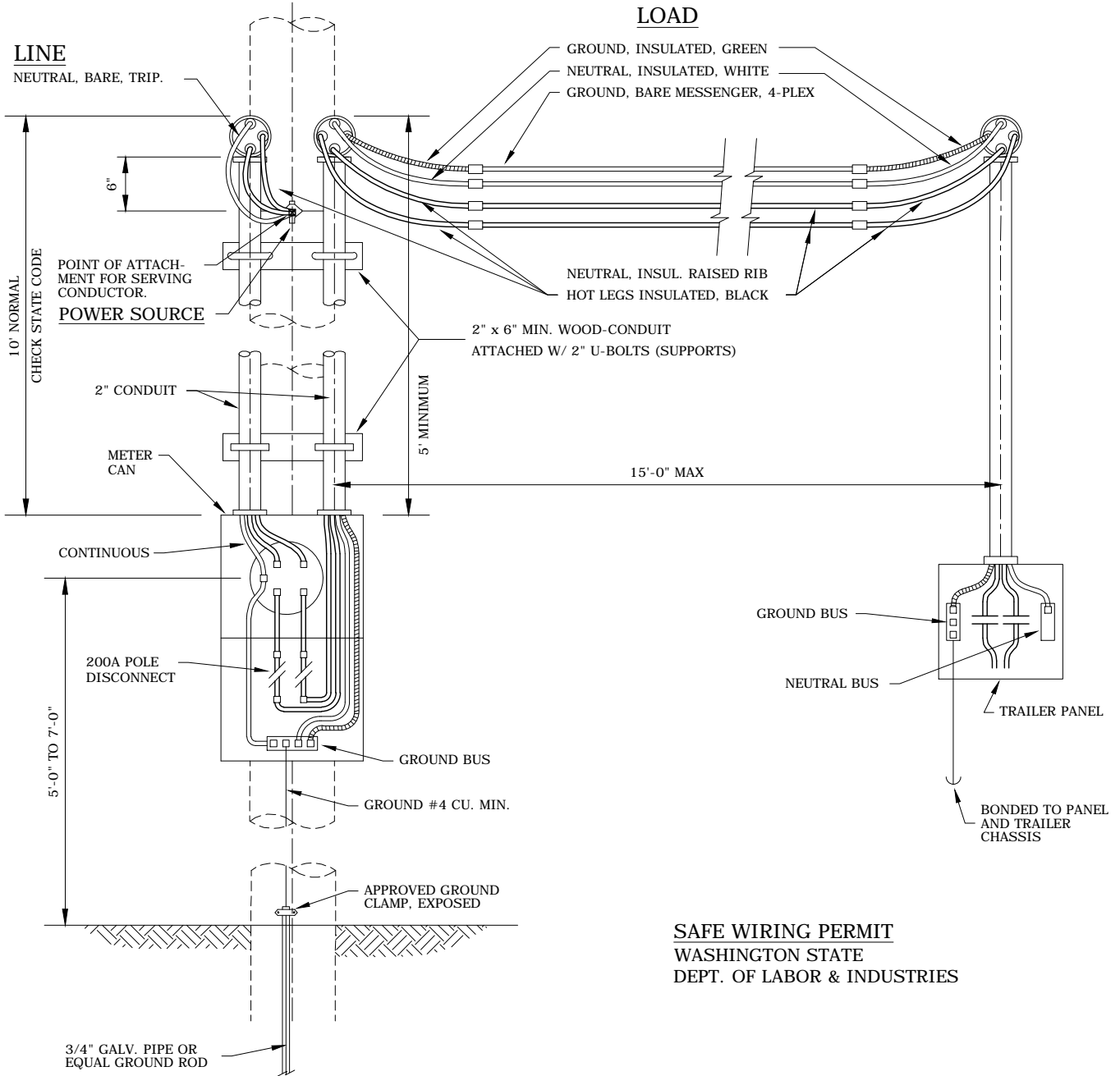
Rev 3: Added Hotline Clamps, Wildlife Guard, One-Hole Compression Lugs, and increased amount of #4 red wire.

ITEM NO.	DESCRIPTION	LA2	
		QTY.	S/N
1	Arrester, Surge, 9kV, MOV, Riser Pole	1	58
2	Conductor, Cu, 1/C, #4, 7-Str, 600V, Red, THW	7 ✱	2512
3	Clamp, Hotline GP 1520, #8 to 2/0 Str, Cu Only	2	283 ✱
4	Connector, Compression Lug, #4, Cu/Al, One-Hole, Tin-Plated, For Arrester	2	2548 ✱
5	Guard, Wildlife, Polymer Arrester	1	2583 ✱



**CONSTRUCTION STANDARDS**  
LIGHTNING (SURGE) ARRESTER

REVISIONS			
DATE	ENGR	OPS	
2/23/00	HWH/JEH	MA	
12/14/09	KJP		
1/16/19	CM	DK	



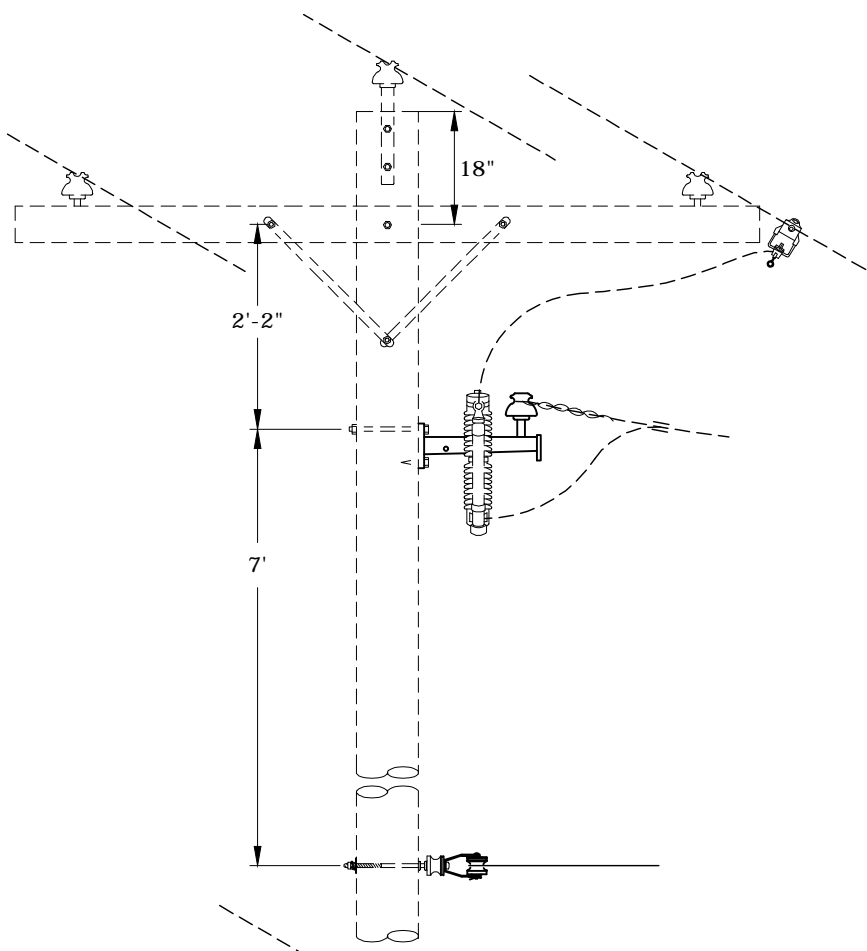
**SAFE WIRING PERMIT**  
**WASHINGTON STATE**  
**DEPT. OF LABOR & INDUSTRIES**

- Notes:**
1. TRAILER SERVICES WILL NOT BE ENERGIZED UNTIL CUSTOMER HAS MADE CONNECTIONS BETWEEN DISCONNECT & TRAILER OR UNLESS PUD INSTALLS SAME.
  2. GROUND BUS & NEUTRAL BUS ARE NOT INTERCONNECTED IN TRAILER PANEL.
  3. DO NOT DEAD END LINE AND LOAD CONDUCTORS ON SAME BOLT AT SERVICE POLE.
  4. CUSTOMER MUST HAVE: (A) GROUND ROD DRIVEN; (B) GROUND WIRE CONNECTED TO GROUND BUS; (C) SUPPORTS ATTACHED TO CONDUITS W/ U-BOLTS BEFORE PUD WILL ATTACH LOOP TO POLE USING 20 PENNY NAILS AND SCREWS SUPPLIED BY CUSTOMER.

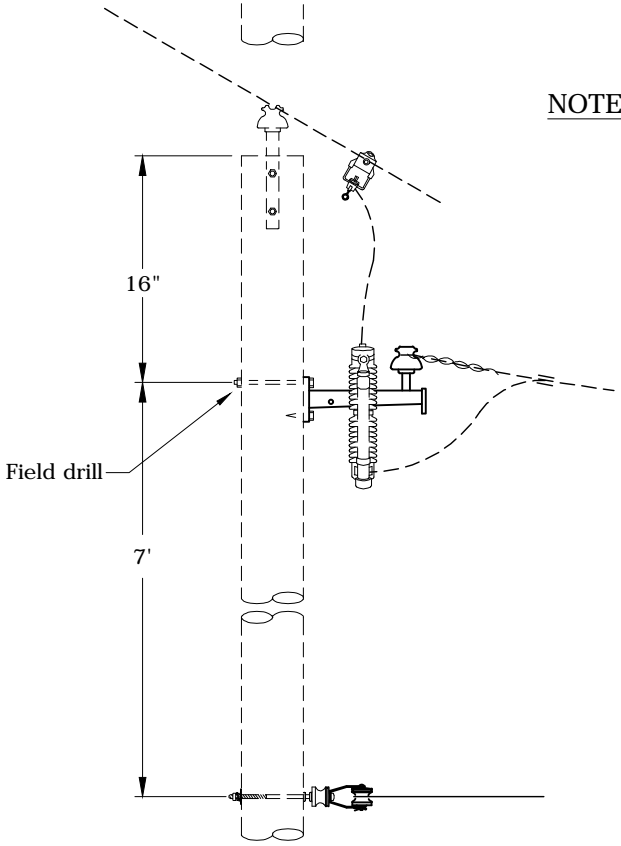


**CONSTRUCTION STANDARDS**  
**MOBILE HOME TRAILER CONNECTION**

REVISIONS											
NO.	DATE	ENGR	OPS								
1	7/10/81	GGW									
2	2/15/10	REDRAWN	IN CAD								
<table border="1"> <tr> <td>APP:</td> <td>ELM</td> <td colspan="2">SECTION</td> </tr> <tr> <td>DATE:</td> <td>1/31/80</td> <td colspan="2">400</td> </tr> </table>				APP:	ELM	SECTION		DATE:	1/31/80	400	
APP:	ELM	SECTION									
DATE:	1/31/80	400									



- NOTES:**
1. A slack span should be kept as short as possible. It should not exceed 100 feet.
  2. Call for cutout separately if needed.
  3. Call for preformed slack span deadend separately.
- #2 ACSR - S/N 2241  
2/0 ACSR - S/N 2242



Rev 2: Updated material & drawing, and changed title



## CONSTRUCTION STANDARDS

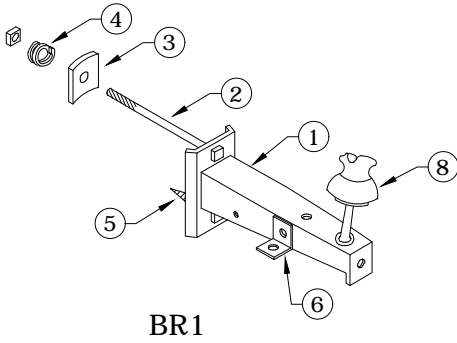
1Ø SLACK SPAN  
2/0 ACSR MAX WIRE

REVISIONS			
△	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	8/25/09	CM	AH
△			
APP:	GGW/RWG	SECTION	
DATE:	6/90	400	

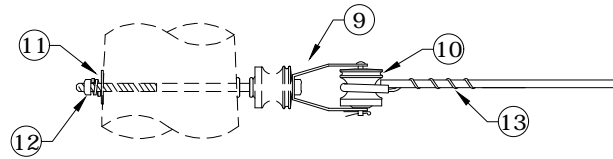
PAGE:  
1 of 2

**SS1**

CAD FILE:  
SSD1



BR1



S4A

Rev 2: Updated material & drawing, and changed title

ITEM NO.	DESCRIPTION	BR1	
		QTY.	S/N
1	Bracket, Steel, Galv., Multi-purpose, 22"	1	2262
2	Bolt, Machine, 5/8"x 16"	1	157
3	Washer, Sq., Curved, Cast, 3"x 3" x 3/8" Thick x 13/16" Hole	1	1392
4	Washer, Spring, 5/8"	1	2217
5	Screw, Lag, 1/2" x 4 1/2"	1	1132
6	Adapter, Angle Clip	1	2248
7	Short Shank Insulator Pin (6")	1	2249
8	Porcelain Pin Insulator C-neck	1	771
ITEM NO.	DESCRIPTION	S4A	
		QTY.	S/N
9	Clevis, D.E., Insulator 1340	1	335
10	Insulator, Spool Clevis, Small	1	773
11	Washer, Lock, 5/8" Galv.	1	1403
12	Nut, Square, 5/8" Galv.	1	923
13	Preformed Slack Span Deadend #2 ACSR	1	2241

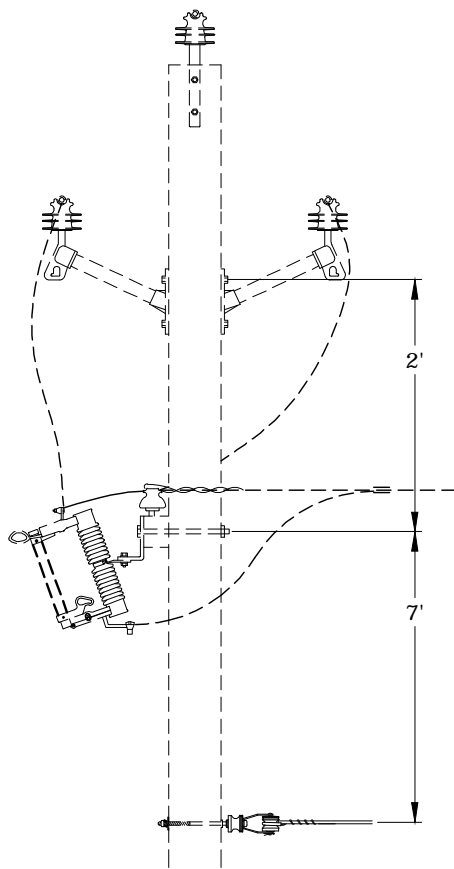


**CONSTRUCTION STANDARDS**

1Ø SLACK SPAN  
2/0 ACSR MAX WIRE

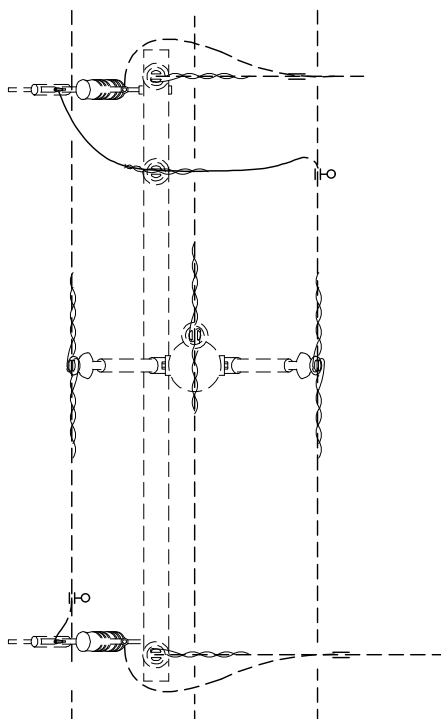
REVISIONS

REV	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	8/25/09	CM	AH



**NOTES:**

1. Pull conductors hand tight. Excessive slack may cause phase-to-phase contact due to wind.
2. A slack span should be kept as short as possible. It should not exceed 100 feet.
3. The deflection angles of the conductors at the crossarms must not exceed 25 degrees due to the reduced separation. Further reduction may cause phase-to-phase contact under windy conditions.
4. This construction can be used for crossarm framing also.
5. Call for cutouts separately if needed.
6. Call for preformed slack span deadend separately.  
 #2 ACSR -S/N 2241  
 2/0 ACSR -S/N 2242



Rev 2: Updated material & drawings, and changed title



**CONSTRUCTION STANDARDS**

2Ø SLACK SPAN  
2/0 ACSR MAX WIRE

REVISIONS

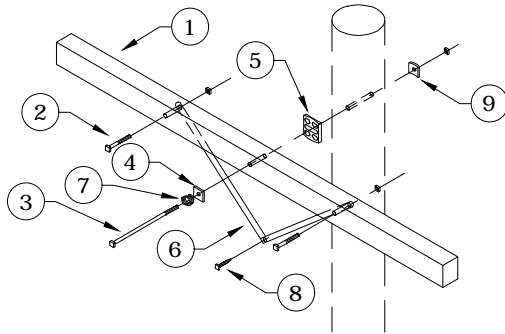
△	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	8/25/09	CM	AH

PAGE:  
1 of 2

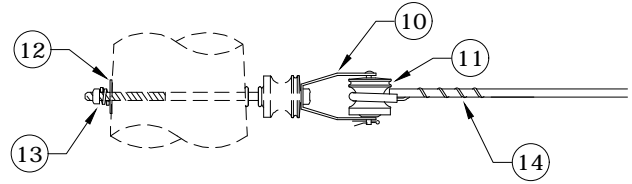
**SS2**

CAD FILE:  
SS2

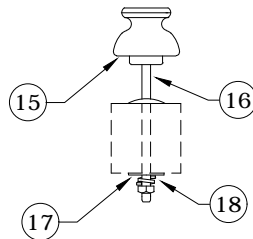
△	APP:	GGW/RWG	SECTION
	DATE:	4/92	<b>400</b>



CR20A



S4A



Rev 2: Updated material & drawings, and changed title

ITEM NO.	DESCRIPTION	CR20A	
		QTY.	S/N
1	Arm, Cross (Distr.), 3 3/4" x 4 3/4"	1	25
2	Bolt, Carriage 3/8" x 5"	2	78
3	Bolt, Machine 5/8" x 16"	1	157
4	Washer, Sq. Flat 5/8", 2 1/4" x 2 1/4"	1	1412
5	Gain, Pole Plastic	1	709
6	Brace, Crossarm 28"	2	205
7	Washer, Spring, 5/8"	1	2217
8	Screw, Lag 1/2" x 4 1/2"	1	1132
9	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
ITEM NO.	DESCRIPTION	S4A	
		QTY.	S/N
10	Clevis, D.E., Insulator 1340	1	335
11	Insulator, Spool Clevis, Small	1	773
12	Washer, Lock, 5/8" Galv.	1	1403
13	Nut, Square, 5/8" Galv.	1	923
14	Preformed Slack Span Deadend #2 ACSR	1	2241
ITEM NO.	DESCRIPTION	ADDITIONAL MATERIAL	
		QTY.	S/N
15	Insulator, Pin C Neck	2	771
16	Crossarm Pin	2	961
17	Washer, Square, Flat 5/8", 2 1/4" x 2 1/4"	2	1412
18	Washer, Spring, 5/8"	2	2217



**CONSTRUCTION STANDARDS**

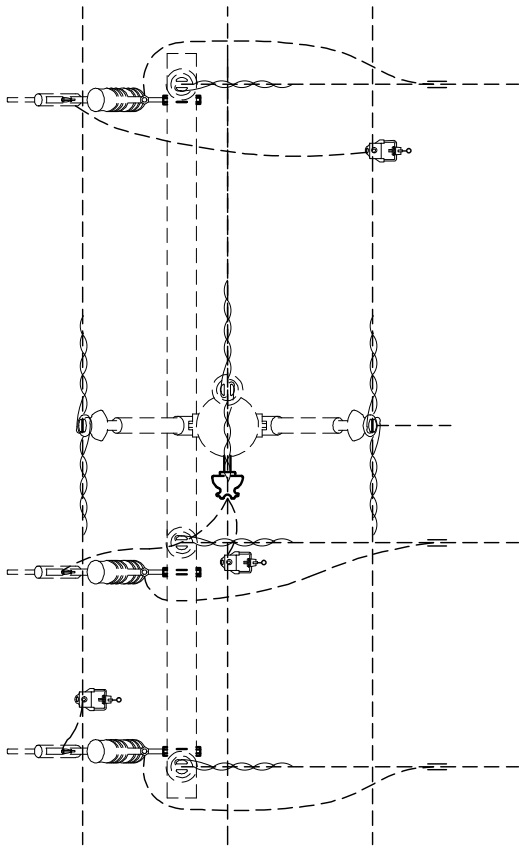
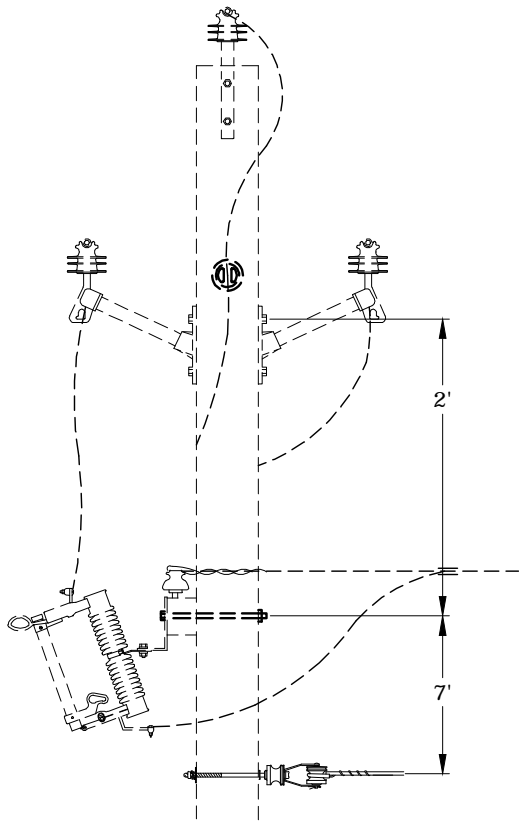
2Ø SLACK SPAN  
2/0 ACSR MAX WIRE

PAGE:  
2 of 2

**SS2**

CAD FILE:  
SS2

REVISIONS			
Δ	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	8/25/09	CM	AH
Δ			
APP:	GGW/RWG	SECTION	
DATE:	4/92	<b>400</b>	



**NOTES:**

1. Pull conductors hand tight. Excessive slack may cause phase-to-phase contact due to wind.
2. A slack span should be kept as short as possible. It should not exceed 100 feet.
3. The deflection angles of the conductors at the crossarms must not exceed 25 degrees due to the reduced separation. Further reduction may cause phase-to-phase contact under windy conditions.
4. This construction can be used for crossarm framing also.
5. Call for cutouts separately if needed.
6. Call for preformed slack span deadend separately.  
 #2 ACSR -S/N 2241  
 2/0 ACSR -S/N 2242

Rev 3: Changed CR21A to CR20A on material issue.



**CONSTRUCTION STANDARDS**

3Ø SLACK SPAN  
2/0 ACSR MAX WIRE

PAGE:  
1 of 2

**SS3**

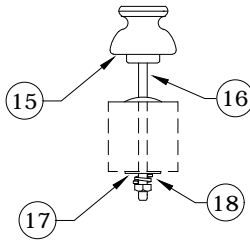
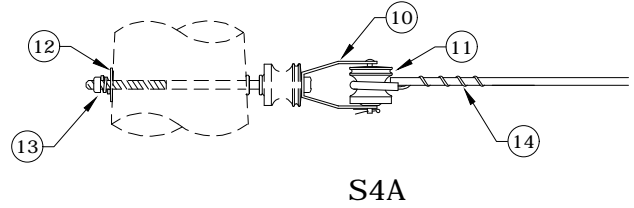
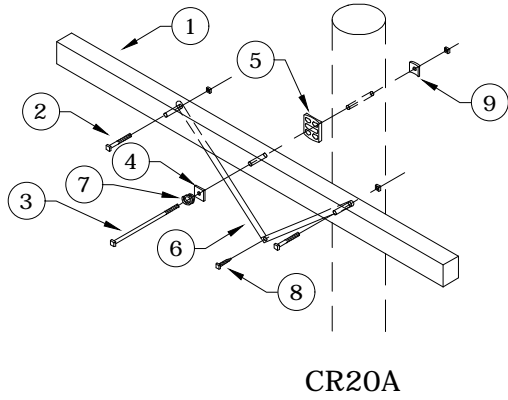
CAD FILE:  
SS3

**REVISIONS**

△	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	8/25/09	CM	AH
3	7/29/10	KJP	

△	APP:	GGW/JCS	SECTION
	DATE:	5/90	<b>400</b>





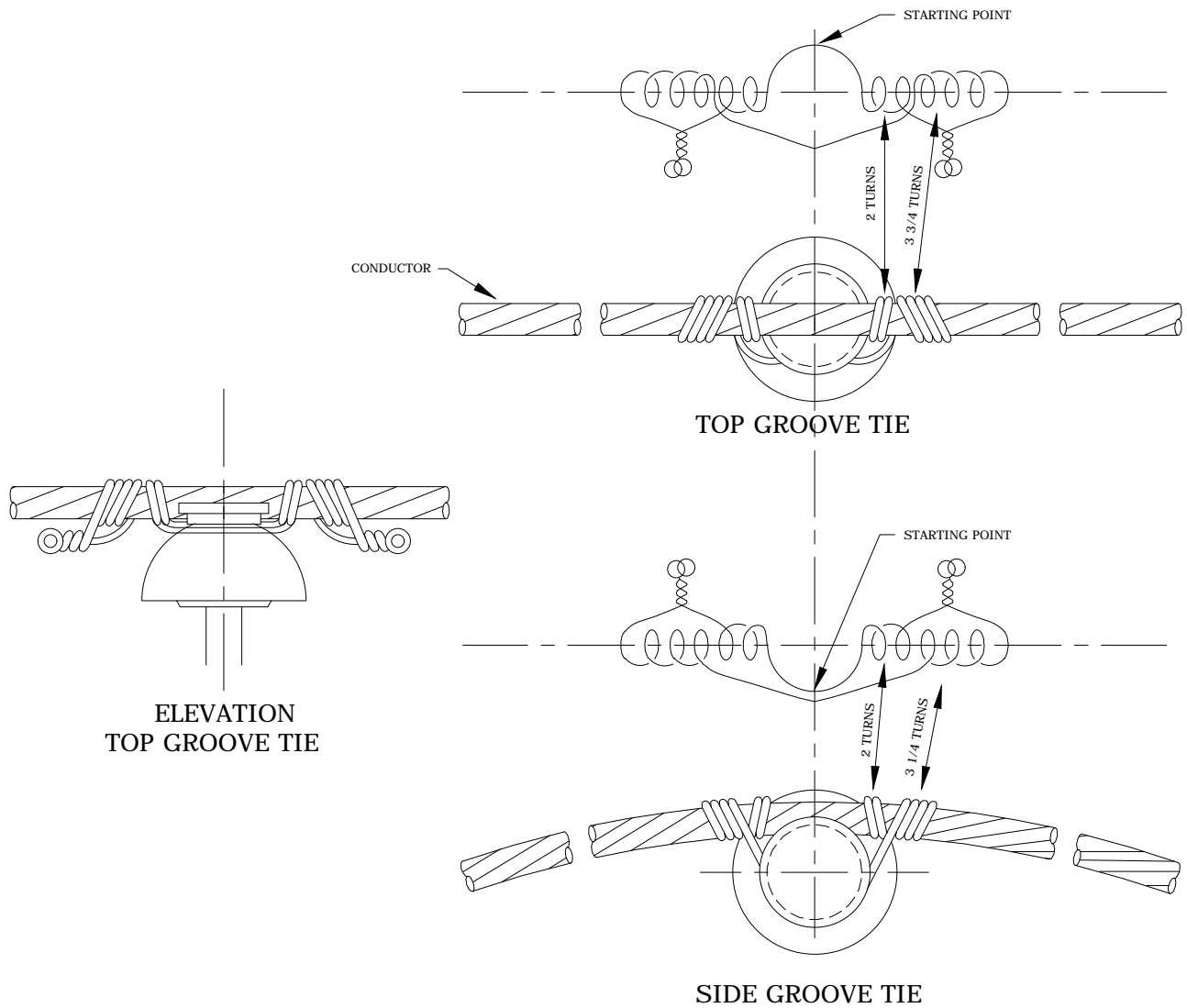
Rev 3: Changed CR21A to CR20A on material issue.

ITEM NO.	DESCRIPTION	SS3	
		QTY.	S/N
1	Arm, Cross (Distr.), 3 3/4" x 4 3/4"	1	25
2	Bolt, Carriage 3/8" x 5"	2	78
3	Bolt, Machine 5/8" x 16"	1	157
4	Washer, Sq. Flat 5/8", 2 1/4" x 2 1/4"	1	1412
5	Gain, Pole Plastic	1	709
6	Brace, Crossarm 28"	2	205
7	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217
8	Screw, Lag 1/2" x 4 1/2"	1	1132
9	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
ITEM NO.	DESCRIPTION	S4A	
		QTY.	S/N
10	Clevis, D.E., Insulator 1340	1	335
11	Insulator, Spool Clevis, Small	1	773
12	Washer, Lock, Spring, Single Coil, Galv., 5/8"	1	1403
13	Nut, Square, 5/8" Galv.	1	923
14	Preformed Slack Span Deadend #2 ACSR	1	2241
ITEM NO.	DESCRIPTION	ADDITIONAL MATERIAL	
		QTY.	S/N
15	Insulator, Pin C Neck	3	771
16	Crossarm Pin	3	961
17	Washer, Square Flat 5/8", 2 1/4" x 2 1/4"	3	1412
18	Washer, Lock, Spring, Double Coil, Galv., 5/8"	3	2217



**CONSTRUCTION STANDARDS**  
 3Ø SLACK SPAN  
 2/0 ACSR MAX WIRE

REVISIONS			
REV	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	8/25/09	CM	AH
3	7/29/10	KJP	
△			
APP:	GGW/JCS	SECTION	
DATE:	5/90	<b>400</b>	



**NOTES:**

1. TIE WIRE ASSEMBLY SHOULD BE AS TIGHT AS CAN BE WRAPPED BY HAND, AND ENDS TWISTED WITH PLIERS OR HOT LINE TOOLS. TWIST LEFTHAND ENDS CLOCKWISE, RIGHTHAND COUNTERCLOCKWISE. WITH HOT LINE LOOPS, TIE WIRES MUST BE 8" LONGER THAN SHOWN.
2. TIE WIRES LENGTHS LISTED BELOW CAN BE USED WITH INSULATORS HAVING NECK DIAMETER UP TO AND INCLUDING 3 1/2".

CONDUCTOR	CONDUCTOR DIAMETER
3/0 - 7 STRAND HD COPPER	.464"
2/0 - 7 STRAND HD COPPER	.414"
1/0 - 7 STRAND HD COPPER	.368"
2-3 STRAND COPPER	.320"
4A COPPERWELD - COPPER	.290"
4 COPPER WIRE	.204"
6 COPPER WIRE	.162"
6A COPPERWELD - COPPER	.230"
8A & 8D COPPERWELD - COPPER	.219"

ANNEALED COPPER TIE WIRE		
SIZE	LENGTH SHORT PIECE	LENGTH LONG PIECE
4	27"	40"
4	27"	40"
4	27"	40"
6	23"	35"
6	23"	35"
6	23"	35"
8	21"	30"
8	21"	30"
8	21"	30"

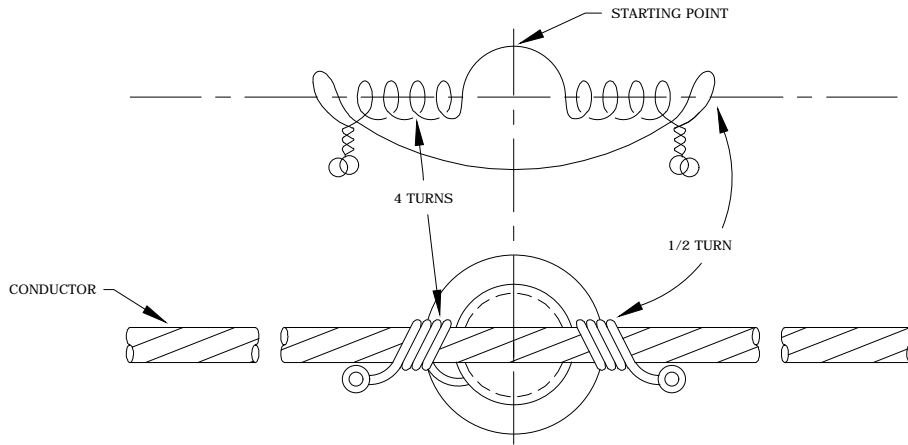


**CONSTRUCTION STANDARDS**  
 SINGLE INSULATOR  
 TWO-PIECE TIE  
 COPPER TYPE CONDUCTORS

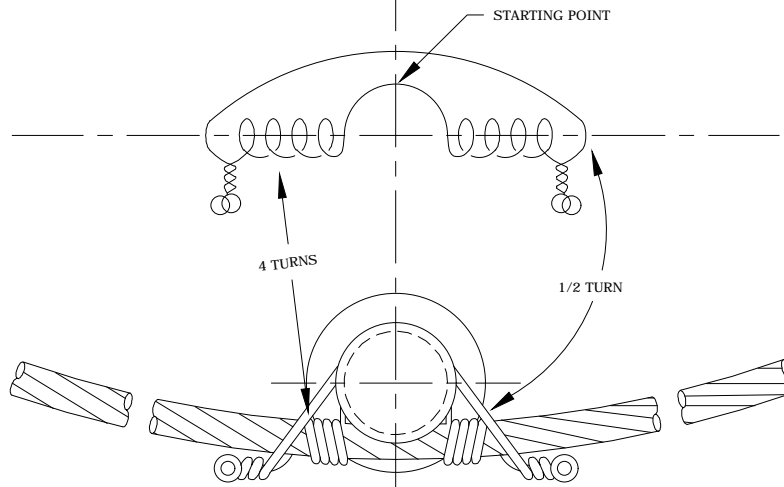
REVISIONS			
NO.	DATE	ENGR	OPS
1	2/15/10	REDRAWN	IN CAD

APP:	ELM	SECTION
DATE:	1/31/80	<b>400</b>



TOP GROOVE TIE



SIDE GROOVE TIE

**NOTES:**

1. TIE WIRE ASSEMBLY SHOULD BE AS TIGHT AS CAN BE WRAPPED AND ENDS TWISTED WITH HOT LINE TOOLS. TWIST LEFTHAND ENDS CLOCKWISE, RIGHTHAND COUNTERCLOCKWISE.
2. TIE WIRES LENGTHS LISTED BELOW CAN BE USED WITH INSULATORS HAVING A NECK DIAMETER UP TO AND INCLUDING 3 1/2".

COPPERWELD COPPER	
SIZE	COND. DIAM.
2F	.308
2A	.366
3A	.326
4A	.290
5A	.258
6A	.230
7A	.223
8A	.199

ANNEALED COPPER TIE WIRE			COPPER	
SIZE AWG	FIRST PIECE	SECOND PIECE	SIZE	COND. DIAM.
6	34"	24"	4/0-7W	.308
6	36"	24"	3/0-7W	.366
6	34"	24"	2/0-7W	.326
6	33"	24"	1/0-7W	.290
6	33"	24"	2-3W	.258
6	32"	23"	2-SOL	.230
6	32"	23"	4-SOL	.223
6	31"	23"	6-SOL	.199

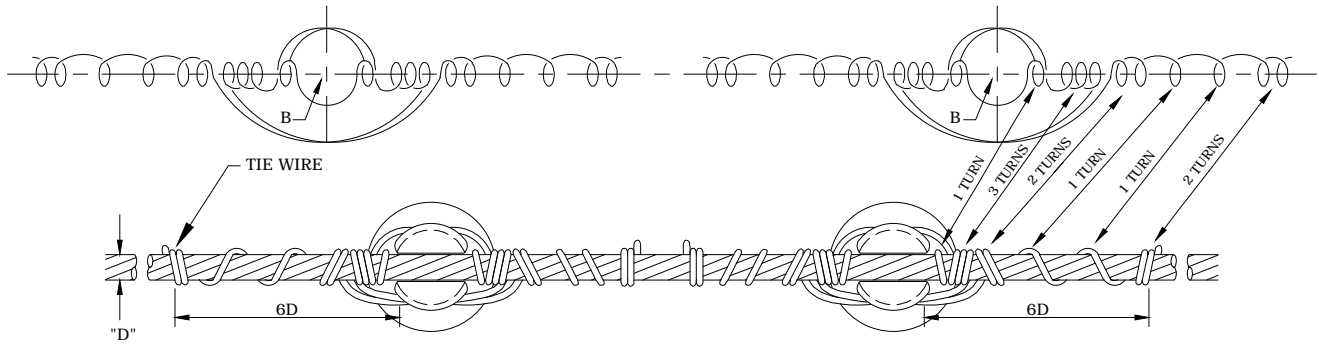
ANNEALED COPPER TIE WIRE		
SIZE AWG	FIRST PIECE	SECOND PIECE
6	38"	29"
6	37"	28"
6	37"	28"
6	36"	27"
6	34"	25"
6	33"	24"
6	32"	23"
6	30"	22"



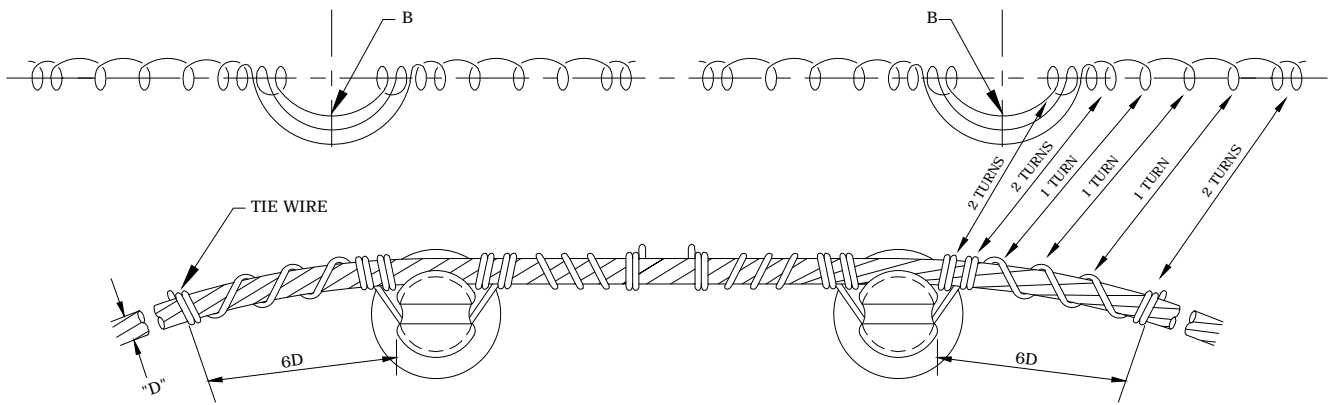
**CONSTRUCTION STANDARDS**  
HOT LINE  
COPPER TYPE CONDUCTORS

REVISIONS			
△	DATE	ENGR	OPS
△			
APP:		SECTION	
DATE:		400	





TOP GROOVE DOUBLE TIE



SIDE GROOVE TIE

**NOTES:**

1. IN MAKING TIES, START WITH MIDDLE OF LENGTH OF TIE WIRE AT POSITION MARKED "B".
2. TO COMPLETE TIE, CINCH UP LAST TWO TURNS AT EACH END WITH PLIARS UNTIL TIE WIRE IS SNUG AND TIGHT.
3. USE THE FLAT FACE OF THE PLIARS AGAINST THE AMOR RODS.

A. C. S. R.	
SIZE	DIAM. INCHES
4/0	.563
3/0	.502
2/0	.477

TIE WIRE ALUMINUM	
SIZE	LENGTH FEET
4	9'-3"
4	8'-9"
4	8'-3"

A. C. S. R.	
SIZE	DIAM. INCHES
1/0	.398
2	.325
4	.257

TIE WIRE ALUMINUM ALLOY	
SIZE	LENGTH FEET
6	8'-3"
6	7'-5"
6	7'-3"



**CONSTRUCTION STANDARDS**

DOUBLE INSULATOR  
ALUMINUM ALLOY, ACSR CONDUCTOR,  
STRAIGHT OR PREFORMED ARMOR RODS

REVISIONS			
DATE	ENGR	OPS	

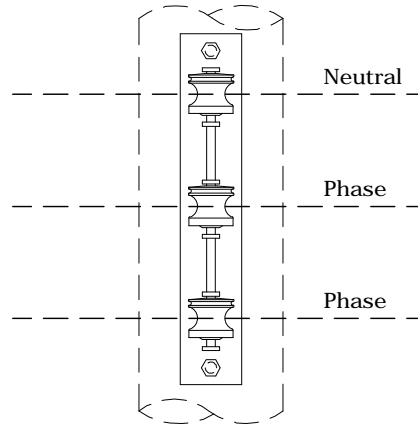
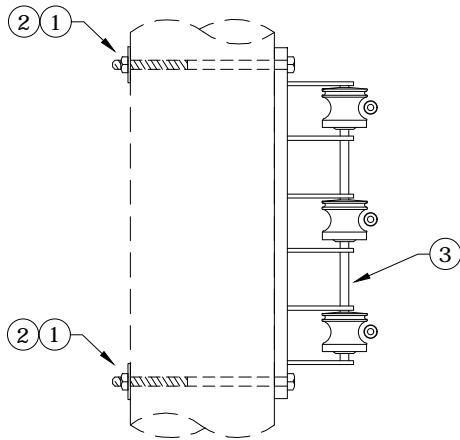
# 410

## OVERHEAD SECONDARY

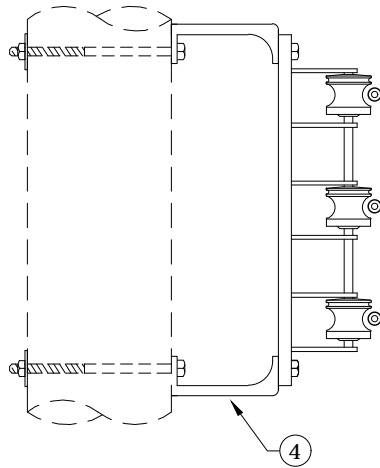
3/14/2023

- ~ S15, S15A 3-Spool Secondary Rack Assembly
- ~ S16, S16A 4-Spool Secondary Rack Assembly
- ~ SE1, SE1A Service Assemblies - Cable Terminations
- ~ SE2, SE2A, SE2B Service Assemblies - Cable Terminations
- ~ SE3, SE3A Service Assemblies - Cable Terminations
- ~ SE6 Typical Heavy Service Detail (>4/0 Al Triplex or Quad)
- ~ SE7 Typical Service Take-Off - Crossarm Secondaries
- ~ SE8 Bridal Guy for Two or More Services
- ~ SE9 Bridal Guy for Single Service

- N** New Standard
- R** Redrawn Standard
- C** Changed Standard
- ~ No Change



3 SPOOL RACK S15



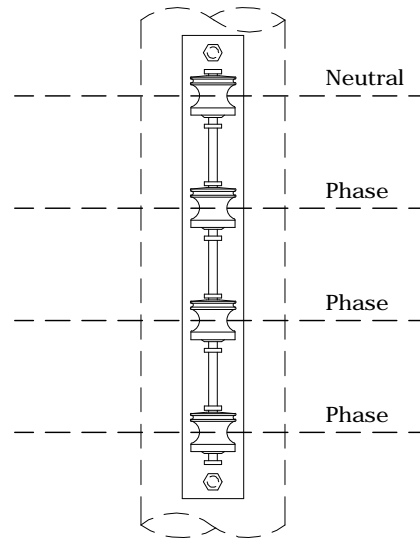
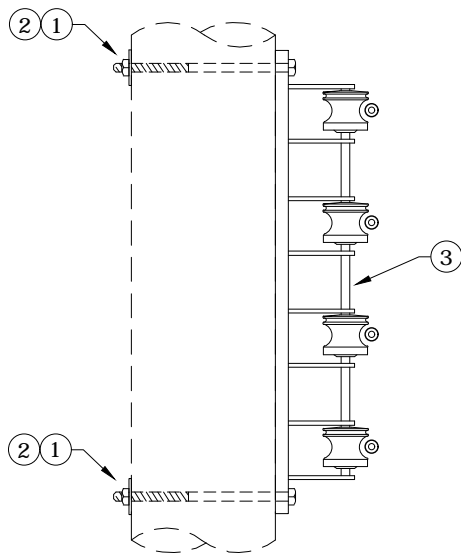
3 SPOOL RACK WITH EXTENSION S15A

ITEM NO.	DESCRIPTION	S15		S15A	
		QTY.	S/N	QTY.	S/N
1	Bolt, Machine 5/8" x 12"	2	155	2	155
2	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	2	1412	2	1412
3	Rack, Secondary 3 Spool	1	1062	1	1062
4	Bracket, Extension, Secondary Rack	-	-	2	N.S.

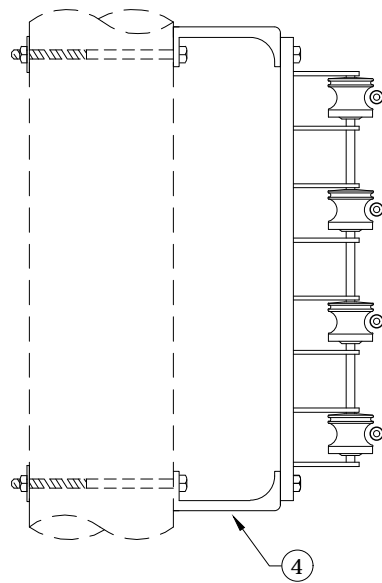


**CONSTRUCTION STANDARDS**  
3 SPOOL  
SECONDARY RACK ASSEMBLY

REVISIONS			
DATE	ENGR	OPS	
3/02			
△ REDRAWN IN CAD			
APP:	ELM	SECTION	
DATE:	1/31/80	410	



4 SPOOL RACK S16



4 SPOOL RACK WITH EXTENSION S16A

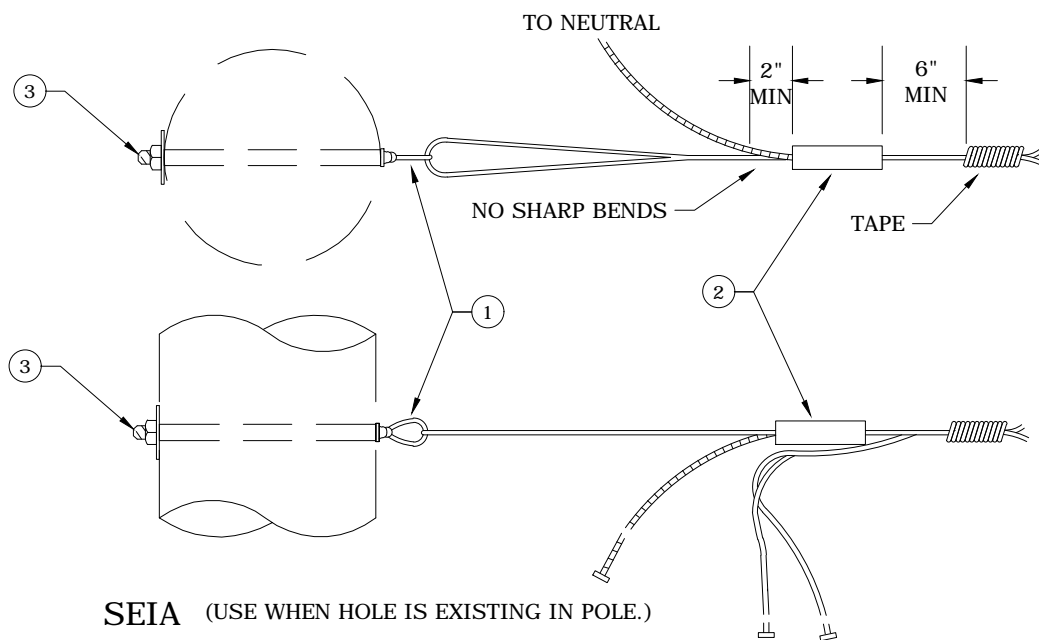
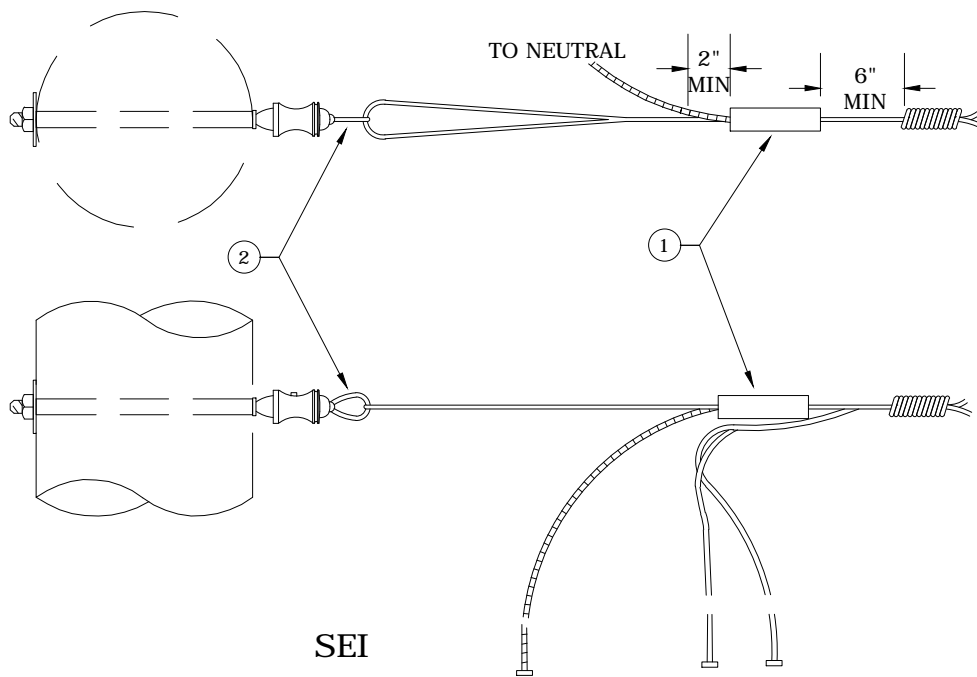
ITEM NO.	DESCRIPTION	S16		S16A	
		QTY.	S/N	QTY.	S/N
1	Bolt, Machine 5/8" x 12"	2	155	2	155
2	Washer, Square, Flat, 5/8", 2 1/4" x 2 1/4"	2	1412	2	1412
3	Rack, Secondary 4 Spool	1	1063	1	1063
4	Bracket, Extension, Secondary Rack	-	---	2	N.S.



**CONSTRUCTION STANDARDS**  
4 SPOOL  
SECONDARY RACK ASSEMBLY

REVISIONS			
Δ	DATE	ENGR	OPS
1	3/02		
Δ REDRAWN IN CAD			
APP:	ELM	SECTION	
DATE:	1/31/80	410	





**CONSTRUCTION STANDARDS**  
 SERVICE ASSEMBLIES  
 CABLE TERMINATIONS

REVISIONS			
DATE	ENGR	OPS	
0	LB	AH	
APP:		SECTION	
DATE:		410	

\*TRUCK STOCK

MATERIAL LIST

ITEM NO.	DESCRIPTION	SE1	
		QTY.	S/N
1	CLAMP, WEDGE	1	AS REQ*
2	NUT, EYE OVAL 5/8" GALV.	1	913

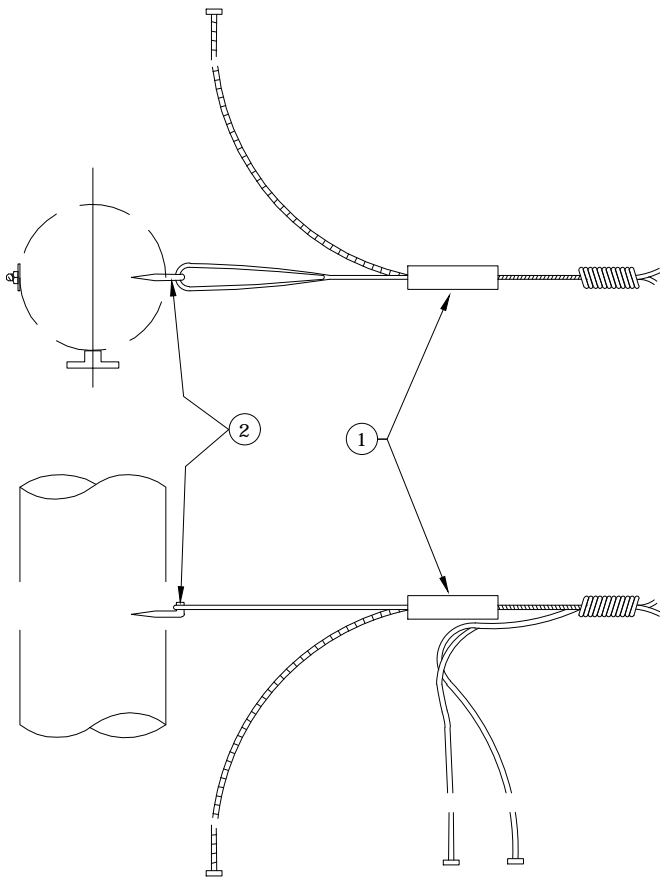
  

ITEM NO.	DESCRIPTION	SE1A	
		QTY.	S/N
1	BOLT, EYE 5/8" x _____" GALV.	1	AS REQ
2	CLAMP, WEDGE	1	AS REQ*
3	WASHER, SQ. FLAT, 5/8"	2	1412

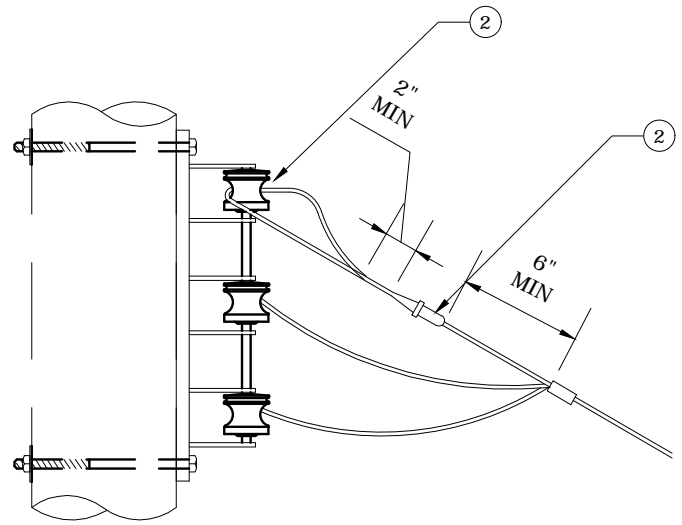


**CONSTRUCTION STANDARDS**  
 SERVICE ASSEMBLIES  
 CABLE TERMINATIONS

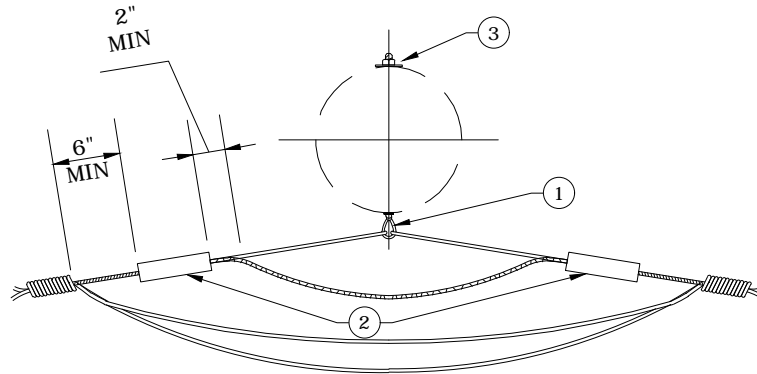
REVISIONS			
△	DATE	ENGR	OPS
0		LB	AH
△			
APP:		SECTION	
DATE:		<b>410</b>	



SE2, USE WHEN HOLE IS NOT EXISTING IN POLE



SE2A, TYPICAL SERVICE CONNECTION TO ROCK.



SE2B  
TYPICAL GUIDE FOR SWING SERVICE



**CONSTRUCTION STANDARDS**  
SERVICE ASSEMBLIES  
CABLE TERMINATIONS

REVISIONS			
REV	DATE	ENGR	OPS
0		LB	AH
APP:		SECTION	
DATE:		410	

\* TRUCK STOCK

MATERIAL LIST

ITEM NO.	DESCRIPTION	SE2	
		QTY.	S/N
1	CLAMP, WEDGE	1	AS REQ*
2	HOOK, DRIVE SCREW	1	751

\* TRUCK STOCK

ITEM NO.	DESCRIPTION	SE2A	
		QTY.	S/N
1	CLAMP, WEDGE	1	AS REQ*
2	CONNECTOR	1	AS REQ*

\* TRUCK STOCK

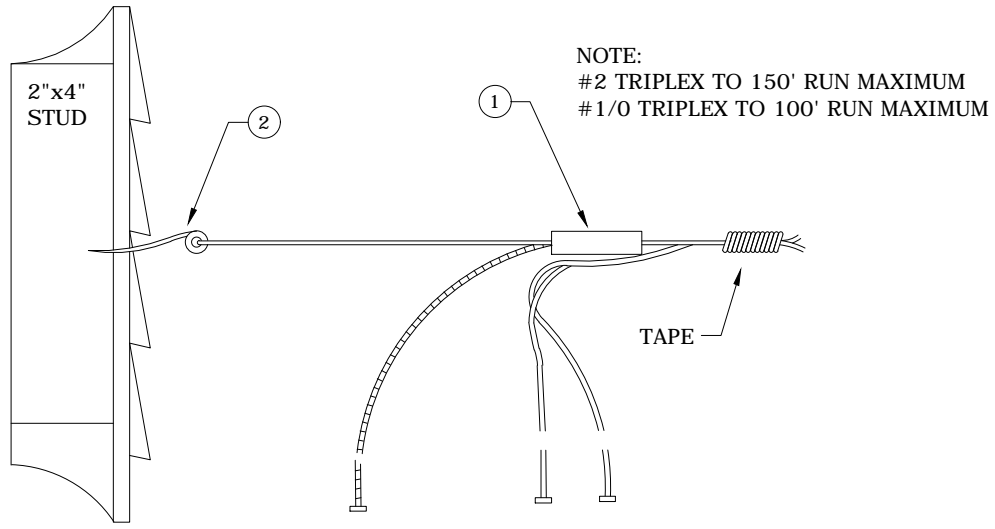
ITEM NO.	DESCRIPTION	SE2B	
		QTY.	S/N
1	BOLT, EYE, 5/8" x _____", GALV.	1	AS REQ*
2	CLAMP, WEDGE	2	AS REQ*
3	WASHER, SQ. FLAT, 5/8"	2	1412



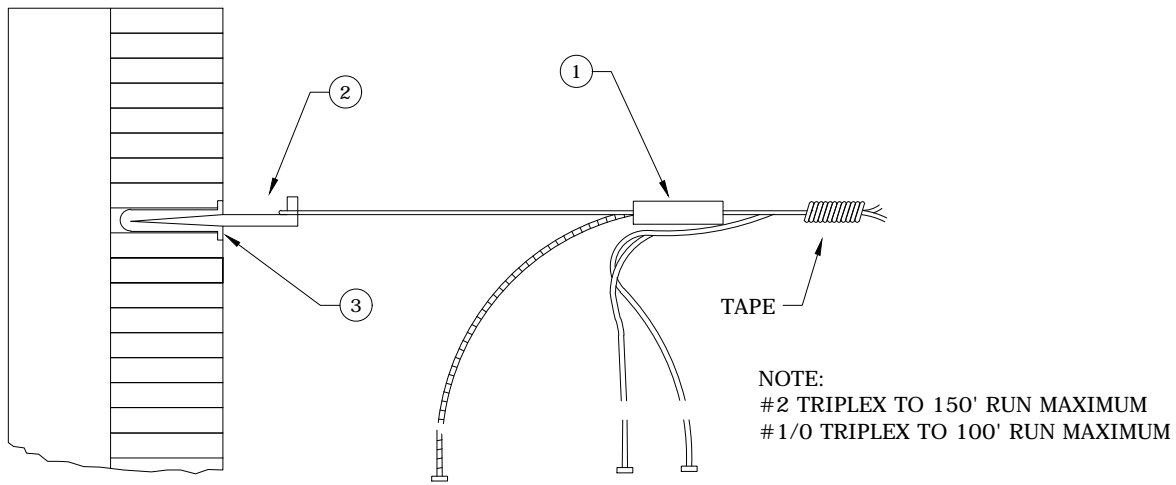
**CONSTRUCTION STANDARDS**  
SERVICE ASSEMBLIES  
CABLE TERMINATIONS

REVISIONS			
DATE	ENGR	OPS	
		LB	AH

APP: \_\_\_\_\_ SECTION  
DATE: \_\_\_\_\_ 410



SE3



SE3A

\*TRUCK STOCK  
N.S. NOT STOCKED

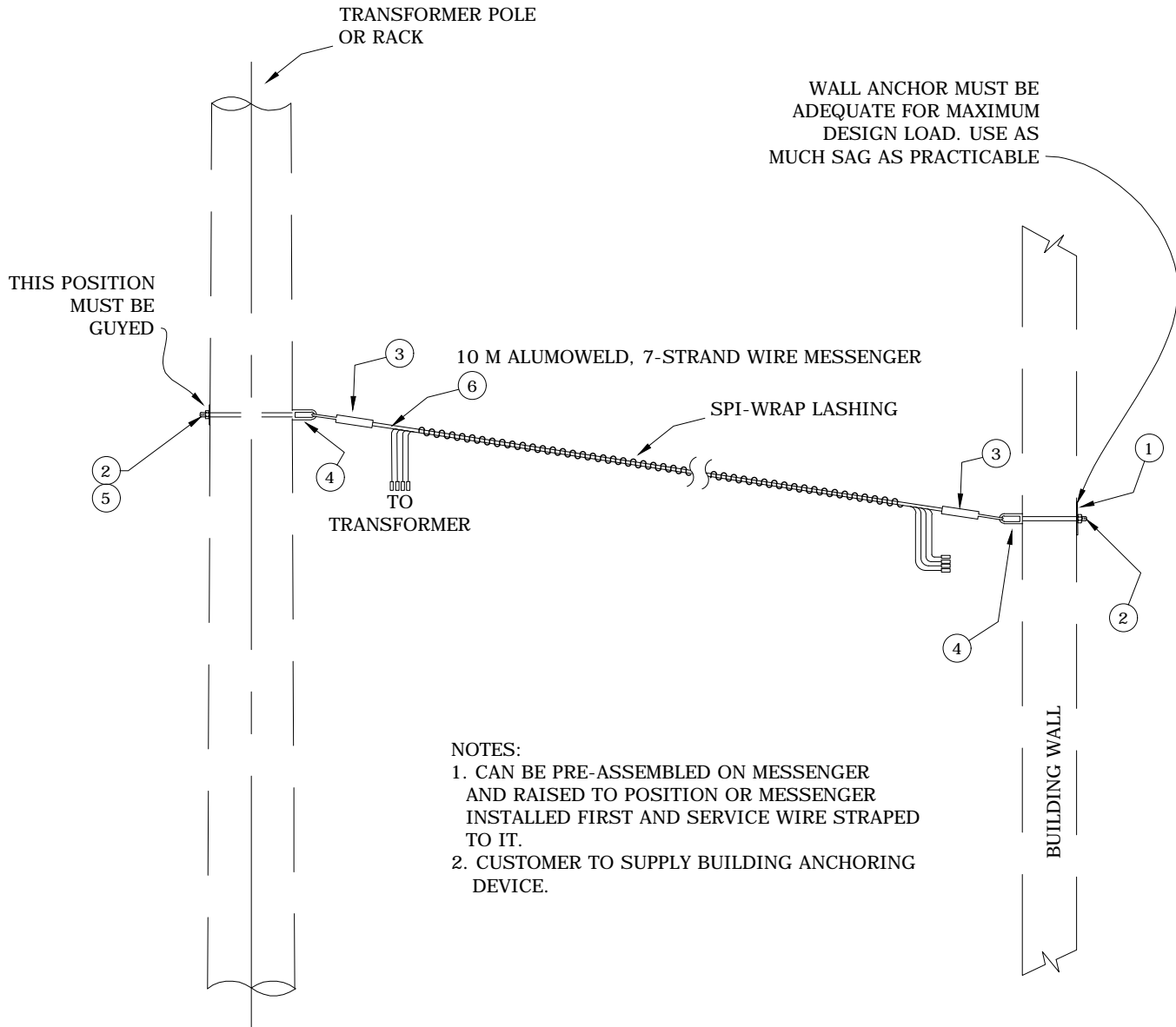
MATERIAL LIST

ITEM NO.	DESCRIPTION	SE3	
		QTY.	S/N
1	CLAMP, WEDGE	1	AS REQ*
2	INSULATOR HOUSE KNOB 1984	1	763
ITEM NO.	DESCRIPTION	SE3A	
		QTY.	S/N
1	CLAMP, WEDGE	1	AS REQ
2	HOOK, DRIVE SCREW	1	751
3	SHIELD EXPANSION	1	N.S.



CONSTRUCTION STANDARDS  
SERVICE ASSEMBLIES  
CABLE TERMINATIONS

REVISIONS			
DATE	ENGR	OPS	
	LB	AH	



MATERIAL LIST

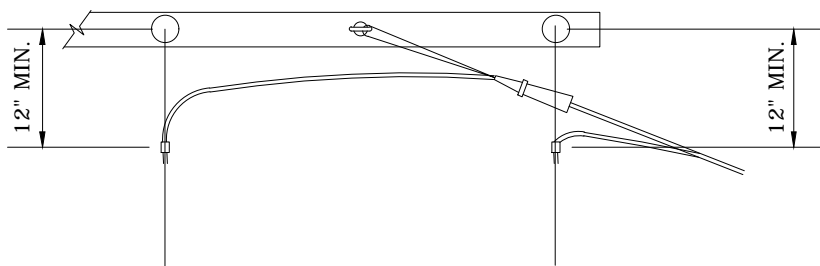
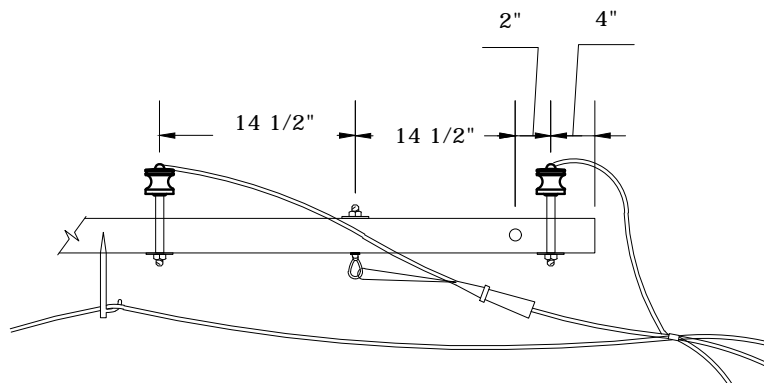
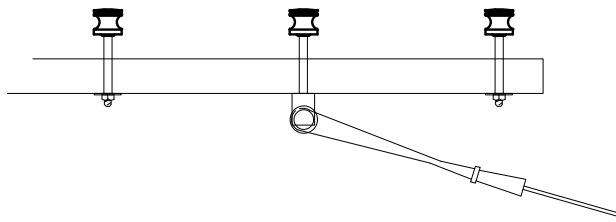
ITEM NO.	DESCRIPTION	SE6	
		QTY.	S/N
1	ANCHOR, WALL (BY CUSTOMER)	1	
2	BOLT, MACHINE 5/8" x ____" GALV	2	AS REQ
3	GRIP, GUY 10M	2	713
4	NUT, EYE OVAL 5/8" GALV	2	913
5	WASHER, SQ FLAT 5/8"	3	1412
6	WIRE, GUY, 10M	AS REQ	1419**

\*\* TO BE CALLED OUT BY ENGINEER



**CONSTRUCTION STANDARDS**  
 TYPICAL HEAVY SERVICE DETAIL  
 LARGER THAN NO. 4/0 ALUM. TRIPLEX  
 OR QUAD

REVISIONS			
DATE	ENGR	OPS	
	LB	AH	



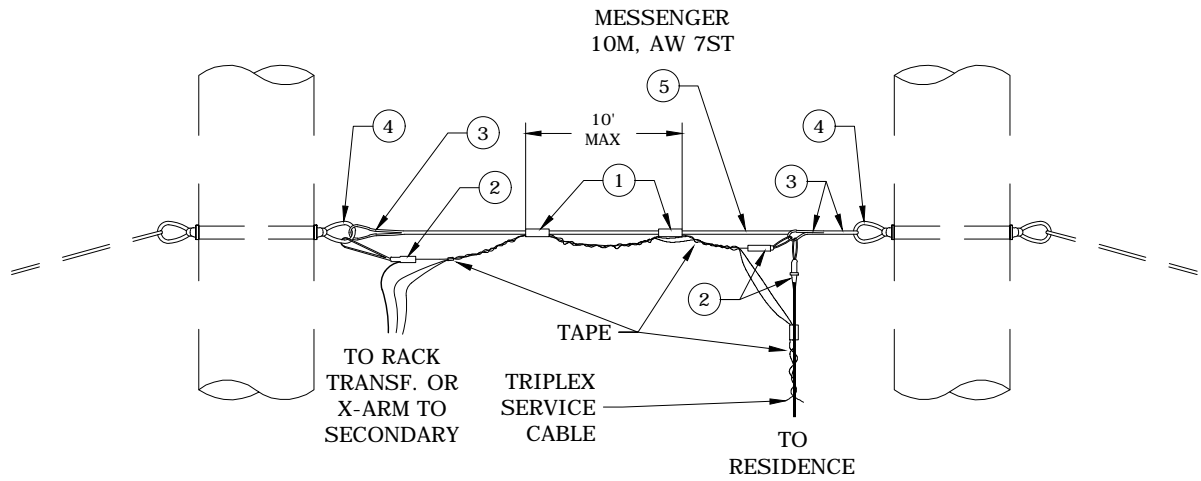
**CONSTRUCTION STANDARDS**  
TYPICAL SERVICE TAKE-OFF  
CROSSARM SECONDARIES

PAGE:  
1 of 1

**SE7**

CAD FILE:  
SE7

REVISIONS			
△	DATE	ENGR	OPS
0		LB	AH
APP:		SECTION	
DATE:		<b>410</b>	



**NOTE:**

1. LOCATION OF BRIDAL ON POLE TO BE DETERMINED BY LOCAL CONDITIONS.
2. INSTALL ONLY ONE CABLE FROM POLE TO GUY GRIP.
3. CLIP TO MESSENGER AS REQUIRED.
4. INSTALL HEAD GUYS BOTH WAYS.

\*TRUCK STOCK  
 \*\*TO BE CALLED OUT BY ENGINEER

**MATERIAL LIST**

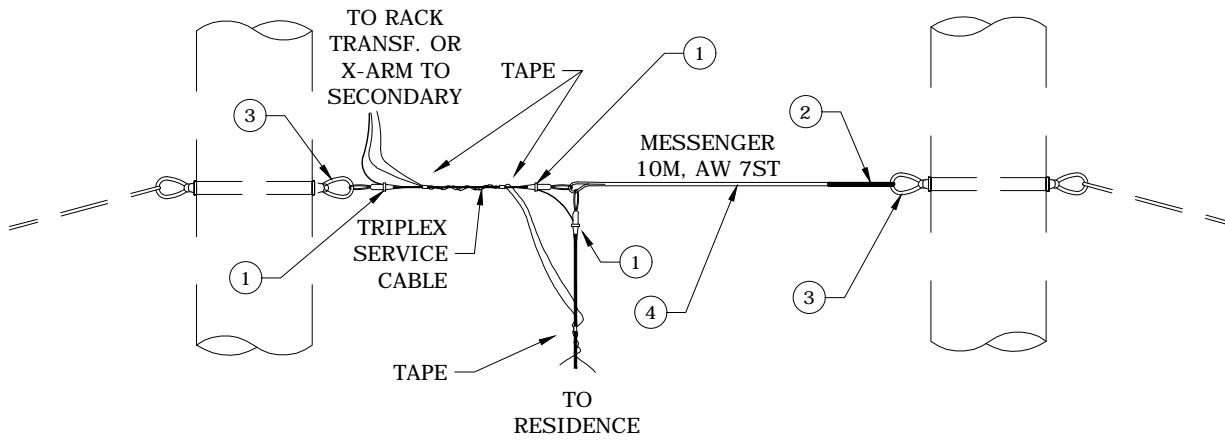
ITEM NO.	DESCRIPTION	SE8	
		QTY.	S/N
1	CLAMP	5	AS REQ*
2	CLAMP, WEDGE	3	AS REQ*
3	GRIP, GUY 10M	3	713
4	NUT, EYE OVAL 5/8" GALV.	2	913
3	WIRE, GUY, 10M	AS REQ	1419**



**CONSTRUCTION STANDARDS**  
 BRIDLE GUY  
 FOR TWO OR MORE SERVICES

REVISIONS			
DATE	ENGR	OPS	
0	LB	AH	





**NOTE:**

- 1. LOCATION OF BRIDAL ON POLE TO BE DETERMINED BY LOCAL CONDITIONS.
- 2. INSTALL HEAD GUYS BOTH WAYS.

\*TRUCK STOCK  
 \*\*TO BE CALLED OUT BY ENGINEER

**MATERIAL LIST**

ITEM NO.	DESCRIPTION	SE9	
		QTY.	S/N
1	CLAMP, WEDGE	3	AS REQ*
2	GRIP, GUY 10M	2	713
3	NUT, EYE OVAL 5/8" GALV.	2	913
4	WIRE, GUY, 10M	AS REQ	1419**



**CONSTRUCTION STANDARDS**  
 BRIDLE GUY  
 FOR SINGLE SERVICE

REVISIONS			
DATE	ENGR	OPS	
0	LB	AH	

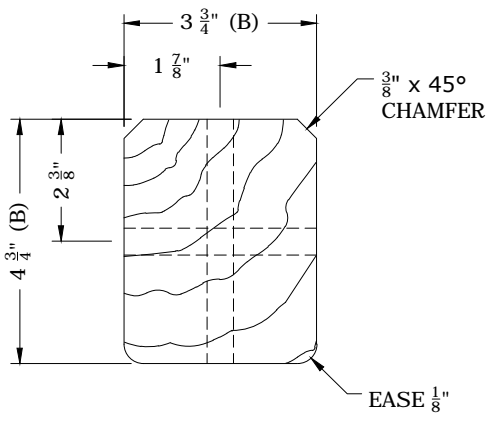
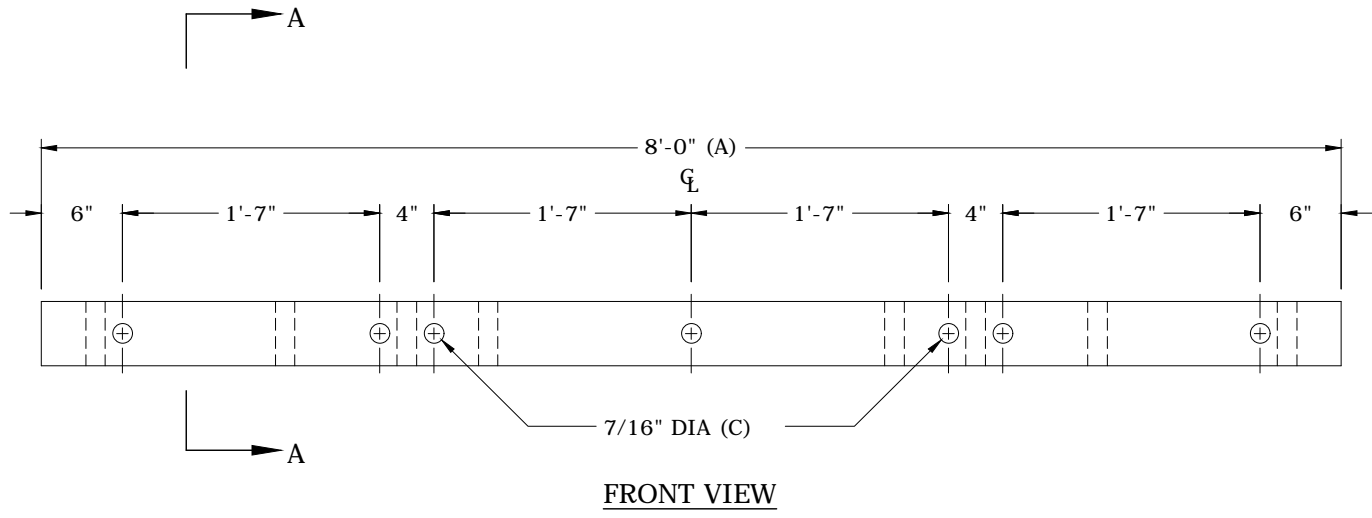
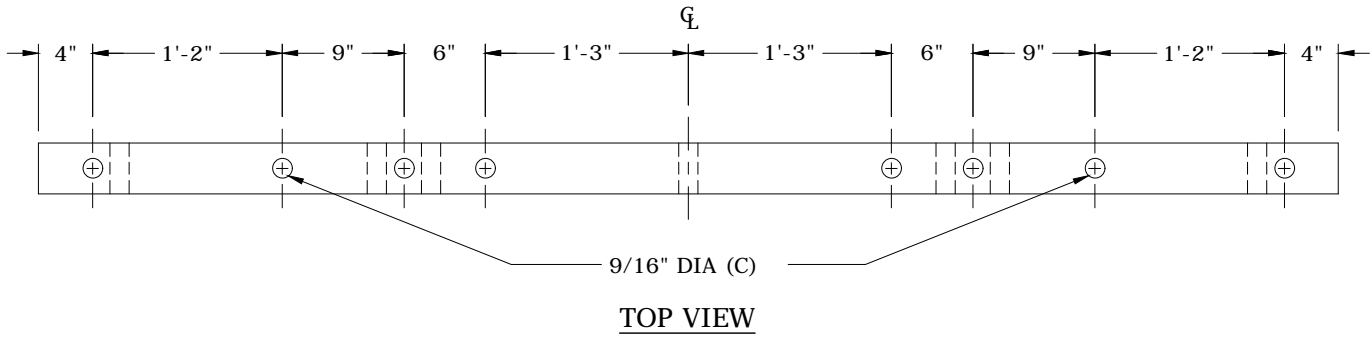
# 500

## CROSSARMS AND POLES

11/19/20

~	CR1	8' Standard Crossarm Drilling Guide
~	CR2	10' Standard Crossarm Drilling Guide
~	CR3	12' Standard Crossarm Drilling Guide
~	CR4	5' Standard Crossarm Drilling Guide
~	DEA1	8' Pre-assembled Deadend Assembly 3-position Drilling Guide
~	DEA2	10' Pre-assembled Deadend Assembly 3-position Drilling Guide
~	DEA3	10' Pre-assembled Deadend Assembly 4-position Drilling Guide
~	P1	25' to 35' Distribution Pole Framing Guide
~	P2	40' to 60' Distribution Pole Framing Guide
~	P3	Pole Setting Depth Guide
~	P4	Transmission-Distribution Pole Thru Boring at Ground Line
~	P5	Transmission-Distribution Pole Thru Boring at Pole Top
~	TP2	115kV Transmission Line General Pole Drilling Specification
<b>N</b>	TPW	Transmission Wood Pole Weights

<b>N</b>	New Standard
<b>R</b>	Redrawn Standard
<b>C</b>	Changed Standard
~	No Change



SECTION A-A

TOLERANCES

	<u>OVER</u>	<u>UNDER</u>
(A)	1/4"	1/4"
(B)	1/8"	1/8"
(C)	1/32"	1/32"

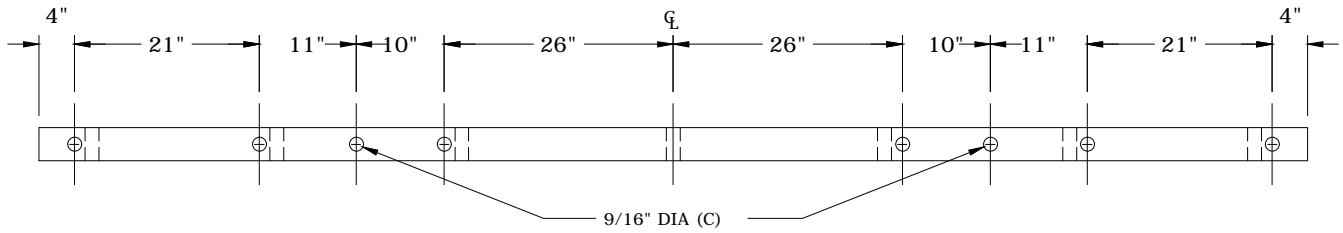
NOTES  
 1. HOLES TO BE 11/16" DIA. (c) UNLESS OTHERWISE INDICATED.



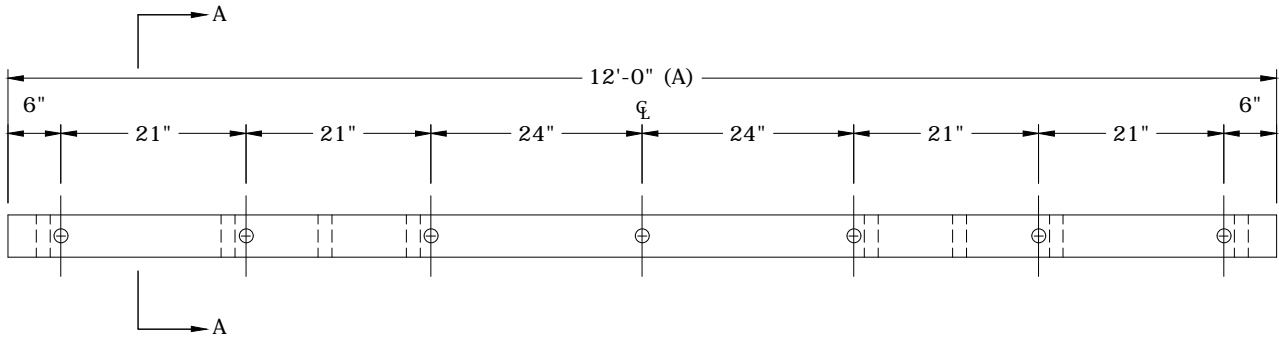
**CONSTRUCTION STANDARDS**  
 8' STANDARD CROSSARM  
 DRILLING GUIDE

REVISIONS											
#	DATE	ENGR	OPS								
1	2/8/93										
<table border="1"> <thead> <tr> <th style="text-align: center;">APP:</th> <th style="text-align: center;">HWH</th> <th colspan="2" style="text-align: center;">SECTION</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">DATE:</td> <td style="text-align: center;">1/22/80</td> <td colspan="2" style="text-align: center;"><b>500</b></td> </tr> </tbody> </table>				APP:	HWH	SECTION		DATE:	1/22/80	<b>500</b>	
APP:	HWH	SECTION									
DATE:	1/22/80	<b>500</b>									

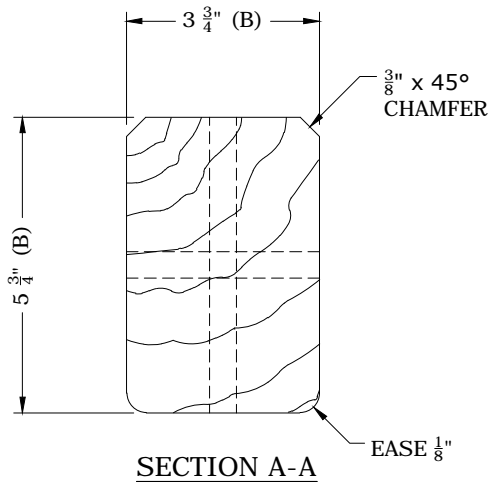




TOP VIEW



SIDE VIEW



SECTION A-A

TOLERANCES

	<u>OVER</u>	<u>UNDER</u>
(A)	1/4"	1/4"
(B)	1/8"	1/8"
(C)	1/32"	1/32"

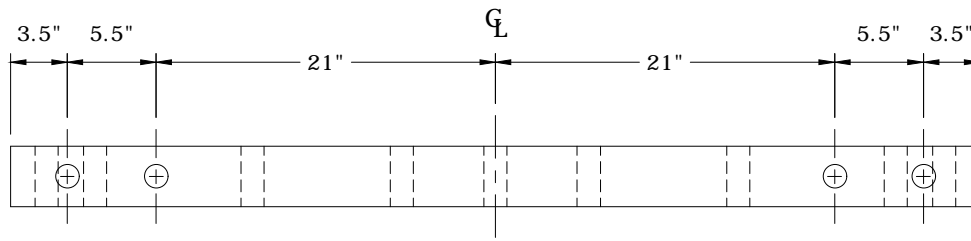
NOTES

- HOLES TO BE 11/16" DIA. (c) UNLESS OTHERWISE INDICATED.

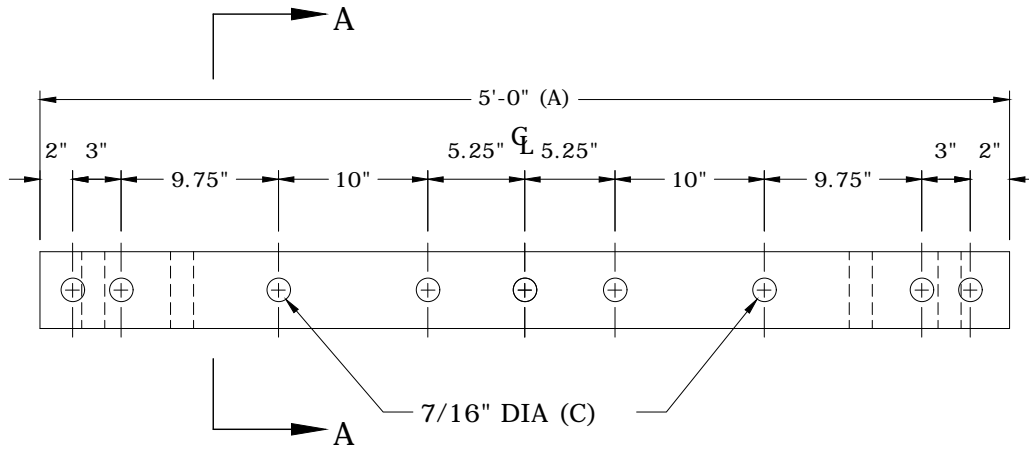


**CONSTRUCTION STANDARDS**  
12' STANDARD CROSSARM  
DRILLING GUIDE

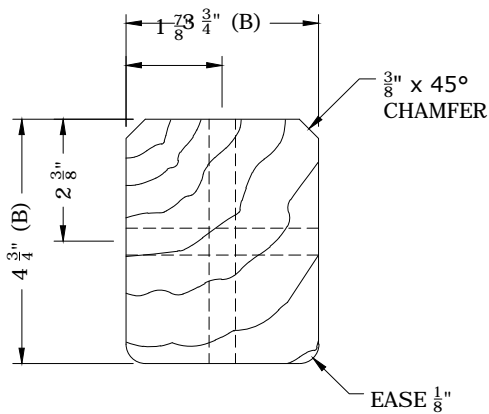
<u>REVISIONS</u>			
<u>Δ</u>	<u>DATE</u>	<u>ENGR</u>	<u>OPS</u>
1	2/8/93		
<u>Δ</u>			
APP:	HWH	SECTION	
DATE:	1/22/80	<b>500</b>	



**TOP VIEW**



**FRONT VIEW**



**SECTION A-A**

**TOLERANCES**

	<u>OVER</u>	<u>UNDER</u>
(A)	1/4"	1/4"
(B)	1/8"	1/8"
(C)	1/32"	1/32"

**NOTES**

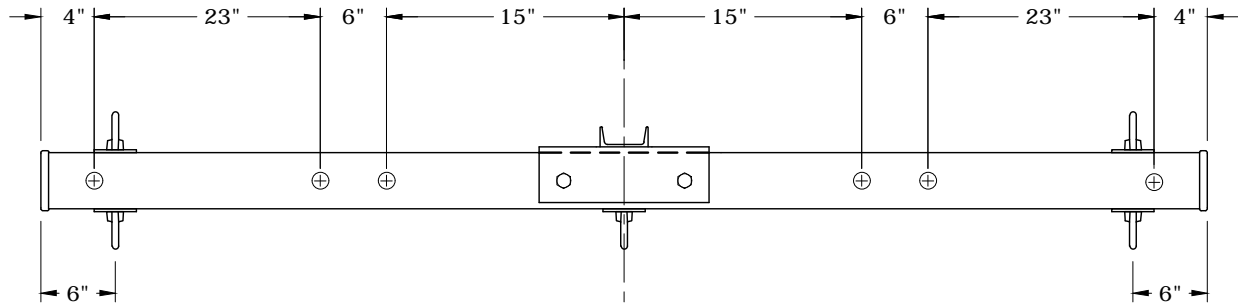
- HOLES TO BE 11/16" DIA. (c) UNLESS OTHERWISE INDICATED.



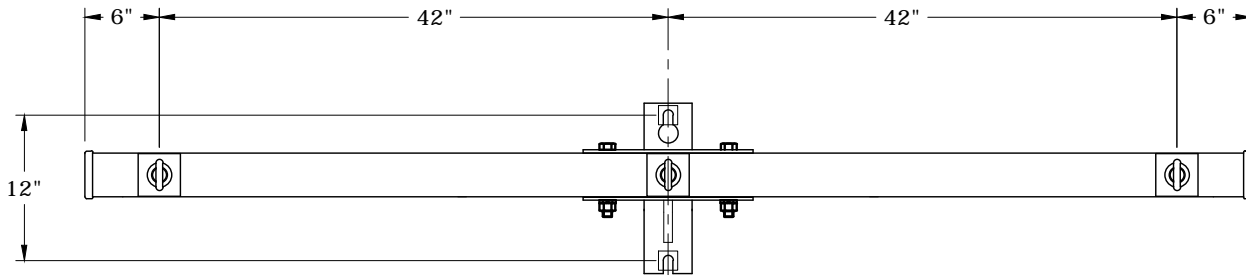
**CONSTRUCTION STANDARDS**

**5' STANDARD CROSSARM  
DRILLING GUIDE**

REVISIONS			
REV	DATE	ENGR	OPS
0	4/02		
△ REDRAWN IN CAD			
APP:	ELM	SECTION	
DATE:	1/31/80	500	



TOP VIEW



FRONT VIEW

- Notes: 1.) Holes to be 11/16" diameter.  
 2.) Double guy attachment required.



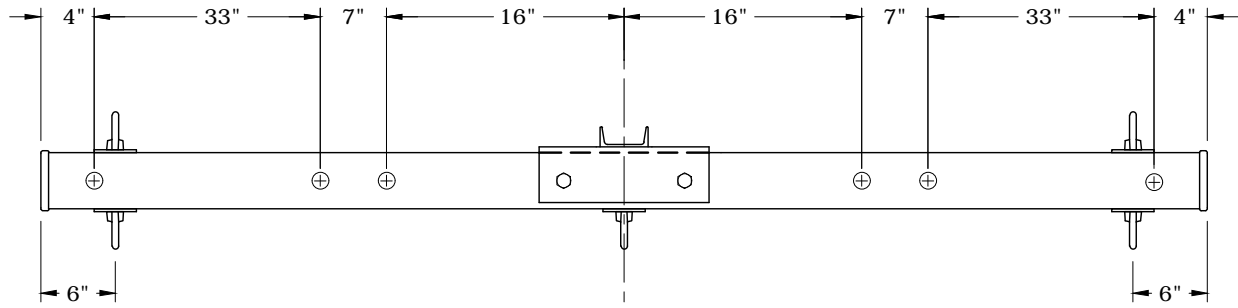
**CONSTRUCTION STANDARDS**  
 8' PRE-ASSEMBLED DEADEND ASSEMBLY  
 3-POSITION  
 DRILLING GUIDE

PAGE:  
1 of 1

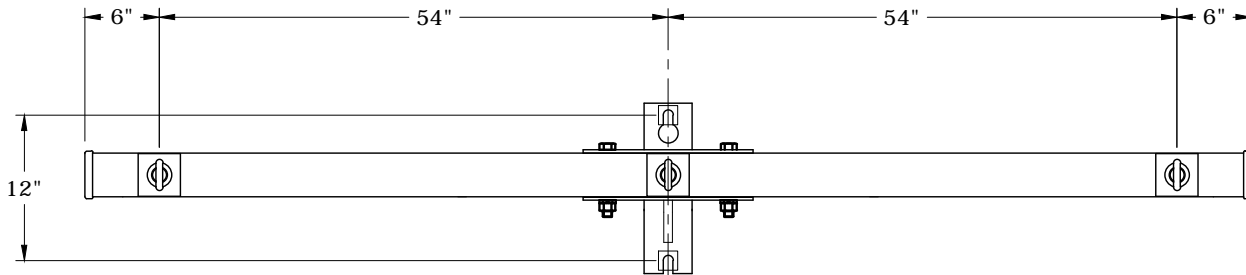
**DEA1**

CAD FILE:  
DEA1

REVISIONS			
△	DATE	ENGR	OPS
△			
APP:	LB/AH	SECTION	
DATE:	3/5/08	<b>500</b>	



TOP VIEW



FRONT VIEW

- Notes: 1.) Holes to be 11/16" diameter.  
 2.) Double guy attachment required.



**CONSTRUCTION STANDARDS**  
 10' PRE-ASSEMBLED DEADEND ASSEMBLY  
 3-POSITION  
 DRILLING GUIDE

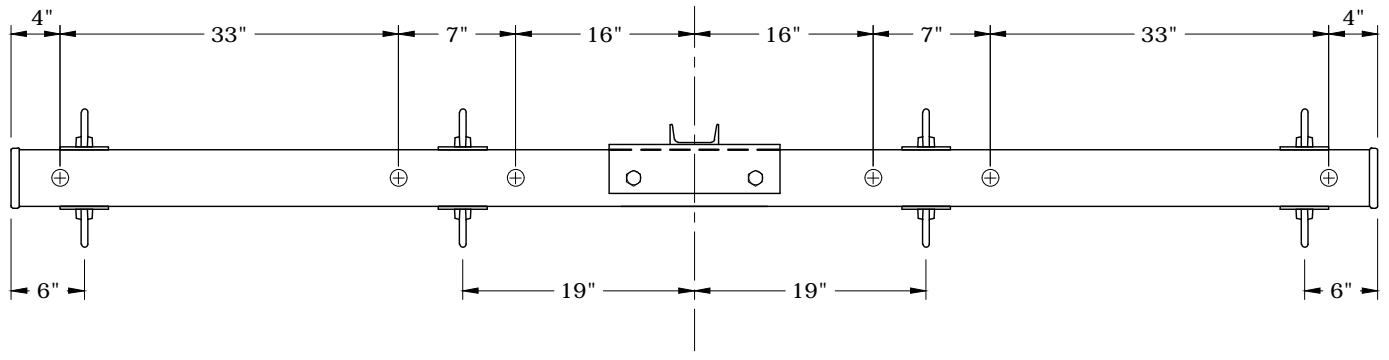
PAGE:  
1 of 1

**DEA2**

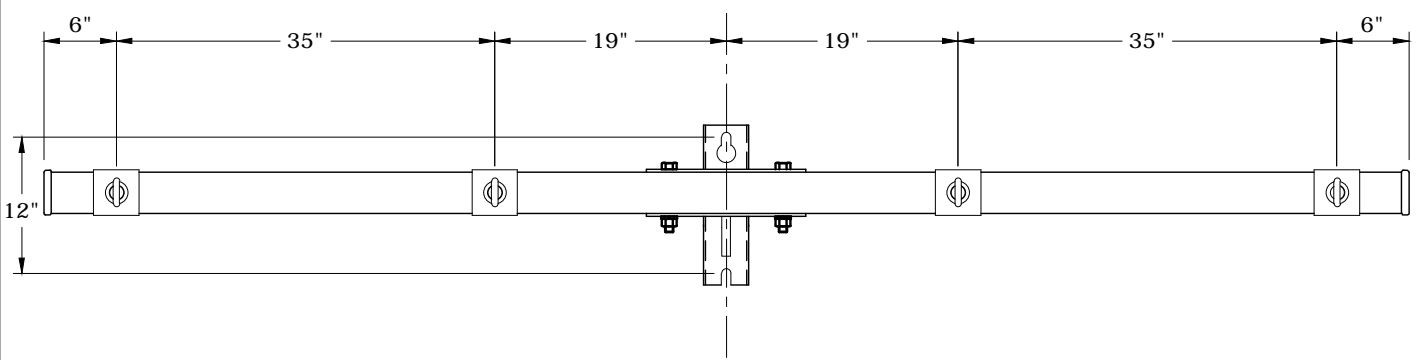
CAD FILE:  
DEA2

REVISIONS			
△	DATE	ENGR	OPS
△			
APP:	LB/AH	SECTION	
DATE:	3/5/08	<b>500</b>	





TOP VIEW



FRONT VIEW

Notes: 1.) Holes to be 11/16" diameter.  
 2.) Double guy attachment required.



**CONSTRUCTION STANDARDS**  
 10' PRE-ASSEMBLED DEADEND ASSEMBLY  
 4-POSITION  
 DRILLING GUIDE

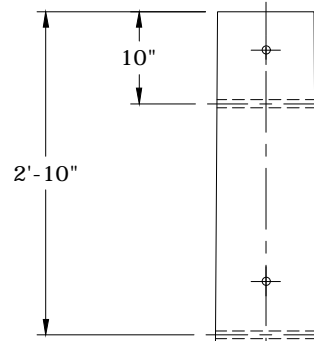
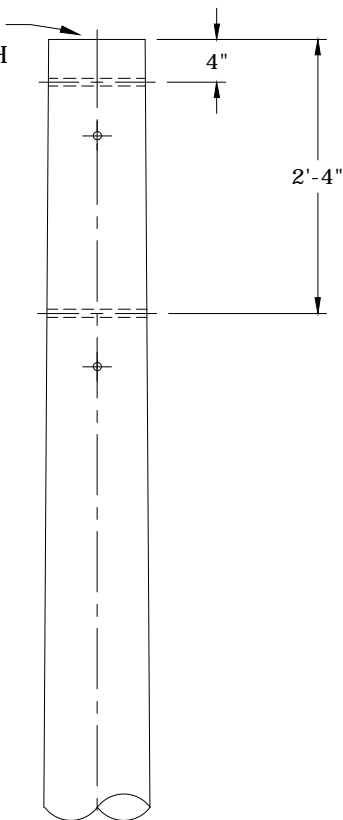
PAGE:  
1 of 1

**DEA3**

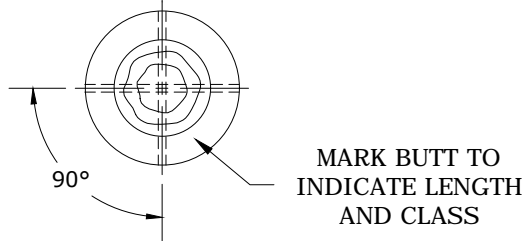
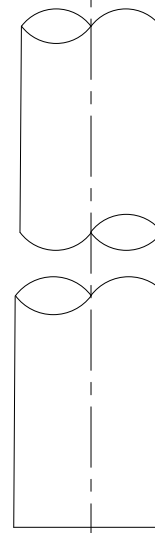
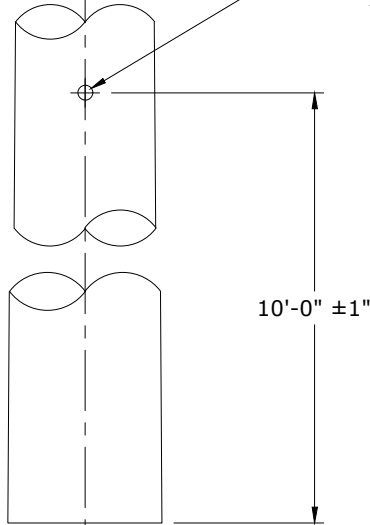
CAD FILE:  
DEA3

REVISIONS			
△	DATE	ENGR	OPS
△			
APP:	LB/AH	SECTION	
DATE:	3/5/08	<b>500</b>	

MARK TOP TO  
INDICATE LENGTH  
AND CLASS



METAL TAG  
REFER TO SPECS FOR  
MARKING DETAIL



**Notes:**

- 1.) Holes to be 11/16" dia.
- 2.) Call for P1 drilling, 30' pole class 4 as (P1-30-4)

Rev 2: Added length and class tag at top of pole.



**CONSTRUCTION STANDARDS**  
25' TO 35' DISTRIBUTION POLE  
FRAMING GUIDE

REVISIONS

NO.	DATE	ENGR	OPS
1	10/17/08	CM	AH
2	12/31/09	KJP	

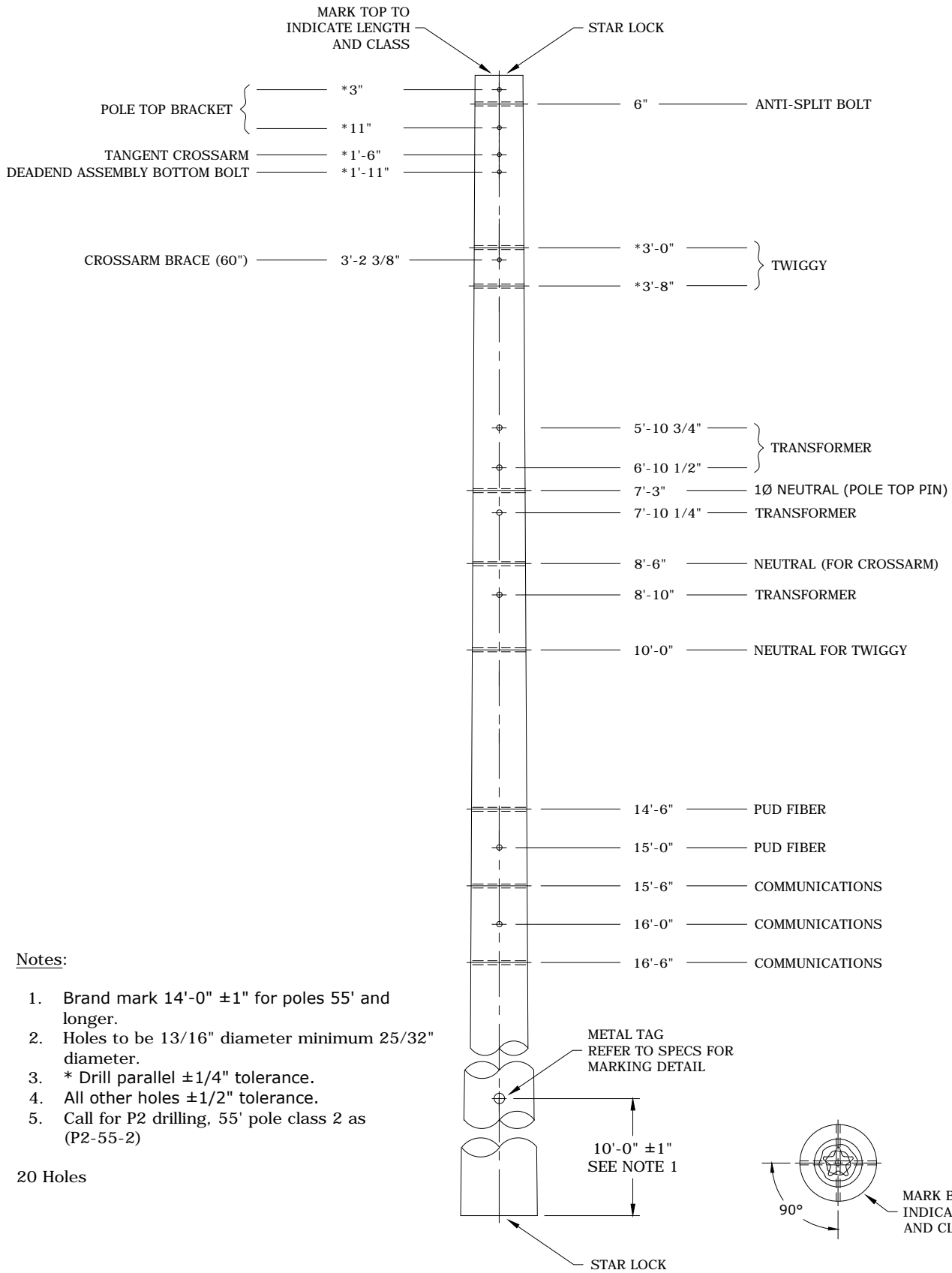
PAGE:  
1 of 1

**P1**

CAD FILE:  
P1

APP:  
DATE: 1/31/80

SECTION  
**500**



**Notes:**

1. Brand mark 14'-0" ±1" for poles 55' and longer.
2. Holes to be 13/16" diameter minimum 25/32" diameter.
3. \* Drill parallel ±1/4" tolerance.
4. All other holes ±1/2" tolerance.
5. Call for P2 drilling, 55' pole class 2 as (P2-55-2)

20 Holes

Rev. 6 - Added star lock on butt.



**CONSTRUCTION STANDARDS**  
40' TO 60' DISTRIBUTION  
POLE FRAMING GUIDE

PAGE:  
1 of 1

**P2**

CAD FILE:  
P2

REVISIONS											
NO.	DATE	ENGR	OPS								
3	10/17/08	CM	AH								
4	12/31/08	KJP	AH								
5	12/15/16	KJP									
6	10/3/17	KJP									
<table border="1"> <tr> <td>APP:</td> <td>HWH</td> <td colspan="2">SECTION</td> </tr> <tr> <td>DATE:</td> <td>1/22/80</td> <td colspan="2"><b>500</b></td> </tr> </table>				APP:	HWH	SECTION		DATE:	1/22/80	<b>500</b>	
APP:	HWH	SECTION									
DATE:	1/22/80	<b>500</b>									



# POLE DEPTH SETTING CHART

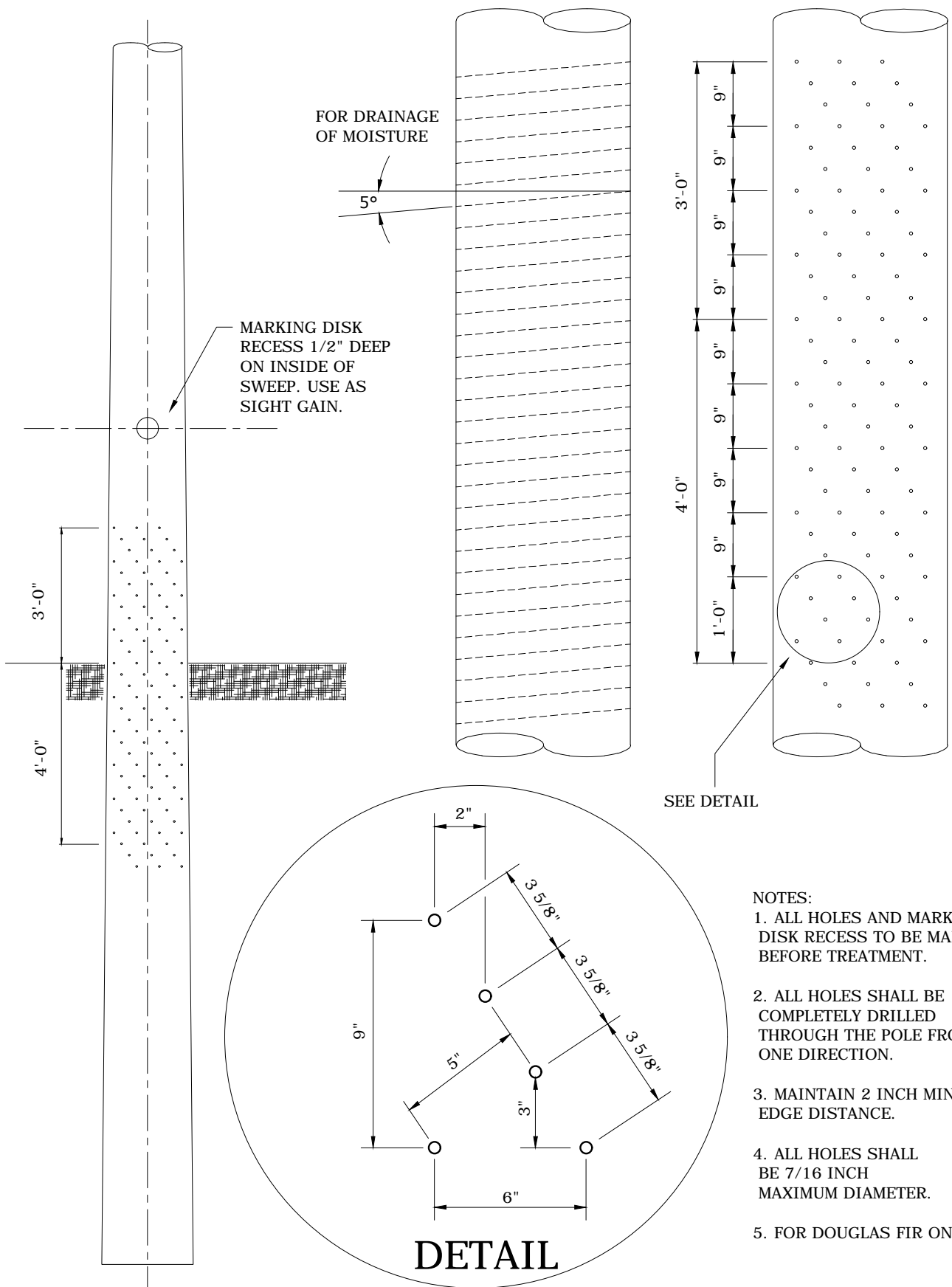
THE MINIMUM DEPTH FOR SETTING POLES SHALL BE AS FOLLOWS:

LENGHT OF POLE (FT)	MINIMUM SETTING DEPTH
UP TO 30'	5'-0"
35'-0"	5'-6"
40'-0"	6'-0"
45'-0"	6'-6"
50'-0"	7'-0"
55'-0"	7'-6"
60'-0"	8'-0"
65'-0"	8'-6"
70'-0"	9'-0"
75'-0"	9'-6"
80' AND ABOVE	10'-0"

Notes: 1. Setting depth in rock or swamp will be determined as required.

Rev 1: Redrawn in CAD

	<b>CONSTRUCTION STANDARDS</b> POLE SETTING GUIDE		REVISIONS		
				DATE	ENGR
	1	10/17/08	CM	AH	
PAGE: 1 of 1		<b>P3</b>	CAD FILE: P3		APP: ELM DATE: 1/31/80
				SECTION <b>500</b>	

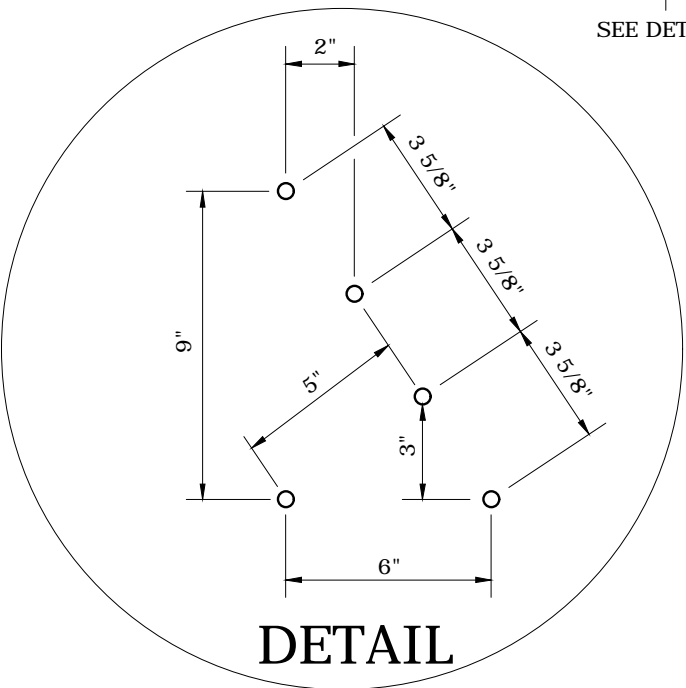


MARKING DISK  
RECESS 1/2" DEEP  
ON INSIDE OF  
SWEEP. USE AS  
SIGHT GAIN.

FOR DRAINAGE  
OF MOISTURE

5°

SEE DETAIL



**DETAIL**

- NOTES:
1. ALL HOLES AND MARKING DISK RECESS TO BE MADE BEFORE TREATMENT.
  2. ALL HOLES SHALL BE COMPLETELY DRILLED THROUGH THE POLE FROM ONE DIRECTION.
  3. MAINTAIN 2 INCH MINIMUM EDGE DISTANCE.
  4. ALL HOLES SHALL BE 7/16 INCH MAXIMUM DIAMETER.
  5. FOR DOUGLAS FIR ONLY.

Rev 1: Added to Standards Book.



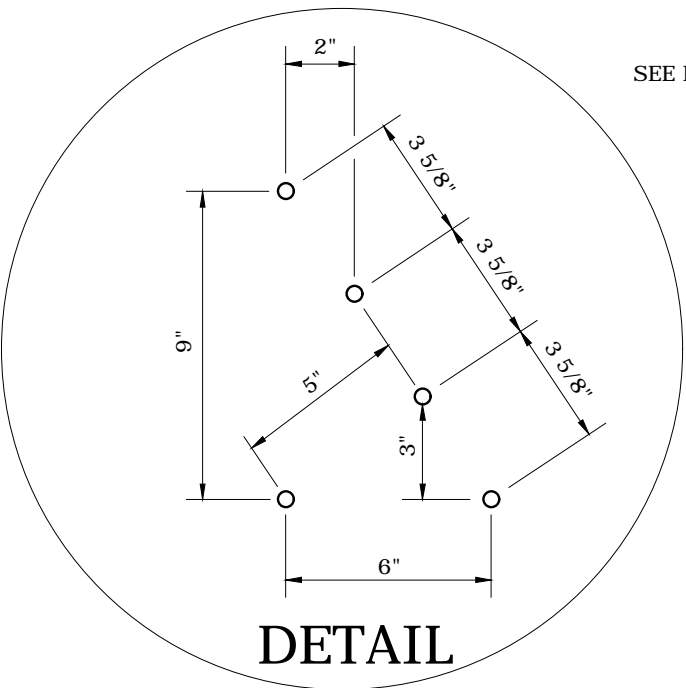
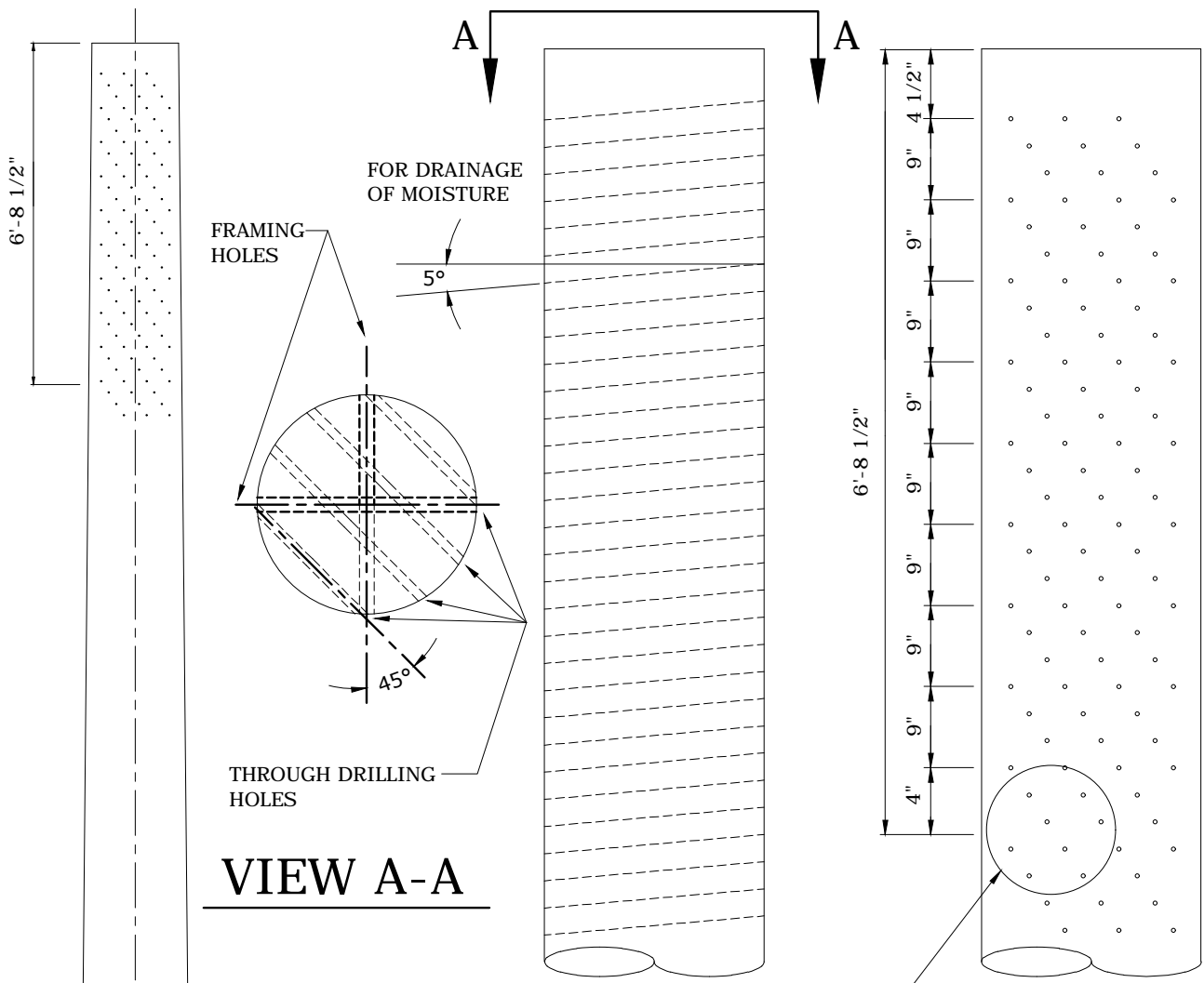
**CONSTRUCTION STANDARDS**  
TRANSMISSION-DISTRIBUTION POLE  
THROUGH BORING GUIDE  
AT GROUND LINE

REVISIONS			
NO.	DATE	ENGR	OPS
1	2/11/10	KJP	
APP:		SECTION	
DATE:		500	

PAGE:  
1 of 1

**P4**

CAD FILE:  
P4



- NOTES:
1. ALL HOLES AND MARKING DISK RECESS TO BE MADE BEFORE TREATMENT.
  2. ALL HOLES SHALL BE COMPLETELY DRILLED THROUGH THE POLE FROM ONE DIRECTION.
  3. MAINTAIN 2 INCH MINIMUM EDGE DISTANCE.
  4. ALL HOLES SHALL BE 5/16 INCH MAXIMUM DIAMETER.
  5. FOR DOUGLAS FIR ONLY.

Rev 1: Added to Standards Book.



**CONSTRUCTION STANDARDS**

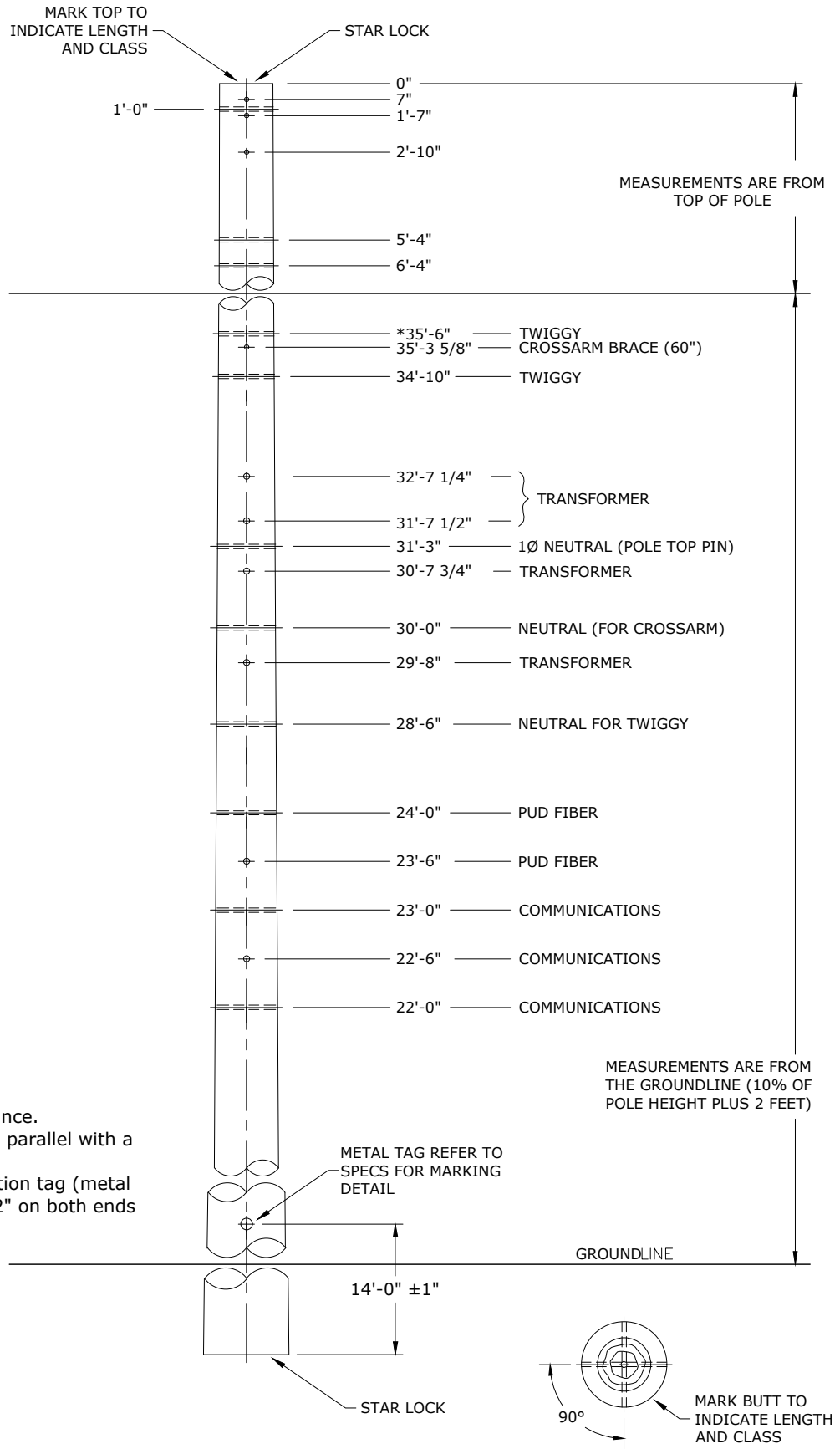
TRANSMISSION POLE  
THROUGH BORING GUIDE  
AT THE POLE TOP

PAGE:  
1 of 1

**P5**

CAD FILE:  
P5

REVISIONS			
NO.	DATE	ENGR	OPS
1	4/2/14	KJP	
APP:		SECTION	
DATE:		<b>500</b>	




**Notes:**

1. All holes are ±1/16" tolerance.
2. \* All parallel holes shall be parallel with a tolerance of ±1/4".
3. Install processor identification tag (metal tag) with drilling spec "TP2" on both ends of pole.

21 Holes

Rev. 2 - Added star lock on butt and added pre-drilled holes for communications.

	CONSTRUCTION STANDARDS		REVISIONS		
	115kV TRANSMISSION LINE GENERAL POLE DRILLING SPECIFICATION		DATE	ENGR	OPS
PAGE: 1 of 1	TP2		1	12/28/16	KJP
CAD FILE: TP2			2	3/12/20	KJP
		APP: HWH/DK	SECTION		
		DATE: 2/02	500		

## Weight of Coastal Douglas Fir Penta or Copper Naphthenate

Class	H1	H2	H3	H4	H6
Pole Length (ft)	Estimated Weight (lb) ±10%				
60	3149	3542	3961	4358	5305
65	3534	3973	4432	4920	5970
70	3944	4424	4982	5515	6663
75	4379	4953	5502	6084	7396
80	4834	5457	6052	6749	8028
85	5310	5982	6630	7376	8918
90	5752	6470	7302	8020	9733
95	6273	7044	7860	8725	10545
100	6745	7569	8434	9455	11382
105	7314	8192	9123	10143	12259

Note: Contact Standards Engineering for weights of other poles. Weights are estimated from typical wood density and pole dimensions.



### CONSTRUCTION STANDARDS TRANSMISSION WOOD POLE WEIGHTS

REVISIONS			
△	DATE	ENGR	OPS



# 600 GROUNDING

12/23/2022

~	N	Installation of Grounding Assemblies
C	N1,N2	Basic Units - Grounding
C	N3,N4	Basic Units - Copperweld Grounding - Pole Ground Repair
~	TN0	Static Wire History/Policy
C	TN1	Static Wire Assembly - Tangent and Angle
C	TN2	Static Wire Assembly - In-Line Deadend
C	TN3	Static Wire Assembly - In-Line Double Deadend
C	TN4	Static Wire Assembly - Double Deadend 90°

**N** New Standard  
**R** Redrawn Standard  
**C** Changed Standard  
**~** No Change

## Grounding Installations - Distribution Circuits

The minimum requirements for grounding assemblies are specified in the National Electrical Safety Code (IEEE C2-2017).

Rule #93-A: Copper-clad steel ground without joint or splice, if possible, free from sharp bends and as short as possible.

Rule #93-C-2: Ground for AC distribution shall have not less than 1/5 of the line conductance. (#4 Cu-equivalent copper-clad steel).

Rule #94-B: Driven electrodes, if practicable, shall be below permanent moisture level, minimum size 5/8" x 8', driven eight (8) feet deep. When rod cannot be driven eight (8) feet deep, install second rod on opposite side of pole and interconnect ground wire. The top of the ground rod shall be flush with or below the ground level unless suitably protected.


Rule #97-A: Ground conductors shall be run separately to ground for:

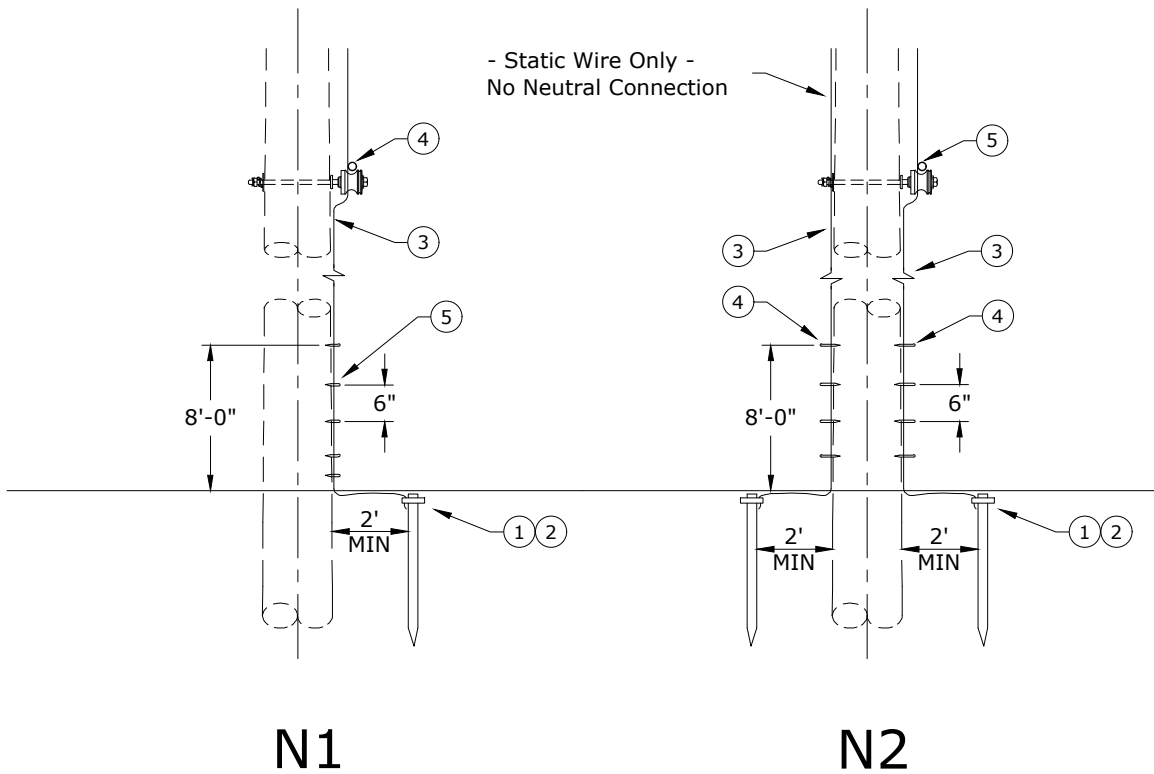
- Surge Arresters over 750v and frames of any equipment operating over 750v (see exceptions below).
- Lighting and power circuits under 750v.
- Shield wires of power circuits

Rule #97-B: An interconnection of primary surge arrester ground and primary and secondary neutral is permitted on a multi-grounded system. This solid interconnection shall be made since surge current is routed through several parallel ground impedances and the danger of insulation damage no longer exists even under conditions of high surge current and high ground impedance.

Rule #215-C: Non-current-carrying parts shall be grounded unless they are 8 feet or more above readily accessible surfaces or they are otherwise isolated or guarded.

Rev. 2 - Updated for 2017 NESC

	CONSTRUCTION STANDARDS		REVISIONS			
	INSTALLATION OF GROUNDING ASSEMBLIES		DATE	ENGR	OPS	APP
	0	4/02	REDRAWN	KJP	IN CAD	ELM
	1	11/18/15	KJP	KJP		SECTION
2	10/27/17	KJP			600	
PAGE: 1 of 1	N	CAD FILE: N	DATE: 1/31/80			



- Notes:**
1. Staple every 6" from ground line up to 8' above ground.
  2. Top of rod must be below final grade.

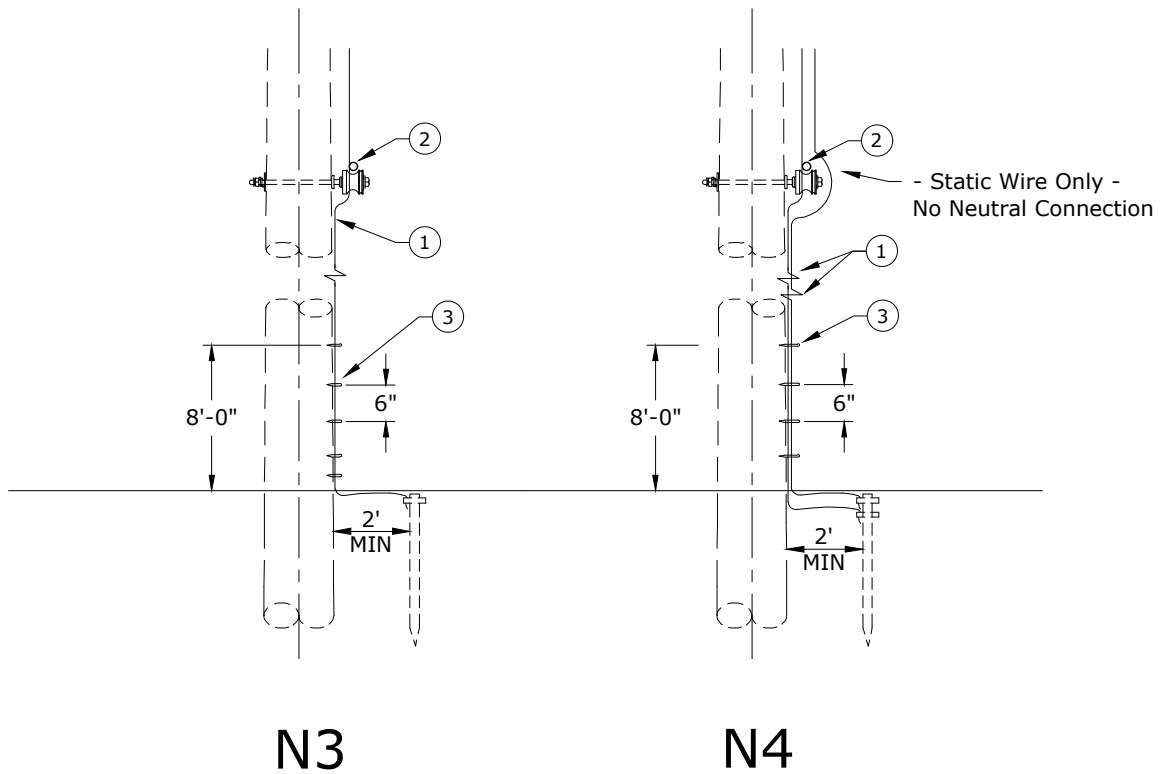
Rev 6 - Changed from Cabelok to H-Tap Connector

ITEM NO.	DESCRIPTION	N1	
		QTY	S/N
1	Rod, Ground, 5/8" x 8'	1	1124
2	Clamp, Ground Rod, 5/8", Small, Bronze	1	281
3	Conductor, Copper-Clad Steel, Black w/ Green Stripe, #4 Cu Equivalent, 40% Annealed	40	1512
4	Connector, H-Tap, Al/Cu, Run #2-2/0 Str - Tap #6-#1 Str *	1	413
5	Staple, Ground, Barbed, Galvanized, 1 1/2"	24	2707
ITEM NO.	DESCRIPTION	N2	
		QTY	S/N
1	Rod, Ground, 5/8" x 8'	2	1124
2	Clamp, Ground Rod, 5/8", Small, Bronze	2	281
3	Conductor, Copper-Clad Steel, Black w/ Green Stripe, #4 Cu Equivalent, 40% Annealed	100	1512
4	Staple, Ground, Barbed, Galvanized, 1 1/2"	40	2707
5	Connector, H-Tap, Al/Cu, Run #2-2/0 Str - Tap #6-#1 Str *	1	413



**CONSTRUCTION STANDARDS**  
BASIC UNITS  
GROUNDING

REVISIONS			
DATE	ENGR	OPS	
12/4/14	KJP		
10/27/17	KJP		
9/12/18	KJP		
11/24/22	KJP		



- Notes:**
1. Staple every 6" from ground line up to 8' above ground.
  2. Top of rod must be below final grade.
  3. For N4, the entire static wire does not need to be replaced for the repair. The static wire may be spliced around the height of the neutral. It will depend on how much of the ground wire is missing.

Rev 4 - Changed from Cabelok to H-Tap Connector

ITEM NO.	DESCRIPTION	N3	
		QTY	S/N
1	Conductor, Copper-Clad Steel, Black w/ Green Stripe, #4 Cu Equivalent, 40% Annealed *	40	1512
2	Connector, H-Tap, Al/Cu, Run #2-2/0 Str - Tap #6-#1 Str *	1	413
3	Staple, Ground, Barbed, Galvanized, 1 1/2"	24	2707
ITEM NO.	DESCRIPTION	N4	
		QTY	S/N
1	Conductor, Copper-Clad Steel, Black w/ Green Stripe, #4 Cu Equivalent, 40% Annealed *	72	1512
2	Connector, H-Tap, Al/Cu, Run #2-2/0 Str - Tap #6-#1 Str *	1	413
3	Staple, Ground, Barbed, Galvanized, 1 1/2"	24	2707



**CONSTRUCTION STANDARDS**  
BASIC UNITS  
GROUNDING  
POLE GROUND REPAIR

REVISIONS			
Δ	DATE	ENGR	OPS
1	12/4/2014	KJP	
2	10/27/17	KJP	
3	9/12/18	KJP	
4	11/24/22	KJP	

## Static Wire History/Policy

CPU used to install static (shield) wires over transmission lines ½ mile from the substation in all directions.




A change was made to a new style substation surge arrester. The manufacturers claimed they would eliminate the need for static wires. CPU had experienced failures of existing static wires that fell into the transmission on multiple occasions during ice storms. Operations questioned the need for static wires. The decision was made to eliminate in some cases. Operations preferred the THPA standard (which does not allow for static wire) and would like to limit static wire to areas of known lightning problems.

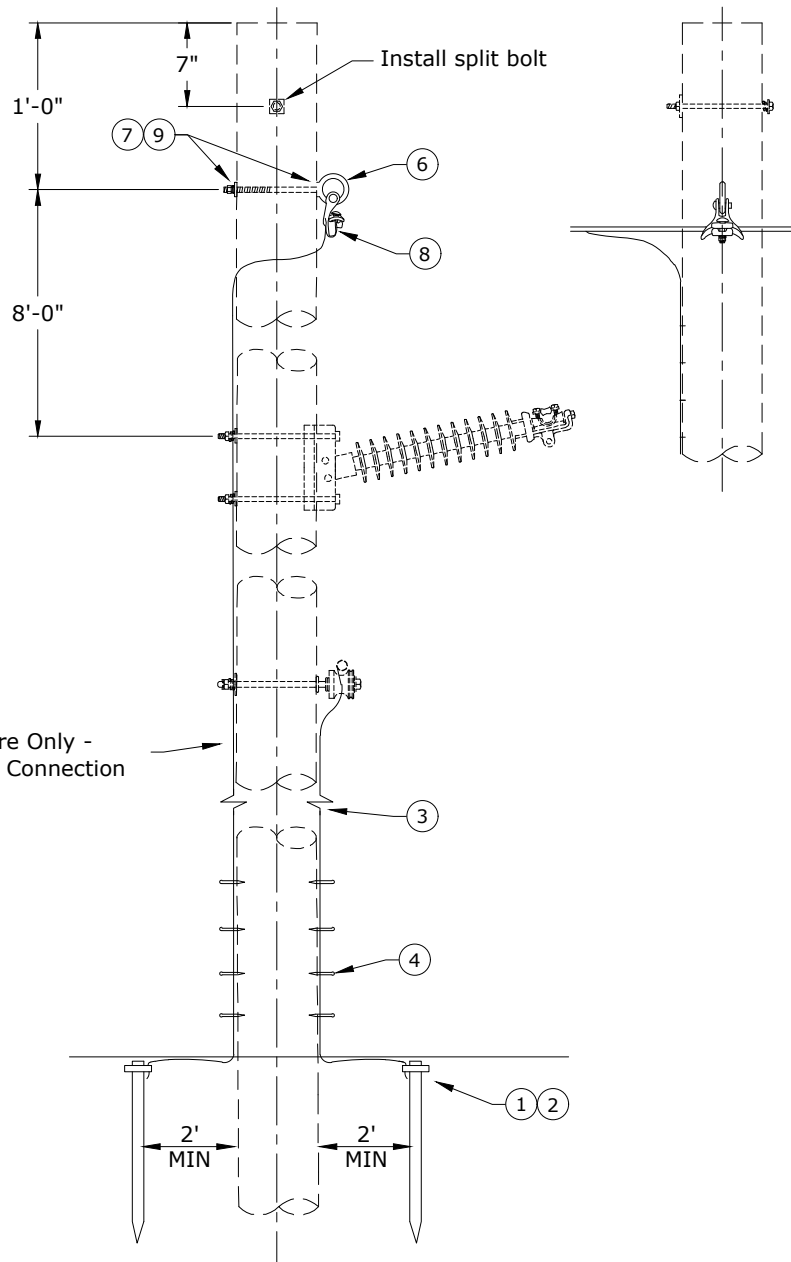
Subsequent information shows that the new surge arresters (90kV) do not completely protect substation transformers as thought. The Chelatchie transformer was damaged by a nearby lightning strike. The surge arrester failed when the line was re-energized.

A determination was made to install static wires out ½ mile from substations when possible but each case would be examined individually to see if it made sense. Substation transformers are now approximately \$1 million, and reliability is a customer priority.

Systems Engineering should be consulted before new transmission is designed or maintenance on existing transmission within a ½ mile of the substation is done so the occurrence of lightning in the area of that substation can be evaluated.

K. Perzanowski  
January 9, 2012

	<b>CONSTRUCTION STANDARDS</b> STATIC WIRE HISTORY/POLICY		REVISIONS			
		DATE	ENGR	OPS		
	APP:	CM/DK	SECTION			
PAGE: 1 of 1	TNO		CAD FILE: TNO	DATE: 1/4/17	600	



Rev 3 - Changed from Cabelok to H-Tap Connector

ITEM NO.	DESCRIPTION	TN1	
		QTY	S/N
1	Rod, Ground, 5/8" x 8'	2	1124
2	Clamp, Ground Rod, 5/8", Small, Bronze	2	281
3	Conductor, Copper-Clad Steel, Black w/ Green Stripe, #4 Cu Equivalent, 40% Annealed*	100	1512
4	Staple, Ground Wire, Barbed, Galv. 1 1/2"	40	2707
5	Connector, H-Tap, Al/Cu, Run #2-2/0 Str - Tap #6-#1 Str *	1	413
ITEM NO.	DESCRIPTION	ADDITIONAL MATERIAL	
		QTY	S/N
6	Bolt, Shoulder Eye, 3/4" x 12" Galv., 18,350 lbs. Ultimate Tensile	1	186
7	Washer, Curved, Cast, 4" x 4" x 13/16"	2	1910
8	Clamp, Angle Straight .16-.75, Max Angle = 120°, 11,000 lbs. Ultimate Strength	1	273
9	Washer, Lock, Spring, Double Coil, Galv., 3/4"	2	2218

Clark  
Public  
Utilities



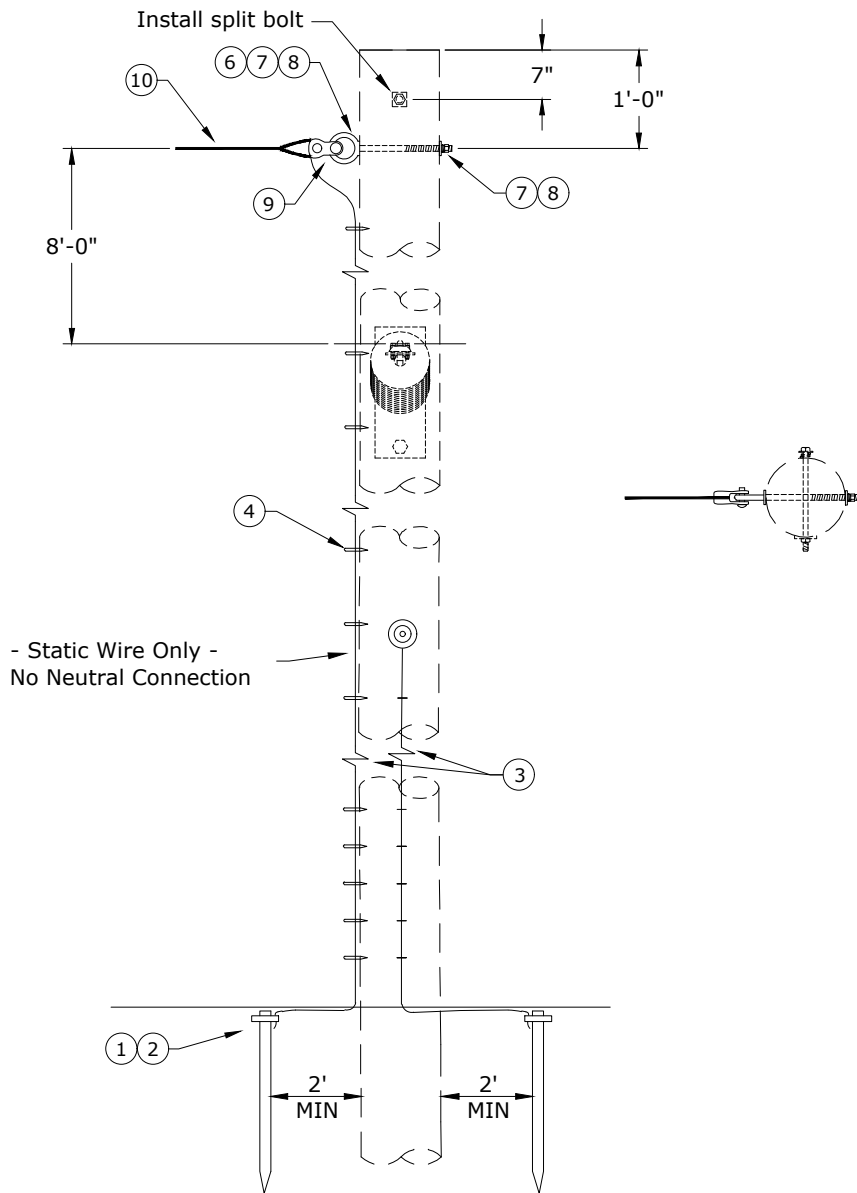
**CONSTRUCTION STANDARDS**  
STATIC WIRE ASSEMBLY  
TANGENT AND ANGLE

PAGE:  
1 of 1

**TN1**

CAD FILE:  
TN1

REVISIONS			
Δ	DATE	ENGR	OPS
1	8/01	REDRAWN	IN CAD
2	1/4/17	CM	DK
3	11/24/22	KJP	
APP:		SECTION	
DATE: 5/12/66		<b>600</b>	



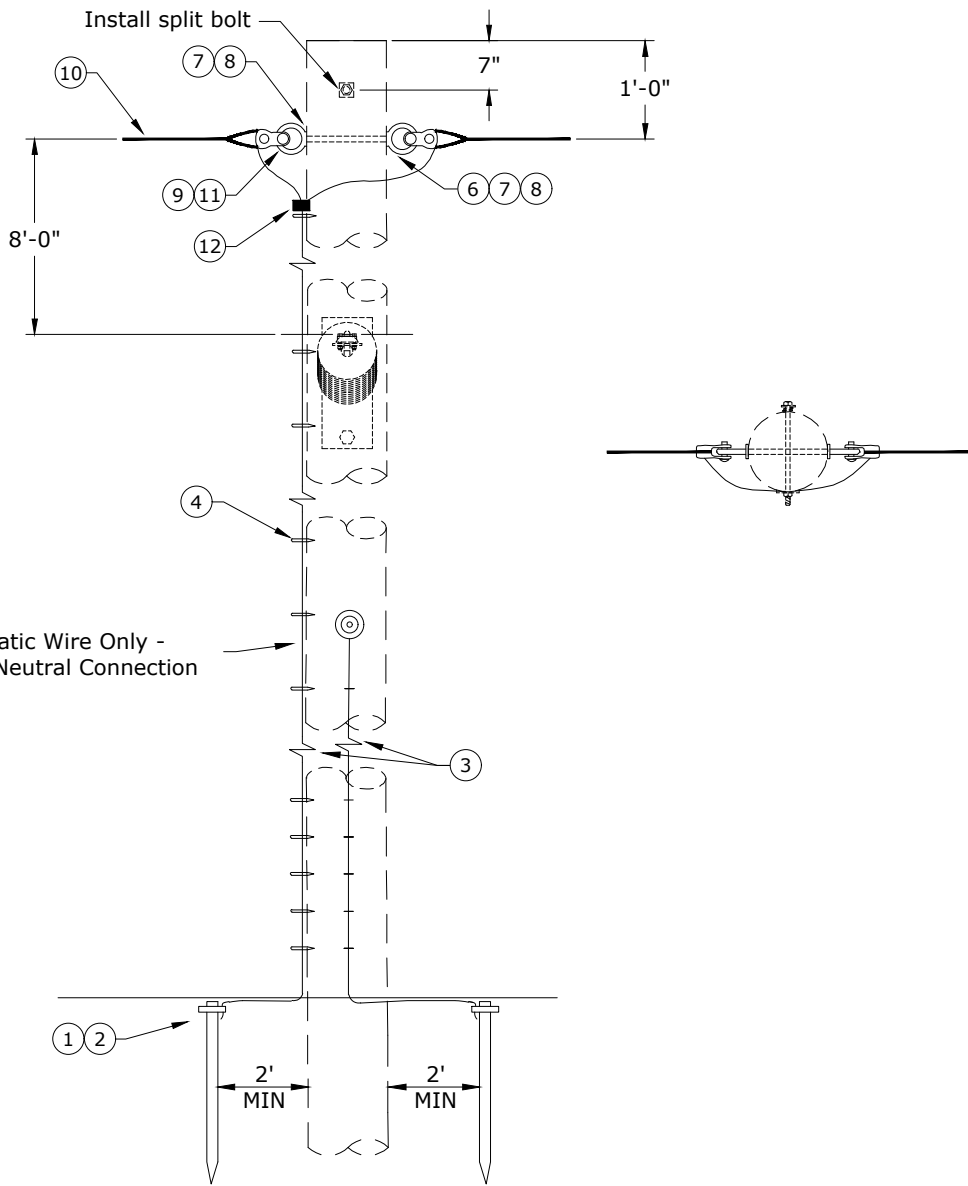
Rev 3 - Changed from Cabelok to H-Tap Connector

ITEM NO.	DESCRIPTION	TN2	
		QTY	S/N
1	Rod, Ground, 5/8" x 8'	2	1124
2	Clamp, Ground Rod, 5/8", Small, Bronze	2	281
3	Conductor, Copper-Clad Steel, Black w/ Green Stripe, #4 Cu Equivalent, 40% Annealed *	100	1512
4	Staple, Ground Wire, Barbed, Galv., 1 1/2"	40	2707
5	Connector, H-Tap, Al/Cu, Run #2-2/0 Str - Tap #6-#1 Str *	1	413
ITEM NO.	DESCRIPTION	ADDITIONAL MATERIAL	
		QTY	S/N
6	Bolt, Shoulder Eye, 3/4" x 12" Galv., 18,350 lbs. Ultimate Tensile	1	186
7	Washer, Curved, Cast, 4" x 4" x 13/16" Hole	2	1910
8	Washer, Lock, Spring, Double Coil, Galv., 3/4"	2	2218
9	Clevis, Thimble, 1 1/4" Dia., 10M Guy	1	1628
10	Grip, Guy, 10M	1	713



**CONSTRUCTION STANDARDS**  
 STATIC WIRE ASSEMBLY  
 IN-LINE DEADEND

REVISIONS			
Δ	DATE	ENGR	OPS
1	8/01	REDRAWN	IN CAD
2	1/4/17	CM	DK
3	11/24/22	KJP	



Rev 3 - Changed from Cabelok to H-Tap Connector

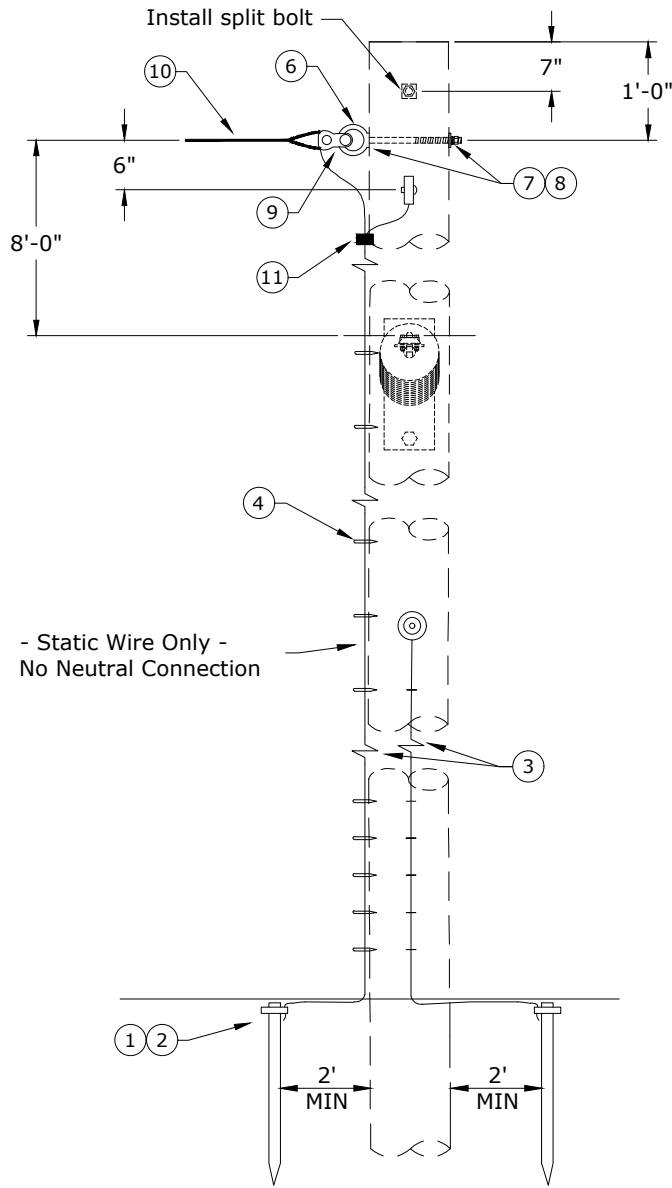
ITEM NO.	DESCRIPTION	TN3	
		QTY	S/N
1	Rod, Ground, 5/8" x 8'	2	1124
2	Clamp, Ground Rod, 5/8", Small, Bronze	2	281
3	Conductor, Copper-Clad Steel, Black w/ Green Stripe, #4 Cu Equivalent, 40% Annealed *	100	1512
4	Staple, Ground Wire, Barbed, Galv., 1 1/2"	40	2707
5	Connector, H-Tap, Al/Cu, Run #2-2/0 Str - Tap #6-#1 Str *	1	413
ITEM NO.	DESCRIPTION	ADDITIONAL MATERIAL	
		QTY	S/N
6	Bolt, Shoulder Eye, 3/4" x 14" Galv., 18,350 lbs. Ultimate Tensile	1	187
7	Washer, Curved, Cast, 4" x 4" x 13/16" Hole	2	1910
8	Washer, Lock, Spring, Double Coil, Galv., 3/4"	2	2218
9	Clevis, Thimble, 1 1/4" Dia., 10M Guy	2	1628
10	Grip, Guy, 10M	2	713
11	Nut, Eye, Oval, 3/4" Galv.	1	914
12	Connector, Crimpet, Cu 2/0-1/0 To #2-#6	1	456



**CONSTRUCTION STANDARDS**  
 STATIC WIRE ASSEMBLY  
 IN-LINE DOUBLE DEADEND

REVISIONS			
DATE	ENGR	OPS	
8/01	REDRAWN	IN CAD	
1/4/17	CM	DK	
11/24/22	KJP		





Rev 3 - Changed from Cabelok to H-Tap Connector.

ITEM NO.	DESCRIPTION	TN4	
		QTY	S/N
1	Rod, Ground, 5/8" x 8'	2	1124
2	Clamp, Ground Rod, 5/8", Small, Bronze	2	281
3	Conductor, Copper-Clad Steel, Black w/ Green Stripe, #4 Cu Equivalent, 40% Annealed *	100	1512
4	Staple, Ground Wire, Barbed, Galvanized, 1 1/2"	40	2707
5	Connector, H-Tap, Al/Cu, Run #2-2/0 Str - Tap #6-#1 Str *	1	413
ITEM NO.	DESCRIPTION	ADDITIONAL MATERIAL	
		QTY	S/N
6	Bolt, Shoulder Eye, 3/4" x 12" Galv., 18,350 lbs. Ultimate Tensile	2	186
7	Washer, Curved, Cast, 4" x 4" x 13/16" Hole	4	1910
8	Washer, Lock, Spring, Double Coil, Galv., 3/4"	4	2218
9	Clevis, Thimble, 1 1/4" Dia., 10M Guy	1	1628
10	Grip, Guy, 10M	2	713
11	Connector, Crimpet Cu 2/0-1/0 To #2-#6	1	456



**CONSTRUCTION STANDARDS**  
 STATIC WIRE ASSEMBLY  
 DOUBLE DEADEND  
 90°

REVISIONS			
NO.	DATE	ENGR	OPS
1	8/01	REDRAWN	IN CAD
2	1/4/17	CM	DK
3	11/24/22	KJP	

# 700

## GUYS AND ANCHORS

6/13/2023

<b>C</b>	G	Guy and Anchor Selection
~	G0	Guy and Anchor Chart
~	G1A,G2A, G3A	Single Helix Screw Anchors
~	G3,G4	Expanding and Crossplate Anchors
~	G4A, G4B	Multi-Helix Screw Anchors
~	G5	Sidewalk Guy
~	G9,G10	Rock Anchors
~	G30-G37	Double Guy Attachments
~	G40-G45	Single Guy Attachments
~	GDG50- GDG81	Down Guys
~	GSG50- GSG85	Span Guys

<b>N</b>	New Standard
<b>R</b>	Redrawn Standard
<b>C</b>	Changed Standard
~	No Change

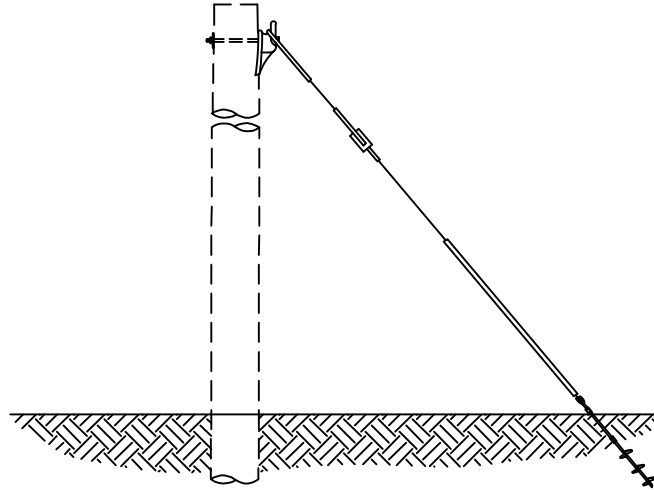
# SCOPE

This section covers selection of down guys, span guys, sidewalk guys, push braces and anchors. The selections are based upon wood strengths, guy component strengths, anchor strengths and soil holding power of anchors.

## DEFINITIONS (Taken from The Lineman's and Cableman's Handbook, Seventh Edition)

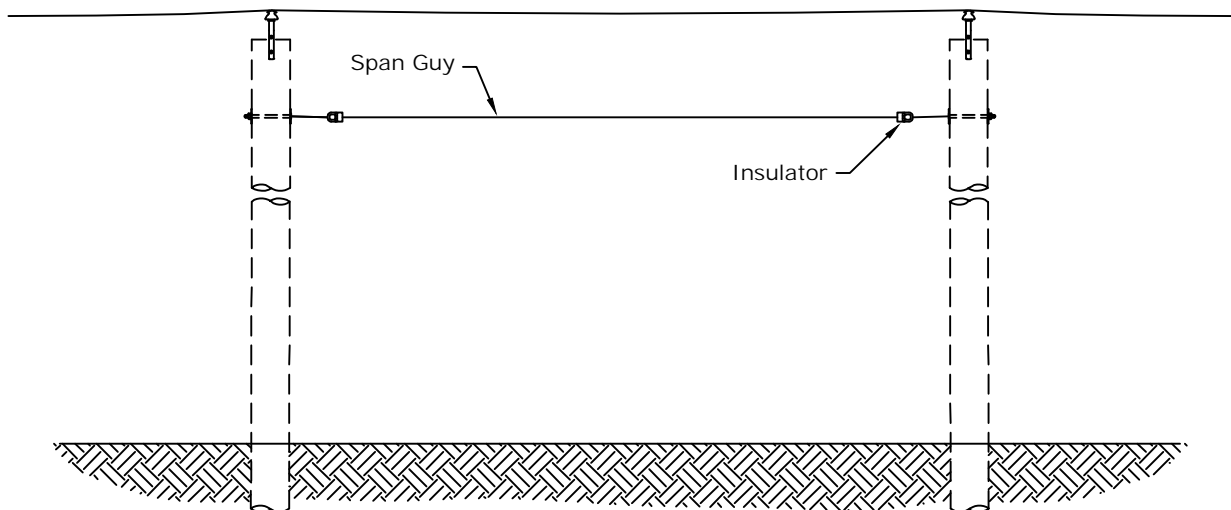
### 1. Down Guy-

Consists of a wire running from the attachment near the top of the pole to a rod and anchor installed in the ground.




### 2. Span Guy-

Consists of a guy wire installed from the top of a pole to the top of an adjacent pole to remove the strain from the line conductors.

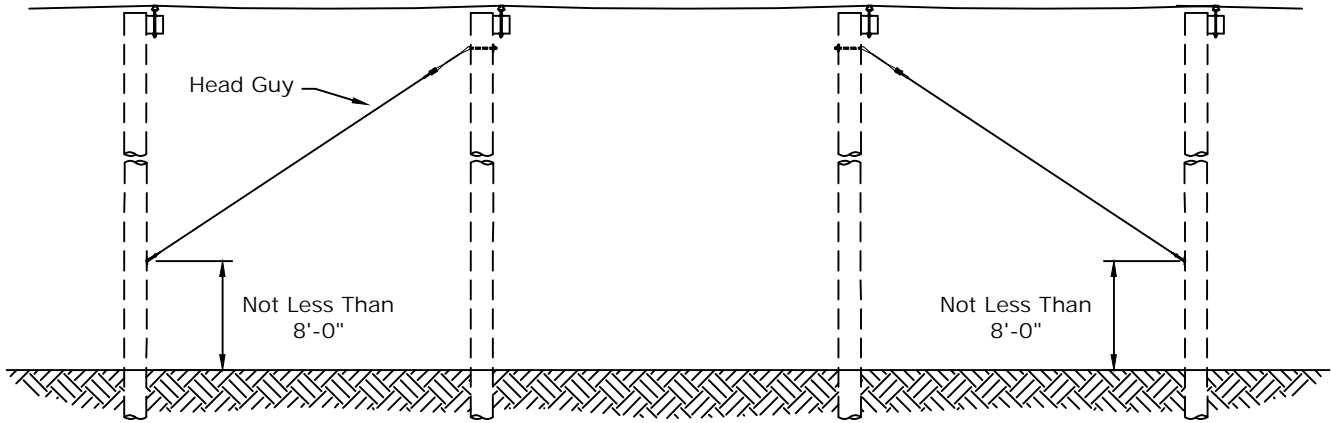


Rev 3: Updated to 2023 NESC.

	<h2>CONSTRUCTION STANDARDS</h2>			<b>REVISIONS</b>			
	<h3>GUY &amp; ANCHOR SELECTION</h3>			DATE ENGR OPS	DATE ENGR OPS	DATE ENGR OPS	DATE ENGR OPS
	1	2/22/00	JEH	2	2/24/11	CM	AH
	3	6/13/23	CSB				
PAGE: 1 of 7	<h1 style="font-size: 2em;">G</h1>			CAD FILE: G	APP: GGW DATE: 4/1/86	SECTION <h2 style="font-size: 1.5em;">700</h2>	

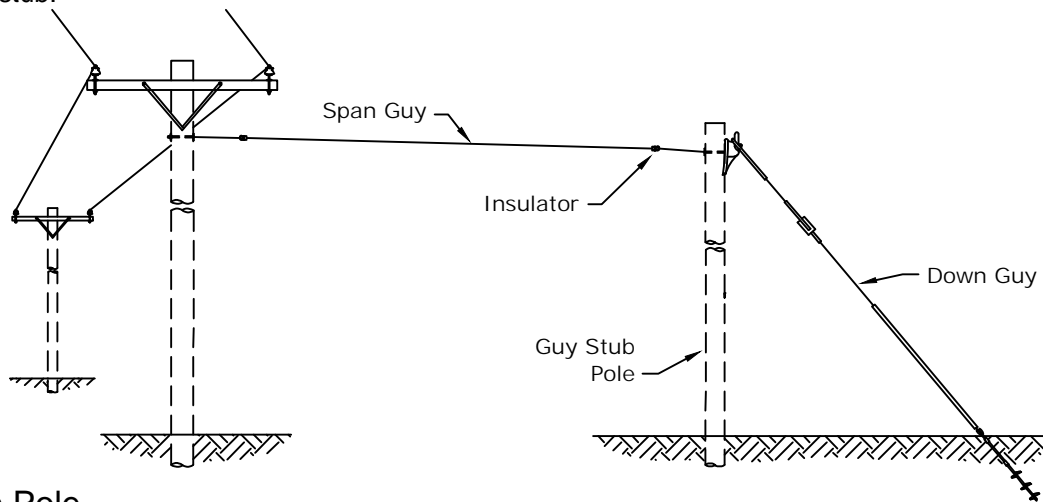
### 3. Head Guy-

A guy wire running from the top of a pole to a point below the top of the adjacent pole.



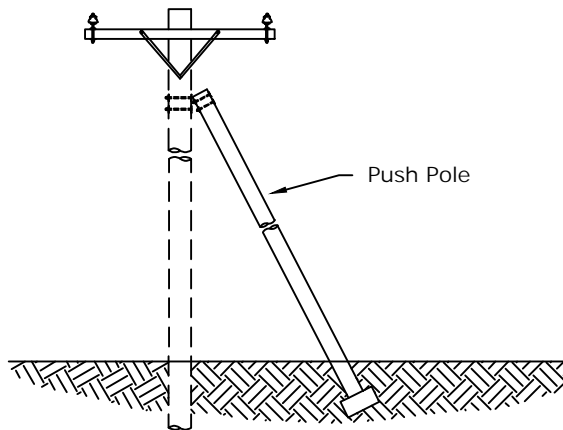
### 4. Guy Stub-

A guy wire installed between a line pole and a stub pole. The span guy, guy stub pole, and the down guy make up the guy stub.



### 5. Push Pole-

A pole used as a brace to a line pole.



Rev 3: Updated to 2023 NESC.



## CONSTRUCTION STANDARDS

### GUY & ANCHOR SELECTION

#### REVISIONS

NO.	DATE	ENGR	OPS
1	2/22/00	JEH	
2	2/24/11	CM	AH
3	6/13/23	CSB	

PAGE:  
2 of 7

G

CAD FILE:  
G

APP: GGW  
DATE: 4/1/86

SECTION  
700

# GENERAL

## 1. Guying

- a) Guying assemblies include down, span and sidewalk types. A push brace consisting of a pole and attachment fittings may be used in place of tensioned wire guying only where tension guying is impossible by reason of location or rights-of-way.
- b) Guying requirements can often be advantageously combined on a deadend pole, a span or more away by extending the circuit or by use of span guys in order to provide a reduced combined guying load on the same pole. A sidewalk guy is an expensive method of guying and provides limited support, particularly on taller poles, due to the comparatively short guy lead. DO NOT use a sidewalk guy if a down or span guy is possible.
- c) Guy assemblies are designed for the maximum allowable load which may be supported by the pole and the related hardware. Heavy duty guying will normally require the use of multiple guying attachments.
- d) A guy marker shall be used on each down guy and sidewalk guy near places where persons are normally encountered or reasonable anticipated. A minimum of one marker per anchor is required elsewhere. It should be noted that guy markers DO NOT PROTECT OR "GUARD" a down/sidewalk guy, but rather warn the public of its presence. \*

## 2. Sidewalk Guy Insulation

Sidewalk guys shall have guy insulators installed in the guy strand above the horizontal guy strut. The breakers should be at a point that will allow at least 6" clearance between the breaker and the strut attachment to the pole, should the guy wire become broken.

## 3. Grounded Guys

Grounded guys shall not be used. All guys on transmission and distribution circuits shall have insulation sections (Johnny balls or fiberglass rods) installed on all new and rebuilt circuits. Grounded guys are to be replaced by insulated guys when work is done on that pole.

## 4. Application of Guy Insulators

It is impractical to show every NESC requirement for applying guy strain insulators. A clear understanding of the rules will provide for the correct applications. These guidelines will help in understanding the requirements.




Guideline 1 (see figure #1) - All down guys shall have a minimum of one guy insulator. (NESC 215C2-2023)

Guideline 2 - All span guys will have a minimum of two guy insulators. (NESC 215C2-2023)

Guideline 3 (see figure #2) - On jointly used poles, down guys that pass within 12 inches of supply conductors, and also pass within 12 inches of communication cables, shall be insulated with a guy insulator at a point below the lowest supply conductor and above the highest communication cable. (NESC 235E, Table 235-6, Note 1-2023)

Guideline 4 (see figure #1) - All guy insulators shall be located at least 8 feet above the ground including when the guy would sag or break. (NESC 215C2-2023)

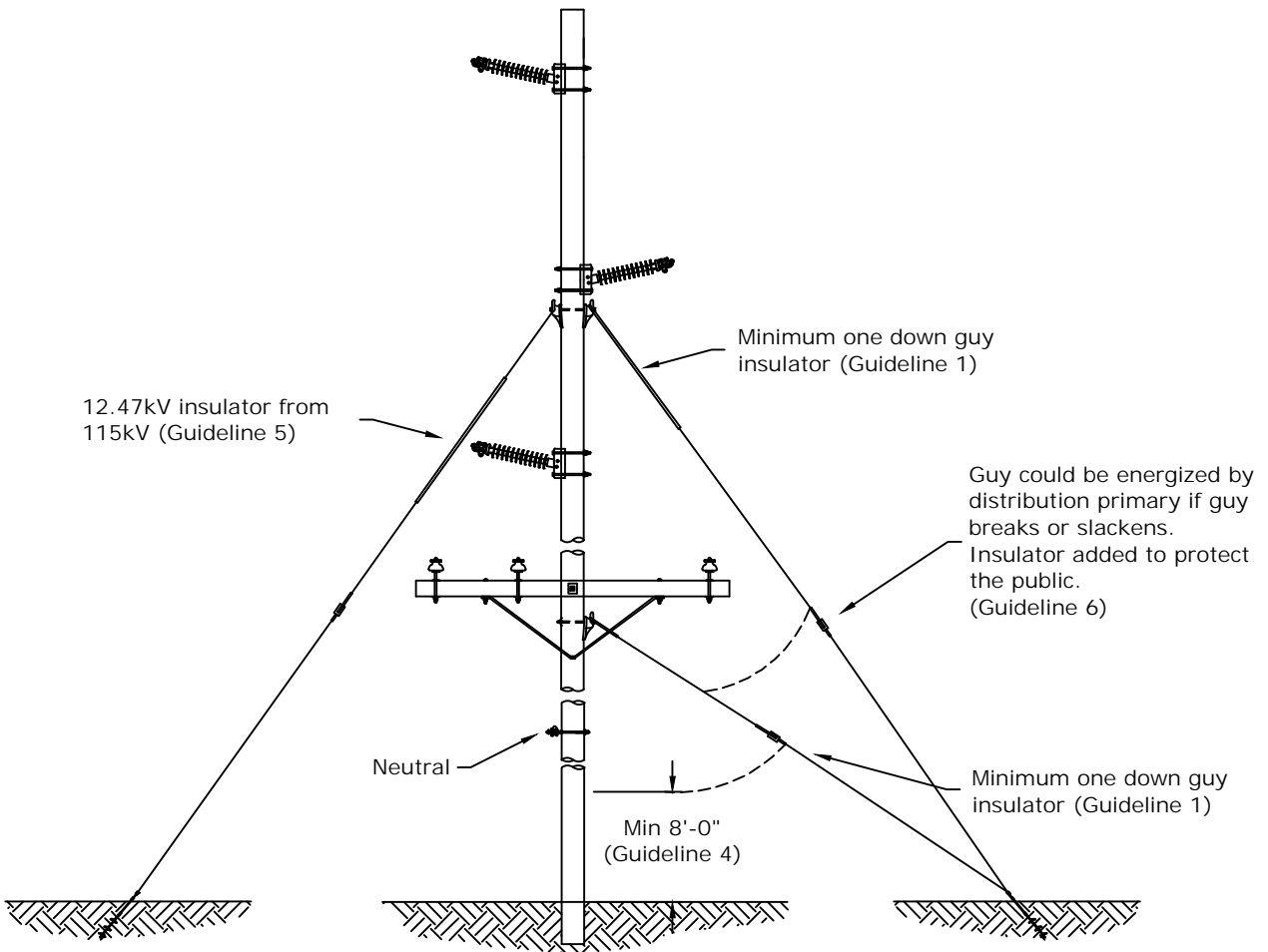
Rev 3: Updated to 2023 NESC.

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				2	2/24/11	CM	AH
			3	6/13/23	CSB		
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PAGE: 3 of 7	<h1>G</h1>			CAD FILE: G	APP: GGW	DATE: 4/1/86	700

**Guideline 5** (see figure #1) - Guy insulators shall be placed so that in case any guy wire contacts, or is contacted by an energized conductor or part, the voltage will not be transferred to other facilities on the structure. (NESC 215C2-2023)

**Guideline 6** (see figure #3) - Guys may sag or break, bringing them into contact with energized conductors, jumpers, or bushings to create a hazard to the public. Guy insulators shall be placed so that when any guy sags down or falls upon another facility, the insulators will remain effective. (NESC 215C2-2023)

Figure 1: Guidelines 1, 4, 5, and 6



Rev 3: Updated to 2023 NESC.



## CONSTRUCTION STANDARDS

### GUY & ANCHOR SELECTION

#### REVISIONS

Δ	DATE	ENGR	OPS
1	2/22/00	JEH	
2	2/24/11	CM	AH
3	6/13/23	CSB	

PAGE:  
4 of 7

G

CAD FILE:  
G

APP: GGW  
DATE: 4/1/86

SECTION  
700

Figure 2: Guying near communication cable (Guideline 3)

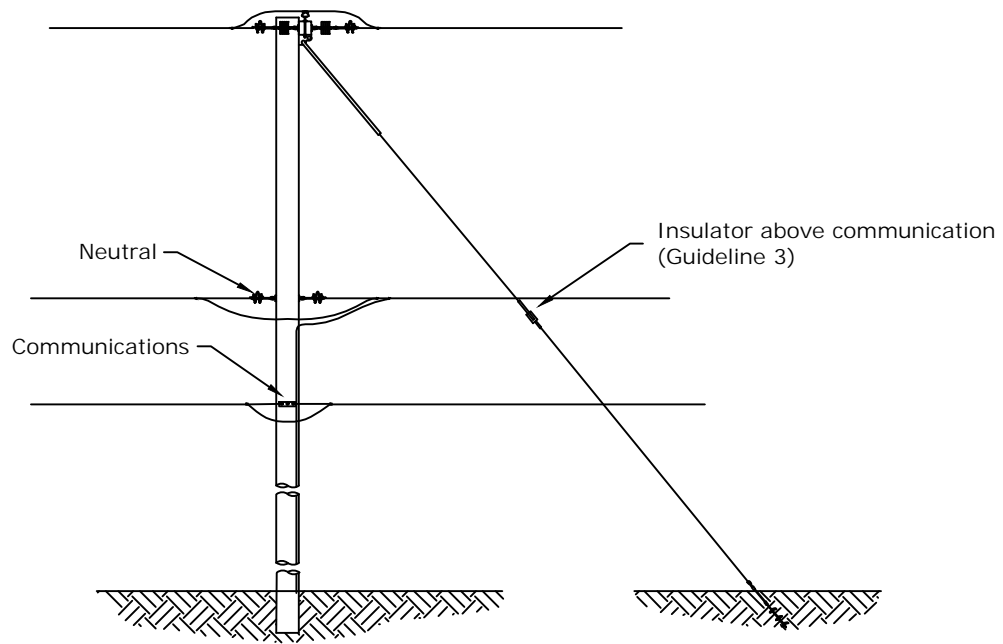
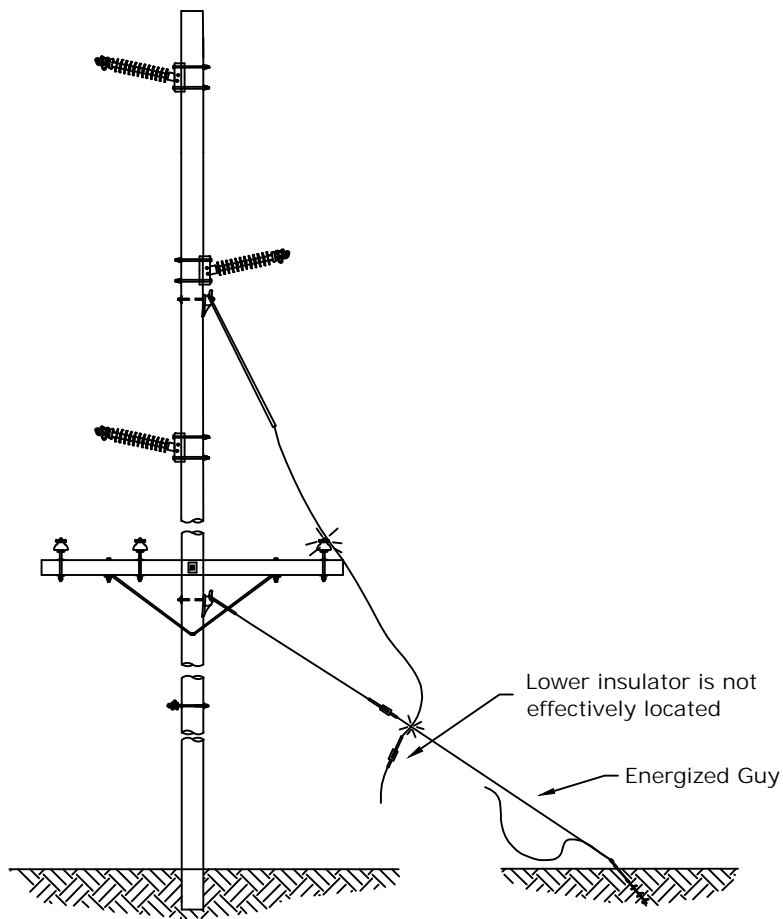


Figure 3: Allow for guys to sag or break (Guideline 6)



Rev 3: Updated to 2023 NESC.



**CONSTRUCTION STANDARDS**  
GUY & ANCHOR SELECTION

REVISIONS			
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1	2/22/00	JEH	
2	2/24/11	CM	AH
3	6/13/23		
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APP:	GGW	SECTION	
DATE:	4/1/86	700	

## 5. Anchors

Anchors shall be located so as to provide as large a lead over height ratio with as little interference to the public as possible.

### ANCHOR SELECTION

#### 1. Anchor Selection in General




- a. Anchor selection is based upon guy tension, type of soil, available installation equipment and location.
- b. Power installed screw anchors are the best choice if soil and location permit their use.
- c. A plate anchor may be used if a hole can be dug either by machine or blasting or hand dug at inaccessible locations.
- d. If solid rock is encountered, specify one of the rock anchors.
- e. Some swamp areas cannot be covered by these anchors and must have special design consideration.

#### 2. Soil Classification

The table of soil classification data which follows is for general use in specifying anchors.

SOIL CLASSIFICATION DATA			
CLASS	PROBE VALUE	COMMON SOIL-TYPE DESCRIPTION	GEOLOGICAL SOIL CLASSIFICATION
0	-	Sound hard rock, unweathered	Granite, Basalt, Massive Limestone
1	750-1600 in-lbs	Very dense and/or cemented sands; coarse gravel and cobbles	Caliche, (nitrate-bearing gravel/rock)
2	600-750 in-lbs	Dense fine sand; very hard silts and clays (may be preloaded)	Basal Till; Boulder Clay; Caliche; Weathered Laminated Rock
3	500-600 in-lbs	Dense sands and gravel; hard silts and clays	Glacial Till; Weathered Shales, Schist, Gneiss and Siltstone
4	400-500 in-lbs	Medium dense sand and gravel; very stiff to hard silts and clays	Glacial Till, Hardpan and Marls
5	300-400 in-lbs	Medium dense coarse sands and sandy gravels; stiff to very stiff silts and clays	Saprolites, Residual Soils
6	200-300 in-lbs	Loose to medium dense fine to coarse sands to stiff clays and silts	Dense Hydraulic Fill; Compacted Fill; Residual Soils
7	100-200 in-lbs	Loose fine sand; alluvium; loess; medium-stiff and varied clays; fill	Flood Plain Soils; Lake Clays; Adobe; Gumbo, Fill
8	< 100 in-lbs	Peat, organic silts; inundated silts, fly ash, very loose sands, very soft to soft clays	Miscellaneous Fill, Swamp Marsh

Rev 3: Updated to 2023 NESC.

	<h2>CONSTRUCTION STANDARDS</h2> <h3>GUY &amp; ANCHOR SELECTION</h3>		REVISIONS			
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	2	2/24/11	CM	CSB		
3	6/13/23					
	APP:	GGW	SECTION			
PAGE: 6 of 7	G	CAD FILE: G	DATE: 4/1/86	700		






# CONVERTING HYDRAULIC PRESSURE TO TORQUE

If a shear pin torque indicator is not going to be used, the operator can make a conversion chart so that pounds per square inch of system hydraulic pressure can be converted to torque at the anchor. This chart can be made by temporarily using a shear pin torque indicator and recording maximum hydraulic pressure readings when various numbers of pins shear. Each pin is equal to 500 ft-lb of torque. After the conversion chart is completed, it is not necessary to use the shear pin torque indicator. Any changes in the hydraulic motor system will require a new conversion chart. Check the accuracy of the chart annually, after any hydraulic system repairs, or before critical anchor installation such as mainline, distribution lines, or transmission lines.

TRUCK # _____		CHART DATE _____	OPERATOR _____
SYSTEM HYDRAULIC PRESSURE LBS./SQ. IN.	TORQUE IN FT. LBS	NUMBER OF SHEARED PINS	NOTES
	500	1	
	1000	2	
	1500	3	
	2000	4	
	2500	5	
	3000	6	
	3500	7	
	4000	8	
	4500	9	
	5000	10	
	5500	11	
	6000	12	
	6500	13	
	7000	14	

Rev 3: Updated to 2023 NESC.

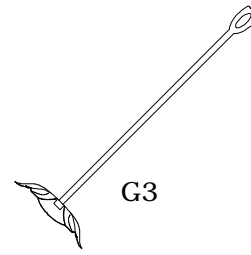
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		DATE	ENGR	OPS	
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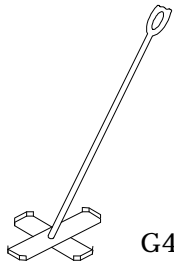
G1A



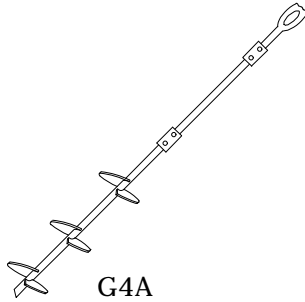
G2A, G3A



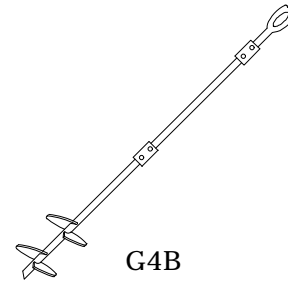
G3



G4



G4A



G4B



G9, G10

GUY & ANCHOR CHART			
NAME	ANCHOR	ROD SIZE	ULTIMATE HOLDING CAPACITY*
G1A	6" Handscrew	3/4"	6,500
G2A	10" Helix	1"	34,800
G3	12" Expanding Plate	1 1/4"	40,000
G3A	14" Helix	1"	36,000
G4	24" Crossplate	1 1/4"	58,000
G4A	Triple Helix 8-10-12"	1 3/4"	100,000
G4B	Double Helix 8-10"	1 3/4"	100,000
G9	Rock	1"	36,000
G10	Rock	1"	36,000

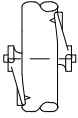
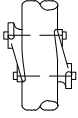
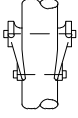
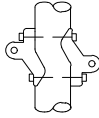
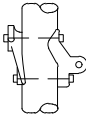
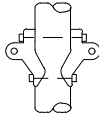
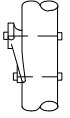
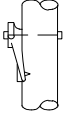
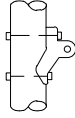

\* SEE ACTUAL STANDARD FOR CAPACITY CHARTS

Rev 2: Obsoleted G1, G2, G3B, G3C, G5A, G6Y, and G9A, and moved G5 to page 2.

	<b>CONSTRUCTION STANDARDS</b> GUY & ANCHOR CHART ANCHORS		<b>REVISIONS</b>											
			<table border="1"> <thead> <tr> <th>DATE</th> <th>ENGR</th> <th>OPS</th> </tr> </thead> <tbody> <tr> <td>2/23/00</td> <td>HWH</td> <td>MA</td> </tr> <tr> <td>2/24/11</td> <td>CM</td> <td>AH</td> </tr> </tbody> </table>	DATE	ENGR	OPS	2/23/00	HWH	MA	2/24/11	CM	AH		
	DATE	ENGR	OPS											
2/23/00	HWH	MA												
2/24/11	CM	AH												
APP: JEH DATE: 2/22/00	CAD FILE: G0	SECTION <b>700</b>												
PAGE: 1 of 2	<b>G0</b>													

# ATTACHMENTS

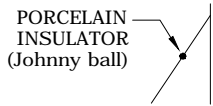
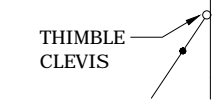
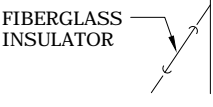


V<sub>MAX</sub>\*

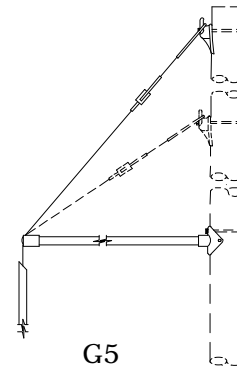
		FIR	CEDAR
	G30	11,560	9,680
	G31	23,120	19,360
	G32	23,120	19,360
	G33	23,120	19,360
	G34	35,520	26,480
	G35	23,120	19,360
	G36	23,120	19,360
	G37	35,520	26,480
	G40	23,120	19,360
	G41	11,560	9,680
	G42	23,120	19,360
	G43	35,520	26,480
	G45	11,560	9,680

NOT THREADED




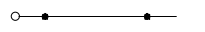
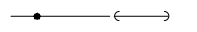


\* Apply Safety Factors per NESC

# DOWN GUYS

	10M	18M
 PORCELAIN INSULATOR (Johnny ball)	GDG50	GDG51
 THIMBLE CLEVIS	GDG52	GDG53
 FIBERGLASS INSULATOR	GDG70	GDG71
	GDG72	GDG73
	GDG80	GDG81



# SPAN GUYS

	10M	18M
	GSG50	GSG51
	GSG52	GSG53
	GSG54	GSG55
	GSG56	GSG57
	GSG70	GSG71
	GSG82	GSG83
	GSG84	GSG85

Rev 2: Obsoleted G44, GSG55, GSG60, GSG62, and added G45, GSG54, GSG55, GSG56, and GSG57.



## CONSTRUCTION STANDARDS

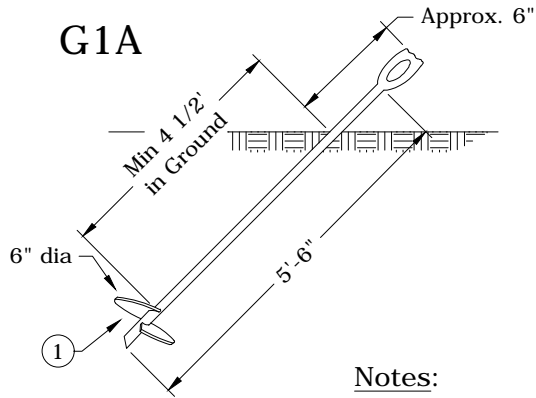
GUY & ANCHOR CHART  
SPAN GUYS, DOWN GUYS, ATTACHMENTS

PAGE:  
2 of 2

GO

CAD FILE:  
GO

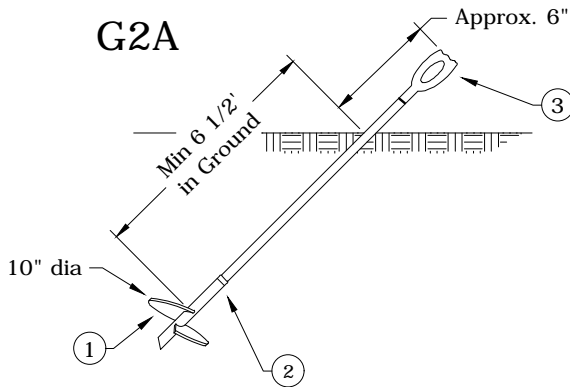
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2/24/11	CM	AH	2								
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APP:	JEH	SECTION									
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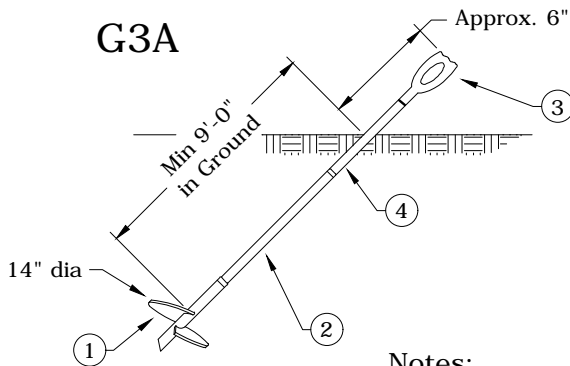
G1A	
ULTIMATE HOLDING CAPACITY	
Soil Class	(lbs)
7	2,500
6	5,000
5	6,500
Max Torque Rating is 400 ft-lbs.	

**Notes:**

1. Only this anchor may be hand installed (use in #5 to #7 soil).
2. A minimum of 4 1/2' of the G1A anchor/rod from the top of the helix must be in the ground to obtain rated holding capacity.



ULTIMATE HOLDING CAPACITY		
	G2A	G3A
Torque	(lbs)	
(ft-lbs)	10" Helix 1" x 7' Rod	14" Helix 1" x 7' Rod + 3 1/2' Rod
500	4,200	7,350
1,000	7,600	10,700
1,500	11,000	14,050
2,000	14,400	17,400
2,500	17,800	20,750
3,000	21,200	24,100
3,500	24,600	27,450
4,000	28,000	30,800
4,500	31,400	34,150
5,000	34,800	36,000



**Notes:**

1. A minimum of 6 1/2' of the G2A anchor/rod from the top of the helix must be in the ground to obtain the rated holding capacity.
2. A minimum of 9' of the G3A anchor/rod from the top of the helix must be in the ground to obtain the rated holding capacity.

Rev 3: Removed G3B and G3C, added material list, corrected notes, and added holding power tables.



**CONSTRUCTION STANDARDS**  
SINGLE HELIX SCREW ANCHORS

REVISIONS			
REV	DATE	ENGR	OPS
1	7/3/82	GGW	GLE
2	6/30/86	RWG	GGW
3	2/24/11	CM	AH
△			
APP:	ELM	SECTION	
DATE:	1/30/80	700	

**Notes:**

1. See Std. G for application guidelines.
2. Install anchor rods at the same slope as the guy strand.
3. G2A and G3A are rated 15,000\* ft-lbs torque and 36,000 lbs. ultimate tensile strength.
4. Holding capacity based on Chance anchoring systems.

Rev 3: Removed G3B and G3C, added material list, corrected notes, and added holding power tables.

ITEM NO.	DESCRIPTION	G1A	
		QTY.	S/N
1	6" Helix Screw Anchor	1	19

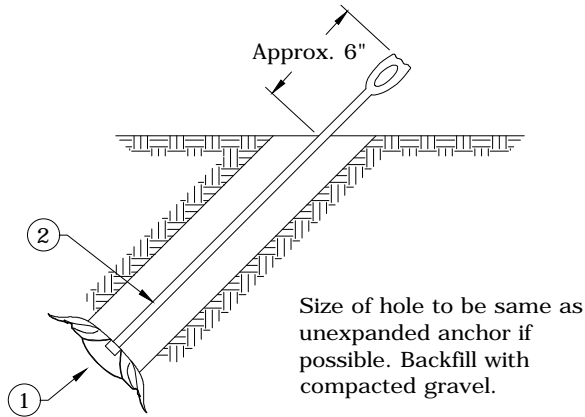
ITEM NO.	DESCRIPTION	G2A	
		QTY.	S/N
1	10" Helix Screw Anchor, 15,000 ft-lbs.	1	13
2	Anchor Rod 1" x 7' - 36,000 lbs. Ultimate Tensile	1	1116
3	Triple Eye Anchor Nut 1"	1	2335

ITEM NO.	DESCRIPTION	G3A	
		QTY.	S/N
1	14" Helix Screw Anchor, 15,000 ft-lbs.	1	14
2	Anchor Rod 1" x 7' - 36,000 lbs. Ultimate Tensile	1	1116
3	Triple Eye Anchor Nut 1"	1	2335
4	Anchor Rod 1" x 3 1/2' - 36,000 lbs. Ultimate Tensile	1	1115

	<b>CONSTRUCTION STANDARDS</b> SINGLE HELIX SCREW ANCHORS		REVISIONS			
			△	DATE	ENGR	OPS
			1	7/3/82	GGW	GLE
			2	6/30/86	RWG	GGW
	3	2/24/11	CM	AH		
	△					
PAGE: 2 of 2	G1A, G2A, G3A		CAD FILE: G1A	APP: ELM	SECTION	
			DATE: 1/30/80	700		

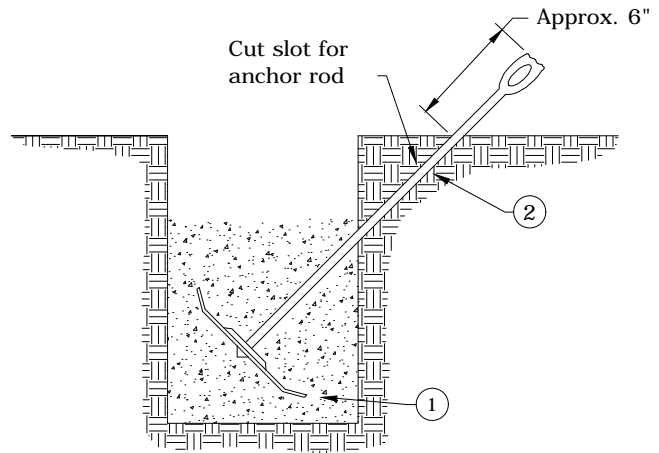
**EXPANDING  
G3**



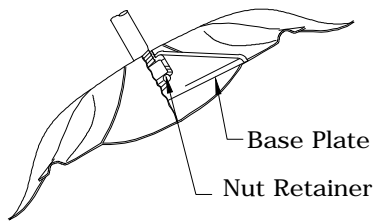
Size of hole to be same as unexpanded anchor if possible. Backfill with compacted gravel.

**CROSSPLATE  
G4**

(See Notes 5 & 6)



Note: Ultimate tensile strength of 1 1/4" rod is 58,000 lbs. ultimate.



ULTIMATE HOLDING CAPACITY (ft-lbs)	
SOIL TYPE	TYPE OF ANCHOR
	G3
	12" Expanding
	1 1/4" x 10' Rod
0	N/A
1	N/A
2	N/A
3	40,000
4	34,000
5	26,500
6	21,500
7	16,000
8	N/A

Notes:

1. See Std. G for application guidelines.
2. Install anchor rods at the same slope as the guy strand.
3. Anchor rod should emerge from ground at point where stake is located.
4. Holding capacity based on Chance anchoring systems.
5. A minimum of 2 yards of concrete are needed to hold the anchor. Place 90% of concrete in front of anchor.
6. 1 1/4" rod is rated 58,000 lbs. ultimate tensile.

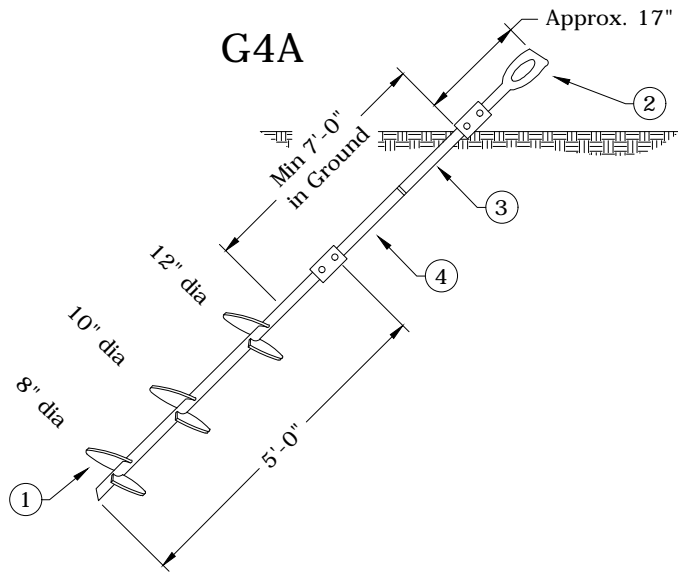
Rev 3: Updated strengths, obsoleted G1 & G2, changed title, corrected material, and added Note 4.

ITEM NO.	DESCRIPTION	G3	
		QTY.	S/N
1	Anchor, Expanding 12"	1	9
2	Rod, Anchor 1 1/4" x 10'	1	1118
ITEM NO.	DESCRIPTION	G4	
		QTY.	S/N
1	Anchor, Heavy Duty 24" Crossplate	1	10
2	Rod, Anchor 1 1/4" x 10'	1	1118



**CONSTRUCTION STANDARDS**  
EXPANDING AND CROSSPLATE ANCHORS

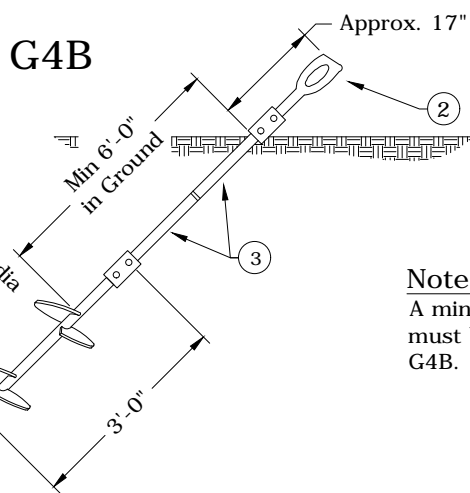
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2	5/5/86	RWG	GGW								
3	2/24/11	CM	AH								
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APP:	ELM	SECTION									
DATE:	1/31/80	700									



**Note:**

A minimum of 7' of the anchor/rod from the top of the 12" helix must be in the ground to obtain the rated holding capacity for G4A.

ULTIMATE HOLDING CAPACITY		
Torque (ft-lbs)	G4A	G4B
	(lbs)	
	8-10-12" (3) 1 3/4" x 3 1/2' Rod	8"-10" (2) 1 3/4" x 3 1/2' Rod
500	NA	NA
1,000	NA	NA
1,500	19,000	17,000
2,000	25,000	23,000
2,500	31,000	29,000
3,000	38,000	34,000
3,500	44,000	40,000
4,000	50,000	46,000
4,500	56,000	52,000
5,000	62,000	58,000
5,500	69,922	64,140
6,000	76,279	69,971
6,500	82,635	75,802
7,000	88,992	81,633
7,500	95,348	87,464
8,000	100,000	93,295
8,500	100,000	99,126
9,000	100,000	100,000



**Note:**

A minimum of 6' of the anchor/rod from the top of the 10" helix must be in the ground to obtain the rated holding capacity for G4B.

**Notes:**

1. See Std. G for application guidelines.
2. Install anchor rods at the same slope as the guy strand.
3. The G4A is for use in soft soils and G4B can be used in hard or rocky soils. They will hold up to 100,000 lbs ultimate and can be installed with torque up to 11,000 ft-lbs (22 pins). Rod is 1 3/4" square shaft.
4. Use as many extensions as needed to obtain the desired torque.
5. Holding capacity based on Chance anchoring system.

Rev. 1 - Added material list, corrected drawings and notes.

ITEM NO.	DESCRIPTION	G4A	
		QTY.	S/N
1	8-10-12" Helix Screw Anchor, 100,000 lbs. Ultimate	1	15
2	Triple Eye 1 3/4" Guy Attachment	1	2522
3	3 1/2' Anchor Rod, 1 3/4" Square Shaft, 11,000 ft-lbs. Ultimate	1	2076
4	7' Anchor Rod, 1 3/4" Square Shaft, 11,000 ft-lbs. Ultimate	1	2077

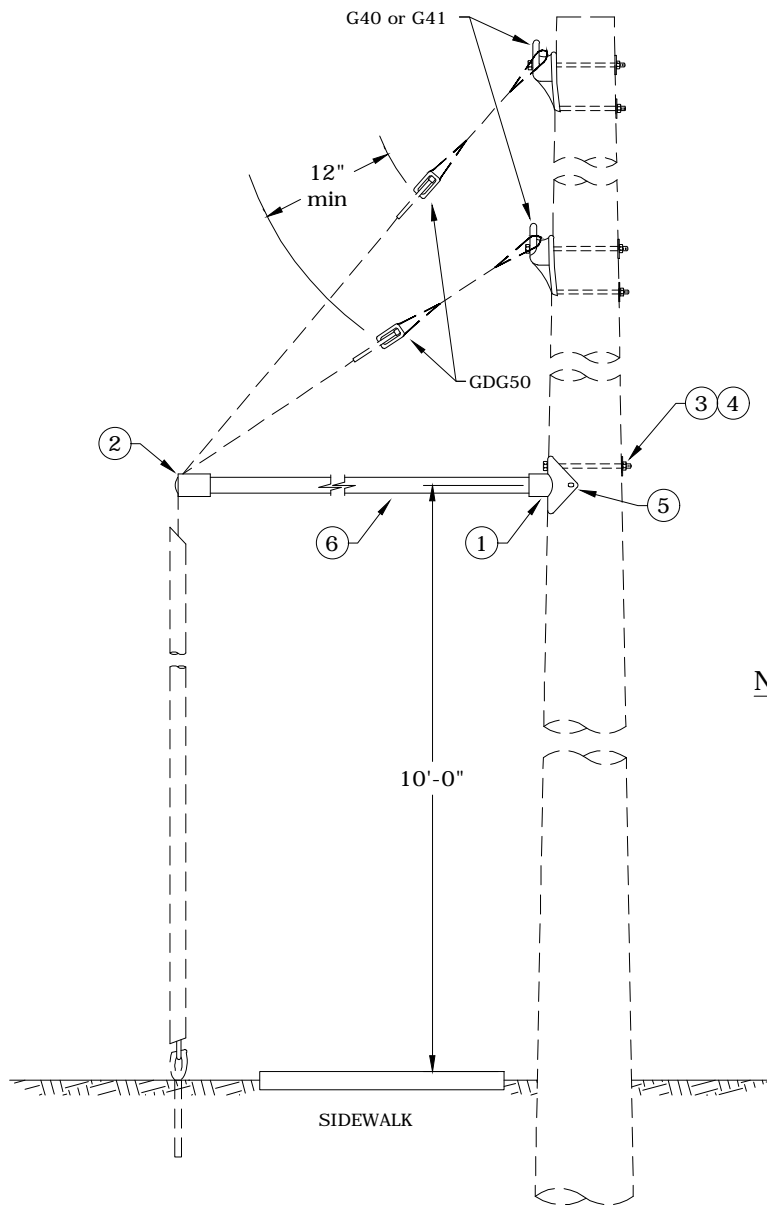
  

ITEM NO.	DESCRIPTION	G4B	
		QTY.	S/N
1	8-10" Helix Screw Anchor, 100,000 lbs. Ultimate	1	2074
2	Triple Eye 1 3/4" Guy Attachment	1	2522
3	3 1/2' Anchor Rod, 1 3/4" Square Shaft, 11,000 ft-lbs. Ultimate	2	2076



**CONSTRUCTION STANDARDS**  
MULTI-HELIX SCREW ANCHORS

REVISIONS			
DATE	ENGR	OPS	
2/24/11	CM	AH	



**Notes:**

1. Down guys and guy attachments are called for separately. Loading will determine whether one or two down guys are needed.
2. Sidewalk guys are only to be installed when 8' clearance over a sidewalk cannot be obtained with a down guy.

Rev. 2 - Corrected material lists and notes and removed G5A.

ITEM NO.	DESCRIPTION	G5	
		QTY.	S/N
1	Fitting, Sidewalk Guy-Pole	1	631
2	Fitting, Sidewalk Triple Guy	1	633 *
3	Bolt, Machine 5/8" x 12"	1	155
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Diameter	1	1392
5	Screw, Lag 1/2" x 4 1/2"	2	1132
6	Conduit, Rigid Galv 2" x 10'	1	407 *



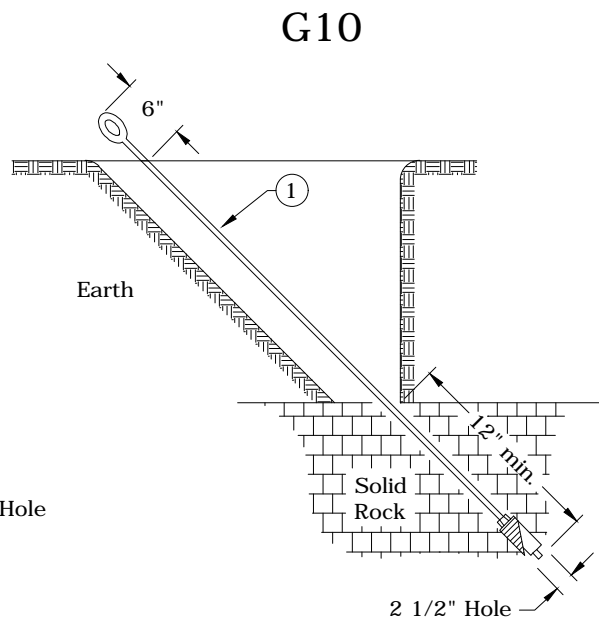
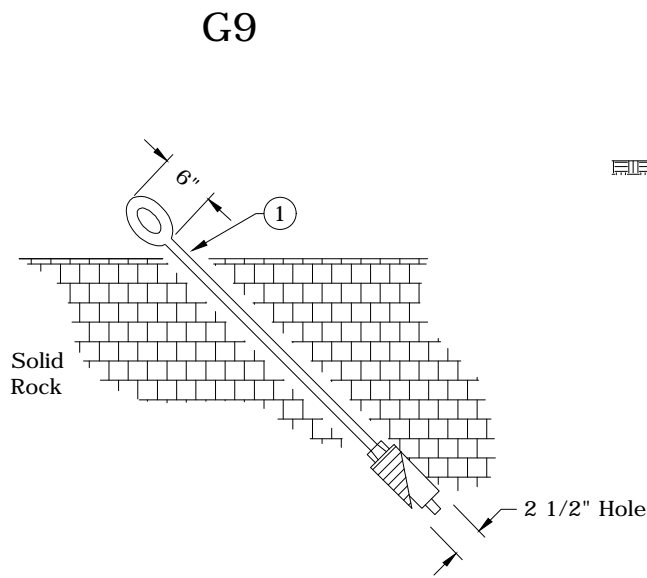
**CONSTRUCTION STANDARDS**

**SIDEWALK GUY**

**REVISIONS**

DATE	ENGR	OPS
5/5/86	AWG	GWG
2/24/11	CM	AH





**Notes:**

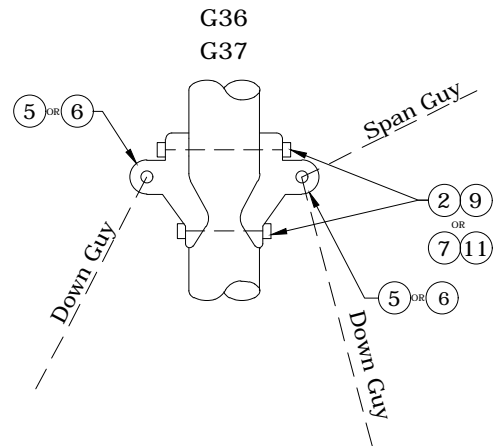
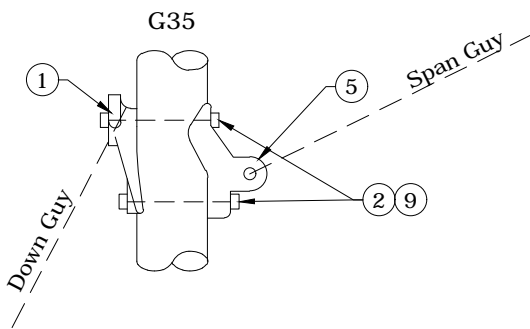
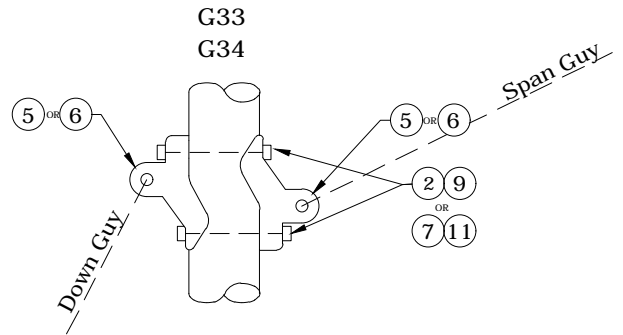
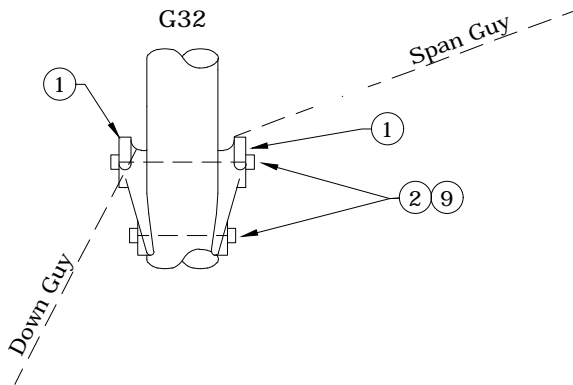
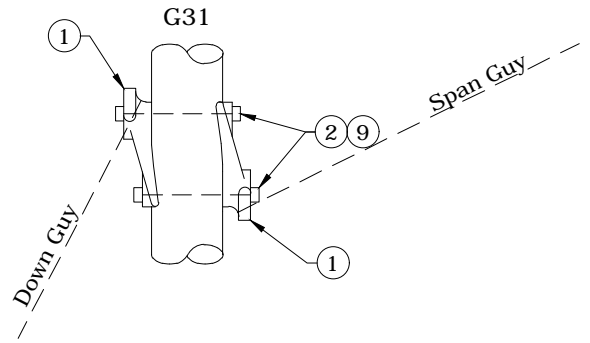
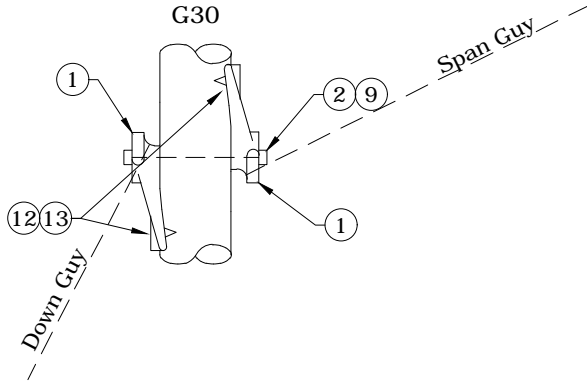
1. Install anchor rods at the same slope as the guy strand.
2. Rods have a 36,000 lbs. ultimate tensile strength.
3. Use only where other anchor assemblies cannot be installed because of insufficient overburden.
4. Installation procedure:
  - a) Drill 2 1/2" hole.
  - b) Push anchor into hole.
  - c) Put a bar in anchor eye, turn rod until anchor is firmly expanded.
  - d) Grout.

Rev. 2 - Corrected material list, drawings, and notes, and deleted G9A.

ITEM NO.	DESCRIPTION	G9	
		QTY.	S/N
1	Anchor, Rock 1" x 30", 36,000 lbs. Ultimate	1	17

ITEM NO.	DESCRIPTION	G10	
		QTY.	S/N
1	Anchor, Rock 1" x 53", 36,000 lbs. Ultimate	1	18

	<b>CONSTRUCTION STANDARDS</b>		REVISIONS			
	ROCK ANCHORS		DATE	ENGR	OPS	
			1	5/5/86	RWG	GGW
			2	2/24/11	CM	AH
PAGE: 1 of 1		<b>G9, G10</b>		SECTION 700		
		CAD FILE: G9		APP: ELM		
				DATE: 1/31/80		



Rev. 1 - Added "double" to title, added types of guys to drawings, and corrected material lists.



## CONSTRUCTION STANDARDS

### DOUBLE GUY ATTACHMENTS

PAGE:  
1 of 2



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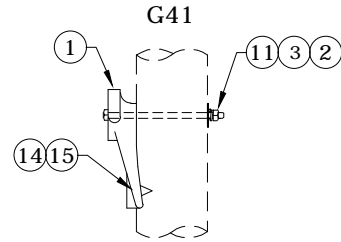
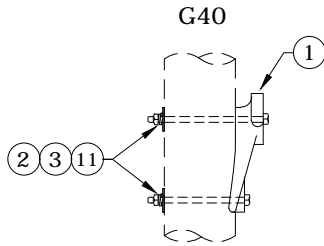
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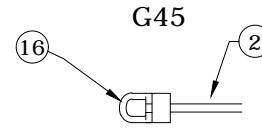
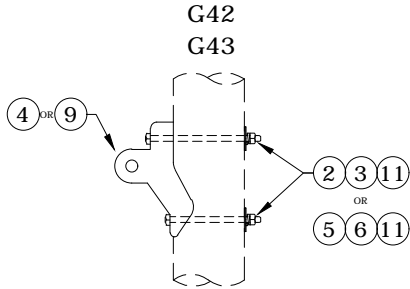
Rev. 1 - Added "double" to title, added types of guys to drawings, and corrected material lists.

ITEM NO.	DESCRIPTION	G30	
		QTY.	S/N
1	Guy Hook, 25,400 lbs. Ultimate Tensile	2	753
2	Machine Bolt, 3/4" x 16", 18,350 lbs. Ultimate Tensile	1	175
9	Double Coil Spring Lock Washer 3/4"	1	2218
12	1/2" x 4 1/2" Lag Screw	2	1132
13	1/2" Flat Round Washer	2	1394
ITEM NO.	DESCRIPTION	G31	
		QTY.	S/N
1	Guy Hook, 25,400 lbs. Ultimate Tensile	2	753
2	Machine Bolt, 3/4" x 16", 18,350 lbs. Ultimate Tensile	2	175
9	Double Coil Spring Lock Washer 3/4"	2	2218
ITEM NO.	DESCRIPTION	G32	
		QTY.	S/N
1	Guy Hook, 25,400 lbs. Ultimate Tensile	2	753
2	Machine Bolt, 3/4" x 16", 18,350 lbs. Ultimate Tensile	2	175
9	Double Coil Spring Lock Washer 3/4"	2	2218
ITEM NO.	DESCRIPTION	G33	
		QTY.	S/N
2	Machine Bolt, 3/4" x 16", 18,350 lbs. Ultimate Tensile	2	175
5	Pole Eye Plate, 21,000 lbs. Ultimate Tensile	2	988
9	Double Coil Spring Lock Washer 3/4"	2	2218
ITEM NO.	DESCRIPTION	G34	
		QTY.	S/N
6	Pole Eye Plate, 36,000 lbs. Ultimate Tensile	2	1908
7	Machine Bolt, 7/8" x 16", 25,400 lbs. Ultimate Tensile	2	1901
11	Double Coil Spring Lock Washer 7/8"	2	2351
ITEM NO.	DESCRIPTION	G35	
		QTY.	S/N
1	Guy Hook, 25,400 lbs. Ultimate Tensile	1	753
2	Machine Bolt, 3/4" x 16", 18,350 lbs. Ultimate Tensile	2	175
5	Pole Eye Plate, 21,000 lbs. Ultimate Tensile	1	988
9	Double Coil Spring Lock Washer 3/4"	2	2218
ITEM NO.	DESCRIPTION	G36	
		QTY.	S/N
2	Machine Bolt, 3/4" x 16", 18,350 lbs. Ultimate Tensile	2	175
5	Pole Eye Plate, 21,000 lbs. Ultimate Tensile	2	988
9	Double Coil Spring Lock Washer 3/4"	2	2218
ITEM NO.	DESCRIPTION	G37	
		QTY.	S/N
6	Pole Eye Plate, 36,000 lbs. Ultimate Tensile	2	1908
7	Machine Bolt, 7/8" x 16", 25,000 lbs. Ultimate Tensile	2	1901
11	Double Coil Spring Lock Washer 7/8"	2	2351

	<b>CONSTRUCTION STANDARDS</b>  DOUBLE GUY ATTACHMENTS		REVISIONS			
				DATE	ENGR	OPS
	1	2/24/11	CM	AH		
PAGE: 2 of 2	<b>G30-G37</b>		CAD FILE: G30	APP: GWG DATE: 4/1/85	SECTION <b>700</b>	



**Note:** For a head guy, turn attachment upside down.



**Note:** Only for bridle and light span guys.

Rev. 2 - Corrected material issues and drawings, added "single" to title, obsoleted G44, and added G45.

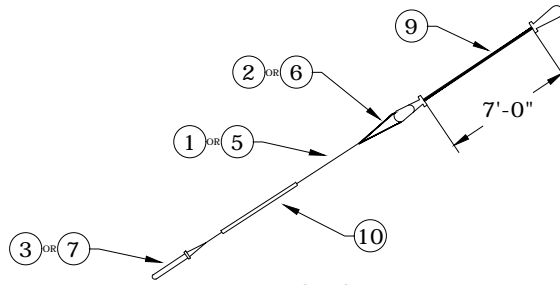
ITEM NO.	DESCRIPTION	G40	
		QTY.	S/N
1	Guy Hook, 25,400 lbs. Ultimate Tensile	1	753
2	Machine Bolt, 3/4" x 14", 18,350 lbs. Ultimate Tensile	2	174
3	Curved Washer, Cast, 4" x 4"	2	1910
11	Double Coil Spring Lock Washer 3/4"	2	2218
ITEM NO.	DESCRIPTION	G41	
		QTY.	S/N
1	Guy Hook, 25,400 lbs. Ultimate Tensile	1	753
2	Machine Bolt, 3/4" x 14", 18,350 lbs. Ultimate Tensile	1	174
3	Curved Washer, Cast, 4" x 4"	1	1910
11	Double Coil Spring Lock Washer 3/4"	1	2218
14	1/2" x 4 1/2" Lag Screw	1	1132
15	1/2" Flat Round Washer	1	1394
ITEM NO.	DESCRIPTION	G42	
		QTY.	S/N
2	Machine Bolt, 3/4" x 14", 18,350 lbs. Ultimate Tensile	2	174
3	Curved Washer, Cast, 4" x 4"	2	1910
4	Pole Eye Plate, 21,000 lbs. Ultimate Tensile	1	988
11	Double Coil Spring Lock Washer 3/4"	2	2218
ITEM NO.	DESCRIPTION	G43	
		QTY.	S/N
5	Machine Bolt, 7/8" x 14", 25,400 lbs. Ultimate Tensile	2	1900
6	Curved Washer, Cast, 4" x 6"	2	1911
9	Pole Eye Plate, Heavy 36,000 lbs. Ultimate Tensile	1	1908
13	Double Coil Spring Lock Washer 7/8"	2	2351
ITEM NO.	DESCRIPTION	G45	
		QTY.	S/N
2	Machine Bolt, 3/4" x 14", 18,350 lbs. Ultimate Tensile	1	174
16	Eyelet, 3/4" Gav., 18,350 lbs. Ultimate Tensile	1	1647



**CONSTRUCTION STANDARDS**  
SINGLE GUY ATTACHMENTS

REVISIONS			
REV	DATE	ENGR	OPS
1	2/23/00	HWH	MA
2	2/24/11	CM	AH





GDG 80  
GDG 81

Notes:

1. If more than one guy will be attached to one anchor, an additional long automatic guy grip must be called for:  
S/N 1190- 10M Long Auto Guy Grip  
S/N 1192- 18M Long Auto Guy Grip
2. 3' and 10' Fiberglass Strain Insulators must be called for separately:  
S/N 776- 3' Fiberglass Strain Insulator  
S/N 1678- 10' Fiberglass Strain Insulator

Rev. 1 - Removed uninsulated guys (GDG60-63), and corrected drawings and material issue.

ITEM NO.	DESCRIPTION	GDG50	
		QTY.	S/N
1	Guy Wire, 10M	45ft	1419
2	Guy Grip, 10M, Preformed	3	713
3	Guy Grip, 10M, Automatic, Short	1	1189
4	Insulator, Guy Strain Small, 12,000 lbs. Ultimate, ANSI 54-2	1	780
10	Marker, Guy 8' Yellow	1	1061
ITEM NO.	DESCRIPTION	GDG51	
		QTY.	S/N
5	Guy Wire, 18M	45ft	1420
6	Guy Grip, 18M, Preformed	3	714
7	Guy Grip, 18M, Automatic, Short	1	1191
10	Marker, Guy 8' Yellow	1	1061
11	Insulator, Guy Strain Large, 20,000 lbs. Ultimate, ANSI 54-3	1	781
ITEM NO.	DESCRIPTION	GDG52	
		QTY.	S/N
1	Guy Wire, 10M	45ft	1419
2	Guy Grip, 10M, Preformed	3	713
3	Guy Grip, 10M, Automatic, Short	1	1189
4	Insulator, Guy Strain Small, 12,000 lbs. Ultimate, ANSI 54-2	1	780
8	Clevis, Thimble 1 1/4"	1	1628
10	Marker, Guy 8' Yellow	1	1061
ITEM NO.	DESCRIPTION	GDG53	
		QTY.	S/N
5	Guy Wire, 18M	45ft	1420
6	Guy Grip, 18M, Preformed	3	714
7	Guy Grip, 18M, Automatic, Short	1	1191
10	Marker, Guy 8' Yellow	1	1061
11	Insulator, Guy Strain Large, 20,000 lbs. Ultimate, ANSI 54-3	1	781
12	Clevis, Thimble 2 1/4"	1	1912



**CONSTRUCTION STANDARDS**

**DOWN GUYS**

PAGE:  
2 of 3

**GDG50 - GDG81**



CAD FILE:  
GDG50

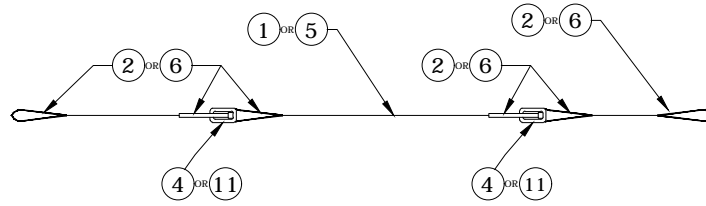
REVISIONS			
NO.	DATE	ENGR	OPS
1	2/24/11	CM	AH

APP: GGW      SECTION  
DATE: 4/1/86      700

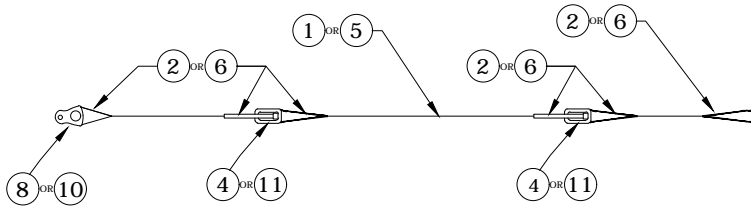
Rev. 1 - Removed uninsulated guys (GDG60-63), and corrected drawings and material issue.

ITEM NO.	DESCRIPTION	GDG70	
		QTY.	S/N
1	Guy Wire, 10M	45ft	1419
2	Guy Grip, 10M, Preformed	3	713
3	Guy Grip, 10M, Automatic, Short	1	1189
9	Insulator, Fiberglass, 2 Wheel, 7', 21,000 lbs. Ultimate, 530kV Wet Flashover	1	778
10	Marker, Guy 8' Yellow	1	1061
ITEM NO.	DESCRIPTION	GDG71	
		QTY.	S/N
5	Guy Wire, 18M	45ft	1420
6	Guy Grip, 18M, Preformed	3	714
7	Guy Grip, 18M, Automatic, Short	1	1191
9	Insulator, Fiberglass, 2 Wheel, 7', 21,000 lbs. Ultimate, 530kV Wet Flashover	1	778
10	Marker, Guy 8' Yellow	1	1061
ITEM NO.	DESCRIPTION	GDG72	
		QTY.	S/N
1	Guy Wire, 10M	45ft	1419
2	Guy Grip, 10M, Preformed	3	713
3	Guy Grip, 10M, Automatic, Short	1	1189
9	Insulator, Fiberglass, 2 Wheel, 7', 21,000 lbs. Ultimate, 530kV Wet Flashover	1	778
10	Marker, Guy 8' Yellow	1	1061
12	Clevis, Thimble, 2 1/4" Diameter	1	1912
ITEM NO.	DESCRIPTION	GDG73	
		QTY.	S/N
5	Guy Wire, 18M	45ft	1420
6	Guy Grip, 18M, Preformed	3	714
7	Guy Grip, 18M, Automatic, Short	1	1191
9	Insulator, Fiberglass, 2 Wheel, 7', 21,000 lbs. Ultimate, 530kV Wet Flashover	1	778
10	Marker, Guy 8' Yellow	1	1061
12	Clevis, Thimble, 2 1/4" Diameter	1	1912
ITEM NO.	DESCRIPTION	GDG80	
		QTY.	S/N
1	Guy Wire, 10M	45ft	1419
2	Guy Grip, 10M, Preformed	1	713
3	Guy Grip, 10M, Automatic, Short	1	1189
9	Insulator, Fiberglass, 2 Wheel, 7', 21,000 lbs. Ultimate, 530kV Wet Flashover	1	778
10	Marker, Guy 8' Yellow	1	1061
ITEM NO.	DESCRIPTION	GDG81	
		QTY.	S/N
5	Guy Wire, 18M	45ft	1420
6	Guy Grip, 18M, Preformed	1	714
7	Guy Grip, 18M, Automatic, Short	1	1191
9	Insulator, Fiberglass, 2 Wheel, 7', 21,000 lbs. Ultimate, 530kV Wet Flashover	1	778
10	Marker, Guy 8' Yellow	1	1061

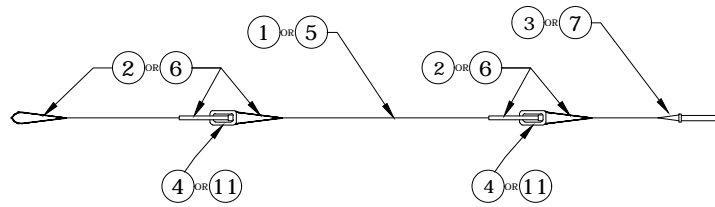
	<b>CONSTRUCTION STANDARDS</b>  DOWN GUYS		REVISIONS				
				DATE	ENGR	OPS	
	1	2/24/11	CM	AH			
PAGE: 3 of 3		<b>GDG50 - GDG81</b>		CAD FILE: GDG50		APP: GGW DATE: 4/1/86	SECTION <b>700</b>



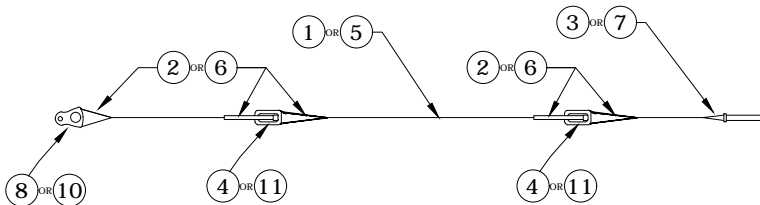
GSG 50  
GSG 51



GSG 52  
GSG 53



GSG 54  
GSG 55



GSG 56  
GSG 57

Rev. 1 - Obsoleted GSG60 to GSG63, added GSG54 to GSG57, and corrected drawings and material lists.



## CONSTRUCTION STANDARDS

### SPAN GUYS

PAGE:  
1 of 4

**GSG50 - GSG85**

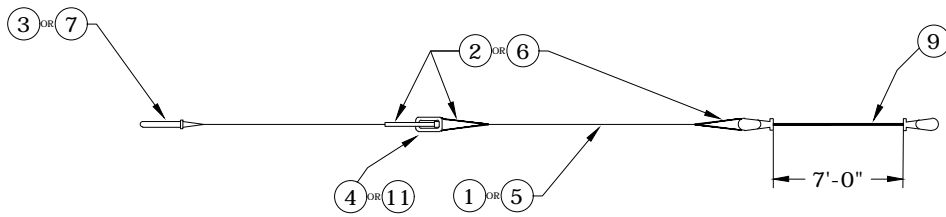
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GSG50

REVISIONS			
NO.	DATE	ENGR	OPS
1	2/24/11	CM	AH

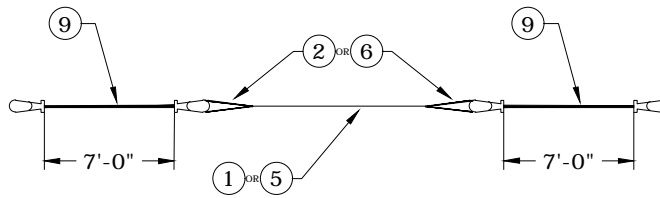
  

APP:	GGW	SECTION
DATE:	4/1/86	700

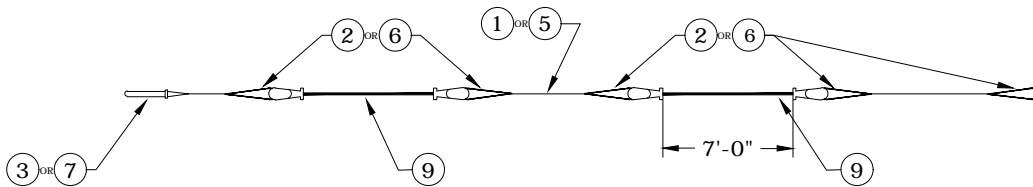




GSG 70  
GSG 71



GSG 82  
GSG 83



GSG 84  
GSG 85

**Note:**

3' and 10' Fiberglass Strain Insulators must be called for separately:  
 S/N 776- 3' Fiberglass Strain Insulator  
 S/N 1678- 10' Fiberglass Strain Insulator

Rev. 1 - Obsoleted GSG60 to GSG63, added GSG54 to GSG57, and corrected drawings and material lists.



**CONSTRUCTION STANDARDS**

SPAN GUYS

PAGE:  
2 of 4

**GSG50 - GSG85**

CAD FILE:  
GSG50

REVISIONS			
NO.	DATE	ENGR	OPS
1	2/24/11	CM	AH

APP: GGW	SECTION
DATE: 4/1/86	700



Rev. 1 - Obsoleted GSG60 to GSG63, added GSG54 to GSG57, and corrected drawings and material lists.

ITEM NO.	DESCRIPTION	GSG70	
		QTY.	S/N
1	Guy Wire, 10M	150ft	1419
2	Guy Grip, 10M, Preformed	3	713
3	Guy Grip, 10M, Automatic, Long	1	1190
4	Insulator, Guy Strain, Small, 12,000 lbs. Ultimate, ANSI 54-2	1	780
9	Insulator, Fiberglass, 2 Wheel, 7', 21,000 lbs. Ultimate, 530kV Wet Flashover	1	778
ITEM NO.	DESCRIPTION	GSG71	
		QTY.	S/N
5	Guy Grip, 18M	150ft	1420
6	Guy Grip, 18M, Preformed	3	714
7	Guy Grip, 18M, Automatic, Long	1	1192
9	Insulator, Fiberglass, 2 Wheel, 7', 21,000 lbs. Ultimate, 530kV Wet Flashover	1	778
11	Insulator, Guy Strain, Large, 20,000 lbs. Ultimate, ANSI 54-3	1	781
ITEM NO.	DESCRIPTION	GSG82	
		QTY.	S/N
1	Guy Wire, 10M	150ft	1419
2	Guy Grip, 10M, Preformed	2	713
9	Insulator, Fiberglass, 2 Wheel, 7', 21,000 lbs. Ultimate, 530kV Wet Flashover	2	778
ITEM NO.	DESCRIPTION	GSG83	
		QTY.	S/N
5	Guy Grip, 18M	150ft	1420
6	Guy Grip, 18M, Preformed	2	714
9	Insulator, Fiberglass, 2 Wheel, 7', 21,000 lbs. Ultimate, 530kV Wet Flashover	2	778
ITEM NO.	DESCRIPTION	GSG84	
		QTY.	S/N
1	Guy Wire, 10M	150ft	1419
2	Guy Grip, 10M, Preformed	5	713
3	Guy Grip, 10M, Automatic, Long	1	1190
9	Insulator, Fiberglass, 2 Wheel, 7', 21,000 lbs. Ultimate, 530kV Wet Flashover	2	778
ITEM NO.	DESCRIPTION	GSG85	
		QTY.	S/N
5	Guy Grip, 18M	150ft	1420
6	Guy Grip, 18M, Preformed	5	714
7	Guy Grip, 18M, Automatic, Long	1	1192
9	Insulator, Fiberglass, 2 Wheel, 7', 21,000 lbs. Ultimate, 530kV Wet Flashover	2	778



## CONSTRUCTION STANDARDS

### SPAN GUYS

#### REVISIONS

REVISION	DATE	ENGR	OPS
1	2/24/11	CM	AH

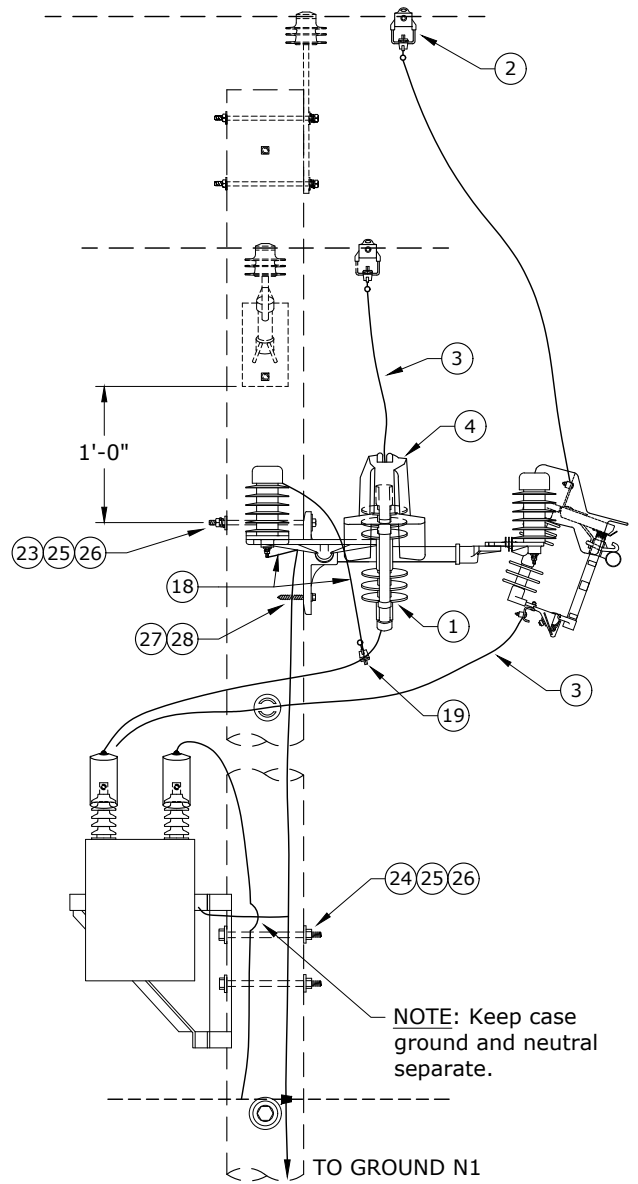
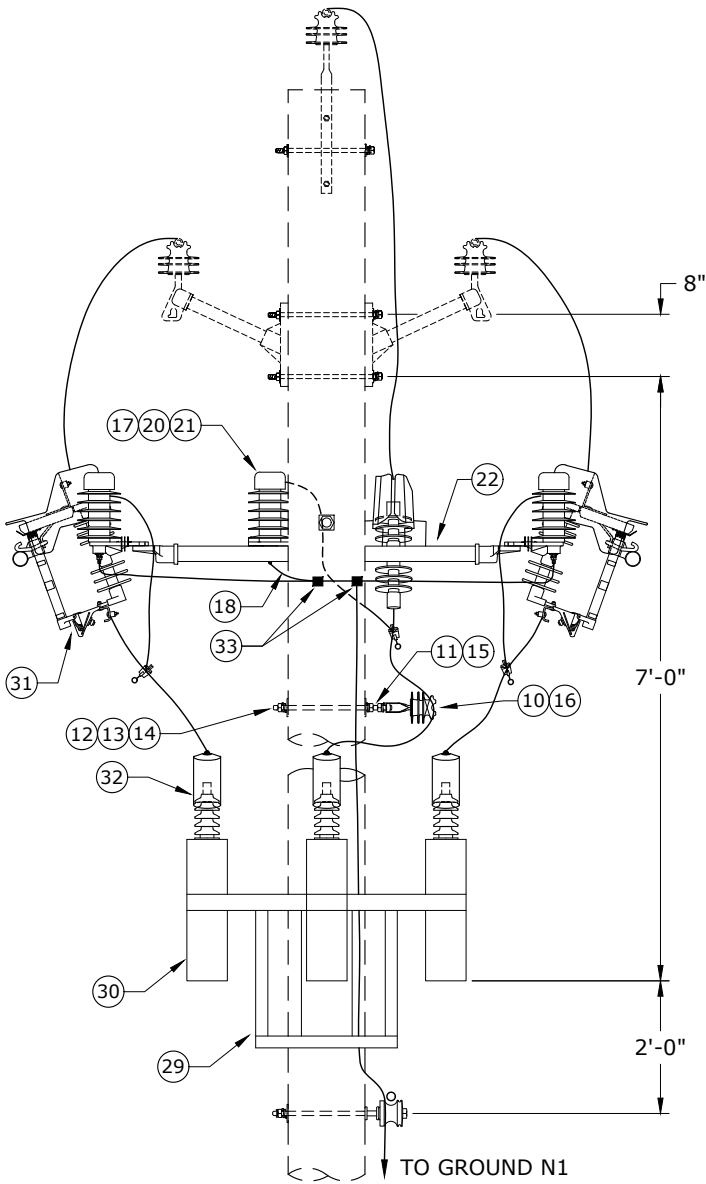
# 800

## LINE DEVICES

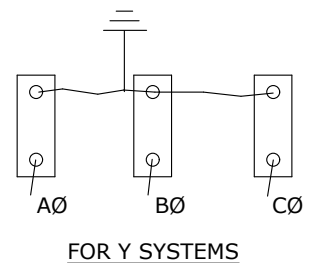
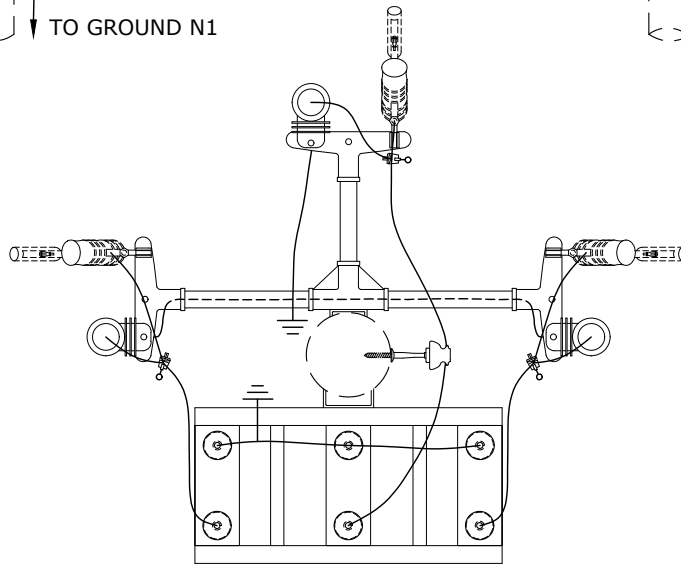
3/13/2023

~	CA600	Capacitor Bank - 3 Units - 600kVAR
~	CF	Capacitor Fuse Schedule
~	CO1	Pole Mounting Bracket for Cutout & Lightning Arrester
~	CO3	Line Cutouts
~	CO100	Universal Cutout - 100 Amp
~	CO200	Universal Cutout - 200 Amp
~	OFI	Overhead Fault Indicators
~	R5	Three 1Ø Solid Dielectric Reclosers
~	R6	Three 1Ø Oil-Filled Reclosers
~	REG3	3Ø Regulator Installation
~	SW3	Pole Top Switch - Switch Number Location
C	SW6	3Ø Switch - Underslung - 900A

N	New Standard
R	Redrawn Standard
C	Changed Standard
~	No Change



NOTE: Connect Arrester Grounds to Capacitor Mounting Bolts.



Rev 4: Changed to polymer cutout and material corrections.



## CONSTRUCTION STANDARDS

CAPACITOR BANK  
3 UNITS  
600 KVAR

PAGE:  
1 of 2

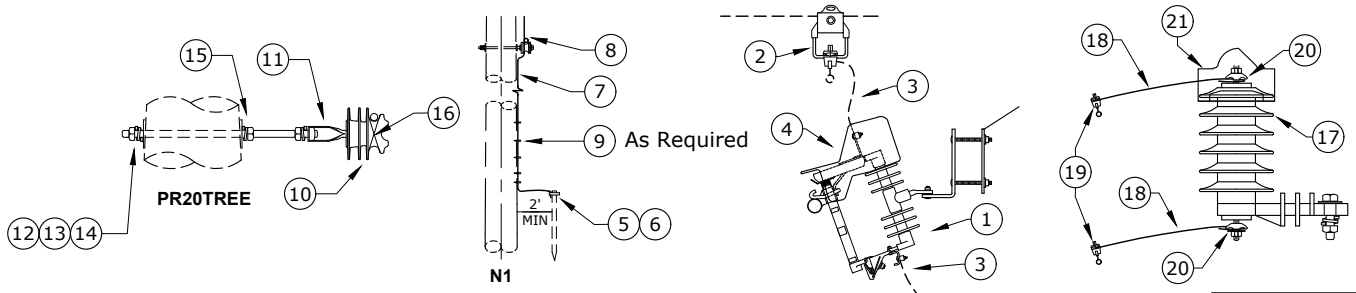
# CA600

CAD FILE:  
CA600

REVISIONS			
Δ	DATE	ENGR	OPS
1	2/23/00	HWH	MA
2	2/6/15	CM	DK
3	3/11/20	KJP	
4	8/13/21	KJP	

APP: HWH/GW	SECTION
DATE: 1/22/80	800



Rev 4: Changed to polymer cutout and material corrections.

ITEM NO.	DESCRIPTION	CA600	
		QTY.	S/N
1	Cutout, Polymer, Universal, 100A, 16kA Asym	3	2532
2	Clamp, Hotline, GP1530, Line #6 Sol - 400MCM, Tap #6 Sol - 4/0 Str, Cu Only	3	284
3	Conductor, 600v, Cu, #4, 7-str, THW, Red	45	2512
4	Guard, Wildlife, Cutout, Polymer	3	2928
ITEM NO.	DESCRIPTION	N1	
		QTY.	S/N
5	Rod, Ground, 5/8" x 8'	1	1124
6	Clamp, Ground Rod, 5/8", Bronze, Small	1	281
7	Conductor, Cu-Clad Steel, #4 Cu Equiv	40	1512
8	Connector, H-Tap, Al/Cu, Run #2 - 2/0 Str, Tap #6 - #1 Str	1	413
9	Staple, Ground, Barbed, Galvanized, 1 1/2"	24	2707
ITEM NO.	DESCRIPTION	PR20TREE	
		QTY.	S/N
10	Insulator, Pin, 15kV, C-Neck, Polymer	1	1968
11	Pin, Adapter	1	959
12	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
13	Bolt, Double Arm, 5/8" x 16" Galv, 12,400 lb Ultimate	1	81
14	Washer, Lock, Spring, Double Coil, Galv, 5/8"	1	2217
15	Washer, Lock, Spring, Single Coil, Galv, 5/8"	2	1403
16	Wire, Tie, Al, #4 Sol w/ 45mil TPR Jacket	11	3012
ITEM NO.	DESCRIPTION	LA2 (3)	
		QTY.	S/N
17	Arrester, Surge, 9kV, MOV, Riser Pole	3	58
18	Conductor, 600v, Cu, #4, 7-Str, THW, Red, 1/C	21	2512
19	Clamp, Hotline GP 1520, Line & Tap #8 to 2/0 Str, Cu Only	6	283
20	Connector, Compression Lug, #4, Cu/Al, One-Hole, Tin-Plated, For Arrester	6	2548
21	Guard, Wildlife, Polymer Arrester	3	2583
ITEM NO.	DESCRIPTION	ADDITIONAL MATERIAL	
		QTY.	S/N
22	Bracket, Arrester/Cutout, 3Ø, 18" Fiberglass	1	2538
23	Bolt, Machine, 5/8" x 12", Galv. 12,400 lbs. Ultimate	1	155
24	Bolt, Machine, 5/8" x 14", Galv. 12,400 lbs. Ultimate	2	156
25	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	3	1392
26	Washer, Lock, Spring, Double Coil Galv. 5/8"	3	2217
27	Screw, Lag 1/2" x 4 1/2", Twist Drive, Drive Point	1	1132
28	Washer, Square Flat, 5/8" x 2 1/4" x 2 1/4"	1	1412
29	Hanger, Rack 3 Unit Capacitor	1	732
30	Capacitor, 200kVAR, 7.2kV	3	1530
31	Fuse, "ELF", 8.3kV, 30A	3	1543
32	Guard, Wildlife, Transformer Bushing	6	721
33	Connector, Crimpet, Cu, 4C4, Run & Tap #6 Sol - #4 Str	4	450



### CONSTRUCTION STANDARDS

CAPACITOR BANK  
3 UNITS  
600 KVAR

PAGE:  
2 of 2

**CA600**

CAD FILE:  
CA600

#### REVISIONS

REV	DATE	ENGR	OPS
1	2/23/00	HWH	MA
2	2/6/15	CM	DK
3	3/11/20	KJP	
4	8/13/21	KJP	

APP: HWH/GW  
DATE: 1/22/80

SECTION  
**800**

## CAPACITOR LINE CURRENT AND FUSE SCHEDULE

CAUTION: CAPACITORS MUST BE GROUNDED AFTER THEY ARE  
DE-ENERGIZED BECAUSE THEY WILL STAY CHARGED  
FOR A LONG TIME.

### NEW BANKS


KVAR UNIT SIZE	7200 VOLTS		
	CURRENT PER PHASE	ELF FUSE	S/N
100	13.88	18A	1544
200	27.76	30A	1543

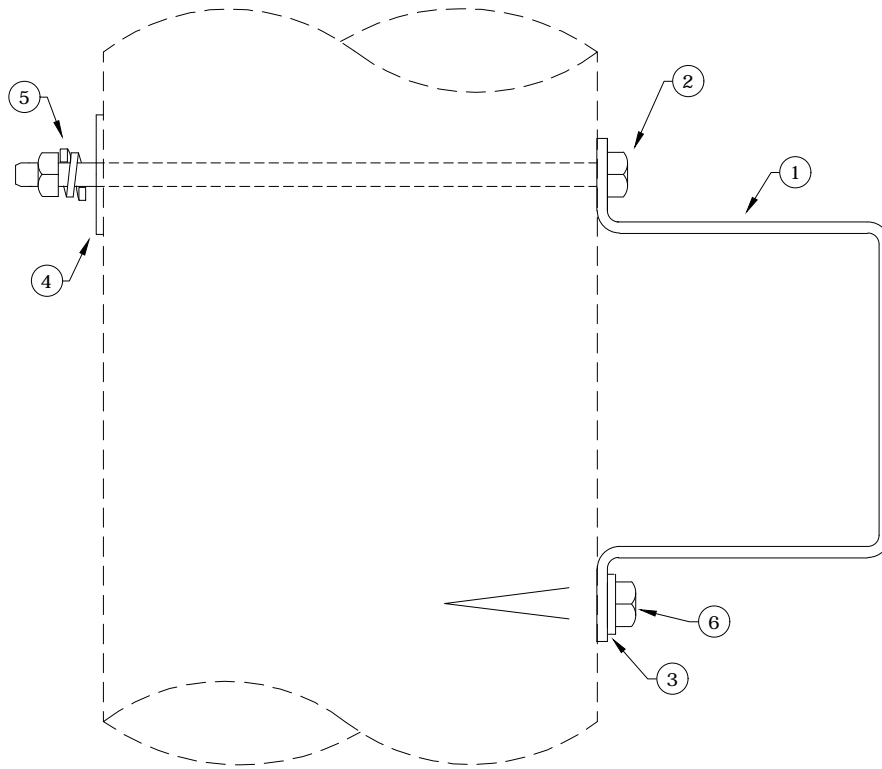
NOTE: "ELF" fuse is a combination expulsion and CLF that fits in a universal cutout. The fuse is made by Cooper.

### OLD BANKS (INSTALLED PRIOR TO 2012)

KVAR UNIT SIZE	7200 VOLTS		
	CURRENT PER PHASE	EXPULSION FUSE	CURRENT LIMITING FUSE
100	13.88	15A	25A
200	27.76	25A	40A

Rev 1: Changed to "ELF" fuse from expulsion & CLF.

	<h2 style="margin: 0;">CONSTRUCTION STANDARDS</h2> <h3 style="margin: 0;">CAPACITOR FUSE SCHEDULE</h3>		REVISIONS		
	1	2/6/15	CM	DK	
PAGE: 1 of 1	CF		CAD FILE: CF	APP: DATE:	SECTION <b>800</b>



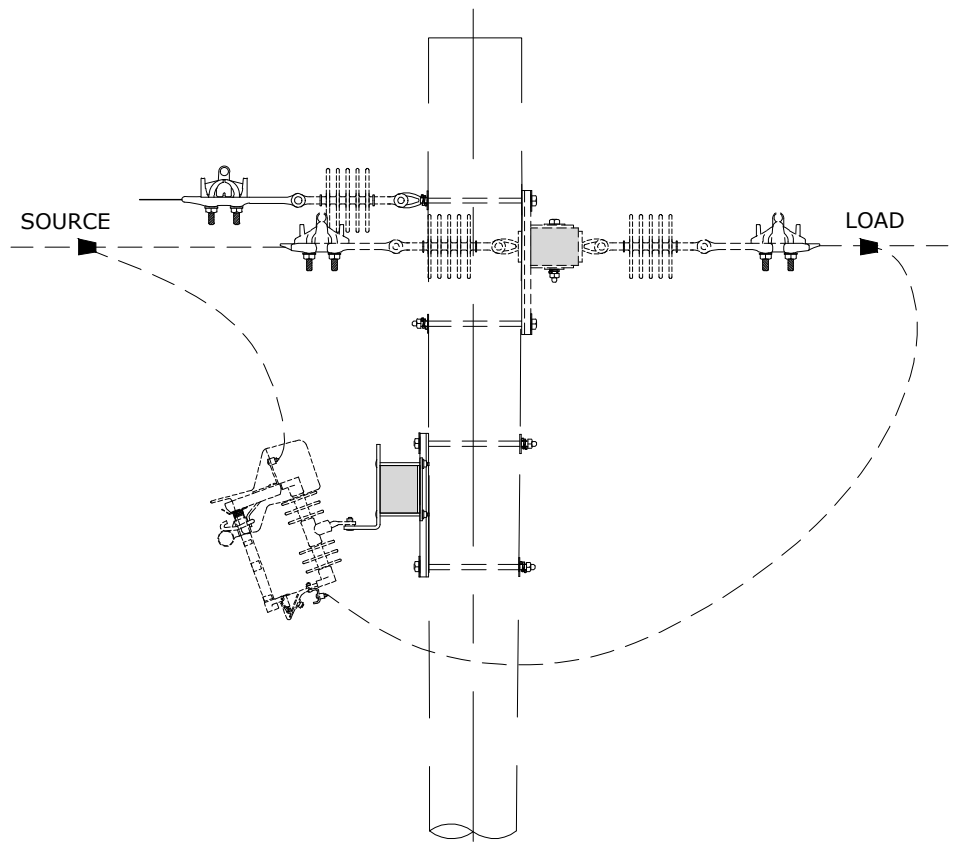
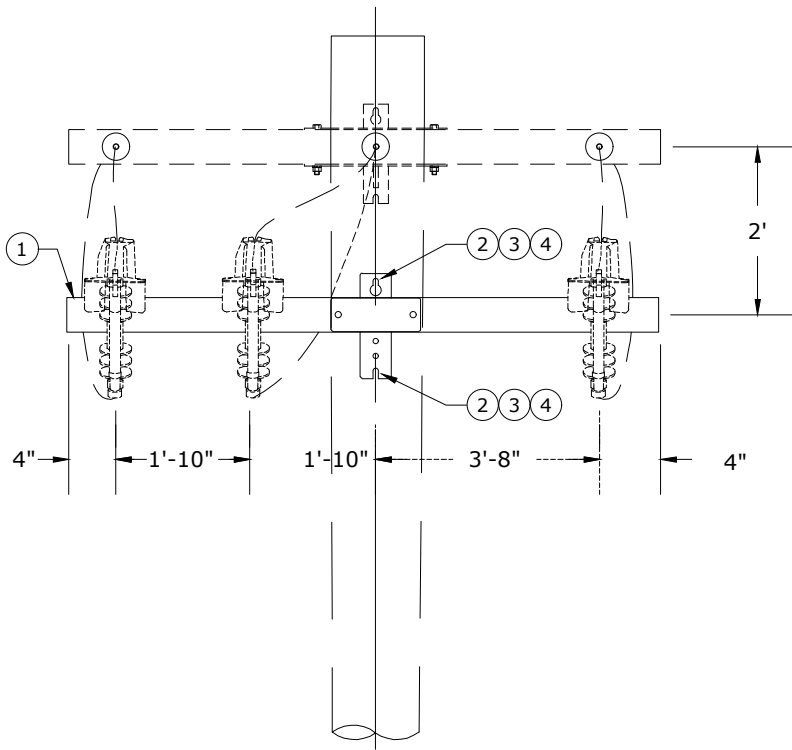
ITEM NO.	DESCRIPTION	CO1	
		QTY.	S/N
1	Bracket, Pole Mount, Cutout	1	219
2	Bolt, Machine 5/8" x 10" Galv.	1	154
3	Washer, Flat Round Galv. 1/2"	1	1394
4	Washer, Square Flat 5/8" x 2 1/4" x 2 1/4"	1	1412
5	Washer, Double Ring 5/8"	1	2217
6	Screw, Lag 1/2" x 3" Drive Point	1	1131



**CONSTRUCTION STANDARDS**  
**POLE MOUNTING BRACKET FOR**  
**CUTOUT & LIGHTNING ARRESTOR**

REVISIONS			
DATE	ENGR	OPS	
3/02			
REDRAWN IN CAD			
APP:	ELM	SECTION	
DATE:	1/31/80	800	





**NOTE:** Call for cutouts separately

Rev 2: Updated drawing to polymer cutouts, fiberglass crossarm, and material issue.

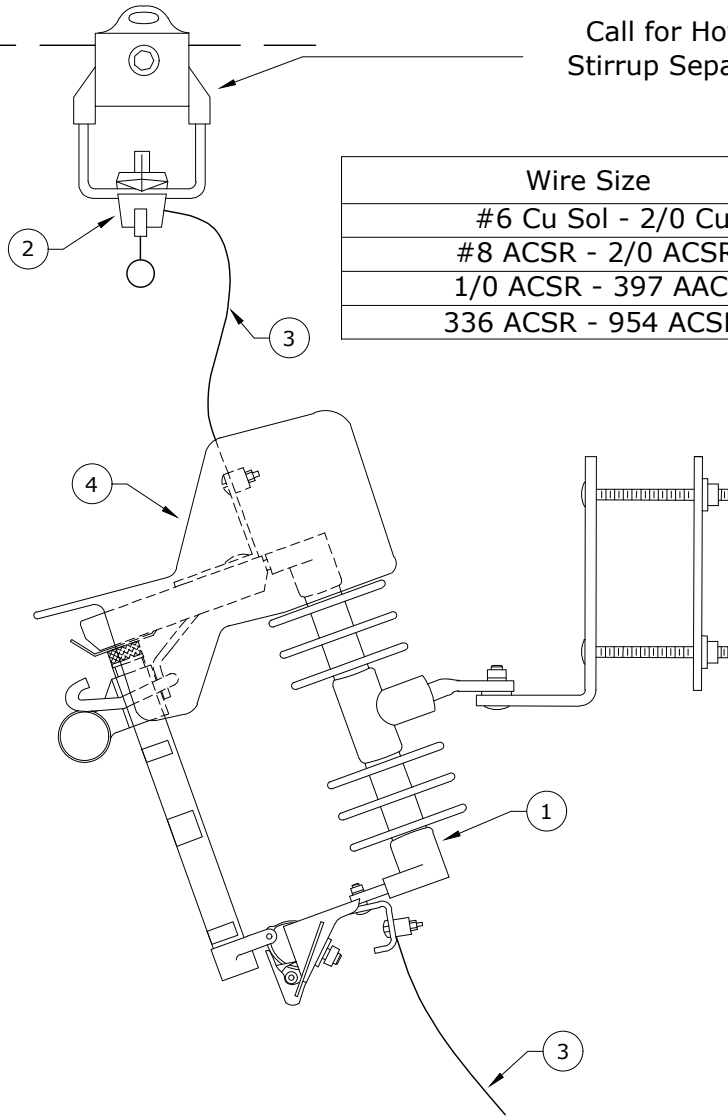
ITEM NO	DESCRIPTION	CO3	
		QTY	S/N
1	Crossarm, Distribution, Fiberglass, 8' Long x 3-5/8" Wide x 4-5/8" High	1	3030*
2	Bolt, Machine, 5/8" x 14", Galv., 12,400 lb Ultimate Tensile	2 *	156 *
3	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2 *	2217
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2 *	1392



**CONSTRUCTION STANDARDS**  
LINE CUTOUTS

REVISIONS			
Δ	DATE	ENGR	OPS
1	8/25/09	CM	AH
2	12/19/22	CRM	GM

Call for Hot Line  
Stirrup Separately.



Wire Size	Bail Size	S/N
#6 Cu Sol - 2/0 Cu	#1 Cu	2338
#8 ACSR - 2/0 ACSR	#1 Cu	2339
1/0 ACSR - 397 AAC	1/0 Cu	2340
336 ACSR - 954 ACSR	2/0 Cu	2341

- Notes:**
1. This cutout is rated up to 100 A.
  2. For loads greater than 100 A use Std CO200 - Universal Cutout 200 A.
  3. By replacing the tube with a slug (solid blade S/N 2168) this cutout becomes an unfused 300 A disconnect.
  4. The Loadbuster tool will allow interruption of currents up to 900 A.
  5. A linkbreak door (S/N 2533) is available for locations that prevent use of the Loadbuster tool for loads up to 100 A.

Rev. 3 - Change from porcelain to polymer cutout, and changed red wire to black RHW-2.

ITEM NO.	DESCRIPTION	CO100	
		QTY.	S/N
1	Cutout, Polymer, Universal, 100A, 16kA Asymmetrical	1	2532 *
2	Clamp, Hot Line, GP1520, Line #8 Sol-2/0 Str, Tap #8 Sol-2/0 Str, Cu Only	1	283
3	Conductor, OH, 600V, Cu, #4, 7-Str, XLPE, 60 mil, Soft-drawn, 1C, RHW-2	15	391 *
4	Guard, Wildlife, Cutout, Polymer	1	2928 *



**CONSTRUCTION STANDARDS**  
UNIVERSAL CUTOUT  
100 AMP

REVISIONS			
DATE	ENGR	OPS	
2/23/00	Redrawn	in CAD	
8/25/09	CM	AH	
12/2/22	KJP		

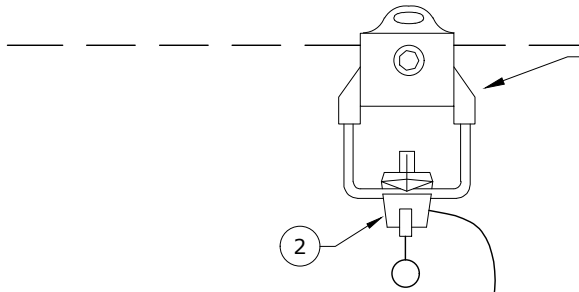
PAGE:  
1 of 1

**CO100**

CAD FILE:  
xCO100

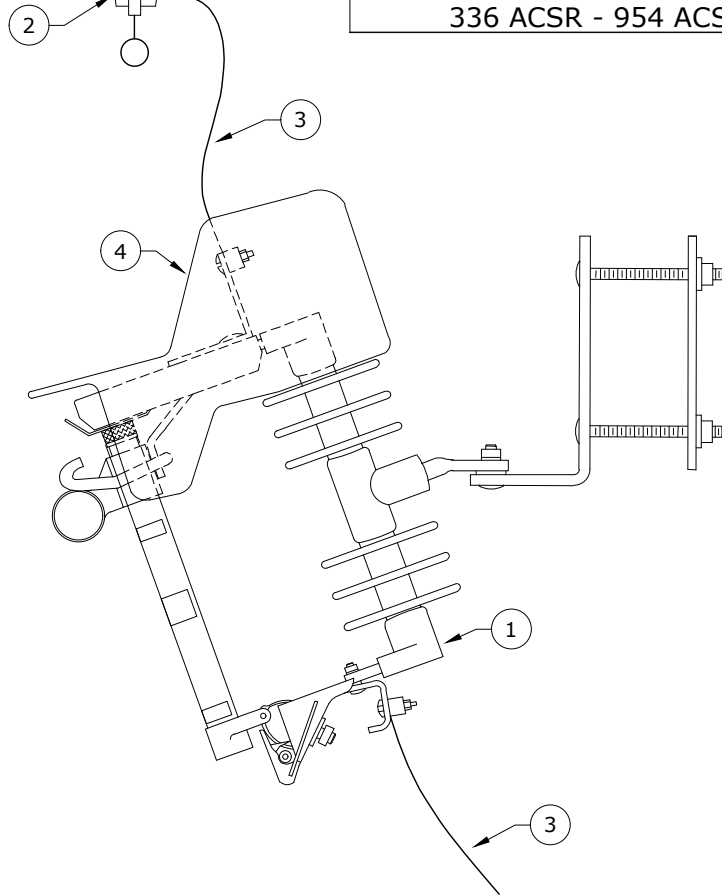
APP: HWH/GW  
DATE: 1/31/80

SECTION  
**800**



Call for Hot Line Stirrup Separately.

Wire Size	Bail Size	S/N
1/0 ACSR - 397 AAC	1/0 Cu	2340
336 ACSR - 954 ACSR	2/0 Cu	2341



- Notes:**
1. This cutout is for use in any application requiring 125 A or larger fuses.
  2. This cutout is limited to 12,000 A AIC. Contact Systems Engineering before installing within 1,000 feet of a substation.
  3. The loadbuster tool will allow interruptions of currents up to 900 A.

Rev. 3 - Change from porcelain to polymer cutout, and changed red wire to black RHW-2.

ITEM NO.	DESCRIPTION	CO200	
		QTY.	S/N
1	Cutout, Polymer, Universal, 200A, 12kA Asymmetrical	1	1906
2	Clamp, Hotline, GP1520, Line #8 Sol-2/0 Str, Tap #8 Sol-2/0 Str, Cu Only	1	283
3	Conductor OH, 600v, Cu 2/0, 19-str, XLPE, 80 mil, Soft-drawn, 1C, RHW-2	15	381*
4	Guard, Wildlife, Cutout, Polymer	1	2928*



**CONSTRUCTION STANDARDS**  
UNIVERSAL CUTOUT  
200 AMP

REVISIONS			
DATE	ENGR	OPS	
2/23/00	Redrawn	in CAD	
8/25/09	CM	AH	
12/2/22	KJP		

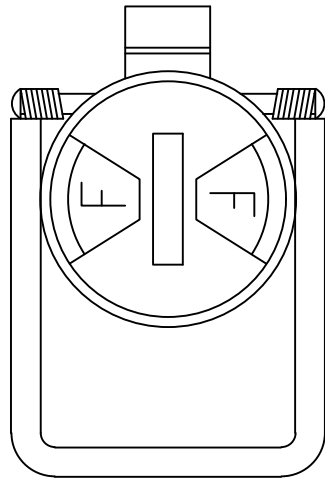
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1 of 1

**CO200**

CAD FILE:  
XCO200

APP: GGW/RWG  
DATE: 4/92

SECTION  
**800**

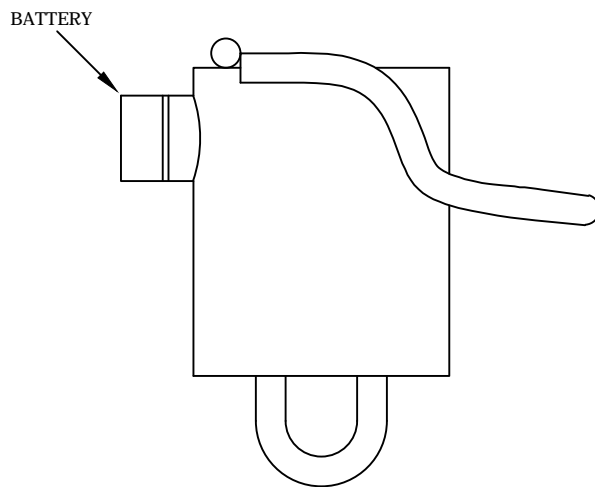


FRONT VIEW

USE: OFF-ROAD LINES, RECLOSERS, UG DIPS, AND WHEREVER NEEDED

TRIP CURRENT: 400A


RESET VOLTAGE AND TIME: 5KV (UP TO 5 MIN.)

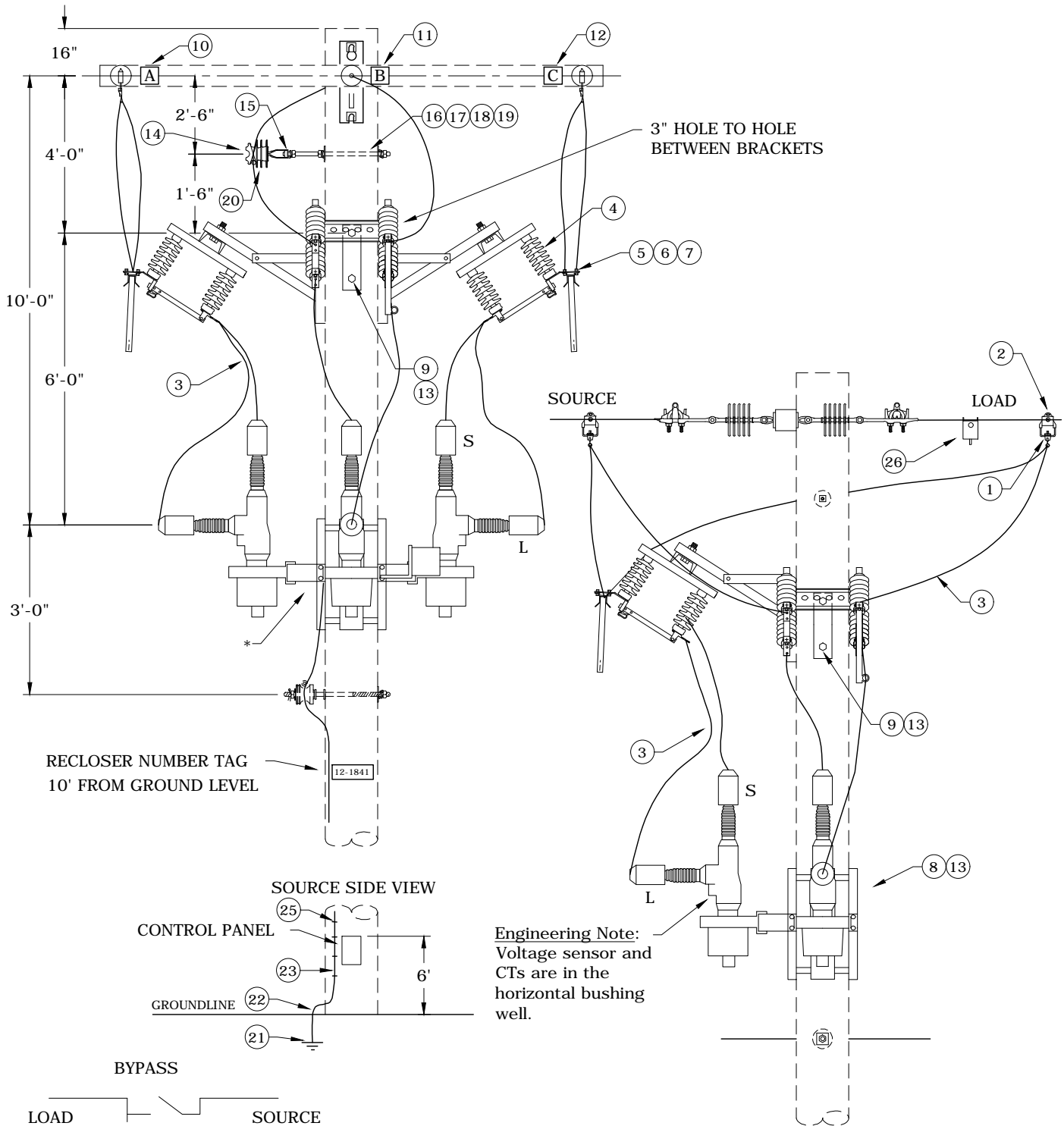


SIDE VIEW

Rev 1: Corrected reset voltage and time.

ITEM NO.	DESCRIPTION	UFI1800	
		QTY.	S/N
1	OVERHEAD FAULT INDICATOR, CURRENT RESET, 400A TRIP	1	2558

	<b>CONSTRUCTION STANDARDS</b> OVERHEAD FAULT INDICATORS		<b>REVISIONS</b>															
			<table border="1"> <thead> <tr> <th>DATE</th> <th>ENGR</th> <th>OPS</th> </tr> </thead> <tbody> <tr> <td>2/15/10</td> <td>KJP</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table>	DATE	ENGR	OPS	2/15/10	KJP										
	DATE	ENGR	OPS															
	2/15/10	KJP																
PAGE: 1 of 1	<b>OFI</b>	CAD FILE: OFI	APP: DATE:	SECTION <b>800</b>														



\* Need pole diameter measurement for Transformer shop to build cluster-mount and consult Service Department for location.

- Notes:**
1. Type G & W reclosers are not source sensitive. Source or load may be on either bushing. Drawing just shows preferred connections.
  2. Call for reclosers separately.
  3. Use 50' Class 4 pole minimum.

Rev 2: Added note on source and load designation, and changed to Copperweld ground.



## CONSTRUCTION STANDARDS

### THREE 1Ø SOLID DIELECTRIC RECLOSERS

PAGE:  
1 of 2

# R5

CAD FILE:  
R5

REVISIONS			
#	DATE	ENGR	OPS
1	7/29/10	KJP	
2	2/25/15	KJP	
△			
APP:	CM/AH	SECTION	
DATE:	1/13/10	<b>800</b>	

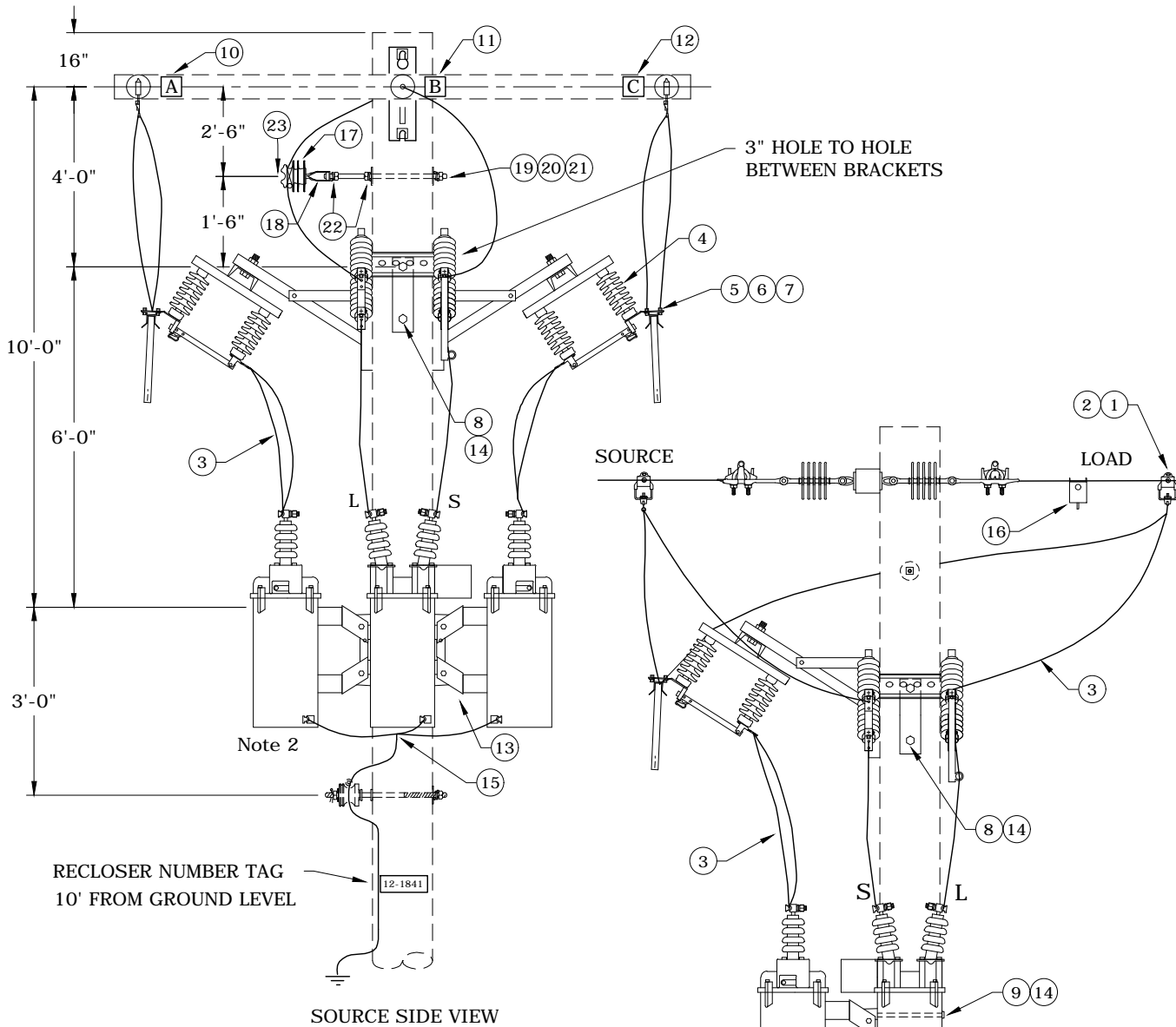
Rev 2: Added note on source and load designation, and changed to Copperweld ground.

		R5	
ITEM NO.	DESCRIPTION	ADDITIONAL MATERIAL	
		QTY.	S/N
1	Clamp, Hotline GP 1540	6	285
2	Clamp, Hotline Stirrup, 266.5 - 397.5 Al/Cu	6	2340
3	Conductor, 4/0 Cu, 1/C, 600V XLP, 19 Str.	80	382
4	Switch, Transfer 600A	3	1276
5	Connector, Comp Lugs, Cu 4/0 to Cu 4/0	12	434
6	Bolt, Machine 1/2" x 2", Stainless Steel	24	132
7	Bolt, Assembly, 1 1/2" x 2", SS W/ Belleville & Flat Washers	48	1389
8	Bolt, Machine 5/8" x 12", Galv., 12,400 lbs. Ultimate Tensile	4	155
9	Bolt, Machine 5/8" x 14", Galv., 12,400 lbs. Ultimate Tensile	2	156
10	Tag, Phasing - A	1	1280
11	Tag, Phasing - B	1	1281
12	Tag, Phasing - C	1	1282
13	Washer, Curved, Square, Cast 3" x 3" x 3/8" Thick x 13/16" Hole	4	1392
ITEM NO.	DESCRIPTION	PR20TREE	
		QTY.	S/N
14	Insulator, Pin, C Neck, Polyethylene	1	1968
15	Pin, Adapter	1	959
16	Washer, Curved, Square, Cast 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
17	Bolt, Double, Arm, 5/8" x 16" Galv.	1	81
18	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217
19	Washer, Lock, Spring, Single Coil, Galv., 5/8"	2	1403
20	Wire, Tie, Al Annealed #4 SD	10	3012
ITEM NO.	DESCRIPTION	N1	
		QTY.	S/N
21	Rod, Ground, 5/8" x 8'	1	1124
22	Clamp, Ground rod, 5/8", Small, Bronze	1	281
23	Conductor, Cu-Clad Steel, #4 Cu Equivalent, Black Jacket	36	1512
24	Connector, Compression, Cu/Al, Neutral	1	413
25	Staple, Ground, Barbed, Galv. 1 1/2"	10	2707
ITEM NO.	DESCRIPTION	ADDITIONAL MATERIAL	
		QTY.	S/N
26	Fault Indicator, OH Beacon, 400A	3	2558
27	Conduit, Flex, Liquid Tight, 3/4"	10	1615
28	Conduit, PVC, 3/4" x 10', Sch. 80	3	2221
29	Conductor, Cu, #12, 600V, 19 Strand (Streetlight)	35	386
30	Standoff Bracket 10 1/2"	3	226



**CONSTRUCTION STANDARDS**  
THREE 1Ø  
SOLID DIELECTRIC RECLOSERS

REVISIONS			
△	DATE	ENGR	OPS
1	7/29/10	KJP	
2	2/25/15	KJP	
△			



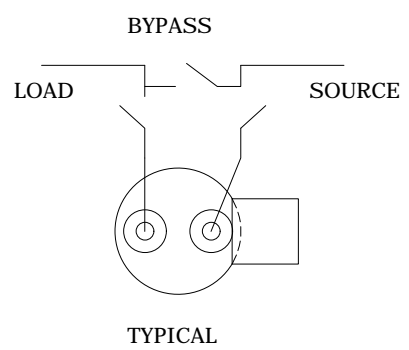
Note 2

RECLOSER NUMBER TAG  
10' FROM GROUND LEVEL

12-1841

SOURCE SIDE VIEW

NOTE: Consult Service Department for location of reclosers.



- NOTES:
1. Type L reclosers are not source sensitive. Source or load may be on either bushing.
  2. Type D and VXE reclosers are source sensitive. The source must be connected to the bushing closest to the indicator rain shield. The tank ground is on top of D & VXE reclosers.
  3. Call for reclosers separately.
  4. Use 50' Class 2 pole minimum.

REV. 3: Added deadend assembly to drawing, changed Note #4 to 50', and added "Oil-Filled" to title



CONSTRUCTION STANDARDS

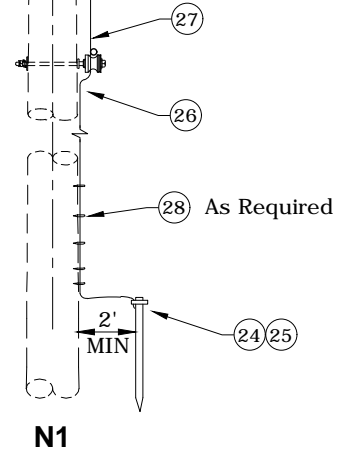
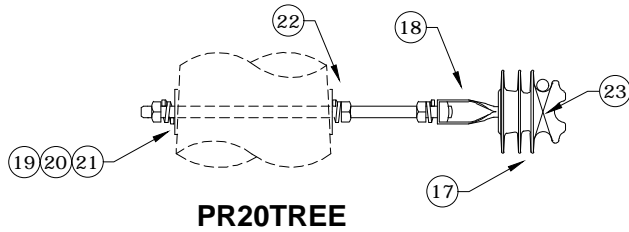
THREE 1Ø  
OIL-FILLED RECLOSERS

PAGE:  
1 of 2

R6

CAD FILE:  
R6

REVISIONS			
REV	DATE	ENGR	OPS
1	2/23/00	HWH	MA
2	6/17/03	LB	DK
3	8/25/09	CM	AH
APP: ELM			
DATE: 1/31/80			SECTION 800



REV. 3: Added deadend assembly to drawing, changed Note #4 to 50', and added "Oil-Filled" to title

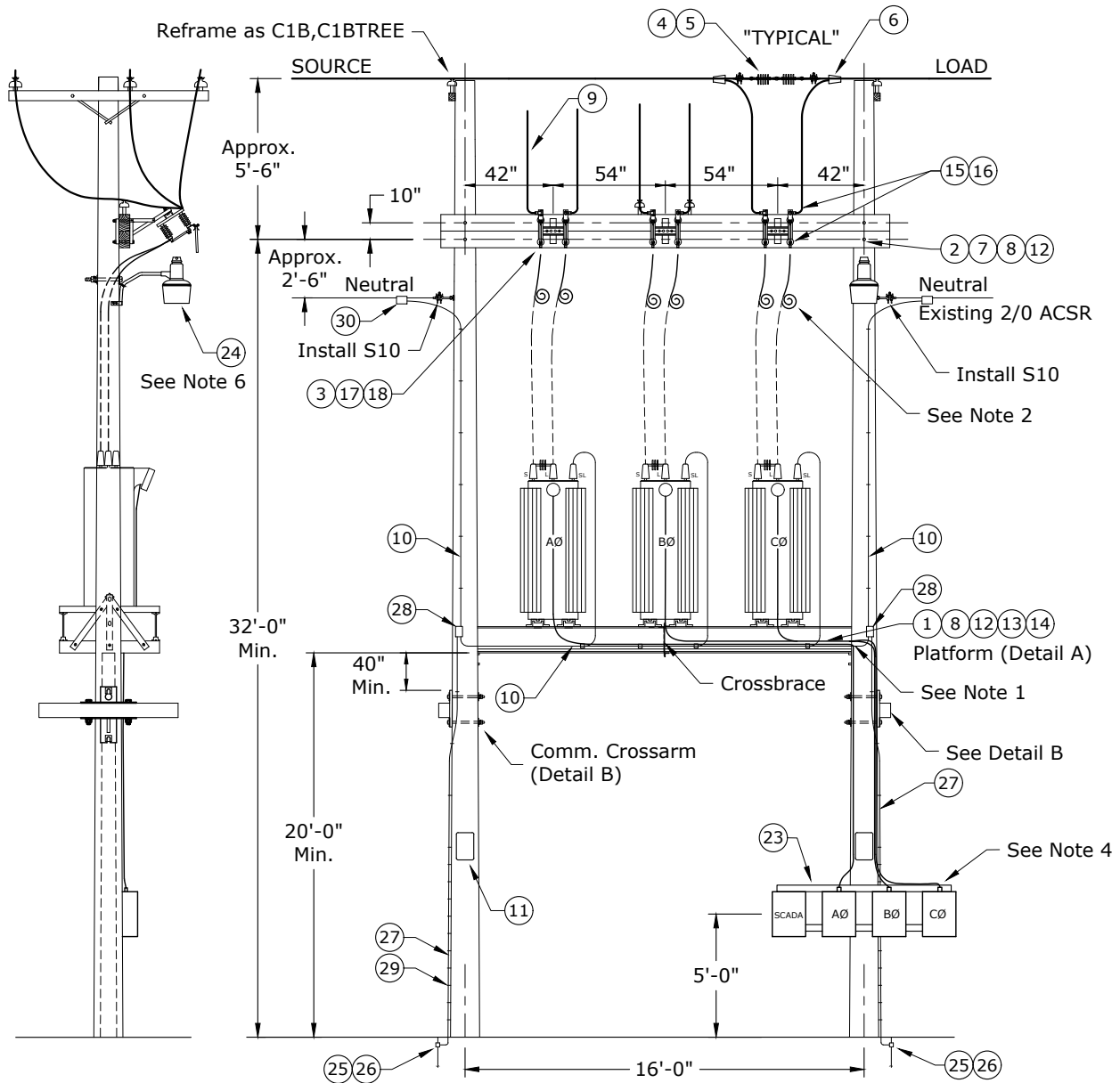
ITEM NO.	DESCRIPTION	R6	
		QTY.	S/N
1	Clamp, Hotline AGP 1540	6	285
2	Clamp, Hotline Stirrup	6	2340
3	Cond. CU 4/0 1C 600V	80	382
4	Switch, Transfer 600A	3	1276
5	Connector, Comp Lug, Cu 4/0	12	434
6	Bolt, Machine 1/2" X 2", SS	24	132
7	Washer Belleville Assembly 1/2"	48	1389
8	Bolt, Machine 5/8" x 12", Galv.	4	155
9	Bolt, Machine 5/8" x 14", Galv.	2	156
10	Tag, Phasing - A	1	1280
11	Tag, Phasing - B	1	1281
12	Tag, Phasing - C	1	1282
13	Mount, Triple Cluster Trans. Al	1	904
14	Washer, Square Curved, 3" x 3" x 3/8" Thick x 13/16" Hole	4	1392
15	Connector, Cu, Compression, #4-#4 (4C4)	3	450
16	Fault Indicator, OH Beacon	3	2558
ITEM NO.	DESCRIPTION	PR20TREE	
		QTY.	S/N
17	Insulator, Pin C Neck	1	1968
18	Pin, Adapter	1	959
19	Washer, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
20	Bolt, Double, Arm, 5/8" x 16"	1	81
21	Washer, Spring, 5/8"	1	2217
22	Washer Lock, 5/8"	2	1403
23	Wire, Tie, Al Annealed #4 SD	10	3012
ITEM NO.	DESCRIPTION	N1	
		QTY.	S/N
24	Rod, Ground, 5/8" x 8'	1	1124
25	Clamp, Ground rod, 5/8", Small, Bronze	1	281
26	Conductor, Cu 4SLD 1C	36	390
27	Connector, Compression, Cu/Al, Neutral	1	413
28	Staple, Ground Wire	10	1228



**CONSTRUCTION STANDARDS**  
THREE 1Ø  
OIL-FILLED RECLOSERS

REVISIONS			
Δ	DATE	ENGR	OPS
1	2/23/00	HWH	MA
2	6/17/03	LB	DK
3	8/25/09	CM	AH
Δ			
APP:	ELM	SECTION	
DATE:	1/31/80	800	





- Notes:**
1. Ground bus across bottom of regulator platform:
    - use 2/0 Str Cu
    - tie ground bus to system neutral
    - tie regulator cases to ground bus
    - tie ground bus to pole ground
  2. Terminate (6) 4/0 Cu leads on switches & coil up 10' and leave for CPU substation crew.
  3. Regulators, poles, and any reframing of primary or neutral must be called for separately.
  4. Tie Jimmy bracket ground to pole ground.
  5. Based on distance to road and size of pull-off, engineer may require control panel, switches, etc. to face the field instead of the road.
  6. Engineer to call for #6 Duplex (S/N 357) for high light from nearest transformer.
  7. Minimum pole size is 45' Class 2.

Rev. 4 - Changed Stirrup connector to wedge tap.



## CONSTRUCTION STANDARDS

### 3Ø REGULATOR INSTALLATION

REVISIONS			
REV	DATE	ENGR	OPS
1	6/17/03	LB	DK
2	2/19/08	LB	AH
3	12/18/19	CM	GM
4	12/14/20	JDK	

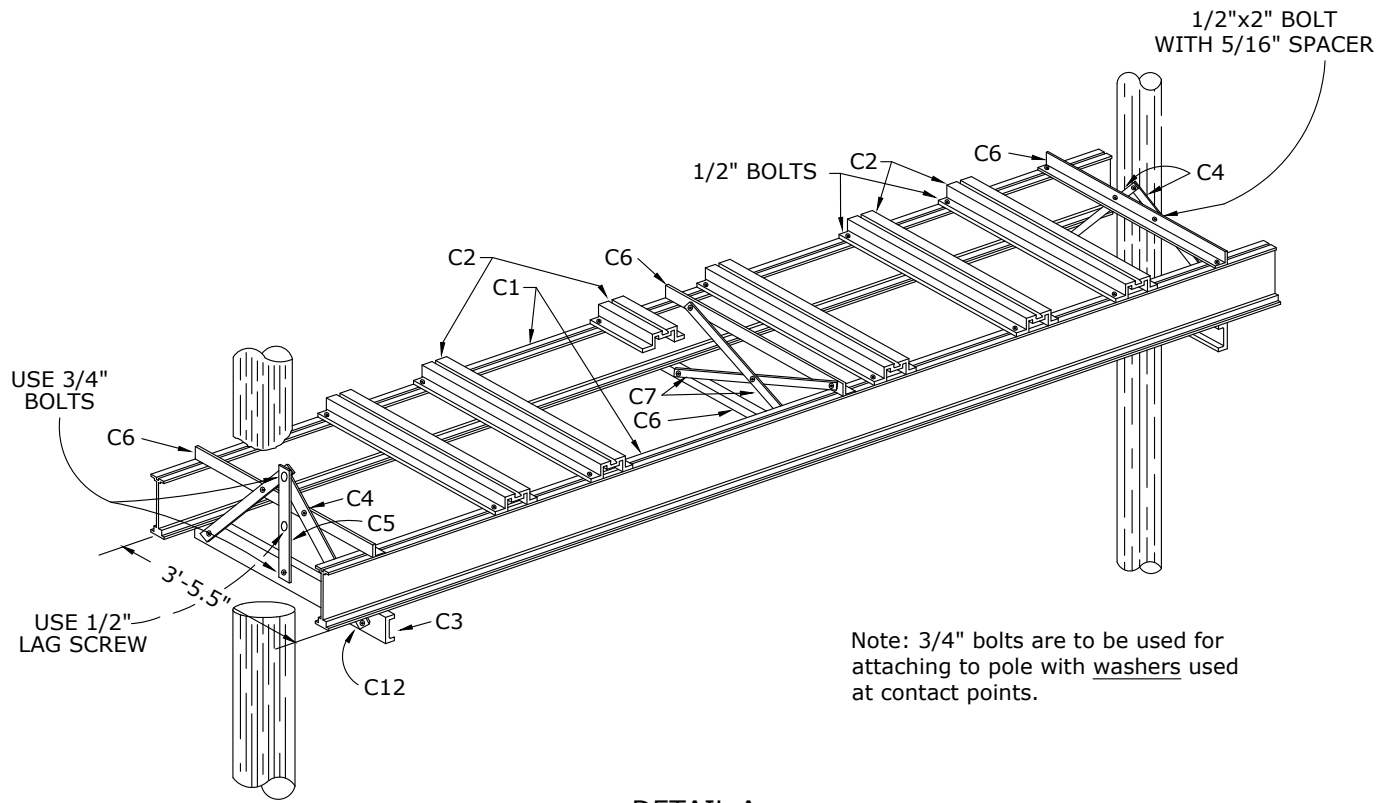
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1 of 4

REG3

CAD FILE:  
REG3

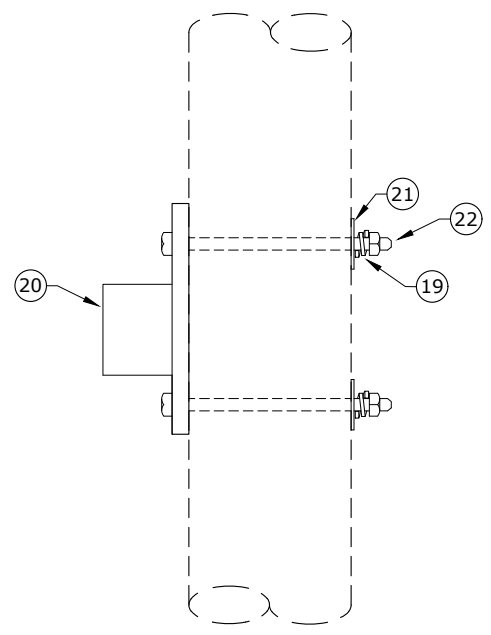
APP: LB/AH  
DATE: 11/1/00

SECTION  
800



**DETAIL A**

Platform Does NOT Come with Lag Screws & Through Bolts



**DETAIL B**

Communications Fiberglass Crossarm

Rev. 4 - Changed Stirrup connector to wedge tap.



**CONSTRUCTION STANDARDS**  
3Ø REGULATOR INSTALLATION

REVISIONS			
Δ	DATE	ENGR	OPS
1	6/17/03	LB	DK
2	2/19/08	LB	AH
3	12/18/19	CM	GM
4	12/14/20	JDK	

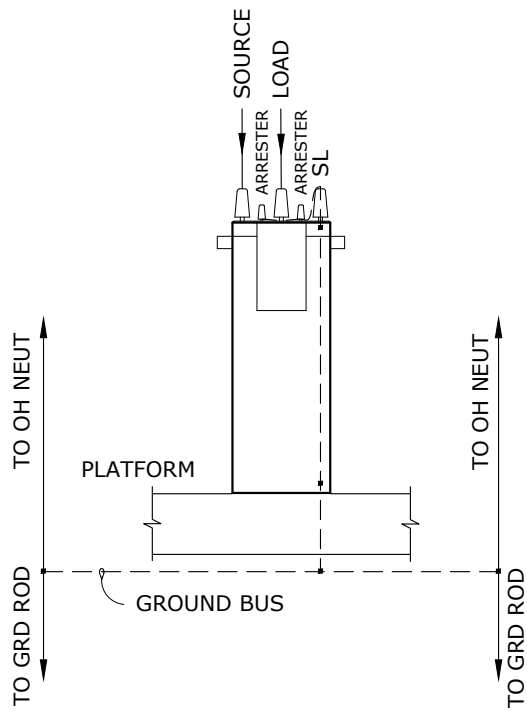
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**REG3**

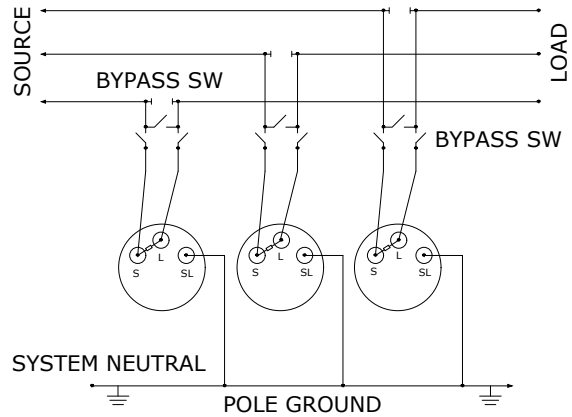
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APP: LB/AH  
DATE: 11/1/00

SECTION  
**800**

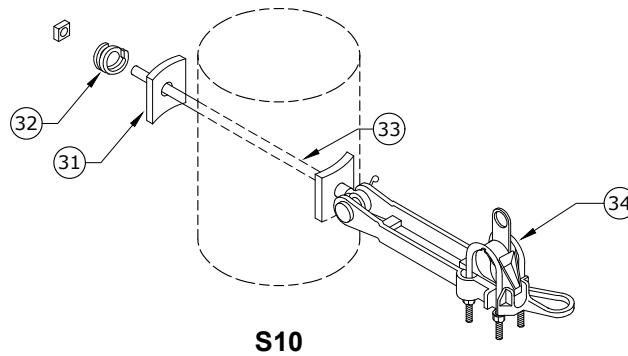


Typical Grounding of Regulator



Electrical Wiring Diagram

Source and load are shown for normal feed. Regulators are reverse feed units and will operate correctly with source and load reversed.



Rev. 4 - Changed Stirrup connector to wedge tap.



**CONSTRUCTION STANDARDS**  
3Ø REGULATOR INSTALLATION

REVISIONS

Δ	DATE	ENGR	OPS
1	6/17/03	LB	DK
2	2/19/08	LB	AH
3	12/18/19	CM	GM
4	12/14/20	JDK	

PAGE:  
3 of 4

**REG3**

CAD FILE:  
REG3

APP: LB/AH  
DATE: 11/1/00

SECTION  
**800**

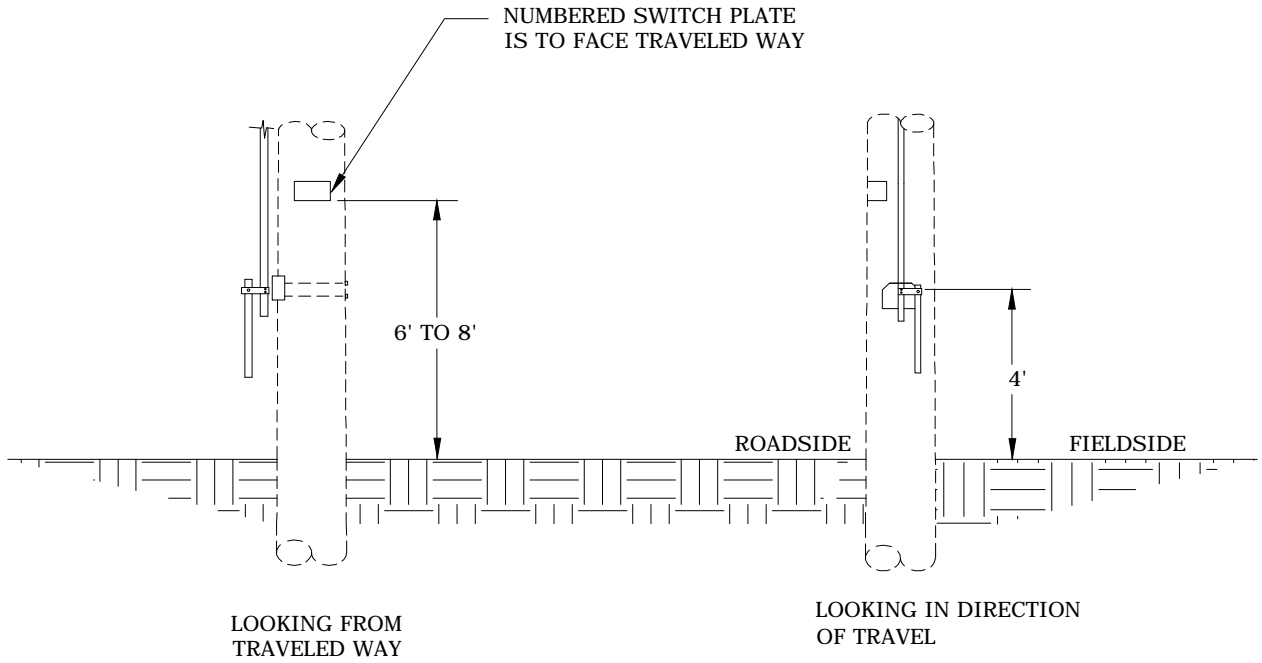
Rev. 4 - Changed Stirrup connector to wedge tap.

ITEM NO.	DESCRIPTION	REG3	
		QTY.	S/N
1	Platform, Regulator, AL, w/o Walkway	1	2505
	Each Platform Consists Of: (Items #C1 Thru #C13)		
C1	11 1/2" Aluminum Beam, 16'-8" length	2	
C2	Aluminum Channel, 41 1/8" long	6	
C3	5" Aluminum Channel, 3'-5 5/8" long	2	
C4	5/16" x 2 3/4" Aluminum Brace	4	
C5	5/16" x 2 3/4" Aluminum Template Brace, 1'-10 7/16" long	2	
C6	Aluminum Angles (Stabilizer)	4	
C7	3/16" x 1 1/2" Aluminum Spacers		
C8	5/16" Aluminum Spacers		
C9	1/2" x 1 1/4" Galvanized Machine Bolts with Hex Nuts		
C10	1/2" x 2" Galvanized Machine Bolts with Hex Nuts		
C11	1/2" Galvanized Palnuts	45	
C12	5/8" x 1 1/2" Galvanized Machine Bolts with Hex Nuts	8	
C13	5/8" Galvanized Palnuts	8	
2	Arm, Cross (Distribution), 18' L x 3 3/4" T x 7 3/4" H	2	850
3	Switch, Bypass, Recloser/Regulator, 600A, 15kV, 1Ø	3	1276
4	Insulator, Suspension, 15kV Clevis-Tongue, Polymer	6	1967
5	Clamp, Strain #2 - 397, Distribution Deadend	6	302
6	Connector, Tap, Wedge, 397 AAC (Run) to 4/0 Str Cu (Tap)	6	2437*
7	Washer, Square, Flat, 4" x 4" x 3/4" Hole	4	1413
8	Washer, Lock, Spring, Double Coil Galv., 3/4"	8	2218
9	Conductor, 600V, XLPE, Cu, 4/0, 19 Str, 1C, USE	150	382
10	Conductor, 600V, XLPE, Cu, 2/0, 19 Str, 1C, USE	40	381
11	Sign, "Warning, Hazardous Voltage"	2	995
12	Bolt, Machine, 3/4" x 16", Galv., 18,300 lb Ultimate Tensile	8	175
13	Screw, Lag, 1/2" x 4 1/2", Twist-Drive, Drive Point	2	1132
14	Washer, Curved, Cast, 4" x 4" w/ 13/16" Hole	4	1910
15	Connector, Compression Lug, 2-Hole, 4/0 CU Only	12	434
16	Bolt, Assembly, 1/2" x 2", SS w/ Belleville & Flat Washers	24	1389
17	Bolt, Machine 1/2" x 8", Galv., 7800 lbs Ultimate Tensile	6	144
18	Washer, Square, Flat, 5/8" x 2 1/4" x 2 1/4"	6	1412
19	Washer, Lock, Spring, Double Coil, Galv., 5/8"	4	2217
20	Arm, Cross (Comm), Fiberglass, 5' L x 3-5/8" T x 4-5/8" H	2	2894
21	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	4	1392
22	Bolt, Machine 5/8" x 16", Galv., 12,400 lb Ultimate Tensile	4	157
23	Jimmy Bracket for Mounting Control Boxes	1	N.S.
24	Luminaire, High Light, LED, 3000K, w/ 2' Arm, Photoeye & 5' of Prewire	1	2890
25	Rod, Ground, 5/8" x 8'	2	1124
26	Clamp, Ground Rod, 5/8", Small, Bronze	2	281
27	Conductor, Copper-Clad Steel, #4 Cu Equivalent, Covered	50	1512
28	Connector, Crimpet, Cu Run 1/0 - 2/0 Str, Tap #8 Sol -#2 Str	2	456
29	Staple, Ground, Barbed, Galvanized, 1 1/2"	60	2707
30	Connector, H-Tap, Al/Cu, Run 1/0-3/0 Str, Tap 1/0-3/0 Str	2	415
ITEM NO.	DESCRIPTION	S10 (2)	
		QTY.	S/N
31	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	4	1392
32	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217
33	Bolt, Eye, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	2	108
34	Clamp, Strain Distribution, #2 - 397.5 MCM	2	302



**CONSTRUCTION STANDARDS**  
3Ø REGULATOR INSTALLATION

REVISIONS			
Δ	DATE	ENGR	OPS
1	6/17/03	LB	DK
2	2/19/08	LB	AH
3	12/18/19	CM	GM
4	12/14/20	JDK	



(LOCATION OF SWITCH HANDLE MAY VARY)



# CONSTRUCTION STANDARDS

## POLE TOP SWITCH SWITCH NUMBER LOCATION

### REVISIONS

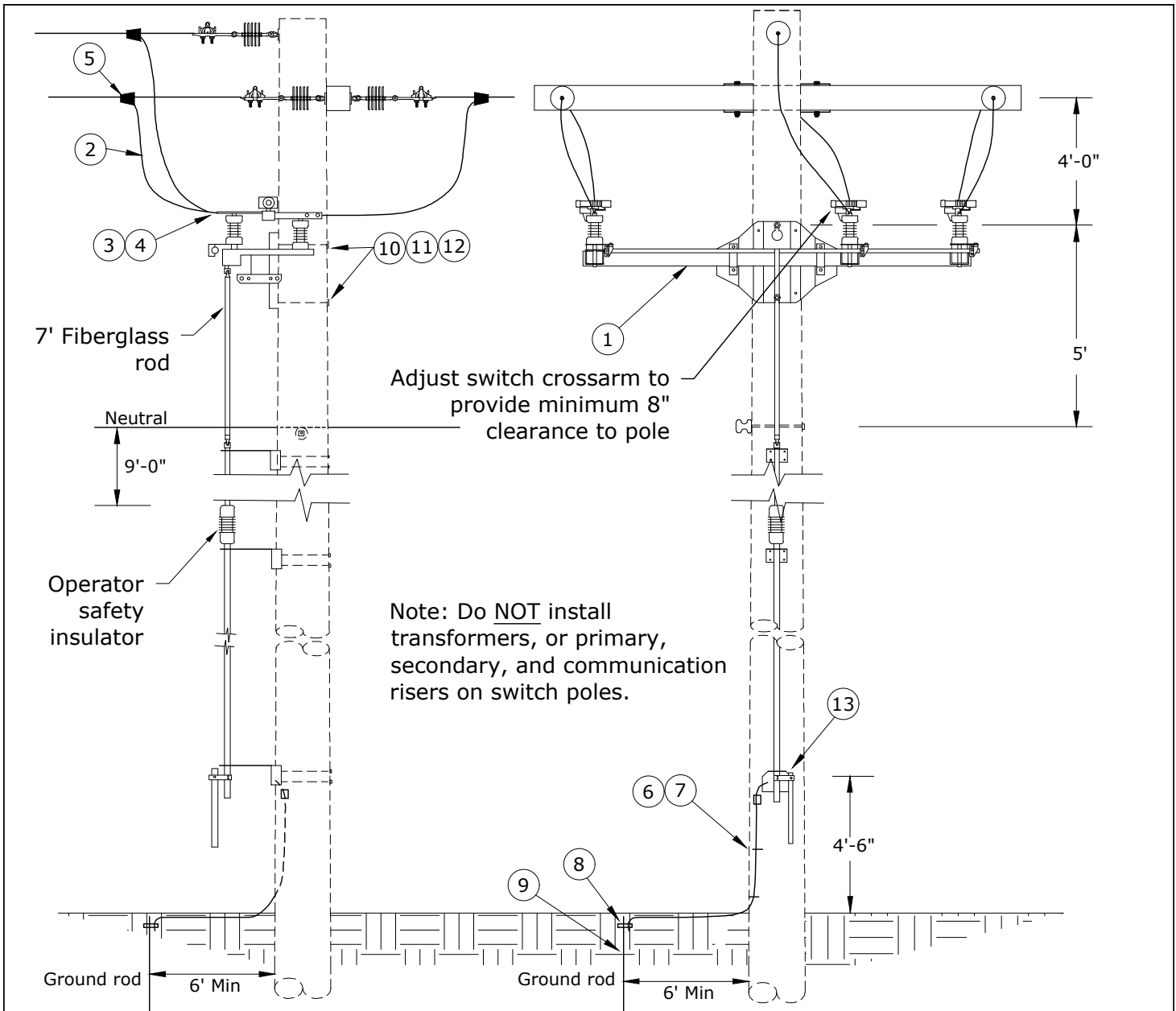
NO.	DATE	ENGR	OPS
1	2/23/00	HWH	MA

PAGE:  
1 of 1

**SW3**

CAD FILE:  
SW3

APP:	SECTION
JEH	800
DATE: 2/22/00	



Rev. 3 - Added secondary and communication risers to note of restricted installations on switch poles, and corrected material issue.

ITEM NO.	DESCRIPTION	SW6	
		QTY.	S/N
1	Switch, Loadbreak, Horizontal, 900A, 15kV	1	2432
2	Conductor, OH, AAC, 397.5 MCM, 19-Str, Bare, 1C	60	367
3	Connector, Compression Lug, 2-Hole, 336 ACSR & 397 AAC	6	438
4	Bolt, Assembly, 1/2" x 2", SS w/ Belleville & Flat Washers	12	1389
5	Connector, Tap, Wedge, Run & Tap 336 ACSR - 397AAC	6	2501
6	Conductor, Copper-Clad Steel, Black w/ Green Strip, #4 Cu Equivalent, 40% Annealed	20	1512*
7	Staple, Ground, Barbed, Galvanized, 1 1/2"	5	2707*
8	Clamp, Ground Rod, 5/8", Small, Bronze	1	281
9	Rod, Ground, 5/8" x 8'	1	1124
10	Bolt, Machine, 3/4" x 16", Galv, 18,350 lb Ultimate Tensile	2	175
11	Washer, Curved, Cast 4" x 4" x 13/16" Hole	2	1910
12	Washer, Lock, Spring, Double Coil, 3/4"	2	2218
13	Lock, Padlock, 2" Hardened Stainless Steel Shackle for OH Switches	1	2564



## CONSTRUCTION STANDARDS

3Ø SWITCH  
UNDERSLUNG  
900A

PAGE:  
1 of 1

# SW6

CAD FILE:  
SW6

REVISIONS			
REV	DATE	ENGR	OPS
1	11/10/05	LB	AH
2	12/14/09	KJP	
3	3/7/23	CM	GM
APP: HWH/MA		SECTION	
DATE: 2/23/00		800	

# 900

## METERING

11/19/2020

~	M	Metering Requirements - General, Commercial & Residential
~	M1	Primary Metering Installation - OH to UG - 7.2kV, Wye - 3-Element Meter
~	M1A	Primary Metering Installation - OH - 7.2kV, Wye - 3-Element Meter
~	M4	Primary Metering Installation - OH to UG - 7.2kV, 1Ø, 1-Element Meter
~	M4A	Primary Metering Installation - OH - 7.2kV, 1Ø, 1-Element Meter
~	M7	Underground Primary Metering Pad - 1Ø - 200 Amp
<b>C</b>	M8	Underground Primary Metering Pad - 3Ø - 200 and 600 Amp
~	M16	Secondary Metering Installation - Pole Mounted - 3Ø, 4-Wire
~	M17	Secondary Metering Installation - Pole Mounted - 1Ø, 3-Wire
~	M20	Pad & Assembly - Secondary Metering for Padmount Transformer
~	M23	D/I CT Metering at Padmount Transformer
~	M28	Recommended Layout for Temporary Electric Service - 120/240v - 3-Wire
~	M28A	Recommended Conductor Supports for Temporary Electric Service
~	MBCT	CT Meter Base Support for Padmount Transformer
~	UM1	Primary 3Ø Metering Enclosure
~	UMS4-36	Secondary 1Ø CT Metering Assemblies Residential

<b>N</b>	New Standard
<b>R</b>	Redrawn Standard
<b>C</b>	Changed Standard
~	No Change

# CLARK PUBLIC UTILITY

## METERING REQUIREMENTS BASED ON EUSERC SPECIFICATIONS

TYPE OF SERVICE OR SOURCE VOLTAGES	SIZE	NUMBER OF TERMINALS	BYPASS PROVISION	TEST SWITCH	DEMAND METERING	REACTIVE METERING
<b>SINGLE PHASE</b> 120/240 VOLTS  (Swimming pools over 35kw will be C.T.'d or 320 amp)	Commercial	200 amp	4	BLOCK BYPASS *	NO	20KW OR GREATER NO
	Residential	200 amp	4	NO	NO	NO
		320 amp	4	BLOCK BYPASS	NO	COMMERCIAL ONLY NO
	Commercial	C.T.	6	NO	YES	20KW OR GREATER NO
	Residential	C.T.	6	NO	NO	NO
<b>NETWORK</b> 120/208V (2 LEGS OF Y)	Commercial	200 amp	5	SAFETY SOCKET	NO	NO
	Residential	200 amp	5	NO	NO	NO
	Commercial	C.T.	8	NO	YES	NO
<b>4 WIRE WYE</b> 120/208 VOLTS	200 amp	7	SAFETY SOCKET	NO	YES	NO
	C.T.	13	NO	YES	YES	YES *
<b>4 WIRE DELTA</b> 240/120 VOLTS	200 amp	7	SAFETY SOCKET	NO	YES	NO
	C.T.	13	NO	YES	YES	YES *
<b>3 WIRE 3Ø DELTA 240V</b> (Existing service only. New services, current trans. Will be 4 wire 240/120)	200 amp	5	SAFETY SOCKET	NO	YES	NO
	C.T.	8	NO	YES	YES	YES *
<b>3 WIRE 3Ø DELTA 480V</b> (Existing service only. New services, current trans. Will be 4 wire 240/480)	200 amp	5	SAFETY SOCKET	NO	YES	NO
	(Contact district about type of socket and whether or not current transformers and reactive metering will be required before making any 480 volt installations)					
<b>4 WIRE 3Ø</b> 277/480 VOLTS	200 amp B/base	7	SAFETY SOCKET	NO	YES	NO
	C.T. & V.T.	13	NO	YES	YES	YES *
	Prim. Met. 7200/120 P.T. & C.T.	13	NO	YES	YES	YES *

C.T. - Current Transformer

V.T. - Voltage Transformer

Rev 2 - Changed blocks marked with a \*.

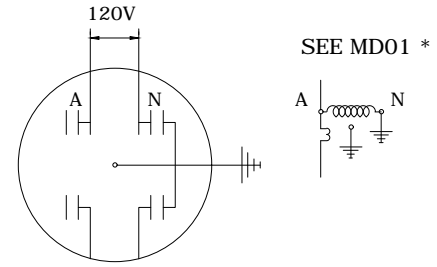
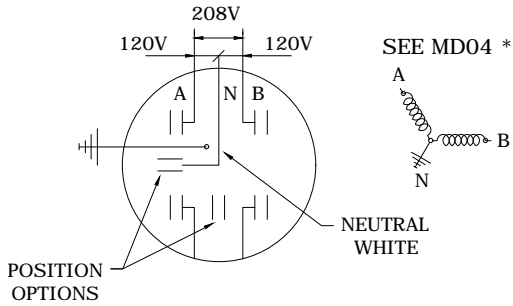
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	METERING REQUIREMENTS GENERAL			#	DATE	ENGR	OPS
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			1	8/2/05	LB	AH	
			2	1/13/10	CM	AH	
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PAGE: 1 of 4	M			CAD FILE: M	APP: JEH	SECTION 900	
				DATE: 2/22/00			



120/208V  
1 PHASE NETWORK

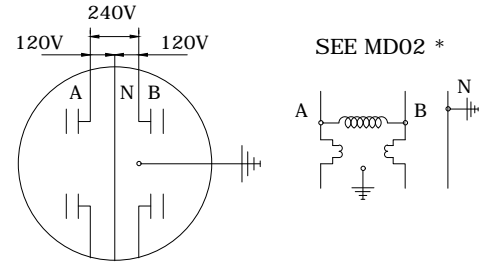
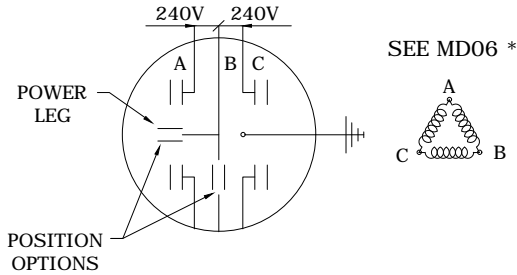
**SELF CONTAINED**

120V 2  
WIRE



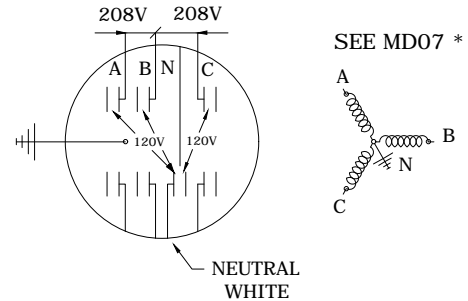
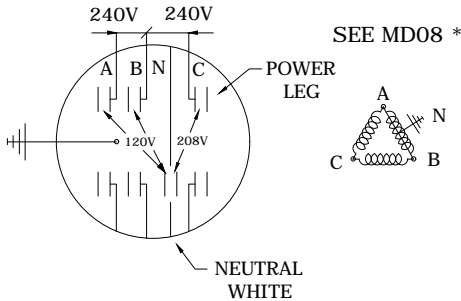
3 PHASE  
3 WIRE 240V

SINGLE PHASE  
3 WIRE 120/240V



3 PHASE 4 WIRE  
DELTA 240/120V

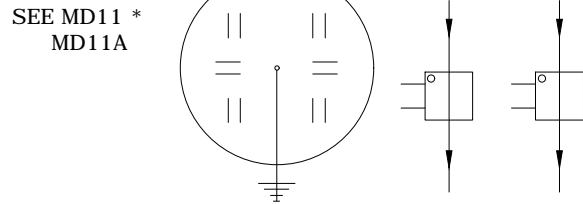
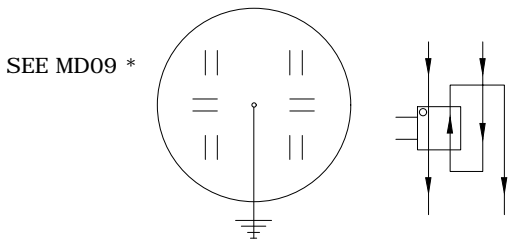
3 PHASE 4 WIRE  
WYE 120/208V  
(or 277/480V)



3 WIRE SERVICE USING ONE  
C.T. 6 TERMINAL SOCKET

**C.T. RATED**

3 WIRE SINGLE SERVICE USING 2  
C.T.'s 6 TERMINAL SOCKET



**LEGEND**

- CURRENT COIL
- VOLTAGE COIL

ALL METER SOCKETS TO BE GROUNDED

\* REV. 1 - Added Metering Diagram Numbers.



**CONSTRUCTION STANDARDS**  
METERING REQUIREMENTS  
GENERAL

REVISIONS			
REV	DATE	ENGR	OPS
0	8/20/02		
1	8/2/05	LB	AH
△ REDRAWN IN CAD			
APP:	JEH	SECTION	
DATE:	2/22/00	900	

**Clark Public Utilities Metering Requirements  
Commercial Applications**

Source Voltage	Ampacity	Reference Circle AW Part Number	Meter Diagram Numbers	Number of Terminals	Bypass Provision Required	Test Switch Required
120 Volts 1Ø 2 Wire	0-100 Amps	U121314*	MD01	4	Yes	No
120/240Volt 1Ø 3Wire	0-200 Amps	U264	MD02	4	Yes	No
120/240Volt 1Ø 3Wire	0-400 Amps	324N, 324NF	MD03	4	Yes	No
120/240Volt 1Ø 3Wire	Over 200 Amps	12146	MD10 MD11	6	No	Yes
240/480Volt 1Ø 3Wire	0-200 Amps	124TB	MD02 MD05 Dmd	4	Yes	No
240/480Volt 1Ø 3Wire	Over 200 Amps	12146	MD10 MD11	6	No	Yes
120/208Volt 3Wire Network	0-200 Amps	125TB	MD04	5	Yes	No
120/208Volt 3Wire Network	Over 200 Amps	12148	MD12	8	No	Yes
240Volt 3Ø 3Wire Delta	0-200 Amps	125TB	MD06	5	Yes	No
120/208Volt 3Ø 4Wire Wye	0-200 Amps	127TB	MD07	7	Yes	No
120/208Volt 3Ø 4Wire Wye	Over 200 Amps	121413	MD13	13	No	Yes
240/120Volt 3Ø 4Wire Delta	0-200 Amps	127TB	MD08	7	Yes	No
240/120Volt 3Ø 4Wire Delta	Over 200 Amps	121413	MD14	13	No	Yes
277/480Volt 3Ø 4Wire Wye	0-200 Amps	127TB	MD07	7	Yes	No
277/480Volt 3Ø 4Wire Wye	Over 200 Amps	121413	MD13	13	No	Yes
480Volt 3Ø 3Wire Delta	0-200 Amps	125TB	MD06	5	Yes	No
480Volt 3Ø 3Wire Delta	Over 200 Amps	12148	MD12	8	No	Yes

Circle AW part numbers are for cross reference only.

**All Commercial current transformer cabinets shall have hinged doors.**

**CURRENT TRANSFORMER CABINET DIMENSIONS, CT MOUNTING BASE**


Amperes	Dimensions	Circle AW or Equivalent
200 Amps- 400 Amps 1Ø	24" X 30" X 11"	6019-HAL (LUG LUG)
401 Amps- 800 Amps 1Ø	30" X 36" X 11"	6019-HEL (LUG LUG)
200 Amps- 400 Amps 3Ø	30" X 36" X 11"	6019-HAL or 6067-HAL
401 Amps- 800 Amps 3Ø	36" X 48" X 11"	6019-HEL or 6067-HEEL

See EUSERC Spec – 328B & 329B

**Over 800 Amps Switchgear Required**

Maximum wire size 600 MCM per lug or parallel per EUSERC SPEC. & UL label

Rev 4: Changed blocks with a \*.

	<h2>CONSTRUCTION STANDARDS</h2> <p>METERING REQUIREMENTS COMMERCIAL APPLICATION</p>			<b>REVISIONS</b>																							
				<table border="1"> <thead> <tr> <th>△</th> <th>DATE</th> <th>ENGR</th> <th>OPS</th> </tr> </thead> <tbody> <tr> <td align="center">1</td> <td align="center">8/2/05</td> <td align="center">LB</td> <td align="center">AH</td> </tr> <tr> <td align="center">2</td> <td align="center">12/19/07</td> <td align="center">LB</td> <td align="center">AH</td> </tr> <tr> <td align="center">3</td> <td align="center">1/13/10</td> <td align="center">CM</td> <td align="center">AH</td> </tr> <tr> <td align="center">4</td> <td align="center">6/18/10</td> <td align="center">KJP</td> <td></td> </tr> </tbody> </table>	△	DATE	ENGR	OPS	1	8/2/05	LB	AH	2	12/19/07	LB	AH	3	1/13/10	CM	AH	4	6/18/10	KJP				
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PAGE: 3 of 4	<h1>M</h1>		CAD FILE: M	APP: DATE: 2/22/00																							

**Clark Public Utilities Metering Requirements**  
**Residential Applications**

Source Voltage	Ampacity	Reference Circle AW Part Number	Meter Diagram Numbers	Number of Terminals	Bypass Provision Required	Test Switch Required
120 Volts 1Ø 2 Wire	0-100 Amps	011	MD01	4	No	No
120/240 Volt 1Ø 3Wire	0-200 Amps	204, U204	MD02	4	No	No
120/240 Volt 1Ø 3Wire	0-400 Amps	324N, 324NF	MD03	4	Yes	No
120/240 Volt 1Ø 3Wire	Over 400 Amps	UO11, 011, 925 or 926	MD09 MD11A	5 or 6	No	No

Circle AW part numbers are for cross reference only.




**CURRENT TRANSFORMER CABINET DIMENSIONS, CT MOUNTING BASE**

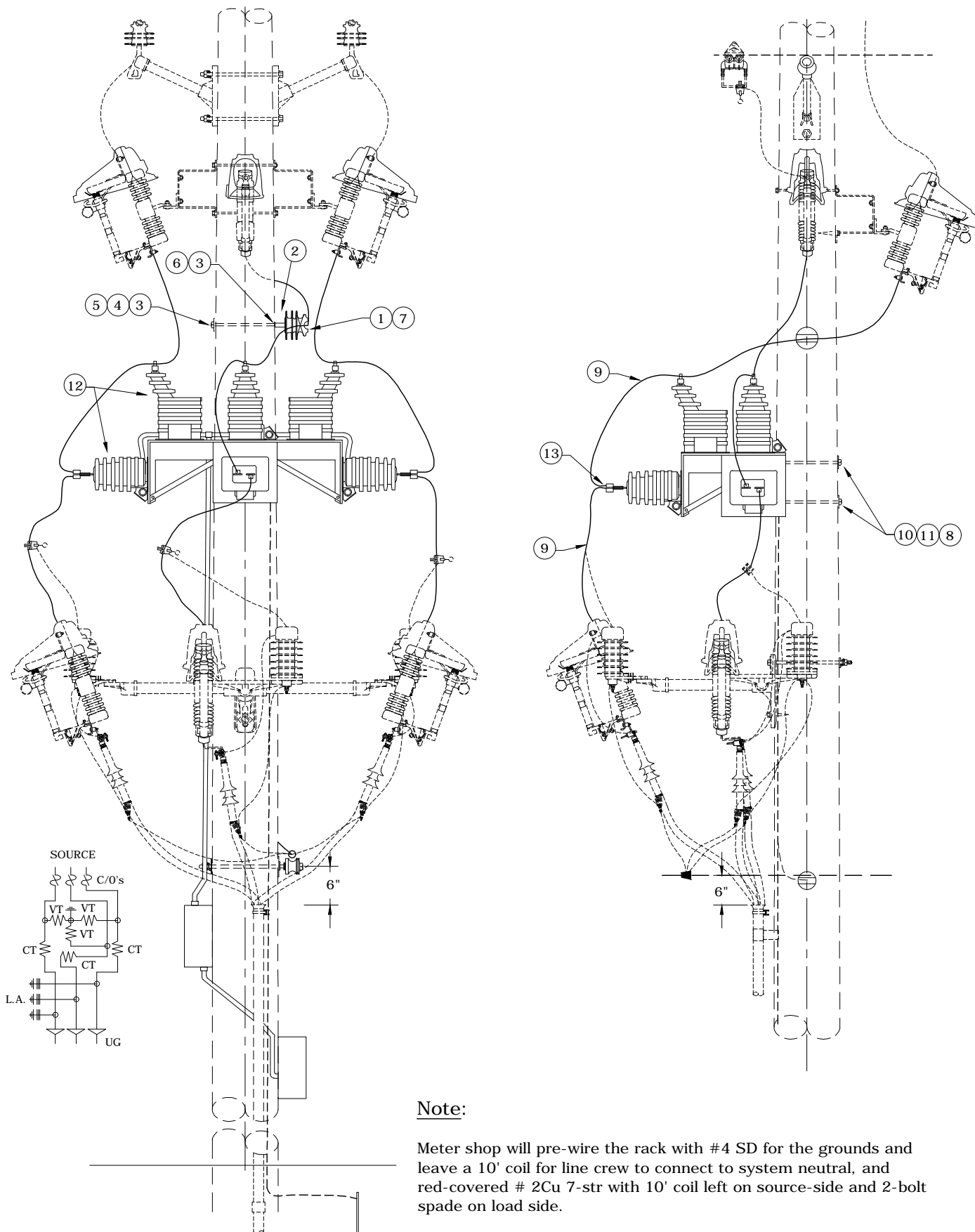
Amperes	Dimensions	Circle AW or Equivalent
200 Amps- 400 Amps 1Ø Window	24"h X 32"w X 9"d	PED
*401 Amps- 800 Amps 1Ø Buss Mt.	24"h X 30"w X 11"d hinged door	6019-HAL (LUG LUG)
200 Amps- 400 Amps 3Ø Window	30"h X 36"w X 11"d	PED
*401 Amps- 800 Amps 3Ø Buss Mt.	36"h X 48"w X 11"d hinged door	6019-HEL (LUG-LUG)

\* Optional

Notes: 1. CT Metering for 200- 400 Amp panels required pre-approval from Clark Public Utilities  
 2. All CT cans shall be mounted outside.

Rev 2: Add optional CT cabinet dimensions and notes.

	<b>CONSTRUCTION STANDARDS</b> METERING REQUIREMENTS RESIDENTIAL			<b>REVISIONS</b>			
					DATE	ENGR	OPS
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			2	12/19/07	LB	AH	
				REDRAWN IN CAD			
PAGE: 4 of 4	<b>M</b>		CAD FILE: M	APP: JEH DATE: 2/22/00	SECTION <b>900</b>		



**Note:**  
 Meter shop will pre-wire the rack with #4 SD for the grounds and leave a 10' coil for line crew to connect to system neutral, and red-covered # 2Cu 7-str with 10' coil left on source-side and 2-bolt spade on load side.

Rev 2: Changed to single-bushing PTs and updated drawing & material list.



## CONSTRUCTION STANDARDS

PRIMARY METERING INSTALLATION  
 OVERHEAD TO UNDERGROUND  
 7.2KV, WYE - 3 ELEMENT METER

PAGE:  
1 of 2

M1


CAD FILE:  
M1

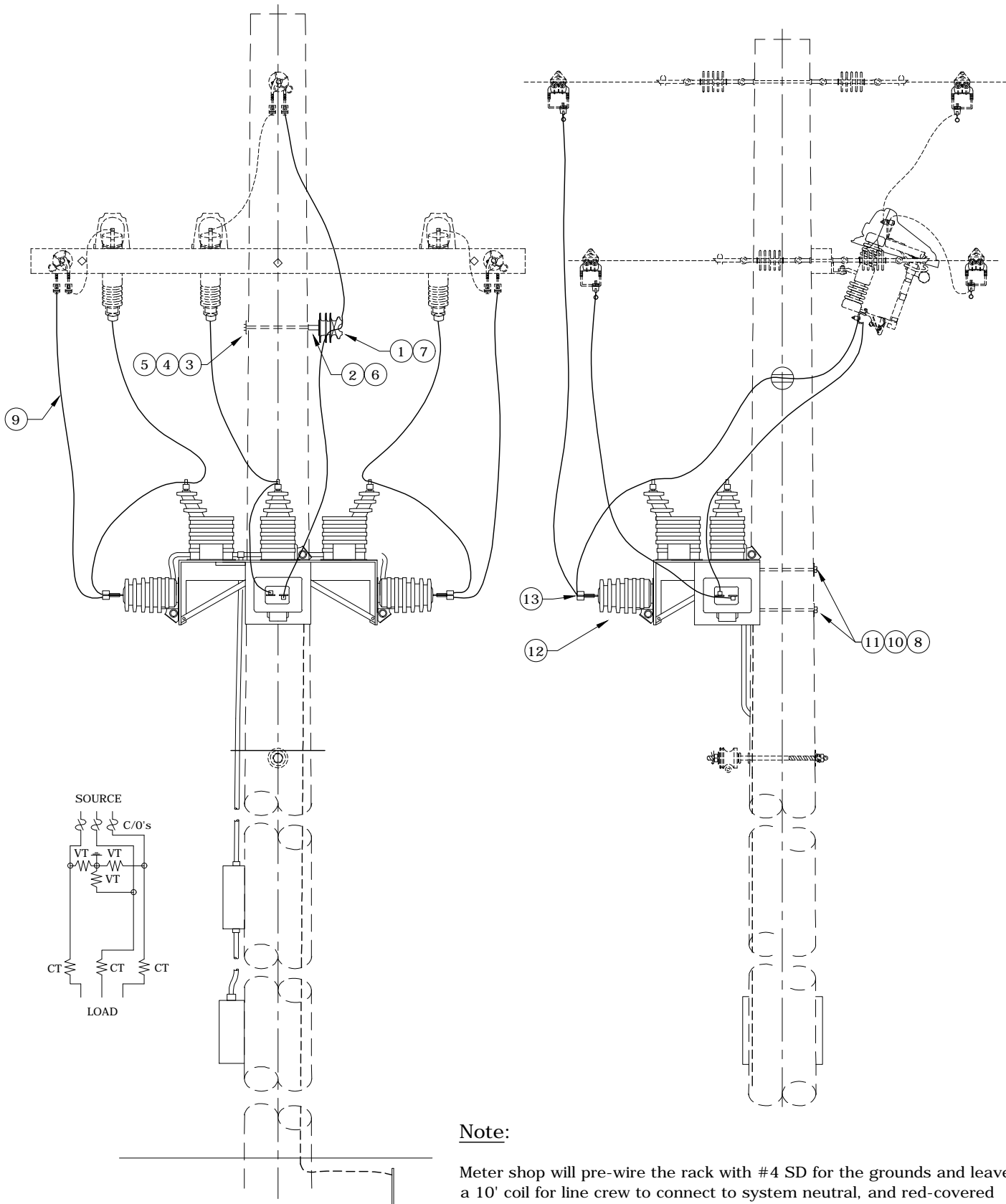
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1	3/02	Redrawn	In Cad
2	8/11/10	CM	AH
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APP:	ELM	SECTION	
DATE:	1/31/80	900	

Rev 2: Changed to single-bushing PTs and updated drawing & material list.

ITEM NO.	DESCRIPTION	PR20TREE	
		QTY.	S/N
1	Insulation Pin C Neck	1	1968
2	Pin Adapter	1	959
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" thick x 13/16" hole	2	1392
4	Bolt, Double, Arm, 5/8" x 16"	1	81
5	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217
6	Washer, Lock, Spring, Single Coil, Galv., 5/8"	2	1403
7	Wire, Tie, AL Annealed #4 SD	10	3012

ITEM NO.	DESCRIPTION	ADDITIONAL MATERIAL	
		QTY.	S/N
8	Bolt, Machine 5/8" x 12" Galv	2	155
9	Cond, Wire, Cu 1/C #2AWG 7Str 600V Red	60	2513
10	Washer, Curved, Square, Cast, 3" x 3" x 3/8" thick x 13/16" hole	2	1392
11	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217
12	MM1 from Meter Dept., CT/VT Assembly w/ Rack	1	N/S
13	Connector, Compression Lug, #2 Cu	3	427

	<b>CONSTRUCTION STANDARDS</b> PRIMARY METERING INSTALLATION OVERHEAD TO UNDERGROUND 7.2KV, WYE - 3 ELEMENT METER		REVISIONS			
	△	DATE	ENGR	OPS		
	1	3/02	Redrawn	In Cad		
	2	8/11/10	CM	AH		
PAGE: 2 of 2		M1	CAD FILE: M1	APP: ELM	SECTION	900
				DATE: 1/31/80		



**Note:**

Meter shop will pre-wire the rack with #4 SD for the grounds and leave a 10' coil for line crew to connect to system neutral, and red-covered #2 Cu 7-str with 10' coil left on source-side and 2-bolt spade on load side.

Rev 2: Changed to single-bushing PTs, removed arresters, and updated drawing & material list.



**CONSTRUCTION STANDARDS**  
 PRIMARY METERING INSTALLATION  
 OVERHEAD CONSTRUCTION  
 7.2KV, WYE - 3 ELEMENT METER

PAGE:  
1 of 2

**M1A**


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M1A

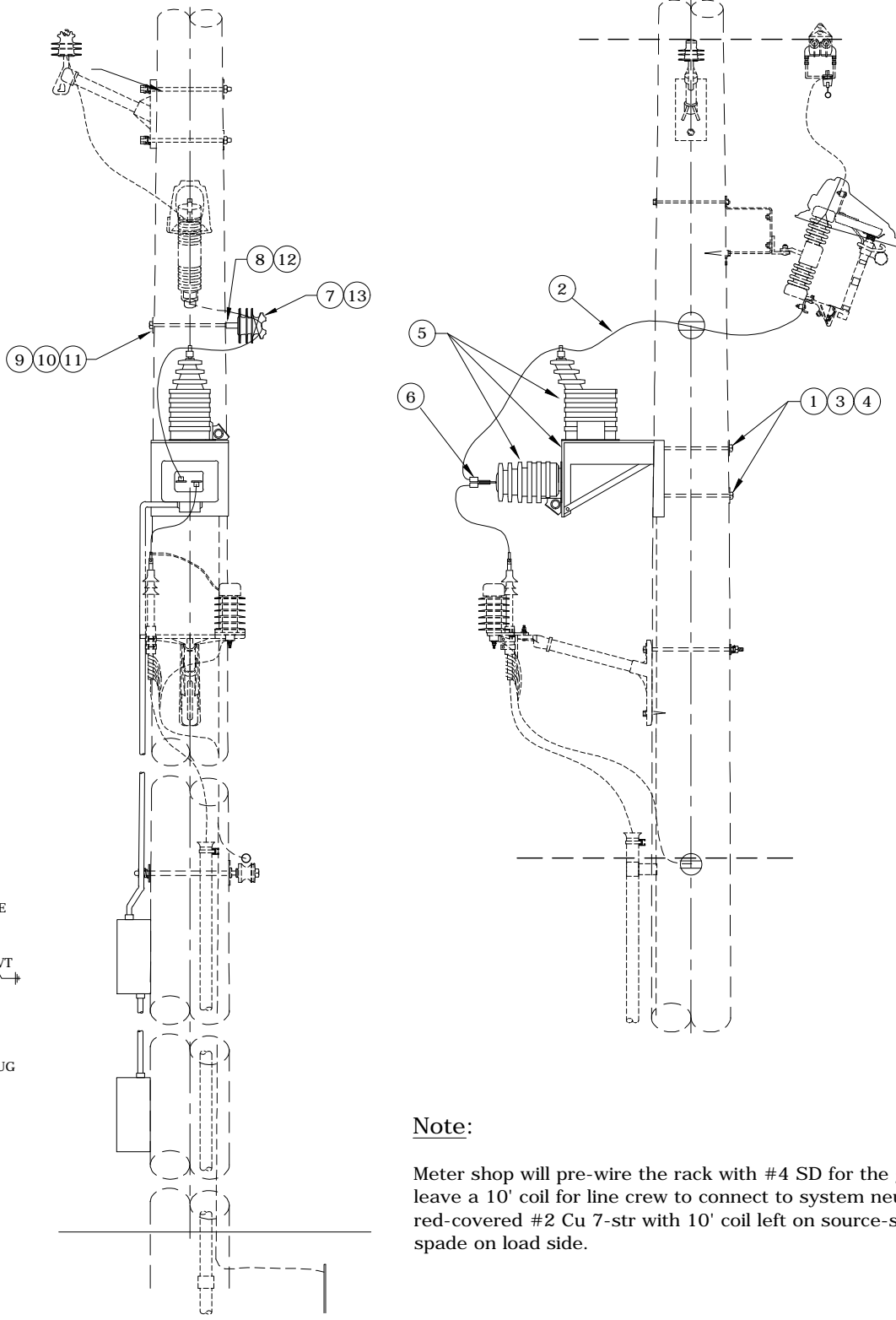
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APP:	ELM	SECTION									
DATE:	1/31/80	900									

Rev 2: Changed to single-bushing PTs, removed arresters, and updated drawing & material list.

ITEM NO.	DESCRIPTION	PR20TREE	
		QTY.	S/N
1	Insulation Pin C Neck	1	1968
2	Pin, Adapter	1	959
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" thick x 13/16" hole	2	1392
4	Bolt, Double Arm, 5/8" x 16"	1	81
5	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217
6	Washer, Lock, Spring, Single Coil, Galv., 5/8"	2	1403
7	Wire, Tie, AL Annealed #4 SD	10	3012

ITEM NO.	DESCRIPTION	Additional Material	
		QTY.	S/N
8	Bolt, Machine 5/8" x 12" Galv	2	155
9	Cond, Wire, Cu 1/C #2AWG 7Str 600V Red	60	2513
10	Washer, Curved, Square, Cast, 3" x 3" x 3/8" thick x 13/16" hole	2	1392
11	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217
12	MM1A from Meter Dept., CT/VT Assembly w/ Rack	1	N/S
13	Connector, Compression Lug, #2 Cu	3	427

	<b>CONSTRUCTION STANDARDS</b> PRIMARY METERING INSTALLATION OVERHEAD CONSTRUCTION 7.2KV, WYE - 3 ELEMENT METER		REVISIONS			
	△	DATE	ENGR	OPS		
	1	3/02	Redrawn	In Cad		
	2	8/11/10	CM	AH		
PAGE: 2 of 2		<b>M1A</b>	CAD FILE: M1A	APP: ELM	SECTION	900
				DATE: 1/31/80		



**Note:**

Meter shop will pre-wire the rack with #4 SD for the grounds and leave a 10' coil for line crew to connect to system neutral, and red-covered #2 Cu 7-str with 10' coil left on source-side and 2-bolt spade on load side.

Rev 2: Changed to single-bushing PTs and drawing & material corrections.



**CONSTRUCTION STANDARDS**

PRIMARY METERING INSTALLATION  
OVERHEAD TO UNDERGROUND  
7.2KV, 1 PHASE, 1 ELEMENT METER

PAGE:  
1 of 2

**M4**

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M4



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DATE:	1/31/80	<b>900</b>	

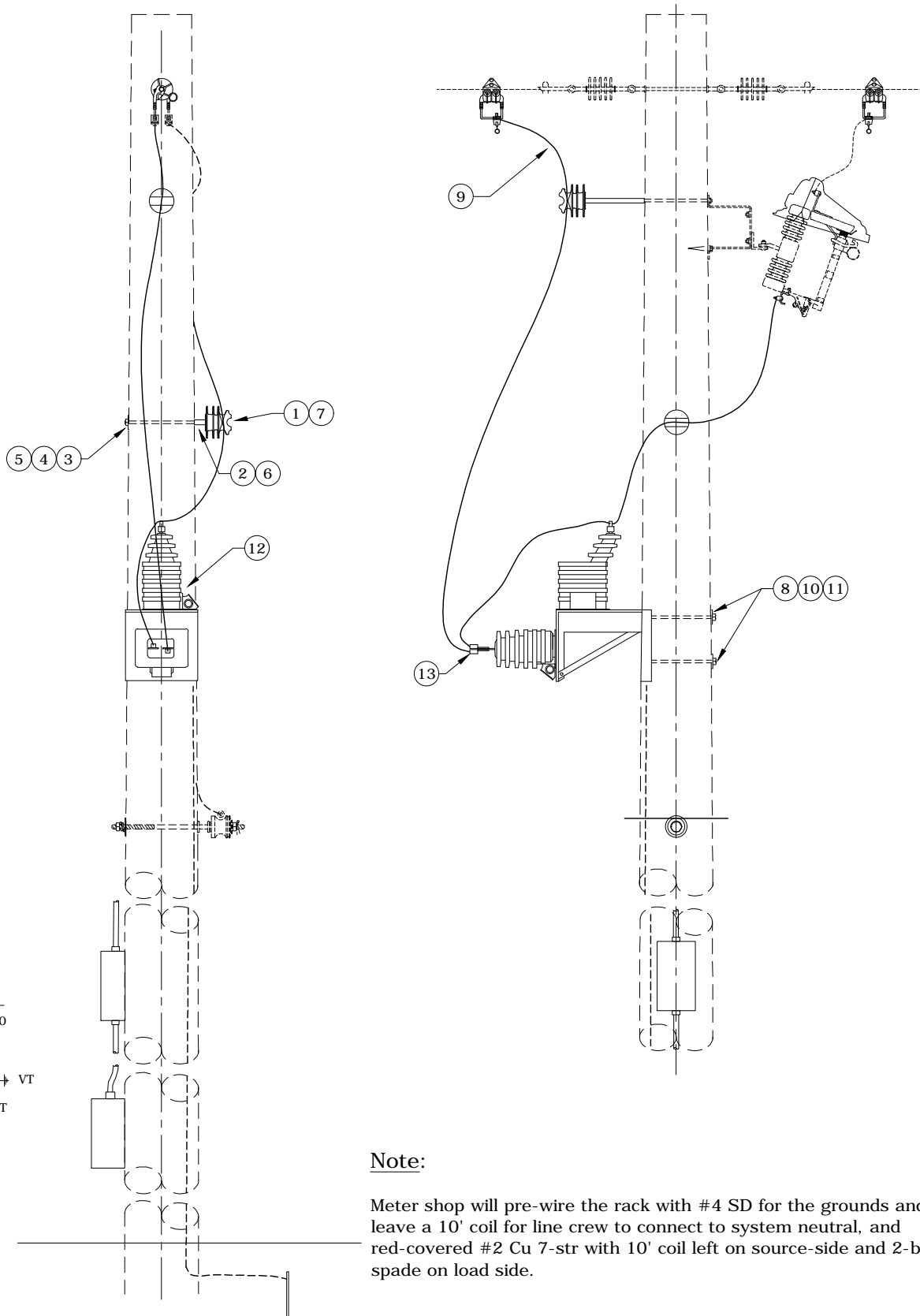


Rev 2: Changed to single-bushing PTs and drawing & material corrections.

ITEM NO.	DESCRIPTION	ADDITIONAL MATERIAL	
		QTY.	S/N
1	Bolt, Machine 5/8" x 12" Galv	2	155
2	Cond, Wire, Cu 1/C #2 7Str 600V Red	20	2513
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" thick x 13/16" hole	2	1392
4	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217
5	MM1 from Meter Dept., CT/VT Assembly w/ Rack	1	N/S
6	Connector, Compression Lug, #2 Cu	1	427

ITEM NO.	DESCRIPTION	PR20TREE	
		QTY.	S/N
7	Insulation Pin C Neck	1	1968
8	Pin Adapter	1	959
9	Washer, Curved, Square, Cast, 3" x 3" x 3/8" thick x 13/16" hole	2	1392
10	Bolt, Double, Arm, 5/8" x 16"	1	81
11	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217
12	Washer, Lock, Spring, Single Coil, Galv., 5/8"	2	1403
13	Wire, Tie, AL Annealed #4 SD	10	3012

	<h2>CONSTRUCTION STANDARDS</h2> <p>PRIMARY METERING INSTALLATION OVERHEAD TO UNDERGROUND 7.2KV, 1 PHASE, 1 ELEMENT METER</p>		<b>REVISIONS</b>			
		DATE	ENGR	OPS		
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	2	8/11/10	CM	AH		
PAGE: 2 of 2		<b>M4</b>	CAD FILE: M4		APP: ELM DATE: 1/31/80	SECTION <b>900</b>



**Note:**

Meter shop will pre-wire the rack with #4 SD for the grounds and leave a 10' coil for line crew to connect to system neutral, and red-covered #2 Cu 7-str with 10' coil left on source-side and 2-bolt spade on load side.

Rev 2: Changed to single-bushing PTs, removed lightning arrester and drawing & material corrections.



**CONSTRUCTION STANDARDS**

PRIMARY METERING INSTALLATION  
OVERHEAD CONSTRUCTION  
7.2KV, 1 PHASE, 1 ELEMENT METER

PAGE:  
1 of 2

**M4A**


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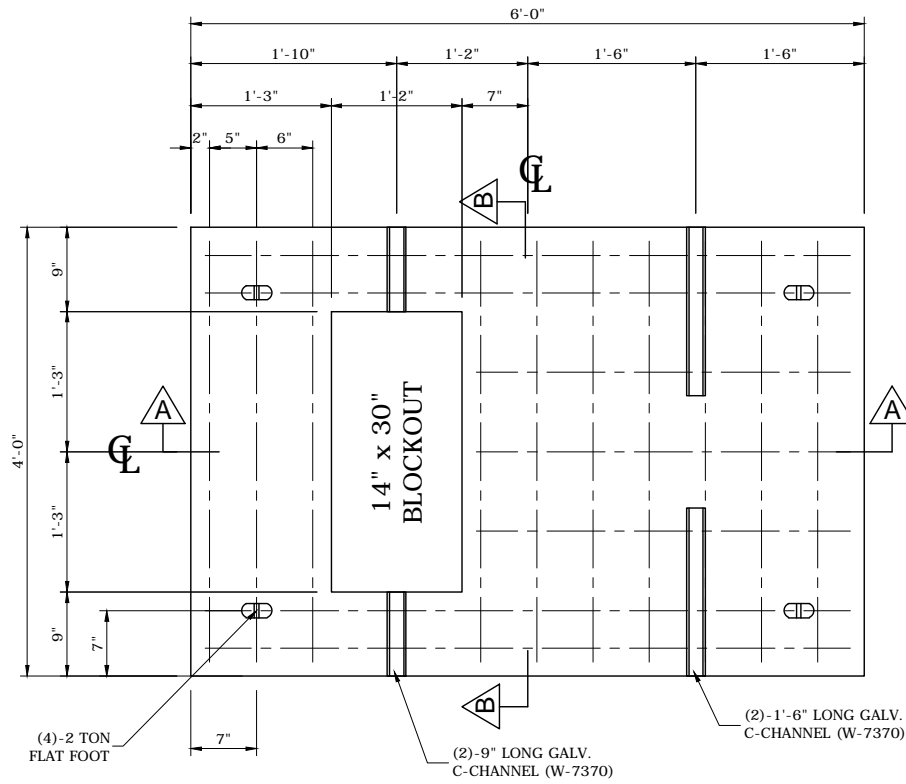
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DATE:	1/31/80	<b>900</b>	

Rev 2: Changed to single-bushing PTs, removed lightning arrester and drawing & material corrections.

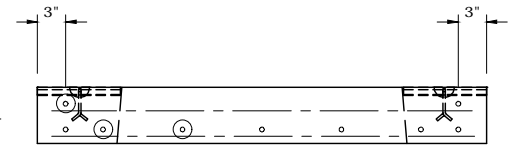
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2	Pin, Adapter	1	959
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4	Bolt, Double Arm, 5/8" x 16"	1	81
5	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217
6	Washer, Lock, Spring, Single Coil, Galv., 5/8"	2	1403
7	Wire, Tie, AL Annealed #4 SD	10	3012

ITEM NO.	DESCRIPTION	Additional Material	
		QTY.	S/N
8	Bolt, Machine 5/8" x 12" Galv	2	155
9	Cond, Wire, Cu 1/C #2AWG 7Str 600V Red	20	2513
10	Washer, Curved, Square, Cast, 3" x 3" x 3/8" thick x 13/16" hole	2	1392
11	Washer, Lock, Spring, Double Coil, Galv., 5/8"	2	2217
12	MM1A from Meter Dept., CT/VT Assembly w/ Rack	1	N/S
13	Connector, Compression Lug, #2 Cu	1	427

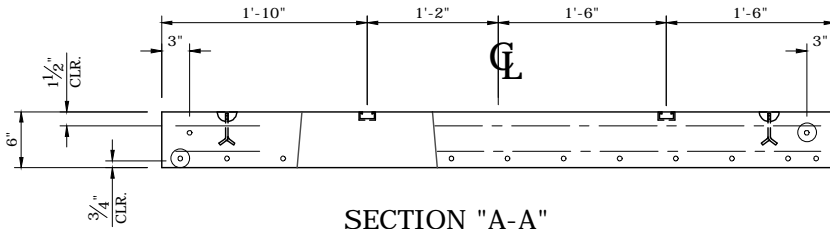
	<b>CONSTRUCTION STANDARDS</b> PRIMARY METERING INSTALLATION OVERHEAD CONSTRUCTION 7.2KV, 1 PHASE, 1 ELEMENT METER		REVISIONS			
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	2	8/11/10	CM	AH		
PAGE: 2 of 2		<b>M4A</b>	CAD FILE: M4A	APP: ELM	SECTION	<b>900</b>
			DATE: 1/31/80			



PLAN



SECTION "B-B"



SECTION "A-A"

CONCRETE:  
VOL. = VOLUME  
WT. = WEIGHT

BILL OF MATERIAL				
PART	DESCRIPTION	QTY.	SIZE	TOTAL WT. LBS.
1	#6 GR. 60	9	6'-9"x STR.	91
2	#6 GR. 60	2	6'-9"x STR.	20
2A	#6 GR. 60	5	4'-11"x STR.	37
3	#4 GR. 60	2	6'-9"x STR. TOP	9
4	#4 GR. 60	2	6'-9"x STR. TOP	9
	LIFT ANCHOR	4	2 TON SPREAD	
	C-CHANNEL(W-7370)	2	8" LONG	
	C-CHANNEL(W-7370)	2	1'-6" LONG	

CONCRETE PAD DETAILS FOR 1Ø 200 AMP  
UNDERGROUND PRIMARY METERING ENCLOSURE

1. ALL CONCRETE SHALL BE 2500 PSI AND HAVE A SLUMP OF 4" TO 6".
2. REINFORCING SHALL CONFORM TO ASTM DESIGNATION A15 AND A305.
3. TROWEL SMOOTH SURFACES AND BRUSH FINISH. ROUND ALL EDGES.

GENERAL NOTES:

1. UTILITY VAULT PAD #4872SLB6-1430CLARK

Rev 4: New pad dimensions for 200 amp 1Ø underground metering enclosure



CONSTRUCTION STANDARDS  
UNDERGROUND PRIMARY METERING PAD  
SINGLE PHASE  
200 AMP

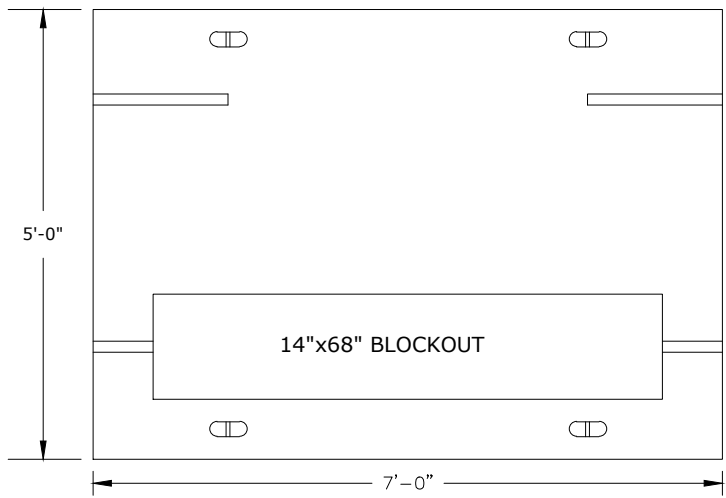
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1 of 1

M7

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M7

REVISIONS			
NO.	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	7/15/02	JEH	TR
3	8/2/05	LB	AH
4	12/19/07	LB	AH

APP:	ELM	SECTION
DATE:	1/31/80	900



**TOP VIEW**



**FRONT VIEW**

1. All concrete shall be 2500 PSI and have a slump of 4" to 6".
2. Reinforcing shall conform to ASTM designation A15 and A305.
3. Trowel smooth surfaces and brush finish. Round all edges.


**GENERAL NOTES:**

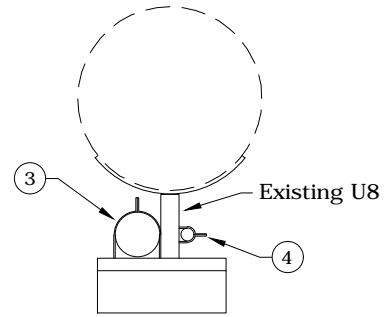
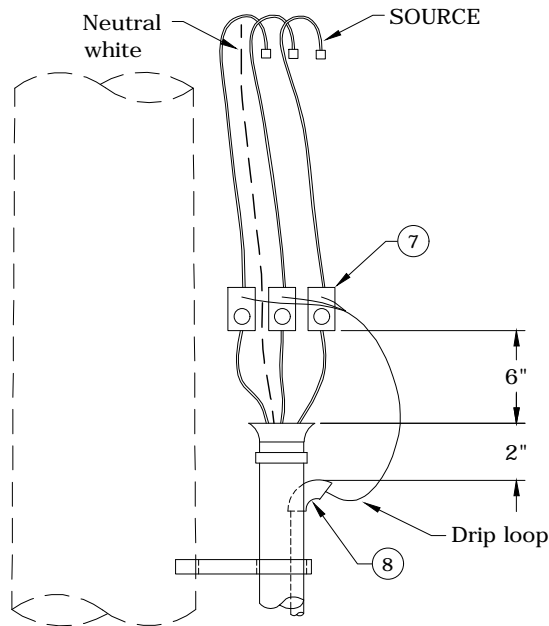
1. Pad = 2,130 lb
2. Oldcastle pad #6084SLB6-1468-Clark.
3. Use template for conduit placement.

Rev 3: Changed to lighter (2130 vs 4769 lb) and smaller pad

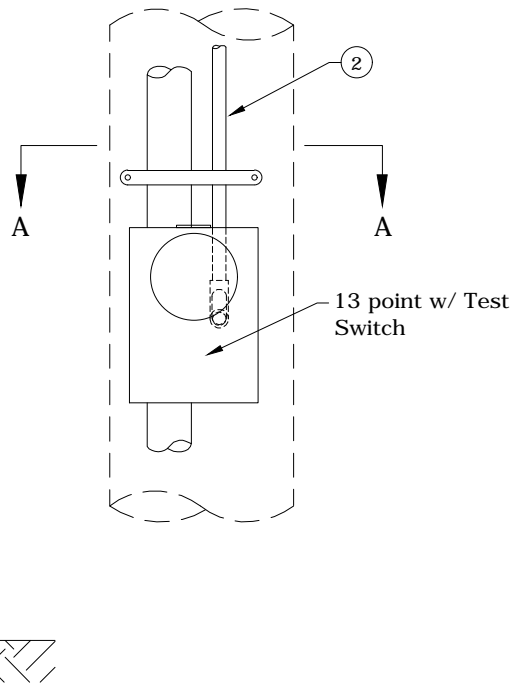
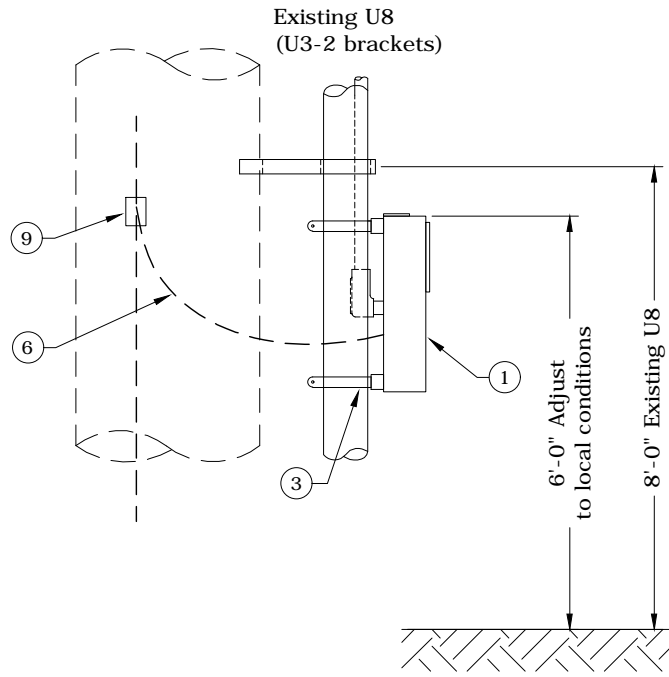
ITEM NO.	DESCRIPTION	M8	
		QTY	S/N
1	Pad, Primary Metering Module, Concrete, 5' x 7' w/ 14" x 68" Blockout	1	2332

	<b>CONSTRUCTION STANDARDS</b>		
	UNDERGROUND PRIMARY METERING PAD		
	THREE PHASE		
	200 AND 600 AMP		
PAGE: 1 of 1		<b>M8</b>	
CAD FILE: M8		REVISIONS	
		APP:	SECTION
		DATE: 12/19/07	900



**SECTION AA**



R2 - Minor drawing changes

ITEM NO.	DESCRIPTION	M16	
		QTY.	S/N
1	Meter base, Superior, w/ channel 1 1/2" x 1 1/2", from Meter Dept.	1	MM1
2	LB, from Meter Dept.	1	MM1
3	Strap, Pipe 3" HW	2	1243
4	Strap, Pipe 1" HW	2	1239
5	Conduit, Schedule 80 PVC 1" x 10'	20	2482
6	Conductor, BSDC 4SLD 1C	10	376
7	Transformer, current, from Meter Dept.	3	MM1
8	Weatherhead 1", from Meter Dept.	1	MM1
9	Connector, crimpet Cu 4/4 - 6/6	1	452



**CONSTRUCTION STANDARDS**  
**SECONDARY METERING INSTALLATION**  
**POLE MOUNTED - 3 PHASE, 4 WIRE**

REVISIONS			
DATE	ENGR	OPS	
3/02	Redrawn	In Cad	1
7/15/02	JEH	TR	2

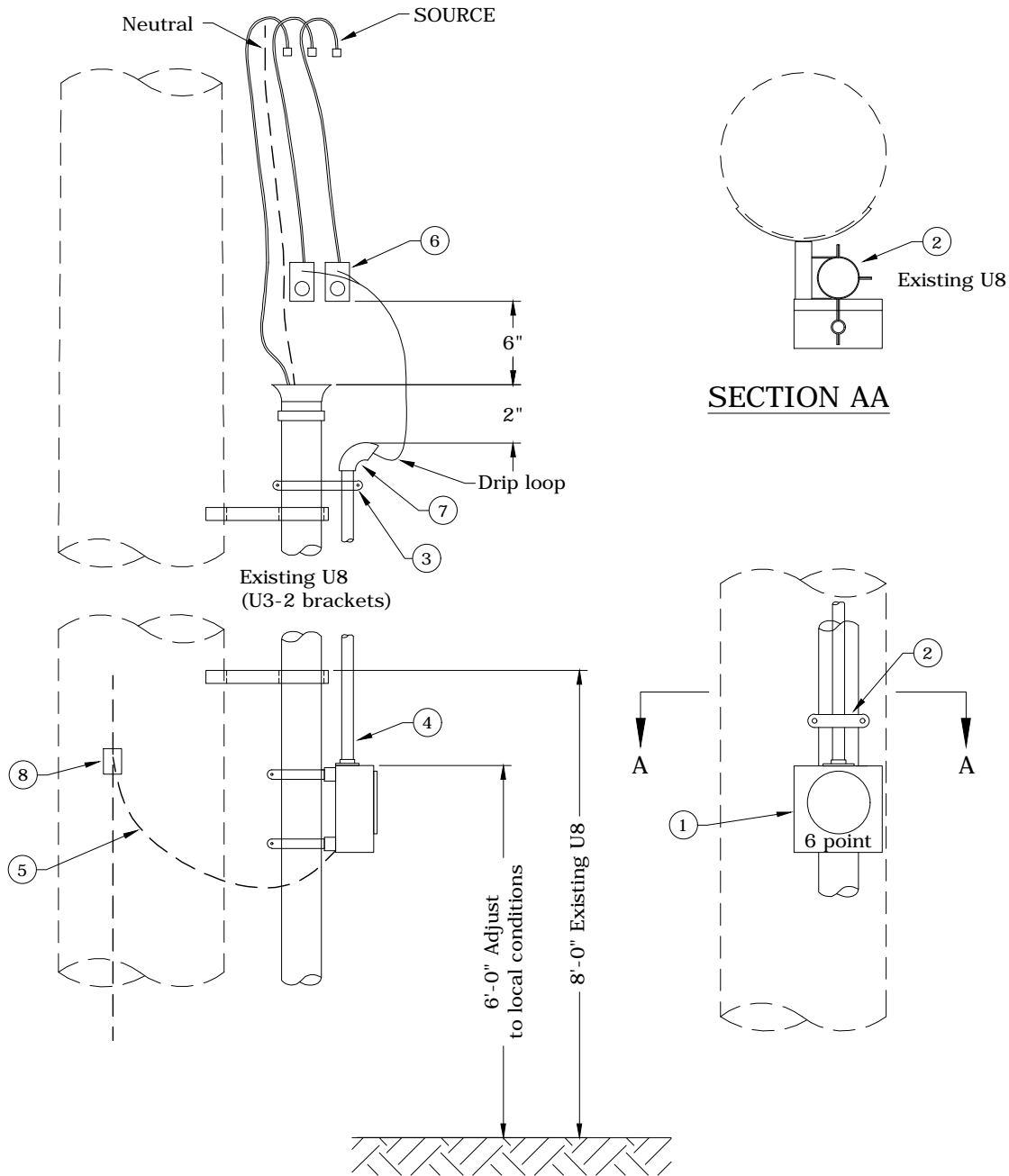
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1 of 1

**M16**

CAD FILE:  
M16

APP: ELM  
DATE: 1/31/80

SECTION  
**900**



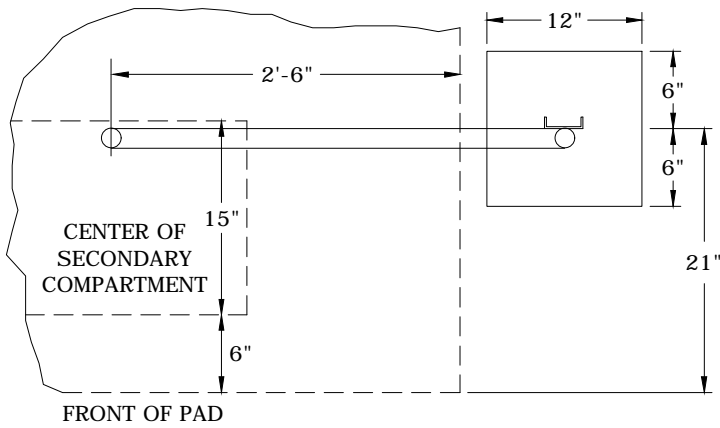
R2 - Minor drawing changes

ITEM NO.	DESCRIPTION	M17	
		QTY.	S/N
1	Meter base w/ channel 3/4" x 1 1/2" from Meter Dept.	1	MM1
2	Strap, Pipe 3" HW	2	1243
3	Conduit band from Meter Dept.	2	MM1
4	Conduit, Schedule 80 PVC 3/4" x 10'	20	2221
5	Conductor, BSDC 4SLD 1C	10	376
6	Transformer, current, from Meter Dept.	2	MM1
7	Weatherhead 3/4", from Meter Dept.	1	MM1
8	Connector, crimpet, Cu 4/4 - 6/6	1	452



**CONSTRUCTION STANDARDS**  
 SECONDARY METERING INSTALLATION  
 POLE MOUNTED - 1 PHASE, 3 WIRE

REVISIONS			
DATE	ENGR	OPS	
3/02	Redrawn	In Cad	1
7/15/02	JEH	TR	2

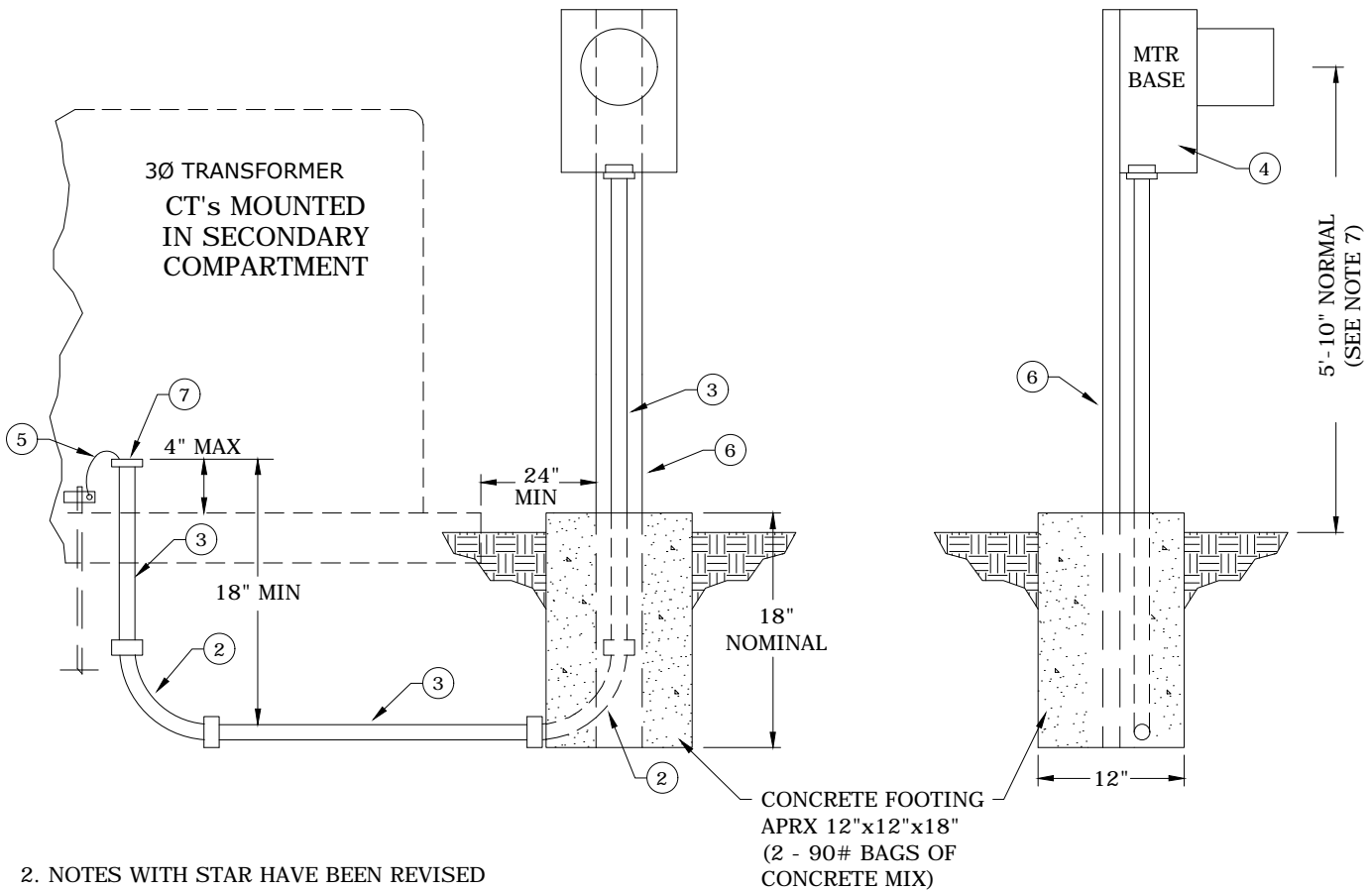


PLAN VIEW

TRANSFORMER PAD & METER FOOTING

Notes:

1. CIRCLE AW 121413 OR EQUIVALENT. METER BASE, 13 POINT, W/SPACE FOR TEST SWITCH.
2. CT's WILL BE FURNISHED BY CPU. \*
3. CUSTOMER WILL INSTALL ASSEMBLY WHEN TRANSFORMER & PAD ARE INSTALLED.
4. CUSTOMER TO POUR CONCRETE FOOTING FOR METER.
5. MAY BE REDUCED TO 4' PROVIDED NOT LESS THAN FLUSH WITH TOP OF TRANSFORMER.
6. THIS INSTALLATION SHALL BE USED ONLY WHEN IT IS IMPRACTICAL TO INSTALL THE METER ON THE BUILDING AND ONLY AFTER DISTRICT APPROVAL.



2. NOTES WITH STAR HAVE BEEN REVISED  
 1. REMOVED CT CAN

ITEM NO.	DESCRIPTION	M20	
		QTY.	S/N
1	Locknut 1"	3	---
2	Ell-90° Cond. 1" Rigid or Sch. 80 PVC	2	---
3	Conduit 1" Rigid or Sch. 80 PVC	Ft.	---
4	Meter Base W/ Test Block - See Note 1	1	---
5	Ground Wire #6 Cu	Ft.	---
6	Channel Support 3" x 8" x 3/8", 5'6"	1	---
7	Bushing Conduit Grounding	4	---



CONSTRUCTION STANDARDS

PAD & ASSEMBLY  
 SECONDARY METERING  
 FOR PADMOUNT TRANSFORMER

PAGE:  
1 of 1

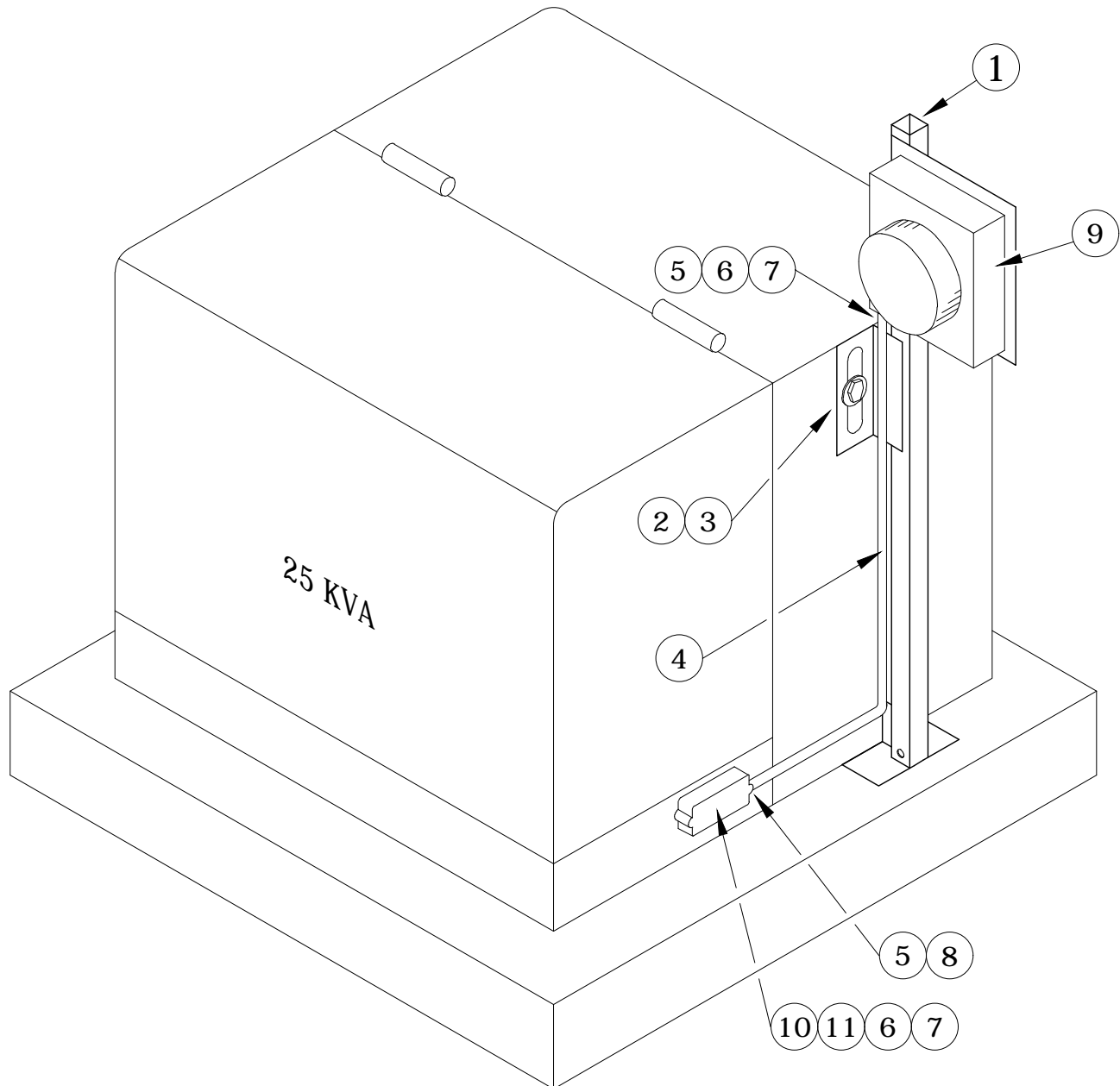
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REVISIONS			
Δ	DATE	ENGR	OPS
1	2/22/00	HWH	MA
2	8/1/00		

APP:	SECTION
DATE: 1/31/80	900





\* M.D.S. MEANS METER DEPARTMENT STOCK

ITEM NO.	DESCRIPTION	M23	
		QTY.	S/N
1	CT METER BASE SUPPORT DRAWING MBCT	1	M.D.S. *
2	MACHINE BOLT 5/8" X 1"	1	138
3	WASHER, FLAT, ROUND, GALV, 5/8"	1	1395
4	CONDUIT, PVC, SCH. 40, 3/4"	43"	1564
5	ADAPTER, PVC, MALE, 3/4"	1	M.D.S. *
6	BUSHING, INSULATED, 3/4"	1	2027
7	LOCKNUT, 3/4"	2	M.D.S. *
8	CONDULET, L.B., 3/4"	10'	M.D.S. *
9	METER BASE, 6, TERMINAL	1	M.D.S. *
10	REDUCER, 3/4" X 2"	1	M.D.S. *
11	NIPPLE, 3/4", CLOSE	1	M.D.S. *



### CONSTRUCTION STANDARDS

DISTRICT INSTALLED  
CT METERING AT PADMOUNT  
TRANSFORMER

#### REVISIONS

REV	DATE	ENGR	OPS
1	2/23/00	HWH	MA

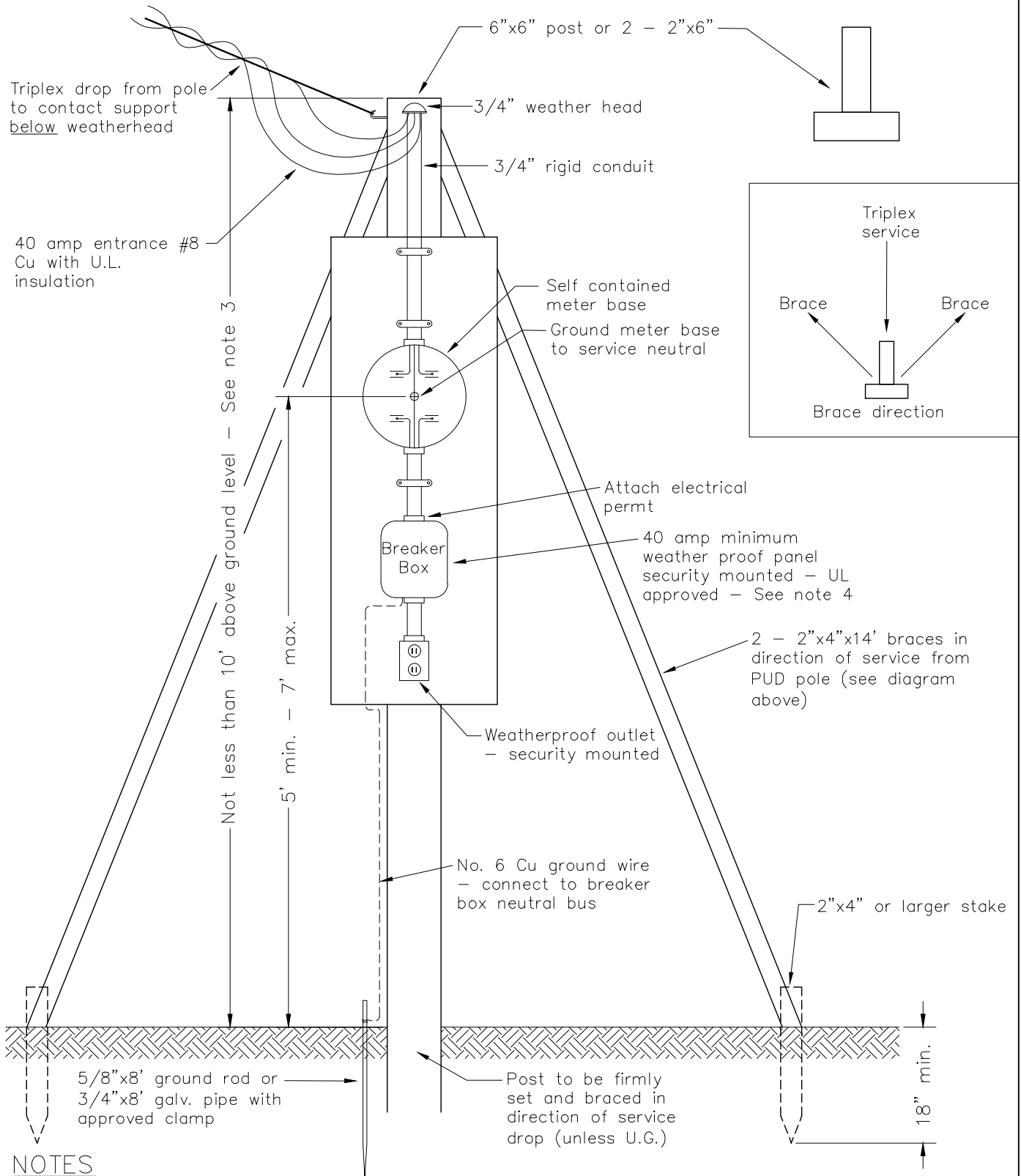
PAGE:  
1 of 1

**M23**

CAD FILE:  
M23

APP:  
DATE: 4/92

SECTION  
**900**



**NOTES**

1. Install service and support 3' from pedestal for U.G. service.
2. Ground equipment per state and local code requirements.
3. Service must clear driveways 12' and streets 18'.
4. Panel circuit breakers must have 10,000 amp interrupting rating.
5. DO NOT attach to district poles.

This installation must be inspected by the Dept. of Labor & Industries before Clark Public Utility can energize.

Dept. of Labor & Industries, 896-2350  
City of Vancouver, 696-8105



**CONSTRUCTION STANDARDS**  
LAYOUT FOR TEMPORARY ELECTRICAL SERVICE  
120/240V - 3 WIRE

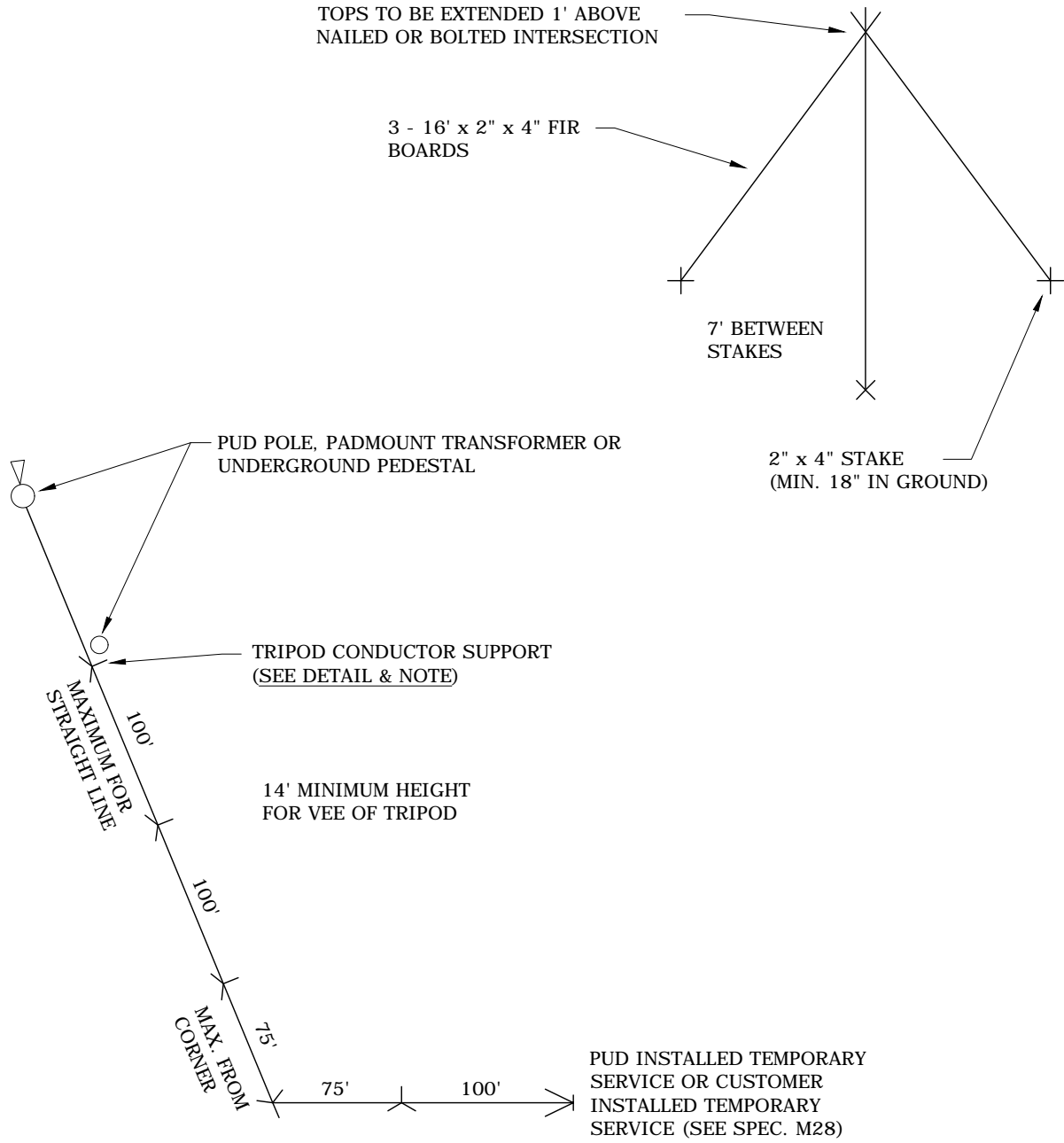
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1 of 1

**M28**

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M28

REVISIONS			
DATE	ENGR	OPS	
3/02			
Redrawn In Cad			
APP:	SECTION		
DATE: 1965	900		

**TRIPOD DETAIL**



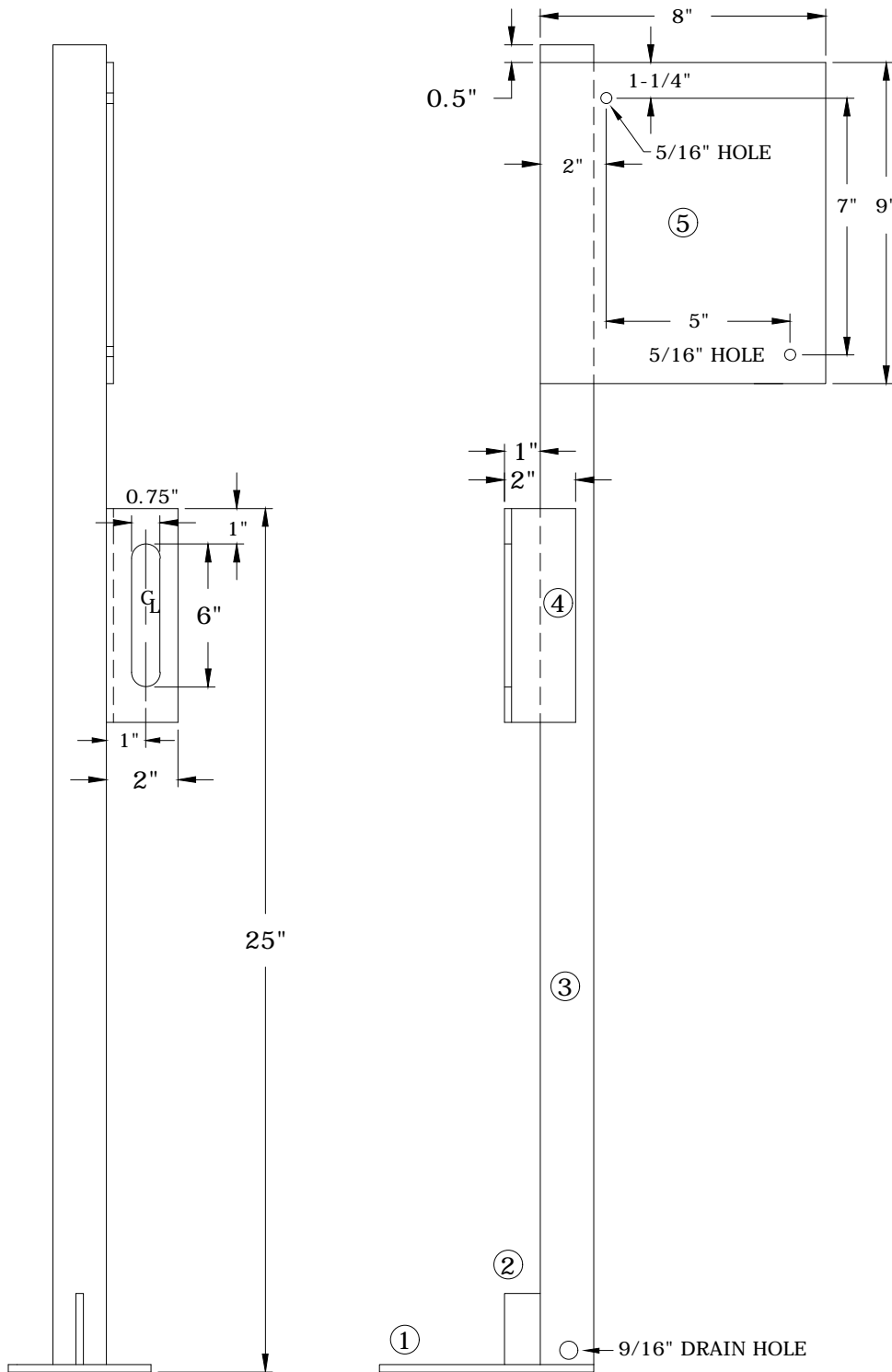
**Note:** IF SERVICE CROSSES A ROADWAY, USE 24' x 2" x 6" FIR BOARDS FOR TRIPODS & PLACE ADJACENT TO ROADWAY TO REDUCE CONDUCTOR SPAN & PROVIDE MINIMUM OF 18' CLEARANCE (CHECK WITH PUD ENGINEER IF SERVICE ROUTE CROSSES STATE HIGHWAY).

TO BE USED ONLY WITH DISTRICT APPROVAL



**CONSTRUCTION STANDARDS**  
CONDUCTOR SUPPORTS  
FOR TEMPORARY ELECTRIC SERVICE

REVISIONS			
NO.	DATE	ENGR	OPS
1	3/02		
⚠ Redrawn In Cad			
APP:		SECTION	
DATE: 8/76		900	



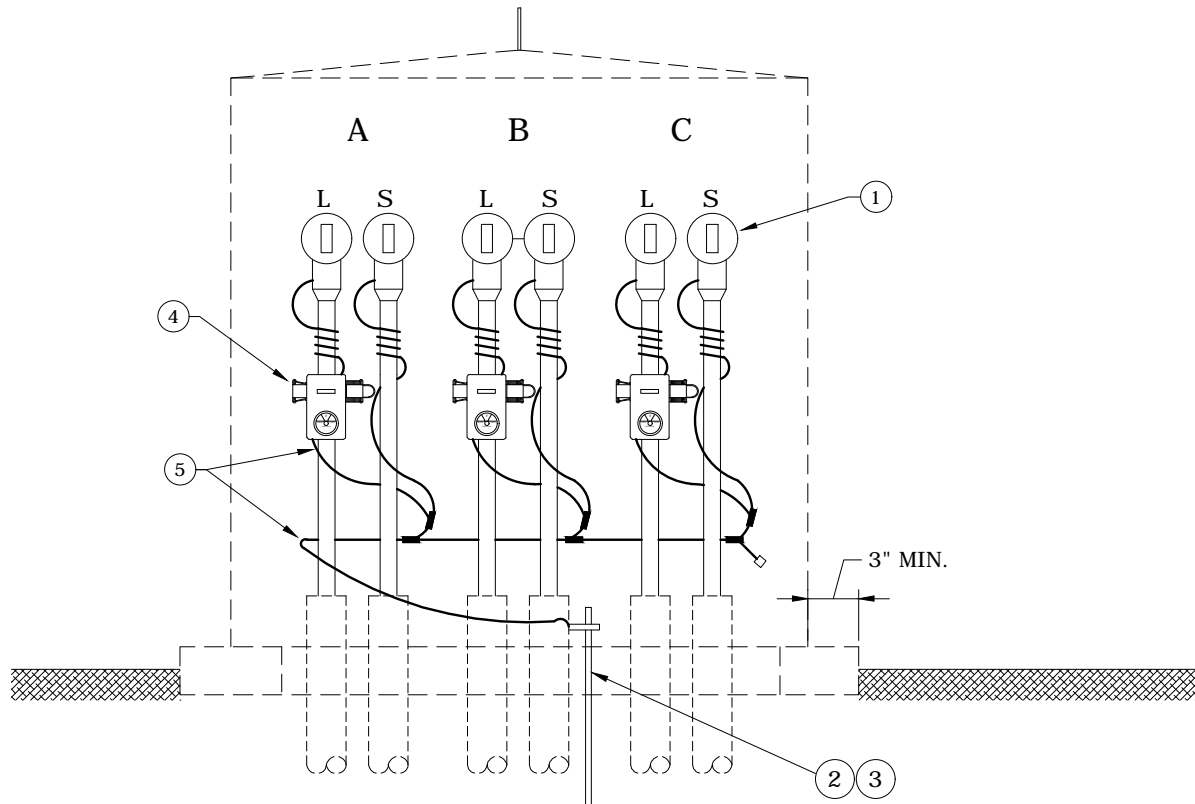
NOTE: HOT DIP GALVANIZE AFTER FABRICATION

ITEM NO.	DESCRIPTION	MBCT	
		QTY.	S/N
1	Plate, Steel Base, 4" x 6" x 1/8"	-	--
2	Plate, Steel Spacer, 1" x 2" x 1/8"	-	--
3	Tube, 1/8" Square, 1 1/2" x 36"	-	--
4	Angle Steel, 1/8" Thick, 2" x 2" x 8"	-	--
5	Plate, Steel, 8" x 9" x 1/8"	-	--



**CONSTRUCTION STANDARDS**  
 CT METER BASE SUPPORT FOR  
 PADMOUNT TRANSFORMER

REVISIONS			
NO.	DATE	ENGR	OPS
1	2/23/00	HWH	MA



**ELEVATION**  
**FRONT VIEW**

ALL NEUTRAL EXTENSIONS SHALL BE #2 B.C.

NOTE: PRIMARY METER ENCLOSURE IS NOT A STOCK ITEM. FOR A REPLACEMENT FOR CPU MAINTENANCE, A "PURCHASE REQUISITION" MUST BE GENERATED BY THE ENGINEER FOR PURCHASING. PURCHASING WILL GENERATE THE "PURCHASE ORDER." A COPY OF THE SPECIFICATION FOR THE ENCLOSURE IS IN THE METERING MANUAL.

REV 2: CHANGED TO CURRENT-RESET FAULT INDICATORS & ADDED NOTES

ITEM NO.	DESCRIPTION	UM1	
		QTY.	S/N
1	Terminator, Elbow L.B. 200A	6	1312
2	Clamp, Ground Rod 5/8" SML	1	281
3	Clamp, Ground Rod 5/8" x 8'	1	1124
4	Fault Indicator	3	2581 *
5	Conductor, Copper, #2 Sol. BCSD	40	1553



**CONSTRUCTION STANDARDS**  
PRIMARY 3 PHASE  
METERING ENCLOSURE

REVISIONS			
DATE	ENGR	OPS	
2/23/00	HWH	MA	
8/2/05	LB	AH	

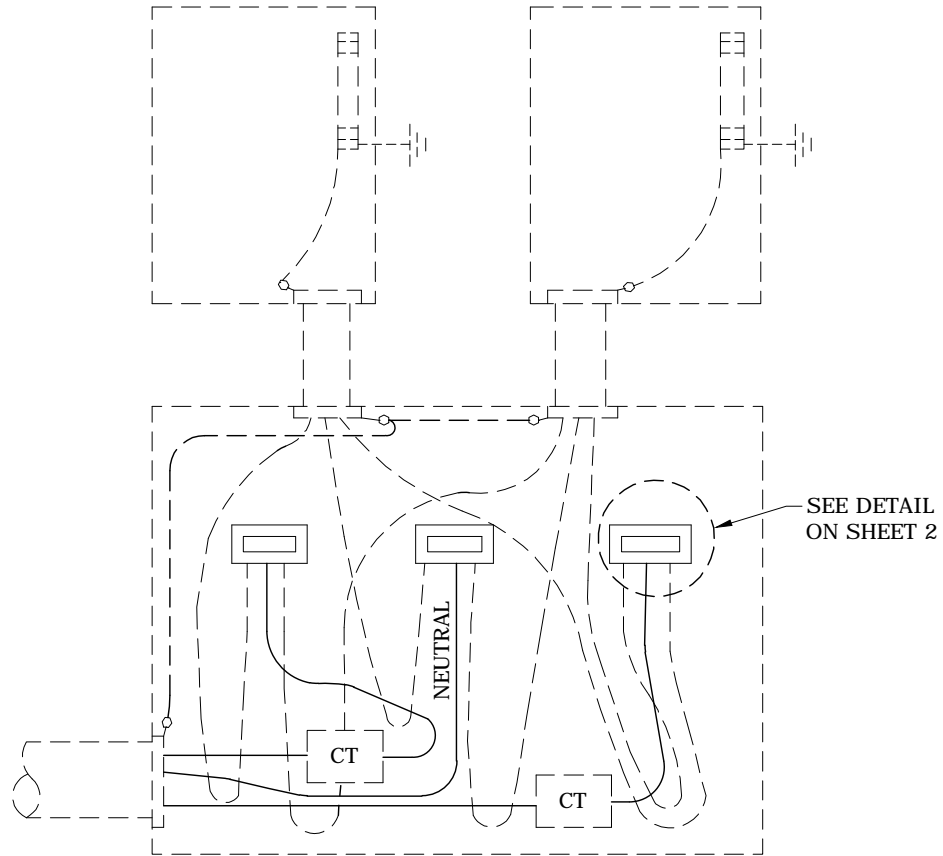
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1 of 1

**UM1**

CAD FILE:  
UM1

APP:  
DATE: 9/94

SECTION  
**900**



**C.T. CAN  
FRONT VIEW**

NOTE: FOR CONDUCTORS 1/0 TO 350 KCM ALUMINUM

REV 1. NOTES FOLLOWED BY STAR HAVE BEEN REVISED

REV 2. REMOVED 3Ø FROM TITLE AND CORRECTED NOTE & MATERIAL ISSUE



**CONSTRUCTION STANDARDS**

SECONDARY 1Ø  
CT METERING ASSEMBLIES  
RESIDENTIAL

REVISIONS

△	DATE	ENGR	OPS
1	2/23/00	HWH	MA
2	8/2/05	LB	AH

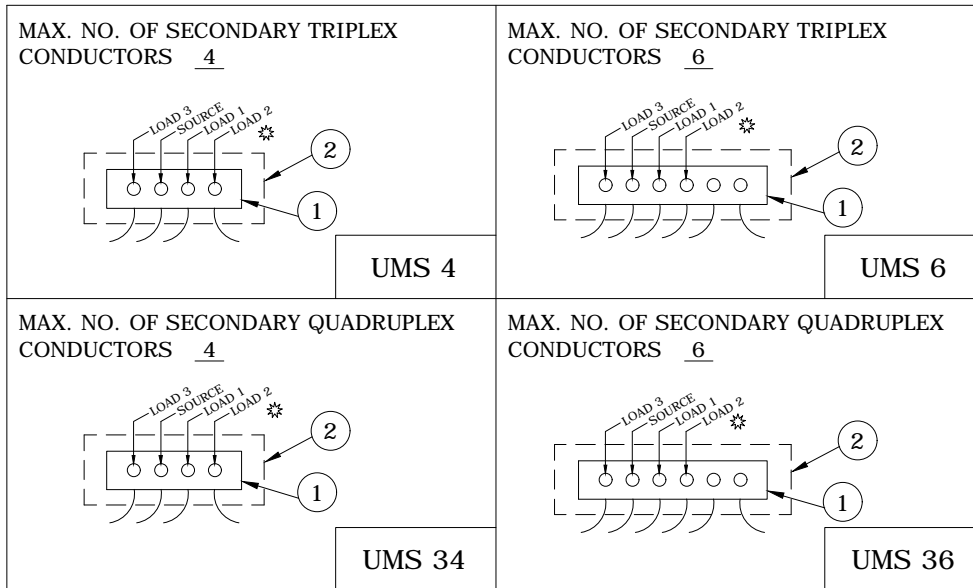
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1 of 2

UMS4, UMS6, UMS34, UMS36

CAD FILE:  
UMS4

APP:  
DATE: 9/94

SECTION  
**900**



REV 2. REMOVED 3Ø FROM TITLE AND CORRECTED NOTE & MATERIAL ISSUE

ITEM NO.	DESCRIPTION	UMS4	
		QTY.	S/N
1	Connector, Pedestal 4	3	528
2	Cover, Connector	3	573 *
ITEM NO.	DESCRIPTION	UMS6	
		QTY.	S/N
1	Connector, Pedestal 6	3	531
2	Cover, Connector	3	574
ITEM NO.	DESCRIPTION	UMS34	
		QTY.	S/N
1	Connector, Pedestal 4	4	528
2	Cover, Connector	4	573 *
ITEM NO.	DESCRIPTION	UMS36	
		QTY.	S/N
1	Connector, Pedestal 6	4	531
2	Cover, Connector	4	574

	<h2>CONSTRUCTION STANDARDS</h2> <p>SECONDARY 1Ø CT METERING ASSEMBLIES RESIDENTIAL</p>			<b>REVISIONS</b>					
		DATE	ENGR	OPS					
	1	2/23/00	HWH	MA					
	2	8/2/05	LB	AH					
<p>PAGE: 2 of 2</p>		<p>UMS4, UMS6, UMS34, UMS36</p>		<p>CAD FILE: UMS4</p>		<p>APP: _____</p>		<p>SECTION 900</p>	
				<p>DATE: 9/94</p>					

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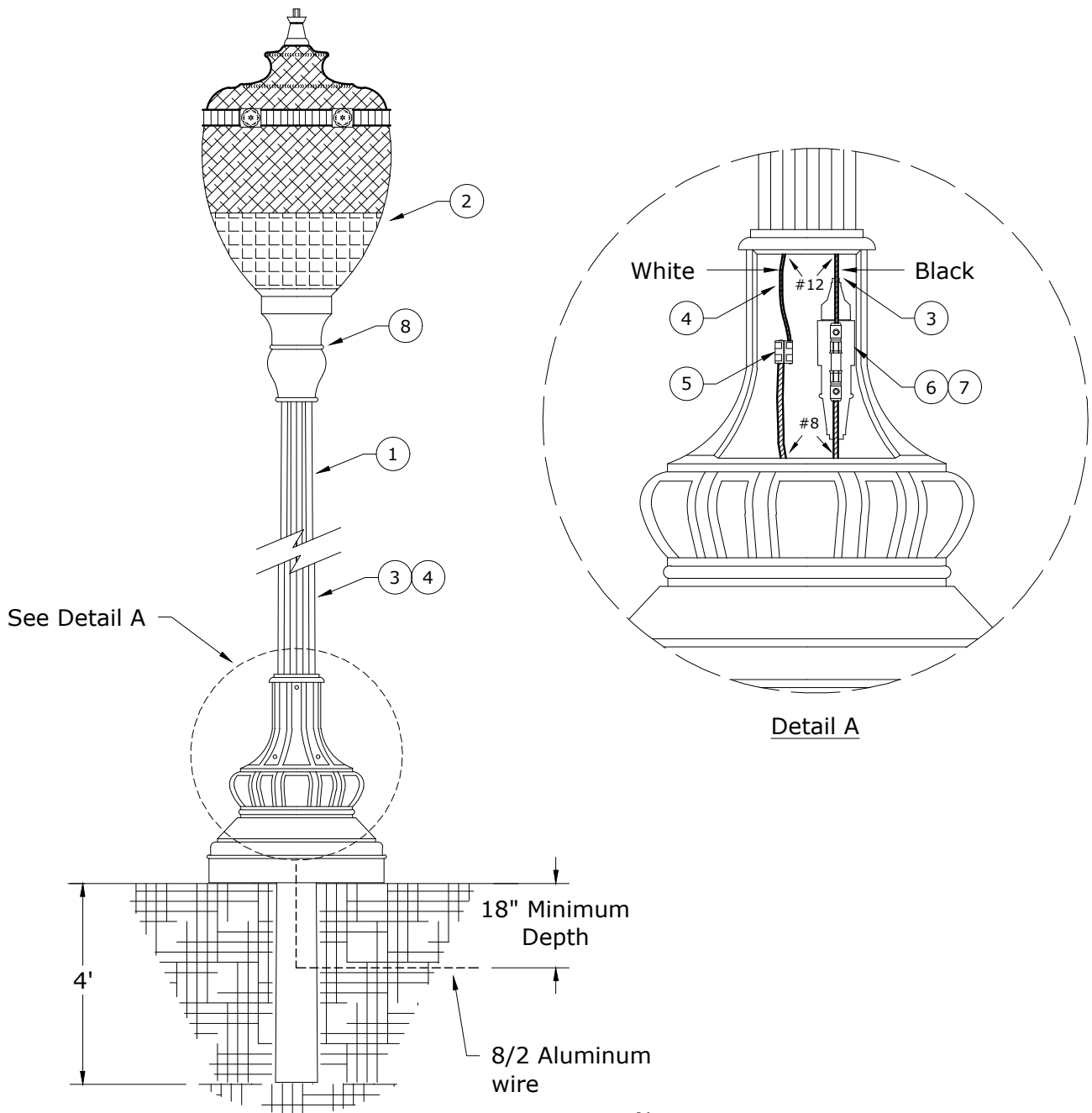
## STREETLIGHTING

6/1/2022

<b>C</b>	DLLED	Decorative LED Area Lighting, Single Acorn, Fiberglass Pole
<b>C</b>	DLTLED	Decorative LED Area Lighting, Twin Acorn, Fiberglass Pole
<b>C</b>	DLSH	Decorative HPS Area Lighting, Shepherds Hook Fiberglass Pole, For Maintenance Only
<b>N</b>	FL200LED- FL400LED	Area LED Light, Floodlight, Wood Pole Mounted
<b>N</b>	HLLED	Area LED Light, High Light, Wood Pole Mounted
<b>C</b>	SL	General Streetlighting, Light Patterns
<b>N</b>	SL100LED- SL200LED	Streetlight, 100/200W Equiv. LED Cobrahead, Wood Pole Mounted
<b>N</b>	SL100ALED- SL200ALED	Streetlight, 100/200W Equiv. LED Cobrahead, Single Arm, Aluminum Pole, Direct Burial
<b>N</b>	SL100SALED	Streetlight, 100W Equiv. LED Cobrahead, Short Mast Arm, Aluminum Pole, Direct Burial
<b>N</b>	SL100SFLED- SL200SFLED	Streetlight, 100/200W Equiv. LED Cobrahead, Single Arm, Aluminum Pole, Anchor Base
<b>M</b>	SL200SFDLED	Streetlight, 200W Equiv. LED Cobrahead, Twin Arm, Aluminum Pole, Anchor Base
<b>C</b>	SLARM6- SLARM22	Streetlight, Mast Arm Installation, Wood Pole Mounted
<b>C</b>	SLF	Streetlight Foundation, Steel - 6" Diameter
~	SLPT	Streetlight Pole Tagging
<b>C</b>	SLR	Secondary Overhead to Underground Riser Assembly, For Streetlight Feeder

<b>N</b>	New Standard
<b>R</b>	Redrawn Standard
<b>C</b>	Changed Standard
~	No Change





**Notes:** Installation meets NESC not NEC.

ITEM NO	DESCRIPTION	DLLED	
		QTY	S/N
1	Pole, Streetlight, Fiberglass, Direct Burial, 14.5' Mounting Height, Fluted Shaft, Clamshell Base	1	2219
2	Luminaire, Post Top Acorn, LED, 60W, 120V, Type 3, 3000K	1	2845
3	Cable, 600V, Cu, #12, 19-Str, Black, 1C	25 ft	386
4	Cable, 600V, Cu, #12, 19-Str, White, 1C	25 ft	387
5	Connector, H-Tap, Al/Cu, Run #6-#2 Str - Tap #14-#8 Str	1	416
6	Fuse, 10A, 250V, Time Delay, Streetlight	1	2389
7	Holder, Fuse, Streetlight	1	2388
8	Photoeye, LED and HPS, 120V, 3-pin	1	2872



**CONSTRUCTION STANDARDS**  
 DECORATIVE LED AREA LIGHTING  
 SINGLE ACORN  
 FIBERGLASS POLE

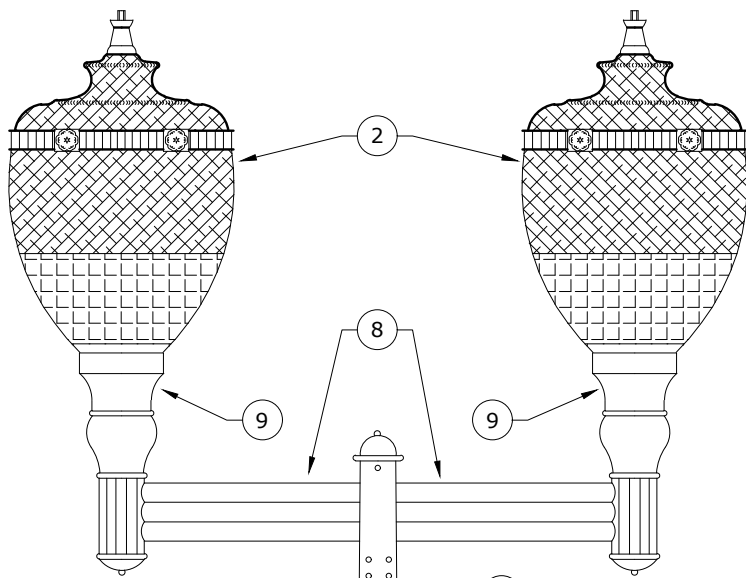
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1 of 1

**DLLED**

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DLLED

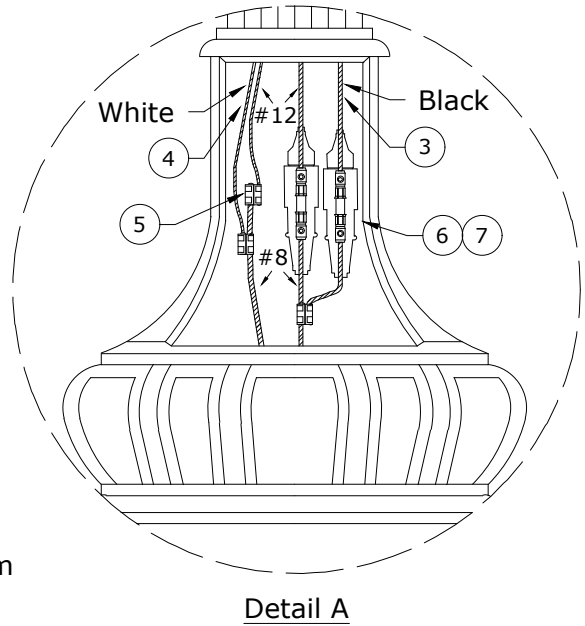
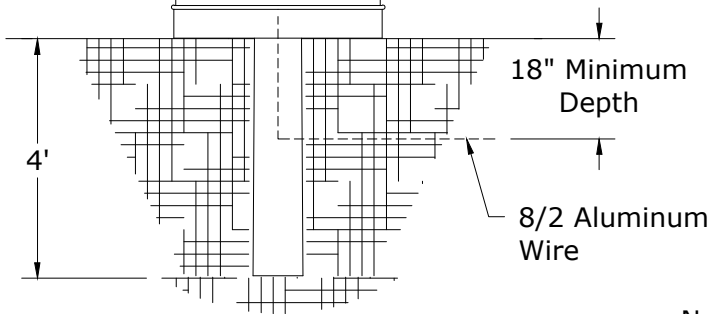
REVISIONS			
DATE	ENGR	OPS	

APP: DRK/KJP	SECTION
DATE: 6/1/22	<b>1000</b>



See Detail A

Hand Hole Cover



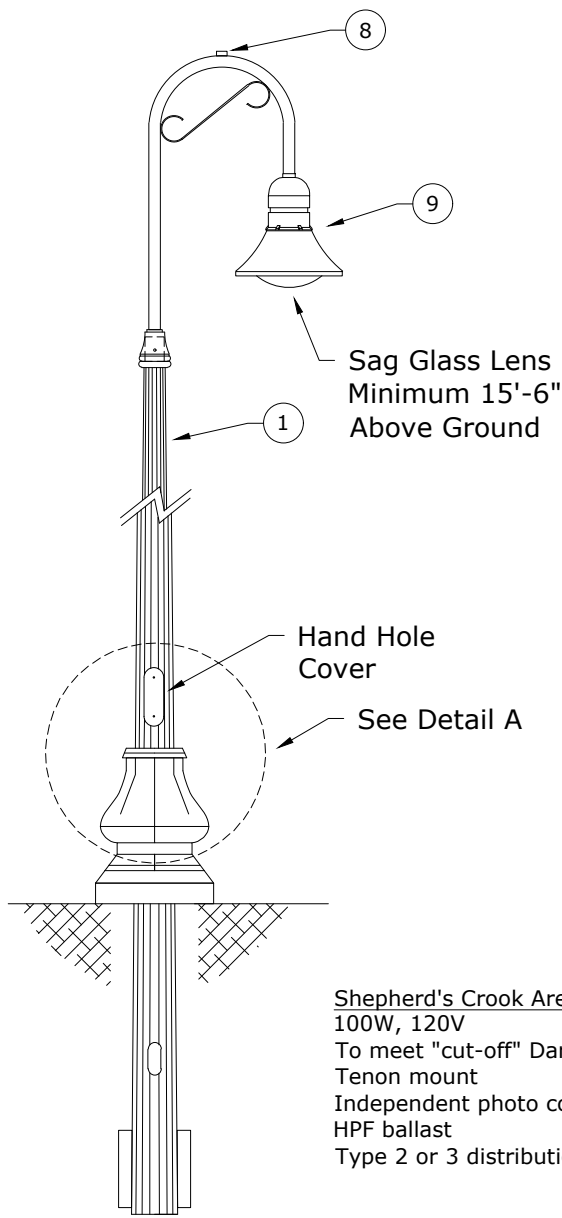
Notes: Installation meets NESC not NEC.

ITEM NO	DESCRIPTION	DLTLED	
		QTY	S/N
1	Pole, Streetlight, Fiberglass, Direct Burial, 14.5' Mounting Height, Fluted Shaft, Clamshell Base	1	2219
2	Luminaire, Post Top Acorn, LED, 60W, 120V, Type 3, 3000K	2	2845
3	Cable, 600V, Cu, #12, 19-Str, Black, 1C	25 ft	386
4	Cable, 600V, Cu, #12, 19-Str, White, 1C	25 ft	387
5	Connector, H-Tap, AL/CU, Run #6-#2 Str - Tap #14-#8 Str	3	416
6	Fuse, 10A, 250V, Time Delay, Streetlight	2	2389
7	Holder, Fuse, Streetlight	2	2388
8	Arm, Twin Fixture, 3" O.D. x 2-7/8" Tenon, Black	1	2200
9	Photoeye, LED and HPS, 120V, 3-pin	2	2872

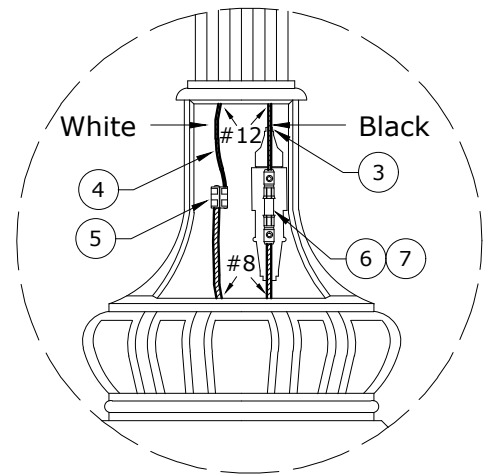


**CONSTRUCTION STANDARDS**  
 DECORATIVE LED AREA LIGHTING  
 TWIN ACORN  
 FIBERGLASS POLE

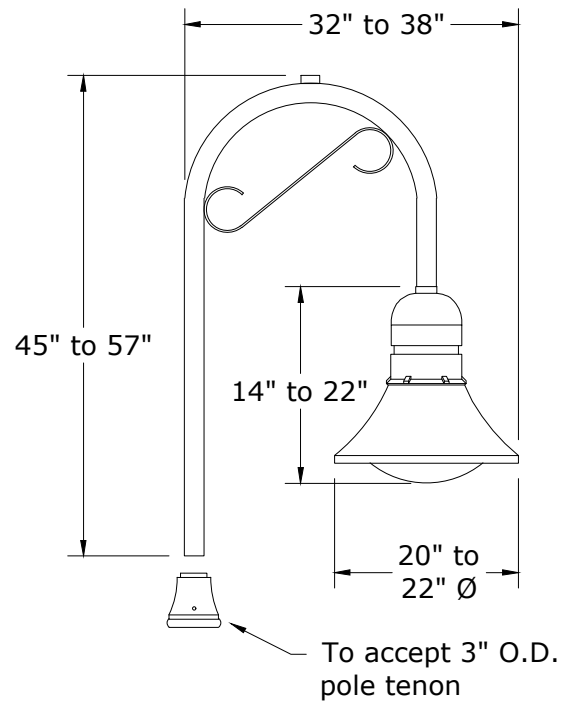
REVISIONS			
DATE	ENGR	OPS	



Shepherd's Crook Area Light Specifications  
 100W, 120V  
 To meet "cut-off" Dark Skies designation  
 Tenon mount  
 Independent photo control  
 HPF ballast  
 Type 2 or 3 distribution pattern



Detail A



- Notes:
1. For maintenance only.
  2. Dimensions are approximate.
  3. Color: Black matte or semi-gloss.

ITEM NO	DESCRIPTION	DLSH	
		QTY	S/N
1	Pole, Streetlight, Fiberglass, Direct Burial, 14.5' Mounting Height, Fluted Shaft, Clamshell Base	1	2219
2	Luminaire, Shepherd Hook, HPS, 100W 120V, Med. Base, Type 2&3	1	2565
3	Cable, 600V, Cu, #12, 19-Str, Black, 1C	35 ft	386
4	Cable, 600V, Cu, #12, 19-Str, White, 1C	35 ft	387
5	Connector, H-Tap, Al/Cu, Run #6-#2 Str - Tap #14-#8 Str	1	416
6	Fuse, 10A, 250V, Time Delay, Streetlight	1	2389
7	Holder, Fuse, Streetlight	1	2388
8	Photoeye, LED and HPS, 120V, 3-pin	1	2872
9	Lamp, HPS, 100W, 55V	1	1745

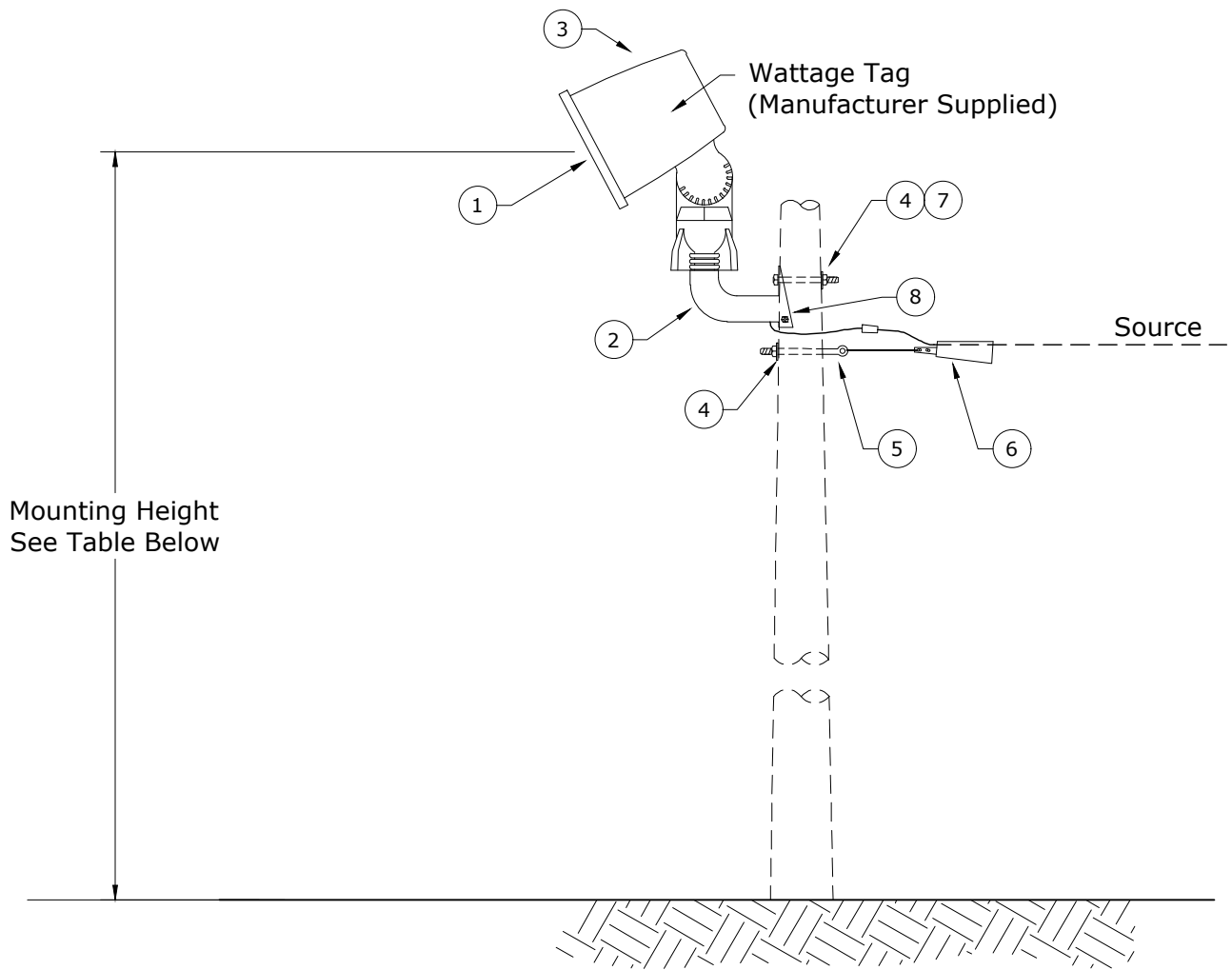


**CONSTRUCTION STANDARDS**

DECORATIVE HPS AREA LIGHTING  
 SHEPHERDS HOOK FIBERGLASS POLE  
 FOR MAINTENANCE ONLY

REVISIONS

REV	DATE	ENGR	OPS
0	8/24/04	LB	AH
1	4/19/22	DRK	



Mounting Height  
See Table Below

RECOMMENDED MOUNTING HEIGHTS			
TYPE	PREFERRED	MINIMUM	MAXIMUM
200W	30 ft	20 ft	32 ft
400W	35 ft	25 ft	37 ft

**Notes:** Installation meets NESC not NEC.

ITEM NO	DESCRIPTION	FL200LED		FL400LED	
		QTY	S/N	QTY	S/N
1	Luminaire, Floodlight, LED, 3000k, HPS-Equivalent	1	2906	1	2907
2	Bracket, Floodlight, PM1, Single Pole Mt.	1	211	1	211
3	Photoeye, LED and HPS, 120V, 3-pin	1	2872	1	2872
4	Washer, Square Flat 5/8" x 2 1/4" x 2 1/4"	2	1412	2	1412
5	Bolt, Eye, 5/8" x 12", Galv, 12,400 LB Ultimate Tensile	1	107	1	107
6	Clamp, Wedge #6-#2 ACSR, Solid Bail	1	310	1	310
7	Bolt, Machine, 5/8" x 12", Galv, 12,400 LB, Ultimate Tensile	1	155	1	155
8	Screw, Lag 1/2" x 3", Fetter Drive, Drive Point	2	1131	2	1131



## CONSTRUCTION STANDARDS

AREA LED LIGHT  
FLOODLIGHT  
WOOD POLE MOUNTED

PAGE:  
1 of 1

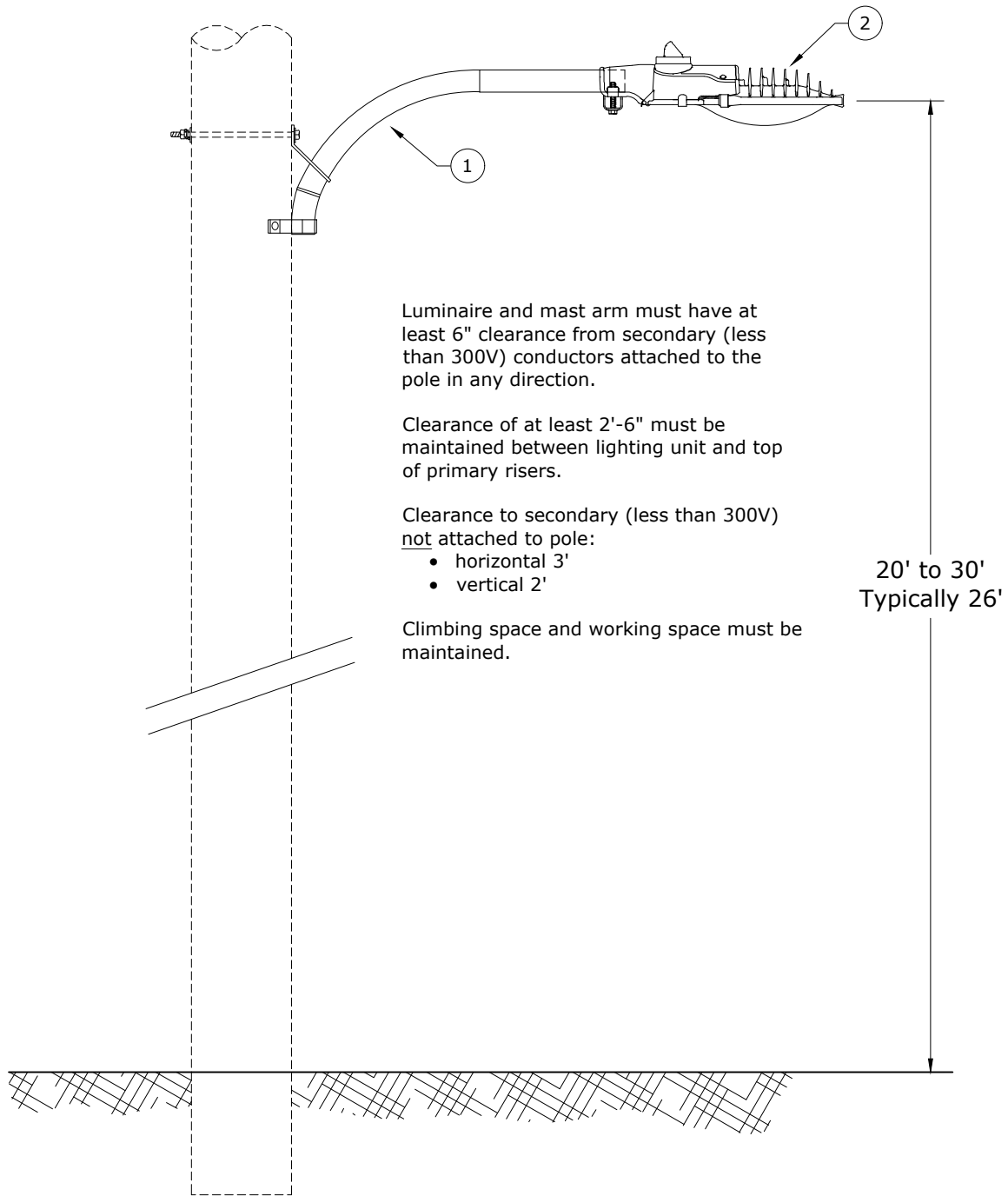
FL200LED, FL400LED

CAD FILE:  
FL200LED

REVISIONS			
DATE	ENGR	OPS	

APP: DRK/KJP  
DATE: 6/1/22

SECTION  
1000



Luminaire and mast arm must have at least 6" clearance from secondary (less than 300V) conductors attached to the pole in any direction.

Clearance of at least 2'-6" must be maintained between lighting unit and top of primary risers.

Clearance to secondary (less than 300V) not attached to pole:

- horizontal 3'
- vertical 2'

Climbing space and working space must be maintained.

20' to 30'  
Typically 26'

Notes: Installation meets NESC not NEC.

ITEM NO	DESCRIPTION	HLLED	
		QTY	S/N
1	Arm, Mast Al 2', Highlite, Wood Pole	1	44
2	Luminaire, High Light, LED, 3000K, Integrated Photoeye, HPS Equivalent	1	2890



### CONSTRUCTION STANDARDS

AREA LED LIGHT  
HIGH LIGHT  
WOOD POLE MOUNTED

REVISIONS			
△	DATE	ENGR	OPS

PAGE:  
1 of 1

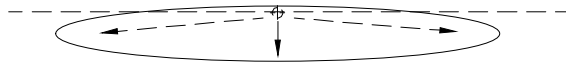
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CAD FILE:  
HLLED

APP: DRK/KJP  
DATE: 6/1/22

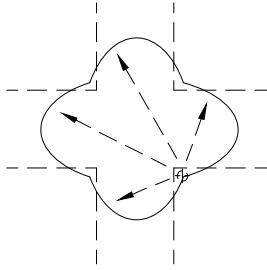
SECTION  
**1000**

# X. LIGHTING TYPES



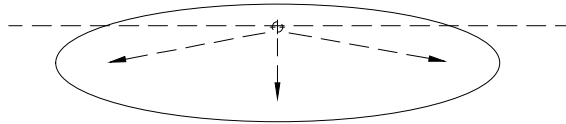
## IES TYPE II

For use on narrow to medium width street using mast arm mounted luminaire. Mount at right angle (90°) with centerline of street. Not a CPU standard.



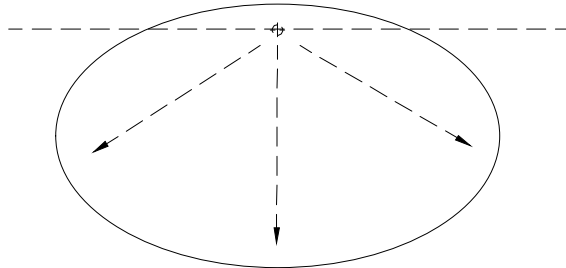
## IES TYPE II 4-WAY

For use at intersections when only one mast arm mounted luminaire can be used. Mount luminaire as near as possible to center of intersection. Not a CPU standard.



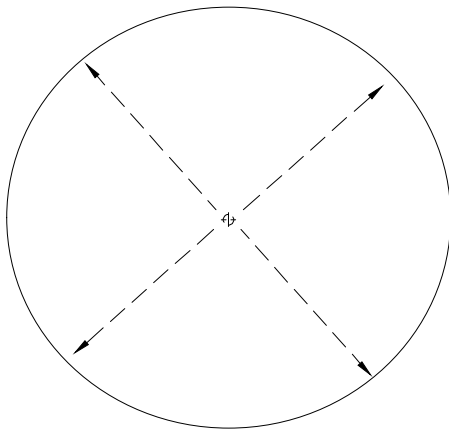
## IES TYPE III

For use on wide width streets using mast arm mounted luminaires. Mount at right angle (90°) with centerline of street. Cobrahead and decorative acorns use this pattern.



## IES TYPE IV

For use in subdivision cul-de-sacs using specialized cobrahead luminaires. Aim luminaire as near as possible to center of cul-de-sac. Not a CPU standard.



## IES TYPE V

Yard lights (HLED) use this pattern when located in center of area to be illuminated.

## FLOODLIGHTS

1. To be used for parking lots, storage areas, etc. Not to be used for streetlighting.
2. Always take into account unintentional light trespass on surrounding areas prior to installation.
3. Floodlights used by CPU have a beam spread of 65° both vertically and horizontally.
4. Aiming of floodlight should be 1/2 to 2/3 of distance across area to be illuminated.

Rev. 2 - Added type of light to IES type and replaced Std. SL.



## CONSTRUCTION STANDARDS

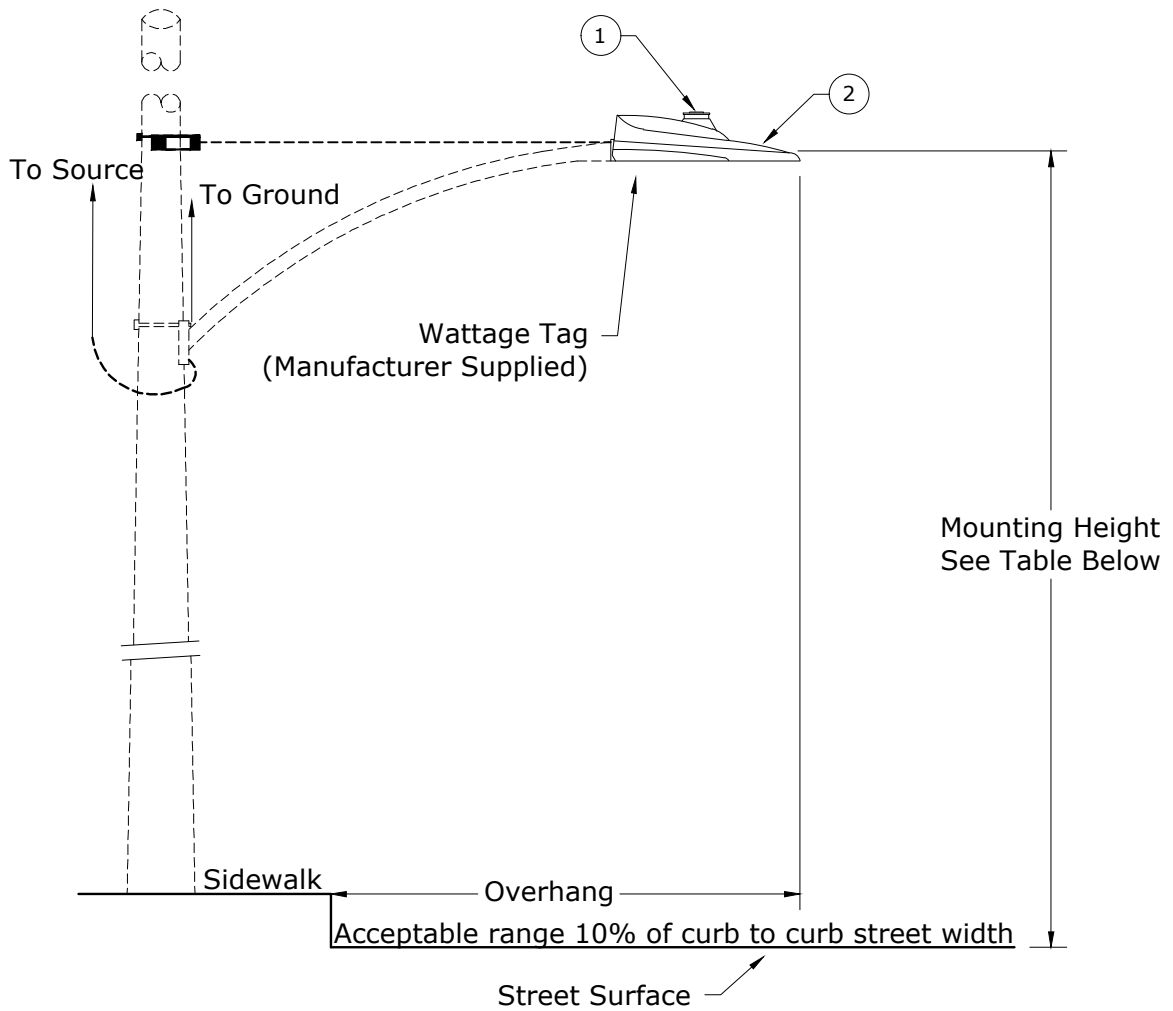
### GENERAL STREETLIGHTING LIGHT PATTERNS

REVISIONS			
DATE	ENGR	OPS	
0	2/23/00	HWH	MA
1	8/24/04	LB	AH
2	4/21/22	DRK	
APP: HWH/RGH		SECTION	
DATE: 1/13/82	1000		

PAGE:  
1 of 1

SL

CAD FILE:  
SL



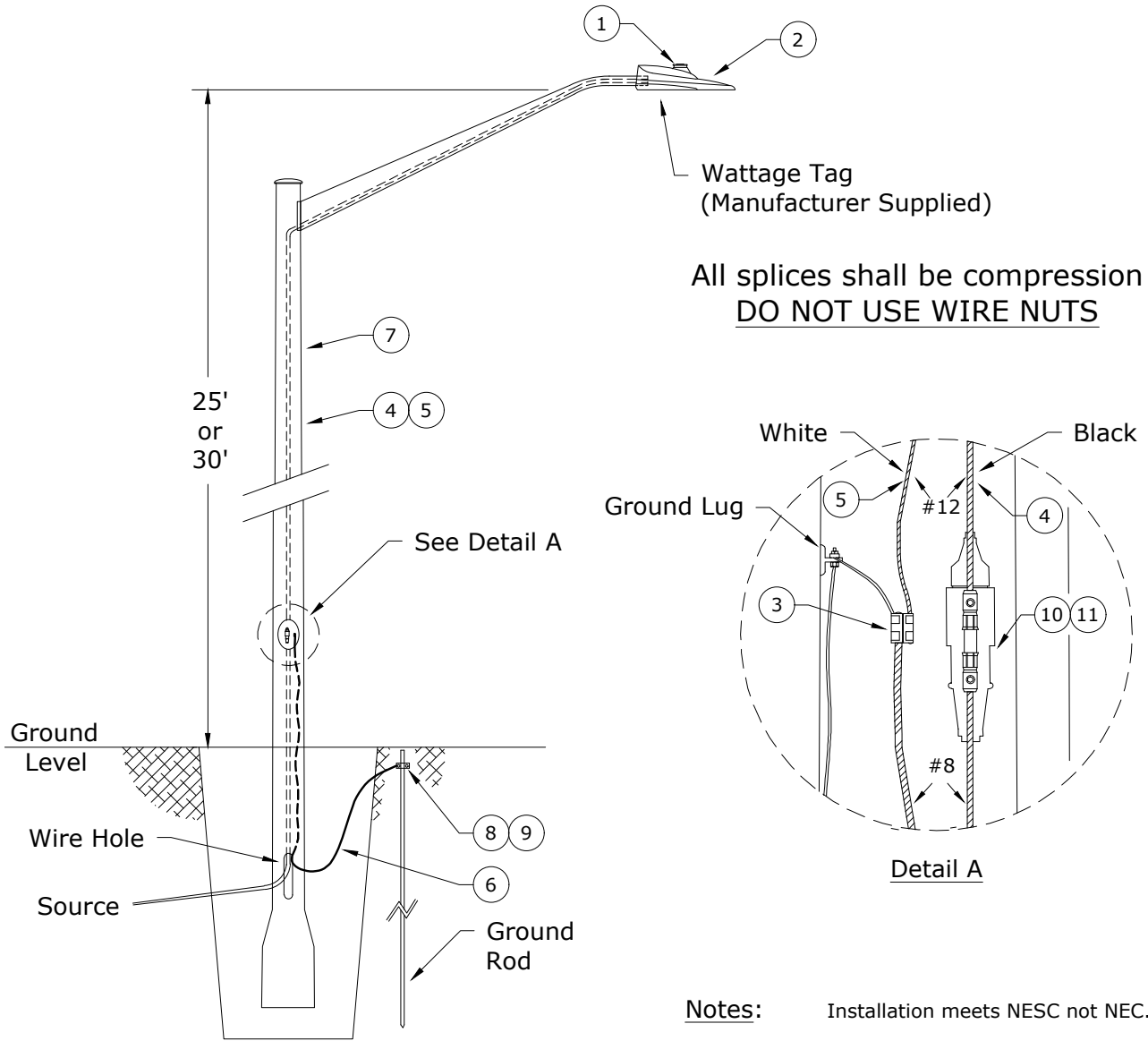
RECOMMENDED MOUNTING HEIGHTS		
TYPE	MINIMUM	MAXIMUM
100W	25 ft	27 ft
200W	30 ft	32 ft

- Notes:**
1. Installation meets NESC not NEC.
  2. Mast arm attachment height varies with type of arm and must be positioned so luminaire is level.

Rev. 1 - Updated to LED and added note #1.

ITEM NO	DESCRIPTION	SL100LED		SL200LED	
		QTY	S/N	QTY	S/N
1	Photoeye, LED and HPS, 120V, 3-Pin	1	2872	1	2872
2	Luminaire, Cobrahead, LED, Type 3, 3000K, HPS Equivalent	1	2889	1	2895

	<b>CONSTRUCTION STANDARDS</b>			REVISIONS					
	STREETLIGHT 100/200W EQUIV. LED COBRAHEAD WOOD POLE MOUNTED			DATE	ENGR	OPS			
	1	6/1/22	DRK						
PAGE: 1 of 1		<b>SL100LED, SL200LED</b>		CAD FILE: SL100LED		APP: HWH/GLE		SECTION 1000	
				DATE: 1/31/80					



ITEM NO	DESCRIPTION	SL100ALED		SL200ALED	
		QTY	S/N	QTY	S/N
1	Photoeye, LED and HPS, 120V, 3-pin	1	2872	1	2872
2	Luminaire, Cobrahead, LED, Type 3, 3000K, HPS Equivalent	1	2889	1	2895
3	Connector, H-Tap, Al/Cu, Run #6-#2 Str, Tap #14-#8 Str	1	416	1	416
4	Cable, 600V, Cu, #12, 19-Str, Black, 1C	42 ft	386	42 ft	386
5	Cable, 600V, Cu, #12, 19-Str, White, 1C	42 ft	387	42 ft	387
6	Conductor, Cu, #6, Solid, Bare, Soft Drawn, 1C	2 ft	374	2 ft	374
7	Pole, Streetlight, Al, Direct Burial, 25' Mounting Height w/ 6' Arm *	1	2946	-	N/A
7	Pole, Streetlight, Al, Direct Burial, 30' Mounting Height w/ 6' Arm *	-	N/A	1	2945
8	Clamp, Ground Rod, 5/8", Bronze, Small	1	281	1	281
9	Rod, Ground, 5/8" x 8'	1	1124	1	1124
10	Fuse, 10A, 250V, Time Delay, Streetlight	1	2389	1	2389
11	Holder, Fuse, Streetlight	1	2388	1	2388

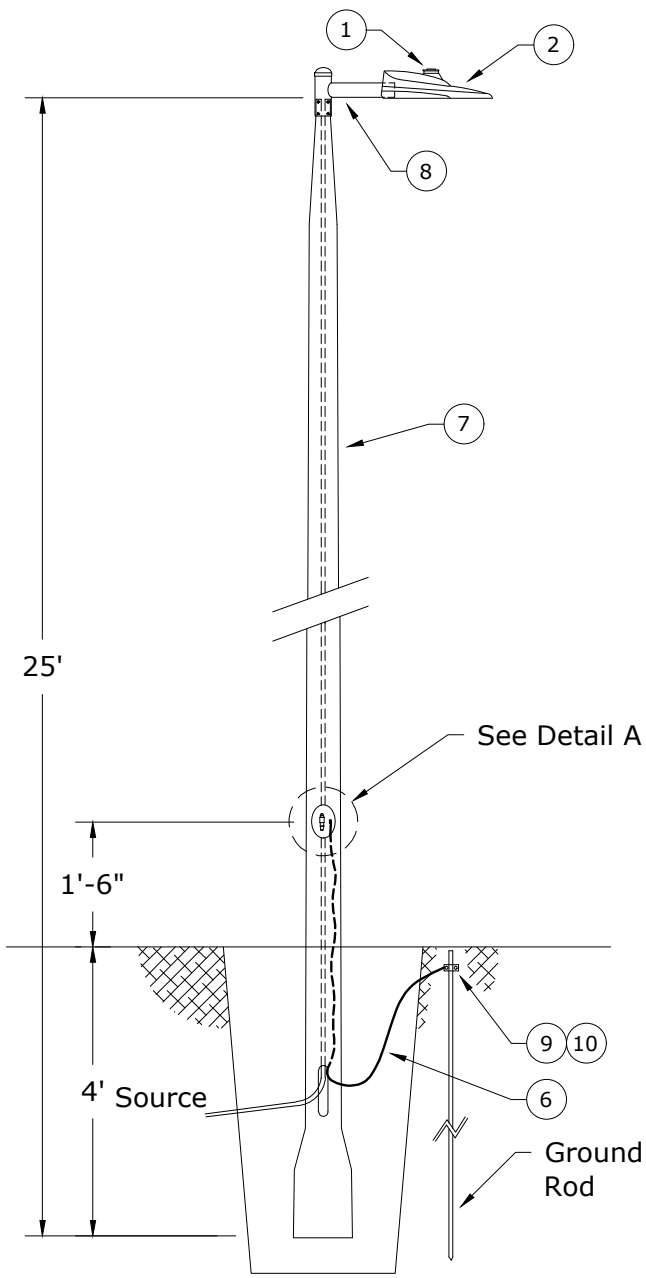


**CONSTRUCTION STANDARDS**  
STREETLIGHT, 100/200W EQUIV. LED COBRAHEAD  
SINGLE ARM  
ALUMINUM POLE, DIRECT BURIAL

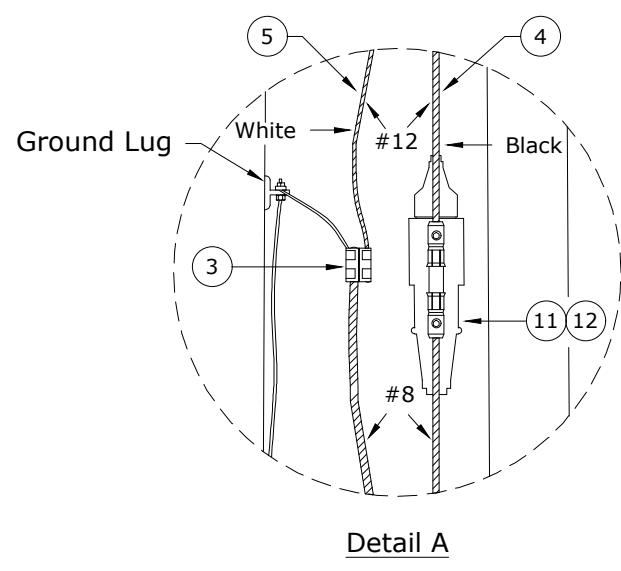
REVISIONS			
DATE	ENGR	OPS	

PAGE: 1 of 1	CAD FILE: SL100ALED	APP: DRK/KJP	SECTION: 1000
SL100ALED,SL200ALED	DATE: 6/1/22		





All splices shall be compression  
DO NOT USE WIRE NUTS



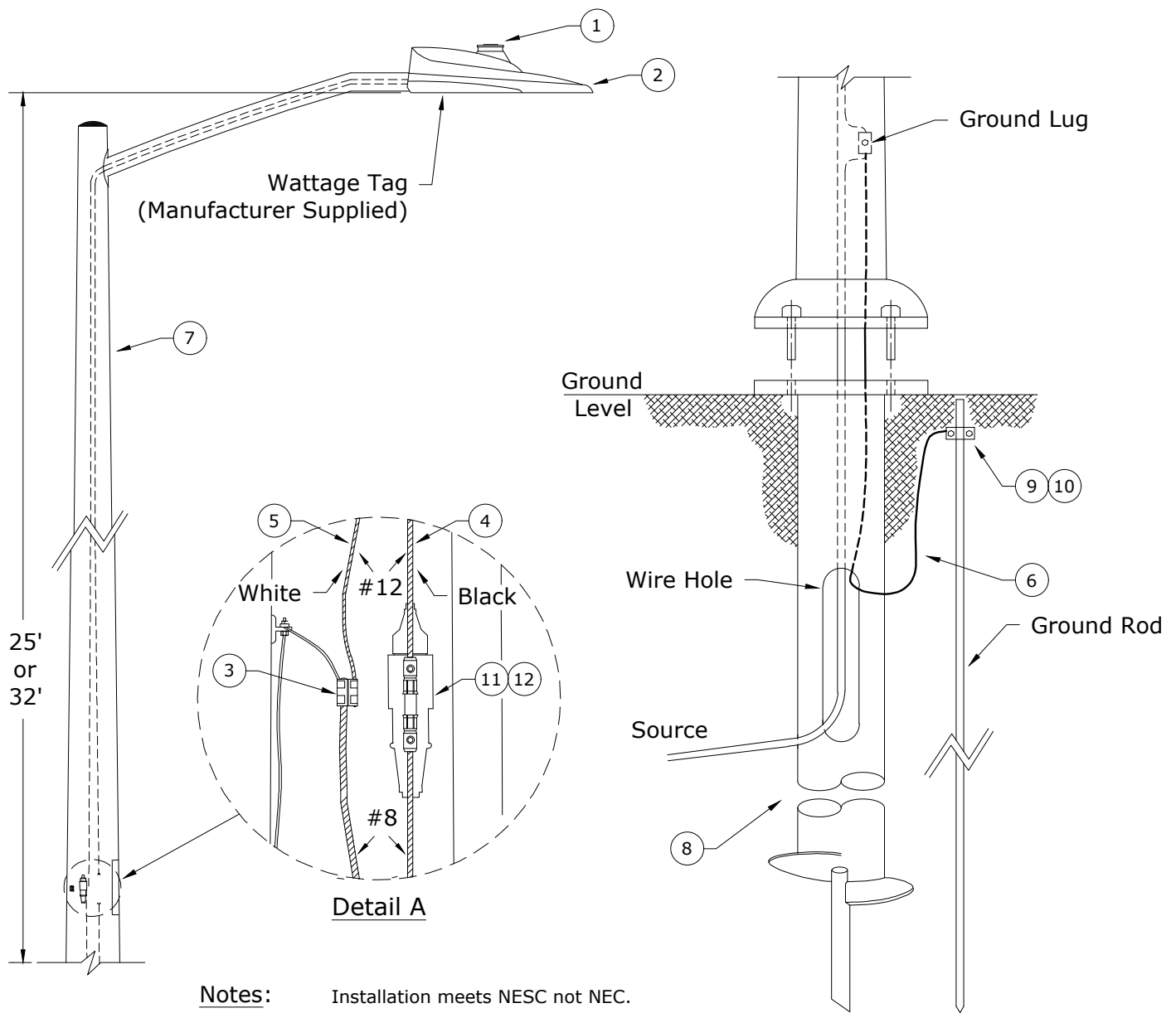
Notes: Installation meets NESC not NEC.

ITEM NO	DESCRIPTION	SL100SALED	
		QTY	S/N
1	Photoeye, LED and HPS, 120V, 3-pin	1	2872
2	Luminaire, Cobrahead, LED Type 3, 3000K, HPS Equivalent	1	2889
3	Connector, H-Tap, Al/Cu, Run #6-#2 Str - Tap #14-#8 Str	1	416
4	Cable, 600V, Cu, #12, 19-Str, Black, 1C	20 ft	386
5	Cable, 600V, Cu, #12, 19-Str, White, 1C	20 ft	387
6	Conductor, Cu, #6, Solid, Bare, Soft Drawn, 1C	2 ft	374
7	Pole, Streetlight, Al, Direct Burial, 25' Mounting Height, Post Top *	1	2947
8	Arm, Tenon-mount, Streetlight	1	2901
9	Clamp, Ground Rod, 5/8", Bronze, Small	1	281
10	Rod, Ground, 5/8" x 8'	1	1124
11	Fuse, 10A, 250V, Time Delay, Streetlight	1	2389
12	Holder, Fuse, Streetlight	1	2388



**CONSTRUCTION STANDARDS**  
 STREETLIGHT, 100W EQUIV. LED COBRAHEAD  
 SHORT MAST ARM  
 ALUMINUM POLE, DIRECT BURIAL

REVISIONS			
DATE	ENGR	OPS	



**Notes:** Installation meets NESC not NEC.

ITEM NO	DESCRIPTION	SL100SFLED		SL200SFLED	
		QTY	S/N	QTY	S/N
1	Photoeye, LED and HPS, 120V, 3-pin	1	2872	1	2872
2	Luminaire, Cobrahead, LED, Type 3, 3000K, HPS Equivalent	1	2889	1	2895
3	Connector, H-Tap, Al/Cu, #6 Solid, Bare, Soft Drawn, 1C	1	416	1	416
4	Cable, 600V, Cu, #12, 19-Str, Black, 1C	42 ft	386	42 ft	386
5	Cable, 600V, Cu, #12, 19-Str, White, 1C	42 ft	387	42 ft	387
6	Conductor, Cu, #6 Solid, Bare, Soft Drawn, 1C	2 ft	374	2 ft	374
7	Pole, Streetlight, Al, Anchor base 11-1/2" bolt circle, 25' mounting height, 6' arm	1	1225	—	N/A
7	Pole, Streetlight, Al, Anchor base 11-1/2" bolt circle, 32' mounting height, 6' arm	—	N/A	1	1226
8	Anchor, Streetlight foundation (rocky soil), 6" Diameter	1	20	1	20
9	Clamp, Ground Rod, 5/8", Bronze, Small	1	281	1	281
10	Rod, Ground 5/8" x 8'	1	1124	1	1124
11	Fuse, 10A, 250V, Time Delay, Streetlight	1	2389	1	2389
12	Holder, Fuse, Streetlight	1	2388	1	2388



### CONSTRUCTION STANDARDS

STREETLIGHT  
100/200W EQUIV. LED COBRAHEAD, SINGLE ARM  
ALUMINUM POLE, ANCHOR BASE

#### REVISIONS

DATE	ENGR	OPS

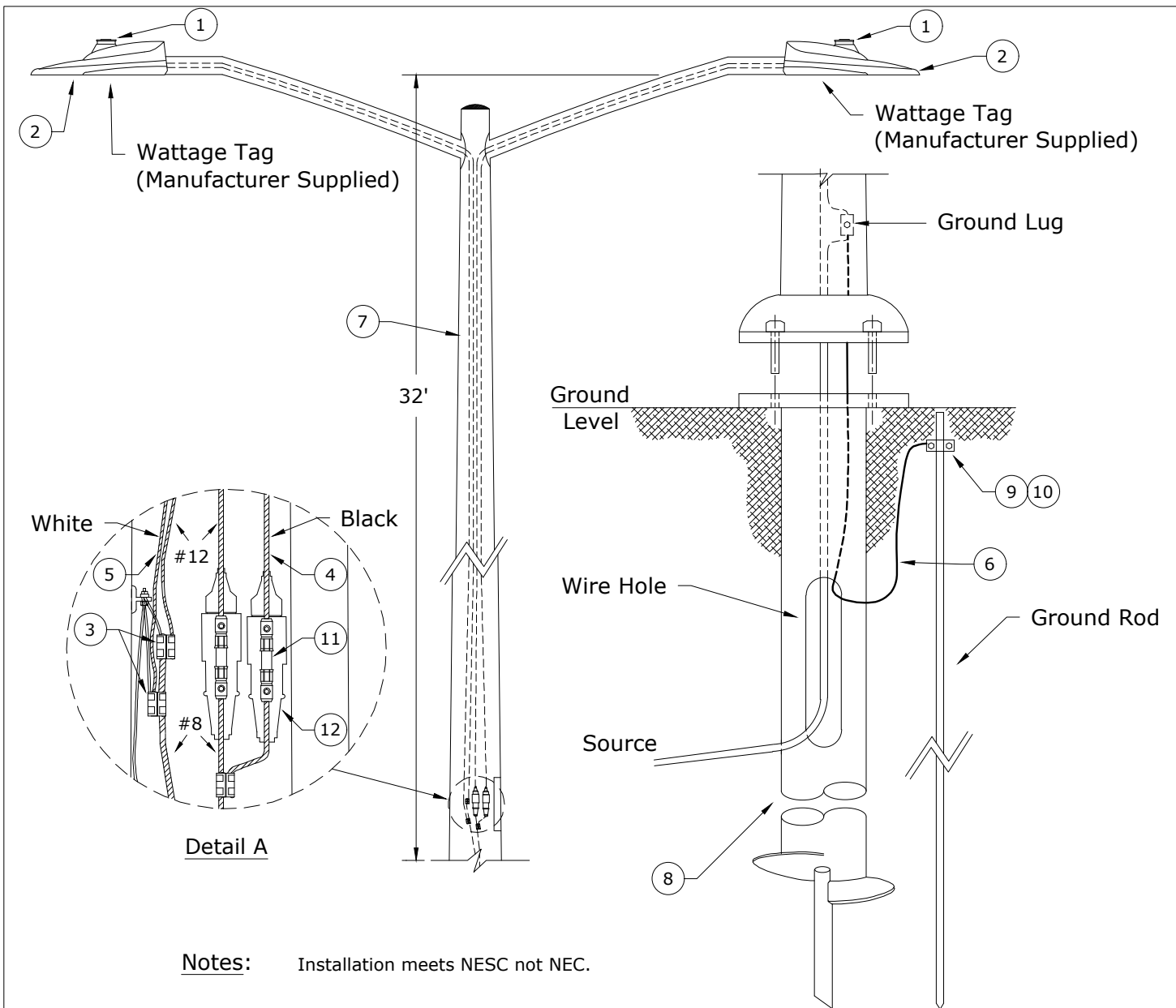
PAGE:  
1 of 1

SL100SFLED,SL200SFLED

CAD FILE:  
SL100SFLED

APP: DRK/KJP  
DATE: 6/1/22

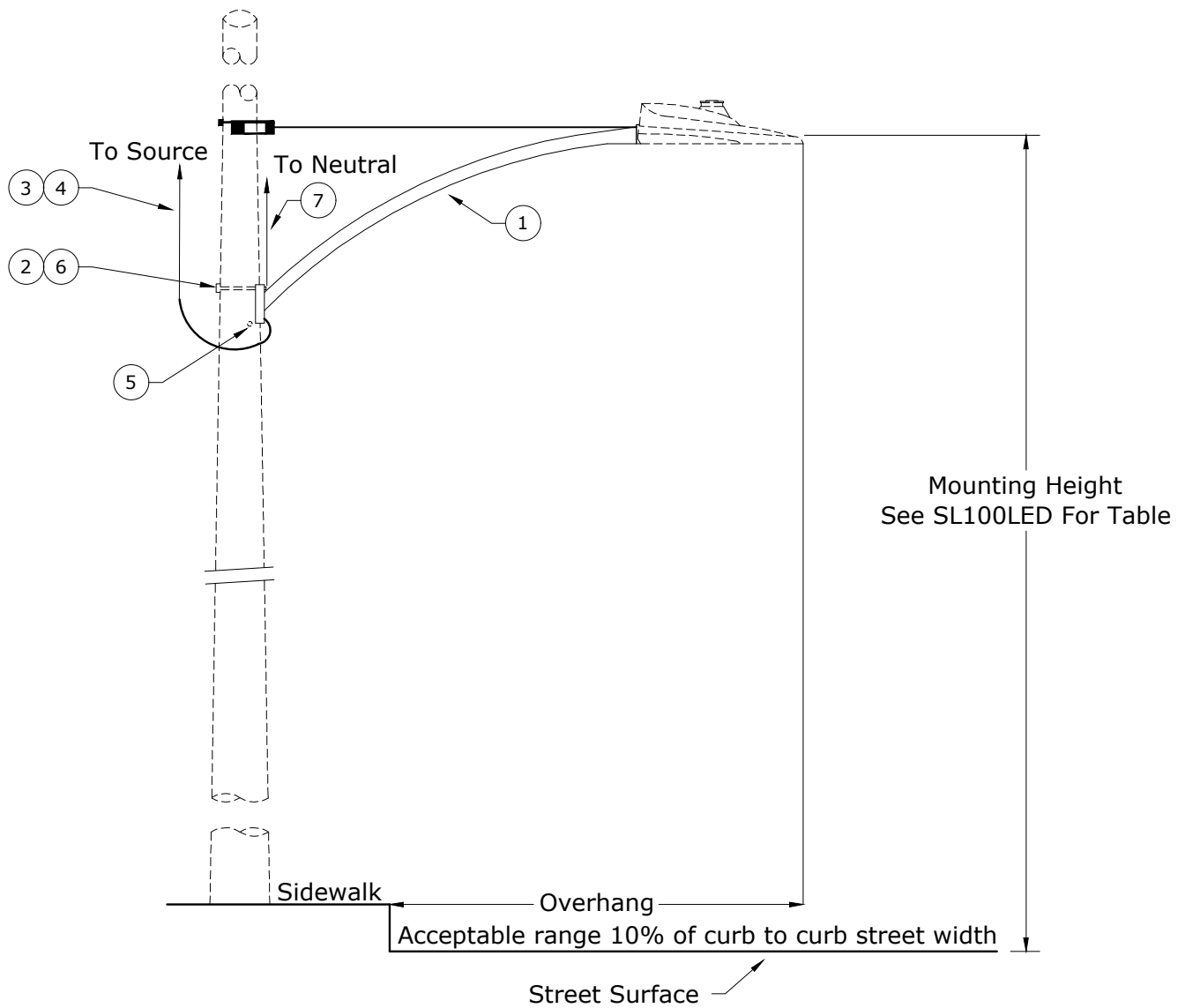
SECTION  
1000



Rev. 2 - Changed to LED lights.

ITEM NO	DESCRIPTION	SL200SFDLED	
		QTY	S/N
1	Photoeye, LED and HPS, 120V, 3-pin	2	2872
2	Luminaire, Cobrahead, LED, Type 3, 3000K, HPS Equivalent	2	2895
3	Connector, H-Tap, Al/Cu, #6 Solid, Bare, Soft Drawn, 1C	2	416
4	Cable, 600V, Cu, #12, 19-Str, Black, 1C	84 ft	386
5	Cable, 600V, Cu, #12, 19-Str, White, 1C	84 ft	387
6	Conductor, Cu, #6 Solid, Bare, Soft Drawn, 1C	3 ft	374
7	Pole, Streetlight, Al, Anchor base 11-1/2" bolt circle, 32' mounting height, Double 6' arm	1	1227*
8	Anchor, Streetlight foundation (rocky soil), 6" Diameter	1	20*
9	Clamp, Ground Rod, 5/8", Bronze, Small	1	281
10	Rod, Ground 5/8" x 8'	1	1124
11	Fuse, 10A, 250V, Time Delay, Streetlight	2	2389
12	Holder, Fuse, Streetlight	2	2388

	<b>CONSTRUCTION STANDARDS</b> STREETLIGHT, 200W EQUIV. LED COBRAHEAD, TWIN ARM ALUMINUM POLE, ANCHOR BASE		<b>REVISIONS</b>															
			<table border="1"> <thead> <tr> <th>DATE</th> <th>ENGR</th> <th>OPS</th> </tr> </thead> <tbody> <tr> <td>2/23/00</td> <td>HWH</td> <td>MA</td> </tr> <tr> <td></td> <td>LB</td> <td>AH</td> </tr> <tr> <td>6/1/22</td> <td>DRK</td> <td></td> </tr> </tbody> </table>	DATE	ENGR	OPS	2/23/00	HWH	MA		LB	AH	6/1/22	DRK				
	DATE	ENGR	OPS															
2/23/00	HWH	MA																
	LB	AH																
6/1/22	DRK																	
PAGE: 1 of 1	<b>SL200SFDLED</b>	CAD FILE: SL200SFDLED	APP: JEH DATE: 2/22/00	SECTION <b>1000</b>														



- Notes:**
1. Installation meets NESC not NEC.
  2. Mast of arm attachment height varies with type of arm and must be positioned so luminaire is level. SLARM6, 8, 12, 14, 16, 18, 20 & 22. Ending numbers specify mast arm length. Conductor wire length will be adjusted to match mast arm size.

Rev. 2 - Obsoleted 4' arm.

ITEM NO	DESCRIPTION	SLARM16	
		QTY	S/N
1	Arm, Mast, Steel, 16' Streetlight, Double Guy	1	51
2	Bolt, Machine, 5/8" x 12" Galv, 12,400 lb Ultimate	2	155
3	Cable, 600V, Cu, #12, 19-Str, Black, 1C	19	386
4	Cable, 600V, Cu, #12, 19-Str, White, 1C	19	387
5	Screw, Lag, 1/2" x 3", Fetter Drive, Drive Point	2	1131
6	Washer, Square Flat, 5/8" x 2-1/4" x 2-1/4"	2	1412
7	Conductor, Cu, #6, Solid, Bare, Soft Drawn, 1C	5*	374



## CONSTRUCTION STANDARDS

STREETLIGHT  
MAST ARM INSTALLATION  
WOOD POLE MOUNTED

PAGE:  
1 of 1

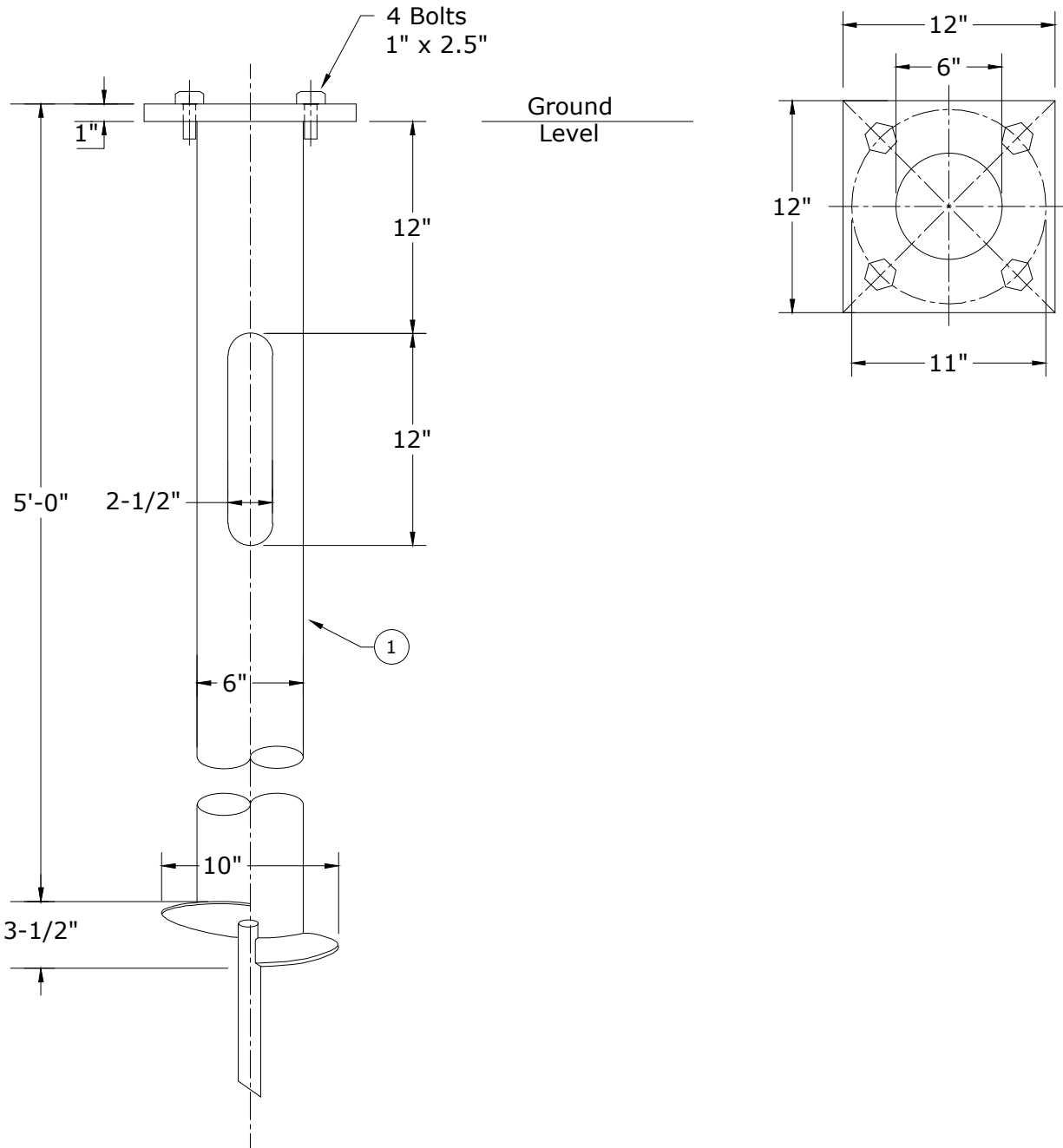
SLARM6-SLARM22

CAD FILE:  
SLARM6

REVISIONS			
DATE	ENGR	OPS	
2/23/00	HWH	MA	
4/20/22	DRK		

APP:  
DATE:


SECTION  
1000



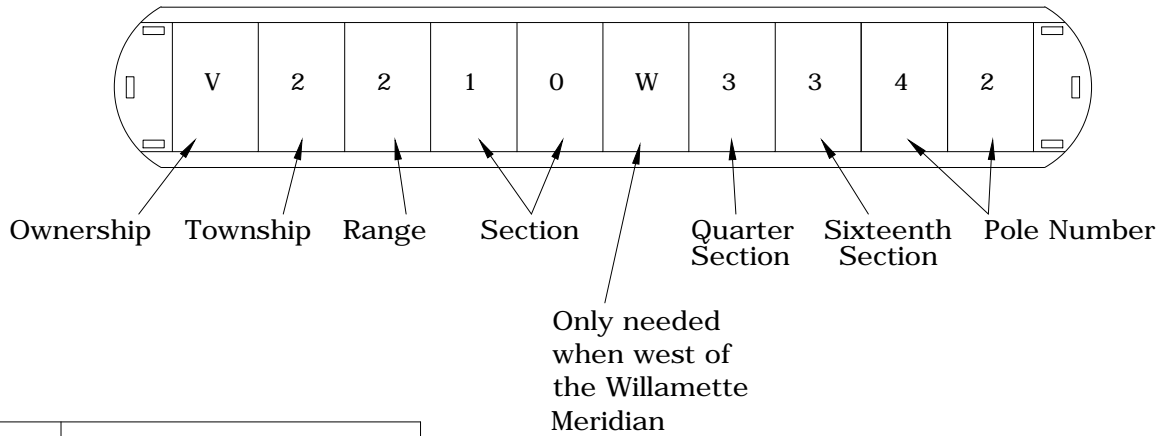
Rev. 2 - Updated dimension formatting.

ITEM NO	DESCRIPTION	SLF	
		QTY	S/N
1	Anchor, Streetlight Foundation (Rocky Soil), 6" Diameter	1	20

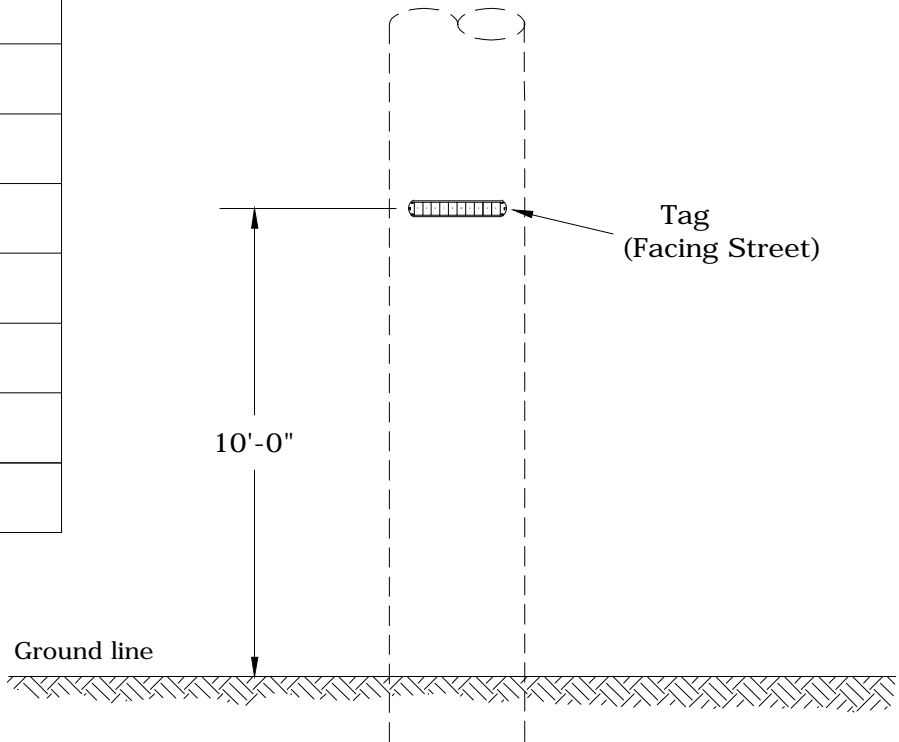
  

	<b>CONSTRUCTION STANDARDS</b> STREETLIGHT FOUNDATION STEEL - 6" DIAMETER			REVISIONS			
		DATE	ENGR	OPS			
	1	2/23/00	HWH	MA			
	2	4/20/22	DRK				
PAGE: 1 of 1	SLF		CAD FILE: SLF	APP: HWH/GW	SECTION 1000	DATE: 1/31/80	

## STREETLIGHT POLE TAGGING

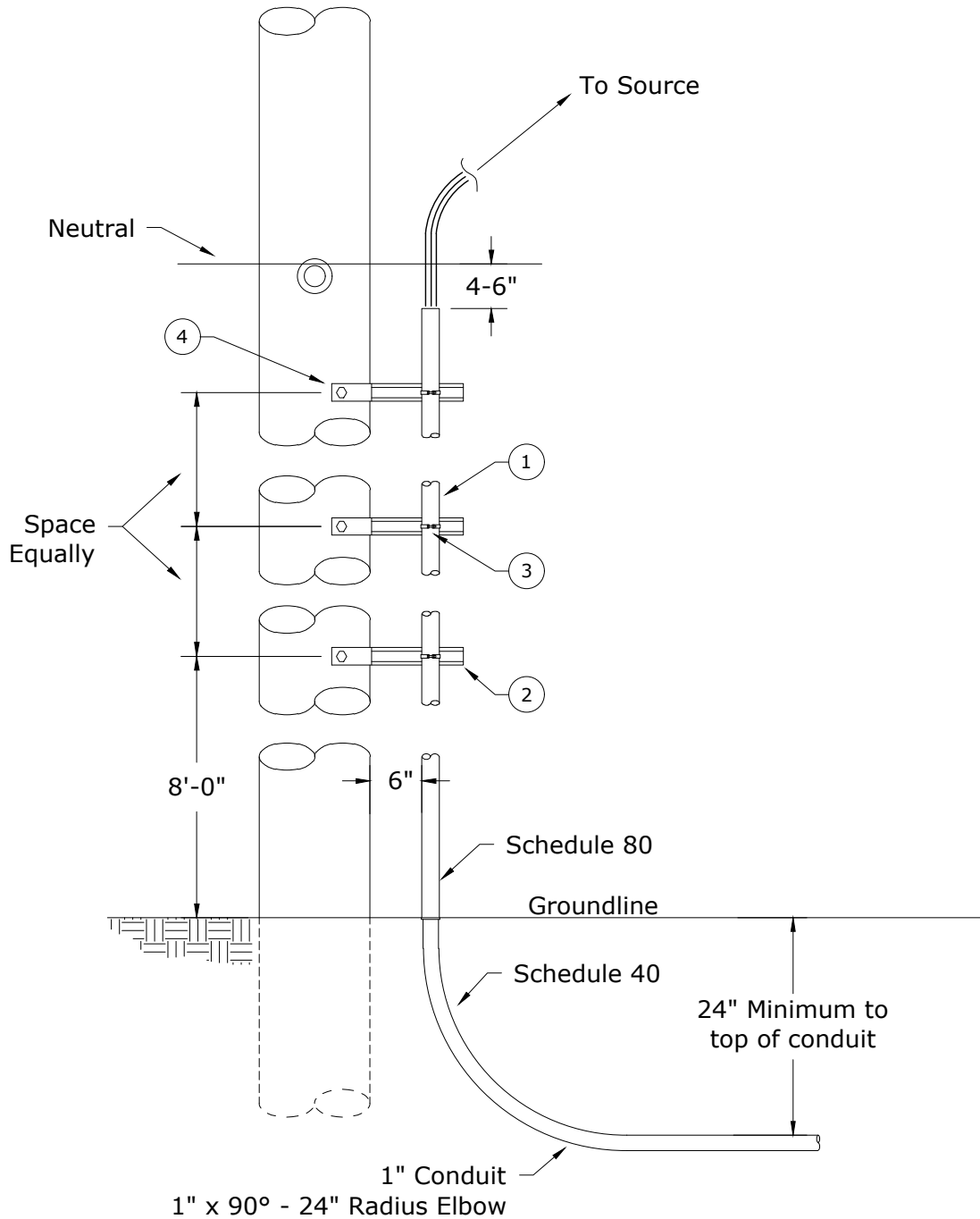


CODE	OWNERSHIP
V	Vancouver
P	Clark Public Utilities
B	Battle Ground
R	Ridgefield
W	Washougal
C	Camas
L	La Center
A	Amboy
Y	Yacolt
U	Unincorporated Clark County
D	WA Dot



### CONSTRUCTION STANDARDS STREETLIGHT POLE TAGGING

REVISIONS			
△	DATE	ENGR	OPS
△			
APP:	CM/AH	SECTION	
DATE:	10/17/08	1000	



Rev. 3 - Updated to 2017 NESC, added lag screws, corrected material quantity, and reformatted.

ITEM NO	DESCRIPTION	SLR	
		QTY	S/N
1	Conduit, PVC, 1" x 10', Sch 80, (1) Bell End	30*	2482
2	Bracket, Standoff, 10.5", w/Stop	3 *	226
3	Clamp, Standoff Bracket, 1" Conduit	3	292
4	Screw, Lag, 1/2" x 3", Fetter Drive, Drive Point	6	1131



## CONSTRUCTION STANDARDS

SECONDARY OVERHEAD TO UNDERGROUND RISER ASSEMBLY FOR STREETLIGHT FEEDER

### REVISIONS

Δ	DATE	ENGR	OPS
1	2/23/00	HWH	MA
2	10/17/08	CM	AH
3	4/20/22	DRK	

PAGE:  
1 of 1

SLR

CAD FILE:  
SLR

APP: HWH/GW  
DATE: 1/22/80

SECTION  
1000

# 1100

## OVERHEAD TRANSFORMERS

3/13/2023

~	F1	Fuse Schedule – Overhead Transformers
~	T1	Transformer Field Stenciling Code
~	T3,T3H	Pole Mounted Transformer and Cutout on Pole
~	T4,T4H	Pole Mounted Transformer and Cutout on Crossarm
~	T5	Overhead Service Installation Guideline
~	T21	Crossarm Construction - Two Transformers - Open Wye Primary
~	T23	Twiggy Construction - Two Transformers - Open Wye Primary
~	T31	Three Transformers - Grounded Y - Grounded Y
~	T32	Three Transformers - Closed $\Delta$ - Closed $\Delta$
~	TC2A	1 $\emptyset$ & 3 $\emptyset$ , 2-Winding Boost or Buck Xfmr Bank - Installation & Removal Procedure
~	TC3	3 $\emptyset$ Open $\Delta$ for 120/240 3 $\emptyset$ 4-wire, 240 3 $\emptyset$ 3-wire, 480v 3 $\emptyset$ 3-wire
~	TC4	3 $\emptyset$ Open-Y Open- $\Delta$ for 120/240 3 $\emptyset$ 4-wire, 240 3 $\emptyset$ 3-wire, 480v 3 $\emptyset$ 3-wire
~	TC5	3 $\emptyset$ $\Delta$ - $\Delta$ for 120/240 3 $\emptyset$ 4-wire, 240 3 $\emptyset$ 3-wire, 480v 3 $\emptyset$ 3-wire
~	TC5A	3 $\emptyset$ $\Delta$ - $\Delta$ Closed Banks for 120/240 3 $\emptyset$ 4-wire, 240 3 $\emptyset$ 3-wire, 480v 3 $\emptyset$ 3-wire
~	TC6	3 $\emptyset$ $\Delta$ -Y for 120/208 or 277/480v Service
~	TC7	3 $\emptyset$ Y-Y for 120/208 or 277/480v Service
~	TC8	3 $\emptyset$ Y- $\Delta$ for 240v 3 $\emptyset$ 3-wire 480v 3 $\emptyset$ 3-wire
~	TC10	3 $\emptyset$ Transformer Connections
~	TC11	3 $\emptyset$ Transformer Connections
<b>C</b>	TL1	Transformer Lead Sizes - Overhead Secondary
~	TL2	Large Transformer Lead Size - Overhead

<b>N</b>	New Standard
<b>R</b>	Redrawn Standard
<b>C</b>	Changed Standard
~	No Change



## 7.2 kV Wye-Connected Primary Overhead Transformers

kVA	Transformer Stock Numbers			Primary Transformer Fusing <sup>*2*6</sup>		Minimum Upstream OH Fuse <sup>*4*6</sup>	
	BM 120/240	BR 240/480	BW 277/480	Size	S/N	Size	S/N
5/10 <sup>*1</sup>	Obsolete			5 A <sup>*</sup>	678	10 A	680
15	1346			5 A	678	10 A	680
25	1347	1356	2041	10 A	680	20 A	682
37.5	1348	1357 (REQ)		15 A	681	25 A	683
50	1349		2236	20 A	682	30 A	684
75	1350		2669	30 A	684	50 A	686
100	1351		2670	40 A	685	65 A	687
167			2671	65 A	687	100 A	689
250 <sup>*</sup>			2053	80 A	688	125 A <sup>*5</sup>	690

## 12 kV Delta-Connected Primary Overhead Transformers

kVA	Transformer Stock Numbers			1 or 2Ø Delta Primary				3Ø Delta Primary <sup>*3</sup>			
				Primary Transformer Fusing <sup>*6</sup>		Minimum Upstream OH Fuse Size <sup>*4*6</sup>		Primary Transformer Fusing <sup>*6</sup>		Minimum Upstream OH Fuse Size <sup>*4*6</sup>	
	CM 120/240	CR 240/480	CW 277/480	Size	S/N	Size	S/N	Size	S/N	Size	S/N
5/10 <sup>*1</sup>	Obsolete	Obsolete	Obsolete	5 A	678	10 A	680	5 A	678	10 A	680
15	1358	1365		5 A	678	10 A	680	5 A	678	10 A	680
25	1359	1366	2234	7 A	679	15 A	681	10 A	680	20 A	682
37.5	1360	1367		10 A	680	20 A	682	15 A	681	25 A	683
50	1361	1934		15 A	681	25 A	683	20 A	682	30 A	684
75	1362			20 A	682	30 A	684	30 A	684	50 A	686
100	1363	1370	1979	25 A	683	40 A	685	40 A	685	65 A	687
167	1364	1371	1376	40 A	685	65 A	687	65 A	687	100 A	689
250	1978	1832		65 A	687	100 A	689	80 A	688	125 A <sup>*5</sup>	690
333 <sup>*</sup>		1372		See Systems Engineering							
500 <sup>*</sup>		1373 (REQ)	2055 (OBS)								

\*1 5 and 10kVA are not stocked. Cannot be used for new services.

\*2 For Y-banked transformers fuse each phase by its 1Ø rating.


\*3 For 3Ø delta banks use two fuses of the same size for lighter and one fuse for the two power transformers.

\*4 Upstream fuses should use the same fuse rating for all phases. Use largest fuse size for application while considering up/downstream fuses, conductor, and loading. Check with Systems Engineering as needed.

\*5 125 A fuse must be approved by Systems Engineering.

\*6 Overhead fuses used in cutout gates are Kearney Type 200 (N).

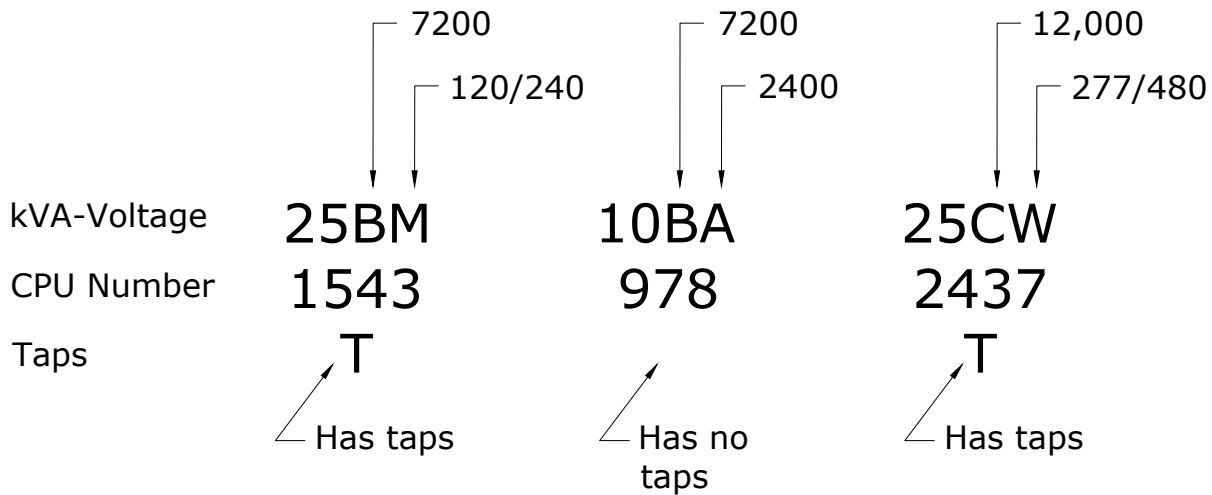
Rev. 2 - Added stock numbers, upstream fuses, and notes.

	CONSTRUCTION STANDARDS			REVISIONS			
	FUSE SCHEDULE OVERHEAD TRANSFORMERS			1	DATE	ENGR	OPS
	PAGE: 1 of 1			1	3/02	Redrawn	in CAD
F1			CAD FILE: F1		APP: ELM	SECTION 1100	
			DATE: 1/31/80				

# Transformer Stenciling Codes

PRIMARY	
CODE	VOLTAGE
A	2,400(Obsolete)
B	7,200
C	12,000

SECONDARY	
CODE	VOLTAGE
A	2,400(Obsolete)
L	120/208
M	120/240
R	240/480
W	277/480



## Tap Settings

The transformer specifications call for taps on all transformers. Each tap changes the voltage  $2\frac{1}{2}\%$ . Assuming that 100% is 120v, each tap will change secondary voltage by 3 volts.

Some single-bushing overhead transformers with "B" primary voltage rating have four taps below 100% ( $97\frac{1}{2}\%$ , 95%,  $92\frac{1}{2}\%$  and 90%). The rest have two taps above ( $102\frac{1}{2}\%$  and 105%) and two taps below ( $97\frac{1}{2}\%$  and 95%). There are some two-bushing "B" voltage rating transformers. They may have 4 taps below or 2 above/2 below.

Two-bushing overhead transformers with "C" primary voltage rating and all padmount transformers have four taps below 100% ( $97\frac{1}{2}\%$ , 95%,  $92\frac{1}{2}\%$ , and 90%).

The taps are not load-tap changing so the transformer must be de-energized to change the tap. The taps actually change the windings ratio ( $N_p/N_s$ ). At 100% for 12470GrdY/7200,  $N_p/N_s=7200/120=60$ . At 95%,  $N_p/N_s=7200/123=58.5$ . At 105%,  $N_p/N_s=7200/114=63.2$ .

Rev 2: Updated voltage codes, combined with Std T1A, and added additional transformer information.



## CONSTRUCTION STANDARDS

### GENERAL TRANSFORMER INFORMATION

REVISIONS			
DATE	ENGR	OPS	
3/02	Redrawn	in CAD	
12/9/22	CRM	GM	

PAGE:  
1 of 4

**T1**

CAD FILE:  
T1

APP: ELM  
DATE: 1/31/80

SECTION  
**1100**

Taps are lowered to raise the voltage and raised to lower the voltage. For example, going from 100% to 97 ½% tap position will raise the secondary voltage. Going from 100% to 102 ½% tap position will lower the secondary voltage.

## Tapped Areas

CPU has tapped areas from 92 ½% to 100%. The tapped areas are indicated on the feeder maps. The tap used will depend on the voltage rating of the transformer.

Any transformer with a "B" voltage rating is rated 12470GrdY/7200v. These are single-bushing overhead transformers and all padmount transformers. There are some two-bushing overhead transformers on the system that also have this rating. The winding ratio for transformers at this voltage rating is 60 at 100%.

Transformers with a "C" voltage rating are rated 12,000v. These are most of the two-bushing overhead transformers. The 3Ø rating for these transformers is 12,000v and the 1Ø rating is 6928v. The winding ratio for transformers in this group is 57.7 at 100%. Since these transformers have a lower voltage rating than the system voltage of 12470/7200v, their tap setting will be two taps above the "B" tap setting.

For example, in the 100% tap areas, "B" transformers will be set at the 100% tap rating to get 120v at the secondary. For "C" transformers, the winding ratios are different. At 100%,  $N_p/N_s=6928/120=57.7$ . At 105%,  $N_p/N_s=6928/114=60.8$ . Installing a "C" transformer in the 100% tap area at the 100% tap would result in  $7200v/57.7=124.8v$  at the secondary. This would be on the high-side of allowable voltage limits. Putting the "C" transformer on the 105% tap would change the ratio to  $7200v/60.8$  and the secondary voltage would be 118.5v.

## Tap Markings



Each manufacturer has a different way of marking the tap positions and there is no consistency. Some use letters, some uses Arabic numbers, some use Roman numerals, some use voltage levels and some just state the tap percentage. It is important to look at the nameplate of each transformer to determine the correct tap setting. Even among the manufacturers that use letters for the steps, some use A=100% and some use A=105%. The transformer nameplate will be the only way to ensure that the proper tap setting is used.

## Overhead Bank Impedances

When matching impedances for overhead transformers that will be connected in a bank, or replacing a burnt out transformer within a bank, make sure that the impedances are within ±25% of each other. For example, if the impedances on a bank of transformers is 3.25% and one needs to be replaced, the replacement should have an impedance between 2.44% and 4.06%.

When paralleling two 1Ø transformers or two 3Ø banks, the impedances between the 1Ø transformers or the two banks should be within ±7.5% of each other.

Rev 2: Updated voltage codes, combined with Std T1A, and added additional transformer information.

	<b>CONSTRUCTION STANDARDS</b> GENERAL TRANSFORMER INFORMATION		REVISIONS			
				DATE	ENGR	OPS
	1	3/02	Redrawn	in CAD		
	2	12/9/22	CRM	GM		
PAGE: 2 of 4	<b>T1</b>	CAD FILE: T1	APP: ELM	SECTION <b>1100</b>		
			DATE: 1/31/80			

# Transformer Polarity

By industry standards, all 1Ø distribution transformers 200kVA and smaller, having primary voltages 8660 volts and below (winding voltage) have additive polarity. All other 1Ø transformers have a subtractive polarity. Polarity only applies to 1Ø distribution transformers so 3Ø padmount transformers do not have polarity.

By the standard above, all "B" voltage transformers (12470 GrdY/7200) below 200kVA would be additive polarity. All "C" voltage transformers (12,000v) regardless of size are subtractive because their winding voltage is above 8660 volts.

Polarity does not apply to 3Ø transformers.

# Terminal Markings

By industry standards for 1Ø overhead transformers, the high-voltage terminal marked H<sub>1</sub> is brought out on the left-hand terminal of the high-voltage group as seen when facing the highest voltage side of the case from the secondary bushing side, and other "H" terminals are brought out in numerical order from left to right.

For 1Ø overhead transformers, the low-voltage x<sub>1</sub> bushing is on the right when facing the low-side of the transformer for additive polarity (H<sub>1</sub> is diagonally located across from x<sub>1</sub>). The x<sub>1</sub> bushing is on the left when facing the low-side of the transformer for subtractive polarity (H<sub>1</sub> is located directly across from x<sub>1</sub>). See Figure 1 and Figure 2.

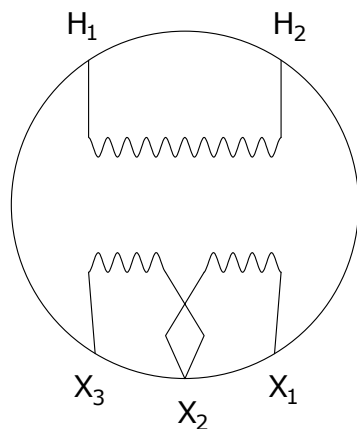


Figure 1: Additive Polarity

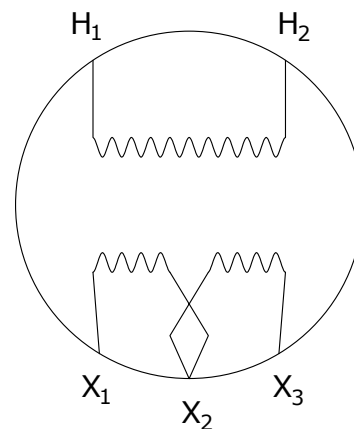



Figure 2: Subtractive Polarity


Rev 2: Updated voltage codes, combined with Std T1A, and added additional transformer information.

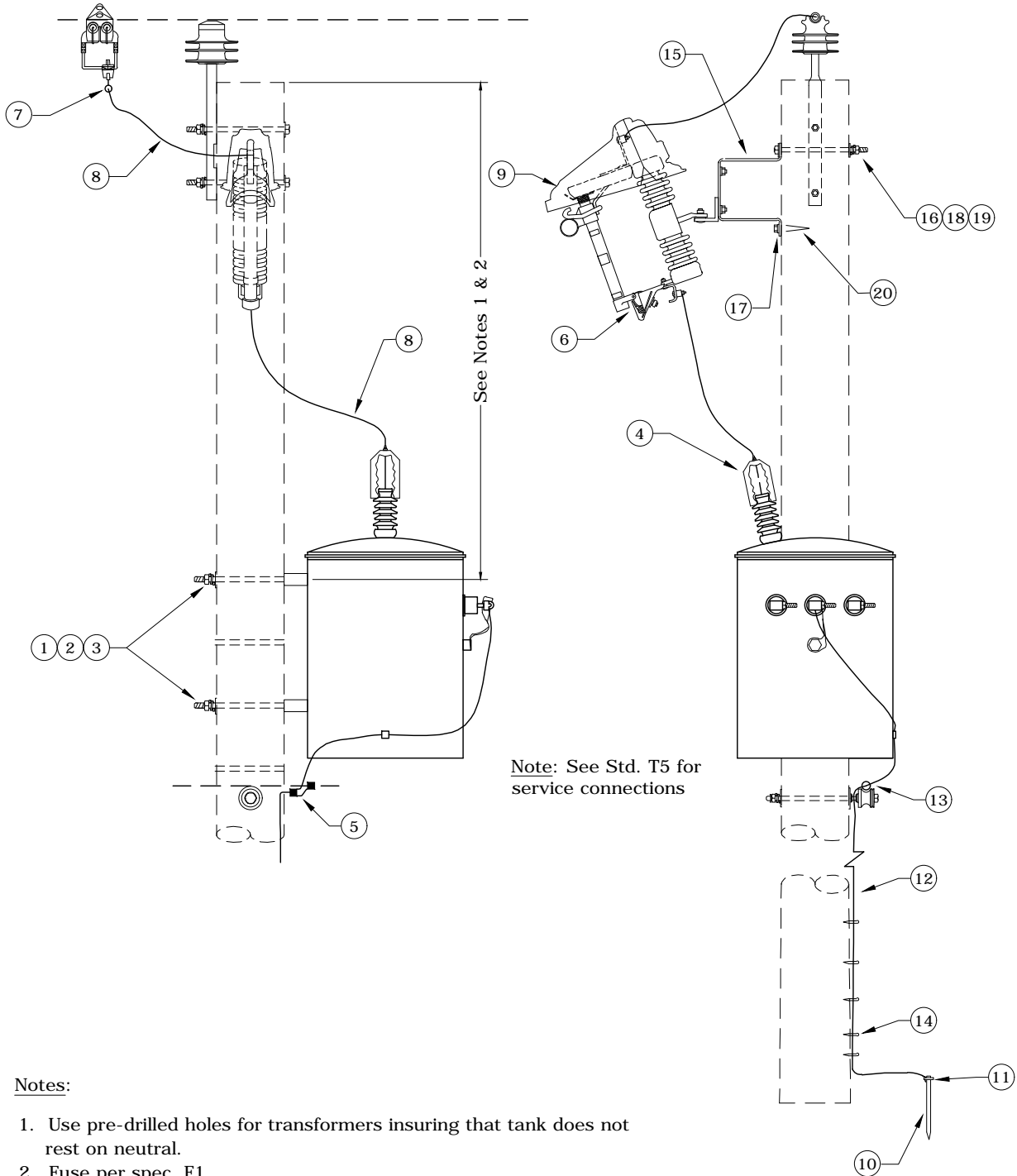
	<b>CONSTRUCTION STANDARDS</b> GENERAL TRANSFORMER INFORMATION		REVISIONS													
			<table border="1"> <tr> <th>Δ</th> <th>DATE</th> <th>ENGR</th> <th>OPS</th> </tr> <tr> <td>1</td> <td>3/02</td> <td>Redrawn</td> <td>in CAD</td> </tr> <tr> <td>2</td> <td>12/9/22</td> <td>CRM</td> <td>GM</td> </tr> </table>	Δ	DATE	ENGR	OPS	1	3/02	Redrawn	in CAD	2	12/9/22	CRM	GM	
	Δ	DATE	ENGR	OPS												
	1	3/02	Redrawn	in CAD												
2	12/9/22	CRM	GM													
PAGE: <b>3 of 4</b>	<b>T1</b>	CAD FILE: <b>T1</b>	APP: ELM DATE: 1/31/80	SECTION <b>1100</b>												

# Available Transformers for New Services

Primary Voltage	Secondary Voltage	Type	Ø's	Taps	Size (S/N)
<b>Padmount</b>					
12470GrdY/7200	240/120	Pad	1	4 Below	<b>25</b> (1317), <b>50</b> (1318), <b>75</b> (1320), <b>100</b> (1322)
12470GrdY/7200	208/120	Pad	3	4 Below	<b>75</b> (1328), <b>150</b> (1329), <b>300</b> (1331), <b>500</b> (1332), <b>750</b> (1333), <b>1000</b> (1334)
12470GrdY/7200	480/277	Pad	3	4 Below	<b>75</b> (1337), <b>150</b> (1338), <b>300</b> (1340), <b>500</b> (1341), <b>750</b> (1342), <b>1000</b> (1343), <b>1500</b> (1344)
12470GrdY/7200	480/240	Pad	1	4 Below	<b>50</b> (2016)
<b>Overhead</b>					
12470GrdY/7200	120/240	Pole	1	4 Below	<b>15</b> (1346), <b>25</b> (1347), <b>37.5</b> (1348), <b>50</b> (1349), <b>75</b> (1350), <b>100</b> (1351)
12470GrdY/7200	240/480	Pole	1	4 Below	<b>25</b> (1356), <b>37.5</b> (1357), <b>50</b> (1934)
12470GrdY/7200	277	Pole	1	2 Above 2 Below	<b>25</b> (2041), <b>50</b> (2236), <b>75</b> (2669), <b>100</b> (2670), <b>167</b> (2671), <b>250</b> (2053)
12000	120/240	Pole	1	2 Above 2 Below	<b>15</b> (1358), <b>25</b> (1359), <b>37.5</b> (1360), <b>50</b> (1361), <b>75</b> (1362), <b>100</b> (1363), <b>167</b> (1364), <b>250</b> (1978)
12000	240/480	Pole	1	2 Above 2 Below	<b>15</b> (1365), <b>25</b> (1366), <b>37.5</b> (1367), <b>100</b> (1370), <b>333</b> (1372)
12000	277	Pole	1	2 Above 2 Below	<b>25</b> (2234), <b>100</b> (1979), <b>167</b> (1376)

Rev 2: Updated voltage codes, combined with Std T1A, and added additional transformer information.

	<b>CONSTRUCTION STANDARDS</b> GENERAL TRANSFORMER INFORMATION		REVISIONS														
			<table border="1"> <thead> <tr> <th>Δ</th> <th>DATE</th> <th>ENGR</th> <th>OPS</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>3/02</td> <td>Redrawn</td> <td>in CAD</td> </tr> <tr> <td>2</td> <td>12/9/22</td> <td>CRM</td> <td>GM</td> </tr> </tbody> </table>	Δ	DATE	ENGR	OPS	1	3/02	Redrawn	in CAD	2	12/9/22	CRM	GM		
	Δ	DATE	ENGR	OPS													
1	3/02	Redrawn	in CAD														
2	12/9/22	CRM	GM														
PAGE: 4 of 4	<b>T1</b>	CAD FILE: T1	APP: ELM DATE: 1/31/80	SECTION <b>1100</b>													



**Notes:**

1. Use pre-drilled holes for transformers insuring that tank does not rest on neutral.
2. Fuse per spec. F1.
3. Call for hot line stirrup separately:
4. 75KVA and larger use T3H.

WIRE SIZE	S/N
#6 SLD-#6 STR Cu	2338
#4-2/0 Al/Cu	2339
397 MCM Al/Cu	2340
795 MCM Al/Cu	2341

Rev 3: Changed to copperweld ground and corrections.



**CONSTRUCTION STANDARDS**  
POLE MOUNTED TRANSFORMER  
AND CUTOUT ON POLE

PAGE:  
1 of 2

**T3, T3H**

CAD FILE:  
T3

REVISIONS			
Δ	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	1/13/10	CM	AH
3	5/31/12	KJP	
Δ			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>1100</b>	

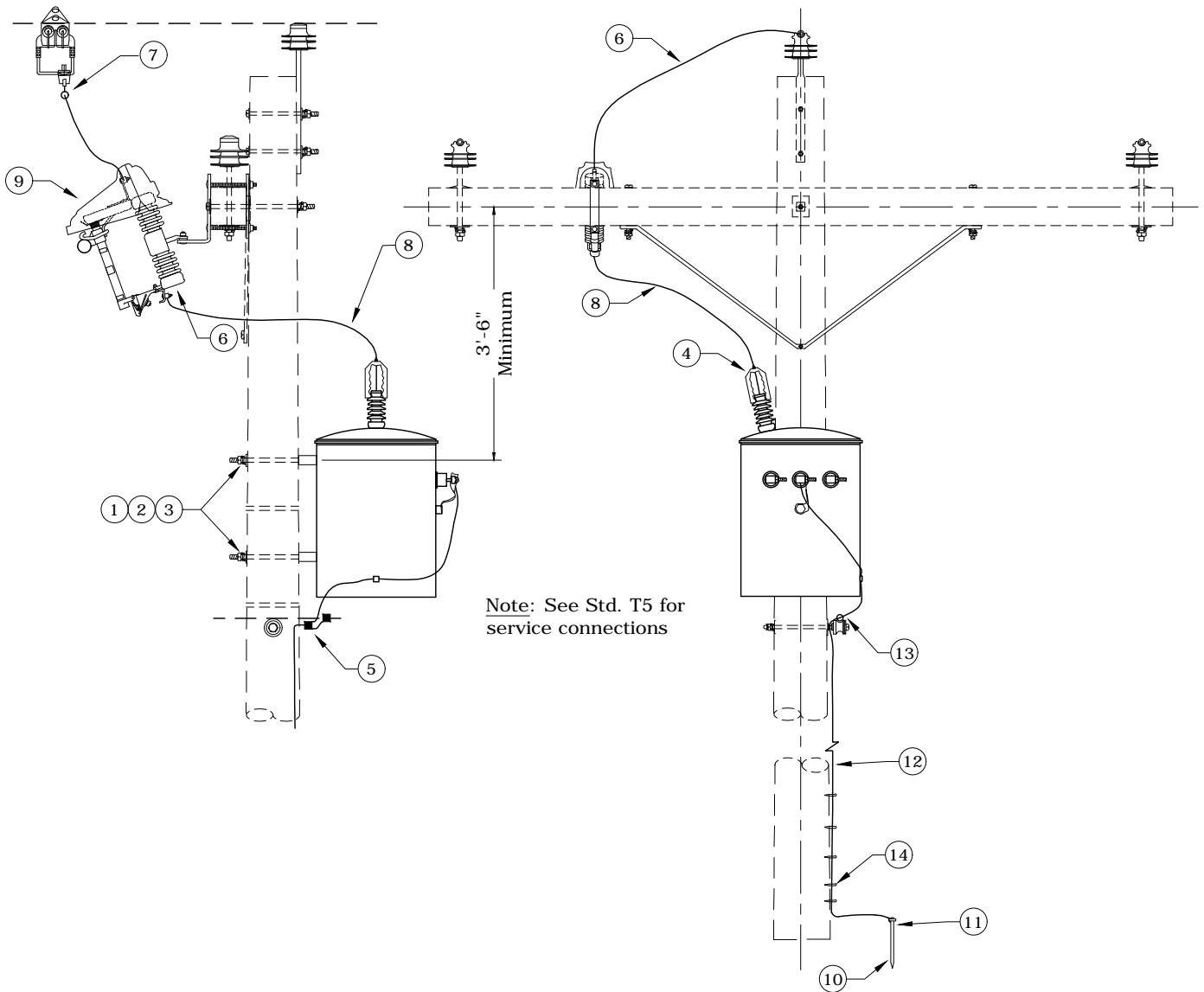
Rev 3: Changed to copperweld ground and corrections.

ITEM NO.	DESCRIPTION	T3		T3H	
		ADDITIONAL MATERIAL		ADDITIONAL MATERIAL	
		QTY.	S/N	QTY.	S/N
1	Washer, Sq. Flat 5/8" x 2 1/4" x 2 1/4" (3/4" For T3H)	2	1412	2	1413
2	Bolt, Machine 5/8" x 14" Galv. (3/4" For T3H)	2	156	2	174
3	Washer, Lock, Spring, Double Coil 5/8" (3/4" For T3H)	2	2217*	2	2218
4	Wildlife Guard, Transformer Bushing	1	721	1	721
5	Connector, Crimpet, Cu 6/4-4/4 (4C4)	1	450	1	450
ITEM NO.	DESCRIPTION	CO100		CO100	
		QTY.	S/N	QTY.	S/N
		6	Cutout 100 Amp.	1	2532
7	Clamp Hot Line, GP1530	1	284	1	284
8	Conductor, Wire Cu 1/C #4 7STR, Insulated, Red	15	2512	15	2512
9	Wildlife Guard, Cutout (Non-loadbreak), Gray	1	2547	1	2547
ITEM NO.	DESCRIPTION	N1		N1	
		QTY.	S/N	QTY.	S/N
		10	Ground Rod 5/8" x 8'	1	1124
11	Ground Rod Clamp, 5/8", Bronze, Small	1	281	1	281
12	Conductor, Copperweld #4	36	1512*	36	1512*
13	Connector, Cabelock YP26 AU 2 Al/Cu 2/0 - #2 STR	1	413	1	413
14	Staple, Ground Wire, Barbed, Galv., 1 1/2"	10	2707*	10	2707*
ITEM NO.	DESCRIPTION	CO1		CO1	
		QTY.	S/N	QTY.	S/N
		15	Cutout Pole-mount Bracket	1	219
16	Machine Bolt 5/8" x 10" Galv.	1	154	1	154
17	Washer, Flat Round Galv. 1/2"	1	1394	1	1394
18	Washer, Square Flat 5/8" x 2 1/4" x 2 1/4"	1	1412	1	1412
19	Washer, Spring 5/8"	1	2217	1	2217
20	Screw, Lag 1/2" x 3" Drive Point	1	1131	1	1131



**CONSTRUCTION STANDARDS**  
POLE MOUNTED TRANSFORMER  
AND CUTOUT ON POLE

REVISIONS			
△	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	1/13/10	CM	AH
3	5/31/12	KJP	
△			
APP:	ELM	SECTION	
DATE:	1/31/80	1100	



Note: See Std. T5 for service connections

Notes:

1. Use pre-drilled holes for transformers insuring that tank does not rest on neutral.
2. Fuse per Std. F1.
3. Call for hot line stirrup separately:
4. 75KVA and larger use T4H.

WIRE SIZE	S/N
#6 SLD-#6 STR Cu	2338
#4-2/0 Al/Cu	2339
397 MCM Al/Cu	2340
795 MCM Al/Cu	2341

Rev 2: Changed to copperweld ground and corrections.



**CONSTRUCTION STANDARDS**  
POLE MOUNTED TRANSFORMER  
AND CUTOUT ON CROSSARM

REVISIONS			
DATE	ENGR	OPS	
3/02	REDRAWN	IN CAD	
1/13/10	CM	AH	
5/31/12	KJP		

PAGE:  
1 of 2

**T4, T4H**

CAD FILE:  
T4

APP: ELM  
DATE: 1/31/80

SECTION  
**1100**



Rev 2: Changed to copperweld ground and corrections.

ITEM NO.	DESCRIPTION	T4		T4H	
		QTY.	S/N	QTY.	S/N
1	Bolt, Machine 5/8" x 14" Galv. (3/4" For T4H)	2	156	2	174
2	Washer, Lock, Spring, Double Coil 5/8" (3/4" For T4H)	2	2217*	2	2218
3	Washer, Sq. Flat 5/8" x 2 1/4" x 2 1/4" (3/4" For T4H)	2	1412	2	1413
4	Wildlife Guard, Transformer Bushing	1	721	1	721
5	Connector, Crimpet, Cu 6/4-4/4 (4C4)	1	450	1	450

ITEM NO.	DESCRIPTION	CO100		CO100	
		QTY.	S/N	QTY.	S/N
6	Cutout 100 Amp.	1	2532	1	2532
7	Clamp Hot Line, GP1530	1	284	1	284
8	Conductor, Wire Cu 1/C #4 7STR, Insulated, Red	15	2512	15	2512
9	Wildlife Guard, Cutout (Non-loadbreak, Gray)	1	2547	1	2547

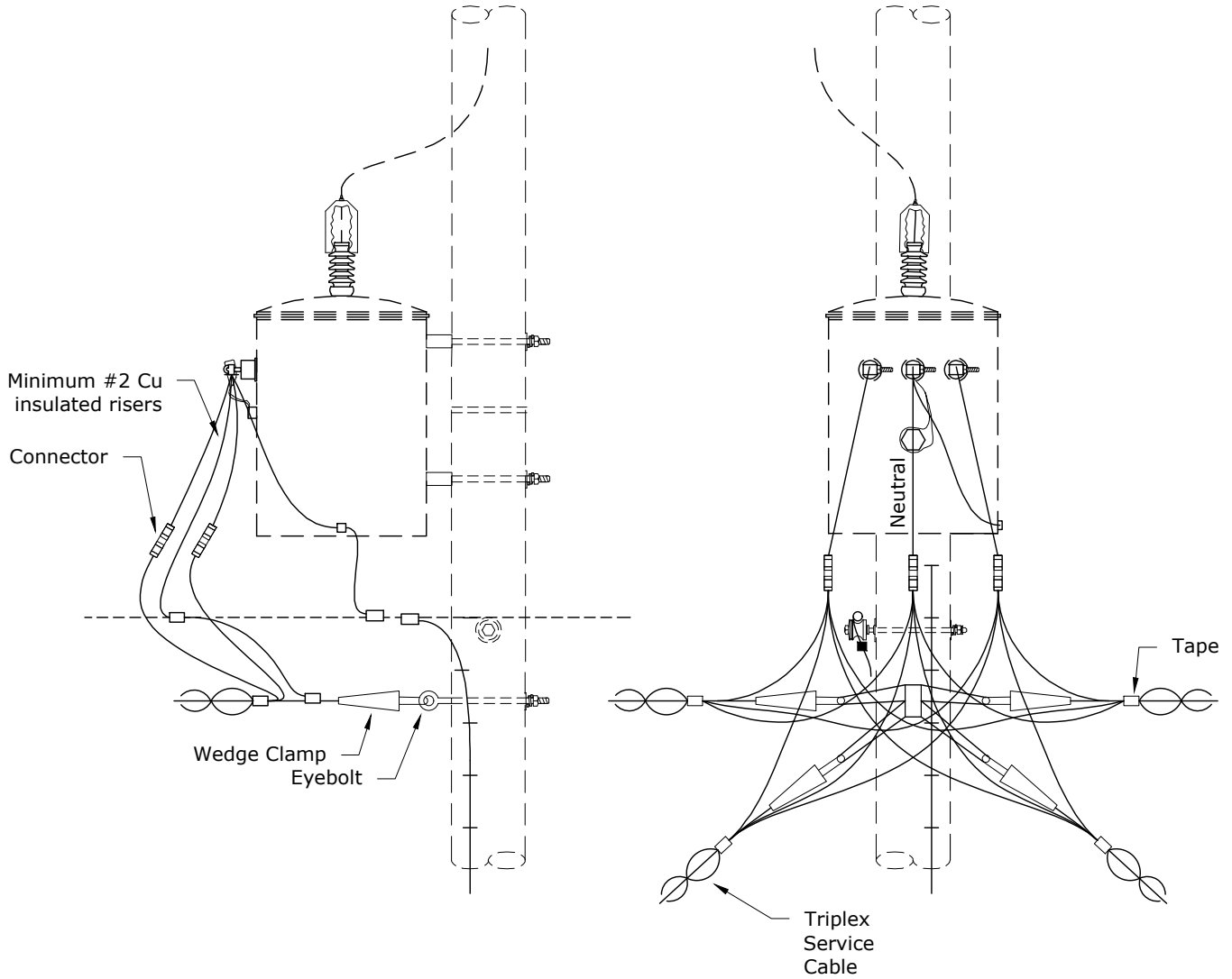
  

ITEM NO.	DESCRIPTION	N1		N1	
		QTY.	S/N	QTY.	S/N
10	Ground Rod 5/8" x 8'	1	1124	1	1124
11	Ground Rod Clamp, 5/8", Bronze, Small	1	281	1	281
12	Conductor, Copperweld #4	36	1512*	36	1512*
13	Connector, Cabelock YP26 AU 2 Al/Cu 2/0 - #2 STR	1	413	1	413
14	Staple, Ground Wire, Barbed, Galv., 1 1/2"	10	2707*	10	2707*



**CONSTRUCTION STANDARDS**  
POLE MOUNTED TRANSFORMER  
AND CUTOUT ON CROSSARM

REVISIONS			
DATE	ENGR	OPS	
3/02	REDRAWN	IN CAD	
1/13/10	CM	AH	
5/31/12	KJP		

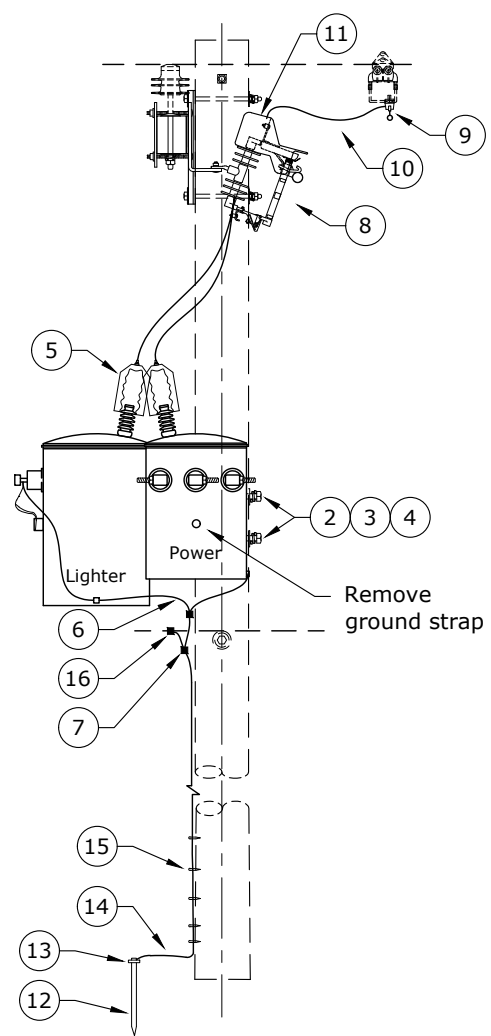
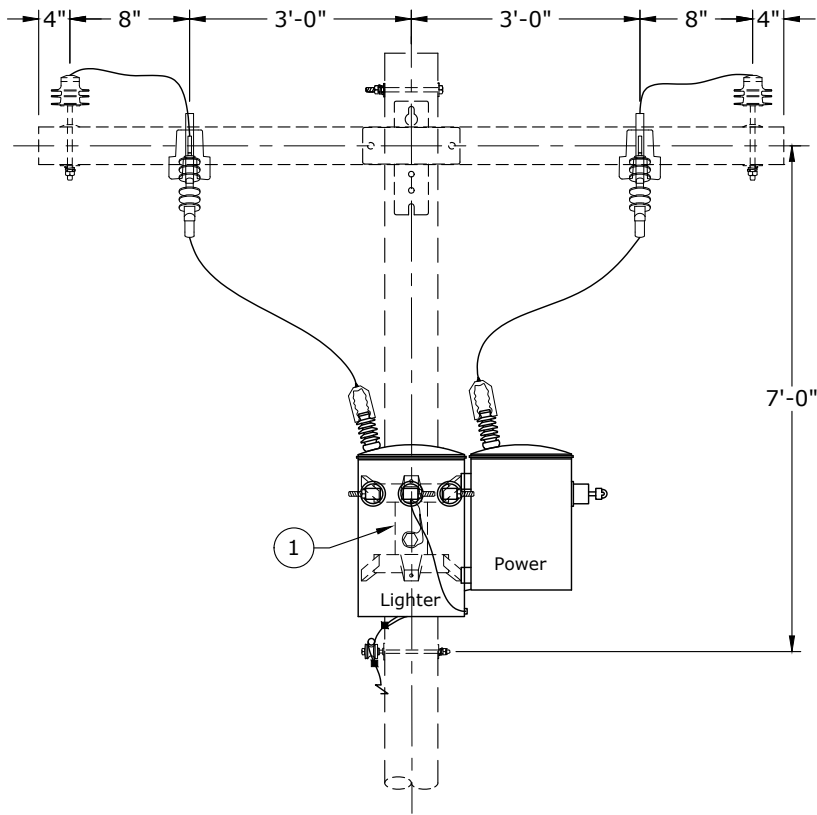


**Note:** See Stds T3 and T4 in Section 1100 for primary material. See Stds SE1, SE1A, and SE3 in Section 410 for secondary material.



**CONSTRUCTION STANDARDS**  
 OVERHEAD SERVICE  
 INSTALLATION GUIDELINE

REVISIONS			
Δ	DATE	ENGR	OPS



**Notes:**

1. See table for maximum weight on poles.
2. The lighter pot shall always be connected to the leading phase.
3. All tanks to be grounded.
4. Ground H2 bushing on all two-bushing transformers.
5. Use pre-drilled holes for transformers ensuring that tank does not rest on neutral.
6. For transformer secondary lead sizes, see  
 Std TL1 - Transformer Lead Sizes Overhead Secondary, or  
 Std TL2 - Large Transformer Lead Size Overhead Secondary.
7. For secondary connections see Std TC4 - Open Wye.
8. Call out on drawing as follows: T21-10-37 1/2  
 Transformer sizes
9. Maximum motor size shall be 15 hp.
10. Fuse per Std F1 - Fuse Schedule Overhead Transformers.
11. Call for hot line stirrup separately. See table for size.

Class	Max Weight
4	1750 lb
2	3200 lb
1	4000 lb

Stirrup Size	S/N
#6 Solid -#6 Str Cu	2338
#4-2/0 Al/Cu	2339
397 MCM Al/Cu	2340
795 MCM Al/Cu	2341

Rev. 4 - Changed to wing transformer mount.



**CONSTRUCTION STANDARDS**

CROSSARM CONSTRUCTION  
TWO TRANSFORMERS  
OPEN WYE PRIMARY

REVISIONS			
Δ	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	1/13/10	CM	AH
3	5/31/12	KJP	
4	12/9/22	CRM	GM

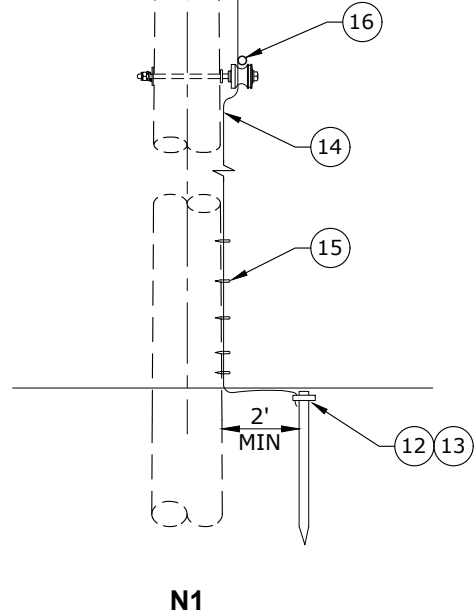
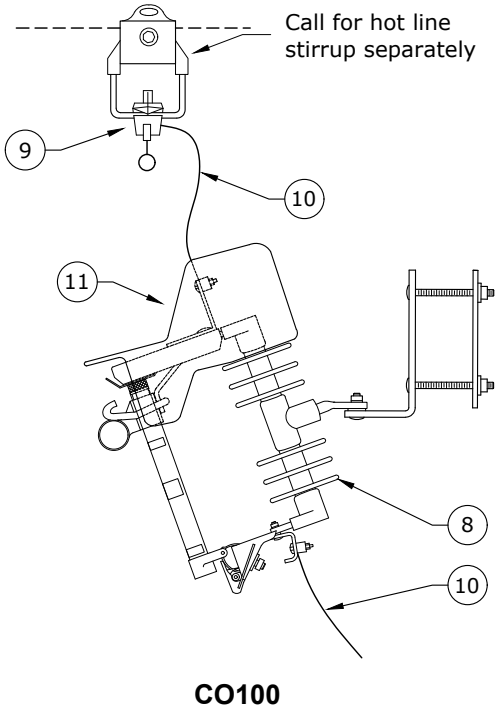
PAGE:  
1 of 2

**T21**

CAD FILE:  
T21

APP: ELM  
DATE: 1/31/80

SECTION  
**1100**



Rev. 4 - Changed to wing transformer mount.

ITEM NO.	DESCRIPTION	T21	
		QTY.	S/N
1	Mount, Transformer, Triple Wing, Al, 100 kVA Max	1	904
2	Bolt, Machine 3/4" x 16" Galv, 18,350 lb Ultimate	2	175
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" With 13/16" Hole, Galv	2	1392
4	Washer, Lock, Spring, Double Coil, Galv, 3/4"	2	2218
5	Guard, Wildlife, Transformer Bushing	2	721
6	Conductor, OH, Cu, #4, Solid, Bare, Soft Drawn, 1C	15	376
7	Connector, Crimpet, Cu, Run & Tap #6 Sol - #4 Str (4C4)	2	450
ITEM NO.	DESCRIPTION	CO100 (2)	
8	Cutout, Polymer, Universal, 100 Amp, 16 kA Asymmetrical	2	2532
9	Clamp, Hot Line, GP1530, Line #6 Solid - 400 MCM, Tap #6 Solid - 4/0 Str, Cu Only	2	284
10	Conductor, OH, 600V, Cu, #4, 7-Str, XLPE, 60 mil, Soft-drawn, 1C, RHW-2	30	391*
11	Guard, Wildlife, Cutout, Polymer	2	2928
ITEM NO.	DESCRIPTION	N1	
12	Rod, Ground, 5/8" x 8'	2	1124
13	Clamp, Ground Rod, 5/8", Small, Bronze	2	281
14	Conductor, Copper-Clad Steel, Black w/ Green Strip, #4 Cu Equivalent, 40% Annealed	100	1512
15	Staple, Ground, Barbed, Galvanized, 1 1/2"	40	2707
16	Connector, H-Tap, Al/Cu, Run #2-2/0 Str - Tap #6-#1 Str	1	413



## CONSTRUCTION STANDARDS

CROSSARM CONSTRUCTION  
TWO TRANSFORMERS  
OPEN WYE PRIMARY

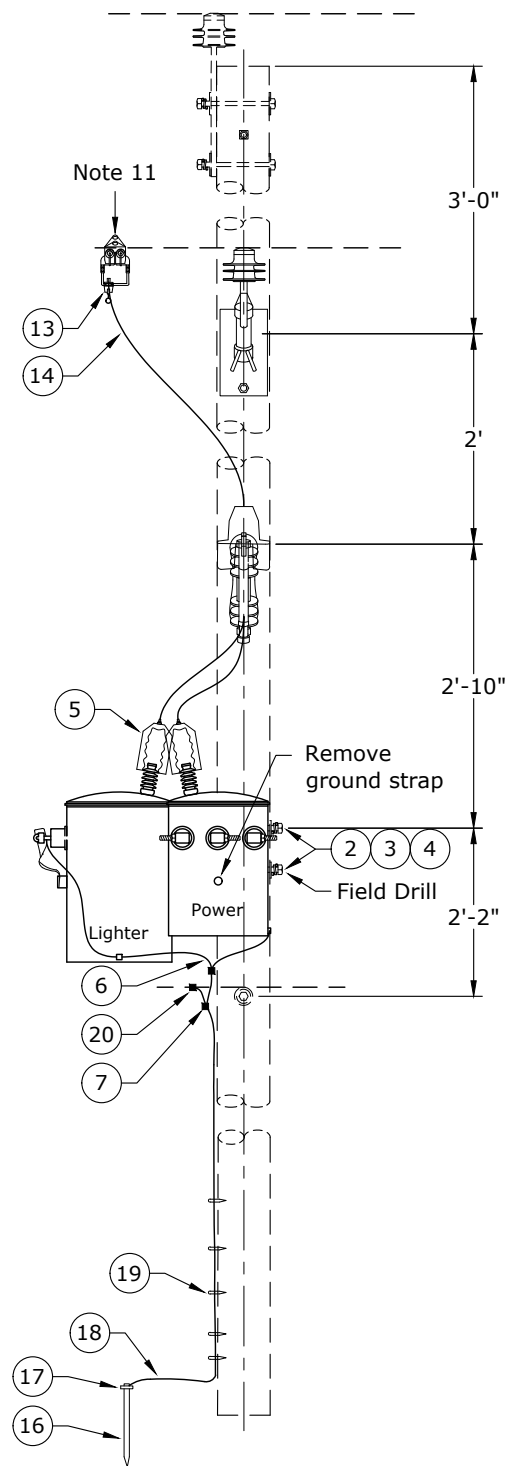
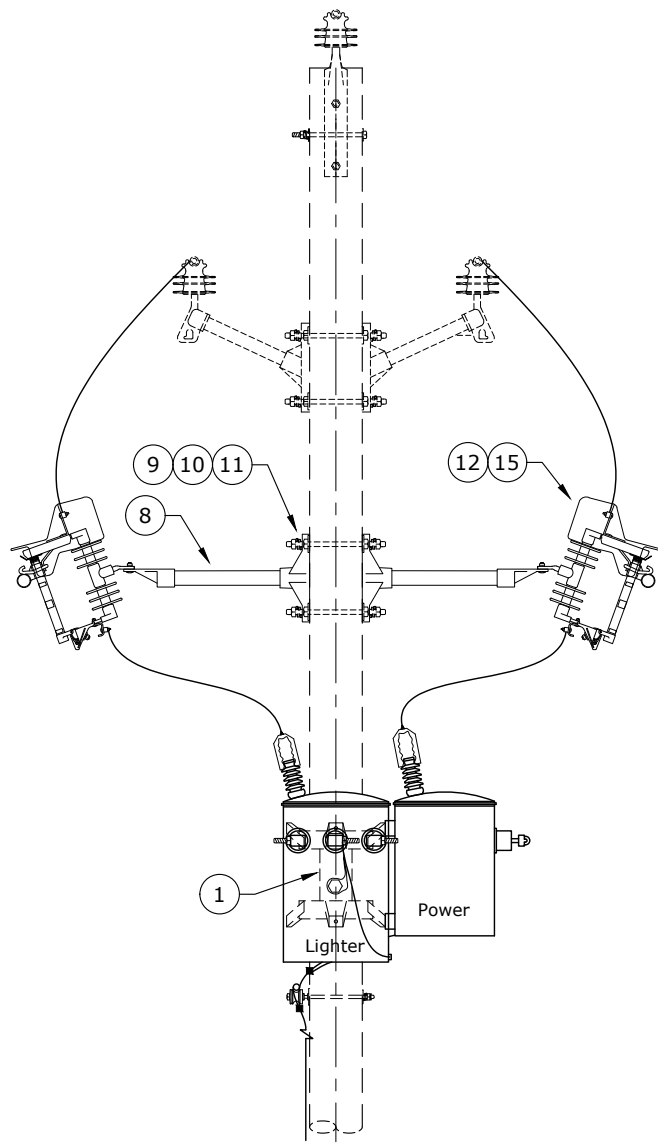
PAGE:  
2 of 2

**T21**

CAD FILE:  
T21

REVISIONS			
Δ	DATE	ENGR	OPS
1	3/02	REDRAWN	IN CAD
2	1/13/10	CM	AH
3	5/31/12	KJP	
4	12/9/22	CRM	GM

APP: ELM	SECTION
DATE: 1/31/80	<b>1100</b>



**Notes:**

1. See table for maximum weight on poles.
2. The lighter pot shall always be connected to the leading phase.
3. All tanks to be grounded.
4. Ground H2 bushing on all two-bushing transformers.
5. Use pre-drilled holes for transformers ensuring that tank does not rest on neutral.
6. For transformer secondary lead sizes, see  
Std TL1 - Transformer Lead Sizes Overhead Secondary, or  
Std TL2 - Large Transformer Lead Size Overhead Secondary.
7. For secondary connections see Std TC4 - Open Wye.
8. Call out on drawing as follows: T23-10-37 1/2

Transformer sizes

9. Maximum motor size shall be 15 hp.
10. Fuse per Std F1 - Fuse Schedule Overhead Transformers.
11. Call for hot line stirrup separately.  
See table for size.

Stirrup Size	S/N
#6 SLD-#6 STR Cu	2338
#4-2/0 Al/Cu	2339
397 MCM Al/Cu	2340
795 MCM Al/Cu	2341

Class	Max Weight
4	1750 lb
2	3200 lb
1	4000 lb

Rev. 4 - Changed to wing transformer mount and fiberglass cutout mounts.



**CONSTRUCTION STANDARDS**

TWIGGY CONSTRUCTION  
TWO TRANSFORMERS  
OPEN WYE PRIMARY

PAGE:  
1 of 2

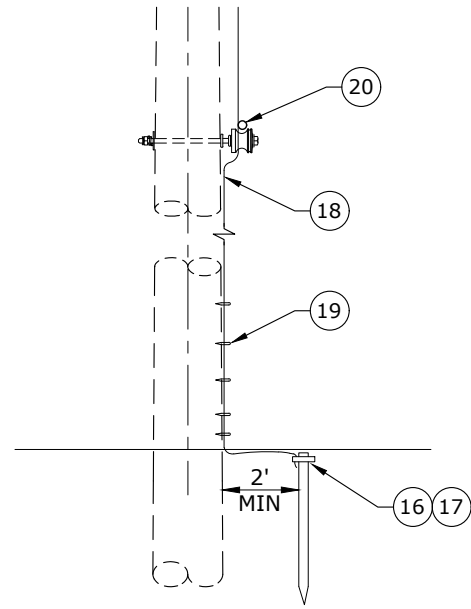
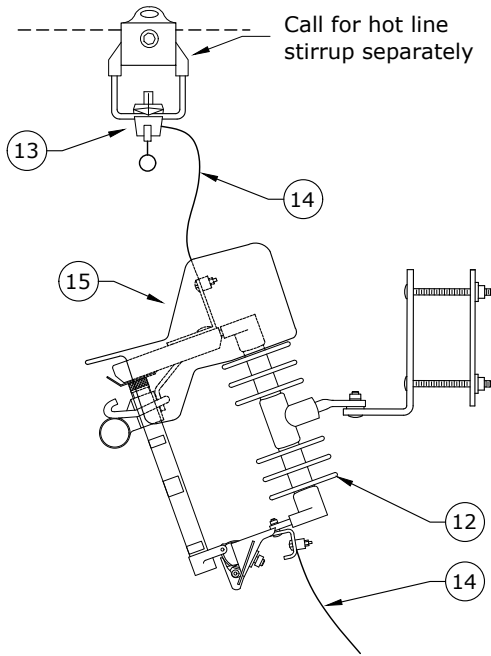
**T23**

CAD FILE:  
T23

REVISIONS			
DATE	ENGR	OPS	
3/02	REDRAWN	IN CAD	1
1/13/10	CM	AH	2
5/31/12	KJP	GM	3
12/9/22	CRM	GM	4

APP: ELM	SECTION
DATE: 1/31/80	<b>1100</b>



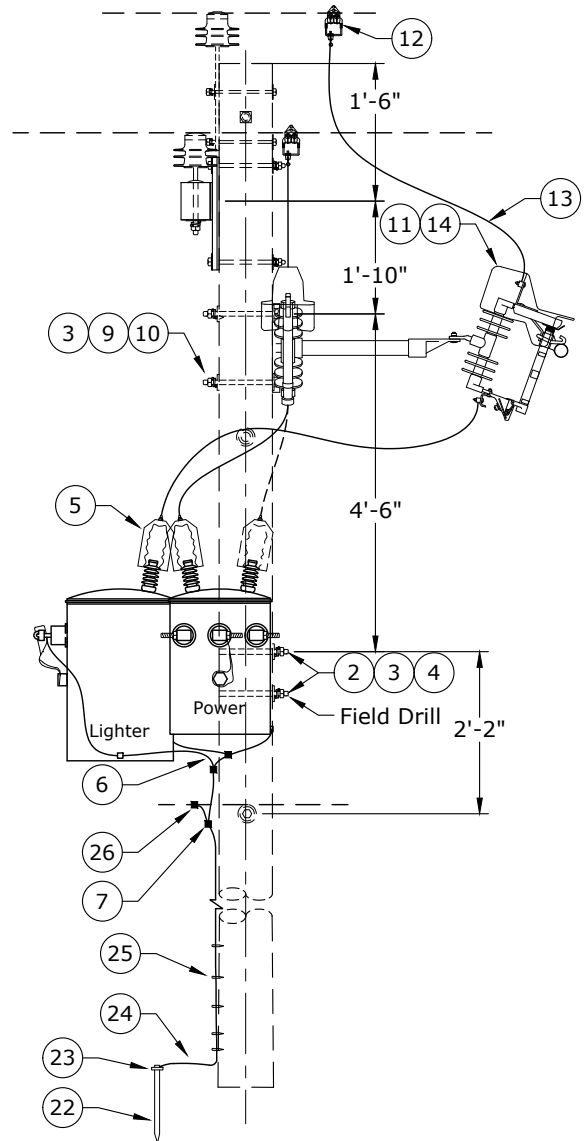
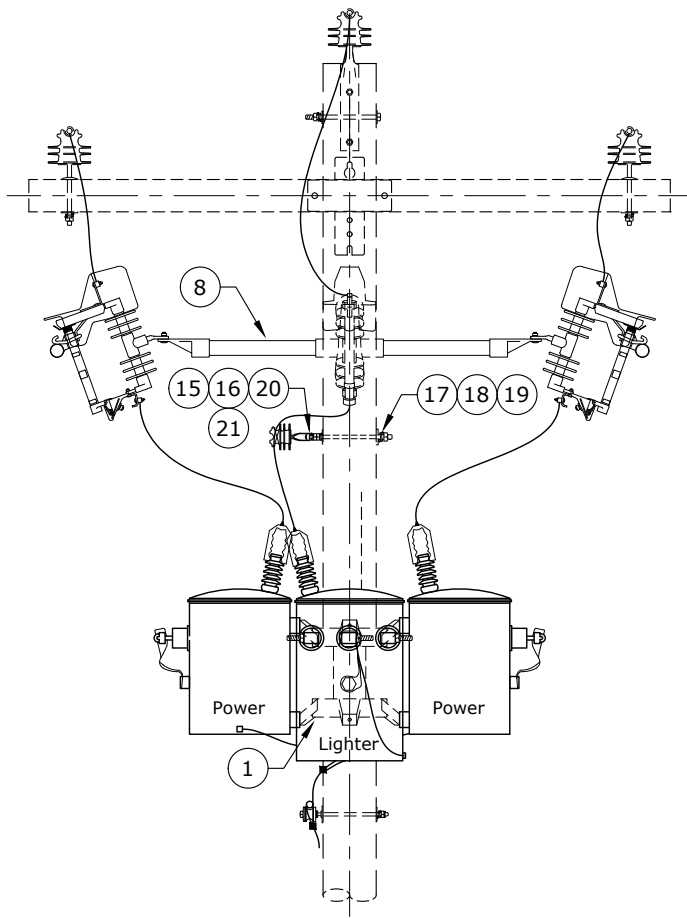
Rev. 4 - Changed to wing transformer mount and fiberglass cutout mounts.

ITEM NO.	DESCRIPTION	T23	
		QTY.	S/N
1	Mount, Transformer, Triple Wing, Al, 100 kVA Max	1	904
2	Bolt, Machine 3/4" x 16" Galv, 18,350 lb Ultimate	2	175
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" With 13/16" Hole, Galv	2	1392
4	Washer, Lock, Spring, Double Coil, Galv, 3/4"	2	2218
5	Guard, Wildlife, Tranformer Bushing	2	721
6	Conductor, OH, Cu, #4, Solid, Bare, Soft Drawn, 1C	15	376
7	Connector, Crimpet, Cu, Run & Tap #6 Sol - #4 Str (4C4)	2	450
8	Bracket, Cutout Mount, 1 Phase, 18" Fiberglass	2	2998
9	Bolt, Double Arm, 5/8" x 18", Galv., 12,400 lb Ultimate Tensile	2	82
10	Washer, Flat Round Galv., 5/8"	4	1395
11	Washer, Lock, Spring, Double Coil, Galv., 5/8"	4	2217
ITEM NO.	DESCRIPTION	CO100 (2)	
		QTY.	S/N
12	Cutout, Polymer, Universal, 100 Amp, 16 kA Asymmetrical	2	2532
13	Clamp, Hot Line, GP1530, Line #6 Solid - 400 MCM, Tap #6 Solid - 4/0 Str, Cu Only	2	284
14	Conductor, OH, 600V, Cu, #4, 7-Str, XLPE, 60 mil, Soft-drawn, 1C, RHW-2	30	391*
15	Guard, Wildlife, Cutout, Polymer	2	2928
ITEM NO.	DESCRIPTION	N1	
		QTY.	S/N
16	Rod, Ground, 5/8" x 8'	2	1124
17	Clamp, Ground Rod, 5/8", Small, Bronze	2	281
18	Conductor, Copper-Clad Steel, Black w/ Green Strip, #4 Cu Equivalent, 40% Annealed	100	1512
19	Staple, Ground, Barbed, Galvanized, 1 1/2"	40	2707
20	Connector, H-Tap, Al/Cu, Run #2-2/0 Str - Tap #6-#1 Str	1	413



**CONSTRUCTION STANDARDS**  
 TWIGGY CONSTRUCTION  
 TWO TRANSFORMERS  
 OPEN WYE PRIMARY

REVISIONS			
DATE	ENGR	OPS	
3/02	REDRAWN	IN CAD	
1/13/10	CM	AH	
5/31/12	KJP		
12/9/22	CRM	GM	



**Notes:**

1. See table for maximum weight on poles.
2. To determine the total transformer weight take three times the weight of the heaviest.
3. All tanks to be grounded.
4. Ground the H2 bushing on all two-bushing transformers.
5. Use pre-drilled holes for transformers, ensuring that tank does not rest on neutral.
6. For transformer secondary lead sizes, see  
 Std TL1 - Transformer Lead Sizes Overhead Secondary, or  
 Std TL2 - Large Transformer Lead Size Overhead Secondary.
7. For secondary connections see the Std TC7 - Grounded Wye-Wye.
8. Call out on drawing as follows: T31-25-25-25  
 Transformer sizes
9. Fuse per Std F1 - Fuse Schedule Overhead Transformers.
10. Call for hot line stirrup separately. See table for size.

Class	Max Weight
4	1750 lb
2	3200 lb
1	4000 lb

Stirrup Size	S/N
#6 Solid - #6 Str Cu	2338
#4-2/0 Al/Cu	2339
397 MCM Al/Cu	2340
795 MCM Al/Cu	2341

Rev. 4 - Changed to wing transformer mount and fiberglass equipment mount.



**CONSTRUCTION STANDARDS**

THREE TRANSFORMERS  
 GROUNDED Y - GROUNDED Y

REVISIONS			
R	DATE	ENGR	OPS
1	7/02		
2	1/13/10	CM	AH
3	5/31/12	KJP	
4	12/9/22	CRM	GM

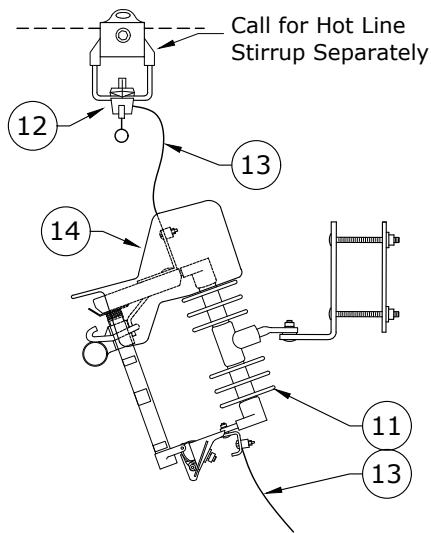
PAGE:  
1 of 2

**T31**

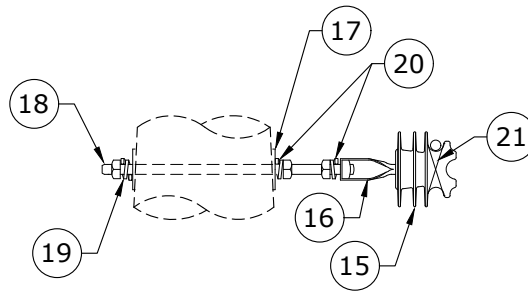
CAD FILE:  
T31

APP: ELM  
DATE: 1/31/80

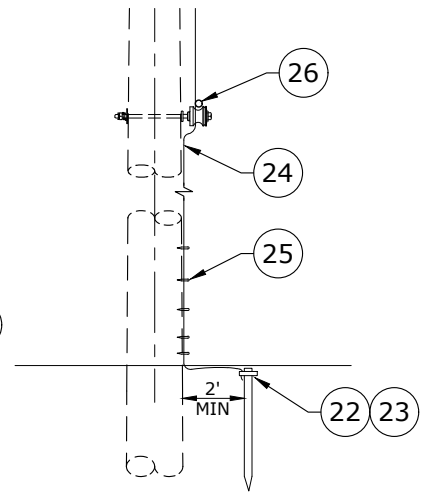
SECTION  
**1100**



**CO100**



**PR20TREE**



**N1**

Rev. 4 - Changed to wing transformer mount and fiberglass equipment mount.

ITEM NO.	DESCRIPTION	T31	
		QTY.	S/N
1	Mount, Transformer, Triple Wing, Al, 100 kVA Max	1	904
2	Bolt, Machine 3/4" x 16" Galv, 18,350 lb Ultimate	2	175
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" With 13/16" Hole, Galv	4	1392
4	Washer, Lock, Spring, Double Coil, Galv, 3/4"	2	2218
5	Guard, Wildlife, Transformer Bushing	3	721
6	Conductor, OH, Cu, #4, Solid, Bare, Soft Drawn, 1C	20	376
7	Connector, Crimpet, Cu, Run & Tap #6 Sol - #4 Str (4C4)	3	450
8	Bracket, Cutout Mount, 3 Phase, 18" Fiberglass	2	2999
9	Bolt, Machine, 5/8" x 16", Galv, 12,400 lb Ultimate Tensile	2	157
10	Washer, Lock, Spring, Double Coil, Galv, 5/8"	2	2217
ITEM NO.	DESCRIPTION	CO100 (3)	
		QTY.	S/N
11	Cutout, Polymer, Universal, 100 Amp, 16 kA Asymmetrical	3	2532
12	Clamp, Hot Line, GP1530, Line #6 Solid - 400 MCM, Tap #6 Solid - 4/0 Str, Cu Only	3	284
13	Conductor, OH, 600V, Cu, #4, 7-Str, XLPE, 60 mil, Soft-drawn, 1C, RHW-2	45	391*
14	Guard, Wildlife, Cutout, Polymer	3	2928
ITEM NO.	DESCRIPTION	PR20TREE	
		QTY.	S/N
15	Insulator, Pin, C Neck, Polymer	1	1968
16	Pin, Adapter	1	959
17	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
18	Bolt, Double Arm, 5/8" x 16" Galv., 12,400 lbs Ultimate Tensile	1	81
19	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217
20	Washer, Lock, Spring, Single Coil, Galv., 5/8"	2	1403
21	Wire, Tie, Al #4 Solid with 45mil TPR Jacket	11	3012
ITEM NO.	DESCRIPTION	N1	
		QTY.	S/N
22	Rod, Ground, 5/8" x 8'	2	1124
23	Clamp, Ground Rod, 5/8", Small, Bronze	2	281
24	Conductor, Copper-Clad Steel, Black w/ Green Stripe, #4 Cu Equivalent, 40% Annealed	100	1512
25	Staple, Ground, Barbed, Galvanized, 1 1/2"	40	2707
26	Connector, H-Tap, Al/Cu, Run #2-2/0 Str - Tap #6-#1 Str	1	413

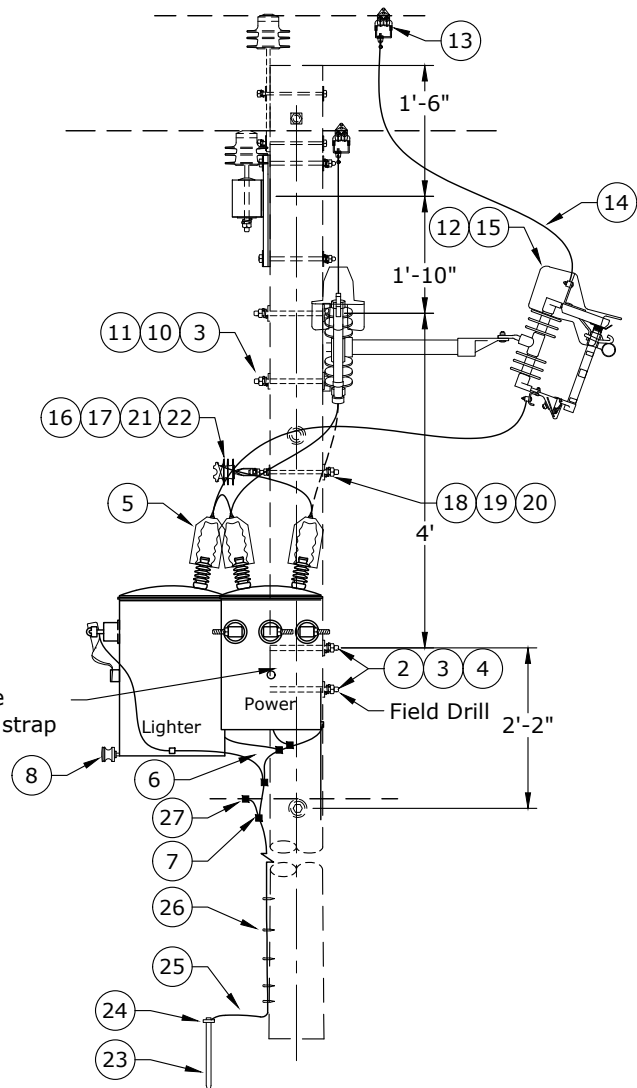
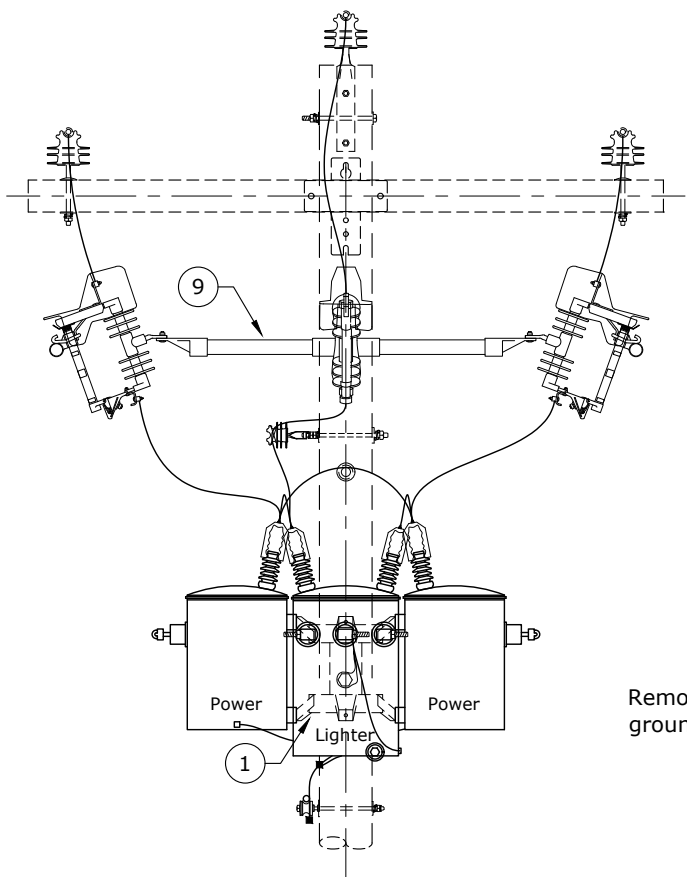


**CONSTRUCTION STANDARDS**

THREE TRANSFORMERS  
GROUNDED Y - GROUNDED Y

REVISIONS			
R	DATE	ENGR	OPS
1	7/02		
2	1/13/10	CM	AH
3	5/31/12	KJP	
4	12/9/22	CRM	GM





**Notes:**

1. See chart for maximum weight on poles.
2. To determine the total transformer weight take three times the weight of the heaviest.
3. All tanks to be grounded.
4. Use pre-drilled holes for transformers, ensuring that tank does not rest on neutral.
5. For transformer secondary lead sizes, see  
Std TL1 - Transformer Lead Sizes Overhead Secondary, or  
Std TL2 - Large Transformer Lead Size Overhead Secondary.
6. For secondary connections see the Std TC5 - Delta-Delta.
7. Transformer impedances must satisfy Std TC5A - Delta-Delta Impedance Matching.
8. Call out on drawing as follows: T32-25-50-25  
Transformer sizes
9. Fuse per Std F1 - Fuse Schedule Overhead Transformers.
10. Call for hot line stirrup separately. See table for size.

Class	Max Weight
4	1750 lb
2	3200 lb
1	4000 lb

Stirrup Size	S/N
#6 SLD-#6 STR Cu	2338
#4-2/0 Al/Cu	2339
397 MCM Al/Cu	2340
795 MCM Al/Cu	2341

Rev. 4 - Changed to wing transformer mount and fiberglass cutout mount.



**CONSTRUCTION STANDARDS**  
THREE TRANSFORMERS  
CLOSED Δ - CLOSED Δ

PAGE:  
1 of 2

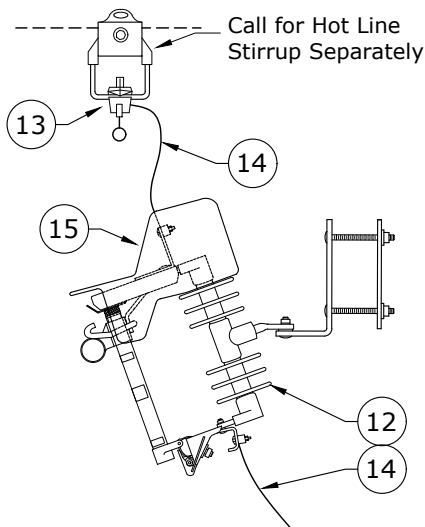
**T32**

CAD FILE:  
T32

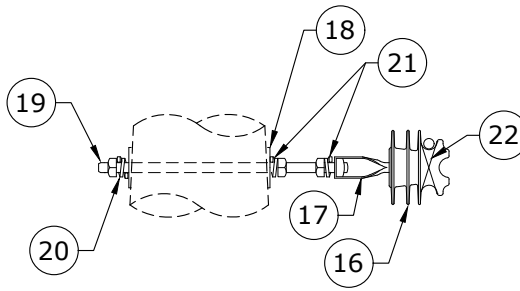
REVISIONS			
Δ	DATE	ENGR	OPS
1	7/02	Redrawn	in CAD
2	1/13/10	CM	AH
3	5/31/12	KJP	
4	12/9/22	CRM	GM

APP: ELM  
DATE: 1/31/80

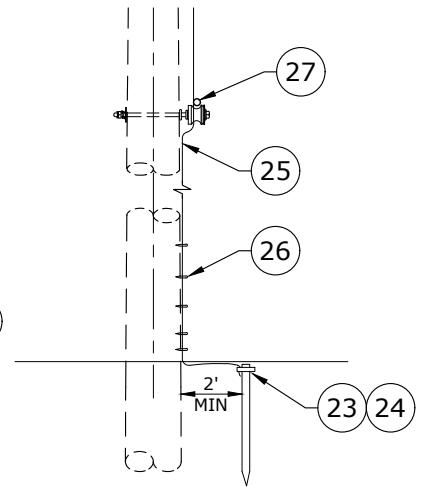
SECTION  
**1100**



**CO100**



**PR20TREE**



**N1**

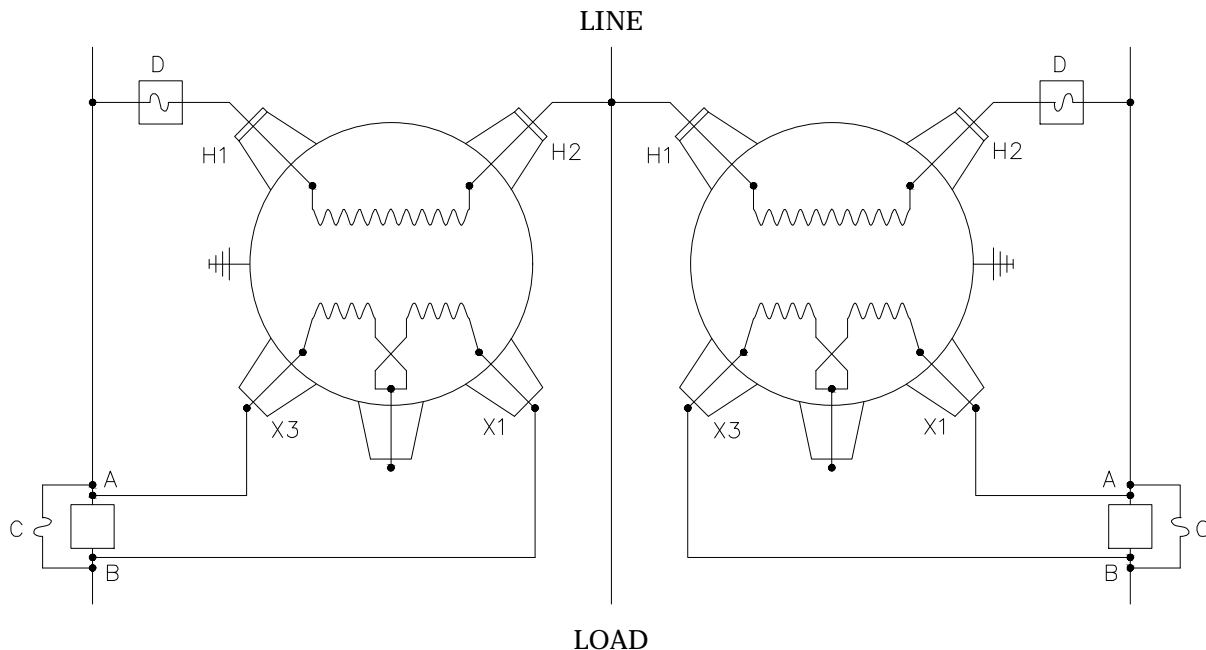
Rev. 4 - Changed to wing transformer mount and fiberglass cutout mount.

ITEM NO.	DESCRIPTION	T23	
		QTY.	S/N
1	Mount, Transformer, Triple Wing, Al, 100 kVA Max	1	904
2	Bolt, Machine 3/4" x 16" Galv, 18,350 lb Ultimate	2	175
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" With 13/16" Hole, Galv	4	1392
4	Washer, Lock, Spring, Double Coil, Galv, 3/4"	2	2218
5	Guard, Wildlife, Tranformer Bushing	6	721
6	Conductor, OH, Cu, #4, Solid, Bare, Soft Drawn, 1C	20	376
7	Connector, Crimpet, Cu, Run & Tap #6 Sol - #4 Str (4C4)	4	450
8	Bracket, Transformer Clearance with Insulator	1	234
9	Bracket, Cutout Mount, 3 Phase, 18" Fiberglass	2	2999
10	Bolt, Machine, 5/8" x 16", Galv., 12,400 lb Ultimate Tensile	2	157
11	Washer, Lock, Spring, Double Coil, Galv, 5/8"	2	2217
ITEM NO.	DESCRIPTION	CO100 (3)	
		QTY.	S/N
12	Cutout, Polymer, Universal, 100 Amp, 16 kA Asymmetrical	3	2532
13	Clamp, Hot Line, GP1530, Line #6 Solid - 400 MCM, Tap #6 Solid - 4/0 Str, Cu Only	3	284
14	Conductor, OH, 600V, Cu, #4, 7-Str, XLPE, 60 mil, Soft-drawn, 1C, RHW-2	45	391*
15	Guard, Wildlife, Cutout, Polymer	3	2928
ITEM NO.	DESCRIPTION	PR20TREE	
		QTY.	S/N
16	Insulator, Pin, C Neck, Polymer	1	1968
17	Pin, Adapter	1	959
18	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	2	1392
19	Bolt, Double Arm, 5/8" x 16" Galv., 12,400 lbs Ultimate Tensile	1	81
20	Washer, Lock, Spring, Double Coil, Galv., 5/8"	1	2217
21	Washer, Lock, Spring, Single Coil, Galv., 5/8"	2	1403
22	Wire, Tie, Al #4 Solid with 45mil TPR Jacket	11	3012
ITEM NO.	DESCRIPTION	N1	
		QTY.	S/N
23	Rod, Ground, 5/8" x 8'	2	1124
24	Clamp, Ground Rod, 5/8", Small, Bronze	2	281
25	Conductor, Copper-Clad Steel, Black w/ Green Stripe, #4 Cu Equivalent, 40% Annealed	100	1512
26	Staple, Ground, Barbed, Galvanized, 1 1/2"	40	2707
27	Connector, H-Tap, Al/Cu, Run #2-2/0 Str - Tap #6-#1 Str	1	413



**CONSTRUCTION STANDARDS**  
THREE TRANSFORMERS  
CLOSED Δ - CLOSED Δ

REVISIONS			
Δ	DATE	ENGR	OPS
1	7/02	Redrawn	in CAD
2	1/13/10	CM	AH
3	5/31/12	KJP	
4	12/9/22	CRM	GM



**INSTALLATION PROCEDURE:**

1. Cut in breaker between point "A" & "B" while keeping circuit closed with a jumper. Install C/O fused just above line current at "C". Close C/O and remove jumper.
2. Install slugged C/O at "D", leave open and connect primary leads to line and transformer.
3. Connect other side of high voltage winding to the line.
4. Install leads from secondary side of transformer to points "A"&"B" as required by desired installation.
5. Repeat procedure for other side.
6. Close C/O at "D" which blows fuse at "C".
7. Remove C/O at "C".
8. Jumper out C/O at "D" and remove.

**REMOVAL PROCEDURE:**

1. Install fused C/O at "D". Use transformer size fuse.
2. Install slugged C/O at "C", -leave open.
3. Repeat procedure for other side.
4. Close C/O at "C" which blows fuse at "D". Transformers are now out of circuit but still HOT.
5. Remove transformer secondary leads at points "A"&"B".
6. Remove primary leads. Transformers are now dead.
7. Remove breaker between points "A"&"B" or install jumper.
8. Remove C/O at "C".

**Notes:**

1. For 1Ø installations follow same procedure.
2. When it is desirable to leave bank in for future use, stop at step 4 of removal procedure.

**CAUTION**

1. When C/O's are left in the circuit they must be slugged.
2. Do not open "D" when "C" is open.
3. Install case ground before energizing bank.

**WARNING:**

The transformer should not be fused or have any device by which it can be readily disconnected. The primary must never be opened while the secondary position carries current, as dangerous voltages will be induced by the series winding.



**CONSTRUCTION STANDARDS**

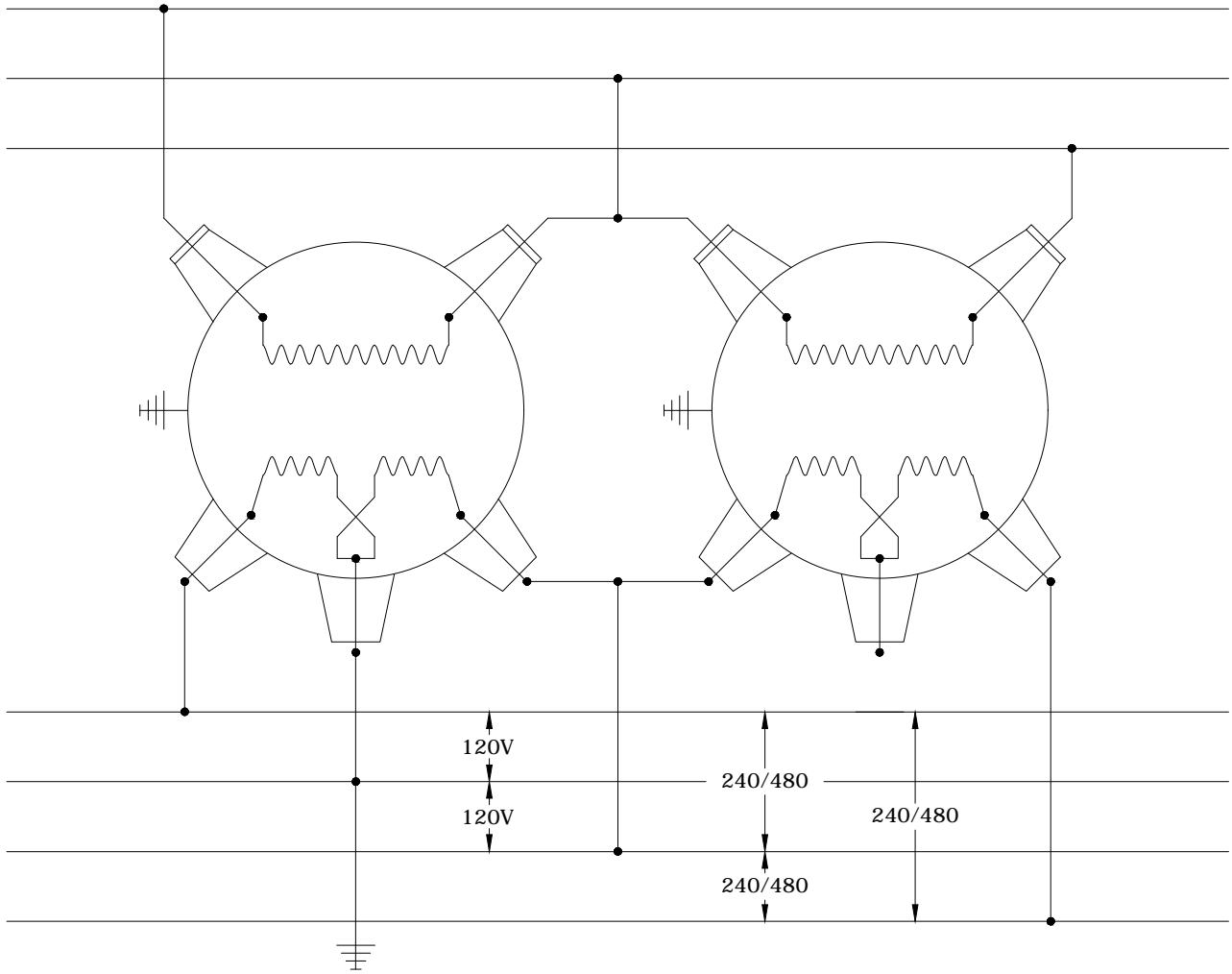
1Ø & 3Ø, 2 WINDING BOOST OR BUCK  
TRANSFORMER BANK  
INSTALLATION & REMOVAL PROCEDURE

PAGE:  
1 of 1

**TC2A**

CAD FILE:  
TC2A

REVISIONS			
NO.	DATE	ENGR	OPS
1	3/02		
⚠ REDRAWN IN CAD			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>1100</b>	



Notes:

1. Extend case ground wire to secondary neutral bushing on lighter transformer only.
2. For 3Ø 3 wire omit neutral installation and secondary grounds.



**CONSTRUCTION STANDARDS**

3Ø OPEN DELTA  
FOR 120/240 3Ø 4-WIRE,  
240 3Ø 3-WIRE, 480V 3Ø 3-WIRE

PAGE:  
1 of 1

**TC3**

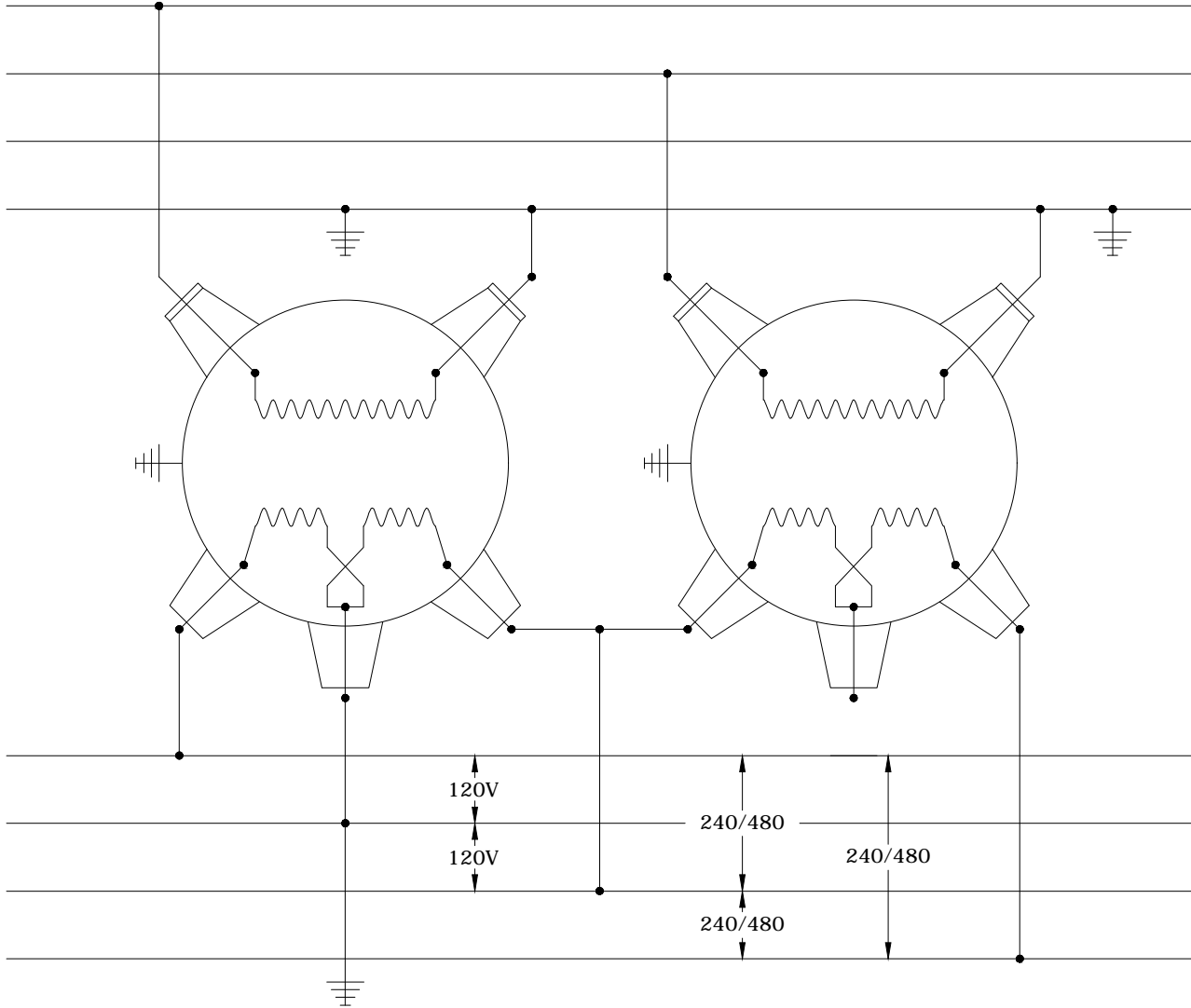
CAD FILE:  
TC3

REVISIONS

REVISION	DATE	ENGR	OPS
1	3/02		

REDRAWN IN CAD

APP:	ELM	SECTION
DATE: 1/31/80		<b>1100</b>



**Notes:**

- 1. Extend case ground wire to secondary neutral bushing on lighter transformer only.
- 2. For 3Ø 3 wire omit neutral installation and secondary grounds.



**CONSTRUCTION STANDARDS**

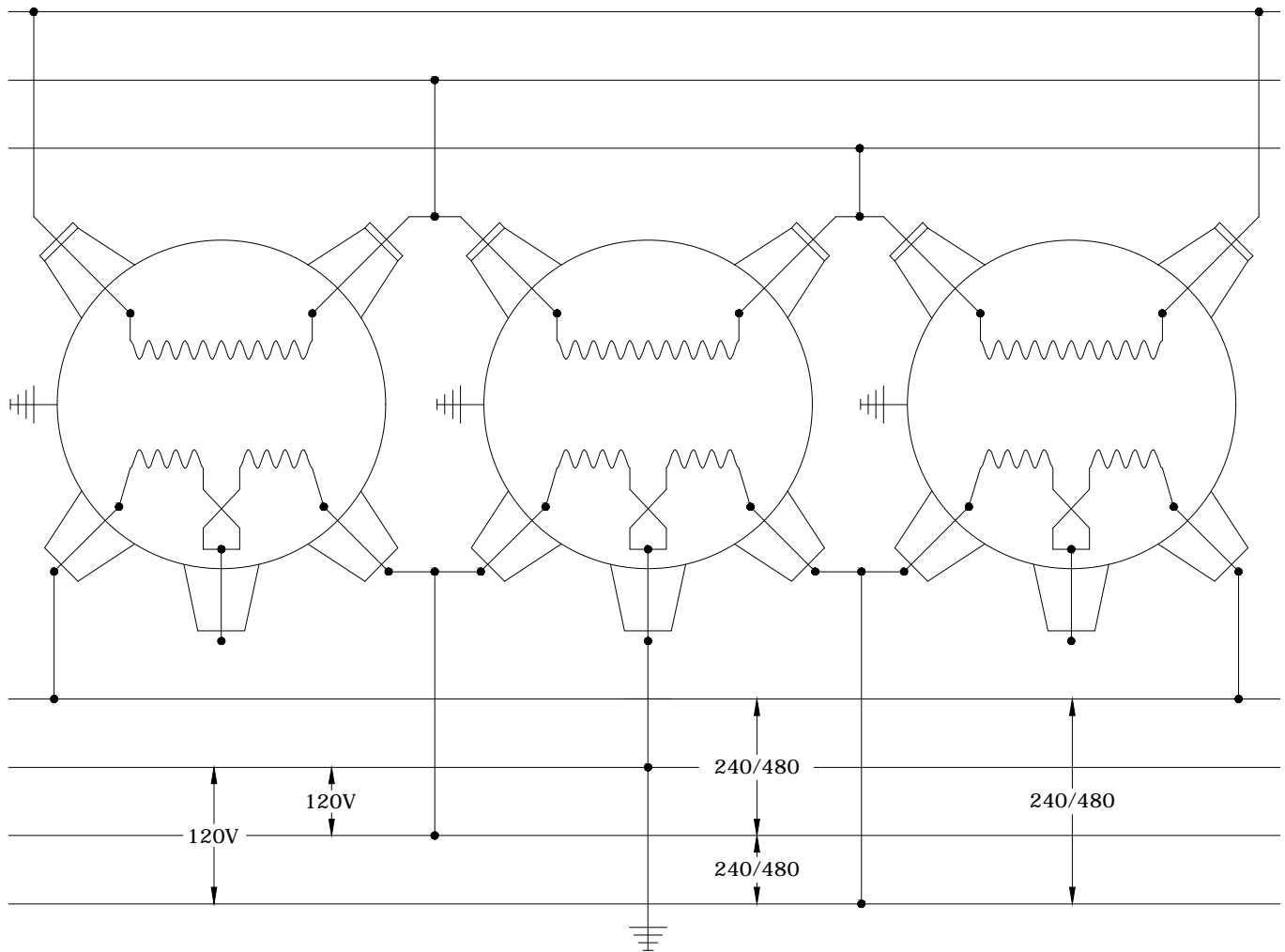
3Ø OPEN-WYE OPEN-DELTA  
FOR 120/240 3Ø 4-WIRE,  
240 3Ø 3-WIRE, 480V 3Ø 3-WIRE

PAGE:  
1 of 1

**TC4**

CAD FILE:  
TC4

REVISIONS			
Δ	DATE	ENGR	OPS
1	3/02		
Δ REDRAWN IN CAD			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>1100</b>	



Notes:

1. Extend case ground wire to secondary neutral bushing on lighter transformer only.
2. For 3Ø 3 wire omit neutral installation and secondary grounds.



**CONSTRUCTION STANDARDS**

3Ø DELTA-DELTA  
 FOR 120/240 3Ø 4-WIRE,  
 240 3Ø 3-WIRE, 480V 3Ø 3-WIRE

PAGE:  
1 of 1

**TC5**

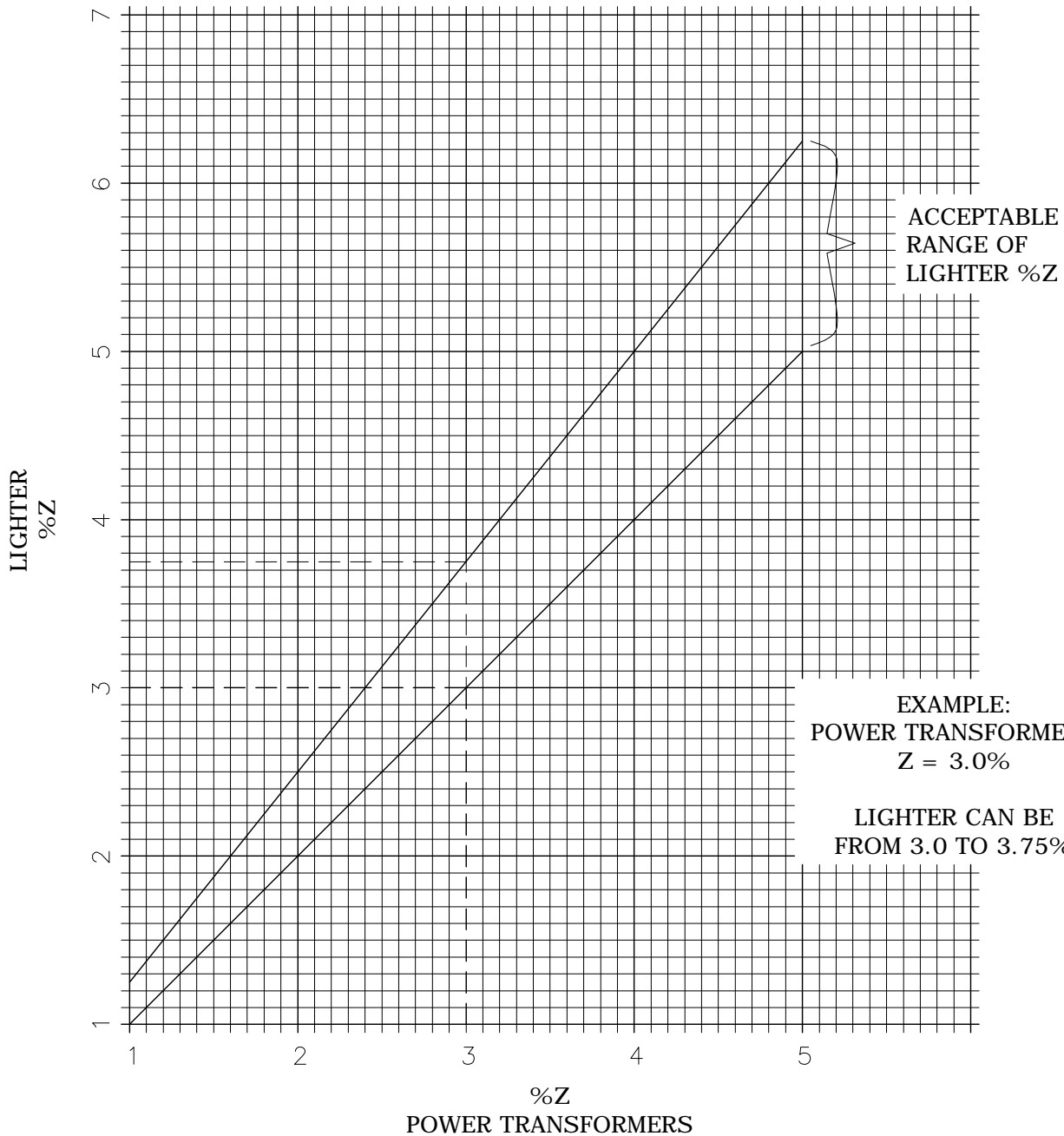
CAD FILE:  
TC5

REVISIONS

REVISION	DATE	ENGR	OPS
1	3/02		

REDRAWN IN CAD

APP:	ELM	SECTION
DATE: 1/31/80		<b>1100</b>



**Notes:**

1. Voltages and tap position must match on all three transformers.
2. Impedances should be matched. If not, the lighter may have up to 25% higher impedance than either power transformer.
3. If the impedances in note 2 can not be obtained, go to the next larger KVA.
4. If a power transformer must be replaced it must match the existing unit. If this is not possible then replace both transformers.



**CONSTRUCTION STANDARDS**

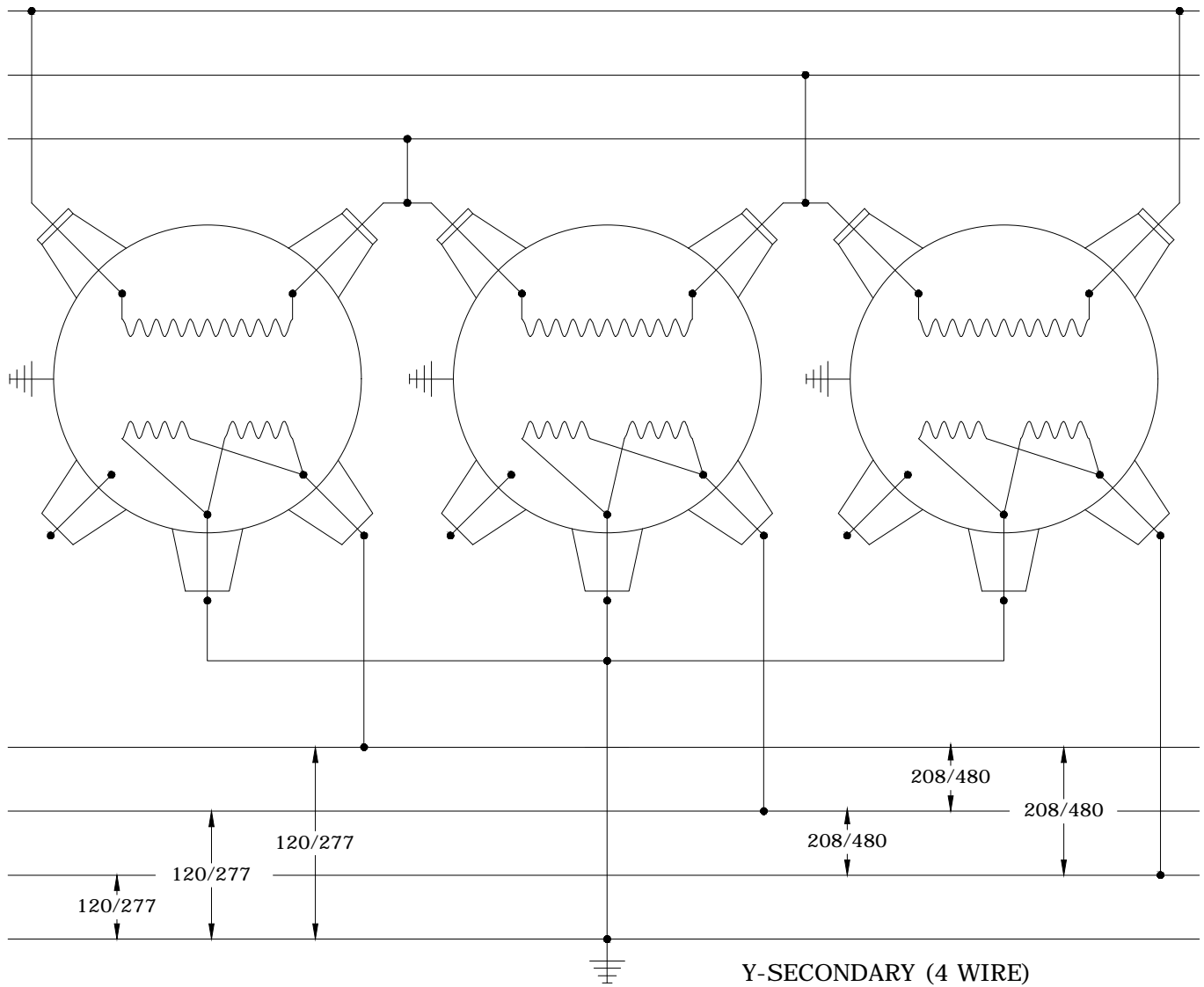
3Ø DELTA-DELTA CLOSED BANKS  
FOR 120/240 3Ø 4-WIRE,  
240 3Ø 3-WIRE, 480V 3Ø 3-WIRE

PAGE:  
1 of 1

**TC5A**

CAD FILE:  
TC5A

REVISIONS			
△	DATE	ENGR	OPS
1	3/02		
△ REDRAWN IN CAD			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>1100</b>	



Notes:

1. Extend case ground wire to secondary bushing.
2. Use transformers with 277V secondary rating to obtain 277/480V.



**CONSTRUCTION STANDARDS**  
 3Ø DELTA WYE  
 FOR 120/208 OR 277/480V SERVICE

PAGE:  
1 of 1

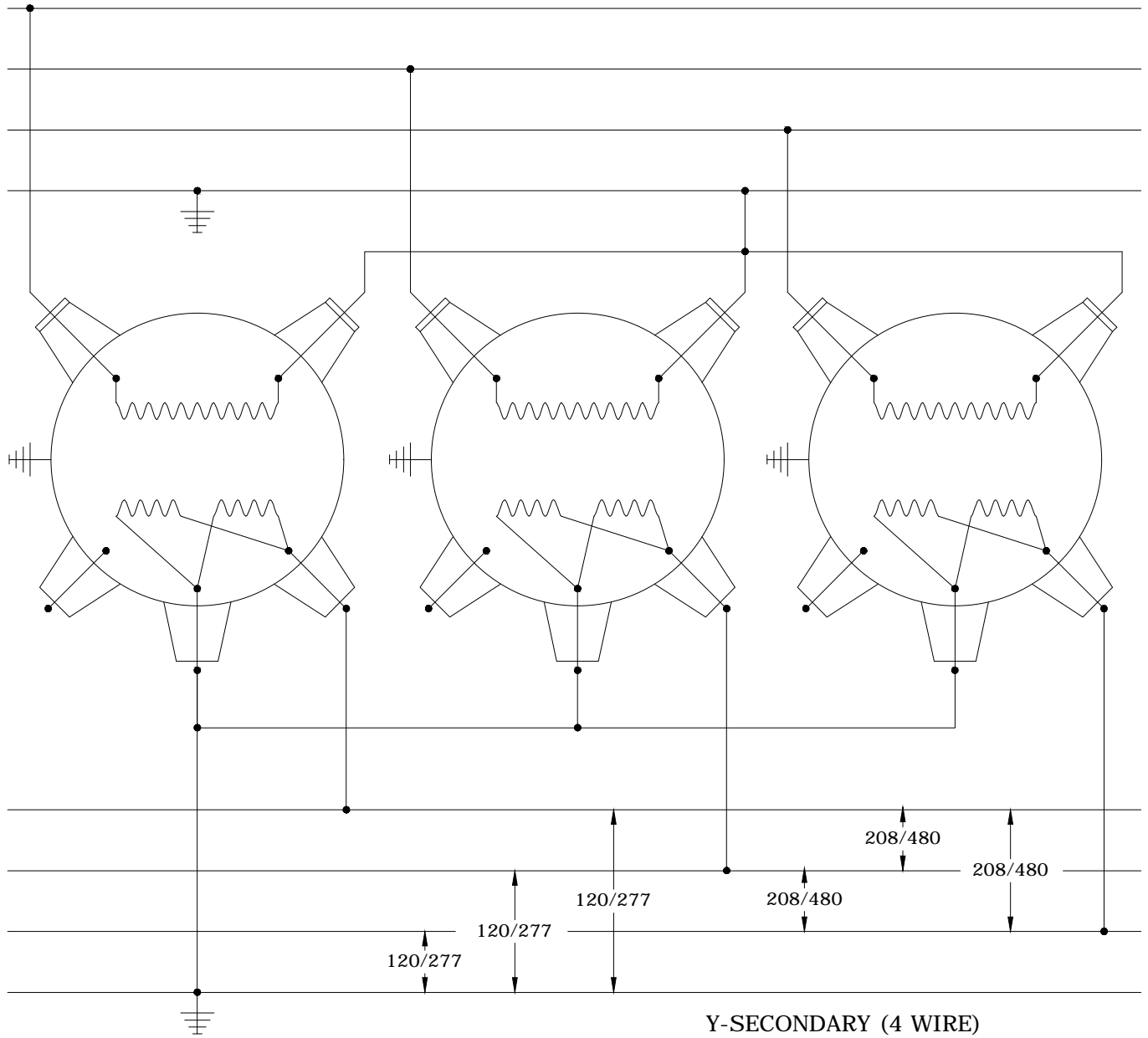
TC6

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TC6

REVISIONS			
#	DATE	ENGR	OPS
1	3/02		
△ REDRAWN IN CAD			
APP: ELM		SECTION	
DATE: 1/31/80		1100	



Y-SECONDARY (4 WIRE)



Notes:

1. Extend case ground wire to secondary bushing.
2. Use transformers with 277V secondary rating to obtain 277/480V.



**CONSTRUCTION STANDARDS**

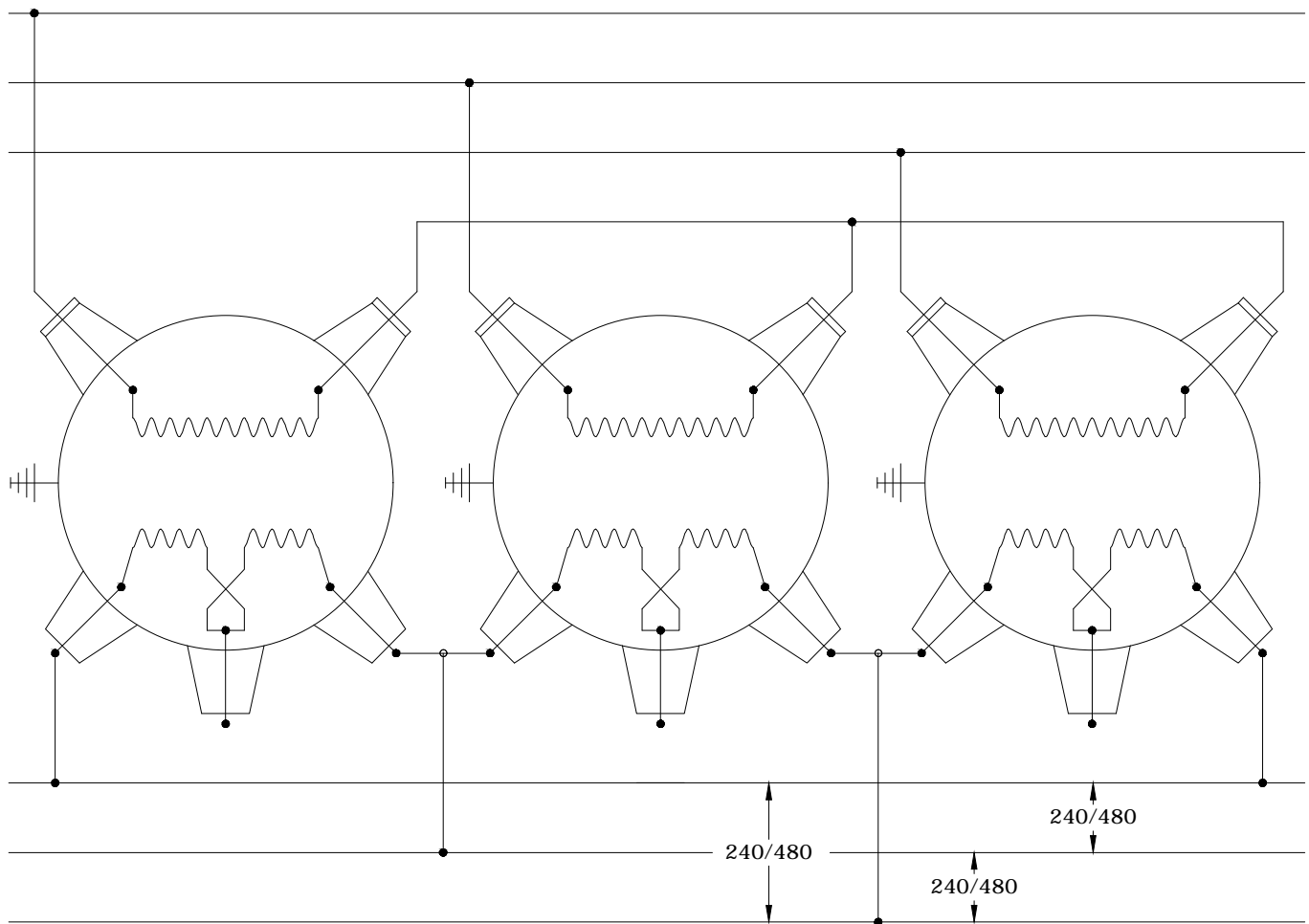
3Ø WYE WYE  
FOR 120/208 OR 277/480V SERVICE

PAGE:  
1 of 1

**TC7**

CAD FILE:  
TC7

REVISIONS			
Δ	DATE	ENGR	OPS
1	3/02		
Δ REDRAWN IN CAD			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>1100</b>	



Notes:

1. Float primary neutral free to grounds
2. Use 2-bushing transformers only.



**CONSTRUCTION STANDARDS**

3Ø WYE DELTA  
 FOR 240V 3Ø 3-WIRE  
 480V 3Ø 3-WIRE

PAGE:  
1 of 1

**TC8**

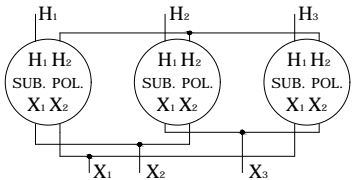
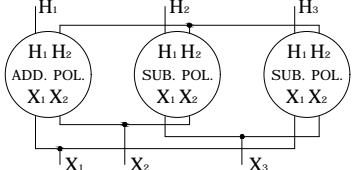
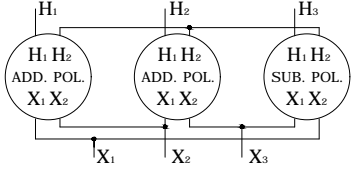
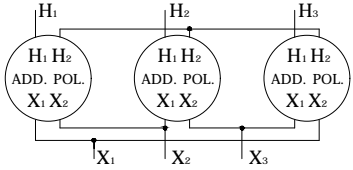
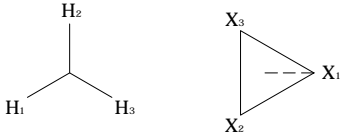
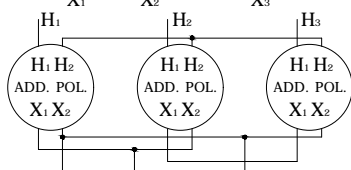
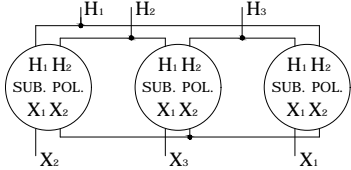
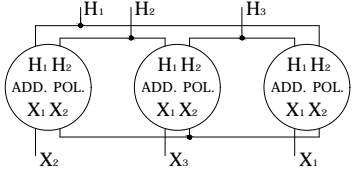
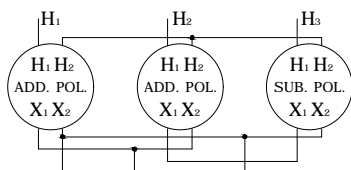
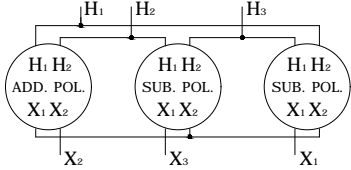
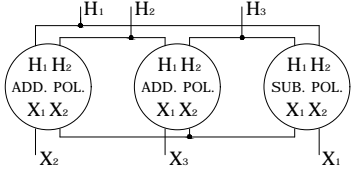
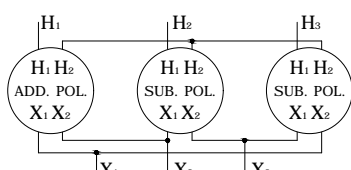
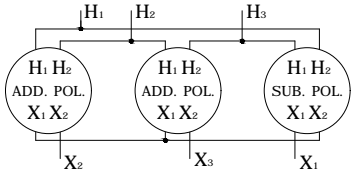
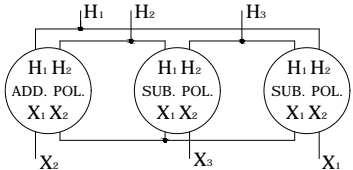
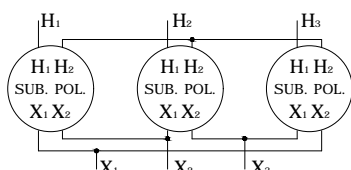
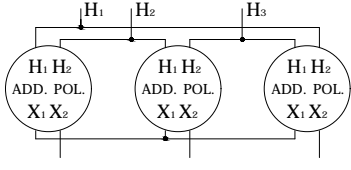
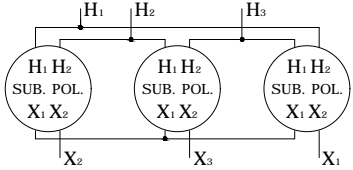
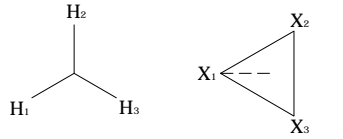
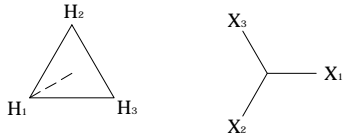
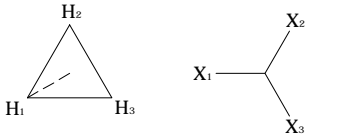
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TC8

REVISIONS

Δ	DATE	ENGR	OPS
1	3/02		

Δ REDRAWN IN CAD

APP:	ELM	SECTION
DATE: 1/31/80		<b>1100</b>



**N.E.M.A STANDARDS FOR 1Ø TRANSFORMER POLARITY MARKING.**

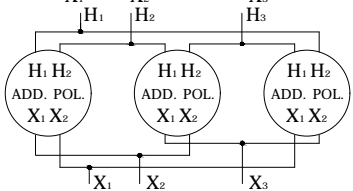
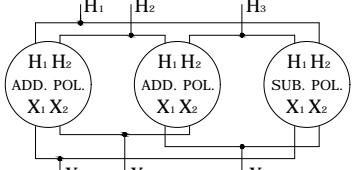
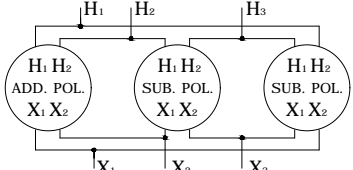
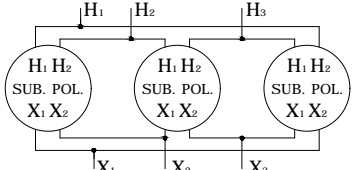
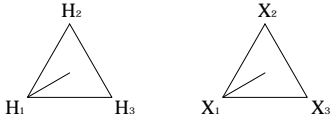
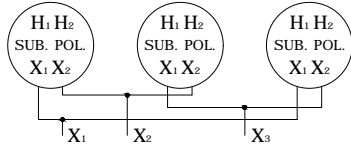
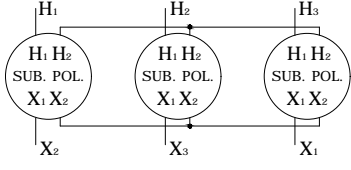
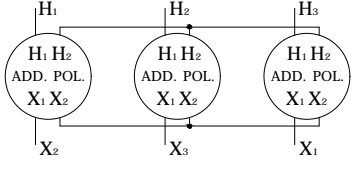
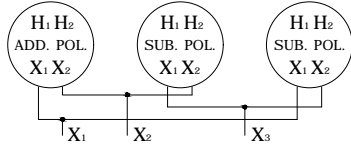
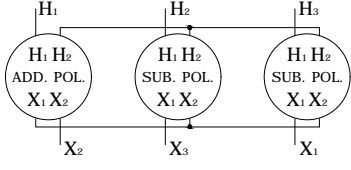
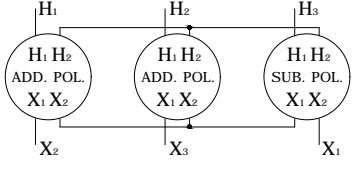
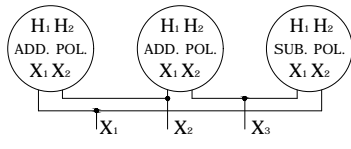
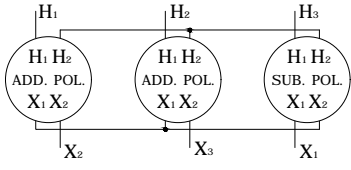
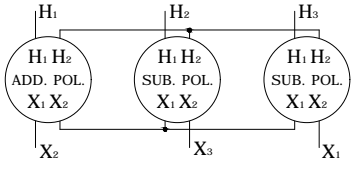
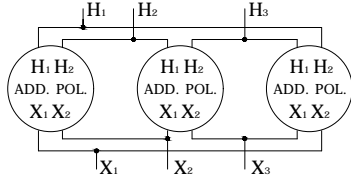
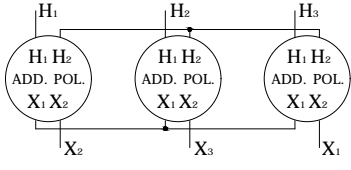
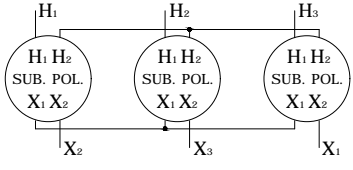
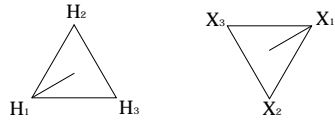
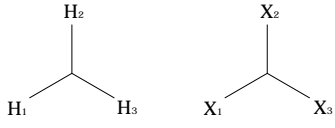
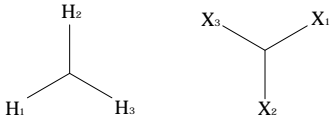
1. Additive polarity is standard for all 1Ø transformers in sizes 200KVA and below having high voltage ratings 8660 volts and below.
2. Subtractive polarity is standard for all other 1Ø transformers.

SUB. POL. = SUBTRACTIVE POLARITY  
ADD. POL. = ADDITIVE POLARITY



**CONSTRUCTION STANDARDS**  
**3Ø TRANSFORMER CONNECTIONS**

REVISIONS			
REV	DATE	ENGR	OPS
0	6/14/02		
△ REDRAWN IN CAD			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>1100</b>	



**N.E.M.A STANDARDS FOR 1Ø TRANSFORMER POLARITY MARKING.**

1. Additive polarity is standard for all 1Ø transformers in sizes 200KVA and below having high voltage ratings 8660 volts and below.
2. Subtractive polarity is standard for all other 1Ø transformers.

SUB. POL. = SUBTRACTIVE POLARITY  
ADD. POL. = ADDITIVE POLARITY



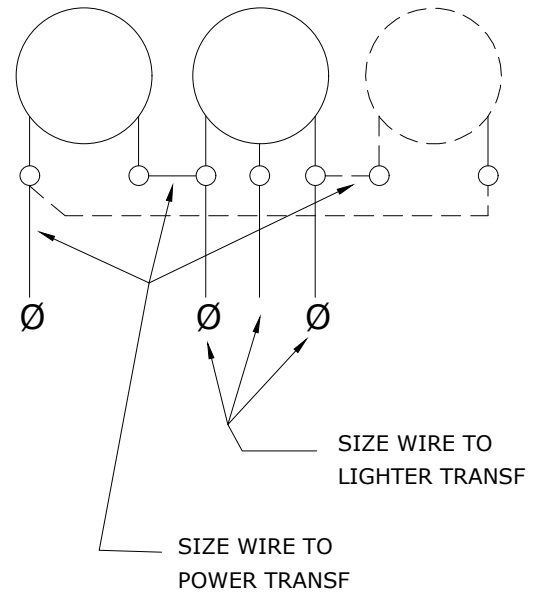
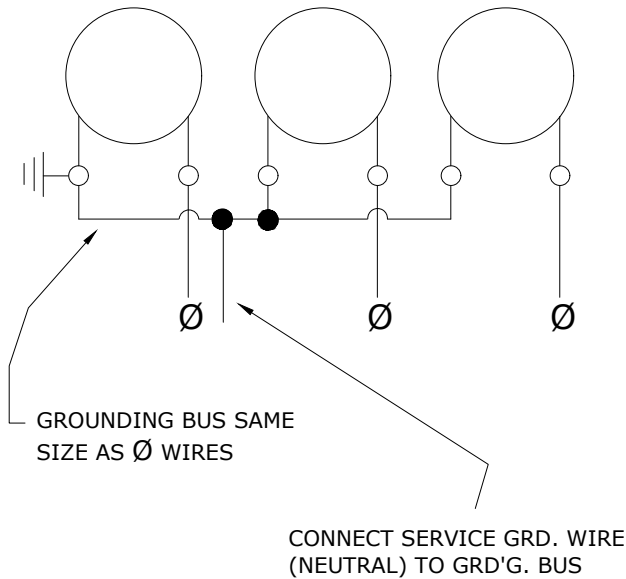
**CONSTRUCTION STANDARDS**  
**3Ø TRANSFORMER CONNECTIONS**

REVISIONS			
REV	DATE	ENGR	OPS
0	6/14/02		
△ REDRAWN IN CAD			
APP:	ELM	SECTION	
DATE:	1/31/80	<b>1100</b>	

TRANSFORMER SIZE KVA		MAX EYEBOLT SIZE	VOLTAGE CHART			
			120V	240V	277V	480V
1Ø	3Ø (BANK)		120V 1Ø 120V/208V 3Ø	120V/240V 1Ø 240V 3Ø	277V/480V 3Ø	480V 3Ø
			COPPER WIRE SIZE			
15	45	4/O	2	2	2	2
25	75	350	2/O	2	2	2
37.5	112.5	350	4/O	2	2	2
50	150	350	350 *	2/O	2/O	2
75	225	SPADE	2-4/O	4/O	4/O	2/O
100	300	SPADE	2-350	350	350	2/O

**WYE CONNECTION**

--- CLOSED Δ  
 ——— OPEN Δ



**Notes:**

1. Transformer loading based on 150% of Nameplate KVA.
2. Wire ampacity based on 90 degree Celsius (the maximum insulation temperature). Summer loading (Reference 02.06.01)
3. See Reference Section 2000, Standard 08.01 for larger bank sizes.
4. All high side jumpers #4 covered wire.

Rev 3 - Removed RED wire from note #4 and removed note #5.



**CONSTRUCTION STANDARDS**  
 TRANSFORMER LEAD SIZES  
 OVERHEAD SECONDARY

REVISIONS			
Δ	DATE	ENGR	OPS
1	2/23/00	HWH	MA
2	12/14/09	KJP	
3	3/6/2023	CSB	

PAGE:  
1 of 1

**TL1**

CAD FILE:  
TL1

APP: ELM  
DATE: 1/31/80

SECTION  
**1100**

480 VOLTS DELTA

3 PHASE BANK	500KVA	750KVA	1000KVA	1500KVA
COPPER WIRE SIZE PER BUSHING	1-350	2-4/0	2-350	3-350
BRAID SIZE	1-800 AMP	1-800 AMP	2-800 AMP	2-800 AMP

480 Y/277 GROUNDED WYE

COPPER WIRE SIZE PER BUSHING INCLUDING NEUTRAL	2-350	2-500	3-500	4-500
ALUMINUM WIRE SIZE PER BUSHING INCLUDING NEUTRAL	3-4/0	3-350	*	*

ALL BUSHING CONNECTIONS SHALL BE MADE WITH COPPER COMPRESSION SPADE TERMINALS. STOCK NUMBERS ARE:


4/0	#434
350	#436
500	#2276

CONNECT SERVICE CONDUCTORS TO TRANSFORMER SPADES WHERE EVER POSSIBLE. IF NOT, CONNECT SERVICE CONDUCTORS TO TRANSFORMER LEADS WITH COMPRESSION CONNECTORS. SEE SHEET 3 OF 3.

\* USE COPPER LEADS AND CONNECT ALUMINUM SERVICE CONDUCTORS TO COPPER LEADS WITH COMPRESSION CONNECTORS.

LEAD SIZES ARE BASED UPON RATINGS IN IEEE S-135, PAGE 260.

R1 - CHANGE TO REFLECT OH JUMPERS

	<b>CONSTRUCTION STANDARDS</b> LARGE TRANSFORMER LEAD SIZE - OVERHEAD		REVISIONS			
			DATE 2/23/00	ENGR HWH	OPS MA	
						REFLECT OH JUMPERS
PAGE: 1 of 3	<b>TL2</b>		CAD FILE: TL2	APP: DATE: 4/92	SECTION <b>1100</b>	

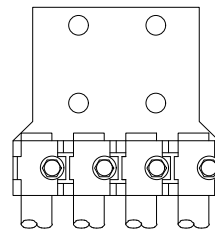
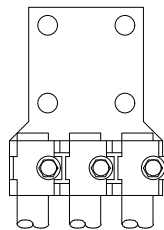
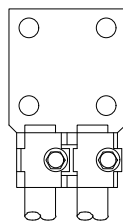
240 VOLTS DELTA

3 PHASE BANK	500KVA	750KVA	1000KVA
COPPER WIRE SIZE PER BUSHING	2-350	3-350	3-500
BRAID SIZE	2-800 AMP	2-800 AMP	3-800 AMP

208 Y/120 VOLTS

COPPER WIRE SIZE PER BUSHING	3-500	(1) 4-750	(1) 5-750
BRAID SIZE	2-800 AMP	2-800 AMP	3-800 AMP

NOTES: (1) 750 COPPER REQUIRES BRONZE BOLT TYPE SPADE CONNECTORS SUCH AS SHOWN BELOW.



FARGO#

2J7A4N

3J7A4N

4J7A4N



**CONSTRUCTION STANDARDS**

LARGE TRANSFORMER  
LEAD SIZE - OVERHEAD

REVISIONS

Δ	DATE	ENGR	OPS
1	2/23/00	HWH	MA

Δ REFLECT OH JUMPERS

PAGE:  
2 of 3

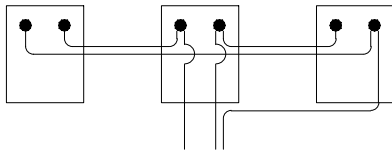
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TL2

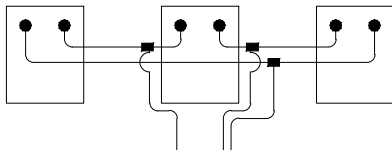
APP:  
DATE: 4/92

SECTION  
**1100**

DELTA

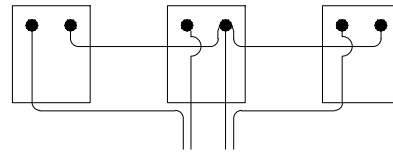


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(COPPER OR ALUMINUM SERVICE)

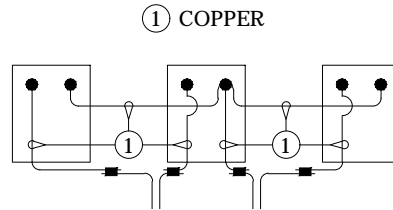


**ALTERNATE**  
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(COPPER OR ALUMINUM SERVICE)

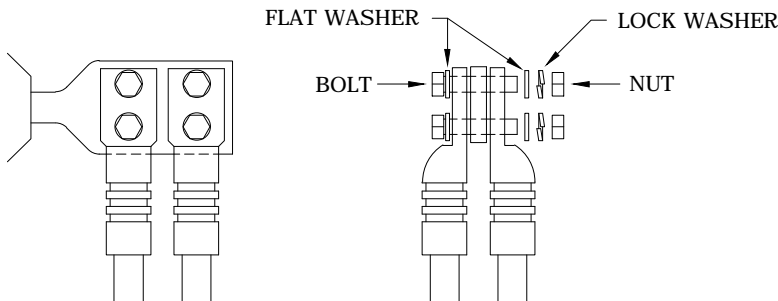
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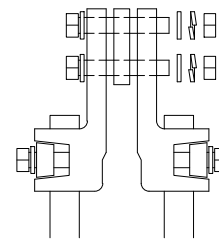
**PREFERRED**  
(ALL ALUMINUM)



① COPPER  
ALUMINUM OR COPPER  
**ALTERNATE**



COMPRESSION CONNECTIONS  
AT BUSHINGS



BRONZE BOLT TYPE  
CONNECTIONS AT BUSHINGS

NOTES:

1. All Aluminum-to -Copper connections must be made so that water will run from the aluminum toward the copper.
2. Use oxide inhibitor at all connections.



**CONSTRUCTION STANDARDS**

LARGE TRANSFORMER  
LEAD SIZE - OVERHEAD

REVISIONS			
Δ	DATE	ENGR	OPS
1	2/23/00	HWH	MA
Δ REFLECT OH JUMPERS			
APP:		SECTION	
DATE:	4/92	<b>1100</b>	

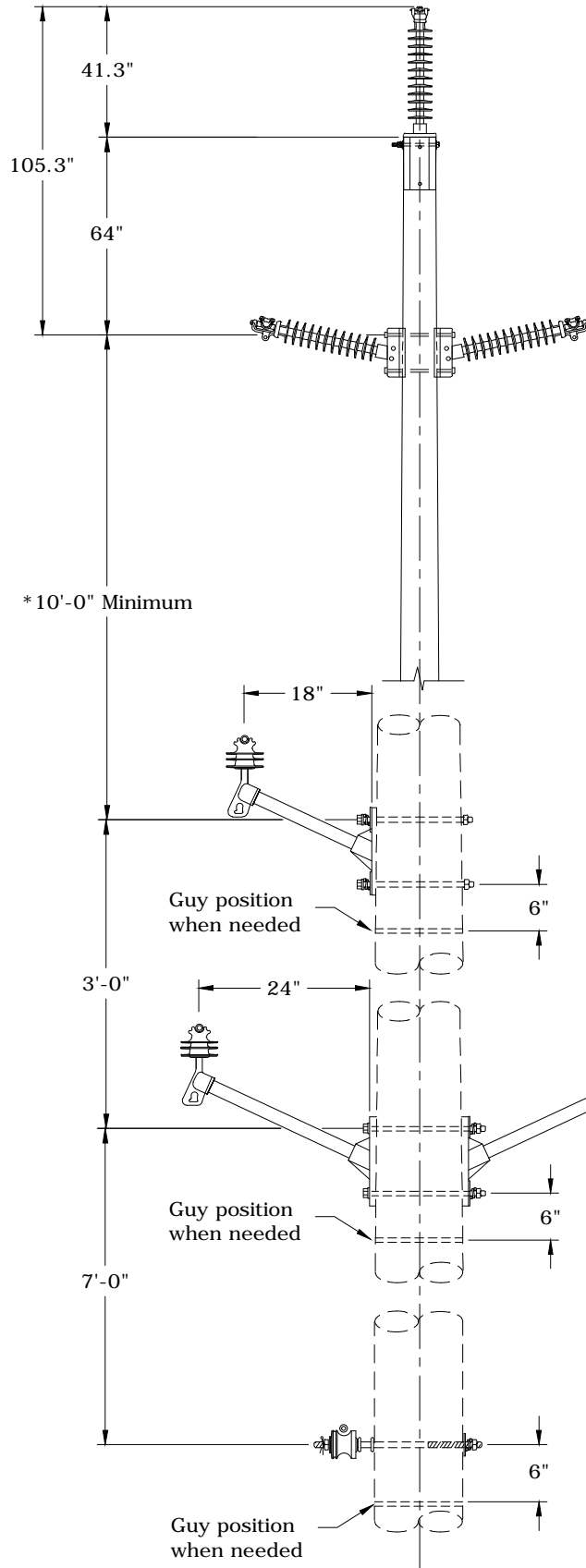


# 1150 CLEARANCES

11/28/2016

~	CFG	Construction Framing Guide
<b>N</b>	COR	OH Clearance to Roadways & Other Surfaces - NESC Minimum
~	CTS	OH Clearance to Structures
<b>N</b>	DC	OH Clearance to Roadways & Other Surfaces - Design Minimum
<b>C</b>	UPTC	Padmount Transformer Clearances

<b>N</b>	New Standard
<b>R</b>	Redrawn Standard
<b>C</b>	Changed Standard
~	No Change

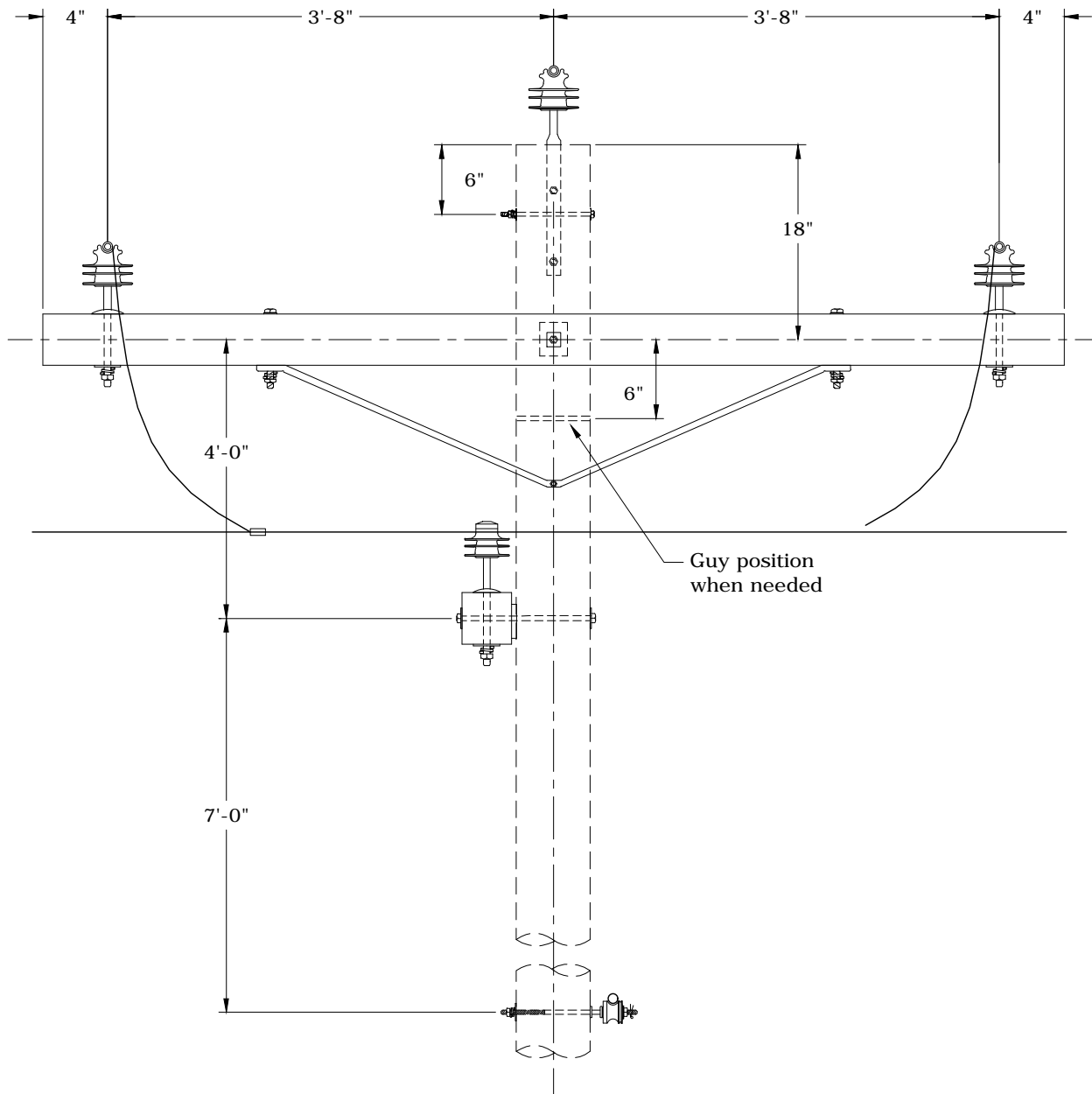


\* For tall poles, make sure the distribution can be reached by a service/line truck.



**CONSTRUCTION STANDARDS**  
 CONSTRUCTION FRAMING GUIDE  
 TRANSMISSION UNDERBUILD

REVISIONS			
△	DATE	ENGR	OPS
△			
APP:	CM/AH	SECTION	
DATE:	10/17/08	1150	



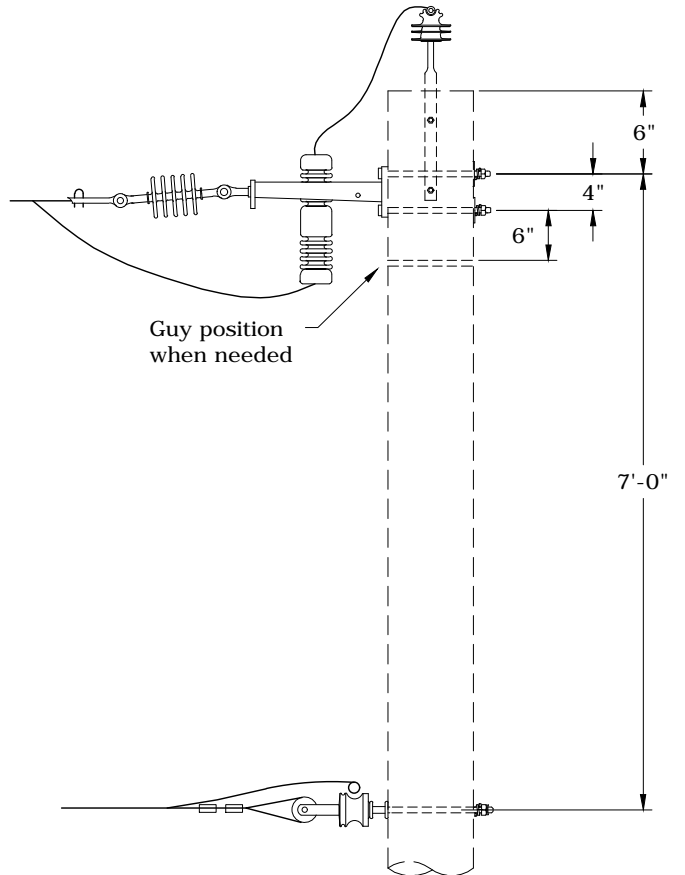
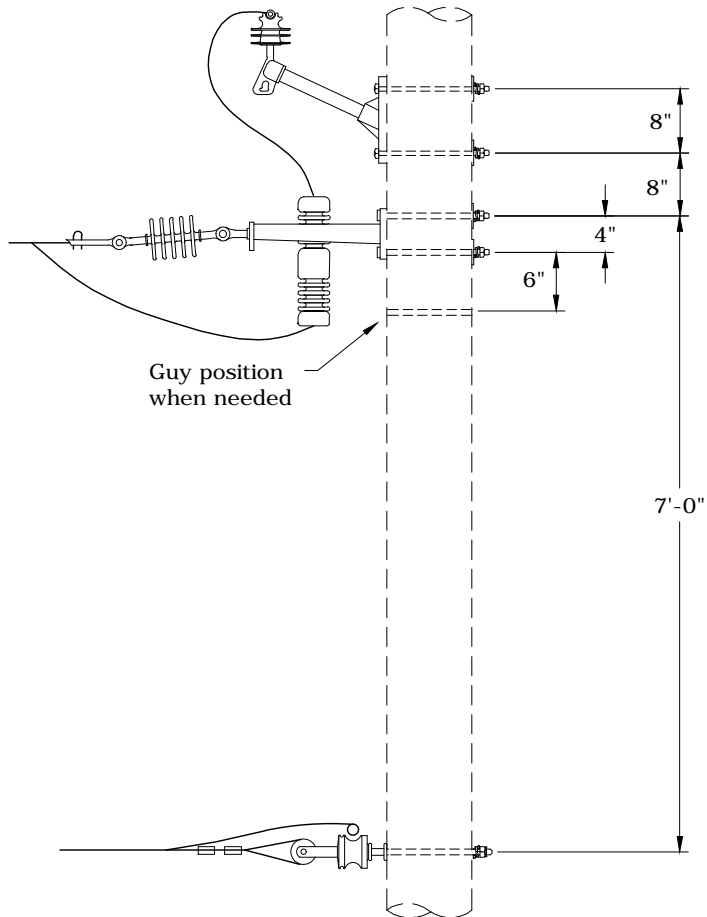
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CONSTRUCTION FRAMING GUIDE  
INTERSECTION

PAGE:  
2 of 6

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DATE:	10/17/08	<b>1150</b>	



Alternate  
for 1Ø



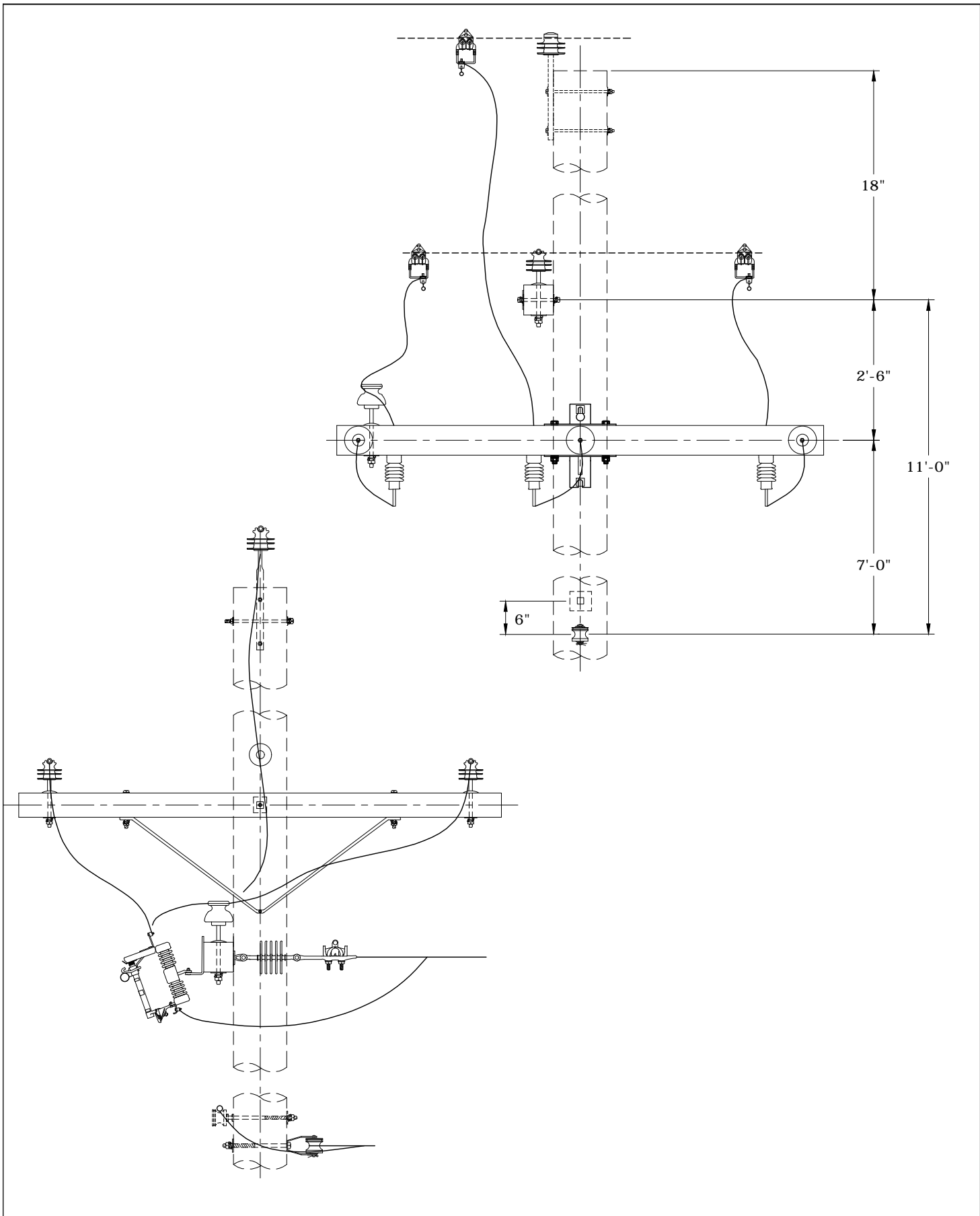
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CONSTRUCTION FRAMING GUIDE  
1Ø FUSED TAP

PAGE:  
3 of 6

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DATE:	10/17/08	1150	



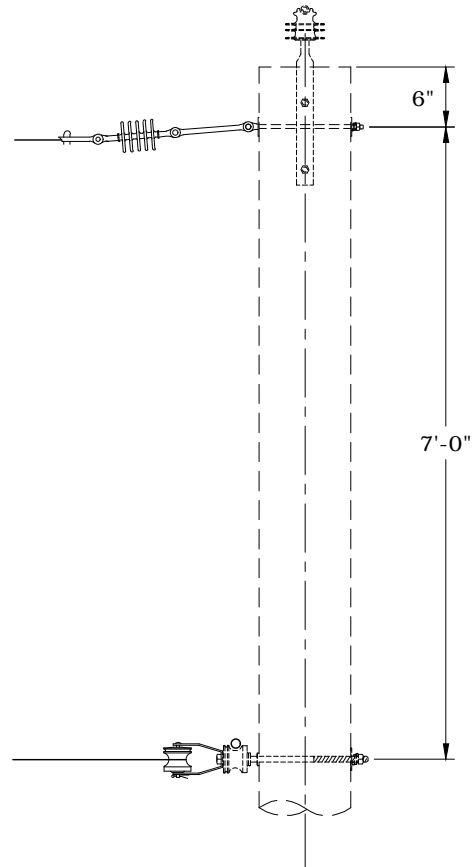
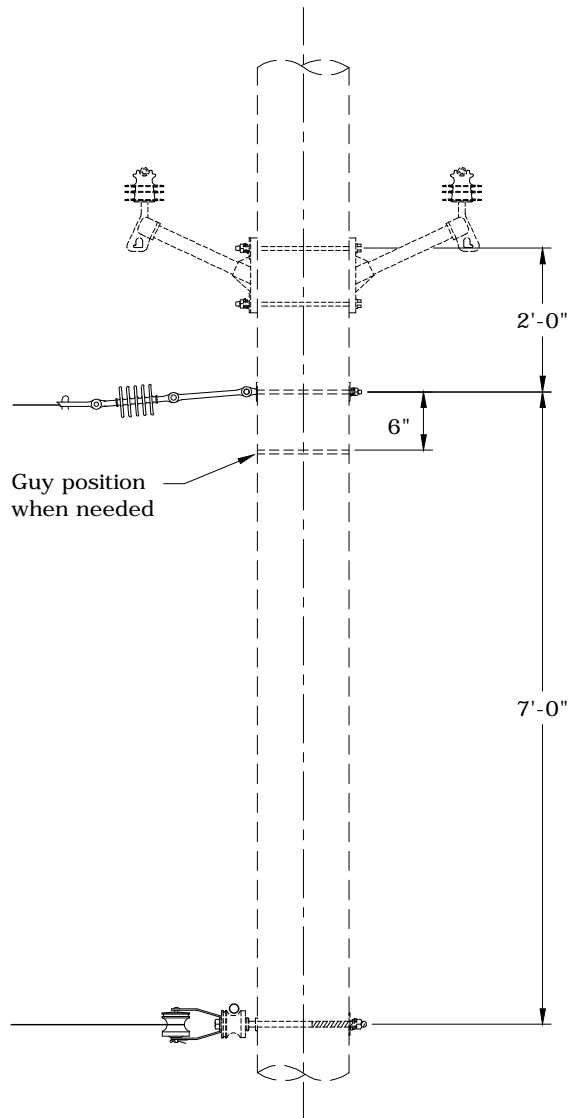
**CONSTRUCTION STANDARDS**  
 CONSTRUCTION FRAMING GUIDE  
 BUCKARM

PAGE:  
4 of 6

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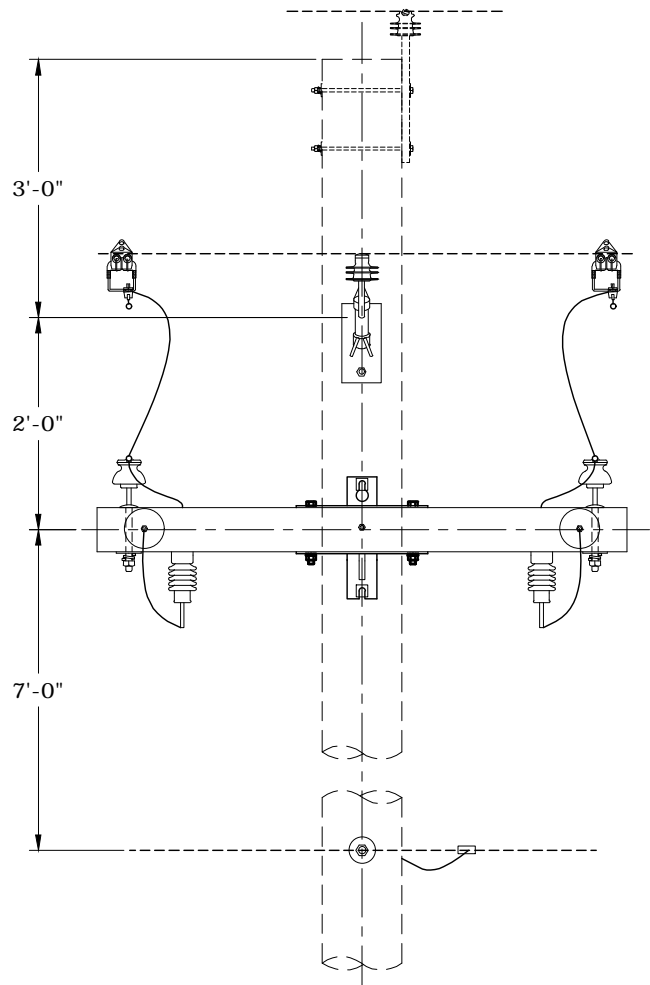
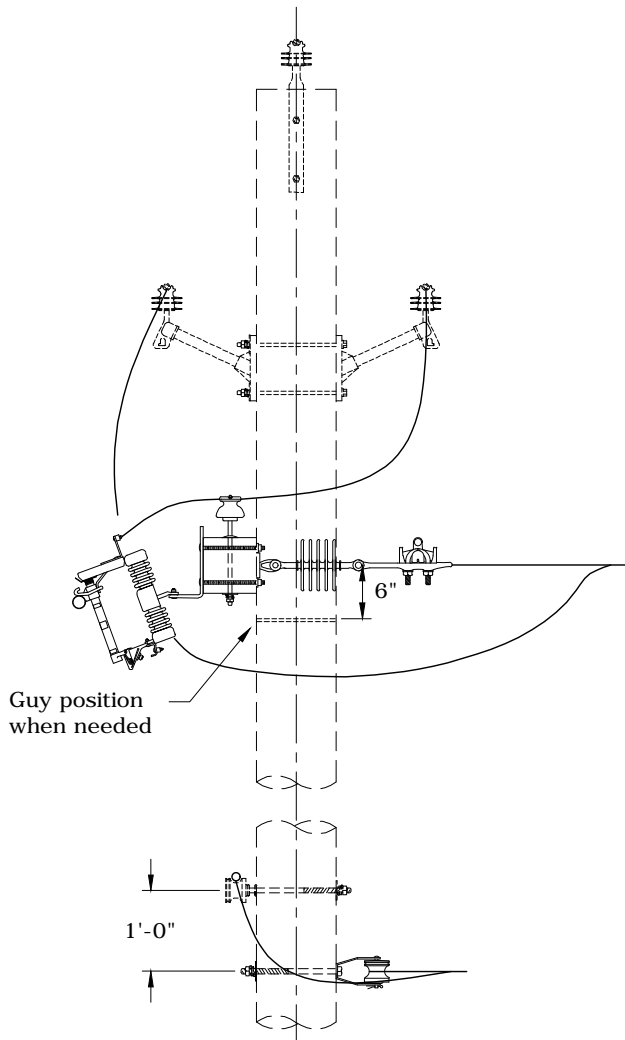


Alternate  
for 10"



**CONSTRUCTION STANDARDS**  
CONSTRUCTION FRAMING GUIDE  
UNFUSED 10" TAP

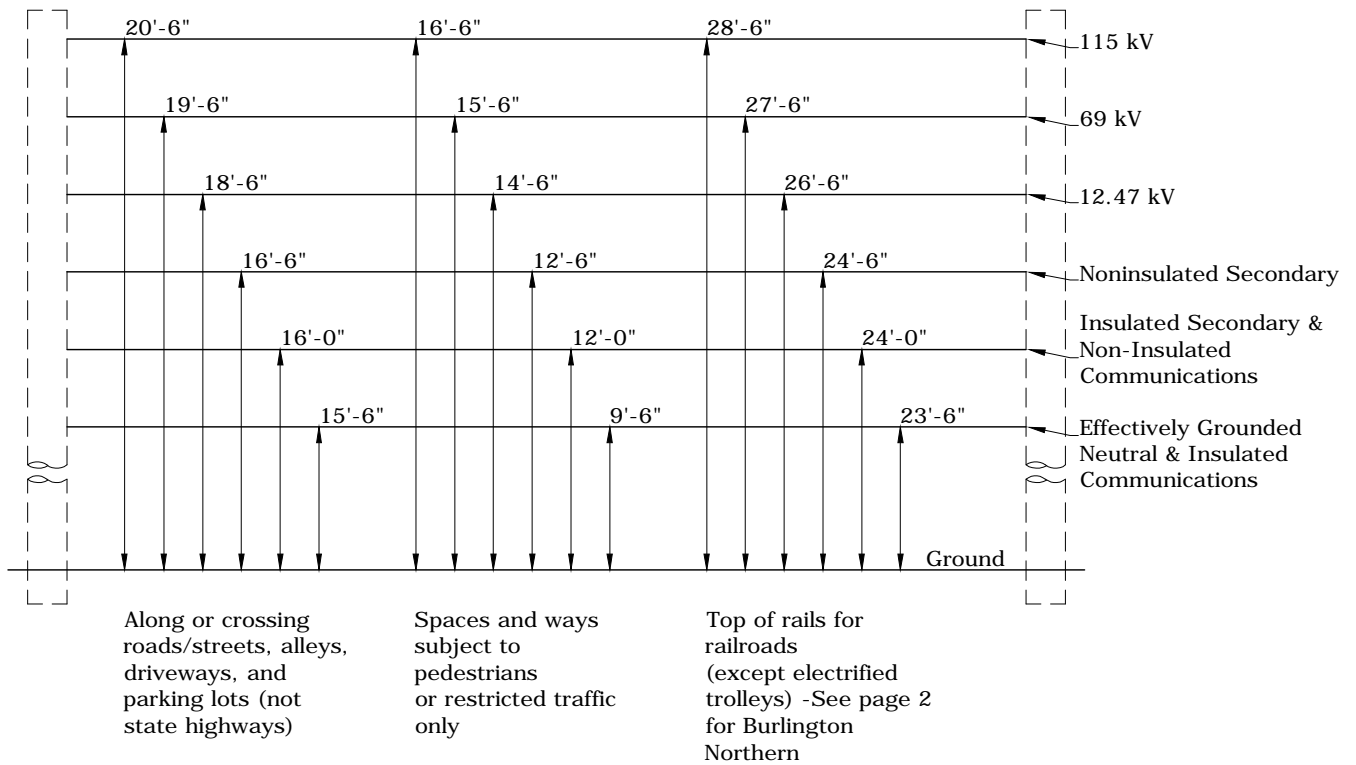
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APP:	CM/AH	SECTION	
DATE:	10/17/08	1150	



**CONSTRUCTION STANDARDS**  
CONSTRUCTION FRAMING GUIDE  
TWIGGY TO TAP ON CROSSARM

REVISIONS			
△	DATE	ENGR	OPS
△			
APP:	CM/AH	SECTION	
DATE:	10/17/08	<b>1150</b>	

# 2017 NESC Minimum Vertical Clearances



Washington State Highways		
Type of Utility Line	Lines Crossing Highway	Lines Parallel To Highway
Communications	24'	20'
Joint Usage Comm.	20'	20'
0-750 V	24'	24'
751-15,000 V	30'	27'
15,001-50,000 V	32'	32'
50,001 V And Over	34'	32'

- Notes:**
1. These minimum clearances must be met at maximum final sag.
  2. See tables that follow for other surfaces and span guys.
  3. Clearances per WAC 468-34-290 and NESC C2-2017 Rule 232.
  4. See Std DC - Design Clearances - Section 1150 for new construction.

	CONSTRUCTION STANDARDS	REVISIONS			
	OVERHEAD CLEARANCE TO ROADWAYS & OTHER SURFACES NESC MINIMUM	△	DATE	ENGR	OPS
PAGE: 1 of 2	COR	CAD FILE: COR	APP: DATE: 11/10/16	CM/DK	SECTION <b>1150</b>



**2017 NESC MINIMUM VERTICAL CLEARANCES**

Nature of Surface Below	CONDUCTORS					
	Neutral* & Insulated Communication	Insulated Secondary & Non-Insulated Communication	Non-Insulated Secondary	12.47 kV	69 kV	115 kV
	SPAN GUYS					
	Span Guys for Poles Carrying 0 to 300 V		Span Guys for Poles Carrying 301 to 750 V	Span Guys for Poles Carrying 12.47 kV		
Roads, streets, alleys, parking lots & other areas subject to truck traffic (including horse trails, farmland, orchards, pastures & forests)	15' 6"	16' 0"	16' 6"	18' 6"	19' 6"	20' 6"
**Burlington Northern	24' for Communication Lines 26' 6" for Primary, Secondary, Neutrals & Span Guys				27' 6"	28' 6"
***Railroad tracks (except those using overhead trolley conductors)	23' 6"	24' 0"	24' 6"	26' 6"	27' 6"	28' 6"
Pedestrian ways where vehicles are prohibited by regulation or permanent obstructions and not reasonably expected to be used by vehicles	9' 6"	12' 0"	12' 6"	14' 6"	15' 6"	16' 6"
Water areas not suitable for sailboating or where sailboating is prohibited	14' 0"	14' 6"	15' 0"	17' 0"	18' 0"	19' 0"
Water suitable for sailboating	See Standards Engineering					

\* This column is for an effectively grounded neutral only. All other neutrals are the same as the phase conductors of the circuit with which they are associated.

\*\* Measured from top of rails to conductor/guy.

\*\*\* The railroad company may require more clearance than shown here.



**CONSTRUCTION STANDARDS**

OVERHEAD CLEARANCE  
TO ROADWAYS & OTHER SURFACES  
NESC MINIMUM

REVISIONS			
△	DATE	ENGR	OPS
△			
APP:	CM/DK	SECTION	
DATE:	11/10/16	<b>1150</b>	

# Scope

This standard lists the MINIMUM conductor clearances between conductors and structures such as buildings, signs, and flag poles. These clearances are taken from the 2017 edition of NESC Rule 234.

**Notes:**

1. The preferred design clearance to structures is 10 feet, if possible, in recognition of WAC 296-24-960 Unqualified Worker minimum clearance of 10 feet to any conductors (including the neutral) up to 50kV. There will be installations where it is not possible to obtain 10 feet of clearance. In those cases the 2017 NESC Rule 234 minimum clearances shall be met.
2. The clearances in these tables are the absolute minimums required by code. The values are based on worst-case conductor loading, conductor tension, and wind loading.
3. Ungrounded guys and ungrounded portions 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.

Table 1 - Horizontal clearances to walls, projections, windows, balconies, and areas accessible to pedestrians.

Conductor	NESC Minimum Horizontal Clearance (feet)
Neutrals, grounded guys, ungrounded guys exposed to 0 to 300V	4'6"
Services (0 to 750V multiplex), (does not include building being served)	5'0"
Unguarded rigid live parts & equipment cases (0 to 750V), ungrounded guys (300 to 750V)	5'0"
Ungrounded guys exposed to 750V to 22kV	7'0"
Primary (7.2/12.5kV)	7'6"
69kV	8'6"
115kV	9'6"

Table 2 - Horizontal clearances to signs, chimneys, billboards, radio and TV antennas, and tanks readily accessible to pedestrians.

Conductor	NESC Minimum Horizontal Clearance (feet)
Neutrals, grounded guys, ungrounded guys exposed to 0 to 300V	4'6"
Services (0 to 750V multiplex)	5'0"
Unguarded rigid live parts & equipment cases (0 to 750V), ungrounded guys (300 to 750V)	5'0"
Ungrounded guys exposed to 750V to 22kV	7'0"
Primary (7.2/12.5kV)	7'6"
69kV	8'6"
115kV	9'6"

Rev. 2 - Updated for 2017 NESC and corrected labels on tables.




	<h2>CONSTRUCTION STANDARDS</h2> <p>OVERHEAD CLEARANCE TO STRUCTURES</p>		<b>REVISIONS</b>				
				DATE	ENGR	OPS	
			1	10/17/08	CM	AH	
				2	9/5/16	KJP	
							
PAGE: 1 of 5		<h1>CTS</h1>		CAD FILE: CTS		APP: LB/AH DATE: 3/17/04	
						SECTION <b>1150</b>	

Table 3 - Horizontal clearances to signs, chimneys, billboards, radio and TV antennas, and tanks not readily accessible to pedestrians.

Conductor	NESC Minimum Horizontal Clearance (feet)
Neutrals, grounded guys, ungrounded guys exposed to 0 to 300V	3'0"
Services (0 to 750V multiplex)	3'6"
Unguarded rigid live parts & equipment cases (0 to 750V), ungrounded guys (300 to 750V)	5'0"
Ungrounded guys exposed to 750V to 22kV	7'0"
Primary (7.2/12.5kV)	7'6"
69kV	8'6"
115kV	9'6"

Table 4 - Vertical clearances over or under building roofs or projections readily accessible to pedestrians.

Conductor	NESC Minimum Vertical Clearance (feet)
Neutrals, grounded guys, ungrounded guys exposed to 0 to 300V	10'6"
Services (0 to 750V multiplex), (does not include building being served)	11'0"
Unguarded rigid live parts & equipment cases (0 to 750V), ungrounded guys (300 to 750V)	11'0"
Ungrounded guys exposed to 750V to 22kV	13'0"
Primary (7.2/12.5kV)	13'6"
69kV	14'6"
115kV	15'6"

Table 5 - Vertical clearances over or under building roofs or projections not readily accessible to pedestrians

Conductor	NESC Minimum Vertical Clearance (feet)
Neutrals, grounded guys, ungrounded guys exposed to 0 to 300V	3'0"
Services (0 to 750V multiplex), (does not include building being served)	3'6"
Unguarded rigid live parts & equipment cases (0 to 750V), ungrounded guys (300 to 750V)	10'0"
Ungrounded guys exposed to 750V to 22kV	12'0"
Primary (7.2/12.5kV)	12'6"
69kV	13'6"
115kV	14'6"

Rev. 2 - Updated for 2017 NESC and corrected labels on tables.



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				DATE	ENGR	OPS	
	1	10/17/08	CM	AH	2	9/5/16	KJP
PAGE: 2 of 5	<b>CTS</b>		CAD FILE: CTS	APP: DATE:	LB/AH 3/17/04	SECTION <b>1150</b>	

Table 6 - Vertical clearances over roofs that are accessible to vehicles less than 8 feet high.

Conductor	NESC Minimum Vertical Clearance (feet)
Neutrals, grounded guys, ungrounded guys exposed to 0 to 300V	10'6"
Services (0 to 750V multiplex)	11'0"
Unguarded rigid live parts & equipment cases (0 to 750V), ungrounded guys (300 to 750V)	11'0"
Ungrounded guys exposed to 750V to 22kV	13'0"
Primary (7.2/12.5kV)	13'6"
69kV	14'6"
115kV	15'6"

Table 7 - Vertical clearances over roofs accessible to truck traffic (vehicles over 8 feet high).

Conductor	NESC Minimum Vertical Clearance (feet)
Neutrals, grounded guys, ungrounded guys exposed to 0 to 300V	15'6"
Services (0 to 750V multiplex)	16'0"
Unguarded rigid live parts & equipment cases (0 to 750V), ungrounded guys (300 to 750V)	16'0"
Ungrounded guys exposed to 750V to 22kV	18'0"
Primary (7.2/12.5kV)	18'6"
69kV	19'6"
115kV	20'6"

Table 8 - Vertical clearances over and under signs, chimneys, billboards, radio and TV antennas, tanks, and other installations not classified as buildings or bridges where the conductor is over or under catwalks and other surfaces where personnel walk.

Conductor	NESC Minimum Vertical Clearance (feet)
Neutrals, grounded guys, ungrounded guys exposed to 0 to 300V	10'6"
Services (0 to 750V multiplex)	11'0"
Unguarded rigid live parts & equipment cases (0 to 750V), ungrounded guys (300 to 750V)	11'0"
Ungrounded guys exposed to 750V to 22kV	13'0"
Primary (7.2/12.5kV)	13'6"
69kV	14'6"
115kV	15'6"

Rev. 2 - Updated for 2017 NESC and corrected labels on tables.



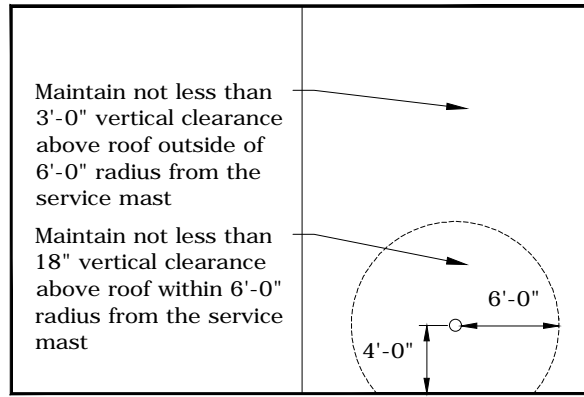
	<b>CONSTRUCTION STANDARDS</b> OVERHEAD CLEARANCE TO STRUCTURES		<b>REVISIONS</b>			
				DATE	ENGR	OPS
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		2	9/5/16	KJP		
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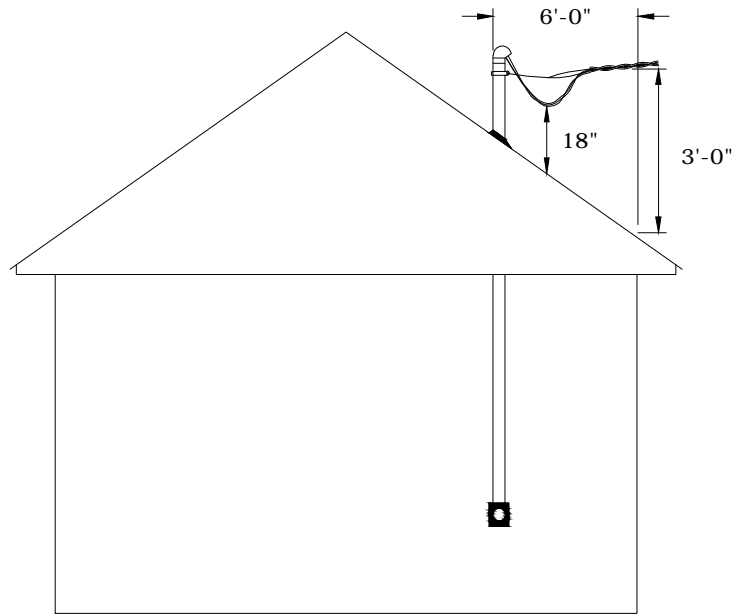


Table 10 - Vertical clearance of service drop conductors, including drip loops, for the building it is serving (see figure 1).

Conductor	NESC Minimum Vertical Clearance (feet)
Multiplex that does not exceed 750V within 6' radius of service mast which is located no more than 4' from the edge of the roof	1'6"
Multiplex that does not exceed 750V outside 6' radius of service mast	3'0"



Plan View of Roof



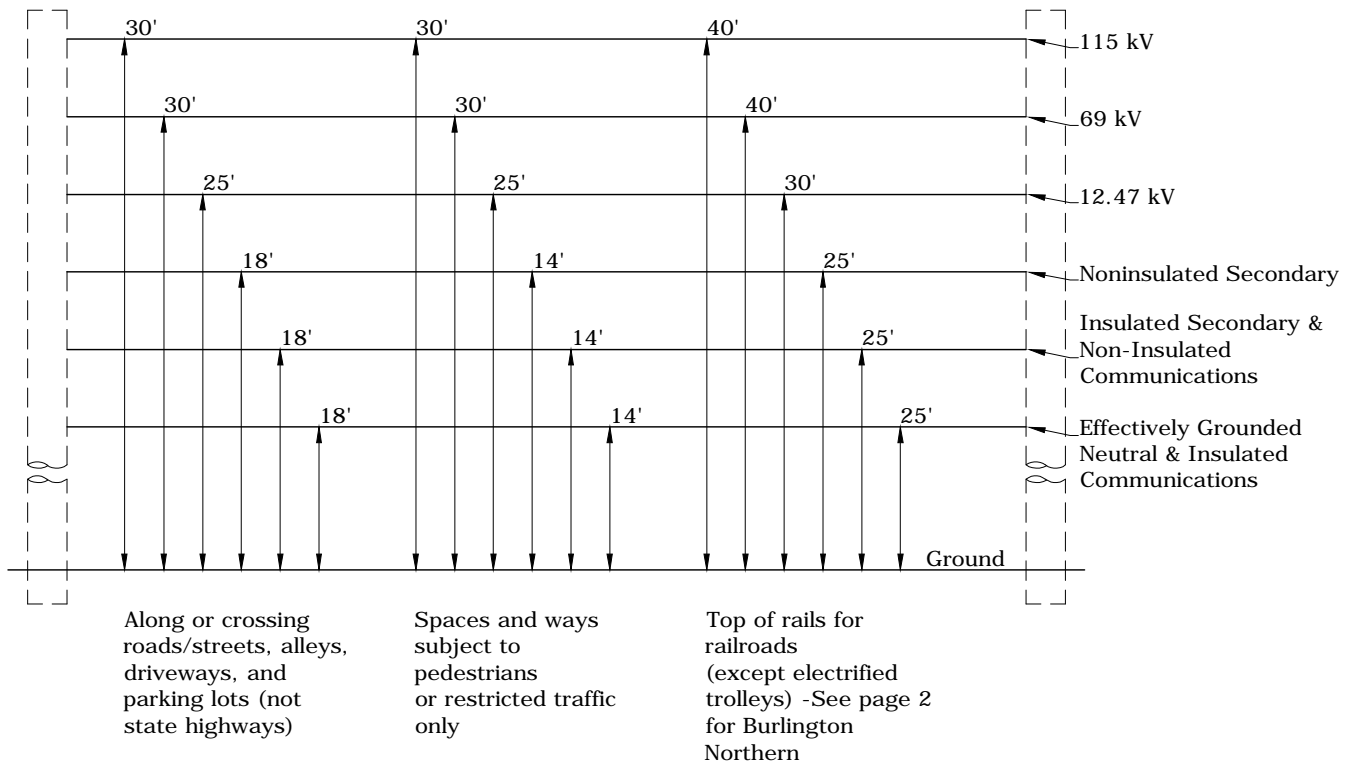
Elevation View

Figure 1- Clearances of service drop terminating on support mast

Rev. 2 - Updated for 2017 NESC and corrected labels on tables.

	<b>CONSTRUCTION STANDARDS</b> OVERHEAD CLEARANCE TO STRUCTURES		REVISIONS																		
			<table border="1"> <thead> <tr> <th>NO.</th> <th>DATE</th> <th>ENGR</th> <th>OPS</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>10/17/08</td> <td>CM</td> <td>AH</td> </tr> <tr> <td>2</td> <td>9/5/16</td> <td>KJP</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	NO.	DATE	ENGR	OPS	1	10/17/08	CM	AH	2	9/5/16	KJP							
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PAGE: 5 of 5	<b>CTS</b>	CAD FILE: CTS	APP: LB/AH DATE: 3/17/04	SECTION <b>1150</b>																	

# Design Minimum Vertical Clearances



Washington State Highways		
Type of Utility Line	Lines Crossing Highway	Lines Parallel To Highway
Communications	25'	21'
Joint Usage Comm.	21'	21'
0-750 V	25'	25'
751-15,000 V	35'	35'
15,001-50,000 V	35'	35'
50,001 V And Over	40'	40'

- Notes:**
1. See tables that follow for other surfaces and span guys.
  2. See Std COR - Overhead Clearance to Roadways and Other Surfaces - Section 1150 for NESC minimums.
  3. Proposed exceptions to these clearances require approval from CPU Engineering.



## CONSTRUCTION STANDARDS

### OVERHEAD CLEARANCE TO ROADWAYS & OTHER SURFACES DESIGN MINIMUM - NEW CONSTRUCTION

REVISIONS			
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APP:	CM/DK	SECTION	
DATE:	11/10/16	<b>1150</b>	

**DESIGN MINIMUM VERTICAL CLEARANCES**

Nature of surface below	CONDUCTORS					
	Neutral* & Insulated Communication	Insulated Secondary & Noninsulated Communication	Noninsulated Secondary	12.47kV	69kV	115kV
	SPAN GUYS					
	Span Guys for Poles carrying 0 to 300v		Span Guys for Poles carrying 310 to 750v	Span Guys for Poles carrying 12.47kV		
Roads, Streets, Alleys, Parking Lots & Other Areas Subject to Truck Traffic (including horse trails, farmland, orchards, pastures & forests)	18'	18'	18'	25'	30'	30'
Burlington Northern	25' for Communication Lines 35' for All Electric Lines, Neutrals & Span Guys				40'	40'
Railroad tracks (except those using overhead trolley conductors)	25'	25'	25'	30'	40'	40'
Pedestrian ways where vehicles are prohibited by regulation or permanent obstructions and not reasonably expected to be used by vehicles or horseback riding	14'	14'	14'	25'	30'	30'
Water areas not suitable for sailboating or where sailboating is prohibited	18'	18'	18'	25'	30'	30'

\* This column is for an effectively grounded neutral only. All other neutrals are the same as the phase conductors of the circuit with which they are associated.



**CONSTRUCTION STANDARDS**

OVERHEAD CLEARANCE  
TO ROADWAYS & OTHER SURFACES  
DESIGN MINIMUM - NEW CONSTRUCTION

PAGE:  
2 of 2

**DC**

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# 1200

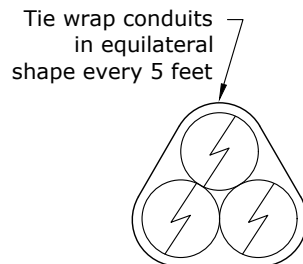
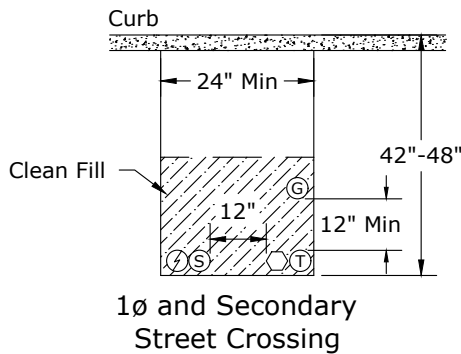
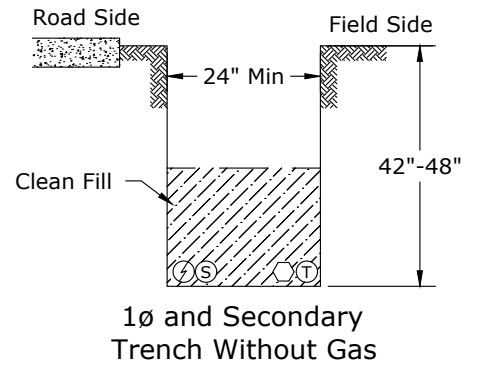
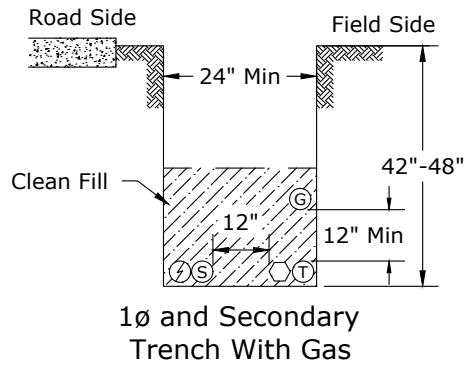
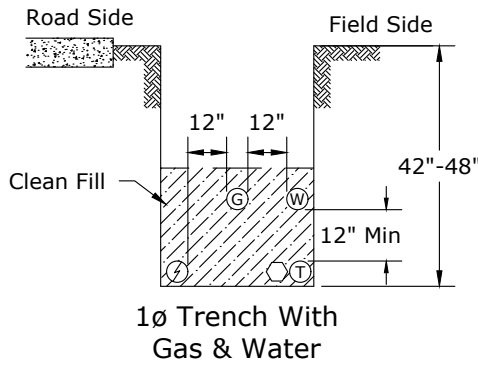
## UNDERGROUND GENERAL AND TRENCHING

9/2/2019

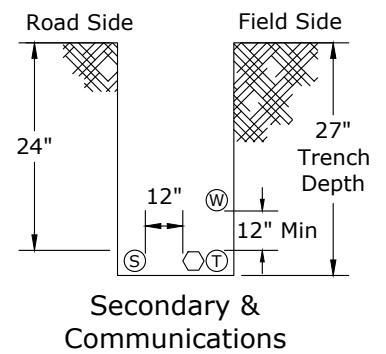
<b>C</b>	UA1	Basic Trench Requirements
~	UC1	Conduit Requirements
~	UD1	Directional Boring Specifications
~	UVE1	Underground Vault 120 V Wiring
~	UVSP1	Underground Vault - Sump Pump

<b>N</b>	New Standard
<b>R</b>	Redrawn Standard
<b>C</b>	Changed Standard
~	No Change

The trench configurations below are shown with 1ø primary. Conduits for 2ø primary cable should lay side-by-side. Conduits for 3ø primary cable should be tie-wrapped to form an equilateral triangle (see Detail A).



**DETAIL A**  
Additional Requirements for 3ø Trenches



- Notes:**
1. All primary and secondary power cables are in conduit.
  2. Select backfill or controlled density fill (CDF) may be required.
  3. Construction scrap material or trash of any kind is not allowed in any part of the trench.

**Legend:**

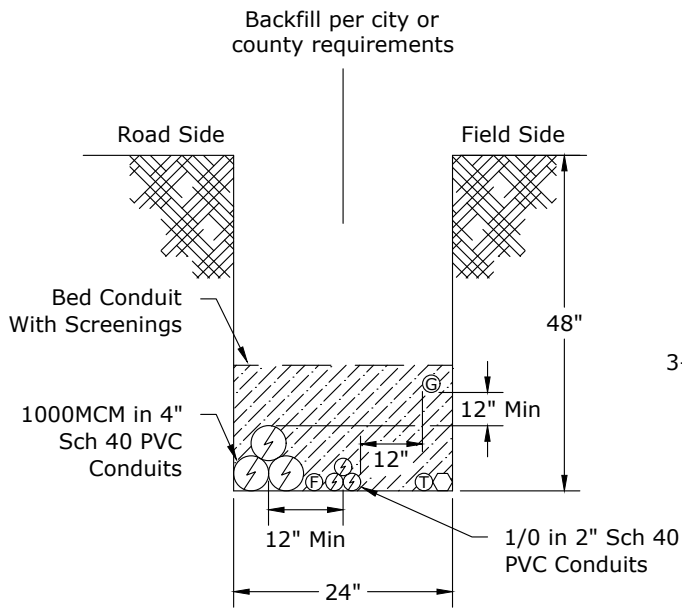
- ⚡ Primary Power
- Ⓣ Telephone
- Ⓔ Gas
- Ⓢ Secondary Power
- Ⓛ TV Cable
- Ⓜ Water Service Only
- ⓕ CPU Fiber (2" conduit)

Rev. 6 - Updated secondary trench depths.

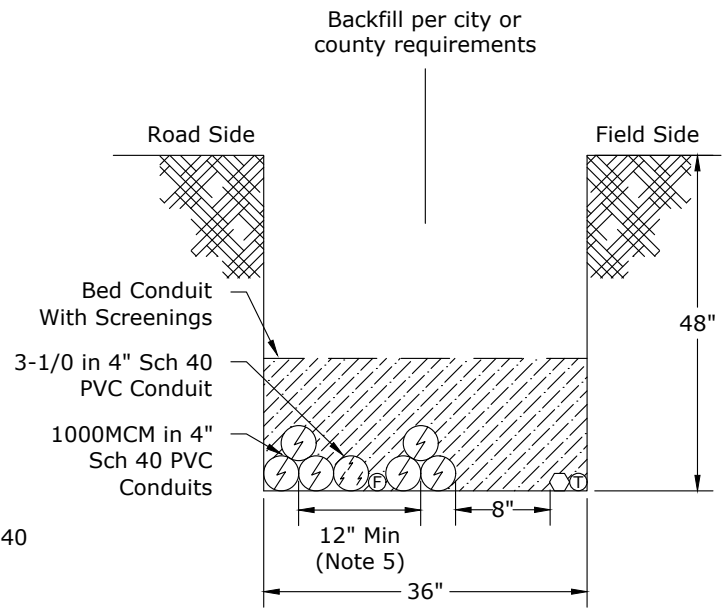


**CONSTRUCTION STANDARDS**  
BASIC TRENCH REQUIREMENTS

REVISIONS			
Δ/R	DATE	ENGR	OPS
3	5/30/07	LB	AH
4	12/14/09	KJP	
5	8/22/19	CM	GM
6	5/19/21	KJP	



1000MCM With 1/0 Trench



2-1000MCM With 3ø-1/0 Trench

**Note: 3Ø conduits (4" and 2") are to be tie wrapped in a triangular configuration every 5 feet. See Detail A on page 1.**


**Notes:**

1. All primary and secondary power cables are in conduit.
2. Select backfill or controlled density fill (CDF) may be required.
3. Construction scrap material or trash of any kind is not allowed in any part of the trench.
4. Caution tape is required one foot above the top 1000 MCM conduit (on screenings).
5. 12-inch minimum horizontal separation applies to both parallel feeders and to different feeders.

**Legend:**

- |                          |             |                      |
|--------------------------|-------------|----------------------|
| ⚡ Primary Power          | Ⓣ Telephone | Ⓜ Gas                |
| Ⓢ Secondary Power        | Ⓣ TV Cable  | Ⓜ Water Service Only |
| Ⓢ CPU Fiber (2" conduit) |             |                      |




Rev. 6 - Upated secondary trench depths.

	CONSTRUCTION STANDARDS		REVISIONS																							
	BASIC TRENCH REQUIREMENTS		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="font-size: 0.6em;">#</th> <th style="font-size: 0.6em;">DATE</th> <th style="font-size: 0.6em;">ENGR</th> <th style="font-size: 0.6em;">OPS</th> </tr> </thead> <tbody> <tr> <td style="font-size: 0.6em;">3</td> <td style="font-size: 0.6em;">5/30/07</td> <td style="font-size: 0.6em;">LB</td> <td style="font-size: 0.6em;">AH</td> </tr> <tr> <td style="font-size: 0.6em;">4</td> <td style="font-size: 0.6em;">12/14/09</td> <td style="font-size: 0.6em;">KJP</td> <td style="font-size: 0.6em;"></td> </tr> <tr> <td style="font-size: 0.6em;">5</td> <td style="font-size: 0.6em;">8/22/19</td> <td style="font-size: 0.6em;">CM</td> <td style="font-size: 0.6em;">GM</td> </tr> <tr> <td style="font-size: 0.6em;">6</td> <td style="font-size: 0.6em;">5/19/21</td> <td style="font-size: 0.6em;">KJP</td> <td style="font-size: 0.6em;"></td> </tr> </tbody> </table>	#	DATE	ENGR	OPS	3	5/30/07	LB	AH	4	12/14/09	KJP		5	8/22/19	CM	GM	6	5/19/21	KJP				
	#	DATE	ENGR	OPS																						
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6	5/19/21	KJP																								
PAGE: 2 of 2	UA1	CAD FILE: UA1	APP: HWH/GW DATE: 1/22/80	SECTION <b>1200</b>																						

ALL CONDUIT SHALL BE GRAY ELECTRICAL CONDUIT AND SHALL BE UL LISTED AND NEMA TC-2 OR TC-3 LABELED -- NO OTHER PIPE IS ACCEPTABLE.

1. All primary and secondary cables shall be in conduit.
2. All road and street crossings shall be in schedule 40, PVC, gray electrical conduit or polyethylene of equal or greater strength specifications. Pipe with other designated use is not acceptable.
3. All risers above finished grade shall be in schedule 80 PVC.
4. Acceptable conduit sizes are as follows:
  - 1Ø, 1/0 primary cable in 1-2" conduit
  - 3Ø, 1/0 primary cable in 1-4" or 3-2" conduits
  - Triplex secondary cable in 1-3" conduit
  - 3Ø, 1000MCM cable in 3-4" conduits
5. Where rock is encountered and the depths shown on UA1 cannot be accomplished, a lesser depth with schedule 80 conduit\* and/or control density fill (CDF) may be approved.\* Contact CPU Engineering.
6. All conduit terminations shall have end bells or bushings.
7. All conduits that terminate into energized enclosures shall be installed by qualified personnel with a CPU standby person.
8. All conduit runs shall be designed to limit pulling tension to the values specified on UCP1.
9. All conduit ends shall be chamfered 45° x 1/4" internally at all straight ends (not belled ends).
10. All conduits installed for future use shall be marked with 3M electrical markers within six inches at both ends. All ends shall be elbowed up as per Std. ULE (section 1500). The elbow shall NOT be glued to the conduit. The elbow shall be covered with a CPU loop enclosure.
11. Sufficient select backfill shall be placed to prevent crushing of the conduits due to trucks and other heavy equipment.
12. Unused conduits shall have removable plugs designed for that purpose in both ends.
13. Road and street crossings may be either trenched and backfilled, bored or pushed whichever is acceptable to the governing agency.
14. All street and road crossings shall be at property lines.
15. Where conduit bends are required, they shall meet the requirements for cable pulling in the construction specifications. Only manufactured radii are acceptable. No heated bends.
16. A condulet (LB) shall never be used.
17. Conduit sweeps shall be 24" secondary\* and 36" primary radius.
18. Conduits installed for futures should be plumbed into transformer with elbows and capped. Flex pipe is not acceptable.
19. Conduits shall be installed so that cable is pulled toward the end bells to avoid scraping cable on sharp edges of conduit.
20. All cut ends of conduits shall be square.
21. Steel mandrels shall be pulled through the conduits to detect damage and debris.


Rev 3: Updated Notes Have A \*

	<h2 style="margin: 0;">CONSTRUCTION STANDARDS</h2> <h3 style="margin: 0;">CONDUIT REQUIREMENTS</h3>			<b>REVISIONS</b>			
		DATE	ENGR	OPS			
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	2	12/29/04	LB	AH			
	3	5/30/07	LB	AH			
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PAGE: 1 of 1	<b>UC1</b>		CAD FILE: UC1	APP: DATE: 9/94	SECTION <b>1200</b>		

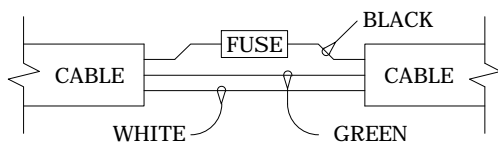
## DIRECTIONAL BORING SPECIFICATIONS

1. DIRECTIONAL DRILLING SHALL BE PERFORMED ONLY BY CPU APPROVED ELECTRICAL CONTRACTORS ON JOBS THAT HAVE BEEN PRE-APPROVED FOR DIRECTIONAL DRILLING.
2. DIRECTIONAL DRILLING EQUIPMENT SHALL BE PRE-APPROVED BY CPU.
3. DIRECTIONAL DRILLING EQUIPMENT SHALL BE OPERATED ONLY BY PERSONNEL WHO HAVE BEEN CERTIFIED OR APPROVED BY CPU OR A CPU ACCEPTED AGENCY.
4. CONDUIT INSTALLATIONS SHALL BE 2", 4" OR 6" GRAY\*POLYETHYLENE PIPE OF NOT-LESS-THAN STANDARD RADIUS DIMENSION (SDR) 13.5. (OUTSIDE DIAMETER DIVIDED BY WALL THICKNESS NLT 13.5). ALL CONDUIT WILL MEET ASTM STANDARDS FOR CONSTRUCTION AND INSTALLATION OF POLYETHYLENE (PE) CONDUIT. CONDUIT INSTALLATIONS USING PVC CONDUIT SHALL HAVE DESIGNS, MATERIAL AND INSTALLATION PRACTICES PRE-APPROVED BY CPU.
5. ALL CONNECTION TO PVC SWEEPS OR CONDUIT WILL BE FULLY GLUED USING IRS WELD-ON 600 ADHESIVE OR CPU APPROVED EQUIVALENT. GLUE USED TO FASTEN PVC TO PVC SHALL BE IRS WELD ON 721 WITH A COMPATIBLE PRIMER (OR APPROVED EQUIVALENT GLUE AND PRIMER).
6. A PLOT AND TRACK OF THE BORE USING THE BORE EQUIPMENT SOFTWARE, OR A CERTIFIED COPY OF A SURVEYED PROFILE OF THE BORE, SHALL BE PROVIDED TO CPU BEFORE ACCEPTANCE OF THE INSTALLATION.
7. THE DEPTH OF THE CONDUIT SHALL BE IDENTIFIED BY A STAKE WITH THE DEPTH EVERY 10 FEET ALONG THE ROUTE IN UNPAVED AREAS AND BY THE DEPTH WRITTEN IN MARKER PAINT EVERY 10 FEET ALONG THE ROUTE IN PAVED AREAS.
8. THE CONDUIT DEPTHS SHALL CONFORM TO THE CPU STANDARDS OF 42" NOMINAL DEPTH, NOT LESS THAN 36", NOR GREATER THAN 48". ANY OTHER DEPTH SHALL REQUIRE PRIOR APPROVAL BY CPU.
9. ALL INSTALLED CONDUITS SHALL BE "PROOFED" USING THE APPROPRIATE MANDREL, AND HAVE A 2500 POUND, 3/4" SEQUENTIALLY-NUMBERED, CONTINUOUS "MULE TAPE" INSTALLED FOR FUTURE CABLE PULLING. CERTIFICATION OF THE TEST MANDRELING SHALL BE PROVIDED TO CPU PRIOR TO ACCEPTANCE BY THE UTILITY.
10. CPU RESERVES THE OPTION TO REQUIRE "POTHOLING" TO DETERMINE DEPTH AND LOCATION FOR ANY INSTALLATIONS THAT ARE QUESTIONABLE. THE "POTHOLING" WILL BE AT THE CONTRACTOR'S EXPENSE.

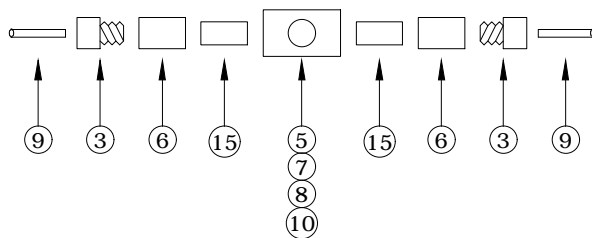
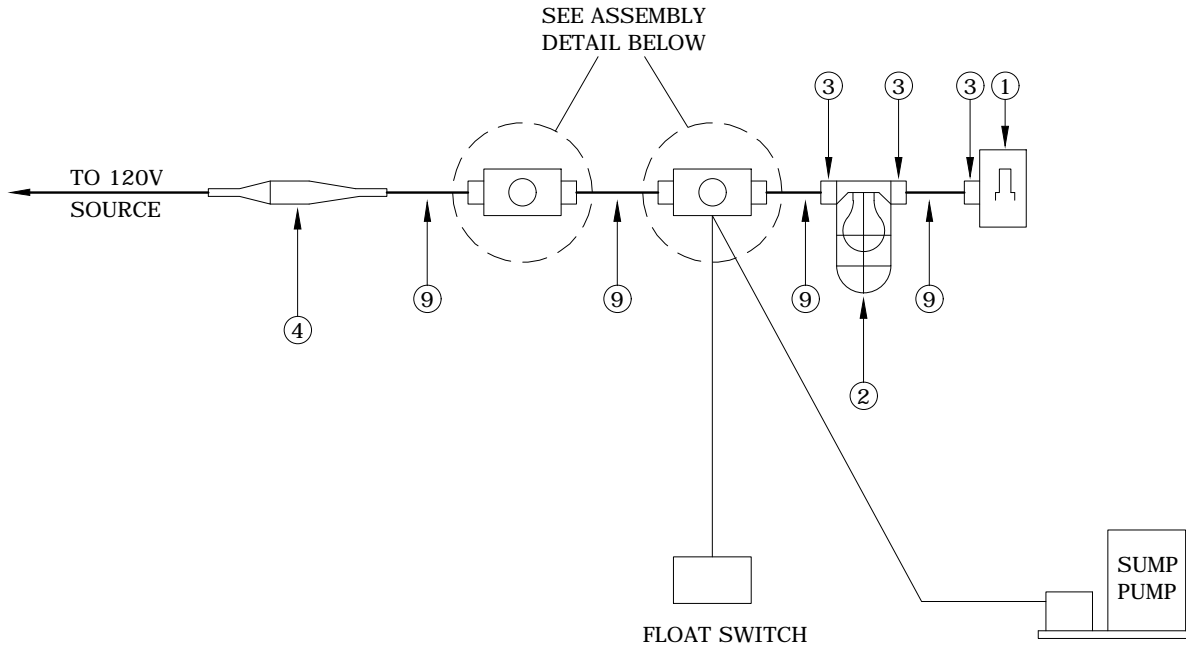
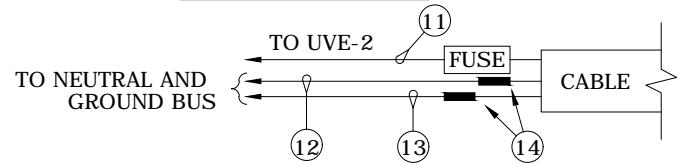
Rev 2: Added "Gray" to Item #4 and 3/4" mule tape in all conduit in Item #9

	CONSTRUCTION STANDARDS		REVISIONS																							
	DIRECTIONAL BORING SPECIFICATIONS		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">#</th> <th style="width: 20%;">DATE</th> <th style="width: 15%;">ENGR</th> <th style="width: 15%;">OPS</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">12/29/04</td> <td style="text-align: center;">LB</td> <td style="text-align: center;">AH</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">12/14/09</td> <td style="text-align: center;">KJP</td> <td></td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	#	DATE	ENGR	OPS	1	12/29/04	LB	AH	2	12/14/09	KJP						<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 5%; text-align: center;">△</td> <td style="width: 15%;">APP:</td> <td style="width: 15%;">SECTION</td> </tr> <tr> <td> </td> <td> </td> <td style="text-align: center; font-weight: bold; font-size: 1.2em;">1200</td> </tr> </table>		△	APP:	SECTION		
#	DATE	ENGR	OPS																							
1	12/29/04	LB	AH																							
2	12/14/09	KJP																								
△	APP:	SECTION																								
		1200																								
PAGE: 1 of 1	UD1		CAD FILE: UD1	DATE: 4/24/01																						

**DETAIL ITEM 4  
REMOTE SOURCE**



**DETAIL ITEM 4  
IN VAULT SOURCE**



STORE ITEM 10 NEAR RECEPTACLE  
WHEN NOT IN USE.

**RECEPTACLE ASSEMBLY  
(TYPICAL)**

R1 - REDRAWN IN CAD



**CONSTRUCTION STANDARDS**  
UNDERGROUND VAULT  
120 VOLT WIRING

PAGE:  
1 of 3


**UVE1**

CAD FILE:  
UVE1

REVISIONS			
DATE	ENGR	OPS	
2/23/00	HWH	MA	
REDRAWN IN CAD			
APP:	SECTION		
DATE: 4/94	1200		

## MATERIAL LIST


ITEM	QTY.	DESCRIPTION	TDM.
1	1	SWITCH, DUST-TIGHT, WATER-TIGHT, 125V, 20A SQUARE 'D' CAT #KW-1	2290
2	1	LIGHT FIXTURE, VAPOR-TIGHT, 150V WITH GLOBE, GUARD AND BASE WITH 2 - 3/4" NPT HUBS HUBBELL CAT #NVX15CHG	2291
3	7	CONNECTOR, STRAIGHT, 3/4" NPT HUB SIZE, MALE, NYLON HUBBELL #SHC-1037-CR	2292
4	1	FUSE HOLDER, HOMAC #SLK	2309
5	2	BOX, CONDUIT, PVC, TYPE FSC, 3/4"	2293
6	4	ADAPTER, FEMALE, 3/4", PVC	1586
7	2	POWER OUTLET, CHROME PLATED BRASS 30A, 3 WIRE, 125V, HUBBELL #60CM63	2294
8	2	ADAPTER, HUBBELL #60CM75 FOR ITEM #7	2295
9	A.R.	CORD, PORTABLE, TYPE STO 3 CONDUCTOR 10 AWG	2296
10	2	ADAPTER, TWIST LOCK MALE 30A TO STRAIGHT BLADE FEMALE 30A, HUBBELL #31CM29	2297
11	A.R.	CONDUCTOR #10 CU BLACK	2298
12	A.R.	CONDUCTOR #10 CU WHITE	2299
13	A.R.	CONDUCTOR #10 CU BARE	2300
14	2	SPLICE COVER, STREET LIGHT, HOMAC FSS20	2115
15	A.R.	CONDUIT, PVC, SCH 40, 3/4"	1564

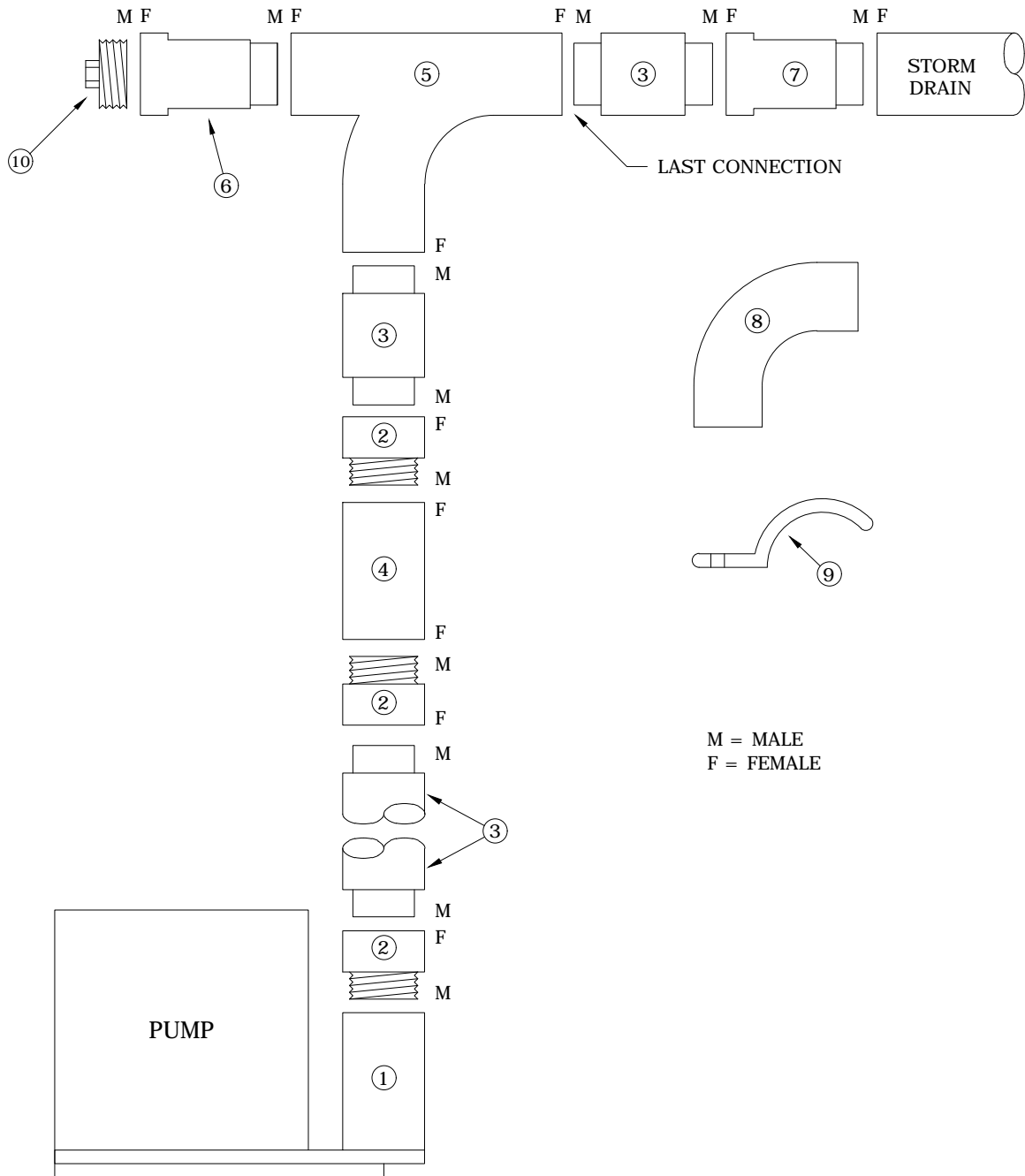
	CONSTRUCTION STANDARDS		REVISIONS			
	UNDERGROUND VAULT 120 VOLT WIRING		DATE	ENGR	OPS	
			1	2/23/00	HWH	MA
			△ REDRAWN IN CAD			
PAGE: 2 of 3	UVE1		CAD FILE: UVE1	APP:	SECTION	
			DATE:	4/94	1200	



NOTES:

1. THIS WIRING DIAGRAM IS TYPICAL ONLY. EACH VAULT REQUIRES SPECIAL CONSIDERATION TO LOCATE EACH COMPONENT FOR OPTIMUM UTILIZATION.
2. LOCATE THE LIGHT SWITCH AS CLOSE TO THE LADDER AS POSSIBLE BUT PROTECT IT FROM DAMAGE WHEN EQUIPMENT IS BEING MOVED IN OR OUT.
3. THE 120 VOLT SOURCE MAY BE FROM A TRANSFORMER IN THE VAULT OR FROM AN EXTERNAL SOURCE.
4. THE FLOAD SWITCH LOCATION MUST BE CALCULATED FOR EACH VAULT SEPARATELY. THE LOCATION DEPENDS UPON THE AMOUNT OF OIL IN THE EQUIPMENT IN THE VAULT. REFER THIS TO ENGINEERING.
5. LOCATE RECEPTACLES AS HIGH AS POSSIBLE TO MINIMIZE THE PROBABILITY OF BEING SUBMERGED.
6. LOCATE FUSE ON OR NEAR THE CEILING
7. FUSE IS 600 VOLT, 30 AMP, 13/32" x 1 1/2" NON-GLASS TYPE.
8. CONNECTOR, ITEM 3, SCREWS DIRECTLY INTO HUB.
9. THE NEUTRAL MAY COME FROM ANY AVAILABLE SOURCE WITHIN THE VAULT IF THE 120 VOLT SOURCE IS INTERNAL. IF THE SOURCE IS EXTERNAL, IT MUST INCLUDE A NEUTRAL.

	CONSTRUCTION STANDARDS		REVISIONS			
	UNDERGROUND VAULT 120 VOLT WIRING		DATE	ENGR	OPS	
	1	2/23/00	HWH	MA		
	<span style="border: 1px solid black; padding: 2px;">1</span> REDRAWN IN CAD					
PAGE: 3 of 3	UVE1		CAD FILE: UVE1	APP: DATE: 4/94	SECTION 1200	



NOTES:

- 1. ALL PIPE AND FITTINGS MUST BE SCHEDULE 40 SEWER TYPE. SEWER AND WATER FITTINGS DON'T FIT TOGETHER EXCEPT AT THREADED JOINTS.
- 2. THIS SPECIFICATION IS TYPICAL ONLY. LOCATION OF STORM DRAIN WILL DICTATE PIPE ROUTING.
- 3. LOCATE CHECK VALVE CLOSE TO PUMP AND IN THE VERTICAL POSITION.
- 4. PUMP MUST BE IN VAULT SUMP.
- 5. SEE UVE FOR ELECTRICAL CONNECTIONS.

R1 - REDRAWN IN CAD




**CONSTRUCTION STANDARDS**  
 UNDERGROUND VAULT  
 SUMP PUMP

REVISIONS			
NO.	DATE	ENGR	OPS
1	2/23/00	HWH	MA
⚠️ REDRAWN IN CAD			
APP: _____ DATE: 4/92		SECTION <b>1200</b>	

## MATERIAL LIST

ITEM	QTY.	DESCRIPTION	TDM.
1	1	SUMP PUMP	1955
2	3	ADAPTER, MALE, 2" PLASTIC, SEWER	2353
3	A. R.	PIPE, SEWER, PLASTIC, 2"	2301
4	1	CHECK VALVE, 2", BRONZE	2354
5	1	COMBINATION Y, 2", PLASTIC	2355
6	1	CLEANOUT FITTING 2", PLASTIC	2356
7	1	REDUCER, PLASTIC, SEWER, 2" x __	A. R.
8	A. R.	1/4 BEND, PLASTIC, SEWER, 2"	2308
9	A. R.	CLAMP, PIPE, 2", ONE BOLT	2307
10	1	CLEANOUT PLUG 2"	2358

	CONSTRUCTION STANDARDS		REVISIONS			
	UNDERGROUND VAULT SUMP PUMP		DATE	ENGR	OPS	
	1	2/23/00	HWH	MA		
PAGE: 2 of 2		UVSP1	CAD FILE: UVSP1	APP: DATE: 4/92		SECTION 1200

# 1300

## UNDERGROUND RISERS, CABLES AND CONNECTORS

12/19/2022

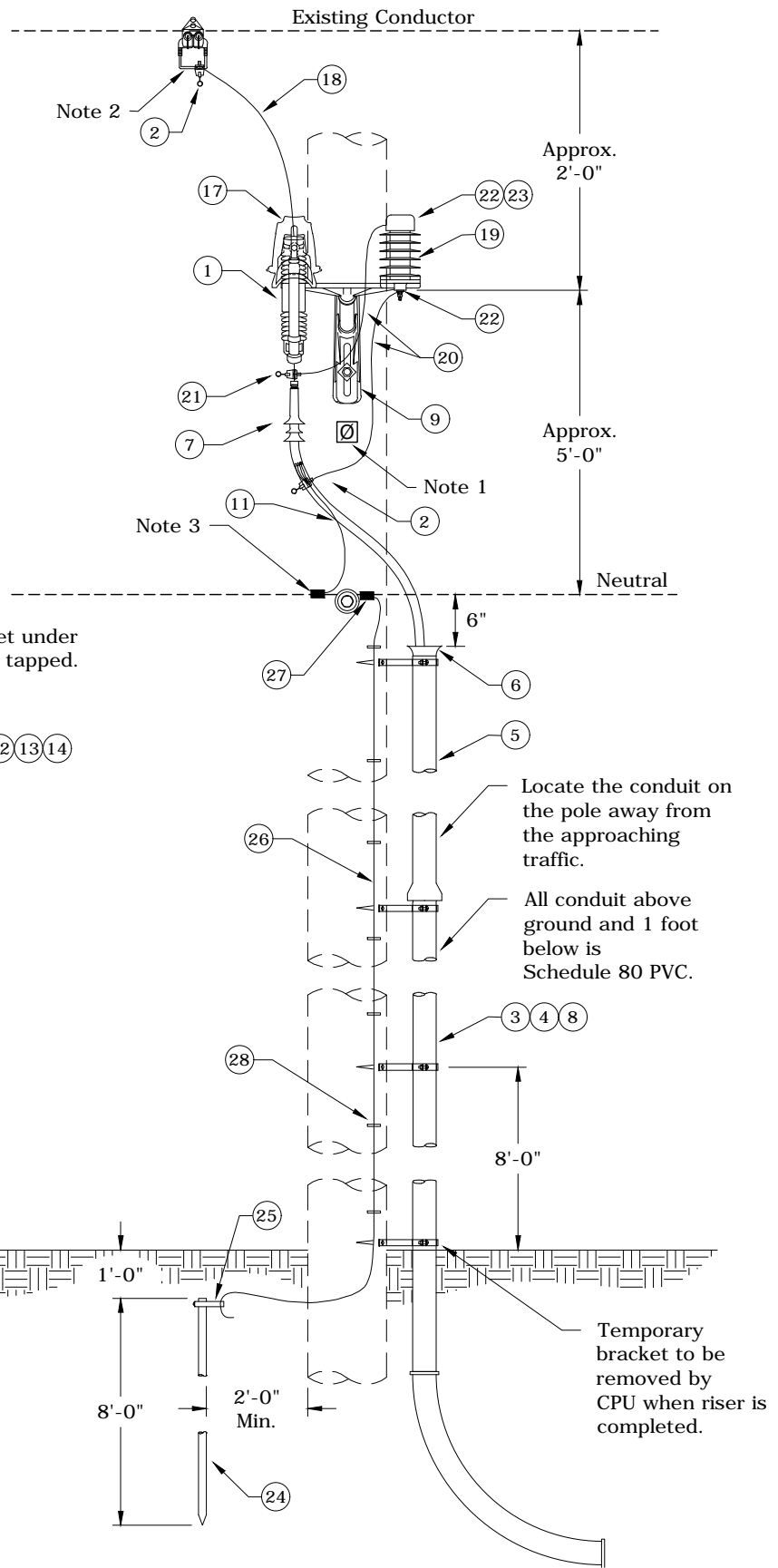
~	U1	1Ø Primary Riser
~	U1R	1Ø Primary Riser, Reverse Feed
~	U2	2Ø Primary Riser
~	U2R	2Ø Primary Riser, Reverse Feed
~	U3	3Ø Primary Riser
~	U3R	3Ø Primary Riser, Reverse Feed
~	U83,U84	Secondary Overhead to Underground Riser Assembly
~	U8P	Secondary OH to UG Riser Assembly with Secondary Pedestal
~	U9	Riser Bracket Assembly
~	U10	1Ø Primary (U1) & Secondary (U8) Riser Guidelines
~	UB20-UB28	Underground Primary Basic Units
~	UCA1-UCA6	Underground Primary Cable Accessories - 200 Amp
~	UCH-0	Underground Cable Reel Handling
~	UCH-1	Underground Cable Handling and Storage
~	UCP1	Underground Cable Pulling Requirements
~	UEP2	Primary Elbow Assembly 200A w/ Current-Reset Fault Indicator
~	UEP3	Primary Elbow Assembly 200A w/ Voltage-Reset Fault Indicator
~	UFI	Underground Fault Indicators
~	UFI2	Underground Cable Current-Reset Fault Indicators Installation
C	UID2	Underground Conductor Identification Tags

**N** New Standard

**R** Redrawn Standard

**C** Changed Standard

**~** No Change



**Notes:**

1. Engineer to call for Ø tag:  
 AØ - S/N 1280  
 BØ - S/N 1281  
 CØ - S/N 1282
2. Engineer to call for stirrup:  
 #6Sol to #2Str Cu - S/N 2338  
 #6ACSR to 2/OACSR - S/N 2339  
 1/OACSR to 477AAC - S/N 2340  
 336ACSR to 954AAC - S/N 2341
3. Engineer to call for connector based on neutral size.

Rev. 6 - Corrected drawing and material.



**CONSTRUCTION STANDARDS**  
 SINGLE PHASE  
 PRIMARY RISER

PAGE:  
1 of 2

**U1**

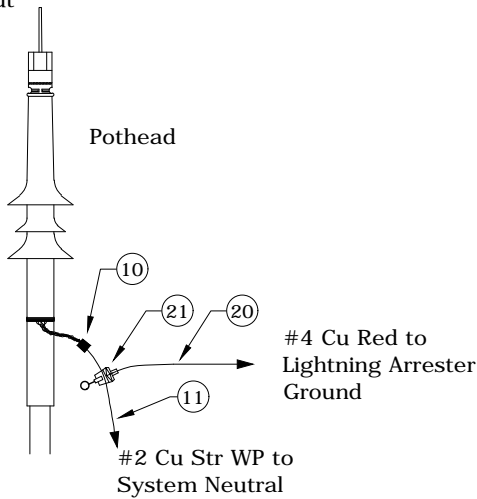
CAD FILE:  
U1

REVISIONS			
REV	DATE	ENGR	OPS
3	12/29/04	LB	AH
4	12/14/09	KJP	
5	10/31/17	CM	DK
6	1/16/19	CM	DK

APP: ELM	SECTION
DATE: 1/31/80	<b>1300</b>

To Cutout



Pothead Connection Detail

**Notes:**

4. Connect concentric neutrals to arrester ground using #4 Cu, Red.
5. Make arrester ground terminal-to-concentric neutral jumper as short as possible.

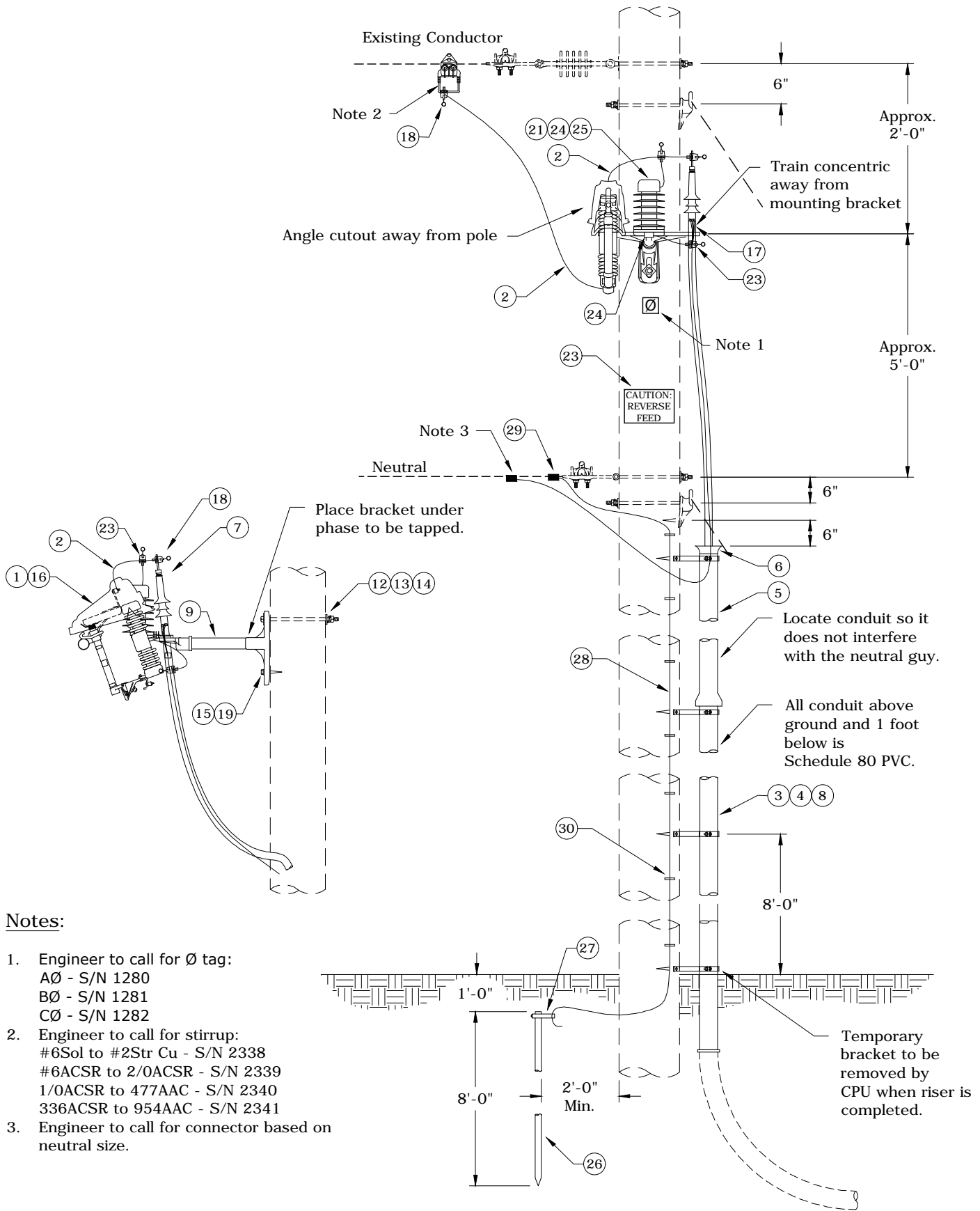
Rev. 6 - Corrected drawing and material.

ITEM NO.	DESCRIPTION	U1	
		QTY.	S/N
1	Cutout, Polymer, Universal, 100A, 16kA Asym.	1	2532
2	Clamp, Hotline, GP 1520, #8 to 2/0 Str, Cu Only	1*	283
3	Screw, Lag, 1/2" x 3", Fetter Drive, Drive Point	6	1131
4	Bracket, Standoff Riser, 10 1/2"	3	226
5	Conduit, PVC, 2" X 10', Sch 80	30*	2205
6	End Bell, 2", Sch 40	1*	2206
7	Terminator, 15kV, Cold-Shrink JCN & CN, 1/0	1	2214
8	Clamp, Standoff Bracket, Conduit, 2"	3	295
9	Bracket, Arrester/Cutout Mounting, 1ø Fiberglass 18"	1	2537
10	Connector, Crimpet, Cu 2/2 - 2/2 (2C2)	1	455
11	Conductor, Cu #2, 1/C, 7-Str, SD, 600V, HMP	10	393
12	Bolt, Machine, 5/8" x 12", 12,400 lbs. Ultimate Tensile	1	155
13	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
14	Washer, Lock, Spring, Double Coil, Galv. 5/8"	1	2217
15	Screw, Lag, 1/2" x 4 1/2", Twist Drive, Drive Point	1	1132
16	Washer, Flat, Round Galv., 1/2"	1	1394
17	Guard, Wildlife, Cutout, Polymer	1	2928 *
18	Conductor, Cu 1/C #2, 7-Str, 600V, Red, THW	3	2513
ITEM NO.	DESCRIPTION	LA2	
		QTY.	S/N
19	Arrester, Surge, 9kV, MOV, Riser Pole	1	58
20	Conductor, Cu 1/C #4, 7-Str, 600V, Red, THW	7	2512
21	Clamp, Hotline, GP 1520, #8 to 2/0 Str, Cu Only	2	283
22	Connector, Compression Lug, #4, Cu/Al, One-Hole, Tin-Plated, For Arrester	2	2548
23	Guard, Wildlife, Polymer Arrester	1	2583
ITEM NO.	DESCRIPTION	N1	
		QTY.	S/N
24	Rod, Ground, 5/8" x 8'	1	1124
25	Clamp, Ground Rod, 5/8", Bronze Small	1	281
26	Conductor, Copper-Clad Steel, #4 Cu Equivalent, Covered	40	1512
27	Connector, Cabelok, Al/Cu, #2-2/0 Run, #6-#1 Tap	1	413
28	Staple, Ground, Barbed, Galv. 1 1/2"	24	2707



**CONSTRUCTION STANDARDS**  
SINGLE PHASE  
PRIMARY RISER

REVISIONS			
DATE	ENGR	OPS	
12/29/04	LB	AH	
12/14/09	KJP		
10/31/17	CM	DK	
1/16/19	CM	DK	



**Notes:**

1. Engineer to call for Ø tag:  
 AØ - S/N 1280  
 BØ - S/N 1281  
 CØ - S/N 1282
2. Engineer to call for stirrup:  
 #6Sol to #2Str Cu - S/N 2338  
 #6ACSR to 2/0ACSR - S/N 2339  
 1/0ACSR to 477AAC - S/N 2340  
 336ACSR to 954AAC - S/N 2341
3. Engineer to call for connector based on neutral size.

Rev. 2 - Moved arrester to middle of bracket, added cutout direction note, and updated materials.



**CONSTRUCTION STANDARDS**  
 SINGLE PHASE  
 PRIMARY RISER  
 REVERSE FEED

PAGE:  
1 of 2

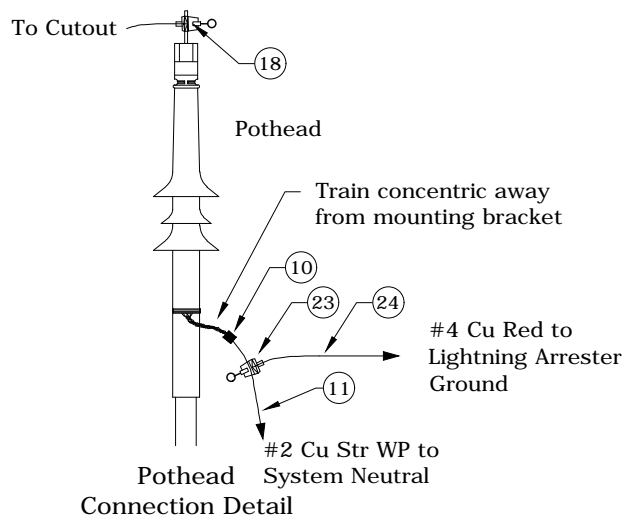
**U1R**

CAD FILE:  
U1R

REVISIONS			
NO.	DATE	ENGR	OPS
1	10/31/17	CM	DK
2	1/16/19	CM	DK

APP: HWH/MA	SECTION
DATE: 2/23/00	1300



**Notes:**

4. Connect concentric neutrals to arrester ground using #4 Cu, Red.
5. Make arrester ground terminal-to-concentric neutral jumper as short as possible.

Rev. 2 - Moved arrester to middle of bracket, added cutout direction note, and updated materials.

ITEM NO.	DESCRIPTION	U1R	
		QTY.	S/N
1	Cutout, Polymer, Universal, 100A, 16kA Asym.	1	2532
2	Conductor, Cu 1/C #2, 7 Str, 600V, Red, THW	6	2513
3	Screw, Lag, 1/2" x 3", Fetter Drive, Drive Point	6	1131
4	Bracket, Standoff Riser, 10 1/2"	3	226
5	Conduit, PVC, 2" x 10', Sch 80	30	2205
6	End Bell, 2", Sch 40	1	2206
7	Terminator, 15kV, Cold-Shrink, JCN & CN, 1/0	1	2214
8	Clamp, Standoff Bracket, 2" Conduit	3	295
9	Bracket, Arrester/Cutout Mounting, 1Ø, Fiberglass 18"	1	2537
10	Connector, Crimpet, Cu, 2/2 - 2/2 (2C2)	1	455
11	Conductor, Cu #2, 1/C, 7-Str, SD, 600V, HMP	10	393
12	Bolt, Machine 5/8" x 12", 12,400 lbs. Ultimate Tensile	1	155
13	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
14	Washer, Lock, Spring, Double Coil, Galv. 5/8"	1	2217
15	Screw, Lag 1/2" x 4 1/2", Twist Drive, Drive Point	1	1132
16	Guard, Wildlife, Cutout, Polymer	1	2928
17	Clamp, 2-Bolt, for 1/0 Terminator	1	1858
18	Clamp, Hotline, GP 1520, #8 to 2/0 Str, Cu Only	2	283
19	Washer, Flat, Round Galv. 1/2"	1	1394
20	Sign, "Caution: Reverse Feed"	1	2719
ITEM NO.	DESCRIPTION	LA2	
		QTY.	S/N
21	Arrester, Surge, 9kV, MOV, Riser Pole	1	58
22	Conductor, Cu 1/C #4, 7-Str, 600V, Red, THW	7	2512
23	Clamp, Hotline, GP 1520, #8 to 2/0 Str, Cu Only	2	283
24	Connector, Compression Lug, #4, Cu/Al, One-Hole, Tin-Plated, For Arrester	2	2548
25	Guard, Wildlife, Polymer Arrester	1	2583
ITEM NO.	DESCRIPTION	N1	
		QTY.	S/N
26	Rod, Ground, 5/8" x 8'	1	1124
27	Clamp, Ground Rod, 5/8", Bronze Small	1	281
28	Conductor, Copper-Clad Steel, #4 Cu Equivalent, Covered	40	1512
29	Connector, Cabelok, Al/Cu, #2-2/0 Run, #6-#1 Tap	1	413
30	Staple, Ground, Barbed, Galvanized, 1 1/2"	24	2707



**CONSTRUCTION STANDARDS**

SINGLE PHASE  
PRIMARY RISER  
REVERSE FEED

PAGE:  
2 of 2

**U1R**

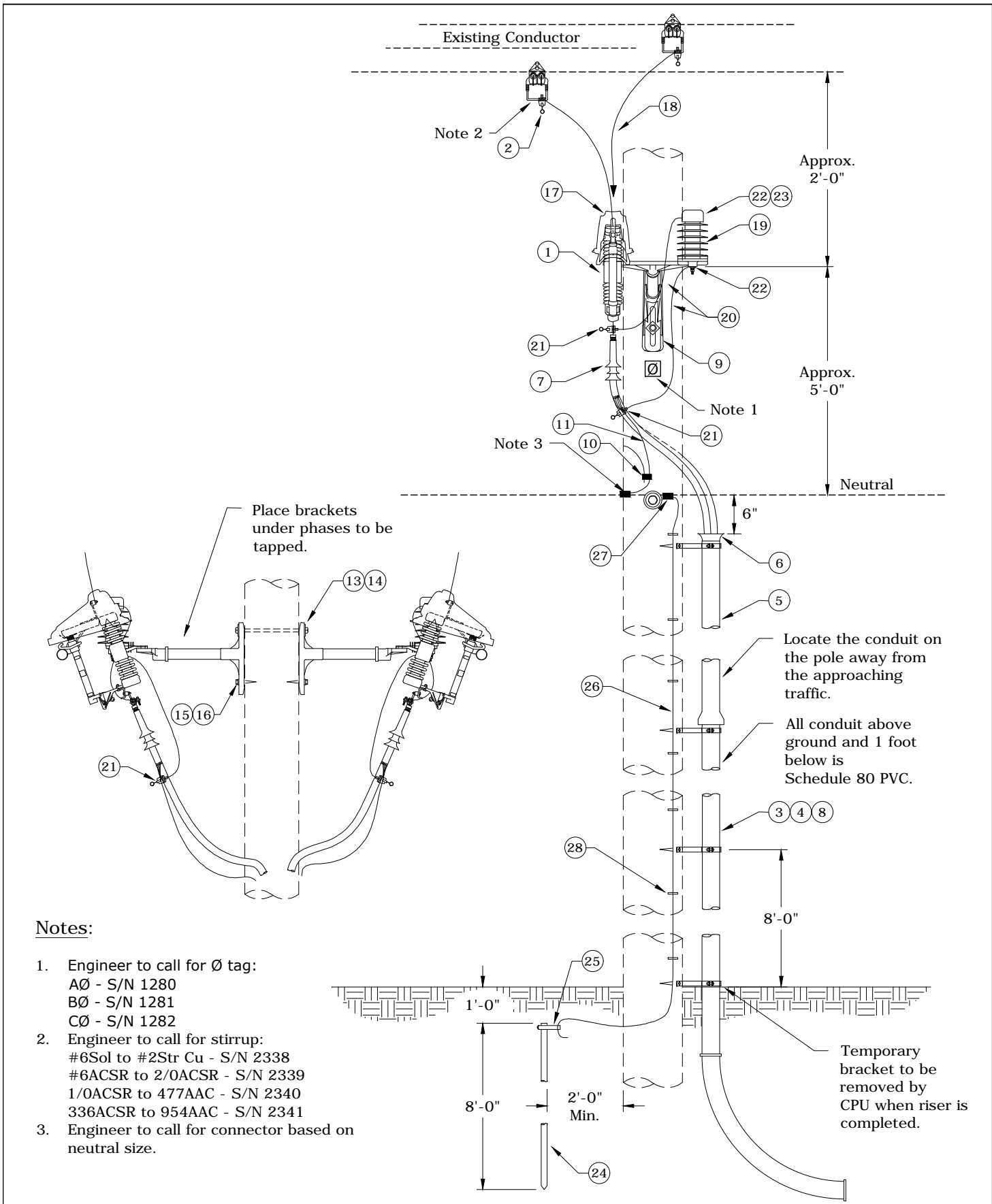
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U1R

REVISIONS			
DATE	ENGR	OPS	
10/31/17	CM	DK	
1/16/19	CM	DK	

APP: HWH/MA	SECTION
DATE: 2/23/00	<b>1300</b>




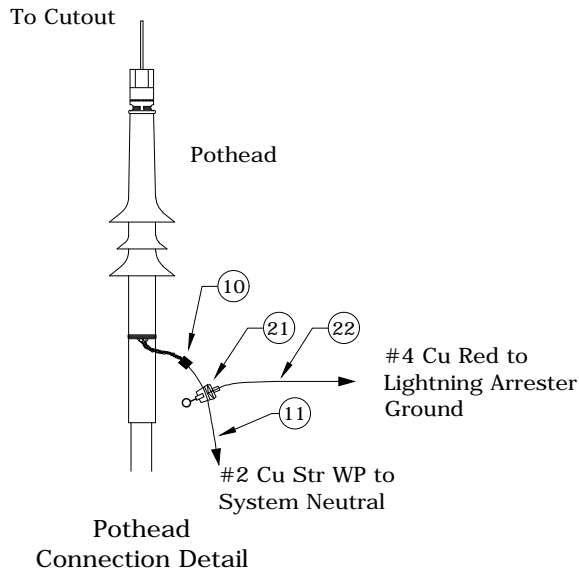


**Notes:**

1. Engineer to call for Ø tag:  
 AØ - S/N 1280  
 BØ - S/N 1281  
 CØ - S/N 1282
2. Engineer to call for stirrup:  
 #6Sol to #2Str Cu - S/N 2338  
 #6ACSR to 2/0ACSR - S/N 2339  
 1/0ACSR to 477AAC - S/N 2340  
 336ACSR to 954AAC - S/N 2341
3. Engineer to call for connector based on neutral size.

Rev. 5 - Corrected drawing and material issue.

	CONSTRUCTION STANDARDS		REVISIONS			
	TWO PHASE PRIMARY RISER		#	DATE	ENGR	OPS
			2	12/29/04	LB	AH
			3	12/14/09	KJP	
			4	10/31/17	CM	DK
			5	1/16/19	CM	DK
PAGE: 1 of 2	U2		CAD FILE: U2	APP: ELM	SECTION 1300	
			DATE: 2/22/00			



**Notes:**

4. Connect concentric neutrals to arrester ground using #4 Cu, Red.
5. Make arrester ground terminal-to-concentric neutral jumper as short as possible.

Rev. 5 - Corrected drawing and material.

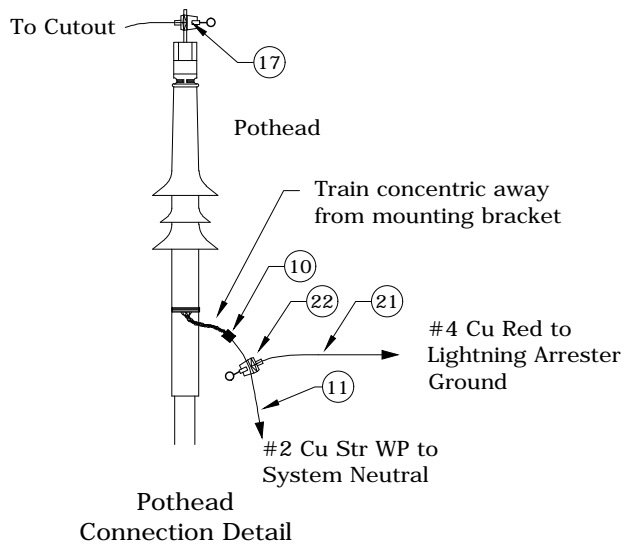
		U2	
ITEM NO.	DESCRIPTION	Additional Material	
		QTY.	S/N
1	Cutout, Polymer, Universal, 100A, 16kA Asym.	2	2532
2	Clamp, Hotline, GP 1520, #8 to 2/0 Str, Cu Only	2*	283
3	Screw, Lag, 1/2" x 3", Fetter Drive, Drive Point	6	1131
4	Bracket, Standoff Riser, 10 1/2"	3	226
5	Conduit, PVC, 4" X 10', Sch 80	30*	2203
6	End Bell, 4", Sch 40	1*	2204
7	Terminator, 15kV, Cold-Shrink JCN & CN, 1/0	2	2214
8	Clamp, Standoff Bracket, Conduit, 4"	3	297
9	Bracket, Arrester/Cutout Mounting, 1ø Fiberglass 18"	2	2537
10	Connector, Crimpet, Cu 2/2 - 2/2 (2C2)	2	455
11	Conductor, Cu #2, 1/C, 7-Str, SD, 600V, HMP	20	393
13	Bolt, Machine, 5/8" x 14", 12,400 lb Ultimate	1	156
14	Washer, Lock, Spring, Double Coil, Galv. 5/8"	1	2217
15	Screw, Lag, 1/2" x 4 1/2", Twist Drive, Drive Point	2	1132
16	Washer, Flat, Round Galv., 1/2"	2	1394
17	Guard, Wildlife, Cutout, Polymer	2	2928 *
18	Conductor, Cu 1/C #2, 7-Str, 600V, Red, THW	6	2513
ITEM NO.	DESCRIPTION	LA2 (2)	
		QTY.	S/N
19	Arrester, Surge, 9kV, MOV, Riser Pole	2	58
20	Conductor, Cu 1/C #4, 7-Str, 600V, Red, THW	14	2512
21	Clamp, Hotline, GP 1520, #8 to 2/0 Str, Cu Only	4	283
22	Connector, Compression Lug, #4, Cu/Al, One-Hole, Tin-Plated, For Arrester	4	2548
23	Guard, Wildlife, Polymer Arrester	2	2583
ITEM NO.	DESCRIPTION	N1	
		QTY.	S/N
24	Rod, Ground, 5/8" x 8'	1	1124
25	Clamp, Ground Rod, 5/8", Bronze Small	1	281
26	Conductor, Copper-Clad Steel, #4 Cu Equivalent, Covered	40	1512
27	Connector, Cabelok, Al/Cu, #2-2/0 Run, #6-#1 Tap	1	413
28	Staple, Ground, Barbed, Galvanized, 1 1/2"	24	2707



**CONSTRUCTION STANDARDS**  
TWO PHASE  
PRIMARY RISER

REVISIONS			
REV	DATE	ENGR	OPS
2	12/29/04	LB	AH
3	12/14/09	KJP	
4	10/31/17	CM	DK
5	1/16/19	CM	DK





**Notes:**

4. Connect concentric neutrals to arrester ground using #4 Cu, Red.
5. Make arrester ground terminal-to-concentric neutral jumper as short as possible.

Rev. 1 - Moved arrester to middle of bracket, added cutout direction note, and updated materials.

		U2R	
ITEM NO.	DESCRIPTION	Additional Material	
		QTY.	S/N
1	Cutout, Polymer, Universal, 100A, 16kA Asym.	2	2532
2	Conductor, Cu 1/C #2, 7-Str, 600V, Red, THW	12	2513
3	Screw, Lag, 1/2" x 3", Fetter Drive, Drive Point	6	1131
4	Bracket, Standoff Riser, 10 1/2"	3	226
5	Conduit, PVC, 4" x 10', Sch 80	30	2203
6	End Bell, 4", Sch 40	2	2204
7	Terminator, 15kV, Cold-Shrink, JCN & CN, 1/0	2	2214
8	Clamp, Standoff Bracket, 4" Conduit	3	297
9	Bracket, Arrester/Cutout Mounting, 1Ø, Fiberglass 18"	2	2537
10	Connector, Crimpet, Cu, 2/2 - 2/2 (2C2)	4	455
11	Conductor, Cu #2, 1/C, 7-Str, SD, 600V, HMP	20	393
12	Bolt, Machine 5/8" x 14", 12,400 lbs. Ultimate Tensile	1	156
13	Washer, Lock, Spring, Double Coil, Galv. 5/8"	1	2217
14	Screw, Lag 1/2" x 4 1/2", Twist Drive, Drive Point	2	1132
15	Guard, Wildlife, Cutout, Polymer	2	2928
16	Clamp, 2-Bolt, for 1/0 Terminator	2	1858
17	Clamp, Hotline, GP 1520, #8 to 2/0 Str, Cu Only	4	283
18	Washer, Flat, Round Galv. 1/2"	2	1394
19	Sign, "Caution: Reverse Feed"	1	2719
ITEM NO.	DESCRIPTION	LA2 (2)	
		QTY.	S/N
20	Arrester, Surge, 9kV, MOV, Riser Pole	2	58
21	Conductor, Cu 1/C #4, 7-Str, 600V, Red, THW	14	2512
22	Clamp, Hotline, GP 1520, #8 to 2/0 Str, Cu Only	4	283
23	Connector, Compression Lug, #4, Cu/Al, One-Hole, Tin-Plated, For Arrester	4	2548
24	Guard, Wildlife, Polymer Arrester	2	2583
ITEM NO.	DESCRIPTION	N1	
		QTY.	S/N
25	Rod, Ground, 5/8" x 8'	1	1124
26	Clamp, Ground Rod, 5/8", Bronze Small	1	281
27	Conductor, Copper-Clad Steel, #4 Cu Equivalent, Covered	40	1512
28	Connector, Cabelok, Al/Cu, #2-2/0 Run, #6-#1 Tap	1	413
29	Staple, Ground, Barbed, Galvanized, 1 1/2"	24	2707



**CONSTRUCTION STANDARDS**

TWO PHASE  
PRIMARY RISER  
REVERSE FEED

PAGE:  
2 of 2

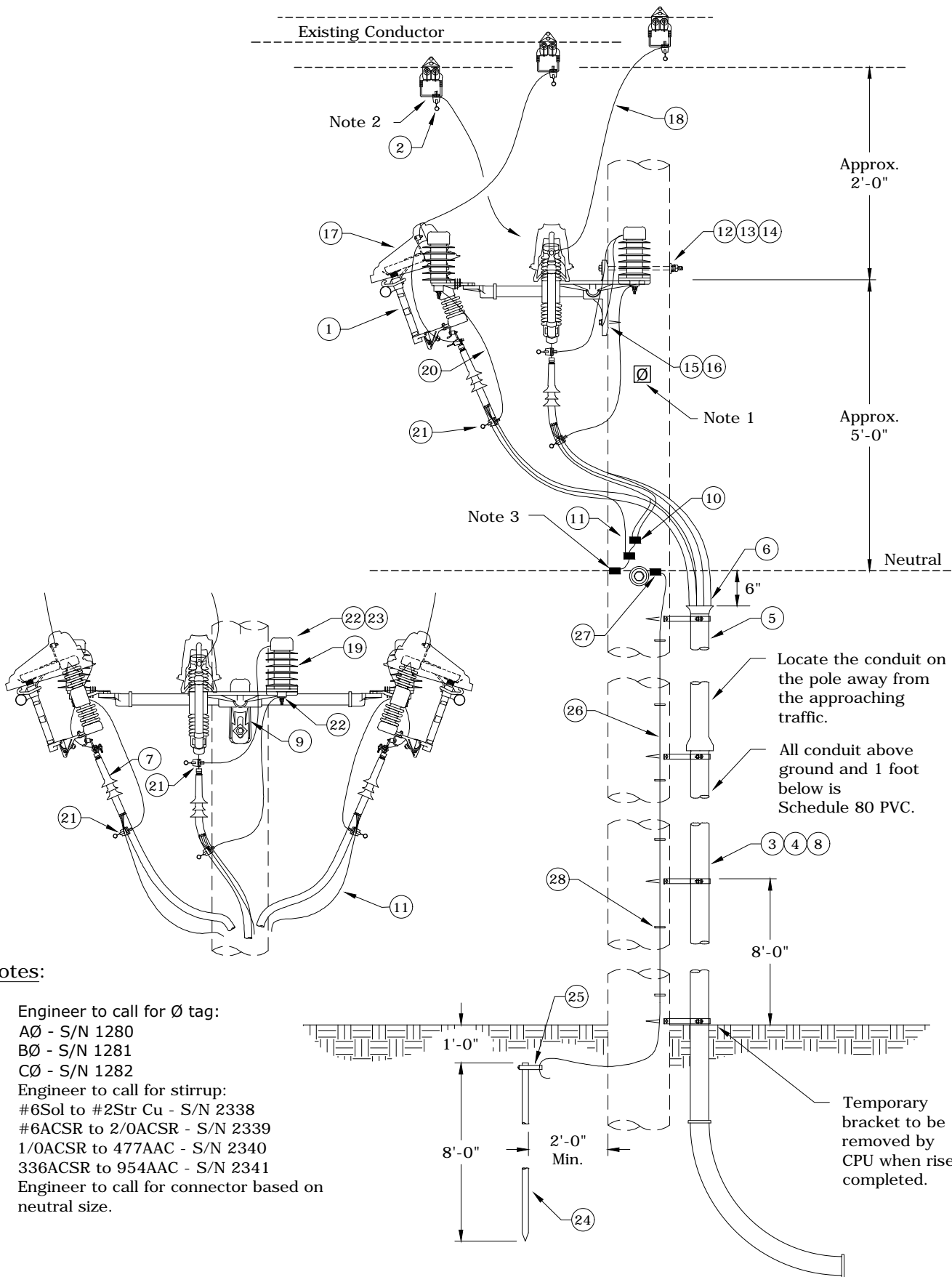
**U2R**

CAD FILE:  
U2R

REVISIONS

DATE	ENGR	OPS
1/16/19	CM	DK

APP: CM/DK      SECTION  
DATE: 10/31/17      **1300**



Locate the conduit on the pole away from the approaching traffic.

All conduit above ground and 1 foot below is Schedule 80 PVC.

Temporary bracket to be removed by CPU when riser is completed.

**Notes:**

1. Engineer to call for Ø tag:  
 AØ - S/N 1280  
 BØ - S/N 1281  
 CØ - S/N 1282
2. Engineer to call for stirrup:  
 #6Sol to #2Str Cu - S/N 2338  
 #6ACSR to 2/0ACSR - S/N 2339  
 1/0ACSR to 477AAC - S/N 2340  
 336ACSR to 954AAC - S/N 2341
3. Engineer to call for connector based on neutral size.

Rev. 6 - Corrected drawing and material issue.



**CONSTRUCTION STANDARDS**  
 THREE PHASE  
 PRIMARY RISER

REVISIONS			
REV	DATE	ENGR	OPS
3	12/29/04	LB	AH
4	12/14/09	KJP	
5	10/31/17	CM	DK
6	1/16/19	CM	DK

PAGE:  
1 of 2

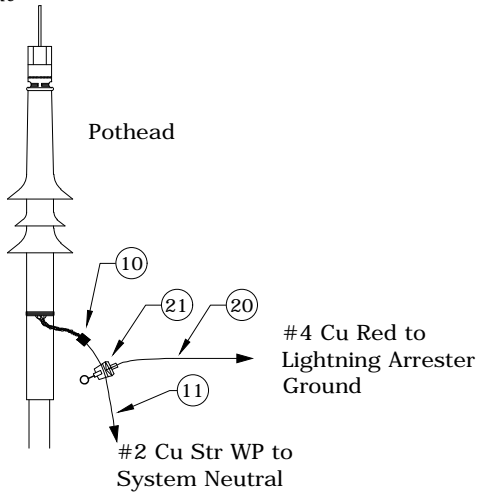
**U3**

CAD FILE:  
U3

APP: ELM  
DATE: 1/31/80

SECTION  
**1300**

To Cutout



Pothead Connection Detail

Notes:

4. Connect concentric neutrals to arrester ground using #4 Cu, Red.
5. Make arrester ground terminal-to-concentric neutral jumper as short as possible.

Rev. 6 - Corrected drawing and material issue.

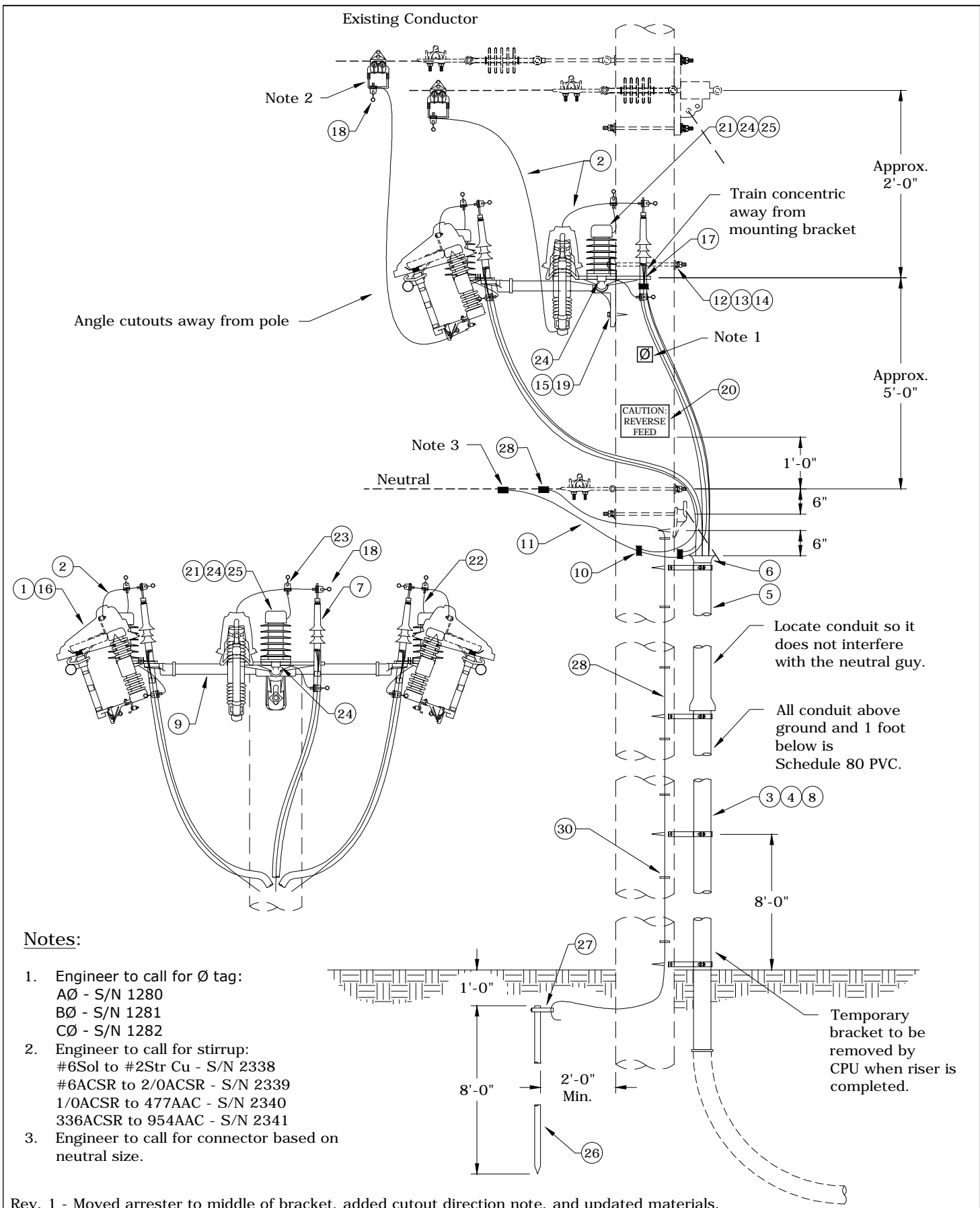
		U3	
ITEM NO.	DESCRIPTION	Additional Material	
		QTY.	S/N
1	Cutout, Polymer, Universal, 100A, 16kA Asym.	3	2532
2	Clamp, Hotline, GP 1520, #8 to 2/0 Str, Cu Only	3	283*
3	Screw, Lag, 1/2" x 3", Fetter Drive, Drive Point	6	1131
4	Bracket, Standoff Riser, 10 1/2"	3	226
5	Conduit, PVC, 4" x 10', Sch 80	30	2203
6	End Bell, 4", Sch 40	1	2204
7	Terminator, 15kV, Cold-Shrink, JCN & CN, 1/0	3	2214
8	Clamp, Standoff Bracket, 4" Conduit	3	297*
9	Bracket, Arrester/Cutout Mounting, 3Ø Fiberglass 18"	1	2538
10	Connector, Crimpet, Cu 2/2 - 2/2 (2C2)	3	455
11	Conductor, Cu #2, 1/C, 7-Str, SD, 600V, HMP	30	393
12	Bolt, Machine, 5/8" x 12", 12,400 lbs. Ultimate Tensile	1	155
13	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
14	Washer, Lock Spring, Double Coil, Galv. 5/8"	1	2217
15	Screw, Lag, 1/2" x 4 1/2", Twist Drive, Drive Point	1	1132
16	Washer, Flat, Round, Galv., 1/2"	1	1394
17	Guard, Wildlife, Cutout, Polymer	3	2928*
18	Conductor, Cu 1/C #2, 7 STR, 600V, Red	9	2513
ITEM NO.	DESCRIPTION	LA2(3)	
		QTY.	S/N
19	Arrester, Surge, 9kV, MOV, Riser Pole	3	58
20	Conductor, Cu 1/C #4, 7-Str, 600V, Red, THW	21	2512
21	Clamp, Hotline, GP 1520, #8 to 2/0 Str, Cu Only	6	283
22	Connector, Compression Lug, #4, Cu/Al, One-Hole, Tin-Plated, For Arrester	6	2548
23	Guard, Wildlife, Polymer Arrester	3	2583
ITEM NO.	DESCRIPTION	N1	
		QTY.	S/N
24	Rod, Ground, 5/8" x 8'	1	1124
25	Clamp, Ground Rod, 5/8" Bronze Small	1	281
26	Cond, Copper-Clad Steel, #4 Cu Equivalent, Covered	40	1512
27	Connector, Cabelok, Al/Cu, #2-2/0 Run, #6-#1 Tap	1	413
28	Staple, Ground, Barbed, Galvanized, 1 1/2"	24	2707



**CONSTRUCTION STANDARDS**  
THREE PHASE  
PRIMARY RISER

REVISIONS


REV	DATE	ENGR	OPS
3	12/29/04	LB	AH
4	12/14/09	KJP	
5	10/31/17	CM	DK
6	1/16/19	CM	DK

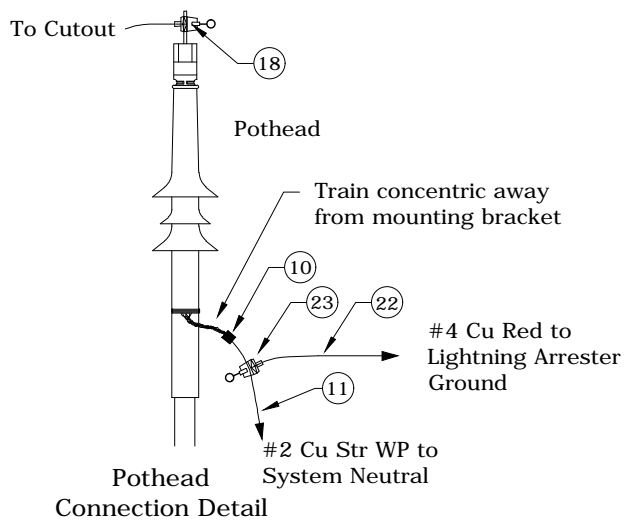


**Notes:**

1. Engineer to call for Ø tag:  
 AØ - S/N 1280  
 BØ - S/N 1281  
 CØ - S/N 1282
2. Engineer to call for stirrup:  
 #6Sol to #2Str Cu - S/N 2338  
 #6ACSR to 2/0ACSR - S/N 2339  
 1/0ACSR to 477AAC - S/N 2340  
 336ACSR to 954AAC - S/N 2341
3. Engineer to call for connector based on neutral size.

Rev. 1 - Moved arrester to middle of bracket, added cutout direction note, and updated materials.

	CONSTRUCTION STANDARDS		REVISIONS																								
	THREE PHASE PRIMARY RISER REVERSE FEED		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">#</th> <th style="width: 20%;">DATE</th> <th style="width: 15%;">ENGR</th> <th style="width: 15%;">OPS</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">1/16/19</td> <td style="text-align: center;">CM</td> <td style="text-align: center;">DK</td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	#	DATE	ENGR	OPS	1	1/16/19	CM	DK									<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">APP:</th> <th style="width: 30%;">CM/DK</th> <th style="width: 40%;">SECTION</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td style="text-align: center;">1300</td> </tr> </tbody> </table>		APP:	CM/DK	SECTION			1300
	#	DATE	ENGR	OPS																							
1	1/16/19	CM	DK																								
APP:	CM/DK	SECTION																									
		1300																									
PAGE: 1 of 2	U3R		CAD FILE: U3R		DATE: 10/31/17																						



**Notes:**

4. Connect concentric neutrals to arrester ground using #4 Cu, Red.
5. Make arrester ground terminal-to-concentric neutral jumper as short as possible.

Rev. 1 - Moved arrester to middle of bracket, added cutout direction note, and updated materials.

		U3R	
ITEM NO.	DESCRIPTION	Additional Material	
		QTY.	S/N
1	Cutout, Polymer, Universal, 100A, 16kA Asym.	3	2532
2	Conductor, Cu 1/C #2, 7 Str, 600V, Red, THW	18	2513
3	Screw, Lag, 1/2" x 3", Fetter Drive, Drive Point	6	1131
4	Bracket, Standoff Riser, 10 1/2"	3	226
5	Conduit, PVC, 4" x 10', Sch 80	30	2203
6	End Bell, 4", Sch 40	1	2204
7	Terminator, 15kV, Cold-Shrink, JCN & CN, 1/0	3	2214
8	Clamp, Standoff Bracket, 4" Conduit	3	297
9	Bracket, Arrester/Cutout Mounting, 3Ø, Fiberglass 18"	1	2538
10	Connector, Crimpet, Cu, 2/2 - 2/2 (2C2)	5	455
11	Conductor, Cu #2, 1/C, 7-Str, SD, 600V, HMP	30	393
12	Bolt, Machine 5/8" x 12", 12,400 lbs. Ultimate Tensile	1	155
13	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
14	Washer, Lock, Spring, Double Coil, Galv. 5/8"	1	2217
15	Screw, Lag 1/2" x 4 1/2", Twist Drive, Drive Point	1	1132
16	Guard, Wildlife, Cutout, Polymer	3	2928
17	Clamp, 2-Bolt, for 1/0 Terminator	3	1858
18	Clamp, Hotline, GP 1520, #8 to 2/0 Str, Cu Only	6	283
19	Washer, Flat, Round Galv. 1/2"	1	1394
20	Sign, "Caution: Reverse Feed"	1	2719
ITEM NO.	DESCRIPTION	LA2(3)	
		QTY.	S/N
21	Arrester, Surge, 9kV, MOV, Riser Pole	3	58
22	Conductor, Cu 1/C #4, 7-Str, 600V, Red, THW	21	2512
23	Clamp, Hotline, GP 1520, #8 to 2/0 Str, Cu Only	6	283
24	Connector, Compression Lug, #4, Cu/Al, One-Hole, Tin-Plated, For Arrester	6	2548
25	Guard, Wildlife, Polymer Arrester	3	2583
ITEM NO.	DESCRIPTION	N1	
		QTY.	S/N
26	Rod, Ground, 5/8" x 8'	1	1124
27	Clamp, Ground Rod, 5/8", Bronze Small	1	281
28	Conductor, Copper-Clad Steel, #4 Cu Equivalent, Covered	40	1512
29	Connector, Cabelok, Al/Cu, #2-2/0 Run, #6-#1 Tap	1	413
30	Staple, Ground, Barbed, Galvanized, 1 1/2"	24	2707



**CONSTRUCTION STANDARDS**  
THREE PHASE  
PRIMARY RISER  
REVERSE FEED

PAGE:  
2 of 2

**U3R**

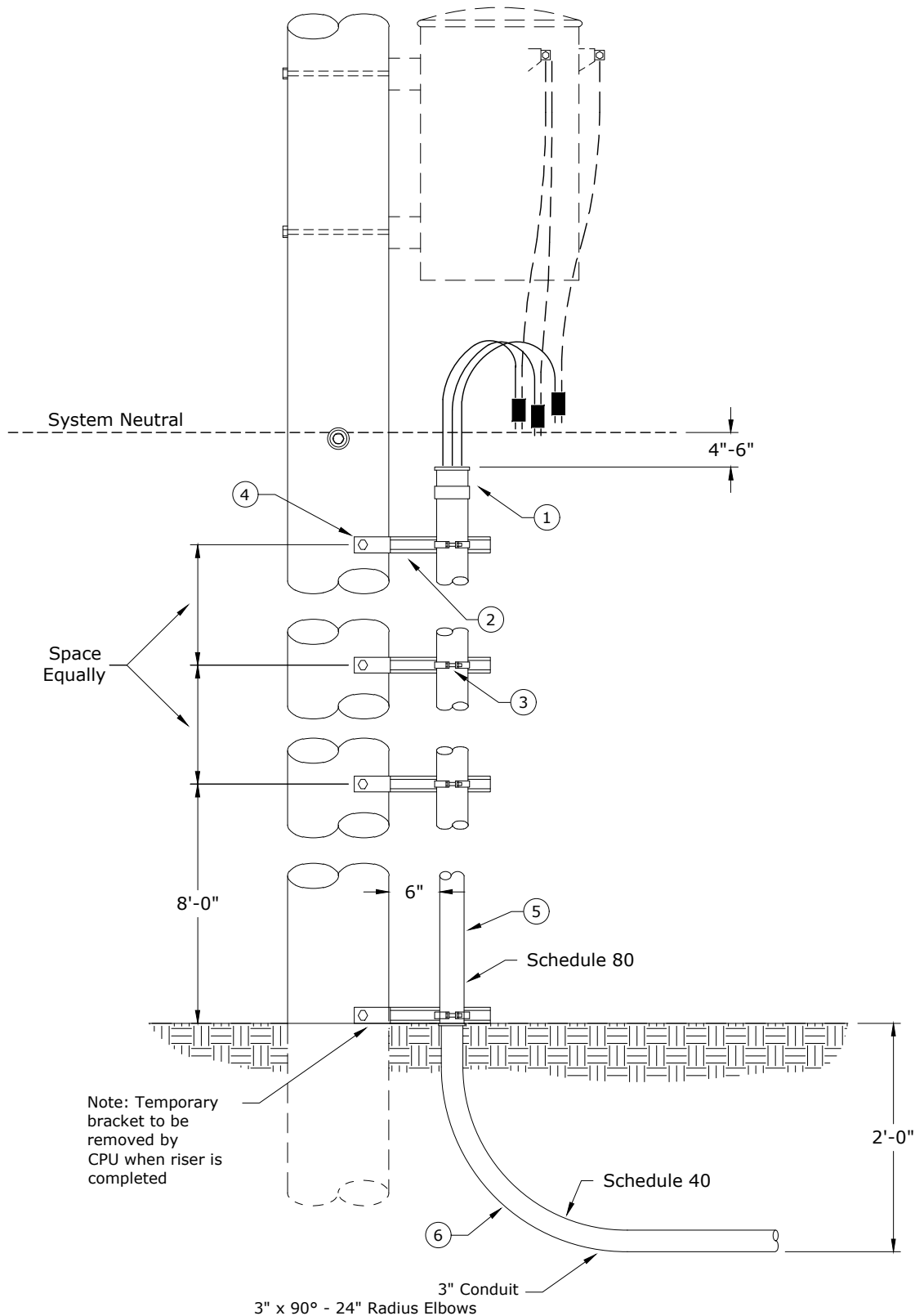
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U3R

REVISIONS			
DATE	ENGR	OPS	
1/16/19	CM	DK	

APP:	CM/DK	SECTION
DATE:	10/31/17	1300





Rev 2: Material corrections.



# CONSTRUCTION STANDARDS

## SECONDARY OVERHEAD TO UNDERGROUND RISER ASSEMBLY

REVISIONS			
Δ	DATE	ENGR	OPS
1	5/30/07	LB	AH
2	6/8/18	KJP	

PAGE:  
1 of 2

**U83,U84**

CAD FILE:  
U83



APP: KJP  
DATE: 12/29/04

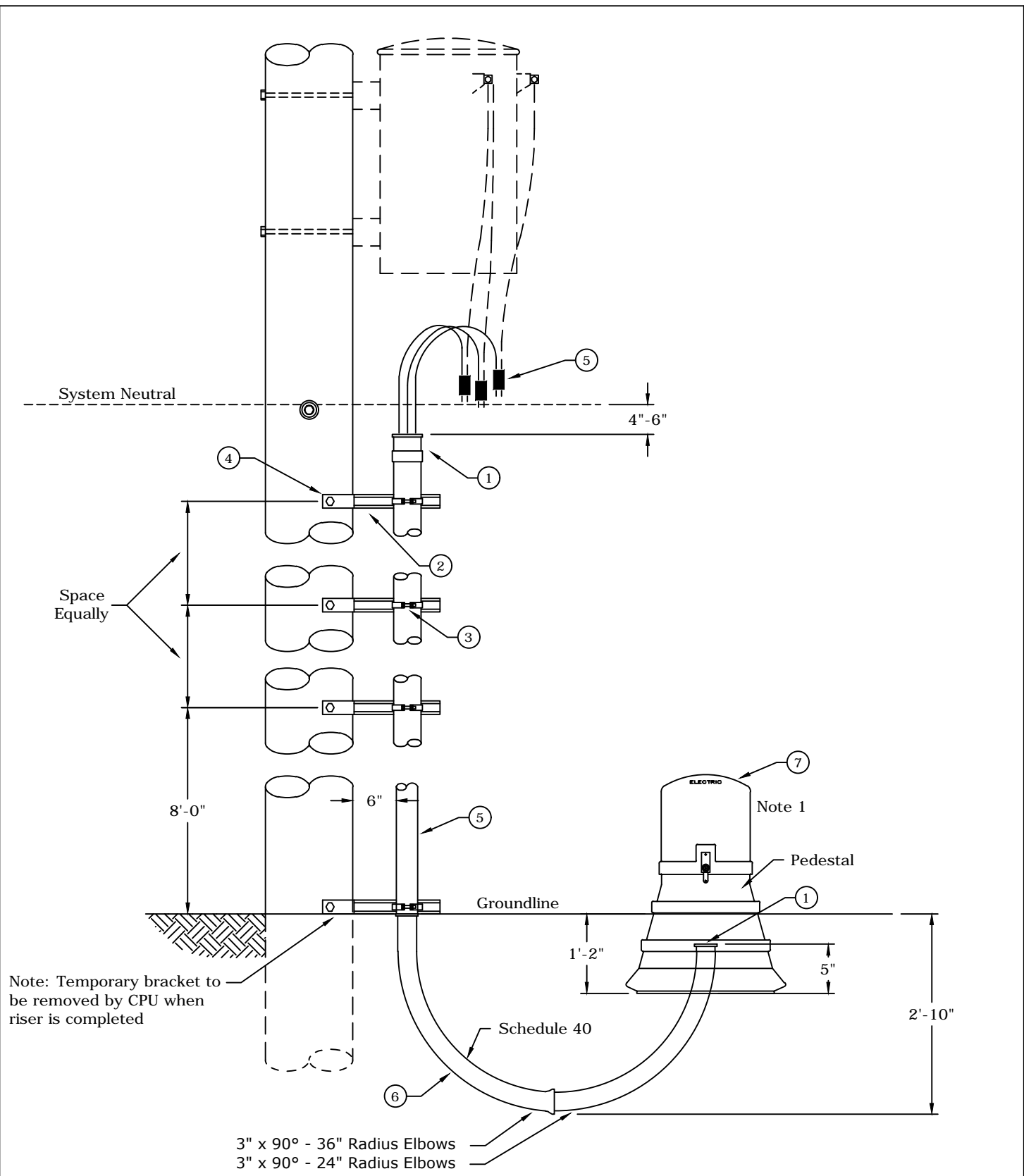
SECTION  
**1300**

Rev 2: Material corrections.

ITEM NO.	DESCRIPTION	U83	
		QTY.	S/N
1	End Bell, 3", Sch 40	1	2317
2	Bracket, Standoff Riser 10 1/2"	3	226
3	Clamp, Standoff Bracket, 3" Conduit	3	296
4	Screw, Lag 1/2" X 3", Fetter Drive, Drive Point	6	1131
5	Conduit, PVC, 3" x 10', Sch 80	30	2313
6	Elbow, PVC, 3", 90°, 24" Radius, Sch 40	1	2574

ITEM NO.	DESCRIPTION	U84	
		QTY.	S/N
1	End Bell, 4", Sch 40	1	2204
2	Bracket, Standoff Riser 10 1/2"	3	226
3	Clamp, Standoff Bracket, 4" Conduit	3	297
4	Screw, Lag 1/2" X 3", Fetter Drive, Drive Point	6	1131
5	Conduit, PVC, 4" x 10', Sch 80	30	2203
6	Elbow, PVC, 4", 90°, 24" Radius, Sch 40	1	1536

	<b>CONSTRUCTION STANDARDS</b> SECONDARY OVERHEAD TO UNDERGROUND RISER ASSEMBLY		<b>REVISIONS</b>			
		DATE	ENGR	OPS		
	1	5/30/07	LB	AH		
	2	6/8/18	KJP			
PAGE: 2 of 2	<b>U83,U84</b>		CAD FILE: U83	APP: KJP DATE: 12/29/04	SECTION <b>1300</b>	



**Note:** Direction of the pedestal will be determined by the CPU Engineer.

Rev 4: Material corrections.



**CONSTRUCTION STANDARDS**  
 SECONDARY OVERHEAD TO  
 UNDERGROUND RISER ASSEMBLY  
 W/ SECONDARY PEDESTAL

**U8P**




REVISIONS			
REV	DATE	ENGR	OPS
1	4/26/04	LB	AH
2	12/29/04	LB	AH
3	12/14/09	KJP	
4	10/6/14	KJP	

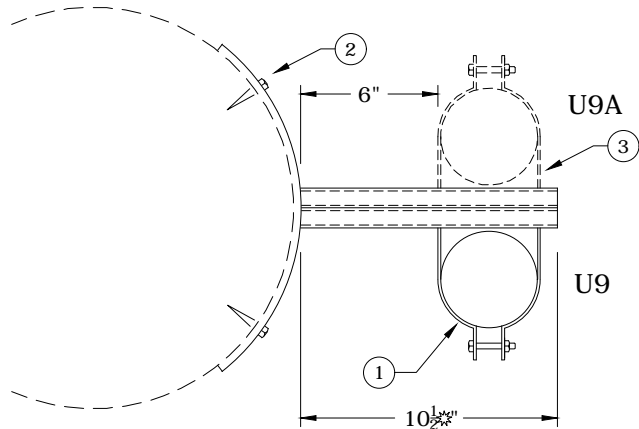
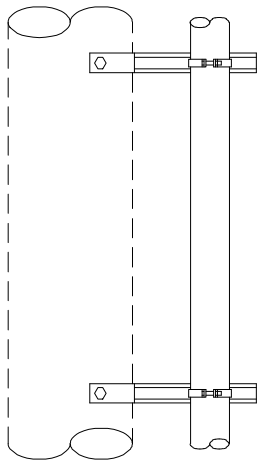
  

PAGE: 1 of 2	CAD FILE: U8P	APP: DATE: 1/80	SECTION <b>1300</b>
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Rev 4: Material corrections.

ITEM NO.	DESCRIPTION	U8P	
		QTY.	S/N
1	End Bell, 3", Sch. 40	2	2317
2	Bracket, Standoff Riser 10-1/2" U.G.	3	226
3	Clamp, Standoff Bracket, 3"	3	296
4	Screw, Lag 1/2" X 3"	6	1131
5	Connector	3	as req*
6	Conduit, PVC, Sch 80, 3" x 10'	30*	2313
7	Pedestal, Secondary, Aboveground W/ Connectors and Covers	1	2562
8	350MCM AL Triplex UG Secondary	40	362
9	Elbow, PVC, 3", 90°, 24" Radius, Sch. 40 Straight	1	2713
10	Elbow, PVC, 3", 90°, 36" Radius, Sch. 40	1	1534

	<b>CONSTRUCTION STANDARDS</b>			REVISIONS				
	SECONDARY OVERHEAD TO UNDERGROUND RISER ASSEMBLY W/ SECONDARY PEDESTAL				DATE	ENGR	OPS	
	1	4/26/04	LB	AH				
	2	12/29/04	LB	AH				
	3	12/14/09	KJP					
	10/6/14	KJP						
								
PAGE: 2 of 2	<b>U8P</b>		CAD FILE: U8P	APP:	SECTION			
				DATE: 1/80	<b>1300</b>			



Rev 3: Corrected drawing and material list to 10 1/2" standoff riser bracket.

ITEM NO.	DESCRIPTION	U9	
		QTY.	S/N
1	Clamp, Standoff Bracket 4"	2	297
2	Screw, Lag 1/2" x 4-1/2"	4	1132
3	Bracket, Standoff Riser 10-1/2" *	2	226
ITEM NO.	DESCRIPTION	U9A	
		QTY.	S/N
1	Clamp, Standoff Bracket 4"	2	297
ITEM NO.	DESCRIPTION	U9B	
		QTY.	S/N
1	Clamp, Standoff Bracket 2"	2	295
2	Screw, Lag 1/2" x 4-1/2"	4	1132
3	Bracket, Standoff Riser 10-1/2" *	2	226
ITEM NO.	DESCRIPTION	U9C	
		QTY.	S/N
1	Clamp, Standoff Bracket 2"	2	295



**CONSTRUCTION STANDARDS**  
RISER BRACKET ASSEMBLY

REVISIONS			
Δ	DATE	ENGR	OPS
1	2/23/00	HWH	MA
2	7/15/02	JEH	TR
3	12/14/09	KJP	

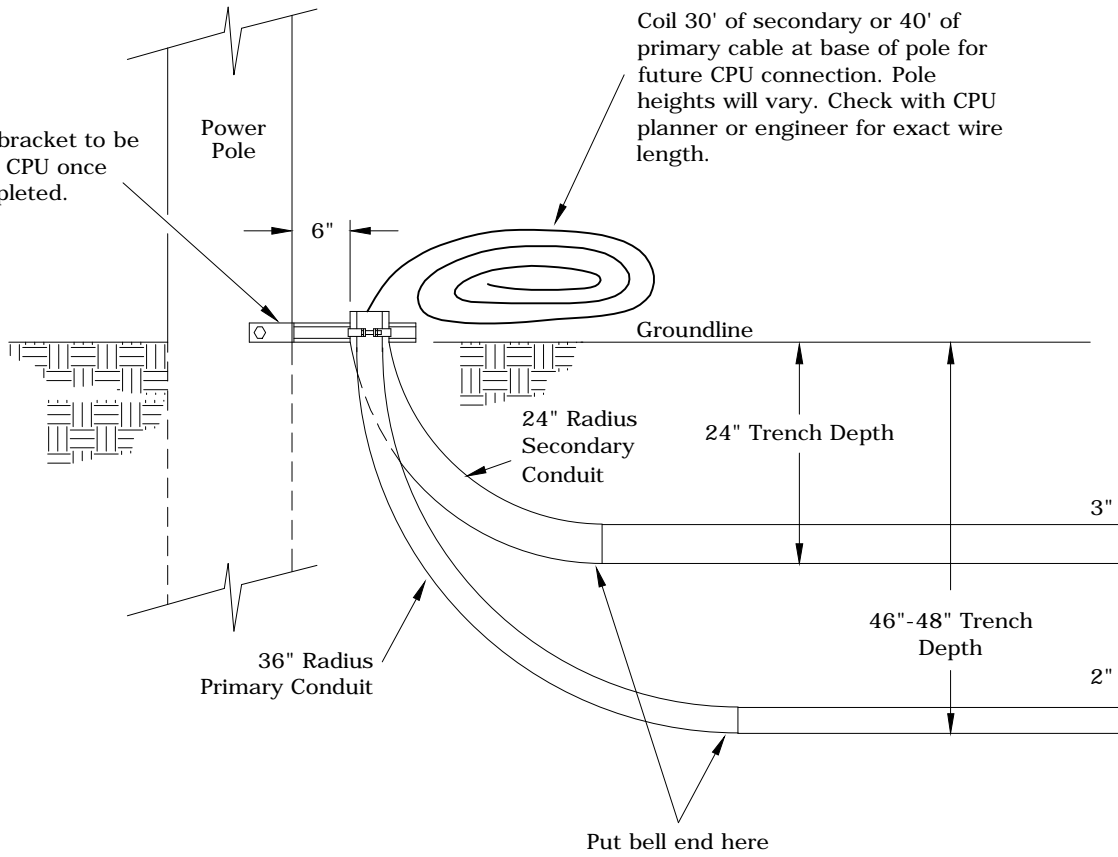
PAGE:  
1 of 1

**U9**

CAD FILE:  
U9

APP:	SECTION
DATE: 2/3/82	<b>1300</b>

Temporary bracket to be removed by CPU once riser is completed.



Coil 30' of secondary or 40' of primary cable at base of pole for future CPU connection. Pole heights will vary. Check with CPU planner or engineer for exact wire length.

Rev. 2 - Change title for clarity, corrected secondary trench, and corrected Note 2.



**CONSTRUCTION STANDARDS**  
 1Ø PRIMARY (U1) & SECONDARY (U8)  
 RISER GUIDELINES

REVISIONS			
NO.	DATE	ENGR	OPS
1	12/29/04	LB	AH
2	1/16/19	KJP	

PAGE:  
1 of 2

**U10**

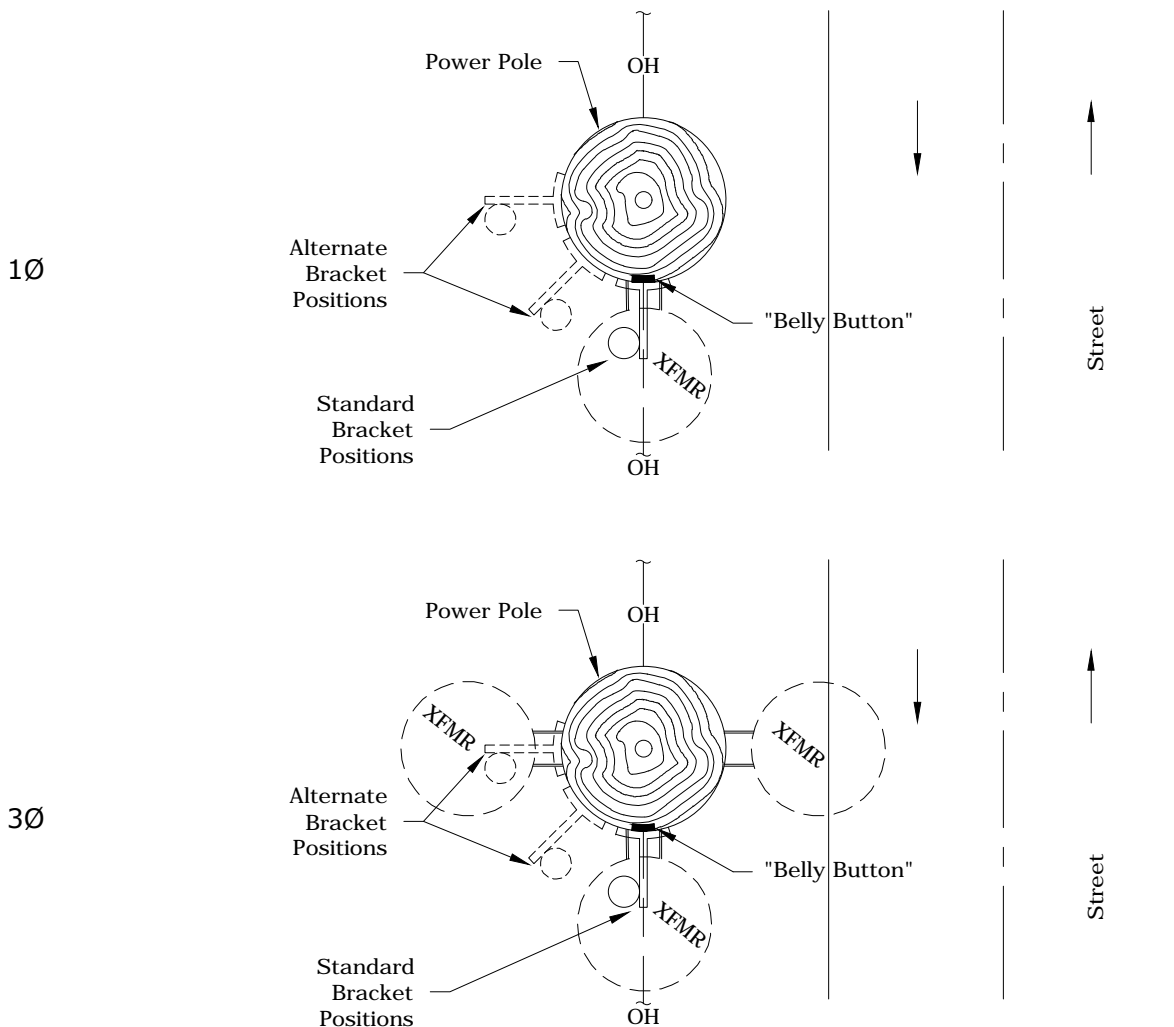
CAD FILE:  
U10

APP:  
DATE: 8/00

SECTION  
**1300**

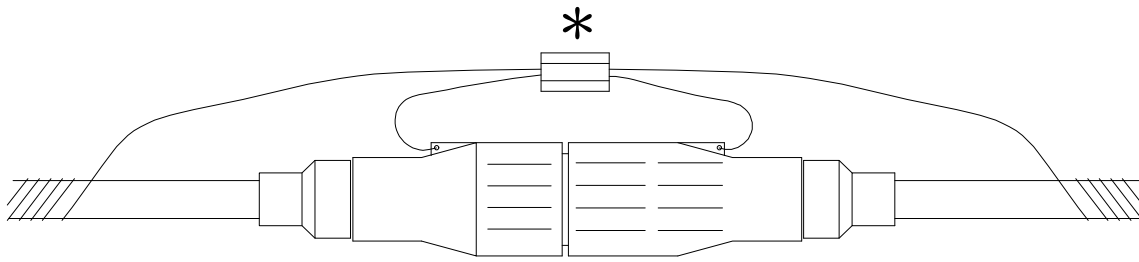
# STANDOFF BRACKET PLACEMENT

- 1) Basic Rule: On poles without anchors or existing clean poles, 1Ø primary and secondary riser brackets should be installed on the "belly button" side of the pole. Typically, a transformer would also be installed on the "belly button" side above the 1Ø primary or secondary riser.
- 2) On poles with an existing transformer or transformer bank, the bracket should be installed under the transformer or center transformer on a bank with the alternative position being 45°-90° away from street side. If the existing transformer is located on the opposite side of the "belly button," place the bracket under the transformer.
- 3) Standoffs are typically not installed under guy wires no matter where the "belly button" is located.
- 4) Standoffs and risers should be placed to avoid conflict with overhead communication wires and guy wires.
- 5) For poles with an existing riser, use the brackets that are installed to maintain climbing space.



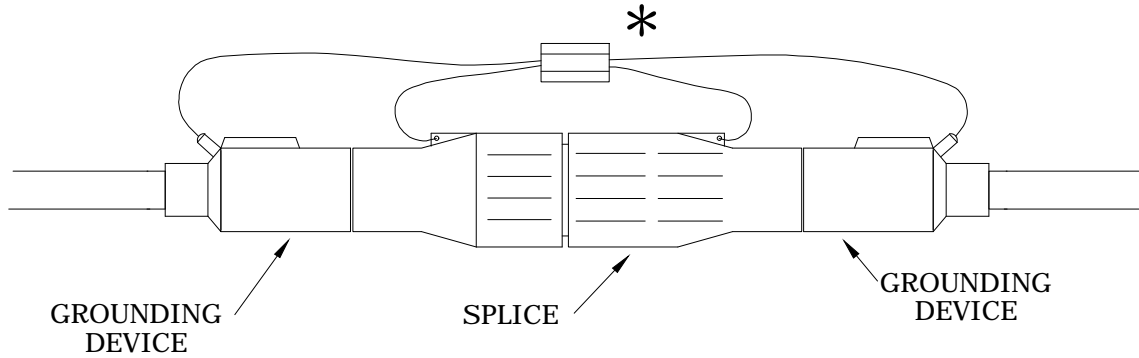
Rev. 2 - Change title for clarity, corrected secondary trench, and corrected Note 2.

	CONSTRUCTION STANDARDS		REVISIONS			
	1Ø PRIMARY (U1) & SECONDARY (U8) RISER GUIDELINES		DATE	ENGR	OPS	
	1	12/29/04	LB	AH		
	2	1/16/19	KJP			
PAGE: 2 of 2	U10		CAD FILE: U10	APP: DATE: 8/00	SECTION 1300	



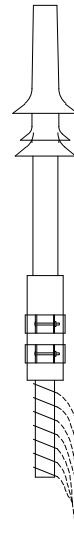
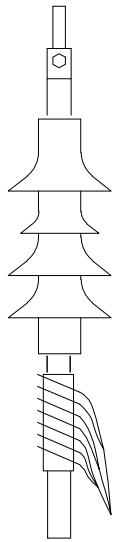
ITEM	MATERIAL DESCRIPTION	S/N
UB20	SPLICE, KIT S 15KV UG 2 AWG	1206

\* NOTE: CONST SPEC. NO. UB20 & UB21 INCLUDE CONNECTOR, CRIMPET YC4C4



ITEM	MATERIAL DESCRIPTION	S/N
UB22	SPLICE, KIT S 15KV UG 1000 MCM	1210
UB23	DEVICE, GROUNDING, 1000 MCM (FOR TAPE SHIELD ONLY)	608

\* NOTE: CONST SPEC. NO. UB22 & UB23 INCLUDE CONNECTOR, CRIMPET YC4C4



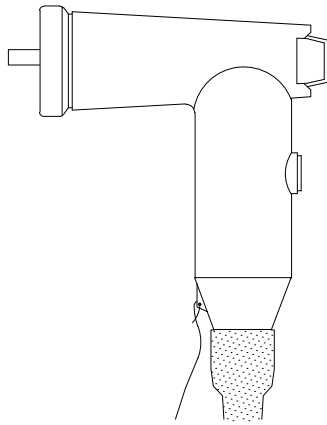
ITEM	MATERIAL DESCRIPTION	S/N	ITEM	MATERIAL DESCRIPTION	S/N
UB22	TERMINATOR, OUTDOOR MOLDED RUBBER, #2, 200A	1305	UB26	TERMINATOR, OUTDOOR BUTYL, 1000 MCM, 600A	2225
UB23	TERMINATOR, OUTDOOR MOLDED RUBBER, 1/0, 200A	2214			



**CONSTRUCTION STANDARDS**  
UNDERGROUND PRIMARY  
BASIC UNITS

REVISIONS			
REV	DATE	ENGR	OPS
0	6/14/02		
△ REDRAWN IN CAD			
APP:	ELM	SECTION	
DATE:	1/31/80	1300	

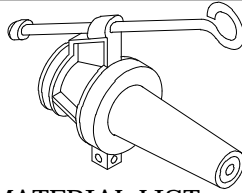




MATERIAL LIST

UCA1, UCA2

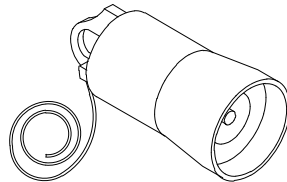
ITEM	QTY.	DESCRIPTION	SIN
UCA1	1	TERMINATOR, ELBOW L.B. 1/0 220MIL ONLY	2186
UCA2	1	TERMINATOR, ELBOW L.B. 1/0 OR 2AL EXCEPT 1/0 220MIL ONLY	1312



MATERIAL LIST

UCA3

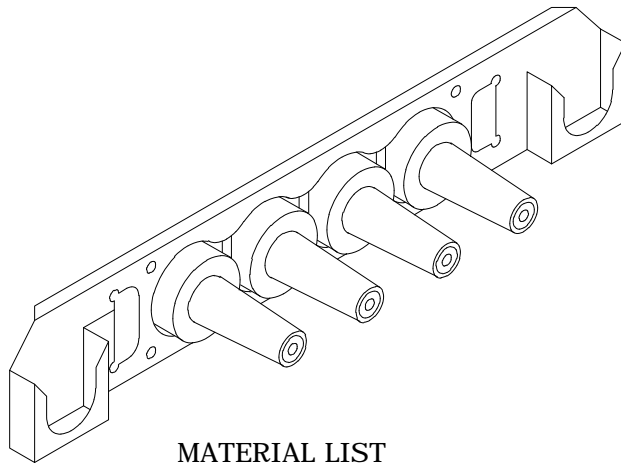
ITEM	QTY.	DESCRIPTION	SIN
UCA3	1	BUSHING, STANDOFF INSUL, 200A	252



MATERIAL LIST

UCA4

ITEM	QTY.	DESCRIPTION	SIN
UCA4	1	CAP, PROTECTIVE GRD. 200A	265



MATERIAL LIST

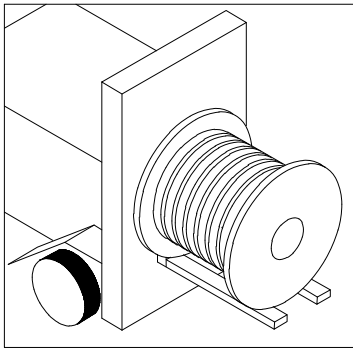
UCA5, UCA6

ITEM	QTY.	DESCRIPTION	SIN
UCA5	1	MODULE 4 POSITION W/ BRACKET	900
UCA6	1	MODULE 4 POSITION W/O BRACKET	901

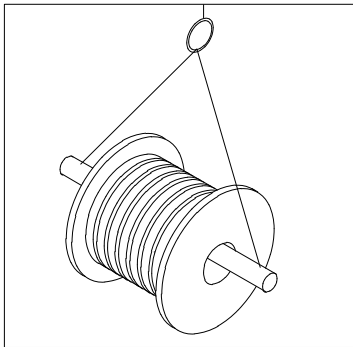


**CONSTRUCTION STANDARDS**  
 UNDERGROUND PRIMARY  
 CABLE ACCESSORIES  
 200A

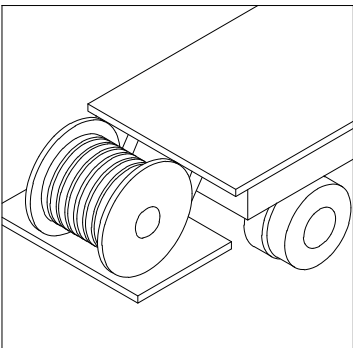
REVISIONS			
ΔR	DATE	ENGR	OPS
0	2/23/00	HWH	MA
Δ			
APP:			SECTION
DATE: 9/94			1300



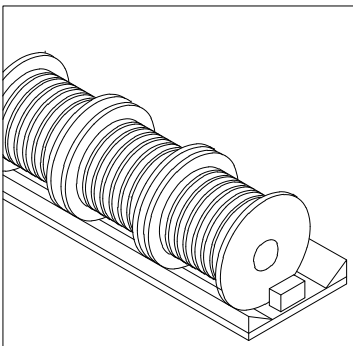
CRADLE BOTH REEL FLANGES BETWEEN FORKS.



REELS CAN BE HOISTED WITH A SHAFT EXTENDING THROUGH BOTH FLANGES.



LOWER REELS FROM TRUCK USING HYDRAULIC GATE, HOIST OR FORK LIFT. (LOWER CAREFULLY)

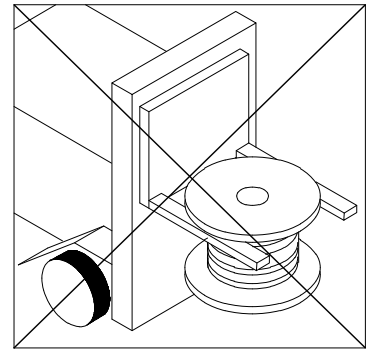


ALWAYS LOAD WITH FLANGES ON EDGE AND CHOCK AND BLOCK SECURELY.

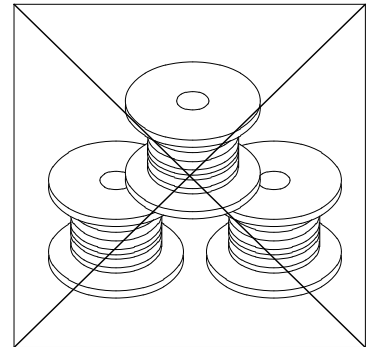
# HOW TO HANDLE CABLE REELS

← YES

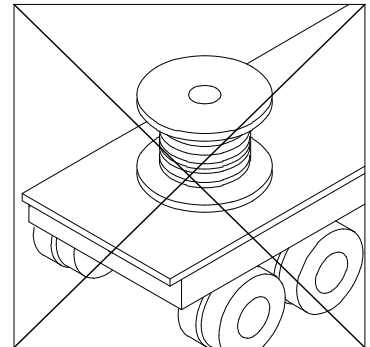
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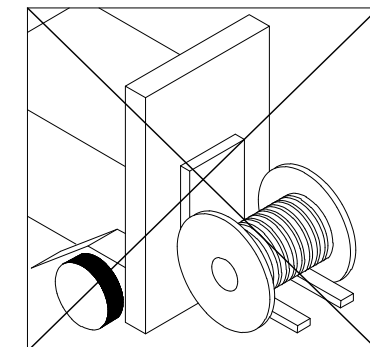
DO NOT LIFT BY TOP FLANGE. CABLE OR REEL WILL BE DAMAGED.



UPENDED HEAVY REELS WILL OFTEN ARRIVE DAMAGED. REFUSE OR RECEIVE SUBJECT TO INSPECTION FOR HIDDEN DAMAGE.



DO NOT UPEND REELS



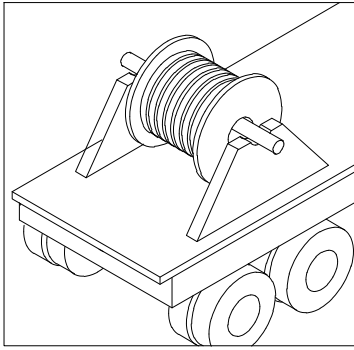
NEVER ALLOW FORKS TO TOUCH CABLE SURFACE OR REEL WRAP.



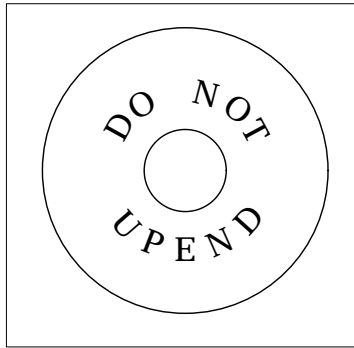
## CONSTRUCTION STANDARDS

### UNDERGROUND CABLE REEL HANDLING

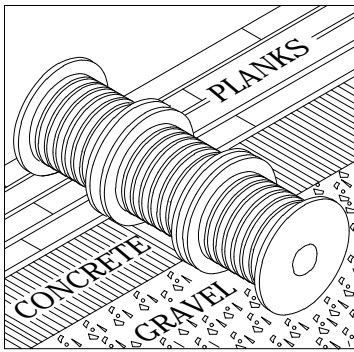
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APP:		SECTION	
DATE:	9/94	1300	



REELS GOING TO JOBS SHALL ALWAYS BE MOUNTED ON A HORIZONTAL AXLE.



THIS SIGN APPLIES FOR ANY REEL HANDLING. NOT JUST FACTORY DELIVERY.

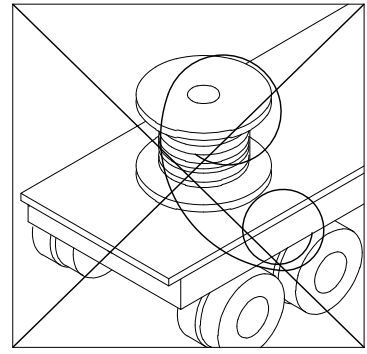


ALWAYS STORE REELS ON A HARD SURFACE.

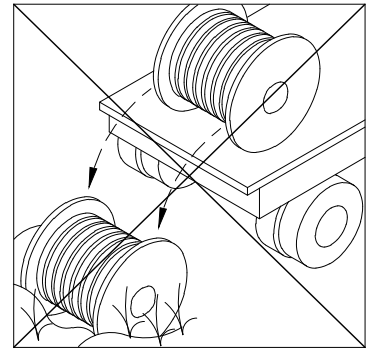
# HOW TO HANDLE CABLE REELS

← YES

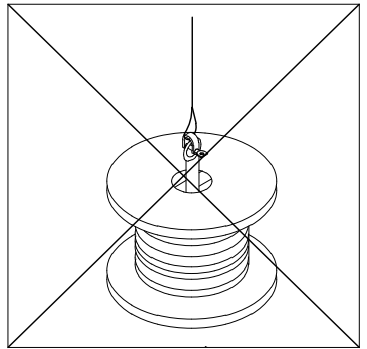
NO →



NEVER REMOVE CABLE FROM A REEL THIS WAY. IT WILL KINK.



NEVER DROP A CABLE REEL FROM ANY HEIGHT WITH EVEN A SMALL AMOUNT OF CABLE ON THE REEL.



NEVER USE A SWIVEL TO REMOVE CABLE FROM A REEL.



## CONSTRUCTION STANDARDS

UNDERGROUND CABLE  
REEL HANDLING

PAGE:  
2 of 2

### UCH-0

CAD FILE:  
UCH-0

REVISIONS			
Δ	DATE	ENGR	OPS
0	2/23/00	HWH	MA
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APP:	SECTION		1300
DATE:	9/94		

MOVEMENT, STORAGE, AND HANDLING OF CABLE

MOVEMENT OF REELS OF CABLE

1. REELS OF CABLE MUST NOT BE DROPPED FROM ANY HEIGHT, PARTICULARLY FROM TRUCKS OR OTHER TRANSPORTING EQUIPMENT.
2. LIFT REELS USING FOLLOWING METHODS:
  - A) CRANE OR BOOM TYPE EQUIPMENT--INSERT SHAFT (HEAVY ROD OR PIPE) THROUGH REEL HUBS AND LIFT WITH SLINGS ON SHAFT, PREFERABLY UTILIZING SPREADER OR YOKE TO REDUCE OR AVOID SLING PRESSURE AGAINST REEL HEAD.
  - B) FORK LIFT TYPE OF EQUIPMENT MAY BE USED TO MOVE SMALLER, NARROWER WIDTH REELS. FORK TINES SHALL BE PLACED SO THAT LIFT PRESSURE IS ON REEL HEADS, NOT ON CABLE, AND MUST REACH ALL THE WAY ACROSS REELS SO LIFT IS AGAINST BOTH REEL HEADS.
3. REELS MAY BE MOVED SHORT DISTANCES BY ROLLING. REELS SHOULD BE ROLLED IN THE DIRECTION INDICATED BY ARROWS PAINTED ON REEL HEADS. SURFACES OVER WHICH THE REELS ARE TO BE ROLLED SHALL BE FIRM, CLEAR OF DEBRIS, AND ALSO CLEAR OF PROTRUDING STONES, HUMPS, ETC. WHICH MIGHT DAMAGE THE CABLE IF THE REEL STRADDLED THEM.

STORAGE OF REELS OF CABLE

1. CABLE ENDS ARE SEALED PRIOR TO SHIPMENT, IF FACTORY SEALS ARE CUT OFF, NEW SEALS MUST BE APPLIED TO PREVENT MOISTURE ENTRY INTO CABLE.
2. WHENEVER POSSIBLE, THE FACTORY APPLIED PROTECTIVE COVER SHOULD BE LEFT IN PLACE UNTIL REMOVAL IS ABSOLUTELY NECESSARY. ADDITIONAL COVERING SUCH AS TARPAULIN, PLASTIC SHEETING, ETC., MAY BE USED IF CABLE IS TO BE STORED FOR LONG PERIODS OUTDOORS OR IN EXCESSIVELY DIRTY, DUSTY AREAS.
3. STORE REELS OF CABLE ON A FIRM SURFACE, PAVED IF POSSIBLE, OR ON PLANKING TO PREVENT SETTLING INTO SOFT GROUND.
4. THE STORAGE AREAS SHALL HAVE GOOD DRAINAGE.
5. USE FENCING OR OTHER BARRIERS TO PROTECT CABLES AND REELS AGAINST DAMAGE BY VEHICLES OR OTHER EQUIPMENT MOVING ABOUT IN THE STORAGE AREA.
6. NEVER STORE REELS ON END.

	<h2 style="margin: 0;">CONSTRUCTION STANDARDS</h2> <p style="margin: 0;">UNDERGROUND CABLE HANDLING &amp; STORAGE</p>		<b>REVISIONS</b>			
		DATE	ENGR	OPS		
0	2/23/00	HWH	MA			
						
PAGE:	<h1 style="margin: 0;">UCH-1</h1>		CAD FILE:			
1 of 2			UCH-1	APP:	SECTION	
				DATE: 9/94	1300	

HANDLING DURING INSTALLATION

1. COLD WEATHER HANDLING AND PULLING-IN CABLE CAN BE MORE DIFFICULT, DEPENDING ON THE CABLE CONSTRUCTION AND INSTALLATION LOCATION. COLD-INDUCED STIFFNESS OF CABLE MUST BE CONSIDERED ALONG WITH RADIUS AND NUMBER OF BENDS IN THE PROPOSED INSTALLATION RUN.

IN GENERAL MOST CABLES CAN BE SAFELY HANDLED WITHOUT DAMAGE IF NOT SUBJECTED TO TEMPERATURE LOWER THAN 10°F (-12°C) IN THE 24 HOUR PERIOD PRECEDING PULLING AND BENDING. IF IT IS ANTICIPATED THAT STORE TEMPERATURES WILL BE BELOW THIS LEVEL DURING THE 24 HOUR PRE-PULL PERIOD, ARRANGEMENTS SHOULD BE MADE TO MOVE THE REEL, AVOIDING IMPACT, TO A WARMER AREA. IF NO INDOOR WARMING AREA IS AVAILABLE, A PLASTIC SHEETING-COVERED SHELTER MAY BE CONSTRUCTED AND HEATED. THE REEL SHOULD BE HELD IN THE WARM STORAGE AREA AT A TEMPERATURE OF AT LEAST 60°F (16°C) FOR 24 HOURS TO ENSURE TOTAL WARMUP. APPLY PULLING EYES OR GRIPS WHILE CABLE IS IN THE WARMING AREA, PRIOR TO MOVEMENT OUTDOORS OR UNCOVERING.

2. FACTORY APPLIED SEALS ON CABLE ENDS MAY BE DISRUPTED DURING THE PULLING OPERATIONS AND, THEREFORE, SHOULD BE CHECKED AND REPLACED IF THE CABLES ARE NOT GOING TO BE SPLICED OR TERMINATED RIGHT AFTER PULL-IN. THIS IS ESPECIALLY IMPORTANT FOR UNDERGROUND RUNS WHERE CABLE ENDS MAY BE LEFT IN ENCLOSURES WHICH ARE SUBJECT TO FLOODING.
3. THE CABLES SHOULD BE LAID INTO THE TRENCH BEING CAREFUL NOT TO TWIST OR KINK THEM. CARE SHOULD BE TAKEN NOT TO ABRABE OR IMPACT THE CABLE SURFACE AS IT LEAVES THE PAY-OFF EQUIPMENT AND ENTERS THE TRENCH. OVER-BENDING THE CABLE TO A POINT LESS THAN THE RECOMMENDED MINIMUM BENDING RADIUS ALSO SHALL BE AVOIDED. CABLES CAN BECOME EASILY OVER-BENT AT GUIDE POINTS SUCH AS SMALL SHEAVES OR ROLLERS LOCATED ON THE CABLE LAYING EQUIPMENT.




AFTER LAYING THE CABLES INTO THE TRENCH, THEY SHOULD BE COVERED WITH A LAYER OF SELECTED BACKFILL TO A LEVEL OF APPROXIMATELY THREE TO FOUR INCHES ABOVE THE CABLES' SURFACES. "SELECTED BACKFILL" IS DEFINED AS EITHER THERMAL SAND OR SAND-CLAY-GRAVEL MIXTURE CONTAINING SOME SMALL STONES NO GREATER IN SIZE THAN ONE-QUARTER TO ONE-HALF INCH ACROSS AT THEIR LARGEST DIMENSION.

	<b>CONSTRUCTION STANDARDS</b> UNDERGROUND CABLE HANDLING & STORAGE		REVISIONS						
			0	2/23/00	HWH	MA			
PAGE: 2 of 2		<b>UCH-1</b>		CAD FILE: UCH-1		APP: DATE: 9/94		SECTION <b>1300</b>	

FOLLOWING ARE THE MINIMUM REQUIREMENTS FOR ANY CABLE PULL:

1. THE ENTIRE CONDUIT LENGTH INCLUDING BENDS AND RISERS SHALL BE CLEAN AND SMOOTH. THE TOTAL NUMBER OF ANGLES SHALL NOT EXCEED 270° \* WITHOUT PRIOR CPU ENGINEERING APPROVAL.
2. THE ENTIRE CONDUIT LENGTH INCLUDING BENDS AND RISERS SHALL BE SECURED IN THE FINAL LOCATION WITH ALL ACCESSORIES FIRMLY ATTACHED.
3. A PULLING TENSION CALCULATION SHALL BE COMPLETED TO ASSURE THAT MAXIMUM TENSION LIMITS WILL NOT BE EXCEEDED. SEE TABLE 1 FOR LIMITS.
4. SUFFICIENT APPROVED CABLE LUBRICANT SHALL BE USED AT THE START OF THE PULL.
5. THE CABLE SHALL NEVER BE BENT TO A RADIUS LESS THAN 12 TIMES THE CABLE DIAMETER. ALL SHEAVES SHALL HAVE A GROOVE DIAMETER OF NOT LESS THAN 24 TIMES THE CABLE DIAMETER.
6. NEVER ALLOW CABLE TENSION AT THE CABLE REELS. THE REELS SHALL BE TURNED BY HAND OR BY A POWER DEVICE SO THAT THE CABLE IS SLACK GOING INTO THE CONDUIT ENTRANCE.
7. LUBRICANT SHALL BE APPLIED TO THE CONDUIT BEFORE THE CABLE ENTERS THE CONDUIT. IT MAY BE POURED IN OR A PLASTIC BAG OF LUBRICANT MAY BE ATTACHED TO THE PULLING LINE AHEAD OF THE CABLE.
8. ALL CABLE ENDS SHALL BE SEALED TO PREVENT THE ENTRY OF MOISTURE OR DIRT.
9. FOR 1000 MCM CABLE, THE PULLING LINE SHALL BE 2500 LB, SEQUENTIALLY-NUMBERED, CONTINUOUS MULE TAPE.
10. CABLE ATTACHMENT MAY BE WITH KELLEMS (CABLE OR BASKET) \* GRIP OR CONDUCTOR (PULLING EYE) GRIP WHICHEVER THE PULLING TENSION CALCULATION DICTATES.
11. ALL CONDUIT ENTRANCES AND EXITS SHALL HAVE PROTECTIVE BUSHINGS IN PLACE THAT WILL ASSURE THAT CABLE DAMAGE DOES NOT OCCUR DURING THE PULL. AT RISER LOCATIONS, DO NOT GLUE PROTECTIVE BUSHING TO CONDUIT.
12. CABLE PULLING SPEED SHALL NOT EXCEED 50 FEET PER MINUTE.
13. ALL CABLE ENDS SHALL BE EITHER TERMINATED OR SEALED IMMEDIATELY AFTER THE PULL. NO CABLE ENDS SHALL BE LEFT EXPOSED OVER NIGHT OR DURING INCLEMENT WEATHER.

REV 1 - CORRECTIONS MARKED WITH A \*

	<h2 style="margin: 0;">CONSTRUCTION STANDARDS</h2> <p style="margin: 0;">UNDERGROUND CABLE PULLING REQUIREMENTS</p>			<b>REVISIONS</b>			
		DATE	ENGR	OPS			
	0	2/23/00	HWH	MA			
	1	12/29/04	LB	AH			
							
PAGE: 1 of 2	<h1 style="margin: 0;">UCP1</h1>		CAD FILE: UCP-1	APP: DATE: 9/94	SECTION <b>1300</b>		

14. IT SHALL BE THE RESPONSIBILITY OF THE DESIGNER TO AVOID UNFAVORABLE SIDEWALL PRESSURES. THE SIDEWALL PRESSURES SHALL BE CALCULATED USING THE FOLLOWING EQUATIONS:

(A.) THE SIDEWALL PRESSURE (P) IN GENERAL IS DEFINED AS THE TENSION OUT OF A BEND EXPRESSED IN POUNDS DIVIDED BY THE INSIDE RADIUS OF THE BEND EXPRESSED IN FEET. EQUATIONS 1A AND 1B ARE FOR THE "WORST CASE" CABLE.

EQ 1:  $P = \frac{T_o}{r}$  (ONE SINGLE CABLE)

1A:  $P = \frac{(3c - 2)}{3} \frac{T_o}{r}$  (TWO OR THREE SINGLE CABLES - CRADLE CONFIGURATION) WHERE  $c = 1 + \frac{4}{3} \left( \frac{d}{D - d} \right)^2$

1B:  $P = \frac{c T_o}{2r}$  (TRIANGULAR CONFIGURATION) WHERE  $c = \sqrt{1 - \left( \frac{d}{D - d} \right)^2}$

P = SIDEWALL PRESSURE, LBS PER FOOT OF RADIUS  
 T<sub>o</sub> = TENSION (LEAVING THE BEND), POUNDS  
 c = WEIGHT CORRECTION FACTOR (EQ. 7 AND 8)  
 r = INSIDE RADIUS OF CONDUIT IN FEET  
 d = CABLE O.D. IN INCHES  
 D = CONDUIT I.D. IN INCHES

THE MAXIMUM SIDEWALL PRESSURE SHALL NOT EXCEED 500 LB/FT FOR 1 CABLE OR 1000 LB/FT FOR 2 OR 3 CABLES.

TABLE 1  
 CABLE PULLING LINE TENSION LIMITS

CABLE	KELLEMS (BASKET) GRIP TENSION (POUNDS)	CONDUCTOR (PULLING EYE) GRIP TENSION (POUNDS)
1 - 1/0 PRIMARY	845 *	845
2 - 1/0 PRIMARY	845 *	845 *
3 - 1/0 PRIMARY	1690 *	1690
1 - 1000 MCM PRIMARY	1000	5000 *
2 - 1000 MCM PRIMARY	1000 *	5000 *
3 - 1000 MCM PRIMARY	2000	5000 *
4/0 - 4/0 - 2/0 SEC.	3000 *	4450
350 - 350 - 4/0 SEC.	3000 *	5000 *

KELLEMS GRIP IS OVER THE CABLE JACKET. ALSO CALLED "CABLE GRIP" OR "BASKET GRIP." \*

NOTE: 5000 LB LIMIT DUE TO EQUIPMENT LIMITS.

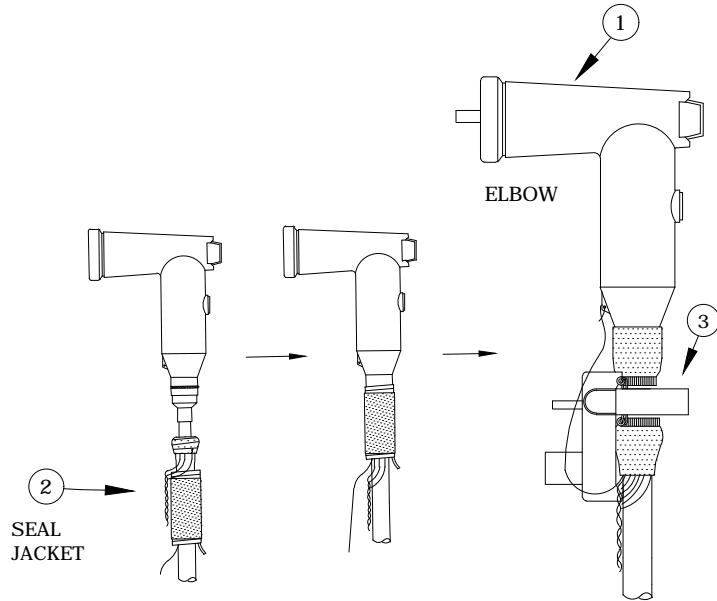
REV 1: CORRECTIONS MARKED WITH A \*



CONSTRUCTION STANDARDS  
 UNDERGROUND CABLE  
 PULLING REQUIREMENTS

REVISIONS			
NO.	DATE	ENGR	OPS
0	2/23/00	HWH	MA
1	12/29/04	LB	AH

TYPICAL ASSEMBLY



FOR REFERENCE ONLY  
 OLD INSTALLATIONS WITHOUT VOLTAGE-TEST POINT  
 NEW INSTALLATIONS HAVE VOLTAGE-TEST POINT

- NOTES:**
1. INDIVIDUALLY PACKAGED INSTRUCTIONS COME WITH EACH OF THE THREE MOULDED RUBBER COMPONENTS.
  2. THE FAULT INDICATOR SHALL BE INSTALLED AS SHOWN. NEUTRAL WIRES MUST BE TRAINED AS SHOWN SO THAT THE FAULT INDICATOR WILL FIT.

Rev 3: Added Current-Reset fault indicator to title and made "Reference Only."

ITEM NO.	DESCRIPTION	UEP2	
		QTY.	S/N
1	Elbow, Loadbreak, 1/0, 200A, 175 MIL	1	1312
2	Kit, Cable Sealing, 15KV, 200A	1	2391
3	Fault Indicator, Current-reset, 400A, 1Ø UG	1	2581

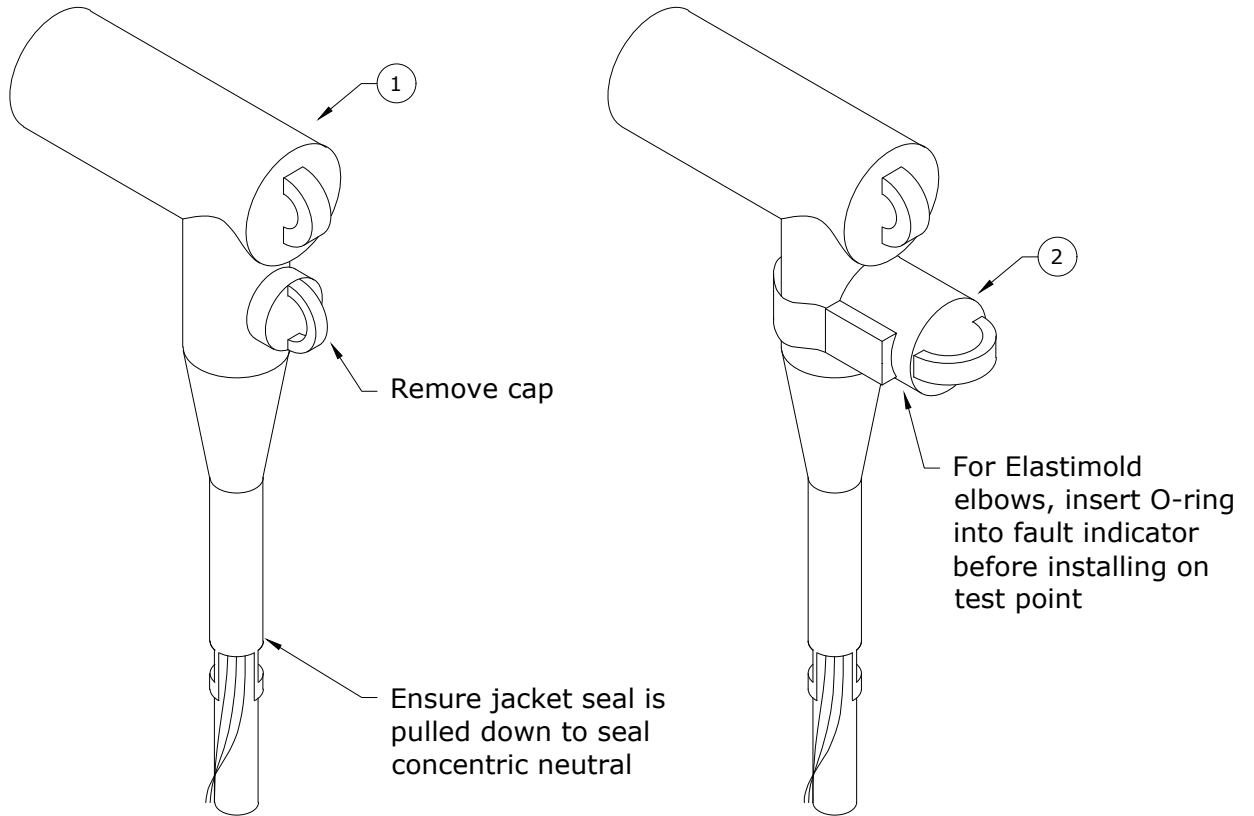


**CONSTRUCTION STANDARDS**  
 PRIMARY ELBOW ASSEMBLY  
 200A WITH  
 CURRENT-RESET FAULT INDICATOR

REVISIONS			
REV	DATE	ENGR	OPS
0	2/23/00	HWH	MA
1	9/23/04	LB	AH
2	8/2/05	LB	AH
3	4/29/09	CM	AH

PAGE: 1 of 1	<b>UEP2</b>	CAD FILE: UEP2	APP: DATE: 9/94	SECTION <b>1300</b>
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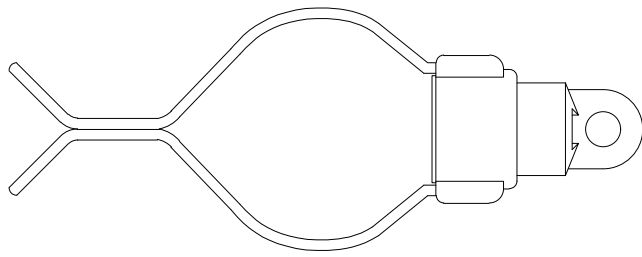


Note: Follow manufacturer's cutbacks and use template provided. Do NOT use a metal tape measure.

Rev. 1 - Changed to elbow with integrated jacket seal.

ITEM NO.	DESCRIPTION	UEP3	
		QTY.	S/N
1	Elbow, 200A, LB, 1/0, 175 & 220 mil, Test Point, 15 kV, Integrated Jacket Seal	1	1312
2	Fault Indicator, Voltage-reset, 400A Trip, 1Ø UG	1	2694

	<b>CONSTRUCTION STANDARDS</b> PRIMARY ELBOW ASSEMBLY 200A WITH VOLTAGE-RESET FAULT INDICATOR		<b>REVISIONS</b>															
			<table border="1"> <thead> <tr> <th>DATE</th> <th>ENGR</th> <th>OPS</th> </tr> </thead> <tbody> <tr> <td>11/19/20</td> <td>CM</td> <td>GM</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	DATE	ENGR	OPS	11/19/20	CM	GM									
	DATE	ENGR	OPS															
11/19/20	CM	GM																
PAGE: 1 of 1	<b>UEP3</b>	CAD FILE: UEP3	APP: CM/AH DATE: 4/29/09	SECTION <b>1300</b>														



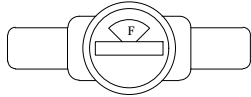
S/N# 2694 - VOLTAGE-RESET FLAG INDICATION

USE: 1Ø AND 3Ø PADMOUNT TRANSFORMERS AND J-BOXES (1/0 CABLE)

TRIP CURRENT: 400A

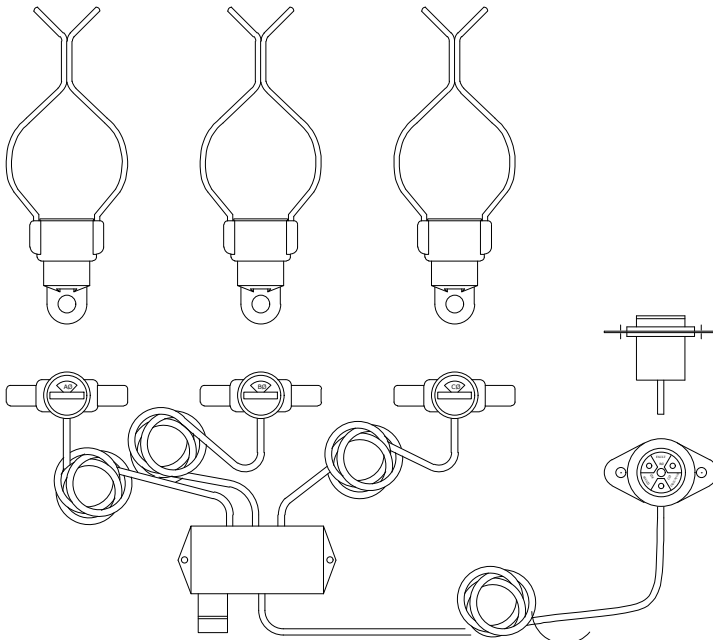
RESET VOLTAGE AND TIME: 5KV (UP TO 4 MIN.)

SEE: UT21-UT22, UT24-UT28, UT30-UT32, UJ1, UJ3, AND UJM



Note: Elastimold elbows (used for Cable Cure) need the ring adapter provided with the fault indicator.

ITEM NO.	DESCRIPTION	UFIV400	
		QTY.	S/N
1	VOLTAGE-RESET FAULT INDICATOR, 400A TRIP, 1Ø UG	1	2694



S/N# 2695 - VOLTAGE-RESET FLAG AND BLINKING LIGHT INDICATION

USE: SWITCHGEAR (1000 MCM CABLE)

TRIP CURRENT: 800A

RESET VOLTAGE AND TIME: 5KV (UP TO 4 MIN.) REPLACEABLE BATTERY FOR FLASHING LIGHT

SEE: USG1

Note: Elastimold elbows (used for Cable Cure) need the ring adapter provided with the fault indicator.

ITEM NO.	DESCRIPTION	UFIV800	
		QTY.	S/N
1	VOLTAGE-RESET FAULT INDICATOR, 800A TRIP, 3Ø UG SWG	1	2695

REV 3 - ADDED VOLTAGE-RESET FAULT INDICATORS AND CHANGED FROM "UFI1" TO "UFI"



**CONSTRUCTION STANDARDS**  
UNDERGROUND  
FAULT INDICATORS

REVISIONS			
NO.	DATE	ENGR	OPS
1	2/23/00	HWH	MA
2	9/23/04	LB	AH
3	4/29/09	CM	AH

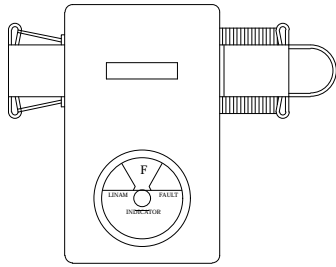
PAGE:  
1 of 2

**UFI**

CAD FILE:  
UFI

APP:  
DATE: 10/94

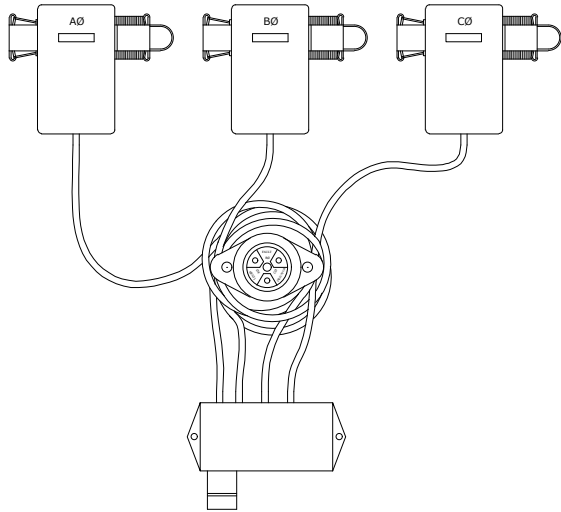
SECTION  
**1300**



S/N# 2581 - CURRENT RESET-FLAG INDICATION  
 USE: 1Ø AND 3Ø PADMOUNT  
 TRANSFORMERS AND J-BOXES (1/0  
 CABLE)  
 TRIP CURRENT: 400A  
 RESET CURRENT AND TIME: 1.5A (40  
 SEC)  
 SEE: UT21-UT22, UT24-UT28,  
 UT30-UT32, UJ1, UJ3, AND UJM

NOTE: ONLY USE ON ELBOWS WITHOUT A VOLTAGE TEST POINT

ITEM NO.	DESCRIPTION	UFIA400	
		QTY.	S/N
1	INDICATOR, FAULT, CURRENT-RESET, 400A, 1Ø UG	1	2581



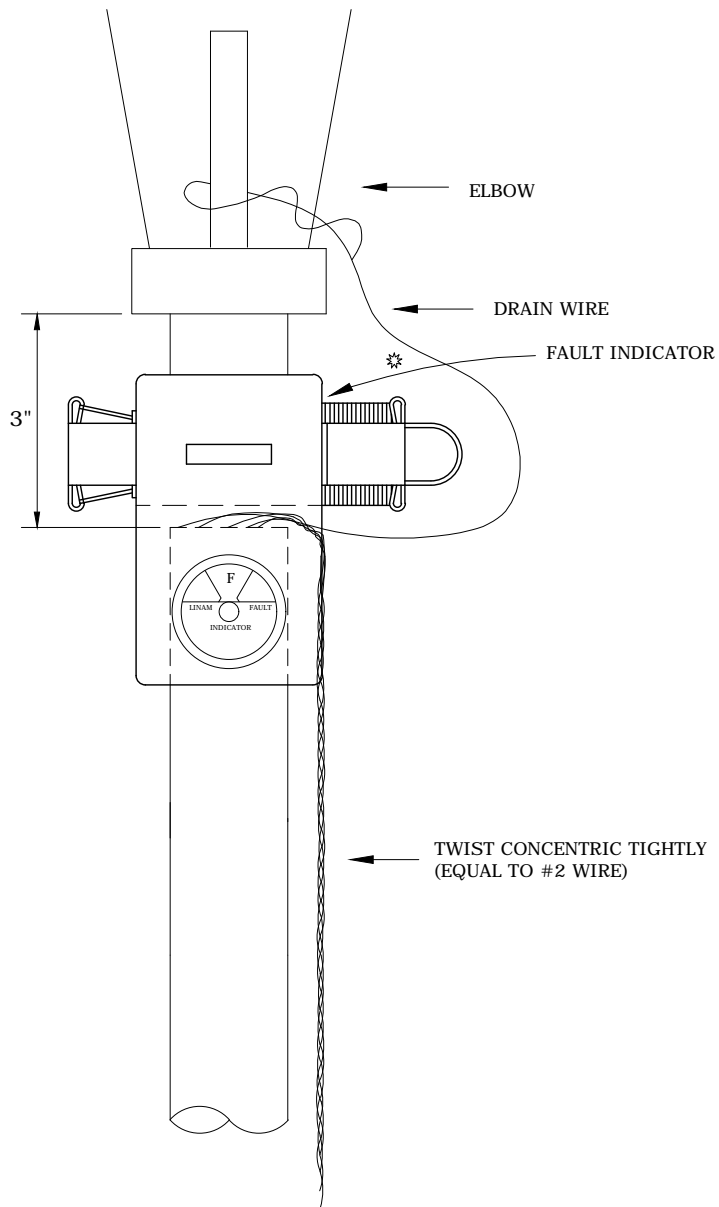
S/N# 2463 - CURRENT RESET-FLAG  
 AND FLASHING LIGHT INDICATION  
 USE: SWITCHGEAR (1000 MCM CABLE)  
 TRIP CURRENT: 800A  
 RESET CURRENT AND TIME: 3A (25 SEC)  
 REPLACEABLE BATTERY FOR FLASHING LIGHT  
 SEE: USG1

NOTE: ONLY USE ON ELBOWS WITHOUT A VOLTAGE TEST POINT

ITEM NO.	DESCRIPTION	UFIA800	
		QTY.	S/N
1	INDICATOR, FAULT, CURRENT-RESET, 800A, 3Ø	1	2463

REV 3 - ADDED VOLTAGE-RESET FAULT INDICATORS AND CHANGED FROM "UFI1" TO "UFI"

	<b>CONSTRUCTION STANDARDS</b> UNDERGROUND FAULT INDICATORS		<b>REVISIONS</b>																			
			<table border="1"> <thead> <tr> <th>REV</th> <th>DATE</th> <th>ENGR</th> <th>OPS</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>2/23/00</td> <td>HWH</td> <td>MA</td> </tr> <tr> <td>2</td> <td>9/23/04</td> <td>LB</td> <td>AH</td> </tr> <tr> <td>3</td> <td>4/29/09</td> <td>CM</td> <td>AH</td> </tr> </tbody> </table>	REV	DATE	ENGR	OPS	1	2/23/00	HWH	MA	2	9/23/04	LB	AH	3	4/29/09	CM	AH			
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2	9/23/04	LB	AH																			
3	4/29/09	CM	AH																			
PAGE: 2 of 2	<b>UFI</b>	CAD FILE: UFI	APP: DATE: 10/94	SECTION <b>1300</b>																		



**JACKETED  
CABLES**

**NOTES**

1. GRAY CLAMP OF FAULT INDICATOR MUST BE ABOVE CONCENTRIC NEUTRAL. IF NOT, INDICATOR WILL NOT WORK.
2. NEUTRALS MUST BE FORMED AS SHOWN SO THAT INDICATOR WILL FIT.

REV 1 - REFLECT JACKETED CABLE - REVISIONS ARE MARKED WITH STAR  
 REV 2 - CHANGED TO CURRENT-RESET FAULT INDICATOR



**CONSTRUCTION STANDARDS**  
 UNDERGROUND CABLE CURRENT-RESET  
 FAULT INDICATOR INSTALLATION

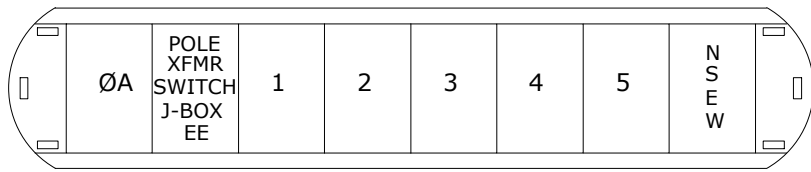
PAGE:  
1 of 1

**UFI2**

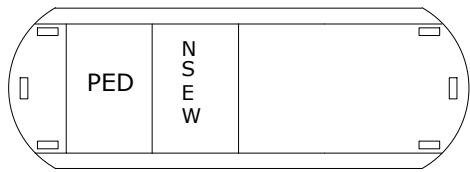
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2	9/23/04	LB	AH
△ REVISIONS MARKED WITH STAR			
APP:			SECTION
DATE: 10/94			<b>1300</b>

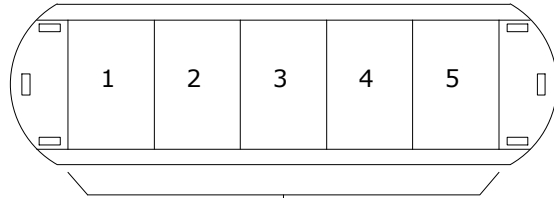
**Primary**



**Secondary**

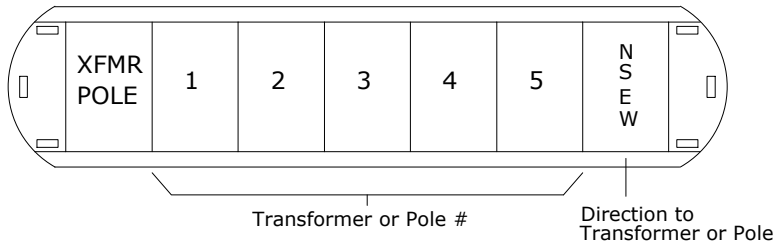


In transformer to secondary pedestal.



House #

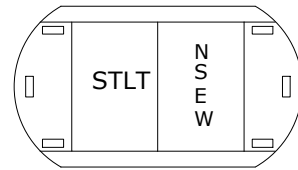
In secondary pedestal to house.



Transformer or Pole #

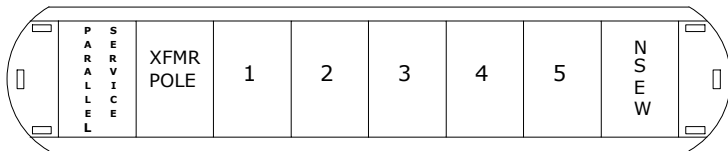
Direction to Transformer or Pole

In secondary pedestal from transformer or pole.

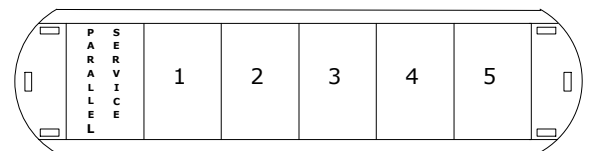


In transformer or pedestal to streetlight.

**Parallel Secondary**



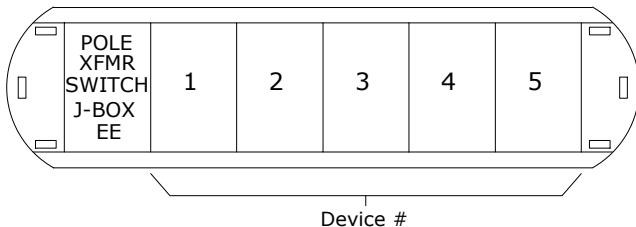
In secondary pedestal from transformer or pole.



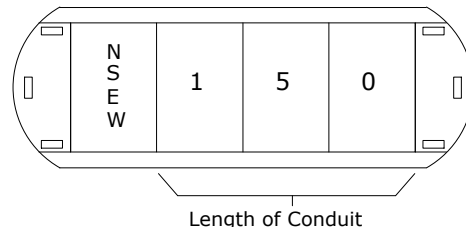
In secondary pedestal to house.

**Note:** Zip tie ONE tag around each set of parallel cables.

**Future Conduits (Normally Will Require Two Tag Holders)**



Device #



Length of Conduit

- Notes:**
1. These tags are for URD primary and secondary cables. Tag all cables.
  2. Parallel cables shall have one tag zip tied around both cables.

Rev 4: Added tagging for parallel conductors.



**CONSTRUCTION STANDARDS**  
UNDERGROUND CONDUCTOR IDENTIFICATION TAGS

REVISIONS			
Δ	DATE	ENGR	OPS
1	2/23/00	HWH	MA
2	9/23/04	LB	AH
3	1/16/19	KJP	
4	12/9/22	CRM	GM

# 1400

## UNDERGROUND TRANSFORMERS

5/13/2024

~	F1A	Fuse Schedule – Padmount Transformers
~	HB16,HB32	Hillside Barrier
~	UID1	Padmounted Equipment Identification Tags & Safety Signs
~	UT2	1Ø Padmount Transformer Radial Feed
~	UT4	Open Y - Open Δ Padmount Transformer Installation
<b>C</b>	UT21,UT22	1Ø Padmount Transformer Assemblies, Loop Feed
~	UT24-UT28	1Ø Pad Xfmr Assembly, Radial or Loop w/ Feed-Thru Bushing
~	UT30-UT32	3Ø Padmount Transformer Assemblies
~	UTB	1Ø Padmount Transformer Boypad (Basement)
~	UTP1	1Ø Transformer Pad – 25 to 75kVA
~	UTP2	1Ø Transformer Pad – 100kVA
~	UTP3	1Ø Transformer Pad Orientation & Conduit Installation
~	UTP4	3Ø Transformer Pad – 75 to 1500kVA
~	UTP5	Precast Pad & Vault for 3Ø Transformers
<b>C</b>	UTP6	3Ø Transformer Pad Orientation & Conduit Installation
~	UTP9	Typical Barrier Installation to Protect Padmounted Equipment

<b>N</b>	New Standard
<b>R</b>	Redrawn Standard
<b>C</b>	Changed Standard
~	No Change

### 1Ø Padmounted Transformers

kVA	Transformer Stock Number		Transformer Primary Protection			Minimum Upstream OH Fuse Size* <sup>2</sup>	
	BM 240/120	BR 480/120	Bayonet Fuse No	S/N	Isolation Link* <sup>7</sup>	Size	S/N
25* <sup>1</sup>	1317		4000358C05 (8 A)	653	3001861A02	25 A	683
50	1318	2016	4000358C08 (15 A)	654	3001861A03	30 A	684
75	1320		4000358C10 (25 A)	655	3001861A05	65 A	687
100	1322		4000358C10 (25 A)	655	3001861A05	65 A	687

### 3Ø Padmounted Transformers


kVA	Transformer Stock Number		Transformer Primary Protection			Minimum Upstream OH Fuse * <sup>2</sup>	
	BL 208/120	BW 480/277	Bayonet Fuse No	S/N	Isolation Link* <sup>7</sup>	Size	S/N
75	1328	1337	4000358C05 (8 A)	653	3001861A02	25 A	683
150	1329	1338	4000358C08 (15 A)	654	3001861A03	30 A	684
300	1331	1340	4000358C10 (25 A)	655	3001861A05	50 A	686
500	1332	1341	4000358C12 (50 A)	656	3001861A06	100 A	689
750	1333	1342	4000358C12 (50 A)	656	3001861A06	100 A	689
1000	1334	1343	4000358C14 (65 A)* <sup>3</sup>	657	3001861A07	100 A* <sup>4</sup>	689
1500		1344	4000353C17 (140 A)	658	3001861A05	100 A* <sup>4</sup> * <sup>5</sup>	689
					ELSP Fuse* <sup>6</sup>		
2000* <sup>*</sup>		2164	4038361C05C (125 A)	2976	CBUC08250D100* <sup>*</sup>	See Systems Engineering	
2500* <sup>*</sup>		1345	4038361C05C (125 A)	2976	CBUC08250D100* <sup>*</sup>		

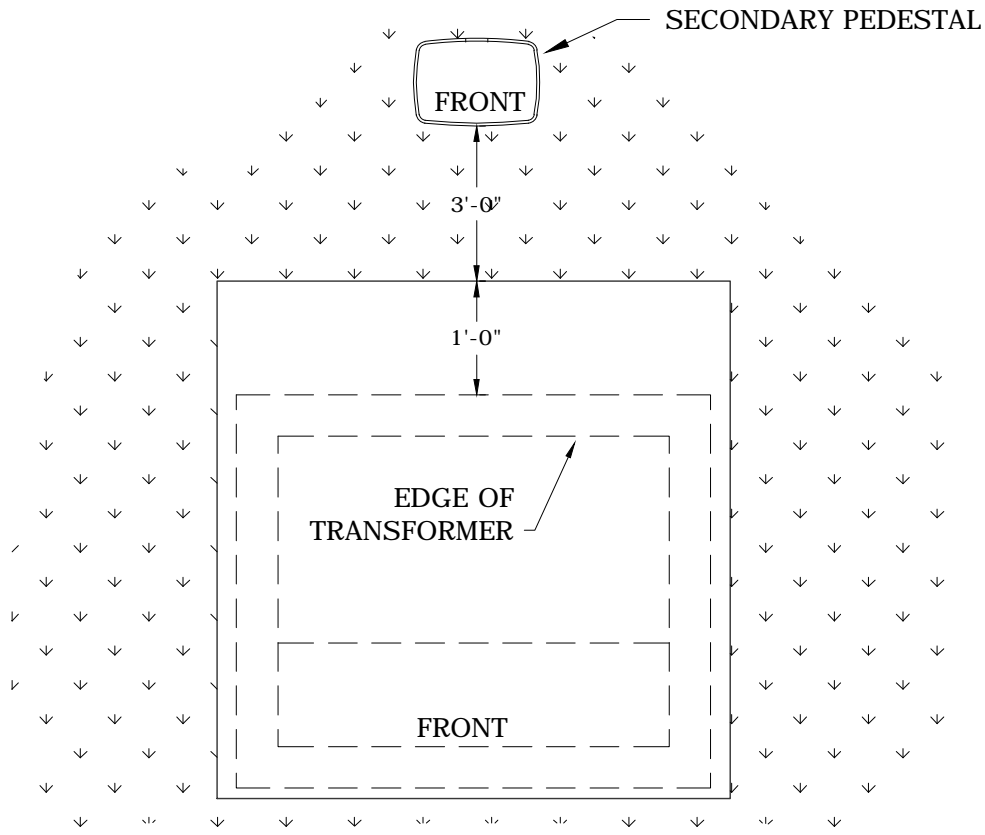
Spare fuses are kept in each transformer. It is the responsibility of the person using the spare fuse to replace it. Fuses are in free issue.

**Notes:**

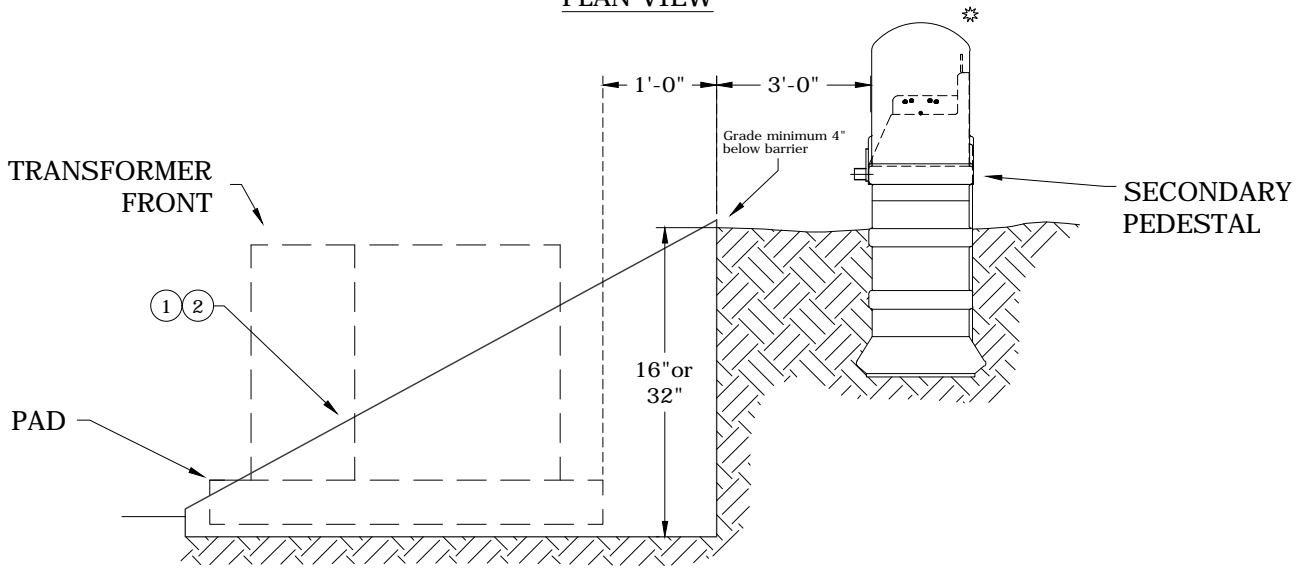
- \*1 Fuses for 25 kVA livefront transformers are stocked for maintenance only (RTE 476B1, S/N 1664).
- \*2 Use largest fuse size for applications while considering up/downstream fuses, conductor, and loading. Check with Systems Engineering as needed.
- \*3 Recommended fuse will result in some loss of overload capability.
- \*4 Transformer and upstream protection may miscoordinate, therefore each transformer should ideally be on separate feeders/protection.
- \*5 Fuse will limit overload capability of transformer.
- \*6 The use of these fuses will provide 175% of rated load for 2 hours and 150% of rated load for 7 hours.
- \*7 Equivalent Howard isolation link may be substituted for Eaton isolation link. See transformer specifications for P/N.

Rev. 4 - Added note 7 to allow Howard isolation links.

	CONSTRUCTION STANDARDS		REVISIONS																							
	FUSE SCHEDULE PADMOUNT TRANSFORMERS		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">#</th> <th style="width: 20%;">DATE</th> <th style="width: 20%;">ENGR</th> <th style="width: 20%;">OPS</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>3/02</td> <td>DRAWN</td> <td>IN CAD</td> </tr> <tr> <td>2</td> <td>2/11/10</td> <td>KJP</td> <td></td> </tr> <tr> <td>3</td> <td>7/10/20</td> <td>KJP</td> <td></td> </tr> <tr> <td>4</td> <td>11/30/21</td> <td>JDK</td> <td></td> </tr> </tbody> </table>	#	DATE	ENGR	OPS	1	3/02	DRAWN	IN CAD	2	2/11/10	KJP		3	7/10/20	KJP		4	11/30/21	JDK				
	#	DATE	ENGR	OPS																						
1	3/02	DRAWN	IN CAD																							
2	2/11/10	KJP																								
3	7/10/20	KJP																								
4	11/30/21	JDK																								
PAGE: 1 of 1	F1A	CAD FILE: F1A	APP: ELM DATE: 1/31/80	SECTION 1400																						



PLAN VIEW



SIDE VIEW

REV 2: Corrected Measurement Behind Pad, and changed title from HB1 to HB16,HB32.

ITEM NO.	DESCRIPTION	HB16		HB32	
		QTY.	S/N	QTY.	S/N
1	BARRIER, 16" Height	1	2460		
2	BARRIER, 32" Height			1	2461

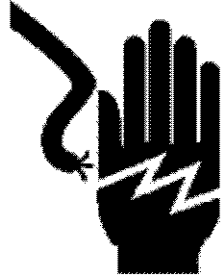


**CONSTRUCTION STANDARDS**  
HILLSIDE BARRIER

REVISIONS			
NO.	DATE	ENGR	OPS
1	4/26/04	LB	AH
2	5/30/07	LB	AH

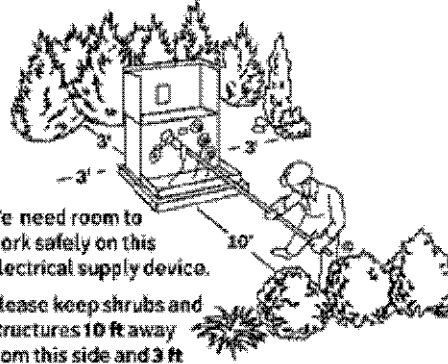


# ⚠ WARNING



**Hazardous voltage inside.**  
**Will shock, burn, or cause death.**  
**If unlocked or open immediately call Clark Public Utilities 360-992-3000.**

# NOTICE



We need room to work safely on this electrical supply device.  
 Please keep shrubs and structures 10 ft away from this side and 3 ft from other sides.  
 Obstructions cause delays when restoring electric service and will be removed at the owner's expense.

# ⚠ CAUTION

**811 UNDERGROUND POWER CABLES ARE LOCATED IN THIS AREA. 811**  
 CALL BEFORE YOU DIG.

Label for outside of padmounted equipment S/N 2568

## ⚠ DANGER

**Hazardous voltage.**  
**Will shock, burn, or cause death.**

**KEEP OUT!**

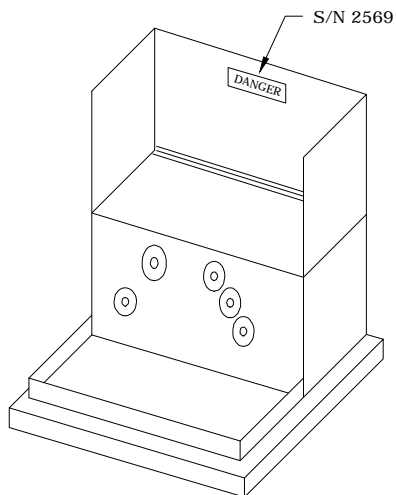
**If open or unlocked immediately call Clark Public Utilities 360-992-3000.**

Label for inside of padmounted equipment S/N 2569

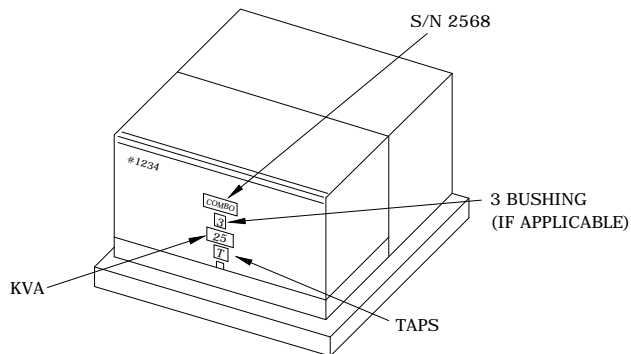
Rev. 2 - Updated warning and danger signs.

	<b>CONSTRUCTION STANDARDS</b>		<b>REVISIONS</b>			
	PADMOUNTED EQUIPMENT IDENTIFICATION TAGS AND SAFETY SIGNS		R	DATE	ENGR	OPS
			0	6/13/02		
			1	6/23/04	LB	AH
			2	8/3/18	KJP	
PAGE: 1 of 3	<b>UID1</b>		CAD FILE: UID1	APP: ELM	SECTION <b>1400</b>	
			DATE: 1/31/80			

**1. SINGLE-PHASE PADMOUNTED TRANSFORMERS**

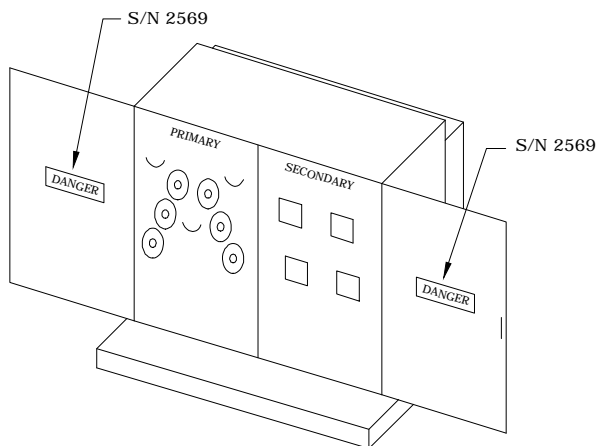


VIEW WITH LID OPEN

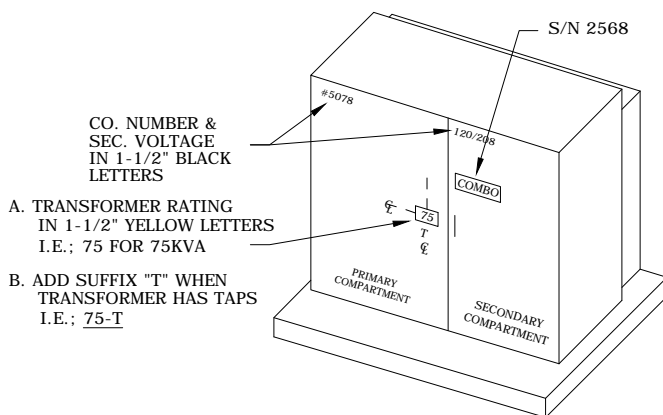


VIEW WITH LID CLOSED

**2. THREE-PHASE PADMOUNTED TRANSFORMERS**

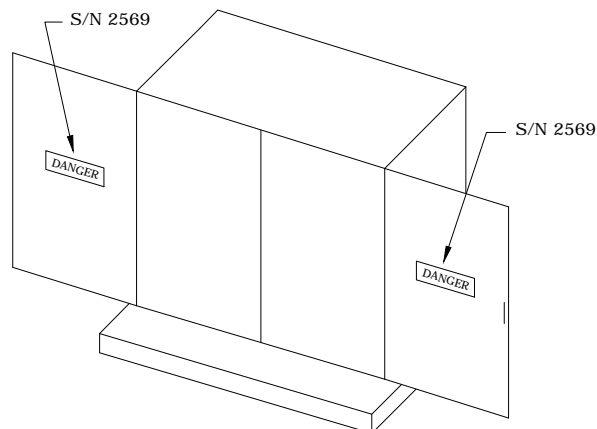


VIEW WITH DOOR OPEN

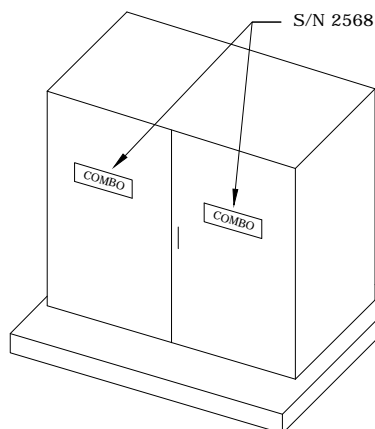


VIEW WITH DOOR CLOSED

**3. OTHER PADMOUNT EQUIPMENT**



VIEW WITH DOOR OPEN



VIEW WITH DOOR CLOSED

Rev. 2 - Updated warning and danger signs.



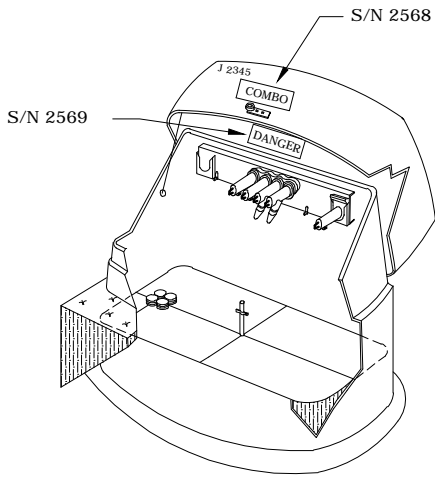
**CONSTRUCTION STANDARDS**

PADMOUNTED EQUIPMENT IDENTIFICATION TAGS AND SAFETY SIGNS

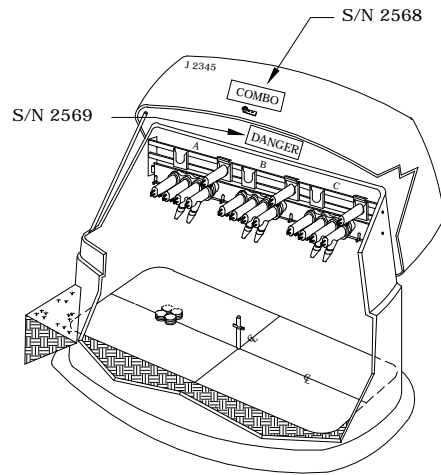
REVISIONS

R	DATE	ENGR	OPS
0	6/13/02		
1	6/23/04	LB	AH
2	8/3/18	KJP	

4. SINGLE-PHASE J-BOX



4. THREE-PHASE J-BOX



Rev. 2 - Updated warning and danger signs.



CONSTRUCTION STANDARDS

PADMOUNTED EQUIPMENT  
IDENTIFICATION TAGS AND  
SAFETY SIGNS

REVISIONS

R	DATE	ENGR	OPS
0	6/13/02		
1	6/23/04	LB	AH
2	8/3/18	KJP	

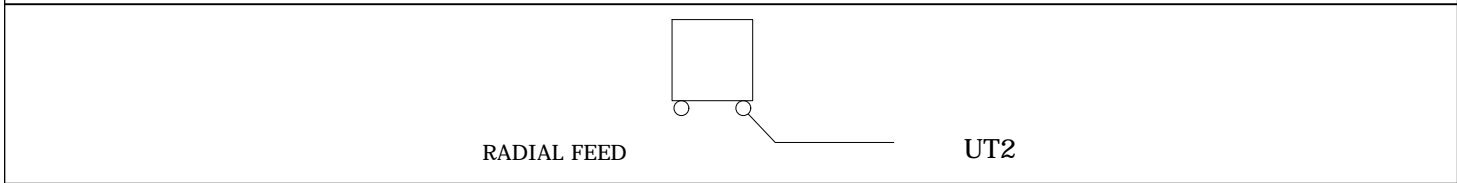
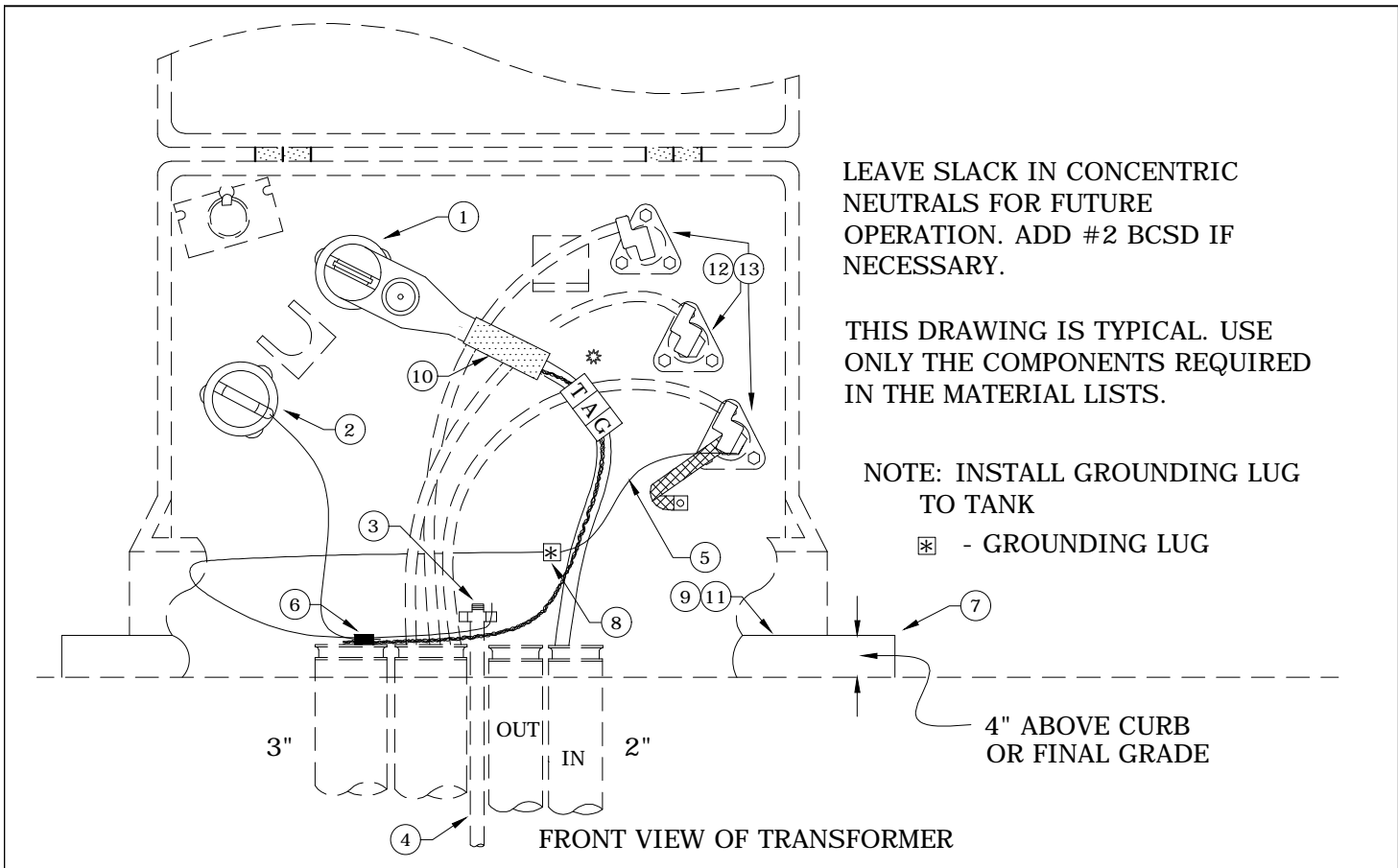
PAGE:  
3 of 3

UID1

CAD FILE:  
UID1

APP: ELM  
DATE: 1/31/80

SECTION  
1400

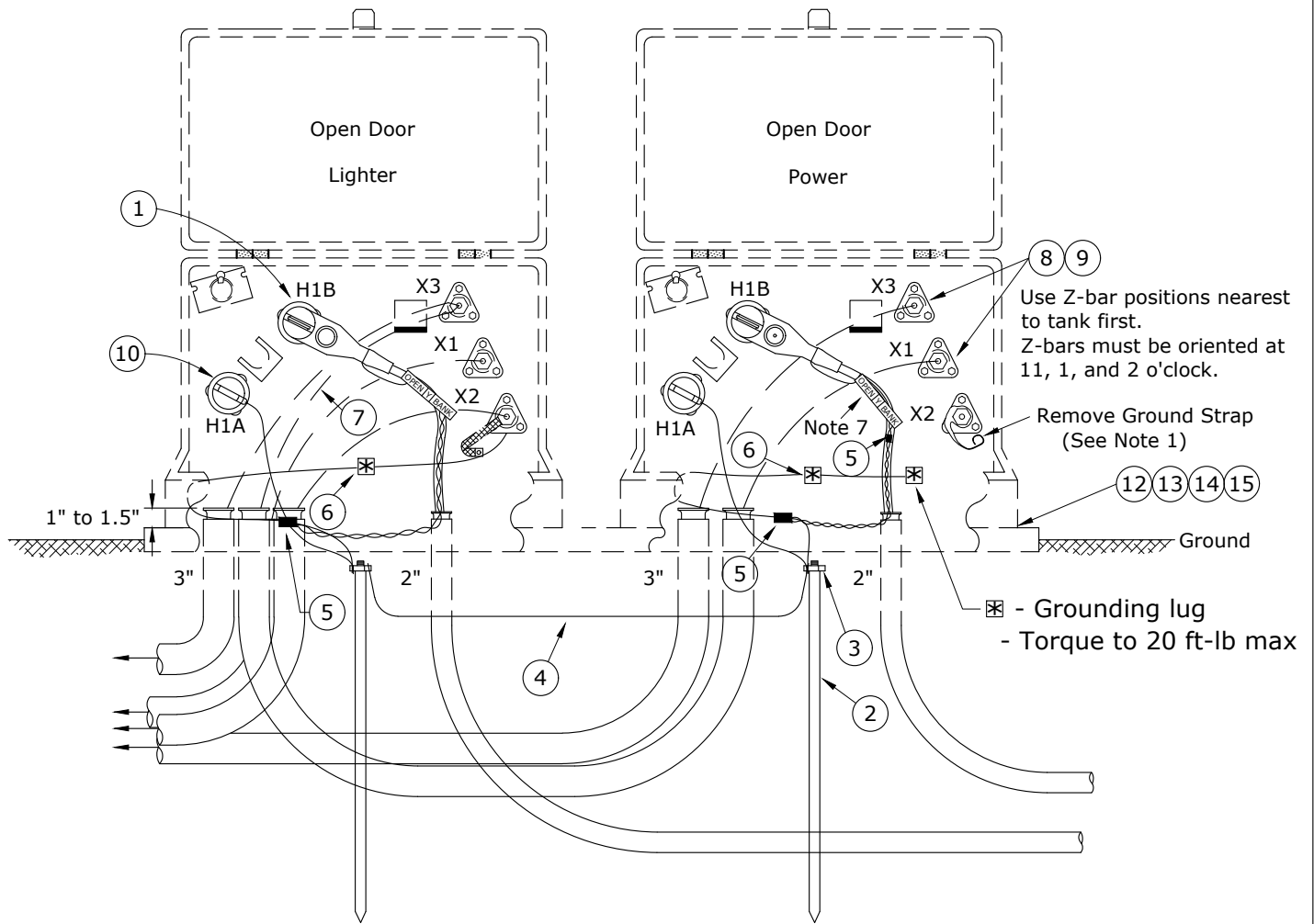


SEE US6 FOR SECONDARY CONNECTIONS DETAILS  
MATERIAL LIST

ITEM NO.	DESCRIPTION		
		QTY.	S/N
1	Elbow, Loadbreak, 1/0, 200A, 175 mil	1	1312
2	Cap, Protective Insulated, 200A	1	265
3	Clamp, Ground Rod 5/8", Small	1	281
4	Rod, Ground 5/8" x 8'	1	1124
5	Conductor, Wire BSDC #4 SLD	6	376
6	Connector, Crimpet, #4 to #2	1	454
7	Pad, Transformer 42" x 42"	1	929
8	Ground Lug	1	842
9	Bolt, Machine, 1/2" x 1-1/2" SS	2	131*
10	Elbow, Sealing Kit, 1/0, 175 & 220 mil	1	2391*
11	Washer, 2" x 3" x 3/16" w/ 9/16" Slotted Hole	2	1415
12	Connector, z-bar #2-500 MCM + Streetlight	3	2265
13	Cover, Connector U.G.	3	2266

Rev. 4 - Corrected material issue.

	CONSTRUCTION STANDARDS		REVISIONS			
	SINGLE PHASE PADMOUNT TRANSFORMER RADIAL FEED		#	DATE	ENGR	OPS
			1	2/23/00	HWH	MA
			2	9/23/04	LB	AH
		3	12/29/04	LB	AH	
		4	11/11/16	KJP		
		△				
PAGE: 1 of 1	UT2	CAD FILE: UT2	APP: JEH	SECTION 1400		
			DATE: 2/22/00			



**Notes:**

1. Remove ground strap from one secondary neutral bushing.  
Caution: Measure resistance from bushing to tank. There may be an internal ground.
2. Ground rods may be driven in trench.
3. Primary and secondary cables may be arranged as required to fit job site.
4. For 2-25kVA only.
5. See Std UTP1 for pad specifications.
6. Both phases must come from the same source and direction.
7. Put tags on cables that say "Open Y Bank".
8. Maximum motor size shall be 15 horsepower.

Rev 6 - Changed to 200A elbow with integral jacket seal, and added pad to material list.



**CONSTRUCTION STANDARDS**

OPEN WYE - OPEN DELTA  
PADMOUNT TRANSFORMER  
INSTALLATION

REVISIONS

△	DATE	ENGR	OPS
3	12/2/22	LB	AH
4	12/14/09	KJP	
5	2/4/14	CM	AH
6	3/7/23	CM	GM

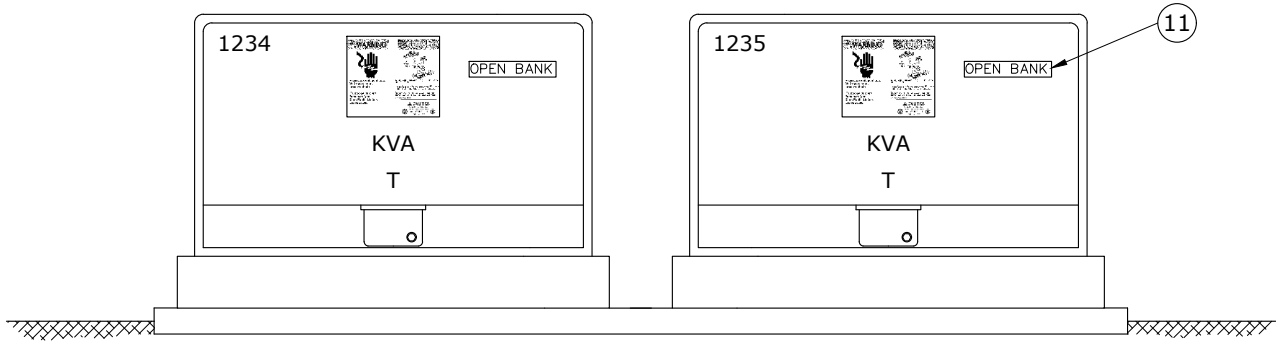
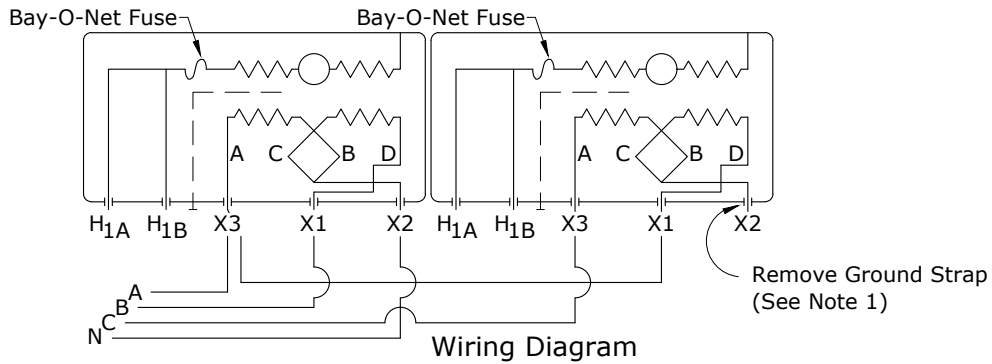
PAGE:  
1 of 2

**UT4**

CAD FILE:  
UT4

APP: TR/GM  
DATE: 1/2/80

SECTION  
**1400**



Rev 6 - Changed to 200A elbow with integral jacket seal, and added pad to material list.

ITEM NO.	DESCRIPTION	UT4	
		QTY.	S/N
1	Elbow, 200A, Loadbreak, 1/0, 200A, 175 & 200 mil, Test Point, 15 kV, w/ Jacket Seal	2	1312 *
2	Rod, Ground, 5/8" x 8'	2	1124
3	Clamp, Ground Rod 5/8", Bronze, Small	2	281
4	Conductor, Cu, #4 Solid, Bare, Soft-Drawn, 1C	30	376
5	Connector, Crimpet, Cu, Run #2 Sol/Str, Tap #8 Sol - #4 Str (2C4)	2	454
6	Lug, Grounding, #8 Sol-2/0 Str, 4-way	3	842
7	Cable, UG, 600v, Al, 4/0, USE, 1C	13	353
8	Connector, Z-Bar, 5/8" Stud, Al/Cu, 6-position, #2 - 500 MCM + Streetlight	5	2265
9	Cover, Connector, Z-Bar, 6-position	5	2266
10	Cap, Protective Insulated, 200A, 15 kV	2	265
11	Label, "Open Bank"	2	2781
12	Pad, Transformer 42" x 42", 1Ø, 25-75 kVA	2	929 *
13	Bolt, Machine, 1/2" x 1-1/2" SS	4	131 *
14	Washer, 2" x 3" x 3/16" w/ 9/16" Slotted Hole	4	1415 *
15	Nut, Spring Loaded, Galv, 1/2" (Unistrut)	4	920 *



## CONSTRUCTION STANDARDS

OPEN WYE - OPEN DELTA  
PADMOUNT TRANSFORMER  
INSTALLATION

### REVISIONS

△	DATE	ENGR	OPS
3	12/29/04	LB	AH
4	12/14/09	KJP	
5	2/4/14	CM	AH
6	3/7/23	CM	GM

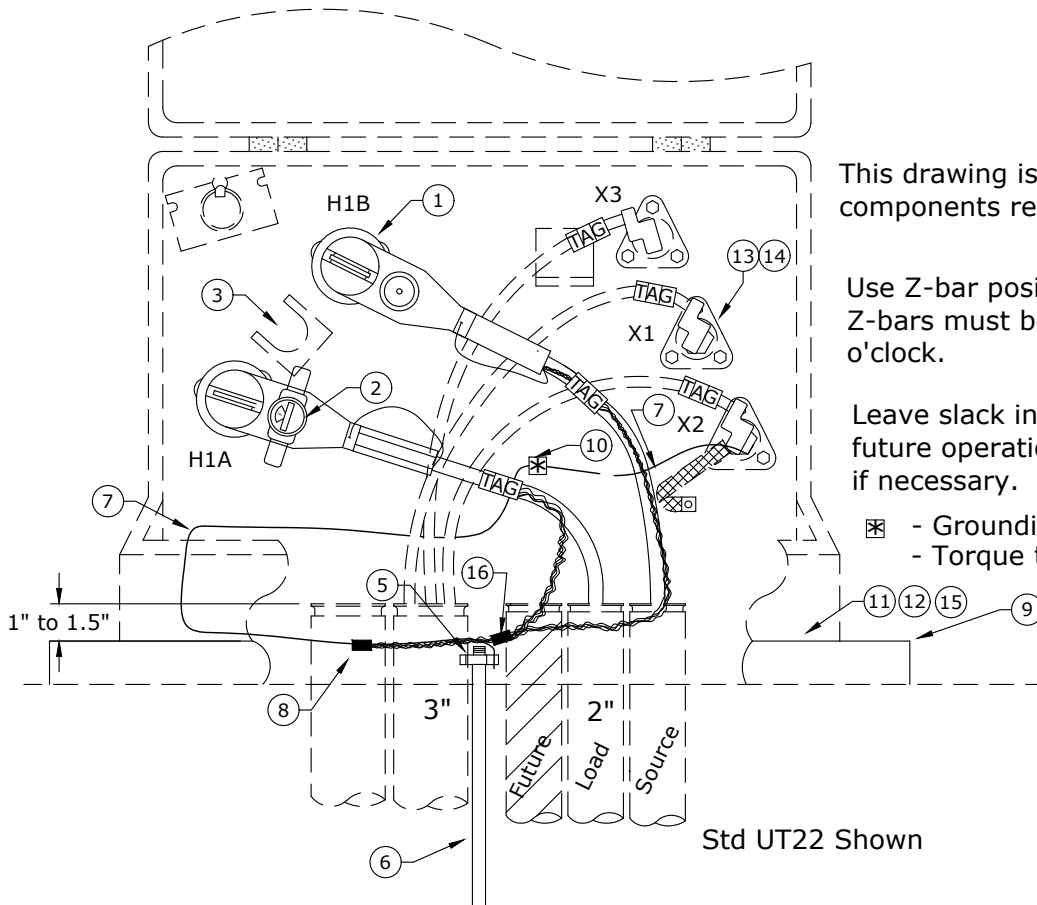
PAGE:  
2 of 2

# UT4

CAD FILE:  
UT4

APP: TR/GM  
DATE: 9/94

SECTION  
**1400**



This drawing is typical. Use only the components required in the material lists.

Use Z-bar positions nearest to tank first. Z-bars must be oriented at 11, 1, and 1 o'clock.

Leave slack in concentric neutrals for future operation. Add #2 BSDC if necessary.

⊗ - Grounding Lug  
 - Torque to 20 ft-lb Max

Std UT22 Shown

**Note:** 1. See Std US6 for secondary connection details.

Rev 4 - Changed to 200A elbow with integral jacket seal.



## CONSTRUCTION STANDARDS

SINGLE PHASE  
 PADMOUNT TRANSFORMER ASSEMBLIES  
 LOOP FEED

### REVISIONS

△	DATE	ENGR	OPS
1	9/23/04	LB	AH
2	12/29/04	LB	AH
3	4/29/09	CM	AH
4	5/8/24	DK	

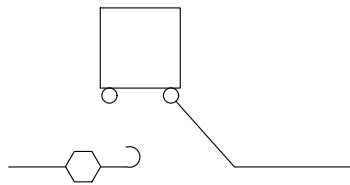
PAGE:  
1 of 2

UT21-UT22

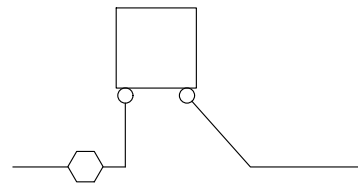
CAD FILE:  
UT21-UT22

APP: HWH/GW  
 DATE: 1/22/80

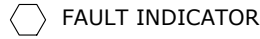
SECTION  
1400



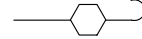
UT21



UT22



FAULT INDICATOR



NORMALLY OPEN

Rev 4 - Changed to 200A elbow with integral jacket seal.

ITEM NO.	DESCRIPTION	UT21	
		QTY.	S/N
1	Elbow, 200A, Loadbreak, 1/0, 175 & 220 mil, Test Point, 15kV, w/ Jacket Seal	2	1312 *
2	Indicator, Fault, UG, 400A, Test Point, Voltage Reset, 1Ø	1	2694
3	Bushing, Standoff Insulated 200A	1	252
4	Cap, Protective Insulated, 200A, 15kV	1	265
5	Clamp, Ground Rod, 5/8", Bronze, Small	1	281
6	Rod, Ground, 5/8" x 8'	1	1124
7	Conductor, Cu, #4 Solid, Bare, Soft-Drawn, 1C	12	376
8	Connector, Crimpet, Cu, Run #2 Sol/Str, Tap #8 Sol - #4 Str (2C4)	1	454
9	Pad, Transformer 42" x 42", 1Ø, 25-75 kVA	1	929
10	Lug, Grounding, #8 Sol - 2/0 Str, 4-way	1	842
11	Bolt, Machine, 1/2" x 1-1/2" SS	2	131 *
12	Washer, 2" x 3" x 3/16" w/ 9/16" Slotted Hole	2	1415
13	Connector, Z-Bar, 5/8" Stud, Al/Cu, 6-position, #2-500 MCM + Streetlight	3	2265
14	Cover, Connector, Z-Bar, 6-position	3	2266
15	Nut, Spring Loaded, Galv, 1/2" (Unistrut)	2	920 *

ITEM NO.	DESCRIPTION	UT22	
		QTY.	S/N
1	Elbow, 200A, Loadbreak, 1/0, 175 & 220 mil, Test Point, 15 kV, w/ Jacket Seal	2	1312 *
2	Indicator, Fault, UG, 400A, Test Point, Voltage Reset, 1Ø	1	2694
5	Clamp, Ground Rod, 5/8", Bronze, Small	1	281
6	Rod, Ground 5/8" x 8'	1	1124
7	Conductor, Cu, #4 Solid, Bare, Soft-Drawn, 1C	12	376
8	Connector, Crimpet, Cu, Run#2 Sol/Str, Tap #8 Sol - #4 Str (2C4)	1	454
9	Pad, Transformer, 42" x 42", 1Ø, 25-75 kVA	1	929
10	Lug, Grounding, #8 Sol - 2/0 Str, 4-way	1	842
11	Bolt, Machine, 1/2" x 1-1/2" SS	2	131 *
12	Washer, 2" x 3" x 3/16" w/ 9/16" Slotted Hole	2	1415
13	Connector, Z-Bar, 5/8" Stud, Al/Cu, 6-position, #2-500 MCM + Streetlight	3	2265
14	Cover, Connector, Z-Bar, 6-position	3	2266
15	Nut, Spring Loaded, Galv, 1/2" (Unistrut)	2	920 *
16	Connector, Crimpet, Cu, Run and Tap #2 Sol/Str (2C2)	1	455



## CONSTRUCTION STANDARDS

SINGLE PHASE  
PADMOUNT TRANSFORMER ASSEMBLIES  
LOOP FEED

### REVISIONS

Δ	DATE	ENGR	OPS
1	9/23/04	LB	AH
2	12/29/04	LB	AH
3	4/29/09	CM	AH
4	5/8/24	DK	

PAGE:  
2 of 2

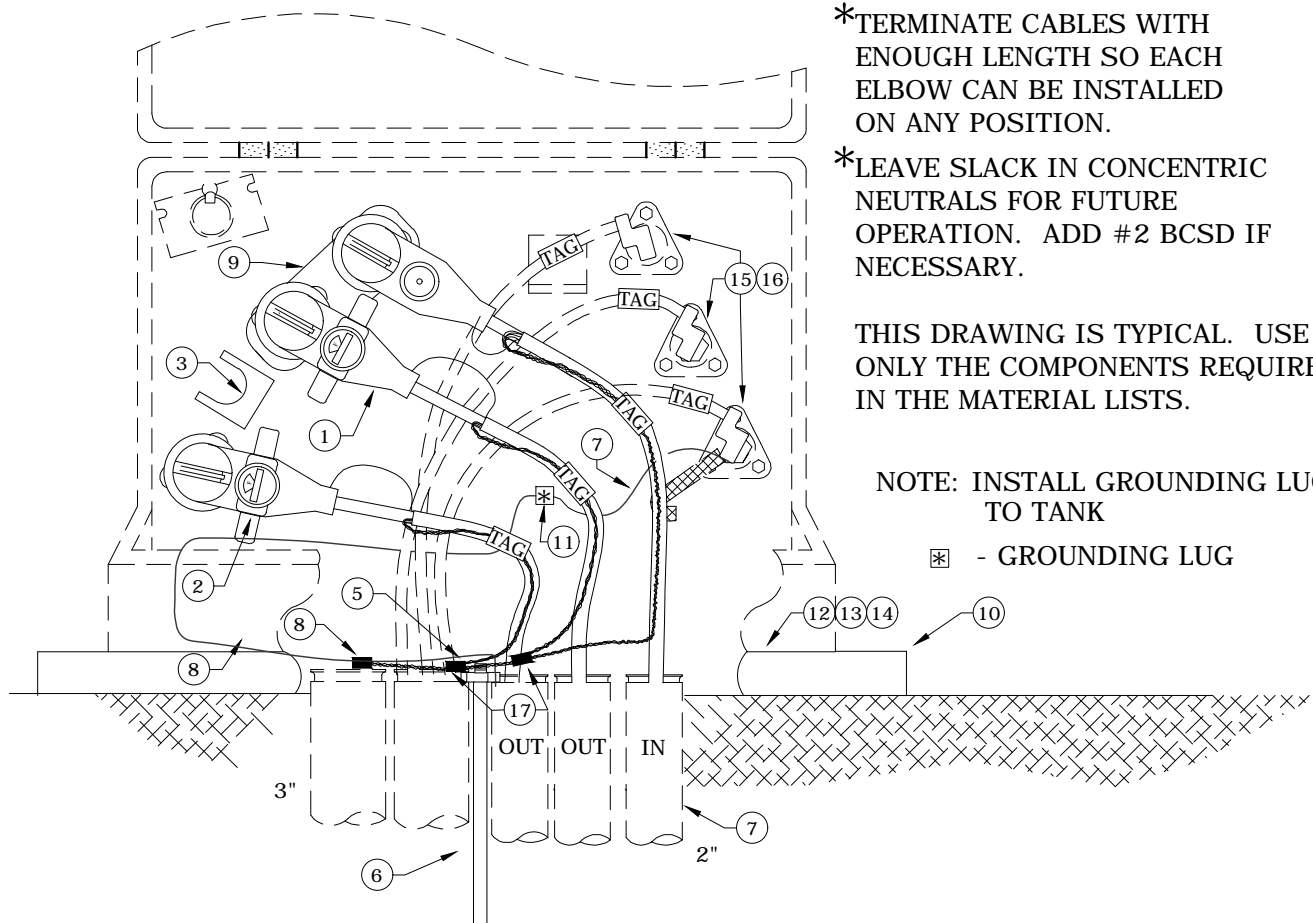
**UT21-UT22**

CAD FILE:  
UT21-UT22

APP: HWH/GW  
DATE: 1/22/80

SECTION  
**1400**





\*TERMINATE CABLES WITH ENOUGH LENGTH SO EACH ELBOW CAN BE INSTALLED ON ANY POSITION.

\*LEAVE SLACK IN CONCENTRIC NEUTRALS FOR FUTURE OPERATION. ADD #2 BCSD IF NECESSARY.

THIS DRAWING IS TYPICAL. USE ONLY THE COMPONENTS REQUIRED IN THE MATERIAL LISTS.

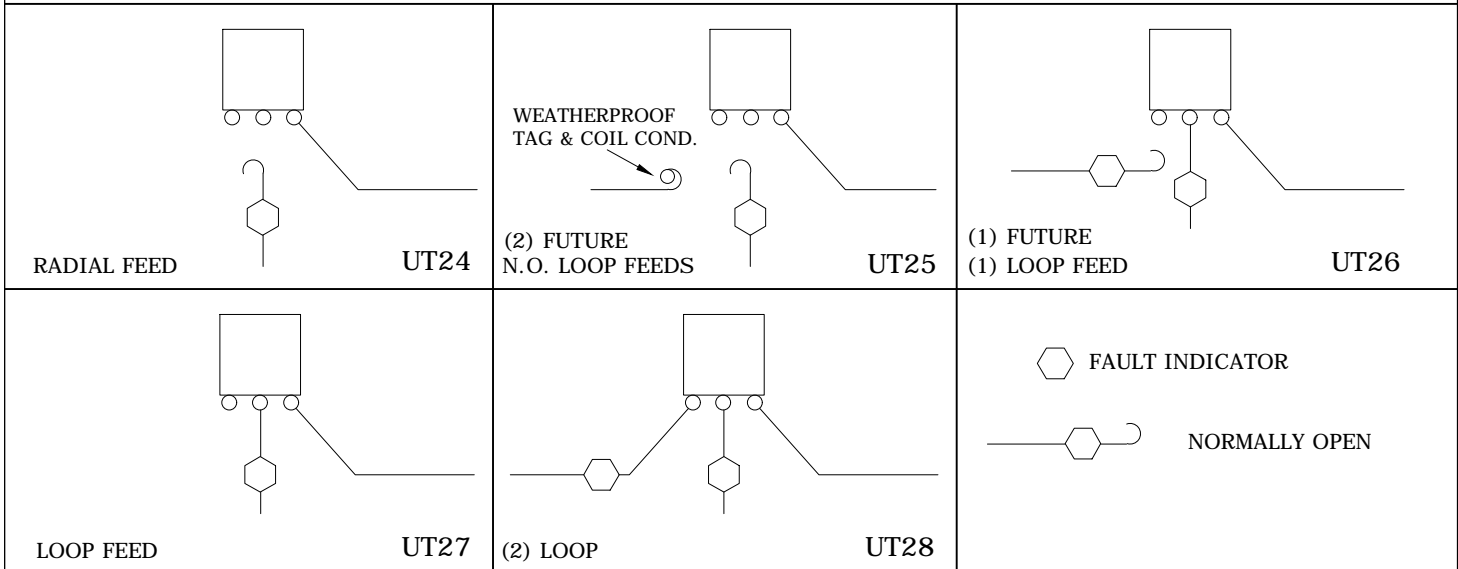
NOTE: INSTALL GROUNDING LUG TO TANK

⊠ - GROUNDING LUG

FRONT VIEW OF TRANSFORMER UT28

SEE US6 FOR SECONDARY CONNECTORS DETAILS

Rev 4: Changed to Voltage-reset fault indicators.



**CONSTRUCTION STANDARDS**  
 SINGLE PHASE  
 PADMOUNT TRANSFORMER ASSEMBLIES RADIAL OR LOOP FEED WITH FEED-THROUGH BUSHING

REVISIONS			
NO.	DATE	ENGR	OPS
1	7/15/02	JEH	TR
2	9/23/04	LB	AH
3	12/29/04	LB	AH
4	4/29/09	CM	AH

PAGE: 1 of 4

**UT24-UT28**

CAD FILE: UT24-UT28

APP: DATE: 10/94

SECTION 1400

Rev 4: Changed to Voltage-reset fault indicators.

ITEM NO.	DESCRIPTION	UT24	
		QTY.	S/N
1	Elbow, Loadbreak. 1/0, 200A, 175 mil	2	1312
2	Voltage-Reset Fault Indicator, 400A Trip, 1Ø UG	1	2694 ✱
3	Bushing, Standoff Insulated 200A	1	252
4	Cap, Protective Insulated 200A	2	265
5	Clamp, Ground Rod 5/8", Small	1	281
6	Rod, Ground 5/8" x 8'	1	1124
7	Conductor, Wire BSDC #4 SLD	6	376
8	Connector, Crimpet, #4 to #2 (2C4)	1	454
9	Insert, Feed-Through	1	237
10	Pad, Transformer 42" x 42"	1	929
11	Ground Lug	1	842
12	Bolt, Unistrut, Padmount Tie Down	2	193
13	Nut, Spring-loaded, Galv, 1/2", Unistrut	2	920
14	Washer, 2" X 3" X 3/16" w/ 9/16" slotted hole	2	1415
15	Connector, Z-Bar #6-500 MCM + St. Lt	3	2265
16	Cover, Connector U.G.	3	2266
17	Connector, Crimpet, #2 to #2 (2C2)	1	455

ITEM NO.	DESCRIPTION	UT25	
		QTY.	S/N
1	Elbow, Loadbreak. 1/0, 200A, 175 mil	2	1312
2	Voltage-Reset Fault Indicator, 400A Trip, 1Ø UG	1	2694 ✱
3	Bushing, Standoff Insulated 200A	1	252
4	Cap, Protective Insulated 200A	2	265
5	Clamp, Ground Rod 5/8", Small	1	281
6	Rod, Ground 5/8" x 8'	1	1124
7	Conductor, Wire BSDC #4 SLD	6	376
8	Connector, Crimpet, #4 to #2 (2C4)	1	454
9	Insert, Feed-Through	1	237
10	Pad, Transformer 42" x 42"	1	929
11	Ground Lug	1	842
12	Bolt, Unistrut, Padmount Tie Down	2	193
13	Nut, Spring-loaded, Galv, 1/2", Unistrut	2	920
14	Washer, 2" X 3" X 3/16" w/ 9/16" slotted hole	2	1415
15	Connector, Z-Bar #6-500 MCM + St. Lt	3	2265
16	Cover, Connector U.G.	3	2266
17	Connector, Crimpet, #2 to #2 (2C2)	1	455



**CONSTRUCTION STANDARDS**  
 SINGLE PHASE  
 PADMOUNT TRANSFORMER ASSEMBLIES RADIAL  
 OR LOOP FEED WITH FEED-THROUGH BUSHING

REVISIONS			
△	DATE	ENGR	OPS
1	7/15/02	JEH	TR
2	9/23/04	LB	AH
3	12/29/04	LB	AH
4	4/29/09	CM	AH

APP:	SECTION
DATE: 10/94	1400

Rev 4: Changed to Voltage-reset fault indicators.

ITEM NO.	DESCRIPTION	UT26	
		QTY.	S/N
1	Elbow, Loadbreak, 1/0, 200A, 175 mil	3	1312
2	Voltage-Reset Fault Indicator, 400A Trip, 1Ø UG	2	2694 *
3	Bushing, Standoff Insulated 200A	1	252
4	Cap, Protective Insulated 200A	1	265
5	Clamp, Ground Rod 5/8", Small	1	281
6	Rod, Ground 5/8" x 8'	1	1124
7	Conductor, Wire BSDC #4 SLD	6	376
8	Connector, Crimpet, #4 to #2 (2C4)	1	454
9	Insert, Feed-Through	1	237
10	Pad, Transformer 42" x 42"	1	929
11	Ground Lug	1	842
12	Bolt, Unistrut, Padmount Tie Down	2	193
13	Nut, Spring-loaded, Galv, 1/2", Unistrut	2	920
14	Washer, 2" X 3" X 3/16" w/ 9/16" slotted hole	2	1415
15	Connector, Z-Bar #6-500 MCM + St. Lt	3	2265
16	Cover, Connector U.G.	3	2266
17	Connector, Crimpet, #2 to #2 (2C2)	2	455

ITEM NO.	DESCRIPTION	UT27	
		QTY.	S/N
1	Elbow, Loadbreak, 1/0, 200A, 175 mil	2	1312
2	Voltage-Reset Fault Indicator, 400A Trip, 1Ø UG	1	2694 *
3	Bushing, Standoff Insulated 200A	1	252
4	Cap, Protective Insulated 200A	1	265
5	Clamp, Ground Rod 5/8", Small	1	281
6	Rod, Ground 5/8" x 8'	1	1124
7	Conductor, Wire BSDC #4 SLD	6	376
8	Connector, Crimpet, #4 to #2 (2C4)	1	454
9	Insert, Feed-Through	1	237
10	Pad, Transformer 42" x 42"	1	929
11	Ground Lug	1	842
12	Bolt, Unistrut, Padmount Tie Down	2	193
13	Nut, Spring-loaded, Galv, 1/2", Unistrut	2	920
14	Washer, 2" X 3" X 3/16" w/ 9/16" slotted hole	2	1415
15	Connector, Z-Bar #6-500 MCM + St. Lt	3	2265
16	Cover, Connector U.G.	3	2266
17	Connector, Crimpet, #2 to #2 (2C2)	1	455




**CONSTRUCTION STANDARDS**  
 SINGLE PHASE  
 PADMOUNT TRANSFORMER ASSEMBLIES RADIAL  
 OR LOOP FEED WITH FEED-THROUGH BUSHING

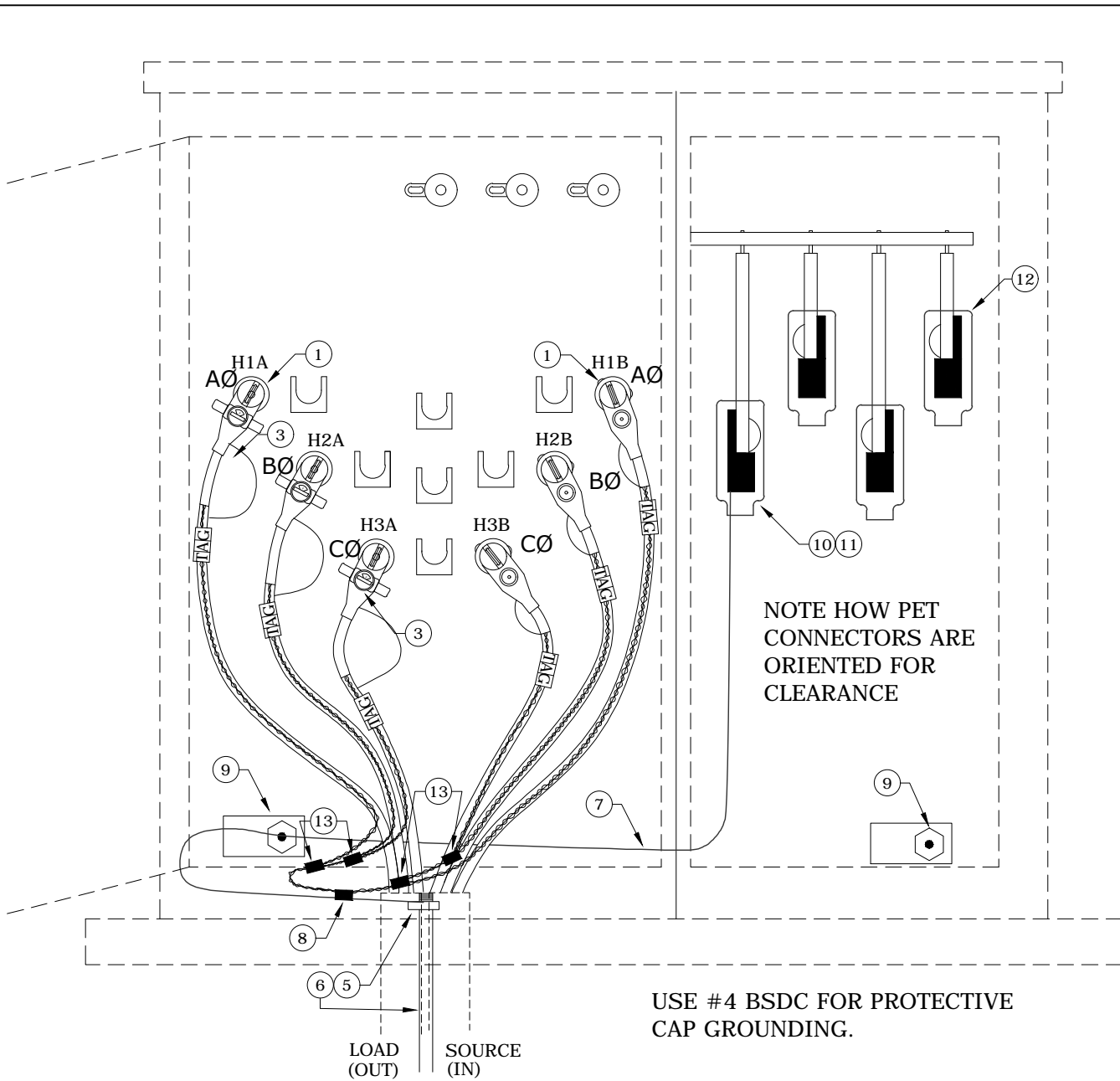
REVISIONS			
NO.	DATE	ENGR	OPS
1	7/15/02	JEH	TR
2	9/23/04	LB	AH
3	12/29/04	LB	AH
4	4/29/09	CM	AH

APP:	SECTION
DATE: 10/94	1400

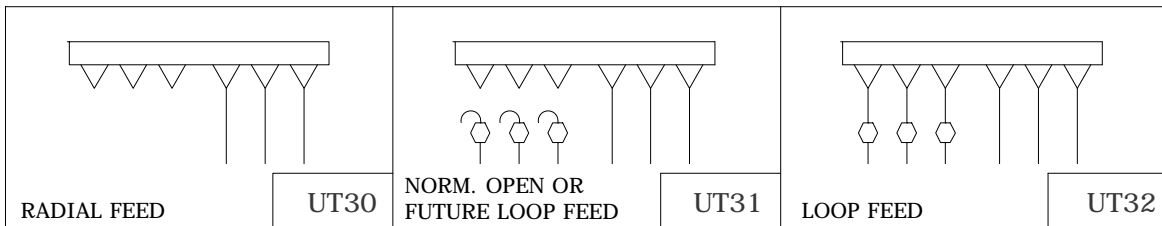
Rev 4: Changed to Voltage-reset fault indicators.

ITEM NO.	DESCRIPTION	UT28	
		QTY.	S/N
1	Elbow, Loadbreak, 1/0, 200A, 175 mil	3	1312
2	Voltage-Reset Fault Indicator, 400A Trip, 1Ø UG	2	2694 *
3	Bushing, Standoff Insulated 200A	1	252
4	Cap, Protective Insulated 200A	-	265
5	Clamp, Ground Rod 5/8", Small	1	281
6	Rod, Ground 5/8" x 8'	1	1124
7	Conductor, Wire BSDC #4 SLD	6	376
8	Connector, Crimpet, #4 to #2 (2C4)	1	454
9	Insert, Feed-Through	1	237
10	Pad, Transformer 42" x 42"	1	929
11	Ground Lug	1	842
12	Bolt, Unistrut, Padmount Tie Down	2	193
13	Nut, Spring-loaded, Galv, 1/2", Unistrut	2	920
14	Washer, 2" X 3" X 3/16" w/ 9/16" slotted hole	2	1415
15	Connector, Z-Bar #6-500 MCM + St. Lt	3	2265
16	Cover, Connector U.G.	3	2266
17	Connector, Crimpet, #2 to #2 (2C2)	2	455

	<b>CONSTRUCTION STANDARDS</b>			REVISIONS						
	SINGLE PHASE PADMOUNT TRANSFORMER ASSEMBLIES RADIAL OR LOOP FEED WITH FEED-THROUGH BUSHING						△	DATE	ENGR	OPS
							1	7/15/02	JEH	TR
							2	9/23/04	LB	AH
							3	12/29/04	LB	AH
						4	4/29/09	CM	AH	
						△				
PAGE: 4 of 4		<b>UT24-UT28</b>			CAD FILE: UT24-UT28		APP: DATE: 10/94		SECTION <b>1400</b>	



**FRONT VIEW OF TRANSFORMER**  
(UT32 SHOWN)



NOTE: SPECIFY I.D. TAGS AS REQUIRED.

Rev 3: Changed to Voltage-reset fault indicators.



**CONSTRUCTION STANDARDS**  
THREE PHASE  
PADMOUNT TRANSFORMER ASSEMBLIES

REVISIONS			
REV	DATE	ENGR	OPS
1	2/23/00	HWH	MA
2	9/23/04	LB	AH
3	4/29/09	CM	AH

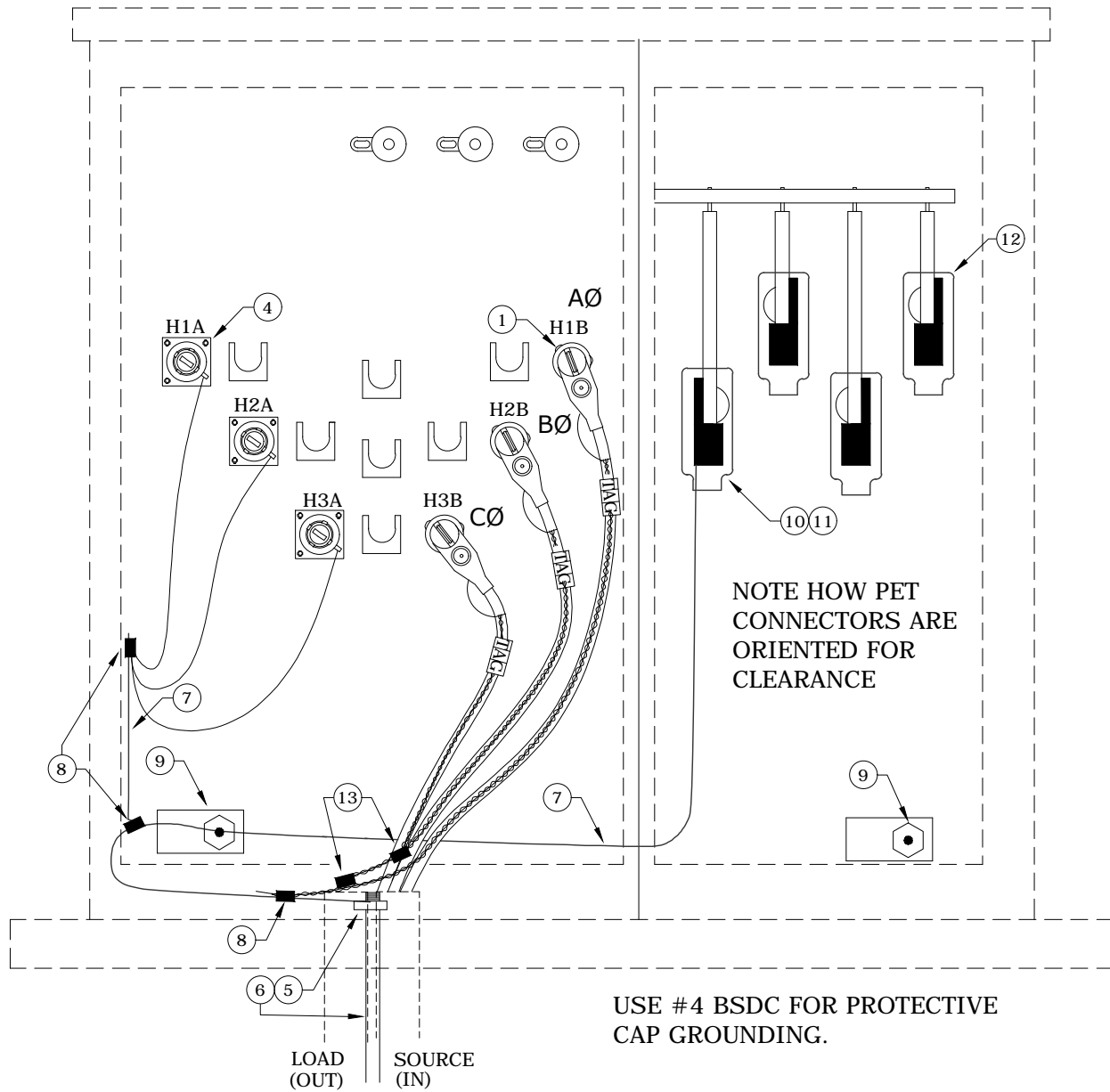
PAGE:  
1 of 3

**UT30-UT32**

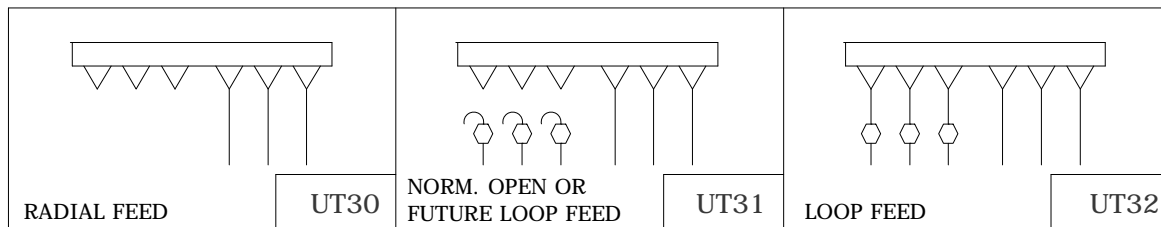
CAD FILE:  
UT30

APP:  
DATE: 10/99

SECTION  
**1400**



**FRONT VIEW OF TRANSFORMER**  
(UT30 SHOWN)



NOTE: SPECIFY I.D. TAGS AS REQUIRED.

Rev 3: Changed to Voltage-reset fault indicators.



**CONSTRUCTION STANDARDS**  
THREE PHASE  
PADMOUNT TRANSFORMER ASSEMBLIES

REVISIONS			
REV	DATE	ENGR	OPS
1	2/23/00	HWH	MA
2	9/23/04	LB	AH
3	4/29/09	CM	AH
APP:		SECTION	
DATE: 10/99		1400	

Rev 3: Changed to Voltage-reset fault indicators.

ITEM NO.	DESCRIPTION	UT30	
		QTY.	S/N
1	Elbow, Loadbreak, 1/0, 200A, 175 mil	3	1312
4	Cap, Protective Insulated 200A	3	265
5	Clamp, Ground Rod 5/8", Small	1	281
6	Rod, Ground 5/8" x 8'	1	1124
7	Conductor, Wire BSDC #4 SLD	10	376
8	Connector, Crimpet, #4 to #2 (2C4)	1	454
9	Ground Lug	2	842
10	Connector, PET, #2-750 Al/Cu, 6 Position	4	2129
11	Bolt, Machine, 1/2 x 2" SS w/ Bronze Nut & Belleville Washer	16	1389
12	Cover, PET, 8 Position	4	2182
13	Connector, Crimpet, #2 to #2 (2C2)	2	455

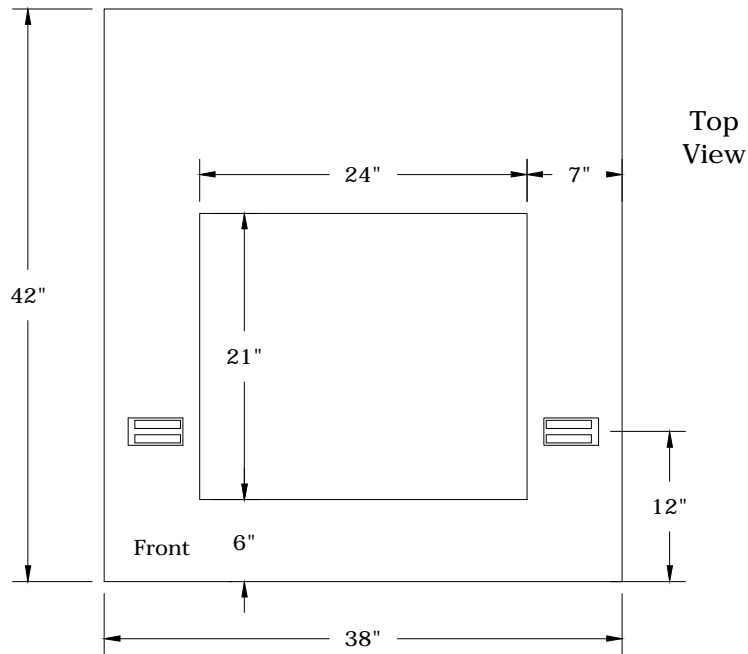
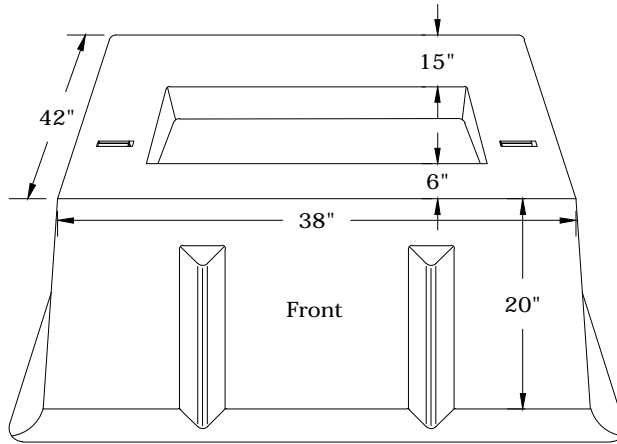
ITEM NO.	DESCRIPTION	UT31	
		QTY.	S/N
1	Elbow, Loadbreak, 1/0, 200A, 175 mil	6	1312
2	Bushing, Standoff Insulated 200A	3	252
3	Voltage-Reset Fault Indicator, 400A Trip, 1Ø UG	3	2694 *
4	Cap, Protective Insulated, 200A	3	265
5	Clamp, Ground Rod 5/8", Small	1	281
6	Rod, Ground 5/8" x 8'	1	1124
7	Conductor, Wire BSDC #4 SLD	10	376
8	Connector, Crimpet, #4 to #2 (2C4)	1	454
9	Ground Lug	2	842
10	Connector, PET, #2-750 Al/Cu, 6 Position	4	2129
11	Bolt, Machine, 1/2 x 2" SS w/ Bronze Nut & Belleville Washer	16	1389
12	Cover, PET, 8 Position	4	2182
13	Connector, Crimpet, #2 to #2 (2C2)	4	455

ITEM NO.	DESCRIPTION	UT32	
		QTY.	S/N
1	Elbow, Loadbreak, 1/0, 200A, 175 mil	6	1312
3	Voltage-Reset Fault Indicator, 400A Trip, 1Ø UG	3	2694 *
5	Clamp, Ground Rod 5/8", Small	1	281
6	Rod, Ground 5/8" x 8'	1	1124
7	Conductor, Wire BSDC #4 SLD	10	376
8	Connector, Crimpet, #4 to #2 (2C4)	1	454
9	Ground Lug	2	842
10	Connector, PET, #2-750 Al/Cu, 6 Position	4	2129
11	Bolt, Machine, 1/2 x 2" SS w/ Bronze Nut & Belleville Washer	16	1389
12	Cover, PET, 8 Position	4	2182
13	Connector, Crimpet, #2 to #2 (2C2)	4	455



**CONSTRUCTION STANDARDS**  
THREE PHASE  
PADMOUNT TRANSFORMER ASSEMBLIES

REVISIONS			
△	DATE	ENGR	OPS
1	2/23/00	HWH	MA
2	9/23/04	LB	AH
3	4/29/09	CM	AH
△			



ITEM NO.	DESCRIPTION	QTY.	S/N
		1	Box Pad, 1Ø Transformer, Fiberglass



**CONSTRUCTION STANDARDS**  
 SINGLE PHASE  
 PADMOUNT TRANSFORMER  
 BOXPAD (BASEMENT)

REVISIONS			
DATE	ENGR	OPS	

PAGE:  
1 of 1

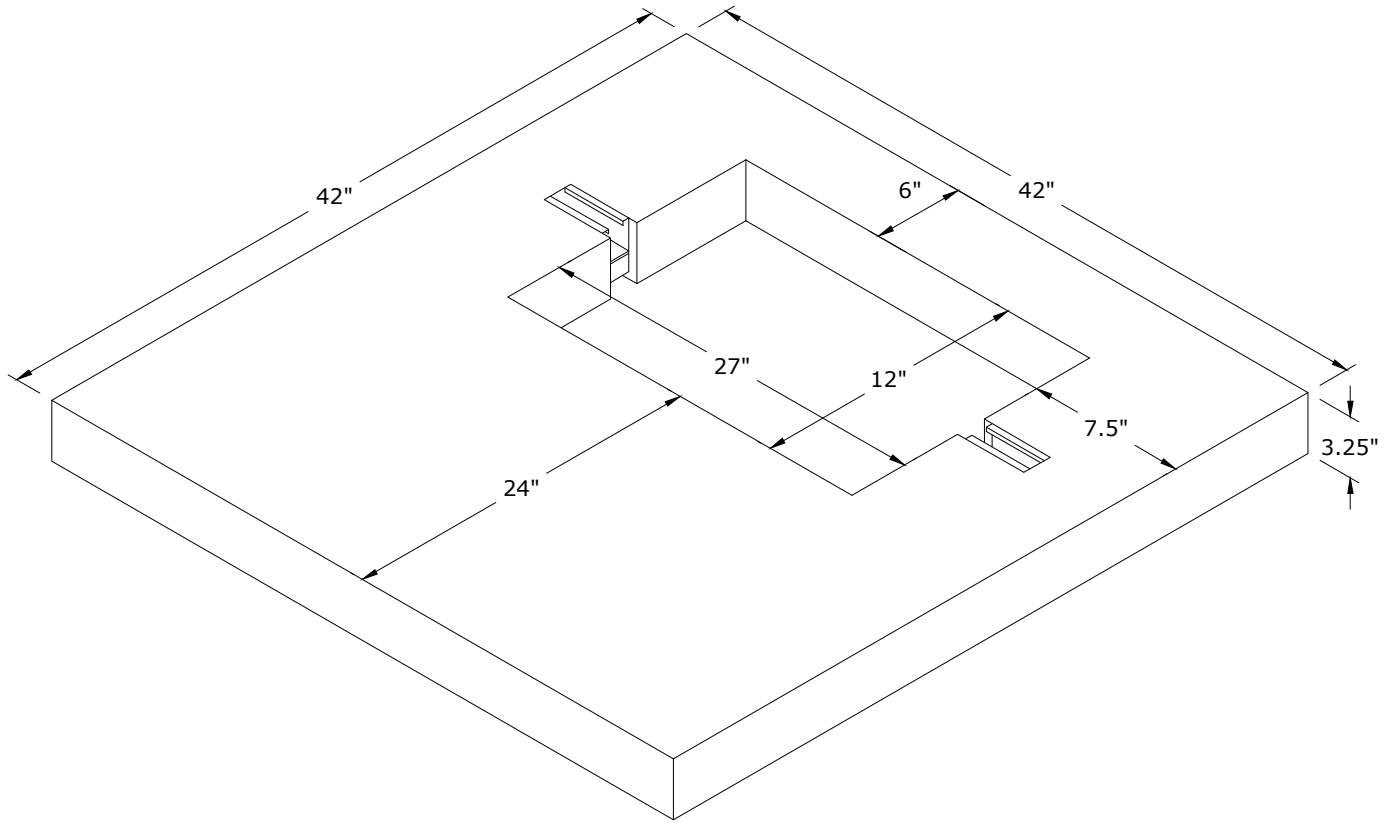
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CAD FILE:  
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APP: KJP  
DATE: 12/29/04

SECTION  
**1400**






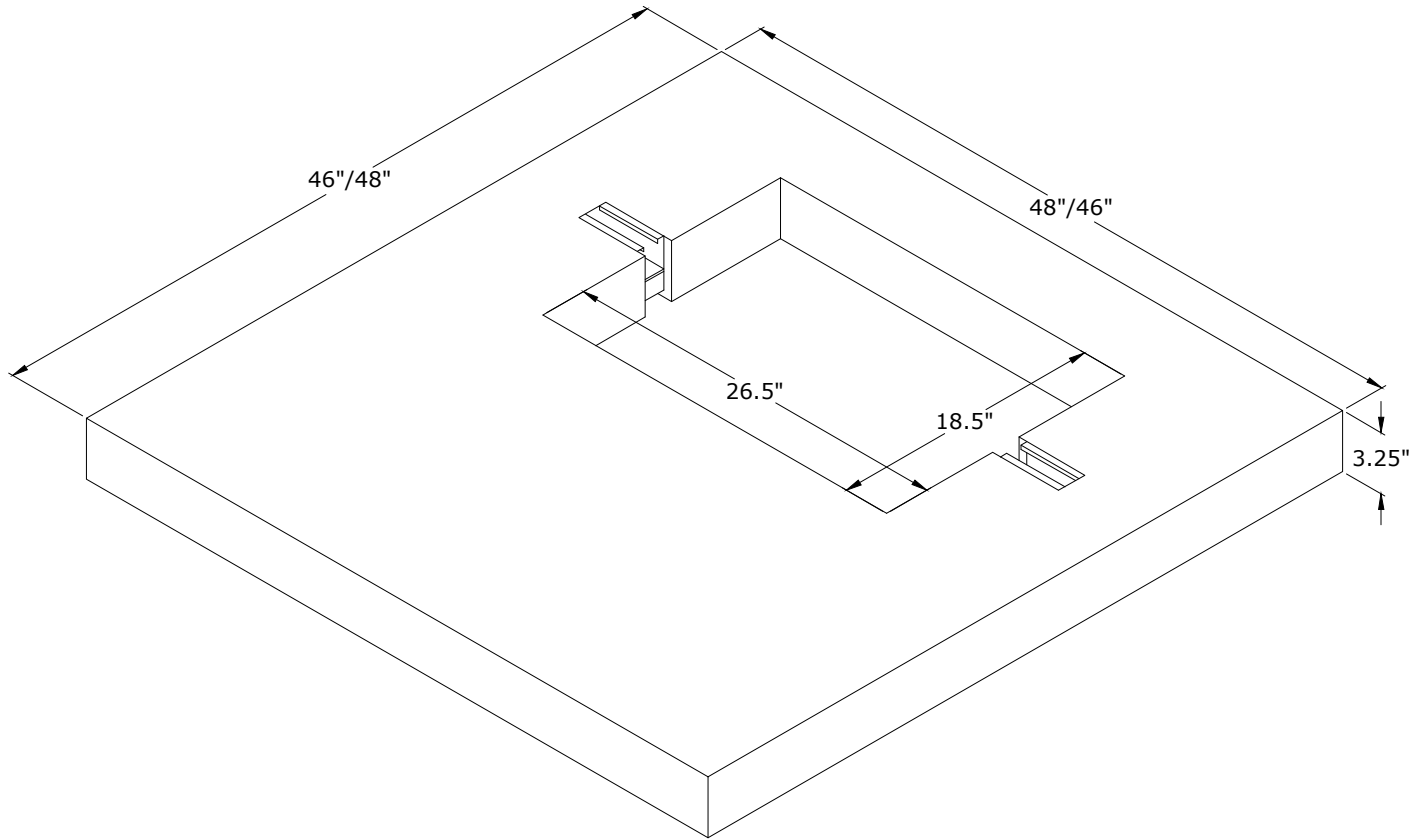
Note: See Std UTP3 - 1Ø Transformer Pad Orientation and Conduit Installation 25-75kVA (page 1) - for installation instructions. ✱

Rev. 2 - Changed from plastic pad to polyconcrete, updated note, and added material issue.

ITEM NO.	DESCRIPTION	UTP1	
		QTY.	S/N
1	Pad, Transformer, 42" x 42", 1Ø, 25-75kVA	1	929


	<b>CONSTRUCTION STANDARDS</b> 1Ø TRANSFORMER PAD 25 to 75 kVA	REVISIONS			
		△	DATE	ENGR	OPS
		1	2/23/00	HWH	MA
		2	12/9/20	CM	GM
PAGE: 1 of 1	<b>UTP1</b>	CAD FILE: UTP1	APP: HWH/GW DATE: 1/22/80	SECTION <b>1400</b>	

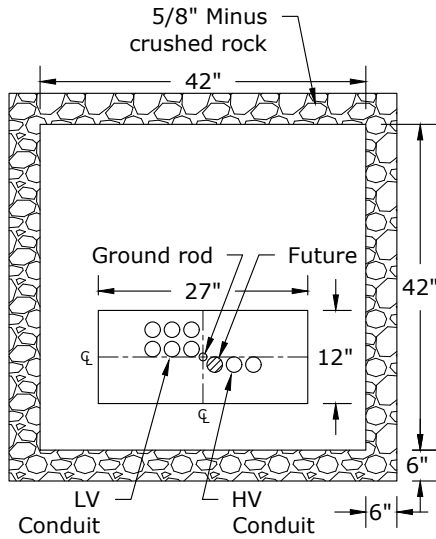


**Notes:** \*

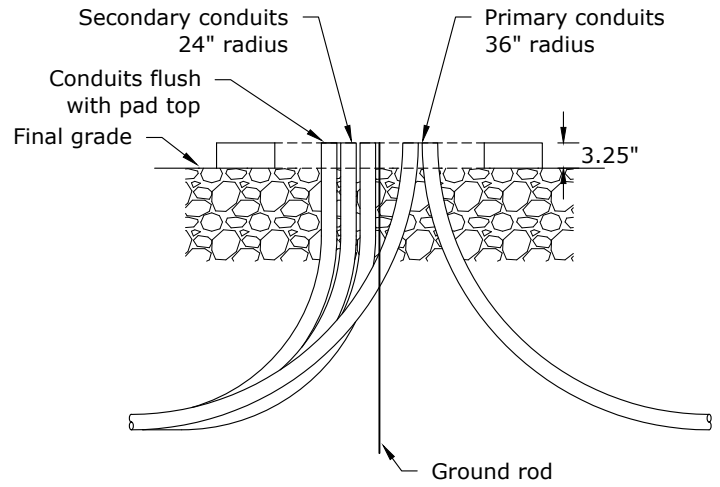
1. See Std UTP3 - 1Ø Transformer Pad Orientation and Conduit Installation 100KVA (page 2) - for installation instructions.
2. Armorcast pad is 48" W x 46" L. Quazite pad is 46" W x 48" L.

Rev. 2 - Updated drawing, notes, and added material issue.

ITEM NO.	DESCRIPTION	UTP2																	
		QTY.	S/N																
1	Pad, Transformer, 48" x 46", 1Ø, 100kVA only	1	930																
		<b>CONSTRUCTION STANDARDS</b>																	
		1Ø TRANSFORMER PAD 100 kVA																	
PAGE: 1 of 1		<table border="1"> <thead> <tr> <th colspan="4">REVISIONS</th> </tr> <tr> <th>DATE</th> <th>ENGR</th> <th>OPS</th> <th></th> </tr> </thead> <tbody> <tr> <td>2/23/00</td> <td>HWH</td> <td>MA</td> <td></td> </tr> <tr> <td>12/9/20</td> <td>CM</td> <td>GM</td> <td></td> </tr> </tbody> </table>		REVISIONS				DATE	ENGR	OPS		2/23/00	HWH	MA		12/9/20	CM	GM	
REVISIONS																			
DATE	ENGR	OPS																	
2/23/00	HWH	MA																	
12/9/20	CM	GM																	
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CAD FILE:	APP:	HWH/GW	SECTION																
UTP2	DATE:	1/22/80	<b>1400</b>																



25-75 KVA PAD  
PLAN VIEW




FRONT VIEW

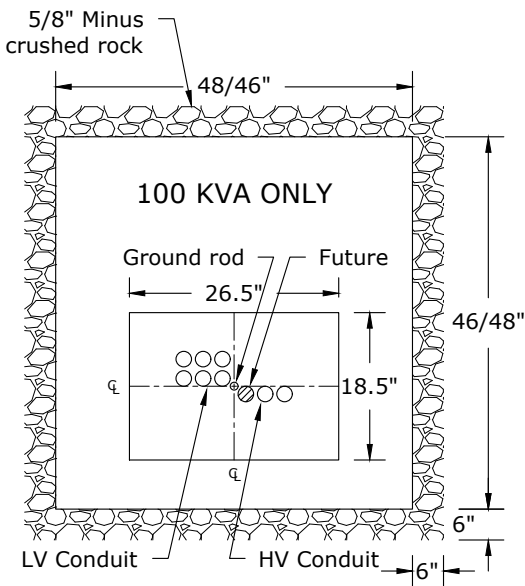
1Ø PADMOUNT TRANSFORMER CONDUIT ORIENTATION (25-75 KVA)

Notes:

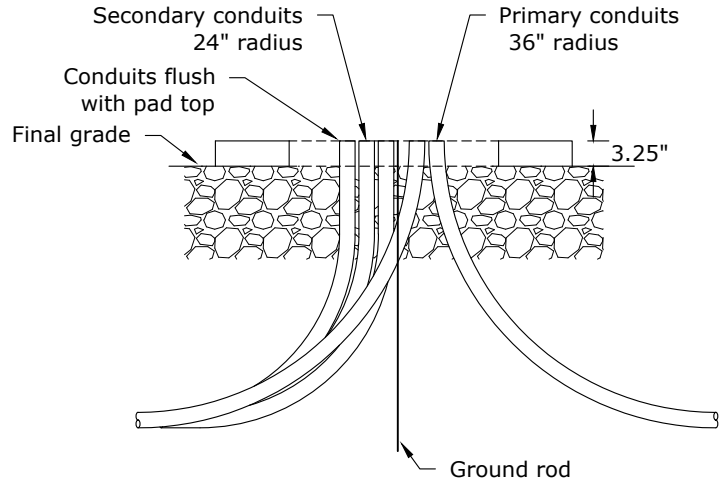
1. AIC for 25 to 75 kVA transformers is 10,000 A.
2. High and low voltage conduits must be within their designated areas.
3. All conduits shall be in place and approved prior to transformer installation.
4. It shall be the responsibility of the owner or owner's representative to comply with all applicable code requirements.
5. The pad shall be furnished by the customer.
6. The front side must have 10 feet clear access for maintenance. See Std UTPC - Padmount Transformer Clearances.
7. All future conduit ends shall extend past the edge of the pad by 48 inches minimum.
8. Radius of secondary conduit elbow shall be 24 inches.
9. Depth of burial of conduits shall be as shown on Std UA1.
10. The pad shall be located so that no part of the transformer is closer than 10 feet to a combustible surface, windows or doors, or 3 feet to a non-combustible structure. See clearances in CPU Residential Handbook.
11. Minimum primary conduit size shall be 2 inches.
12. Backfill under the transformer pad must be 5/8" minus crushed rock compacted in multiple lifts. The rock layer must be a minimum of 12-inches thick below the pad. Soil stability may require more. The rock base shall extend 6 inches beyond the pad on all four sides.

Rev. 2 - Added 100kVA from UTP6, updated drawing and notes.

	<b>CONSTRUCTION STANDARDS</b> 1Ø TRANSFORMER PAD ORIENTATION AND CONDUIT INSTALLATION 25-75 KVA			<b>REVISIONS</b>														
		<table border="1"> <thead> <tr> <th>DATE</th> <th>ENGR</th> <th>OPS</th> </tr> </thead> <tbody> <tr> <td>0 2/23/00</td> <td>HWH</td> <td>MA</td> </tr> <tr> <td>1 1/26/04</td> <td>LB</td> <td>AH</td> </tr> <tr> <td>2 12/9/20</td> <td>CM</td> <td>GM</td> </tr> </tbody> </table>	DATE	ENGR	OPS	0 2/23/00	HWH	MA	1 1/26/04	LB	AH	2 12/9/20	CM	GM				
	DATE	ENGR	OPS															
0 2/23/00	HWH	MA																
1 1/26/04	LB	AH																
2 12/9/20	CM	GM																
PAGE: 1 of 2	<b>UTP3</b>		CAD FILE: UTP3	APP: HWH/GW DATE: 1/22/80	SECTION <b>1400</b>													



100 KVA PAD  
PLAN VIEW




FRONT VIEW

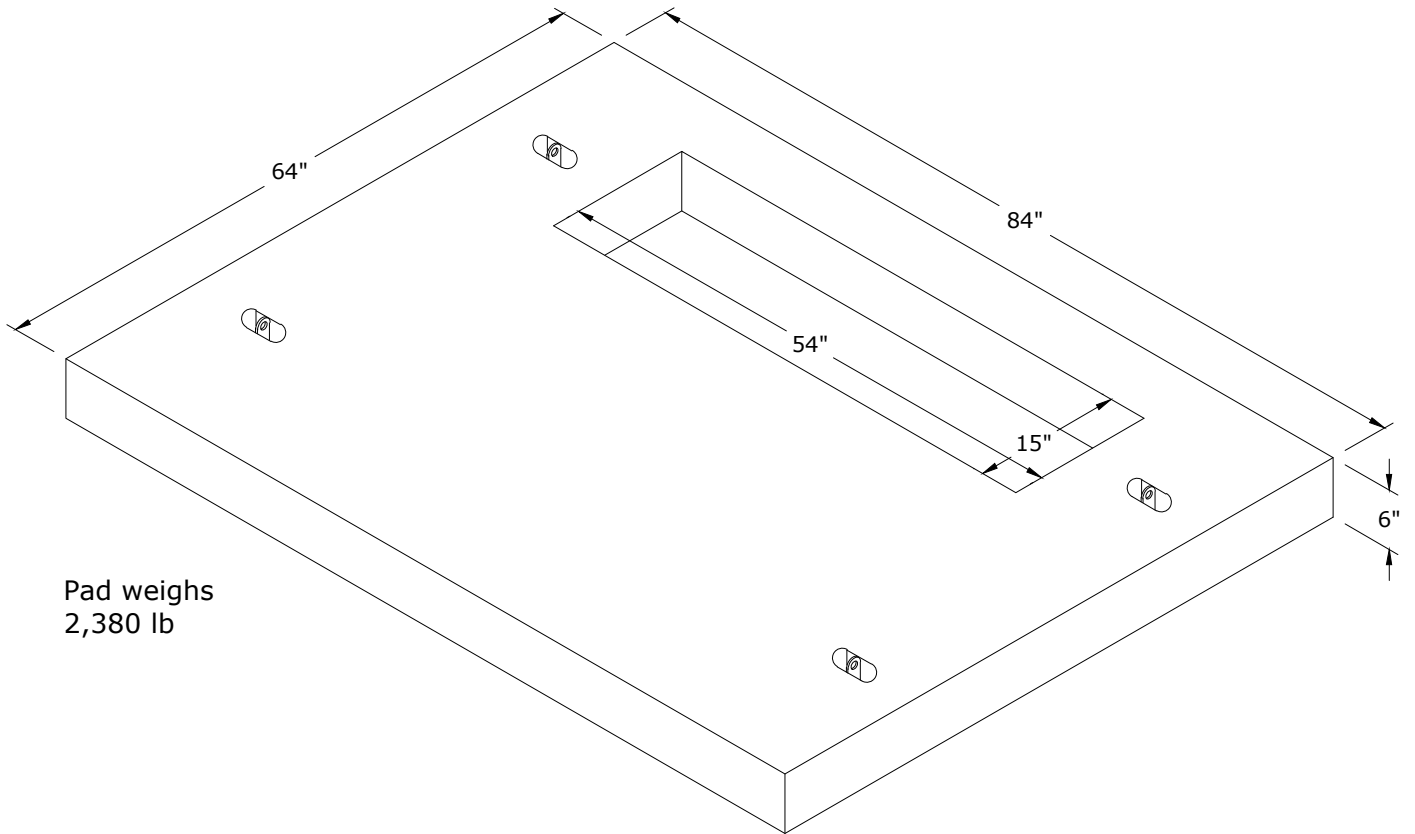
1Ø PADMOUNT TRANSFORMER CONDUIT ORIENTATION (100 KVA)

Notes:

1. AIC for 100 kVA transformer is 14,000 A.
2. High and low voltage conduits must be within their designated areas.
3. All conduits shall be in place and approved prior to transformer installation.
4. It shall be the responsibility of the owner or owner's representative to comply with all applicable code requirements.
5. The pad shall be furnished by the customer.
6. The front side must have 10 feet clear access for maintenance. See Std UTPC - Padmount Transformer Clearances.
7. All future conduit ends shall extend past the edge of the pad by 48 inches minimum.
8. Radius of secondary conduit elbows shall be 24 inches.
9. Depth of burial of conduits shall be as shown on Std UA1.
10. The pad shall be located so that no part of the transformer is closer than 10 feet to a combustible surface, windows or doors or 3 feet to a non-combustible structure. See clearances in CPU Residential Handbook.
11. Minimum primary conduit size shall be 2 inches.
12. Backfill under the transformer pad must be 5/8" minus crushed rock compacted in multiple lifts. The rock layer must be a minimum of 12-inches thick below the pad. Soil stability may require more. The rock base shall extend 6 inches beyond the pad on all four sides.

Rev. 2 - Added 100kVA from UTP6, updated drawing and notes.



	<b>CONSTRUCTION STANDARDS</b> 1Ø TRANSFORMER PAD ORIENTATION AND CONDUIT INSTALLATION 100 KVA			<b>REVISIONS</b>		
	PAGE: 2 of 2	<b>UTP3</b>		CAD FILE: UTP3	APP: HWH/GW DATE: 1/22/80	SECTION <b>1400</b>

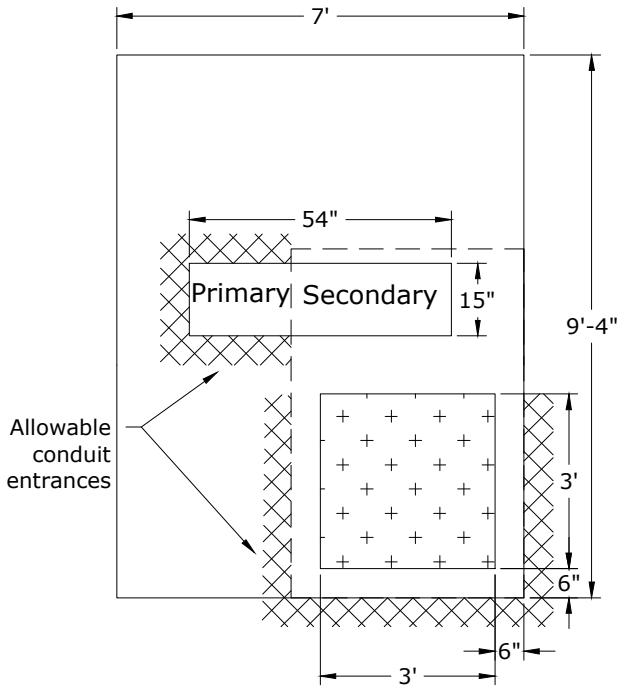


**Notes:**

1. This pad is available from Utility Vault/OldCastle catalog #UTP4 (CPU S/N 2170).
2. This pad is adequate up to 6 conductors per phase. See Std UTP5 - Precast Pad and Vault for 3Ø Transformers - if more conductors are required.
3. See Std UPT6 - 3Ø Transformer Pad Orientation and Conduit Installation - for installation instructions.

Rev. 2 - Updated dimensions, added weight, and removed reinforcement detail.

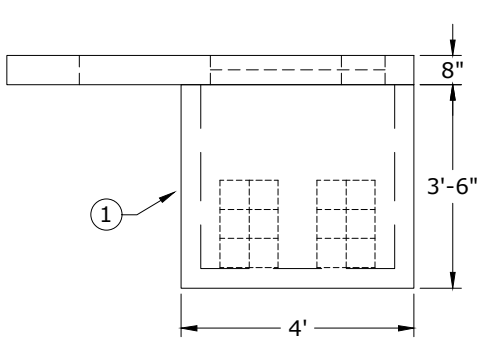
	<b>CONSTRUCTION STANDARDS</b> 3Ø TRANSFORMER PAD 75 to 1500 kVA			<b>REVISIONS</b>		
		DATE	ENGR	OPS		
	0	2/23/00	HWH	MA		
	1	8/17/03	LB	DK		
	2	12/9/20	CM	GM		
PAGE: 1 of 1	<b>UTP4</b>		CAD FILE: UTP4	APP: HWH/GW DATE: 1/22/80	SECTION <b>1400</b>	



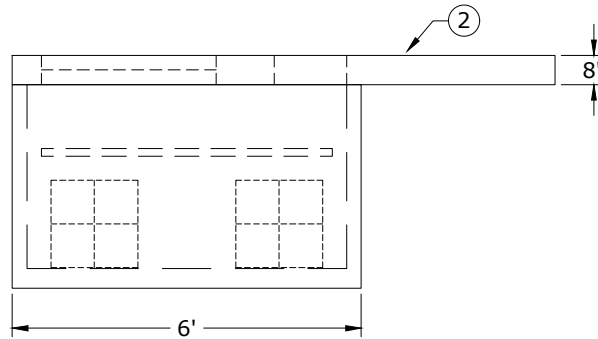
Top View

**Materials:**

1. Vault 6' x 4' x 3'-6" - Oldcastle Part #644LA
2. Pad 7' x 9'-4" x 8" with 15" x 54" opening - Oldcastle Part #0370133.



Front View




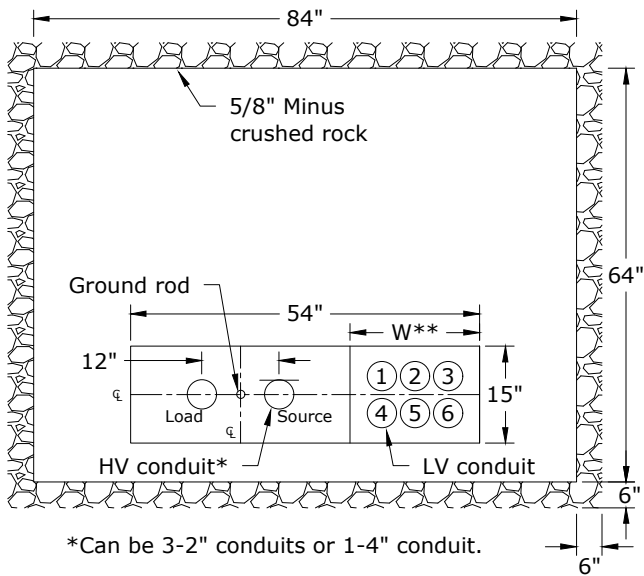
Side View

**Notes:**

1. Locking bolts shall be 1/2" pentahead bolt.
2. Backfill under the vault and transformer pad must be 5/8" minus crushed rock compacted in lifts. The rock layer must be a minimum of 12-inches thick below the pad and vault. Soil stability may require more. The rock base shall extend 6 inches beyond the pad on all four sides.
3. Customer shall install both components shown. All secondary conduits go into 644 vault and enter only in the areas shown. All secondary cables shall have a minimum 10 feet of excess in vault for makeup.
4. All primary conduits shall enter the pad from outside of the vault and only in the locations shown.
5. This pad and vault are required if more than 6 cables per leg are being installed. The maximum number of secondary runs is 8.
6. Install bell ends in conduit in knockouts and grout inside and outside to be even with vault walls.

Rev. 1 - Renamed from UTP4-6, and updated drawing.

	CONSTRUCTION STANDARDS			REVISIONS				
	PRECAST PAD AND VAULT FOR 3Ø TRANSFORMERS			DATE	ENGR	OPS		
PAGE: 1 of 1	UTP5			CAD FILE: UTP5	APP: GW	SECTION	DATE: 12/18/87	1400

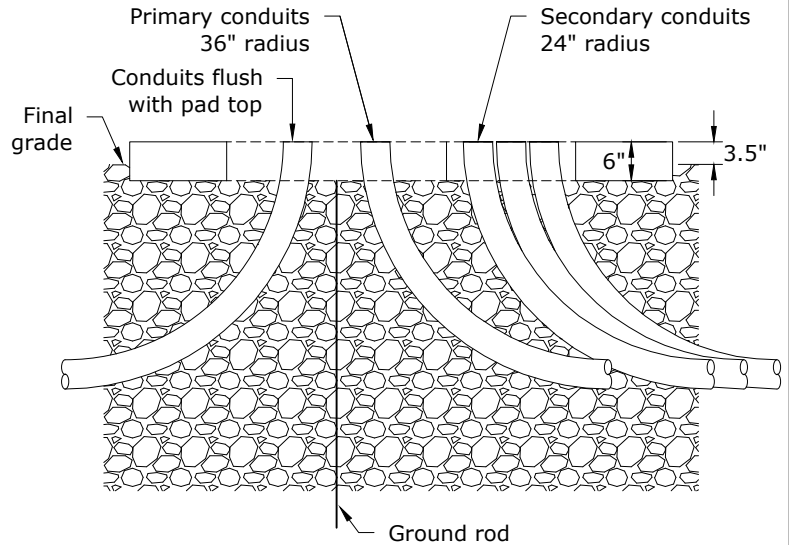


\*Can be 3-2" conduits or 1-4" conduit.

<u>KVA</u>	<u>TYPICAL**</u> <u>"W" INCHES</u>
75 - 300	20
500	22
750 - 1500	28

\*\*Varies by manufacturer

PLAN VIEW



FRONT VIEW

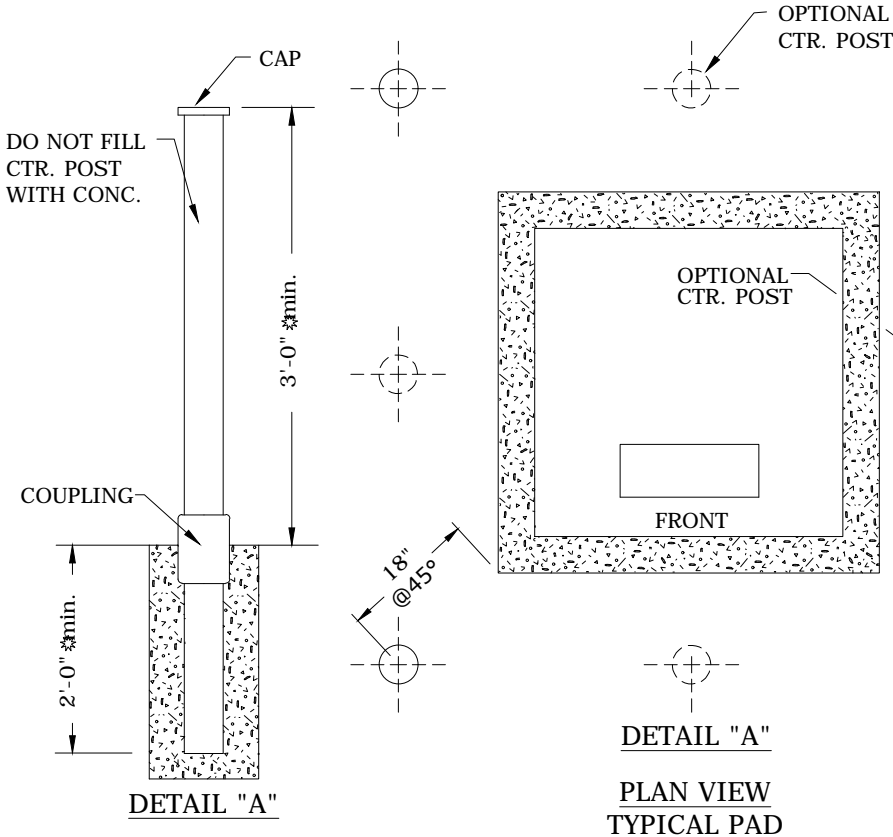
3Ø Padmount Transformer Conduit Orientation

Notes:

1. The concrete pad and all conduits shall be in place and approved by the CPU Inspector prior to transformer installation.
2. Refer to Std UPTC - Padmount Transformer Clearances - and the CPU Commercial Handbook for clearances.
3. See Std UTP4 - 3Ø Transformer Pad 75 to 1500 kVA - for concrete pad details.
4. Backfill under the transformer pad must be 5/8" minus crushed rock compacted in multiple lifts. The rock layer must be a minimum of 12-inches thick below the pad. Soil stability may require more. The rock base shall extend 6 inches beyond the pad on all four sides.

Rev 6. - Clarified LV conduit placement.

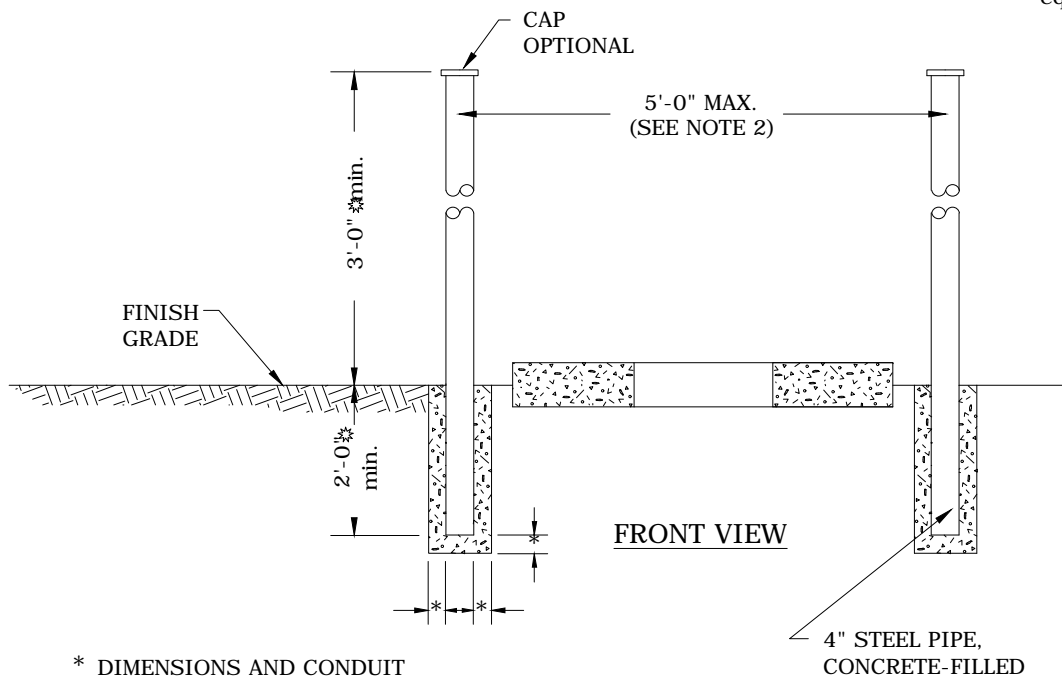
	<b>CONSTRUCTION STANDARDS</b> 3Ø TRANSFORMER PAD ORIENTATION AND CONDUIT INSTALLATION			<b>REVISIONS</b>																		
	PAGE: 1 of 1		<b>UTP6</b>		CAD FILE: UTP6		<table border="1"> <thead> <tr> <th>DATE</th> <th>ENGR</th> <th>OPS</th> </tr> </thead> <tbody> <tr> <td>1/26/04</td> <td>LB</td> <td>AH</td> </tr> <tr> <td>12/29/04</td> <td>LB</td> <td>AH</td> </tr> <tr> <td>12/9/20</td> <td>CM</td> <td>GM</td> </tr> <tr> <td>4/1/24</td> <td>CSB</td> <td></td> </tr> </tbody> </table>	DATE	ENGR	OPS	1/26/04	LB	AH	12/29/04	LB	AH	12/9/20	CM	GM	4/1/24	CSB	
	DATE	ENGR	OPS																			
1/26/04	LB	AH																				
12/29/04	LB	AH																				
12/9/20	CM	GM																				
4/1/24	CSB																					
				APP: DATE: 10/98		SECTION <b>1400</b>																



**Notes:**

1. Typical locations of barriers positioning will vary depending on the following conditions.
  - a. Physical location of equipment with respect to hazards.
  - b. Type of equipment to be protected and accessibility required.
2. If distance between corner barriers exceeds 5 ft., A ctr. post may be required similar to corner post except center post on front side of padmount device may be constructed as det. "A".
3. Project Engineer will determine and indicate number, size, and position of barrier posts.
4. Posts of 4" steel pipe, concrete-filled or substitute of equal strength to be set in concrete. Use same mixture as pad.
5. See WAC 296-46-480 Para. 4, rules and regulations for installing electric wires and equipment.

**DETAIL "A"**  
**PLAN VIEW**  
**TYPICAL PAD**



\* DIMENSIONS AND CONDUIT SIZE TO BE PROVIDED BY PROJECT ENGINEER.

Rev 2: Corrected dimensions on barrier to match Commercial Electric Service Handbook.



**CONSTRUCTION STANDARDS**  
 TYPICAL BARRIER INSTALLATION TO PROTECT PADMOUNTED EQUIPMENT

REVISIONS							
NO.	DATE	ENGR	OPS				
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1	5/30/07	LB	AH				
2	12/14/09	KJP					
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APP:	SECTION						
DATE: 9/94	1400						

PAGE: 1 of 1

**UTP9**

CAD FILE: UTP9



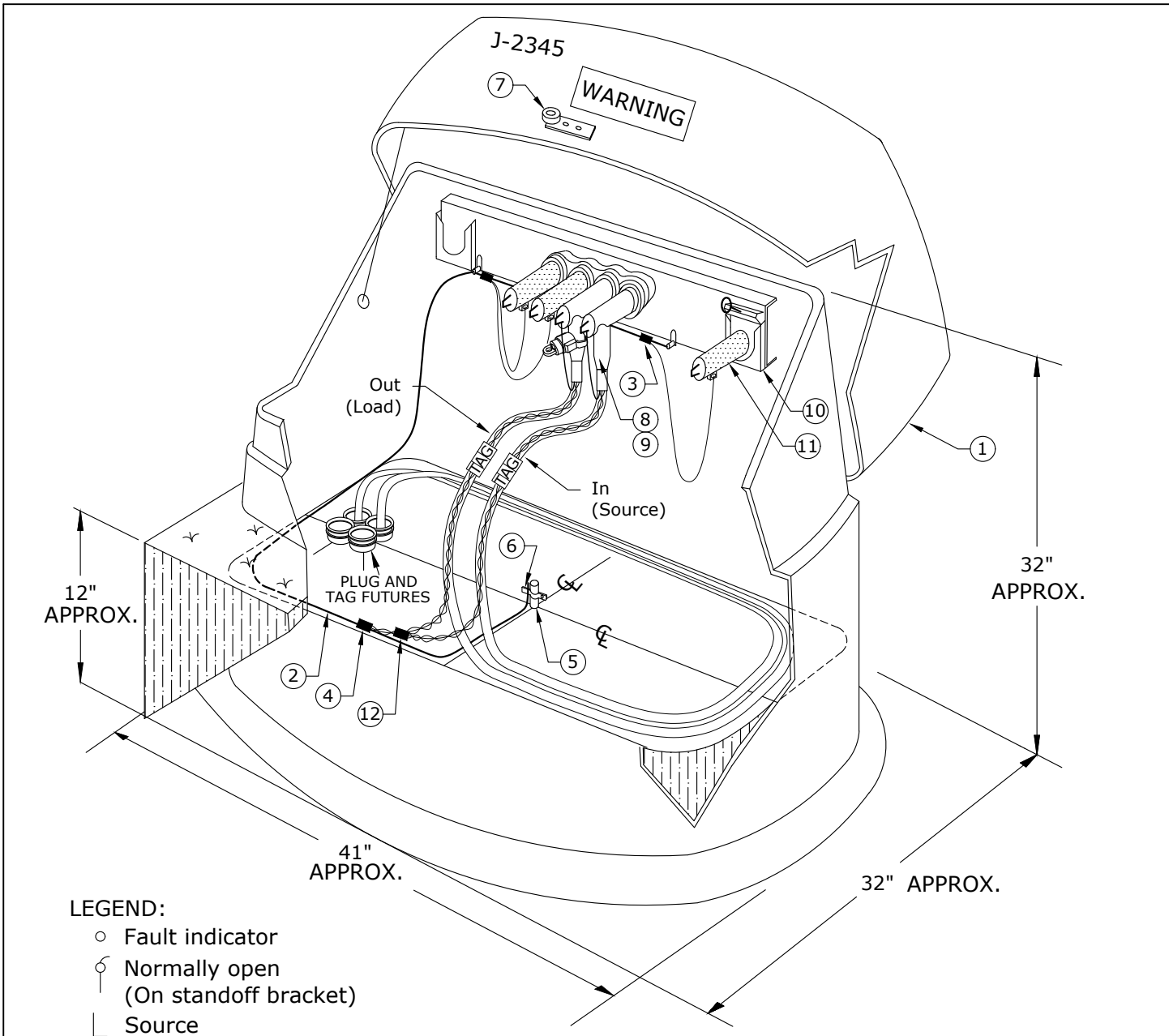
# 1500

## UNDERGROUND J-BOXES & VAULTS

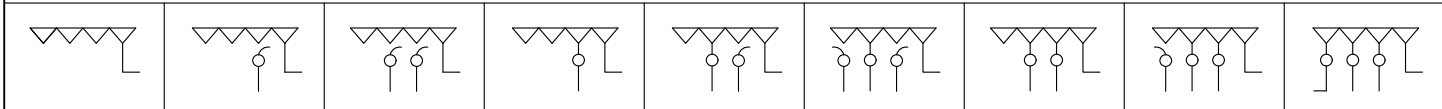
3/14/2023

~	UJ1	1Ø Junction Box 4-Way
~	UJ2	1Ø Junction Box 5-Way
~	UJ3	3Ø Junction Box 4-Way
~	UJ3F	3Ø Junction Box 4-Way Flush-Mount
~	UJ4	3Ø Junction Box 5-Way
~	UJM	Primary Junction Box 1Ø & 3Ø Material List
~	UJMP	Junction Box Marker
~	ULE	Loop Enclosure

<b>N</b>	New Standard
<b>R</b>	Redrawn Standard
<b>C</b>	Changed Standard
<b>~</b>	No Change



Rev. 5 - Added "Plug and Tag Future Conduits" to drawings, added Notes #4-6, and corrected material issue.



ITEM NO.	DESCRIPTION	QTY	S/N
1	Box, Junction, 1Ø, Fiberglass w/LBC4 Installed	1	194
2	Conductor, Cu, #4 Solid, 1C, Bare, Soft-Drawn	15	376
3	Connector, Crimpet, Cu, Run & Tap #6 Sol - #4 Str (4C4)	3	450
4	Connector, Crimpet, Cu, Run #4 Sol - #2 Str, Tap #8 Sol - #4 Str (2C4)	1	454
5	Rod, Ground 5/8" x 8"	1	1124
6	Clamp, Ground Rod, 5/8", Bronze, Small	1	281
7	Lock, Equipment, UG	1	837



**CONSTRUCTION STANDARDS**  
1Ø JUNCTION BOX  
4-WAY

REVISIONS			
△	DATE	ENGR	OPS
2	9/23/04	LB	AH
3	12/29/04	LB	AH
4	4/29/09	CM	AH
5	3/12/20	CM	GM

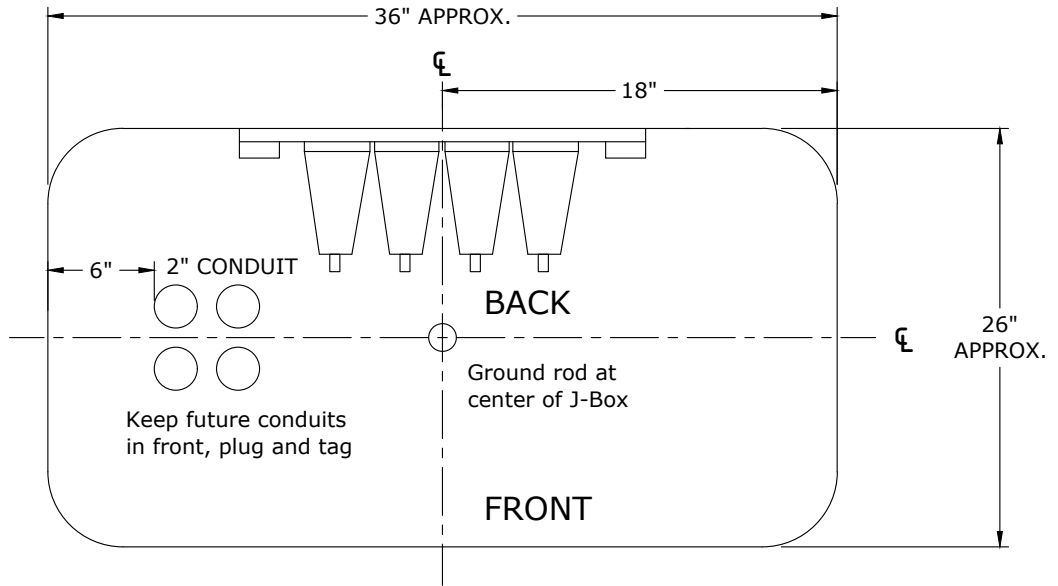
PAGE:  
1 of 2

**UJ1**

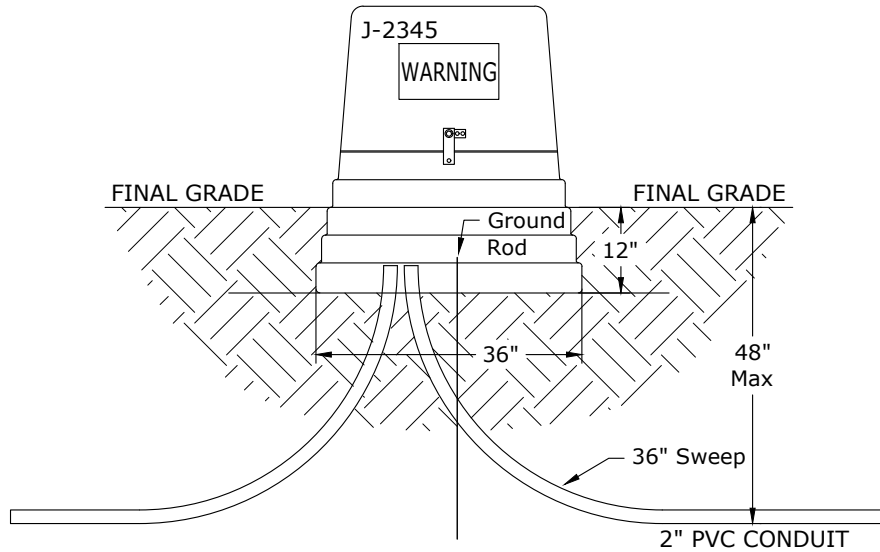
CAD FILE:  
UJ1

APP: HWH/GGW  
DATE: 1/22/80

SECTION  
**1500**



**Plan View 1-Phase J-Box**



**Primary J-Box Conduit Arrangement**

**Notes:**

1. Typical elbow arrangement is shown.
2. Do not put dirt inside junction box. Space is required for cable slack and operating clearance.
3. Leave cable slack for future operations.
4. Future conduits shall be plugged w/  
S/N 2697- 2" plastic conduit plug, or  
S/N 2698- 4" plastic conduit plug.
5. Futures should be tagged with direction and length of conduit. See Std UID2.
6. Proof conduit and install sequentially numbered, 2500 lb mule tape in all futures.

Rev. 5 - Added "Plug and Tag Future Conduits" to drawings, added Notes #4-6, and corrected material issue.



**CONSTRUCTION STANDARDS**

1Ø JUNCTION BOX  
4-WAY

REVISIONS

△	DATE	ENGR	OPS
2	9/23/04	LB	AH
3	12/29/04	LB	AH
4	4/29/09	CM	AH
5	3/12/20	CM	GM

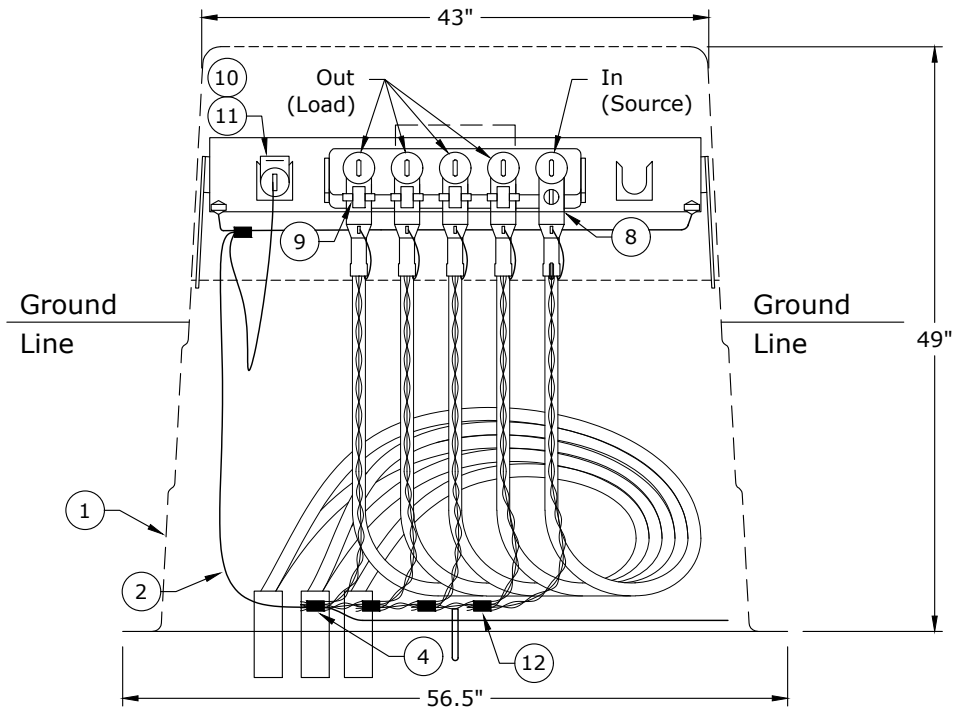
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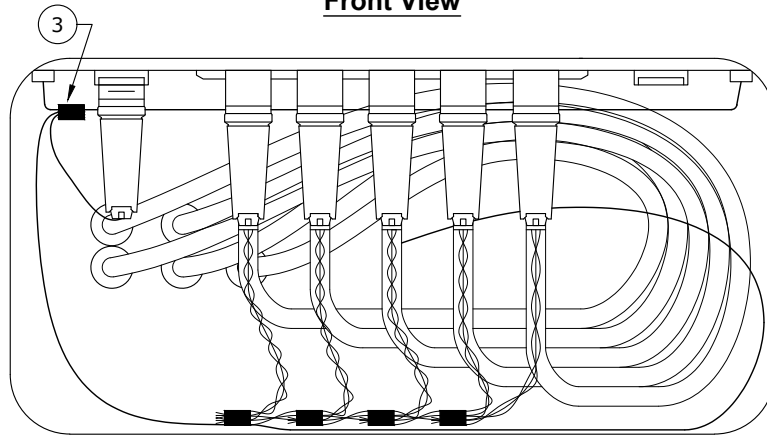
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DATE: 1/22/80

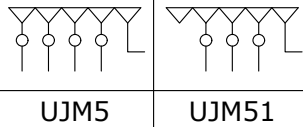
SECTION  
**1500**



**Front View**



**Top View**



**LEGEND:**  
 ○ Fault indicator  
 ┌ Source

ITEM	DESCRIPTION	QTY	S/N
1	Box, Jct., 1Ø, Fiberglass w/ LBC5 and 200A bushing inserts installed	1	2940
2	Conductor, Cu, #4 Sol, 1C, Bare, Soft Drawn	25	376
3	Connector, Crimpet, Cu, Run & Tap #6 Sol - #4 Str (4C4)	1	450
4	Connector, Crimpet, Cu, Run #4 Sol - #2 Str, Tap #8 Sol - #4 Str (2C4)	1	454
5	Rod, Ground 5/8" x 8'	1	1124
6	Clamp, Ground Rod 5/8", Bronze, Small	1	281
7	Lock, Equipment UG	1	837



**CONSTRUCTION STANDARDS**

1Ø JUNCTION BOX  
5-WAY

REVISIONS

△	DATE	ENGR	OPS

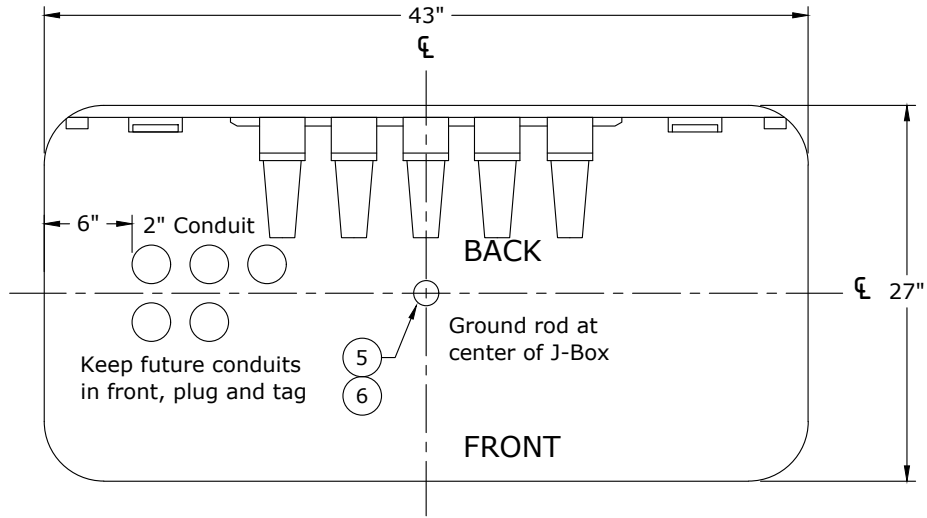
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1 of 2

**UJ2**

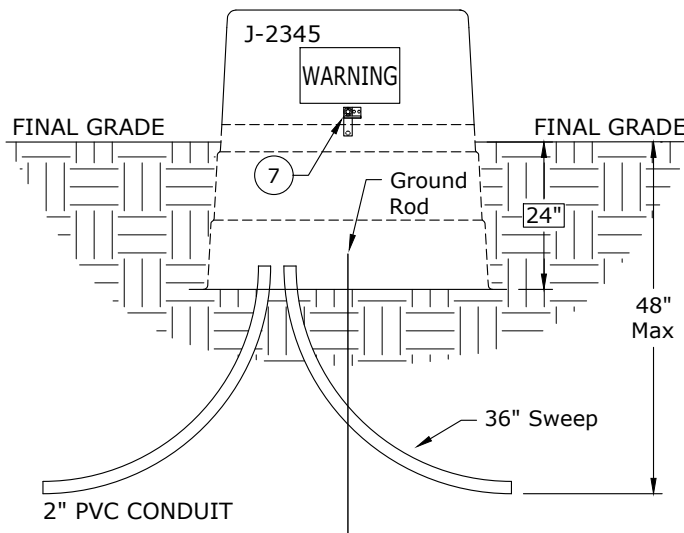
CAD FILE:  
UJ2

APP: CM/GM  
DATE: 3/12/20

SECTION  
**1500**



**Plan View**



**Primary J-Box Conduit Arrangement**

**Notes:**

1. Typical elbow arrangement is shown.
2. Do not put dirt inside junction box. Space is required for cable slack and operating clearance.
3. Leave cable slack for future operations.
4. Future conduits shall be plugged with S/N 2697 - 2" plastic conduit plug, or S/N 2698 - 4" plastic conduit plug.
5. Futures should be tagged with direction and length of conduit. See Std UID2.
6. Proof conduit and install sequentially numbered, 2500 lb mule tape in all futures.



**CONSTRUCTION STANDARDS**

1Ø JUNCTION BOX  
5-WAY

REVISIONS

Δ	DATE	ENGR	OPS

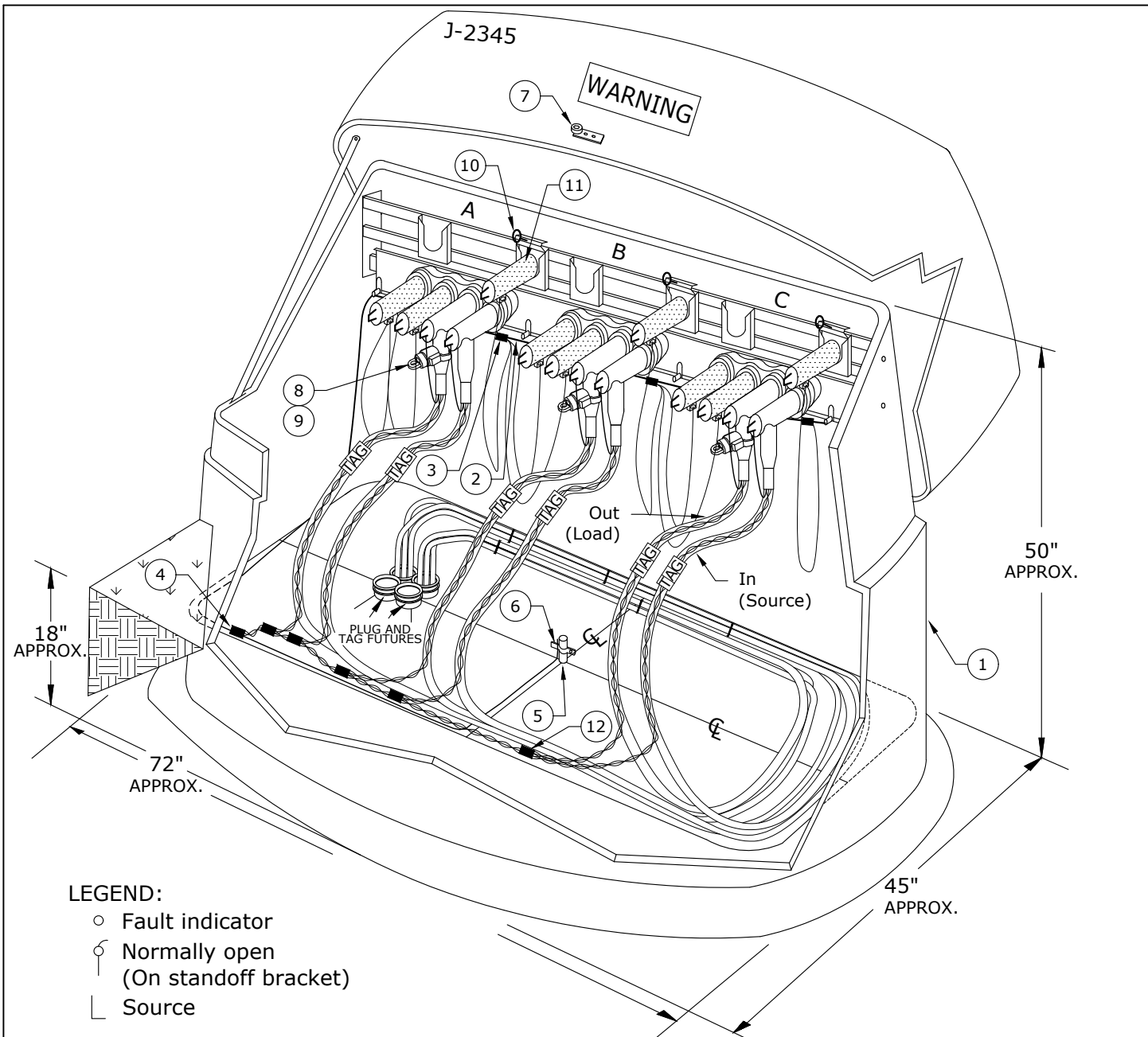
PAGE:  
2 of 2

**UJ2**

CAD FILE:  
UJ2

APP: CM/GM  
DATE: 3/12/20

SECTION  
**1500**



**LEGEND:**

- Fault indicator
- ⊕ Normally open (On standoff bracket)
- └ Source

Rev. 4 - Added "Plug and Tag Future Conduits" to drawings and Notes #4 - #6.

UJM4	UJM41	UJM42	UJM44	UJM45	UJM46	UJM47	UJM48	UJM49

ITEM NO.	DESCRIPTION	QTY	S/N
1	Box, Junction, 3Ø, Fiberglass w/LBC4 Installed, 49" High	1	2047
2	Conductor, Cu, #4 Solid, 1C, Bare, Soft-Drawn	25	376
3	Connector, Crimpet, Cu, Run & Tap #6 Sol - #4 Str (4C4)	5	450
4	Connector, Crimpet, Cu, Run #4 Sol - #2 Str, Tap #8 Sol - #4 Str (2C4)	1	454
5	Rod, Ground 5/8" x 8'	1	1124
6	Clamp, Ground Rod, 5/8", Bronze, Small	1	281
7	Lock, Equipment, UG	1	837



**CONSTRUCTION STANDARDS**  
3Ø JUNCTION BOX  
4-WAY

REVISIONS			
△	DATE	ENGR	OPS
1	9/23/04	LB	AH
2	12/29/04	LB	AH
3	4/29/09	CM	AH
4	3/12/20	CM	GM

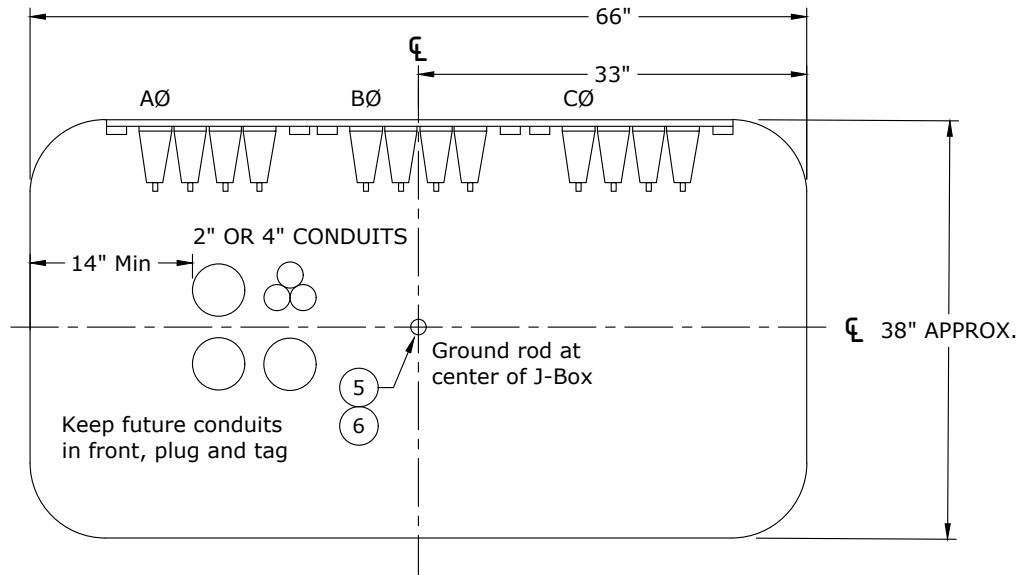
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**UJ3**

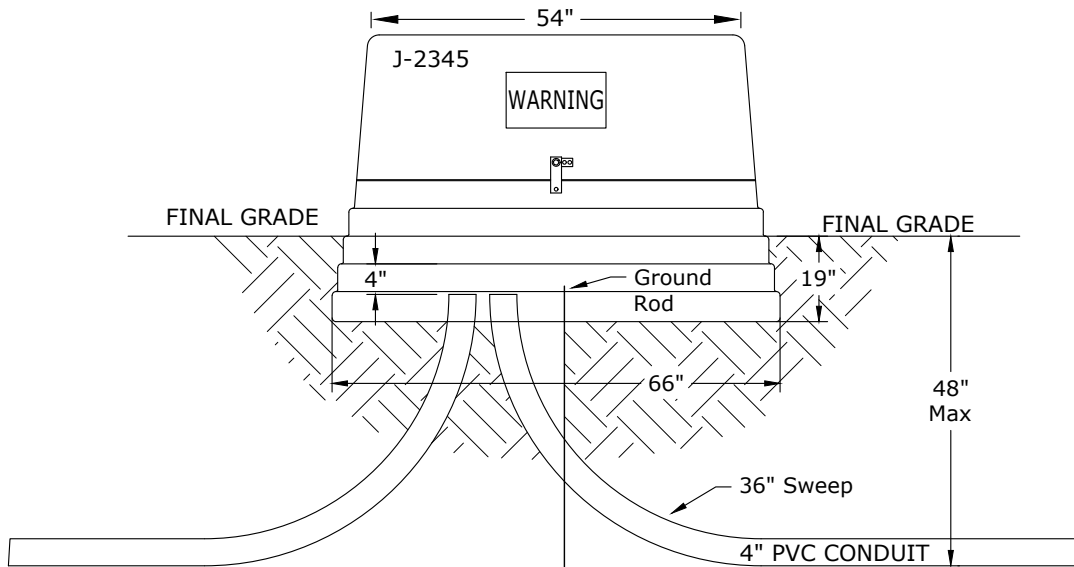
CAD FILE:  
UJ3

APP: HWH/GGW  
DATE: 1/22/80

SECTION  
**1500**



**Plan View 3-Phase J-Box**



**Primary J-Box Conduit Arrangement**

**Notes:**

1. Typical elbow arrangement is shown.
2. Do not put dirt inside junction box. Space is required for cable slack and operating clearance.
3. Leave cable slack for future operations.
4. Future conduits shall be plugged w/  
S/N 2697- 2" plastic conduit plug, or  
S/N 2698- 4" plastic conduit plug.
5. Futures should be tagged with direction and length of conduit. See Std UID2.
6. Proof conduit and install sequentially-numbered, 2500 lb, mule tape in all futures.

Rev. 4 - Added "Plug and Tag Future Conduits" to drawings and Notes #4 - #6.



**CONSTRUCTION STANDARDS**

3Ø JUNCTION BOX  
4-WAY

REVISIONS

△/R	DATE	ENGR	OPS
1	9/23/04	LB	AH
2	12/29/04	LB	AH
3	4/29/09	CM	AH
4	3/12/20	CM	GM

PAGE:  
2 of 2

**UJ3**

CAD FILE:  
UJ3

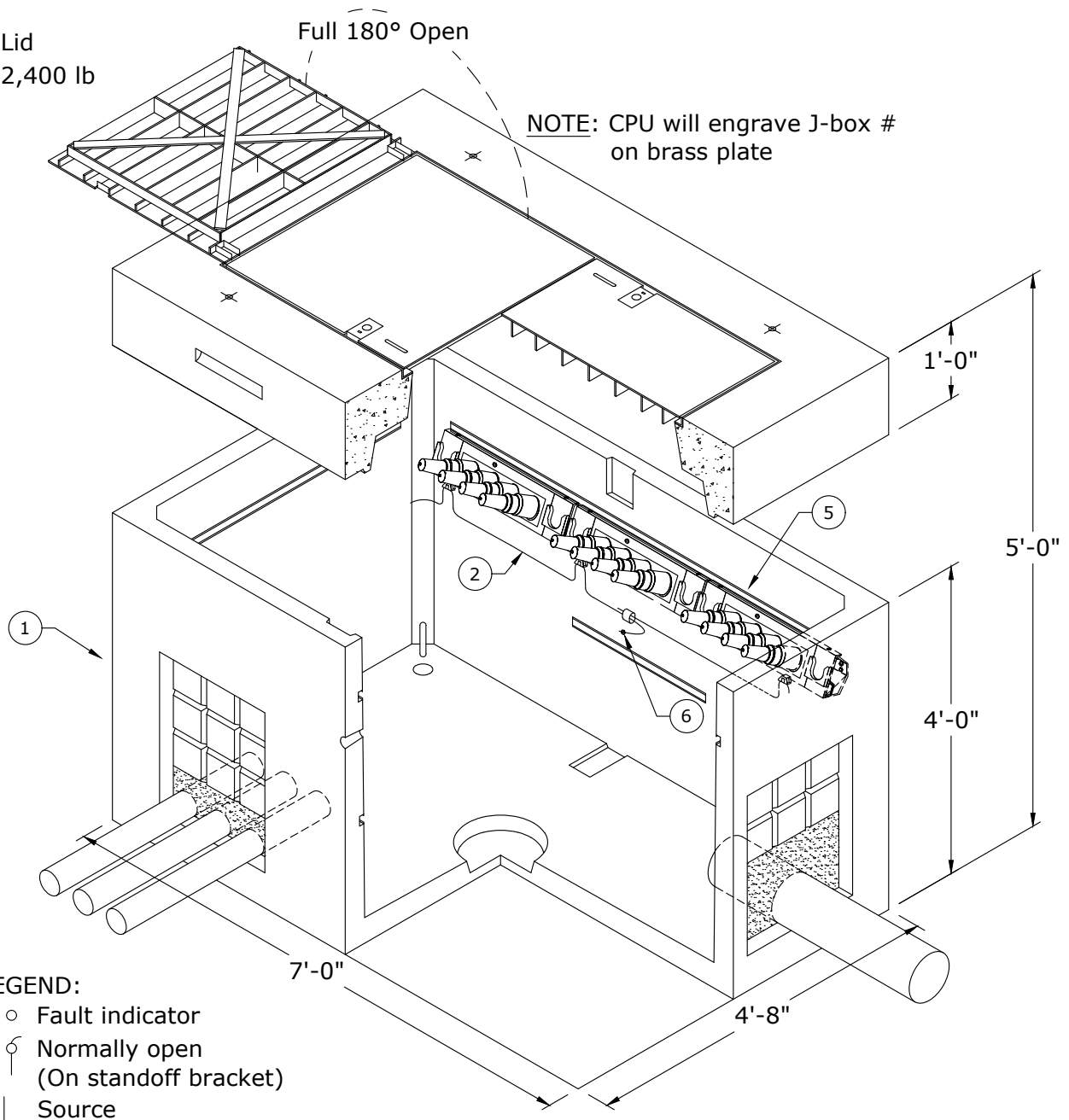
APP: HWH/GGW  
DATE: 1/22/80

SECTION  
**1500**

Lid  
2,400 lb

Full 180° Open

NOTE: CPU will engrave J-box #  
on brass plate



LEGEND:

- Fault indicator
- ⊕ Normally open  
(On standoff bracket)
- └ Source

UJM4	UJM41	UJM42	UJM44	UJM45	UJM46	UJM47	UJM48	UJM49

ITEM NO.	DESCRIPTION	QTY	S/N
1	Vault, 575LA, Flush Mount J-box or EE, Ufer Ground, Non-Slip Lid	1	2722
2	Conductor, Cu, #4 Solid, 1C, Bare, Soft-Drawn	30	376
3	Connector, Crimpet, Cu, Run & Tap #6 Sol - #4 Str	7	450
4	Connector, Crimpet, Cu, Run #4 Sol - #2 Str, Tap #8 Sol - #4 Str	1	454
5	Module, LBC4 UG w/Bracket	3	900
6	Lug, Grounding, #8 Sol - 2/0 Str, 4-way	2	842

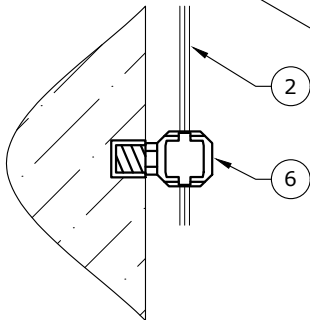
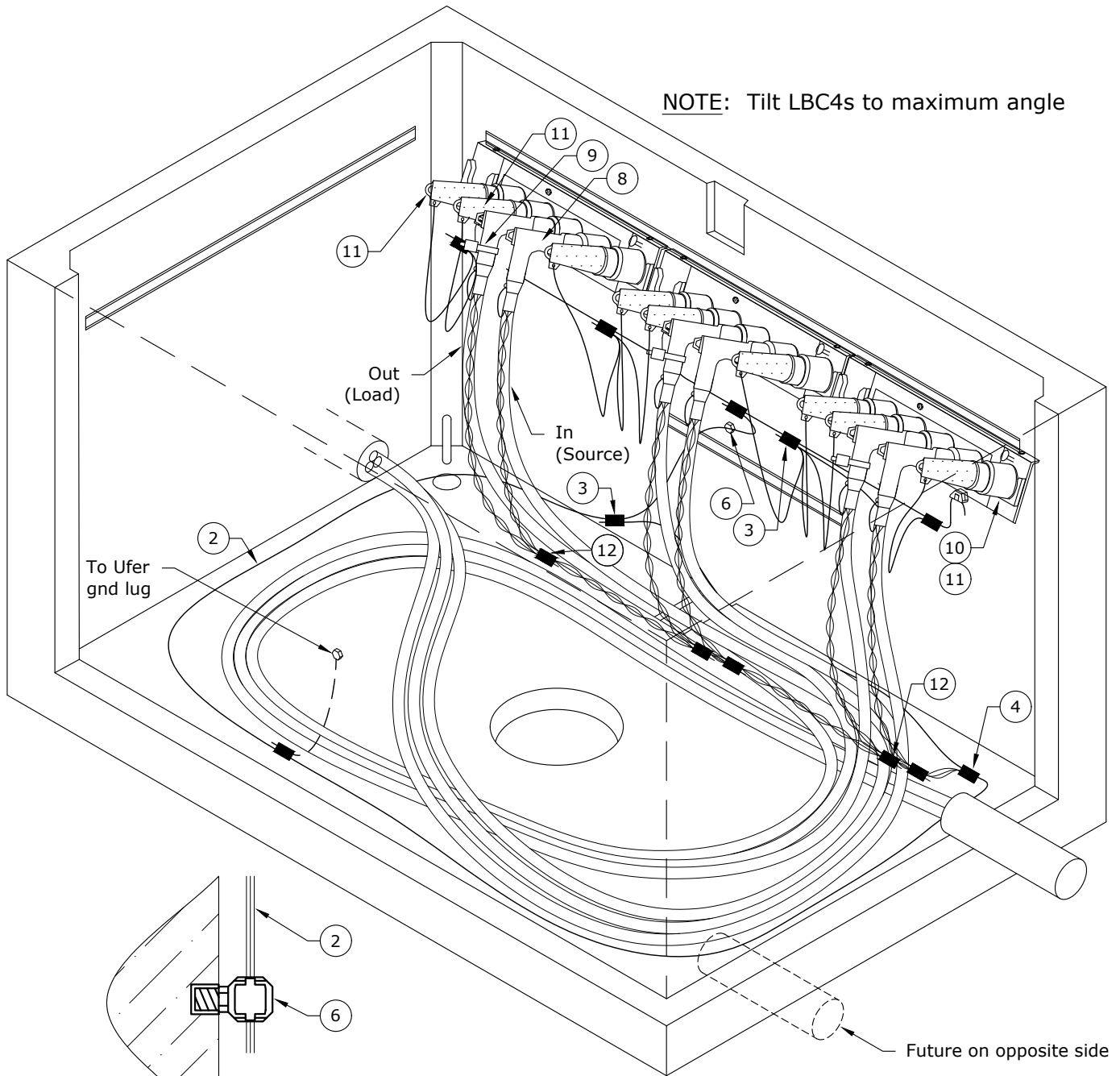


**CONSTRUCTION STANDARDS**  
3Ø JUNCTION BOX  
4-WAY  
FLUSH-MOUNT

REVISIONS			
Δ	DATE	ENGR	OPS
1	12/9/22	CRM	GM



**NOTE:** Tilt LBC4s to maximum angle



**UFER GROUND CONNECTION**

**Notes:**

1. Fully seal knockouts with grout around conduit.
2. Std UJM44 configuration shown in drawing.
3. See Std UJM for cable configurations and material items #8-12.
4. Bring concentrics down on front side of elbows. Leave cable slack for future operations.
5. Future conduits shall be plugged w/  
S/N 2697 - 2" plastic conduit plug, or  
S/N 2698 - 4" plastic conduit plug.
6. Futures should be tagged with direction and length of conduit. See Std UID2.
7. Proof conduit and install sequentially-marked, 2500 lb mule tape in all futures.



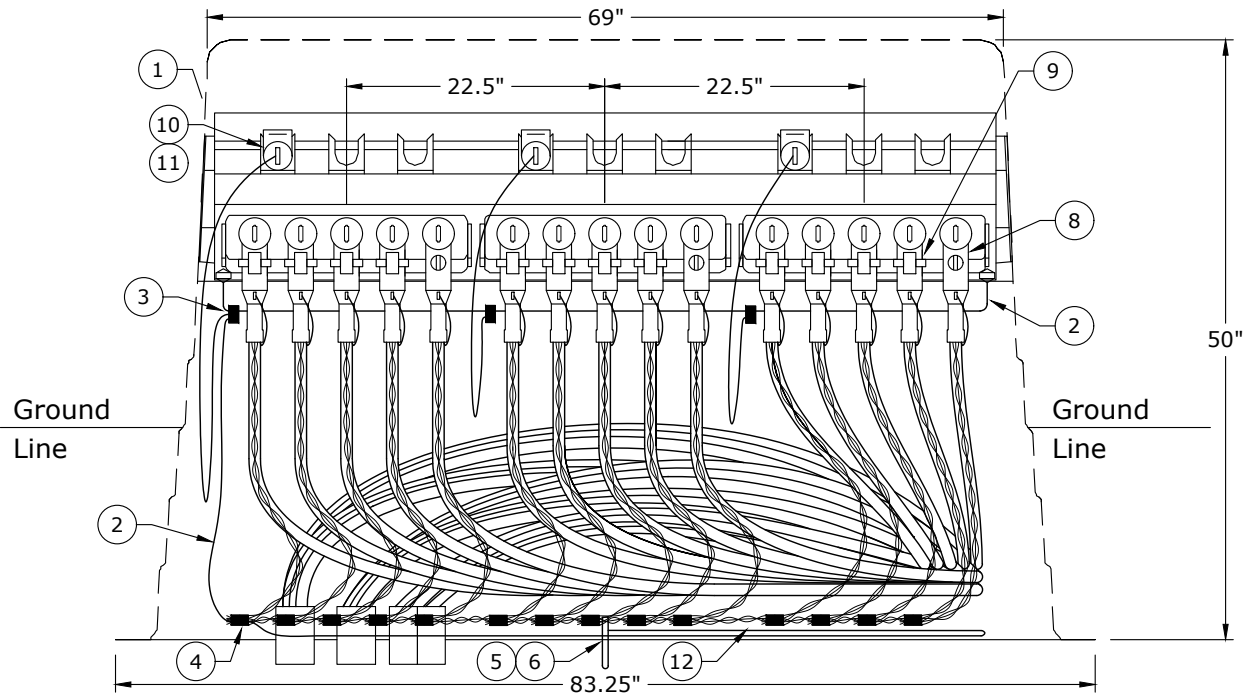
**CONSTRUCTION STANDARDS**  
**30 JUNCTION BOX**  
**4-WAY**  
**FLUSH-MOUNT**

PAGE:  
2 of 2

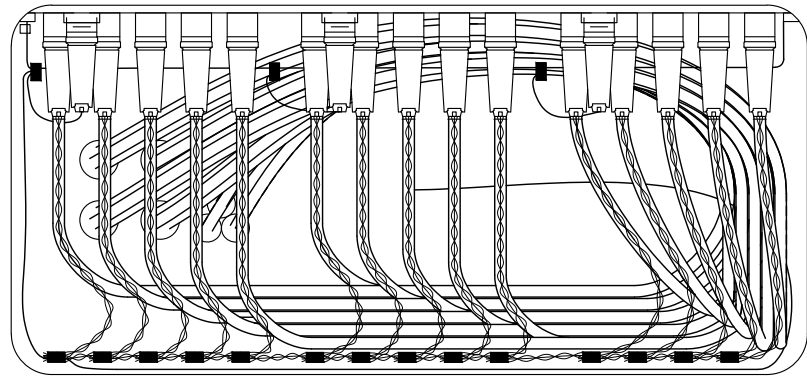
**UJ3F**

CAD FILE:  
UJ3F

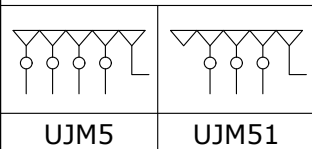
REVISIONS			
DATE	ENGR	OPS	
12/9/22	CRM	GM	
APP:	CM/GM	SECTION	
DATE:	3/12/20	<b>1500</b>	



**Front View**



**Top View**



**LEGEND:**  
 ○ Fault indicator  
 └ Source

ITEM	DESCRIPTION	QTY	S/N
1	Box, Jct., 3ø, Fiberglass w/ LBC5 and 200A bushing inserts installed	1	2941
2	Conductor, Cu, #4 Sol, 1C, Bare, Soft-Drawn	30	376
3	Connector, Crimpet, Cu, Run & Tap #6 Sol - #4 Str (4C4)	3	450
4	Connector, Crimpet, Cu, Run #4 Sol - #2 Str, Tap #8 Sol - #4 Str (2C4)	1	454
5	Rod, Ground, 5/8" x 8'	1	1124
6	Clamp, Ground Rod 5/8", Bronze, Small	1	281
7	Lock, Equipment UG	1	837



**CONSTRUCTION STANDARDS**  
 3Ø JUNCTION BOX  
 5-WAY

REVISIONS			
Δ	DATE	ENGR	OPS

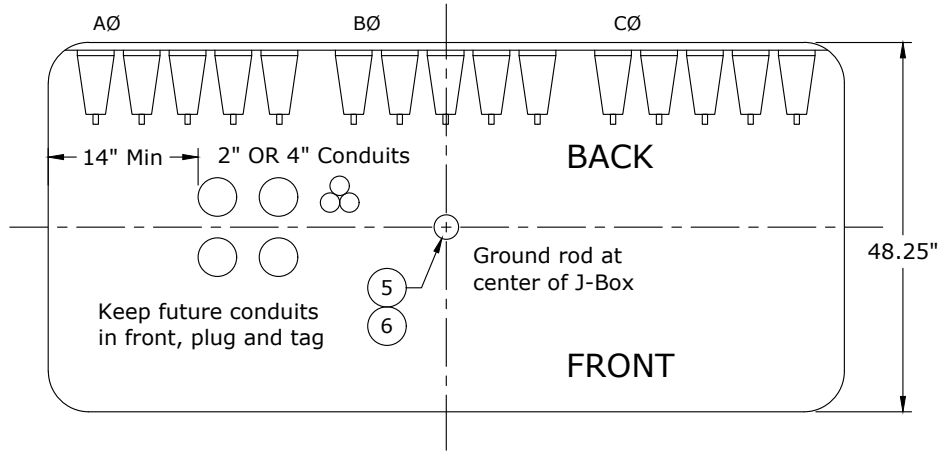
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1 of 2

**UJ4**

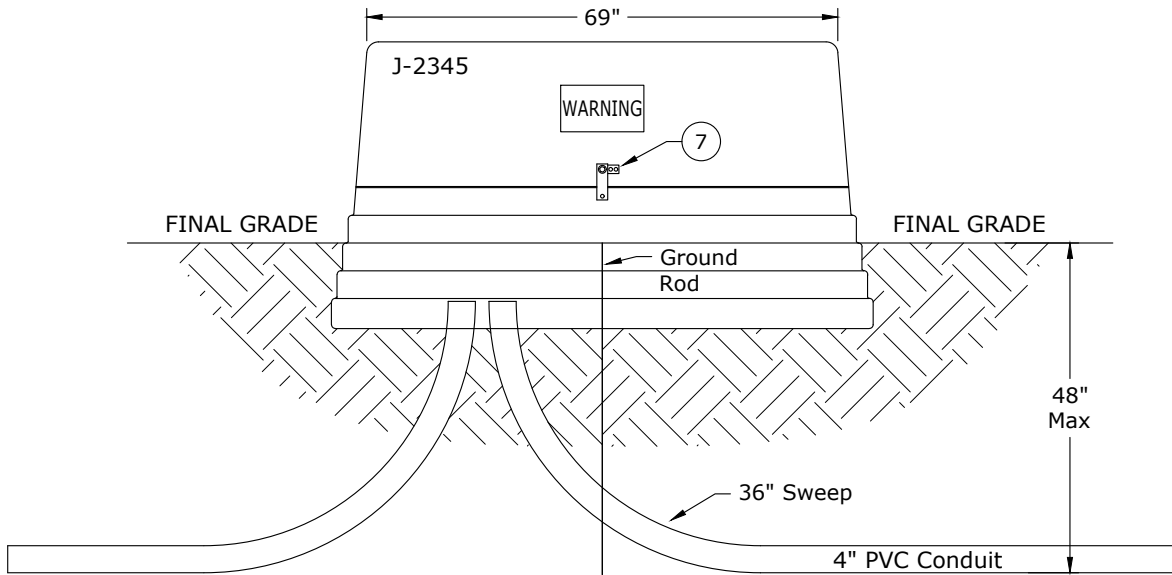
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UJ4

APP: CM/GM  
DATE: 3/12/20

SECTION  
**1500**



**Plan View 3-Phase J-Box**



**Primary J-Box Conduit Arrangement**

**Notes:**

1. Typical elbow arrangement is shown.
2. Do not put dirt inside junction box. Space is required for cable slack and operating clearance.
3. Leave cable slack for future operations.
4. Future conduits shall be plugged with S/N 2697- 2" plastic conduit plug, or S/N 2698- 4" plastic conduit plug.
5. Futures should be tagged with direction and length of conduit. See Std UID2.
6. Proof conduit and install sequentially numbered, 2500 lb mule tape in all futures.



**CONSTRUCTION STANDARDS**

3Ø JUNCTION BOX  
5-WAY

REVISIONS

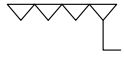
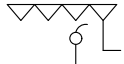
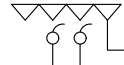
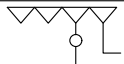
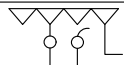
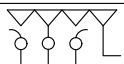
Δ/R	DATE	ENGR	OPS


**LEGEND:**

- Fault indicator
- ⊕ Normally open  
(On standoff bracket)
- └ Source

**The following are for Standards UJ1, UJ3, and UJ3F:**

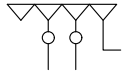
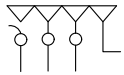
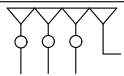
Rev. 4 - Removed LBC4 (installed at factory) from material issue, corrected material issue, and added LBC5 configurations.

ITEM NO.	DESCRIPTION		UJM4	
			QTY.	S/N
8	Elbow, 200A, LB, 1/0, 175 & 220 mil, Test Point, 15kV, w/Jacket Seal		1	1312
10	Bushing, Standoff Insulated, 200A		1	252
11	Cap, Protective Insulated, 200A, 15kV UG		4	265
12	Connector, Crimpet, Cu, Run & Tap #2 Sol - #2 Str (2C2)		1	455
ITEM NO.	DESCRIPTION		UJM41	
			QTY.	S/N
8	Elbow, 200A, LB, 1/0, 175 & 220 mil, Test Point, 15kV, w/Jacket Seal		2	1312
9	Indicator, Fault, UG, 400A, Test Point, Voltage Reset, 1Ø		1	2694
10	Bushing, Standoff Insulated, 200A		1	252
11	Cap, Protective Insulated, 200A, 15kV UG		3	265
12	Connector, Crimpet, Cu, Run & Tap #2 Sol - #2 Str (2C2)		2	455
ITEM NO.	DESCRIPTION		UJM42	
			QTY.	S/N
8	Elbow, 200A, LB, 1/0, 175 & 220 mil, Test Point, 15kV, w/Jacket Seal		3	1312
9	Indicator, Fault, UG, 400A, Test Point, Voltage Reset, 1Ø		2	2694
10	Bushing, Standoff Insulated, 200A		2	252
11	Cap, Protective Insulated, 200A, 15kV UG		3	265
12	Connector, Crimpet, Cu, Run & Tap #2 Sol - #2 Str (2C2)		3	455
ITEM NO.	DESCRIPTION		UJM44	
			QTY.	S/N
8	Elbow, 200A, LB, 1/0, 175 & 220 mil, Test Point, 15kV, w/Jacket Seal		2	1312
9	Indicator, Fault, UG, 400A, Test Point, Voltage Reset, 1Ø		1	2694
10	Bushing, Standoff Insulated, 200A		1	252
11	Cap, Protective Insulated, 200A, 15kV UG		3	265
12	Connector, Crimpet, Cu, Run & Tap #2 Sol - #2 Str (2C2)		2	455
ITEM NO.	DESCRIPTION		UJM45	
			QTY.	S/N
8	Elbow, 200A, LB, 1/0, 175 & 220 mil, Test Point, 15kV, w/Jacket Seal		3	1312
9	Indicator, Fault, UG, 400A, Test Point, Voltage Reset, 1Ø		2	2694
10	Bushing, Standoff Insulated, 200A		1	252
11	Cap, Protective Insulated, 200A, 15kV UG		2	265
12	Connector, Crimpet, Cu, Run & Tap #2 Sol - #2 Str (2C2)		3	455
ITEM NO.	DESCRIPTION		UJM46	
			QTY.	S/N
8	Elbow, 200A, LB, 1/0, 175 & 220 mil, Test Point, 15kV, w/Jacket Seal		4	1312
9	Indicator, Fault, UG, 400A, Test Point, Voltage Reset, 1Ø		3	2694
10	Bushing, Standoff Insulated, 200A		2	252
11	Cap, Protective Insulated, 200A, 15kV UG		2	265
12	Connector, Crimpet, Cu, Run & Tap #2 Sol - #2 Str (2C2)		4	455

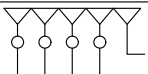
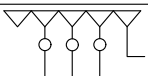
	<h2>CONSTRUCTION STANDARDS</h2> <p>PRIMARY JUNCTION BOX SINGLE AND THREE PHASE MATERIAL LIST</p>		<b>REVISIONS</b>																							
			<table border="1"> <thead> <tr> <th>REV</th> <th>DATE</th> <th>ENGR</th> <th>OPS</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>9/23/04</td> <td>LB</td> <td>AH</td> </tr> <tr> <td>2</td> <td>12/29/04</td> <td>LB</td> <td>AH</td> </tr> <tr> <td>3</td> <td>4/29/09</td> <td>CM</td> <td>AH</td> </tr> <tr> <td>4</td> <td>3/12/20</td> <td>CM</td> <td>GM</td> </tr> </tbody> </table>	REV	DATE	ENGR	OPS	1	9/23/04	LB	AH	2	12/29/04	LB	AH	3	4/29/09	CM	AH	4	3/12/20	CM	GM			
	REV	DATE	ENGR	OPS																						
1	9/23/04	LB	AH																							
2	12/29/04	LB	AH																							
3	4/29/09	CM	AH																							
4	3/12/20	CM	GM																							
PAGE: 1 of 2	<h1>UJM</h1>		CAD FILE: UJM	APP: HWH/GGD DATE: 1/22/80	SECTION <b>1500</b>																					



## The following are for Standards UJ1, UJ3, and UJ3F:

Rev. 4 - Removed LBC4 (installed at factory) from material issue, corrected material issue, and added LBC5 configurations.

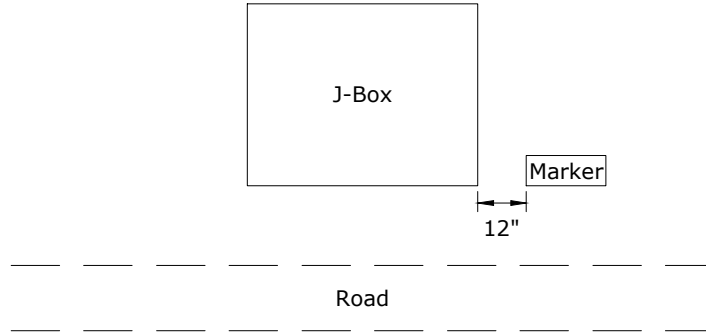
ITEM NO.	DESCRIPTION		UJM47	
			QTY.	S/N
8	Elbow, 200A, LB, 1/0, 175 & 220 mil, Test Point, 15kV, w/Jacket Seal		3	1312
9	Indicator, Fault, UG, 400A, Test Point, Voltage Reset, 1Ø		2	2694
10	Bushing, Standoff Insulated, 200A		1	252
11	Cap, Protective Insulated, 200A, 15kV UG		2	265
12	Connector, Crimpet, Cu, Run & Tap #2 Sol - #2 Str (2C2)		3	455
ITEM NO.	DESCRIPTION		UJM48	
			QTY.	S/N
8	Elbow, 200A, LB, 1/0, 175 & 220 mil, Test Point, 15kV, w/Jacket Seal		4	1312
9	Indicator, Fault, UG, 400A, Test Point, Voltage Reset, 1Ø		3	2694
10	Bushing, Standoff Insulated, 200A		1	252
11	Cap, Protective Insulated, 200A, 15kV UG		1	265
12	Connector, Crimpet, Cu, Run & Tap #2 Sol - #2 Str (2C2)		4	455
ITEM NO.	DESCRIPTION		UJM49	
			QTY.	S/N
8	Elbow, 200A, LB, 1/0, 175 & 220 mil, Test Point, 15kV, w/Jacket Seal		4	1312
9	Indicator, Fault, UG, 400A, Test Point, Voltage Reset, 1Ø		3	2694
10	Bushing, Standoff Insulated, 200A		1	252
11	Cap, Protective Insulated, 200A, 15kV UG		1	265
12	Connector, Crimpet, Cu, Run & Tap #2 Sol - #2 Str (2C2)		4	455

## The following are for Standards UJ2 and UJ4:

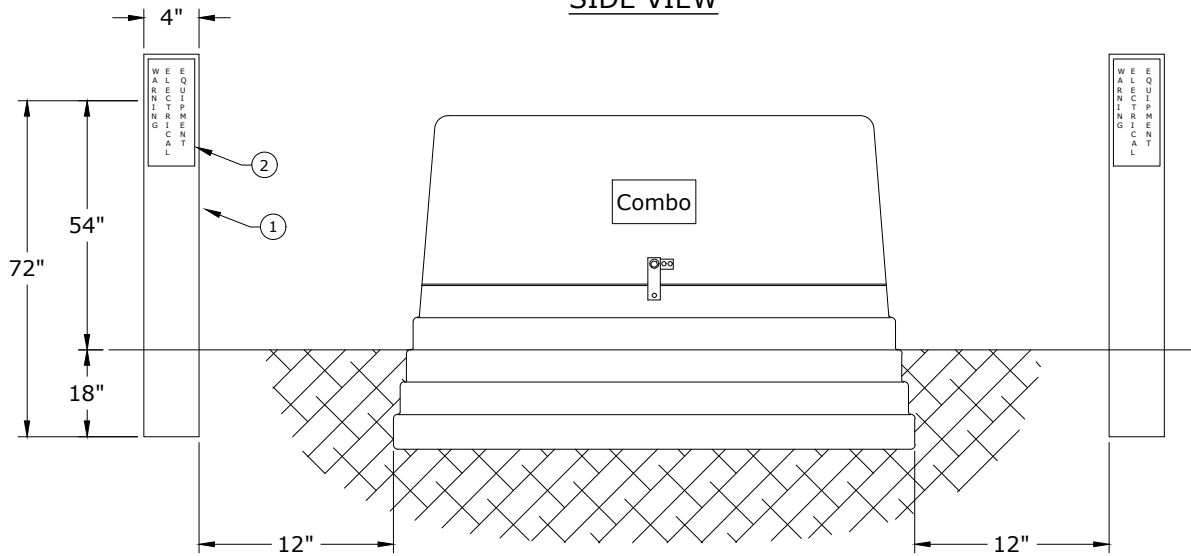
ITEM NO.	DESCRIPTION		UJM5	
			QTY.	S/N
8	Elbow, 200A, LB, 1/0, 175 & 220 mil, Test Point, 15kV, w/Jacket Seal		5	1312
9	Indicator, Fault, UG, 400A, Test Point, Voltage Reset, 1Ø		4	2694
10	Bushing, Standoff Insulated, 200A		1	252
11	Cap, Protective Insulated, 200A, 15kV UG		1	265
12	Connector, Crimpet, Cu, Run & Tap #2 Sol - #2 Str (2C2)		5	455
ITEM NO.	DESCRIPTION		UJM51	
			QTY.	S/N
8	Elbow, 200A, LB, 1/0, 175 & 220 mil, Test Point, 15kV, w/Jacket Seal		4	1312
9	Indicator, Fault, UG, 400A, Test Point, Voltage Reset, 1Ø		3	2694
10	Bushing, Standoff Insulated, 200A		1	252
11	Cap, Protective Insulated, 200A, 15kV UG		2	265
12	Connector, Crimpet, Cu, Run & Tap #2 Sol - #2 Str (2C2)		4	455

	<b>CONSTRUCTION STANDARDS</b>		<b>REVISIONS</b>			
	PRIMARY JUNCTION BOX SINGLE AND THREE PHASE MATERIAL LIST			DATE	ENGR	OPS
			1	9/23/04	LB	AH
		2	12/29/04	LB	AH	
		3	4/29/09	CM	AH	
		4	3/12/20	CM	GM	
PAGE: 2 of 2	<b>UJM</b>		CAD FILE: UJM	APP: HWH/GGD	SECTION <b>1500</b>	
			DATE: 1/22/80			

TOP VIEW



SIDE VIEW



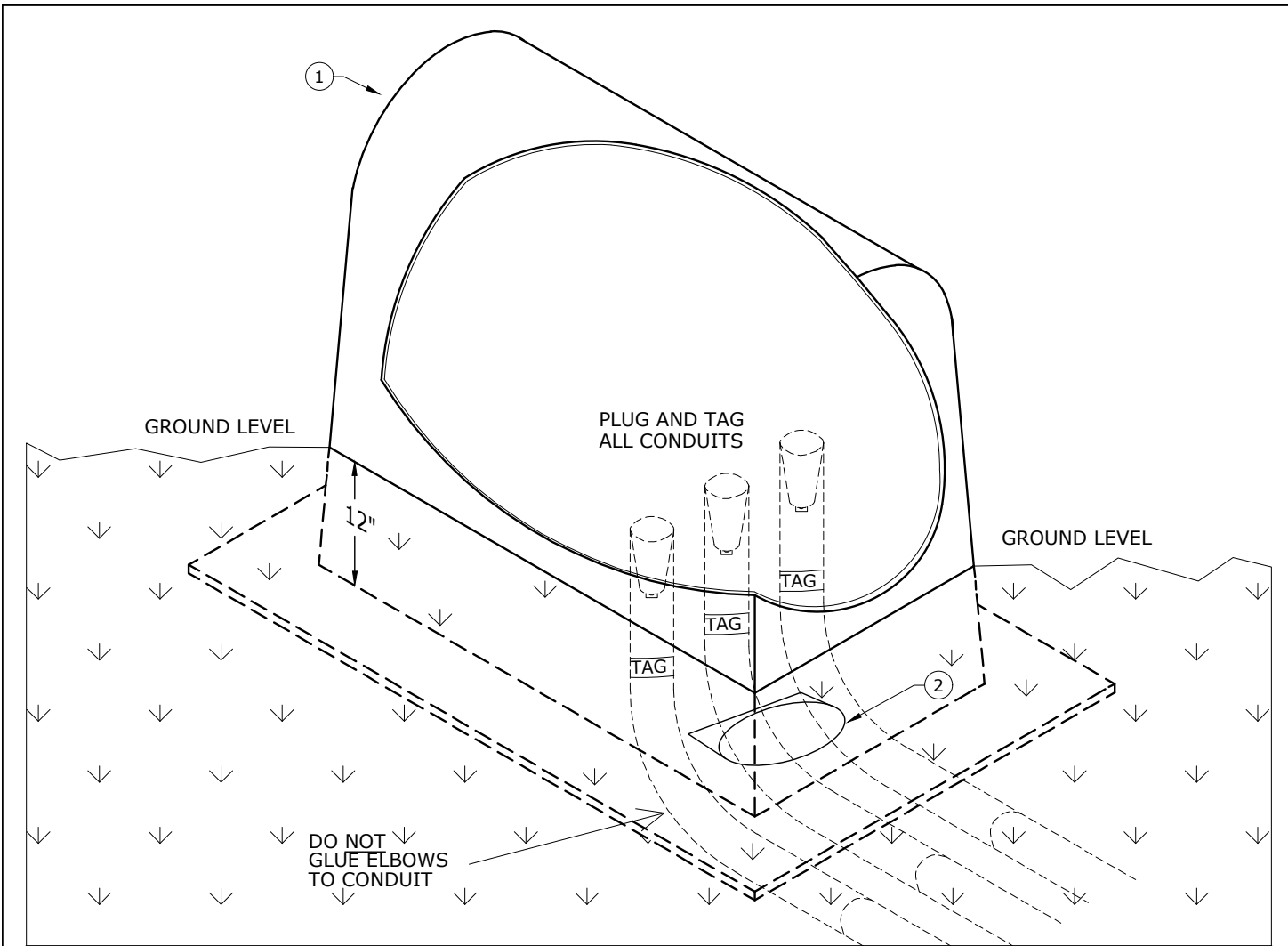
- Notes:**
1. Use marker when view of J-box may be obscured by terrain or foliage.
  2. Call for locates before installing.

ITEM NO.	DESCRIPTION	UJMP	
		QTY.	S/N
1	Marker, Post, Red, 6', Electrical Equipment	2	2896
2	Marker, Post, Marker, Electrical Equipment	2	2893



**CONSTRUCTION STANDARDS**  
JUNCTION BOX MARKER

REVISIONS			
△	DATE	ENGR	OPS




**Notes:**

1. Bury approximately one foot of the enclosure.
2. Conduits shall be buried 42" to 48" deep unless otherwise approved by CPU.
3. The disc marker is to be installed flat with the instructions facing up.
4. The disc should be placed in radius of elbow.
5. CPU has the locator for finding these markers.
6. The markers are reusable.
7. Loop enclosures and marker discs provided by CPU.
8. All conduits shall be plugged w/  
S/N 2697- 2" plastic conduit plug or  
S/N 2698- 4" plastic conduit plug.
9. All conduits should be tagged with direction and length of conduit. See Std. UID2.
10. Proof conduit and install sequentially-numbered, 2500 lb, mule tape in all futures.

Rev. 2 - Added Notes #8, #9, & #10 and added plugs and tags to drawings.

ITEM	DESCRIPTION	QTY	S/N
1	Enclosure, Cable Loop, Fiberglass, 30" x 30" x 8" w/ 5" Flange	1	1821
2	Marker, UG, Disc, Full Range	1	2210

	<b>CONSTRUCTION STANDARDS</b> LOOP ENCLOSURE			<b>REVISIONS</b>															
				<table border="1"> <thead> <tr> <th>DATE</th> <th>ENGR</th> <th>OPS</th> </tr> </thead> <tbody> <tr> <td>9/23/04</td> <td>LB</td> <td>AH</td> </tr> <tr> <td>12/29/04</td> <td>LB</td> <td>AH</td> </tr> <tr> <td>3/12/20</td> <td>CM</td> <td>GM</td> </tr> </tbody> </table>	DATE	ENGR	OPS	9/23/04	LB	AH	12/29/04	LB	AH	3/12/20	CM	GM			
	DATE	ENGR	OPS																
9/23/04	LB	AH																	
12/29/04	LB	AH																	
3/12/20	CM	GM																	
PAGE: 1 of 1	<b>ULE</b>		CAD FILE: ULE	APP: HWH/GGW DATE: 9/94	SECTION <b>1500</b>														

# 1600

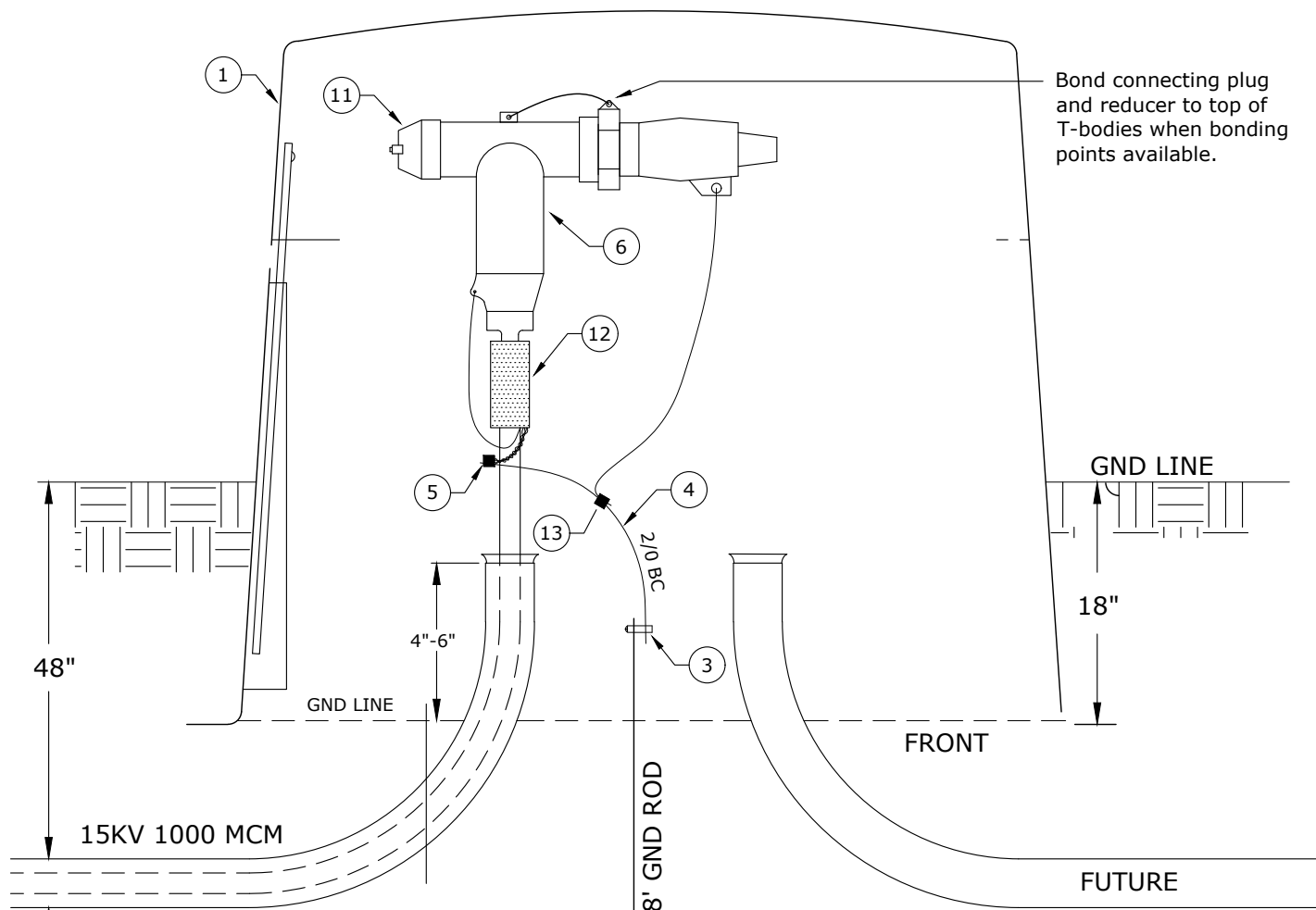
## 1000 MCM CABLE

12/23/2022

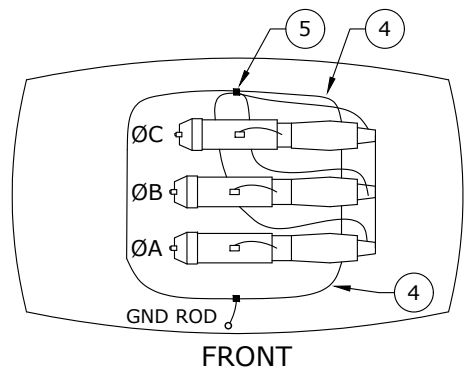
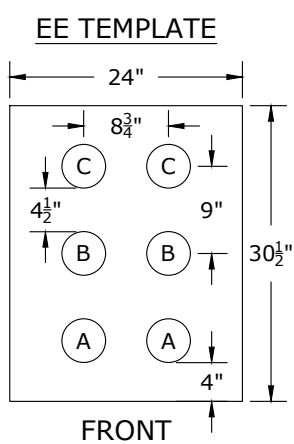
~	UEE1	Elbow Enclosure - Deadend
~	UEE2	Elbow Enclosure - Feed-Through
C	UPR1	1000 MCM Cable Riser
C	UPR2	1000 MCM Power Cable Riser Grounding Detail
C	UPR4	1000 MCM Cable Riser with 3Ø Switch
C	UPR5	1000 MCM Cable Riser with 600 Amp Disconnects
C	UPR6	Parallel 1000 MCM Cable Riser with 3Ø Switch
~	USG1	Padmount Switchgear - 600A Elbow - 1000MCM Cable
~	USG2	Padmount Switchgear Chart
~	USG3	Deadfront Switchgear – 612 Vault Detail
~	USG5	Deadfront Switchgear on 774 Vault For Maintenance Only or When Std USG3 Vault Will Not Fit
~	USG8	Below Grade Switchgear – Use w/ Std USG9
~	USG9	Below Grade Switchgear – Vault Detail – Use w/ Std USG8
~	USP	1000MCM Splice Pit Flush-Mount

<b>N</b>	New Standard
<b>R</b>	Redrawn Standard
<b>C</b>	Changed Standard
<b>~</b>	No Change





Bond connecting plug and reducer to top of T-bodies when bonding points available.



**Notes:**

1. Use EE template when framing conduits and backfilling.
2. Leave enough cable slack to position the elbow near the top of the enclosure lid. This provides room for future operations.
3. Elbows assemble 8-3/4" apart (center to center). Align conduits to avoid cable bending.

Rev. 4 - Corrected material list, torque requirements, and template dimensions.



**CONSTRUCTION STANDARDS**  
ELBOW ENCLOSURE  
DEADEND

REVISIONS			
Δ	DATE	ENGR	OPS
1	9/23/04	LB	AH
2	10/7/05	LB	AH
3	12/14/09	KJP	
4	8/8/22	CRM	GM

PAGE:  
1 of 2

UEE1

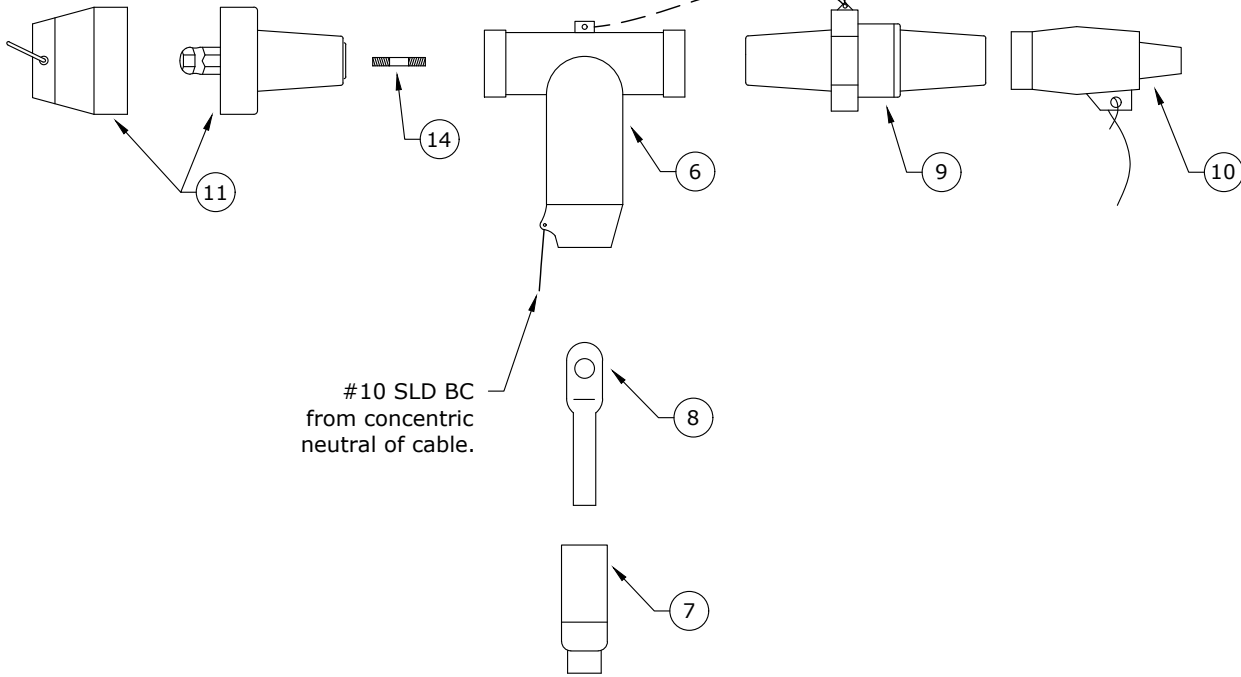
CAD FILE:  
UEE1

APP:  
DATE: 6/90

SECTION  
**1600**

For insulating plug:  
Use torque wrench & tighten  
according to manufacturers  
specifications.

For connector plug, tap plug or tap  
well:  
Use torque wrench and  
tighten according to  
manufacturers specifications.



DEADEND

Rev. 4 - Corrected material list, torque requirements, and template dimensions.

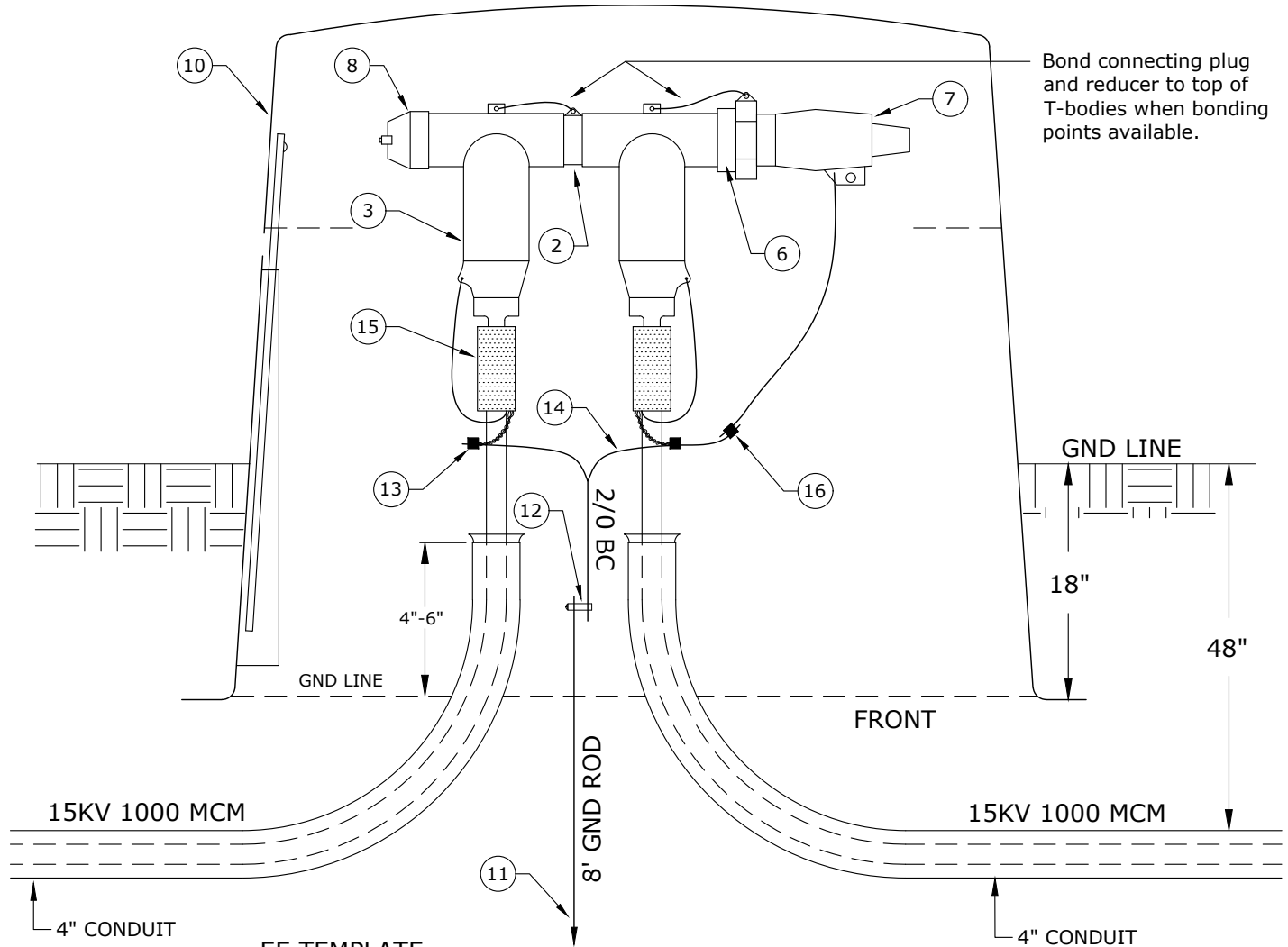
ITEM NO.	DESCRIPTION	UEE1*	
		QTY.	S/N
1	Enclosure, Elbow (EE), Fiberglass, 72"w x 49"h x 44"d	1	2213
2	Rod, Ground, 5/8" x 8'	1	1124
3	Clamp, Ground Rod, 5/8" Bronze, Large	1	282
4	Conductor, OH, Cu, 2/0, 7-Str, Bare, Soft-Drawn, 1C	30 Ft.	379 *
5	Connector, Crimpet, Cu, Run & Tap 3/0 to 4/0 Str	3	460
6	Elbow, 600 Amp, T-body	3	1825
7	Adapter, Cable, 1000 MCM	3	1
8	Contact, Compression, Al, 1000 MCM, Non-Threaded Hole	3	941
9	Plug, Loadbreak, Reducing Tap, 600A-200A	3	1769
10	Cap, Protective Insulated, 200A	3	265
11	Plug, Basic Insulating	3	1824
12	Elbow, Sealing Kit, 1000MCM, 175 & 220 mil	3	2376
13	Connector, Crimpet, Cu, Run & Tap 1/0 to 2/0 Str	1	457
14	Stud, Al, 600A T-body To Reducer Plug	3	2704 *



**CONSTRUCTION STANDARDS**  
ELBOW ENCLOSURE  
DEADEND

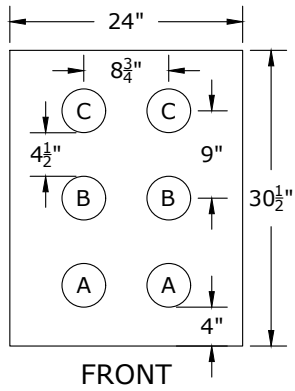
REVISIONS

REV	DATE	ENGR	OPS
1	9/23/04	LB	AH
2	10/7/05	LB	AH
3	12/14/09	KJP	
4	8/8/22	CRM	GM

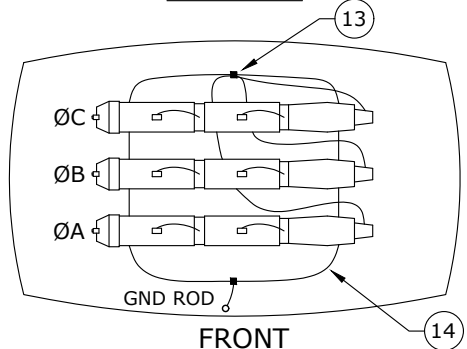


Bond connecting plug and reducer to top of T-bodies when bonding points available.

EE TEMPLATE



TOP VIEW



Notes:

1. Use EE template when framing conduits and backfilling.
2. Leave enough cable slack to position the elbow near the top of the enclosure lid. This provides room for future operations.
3. Elbows assemble 8-3/4" apart (center to center). Align conduits to avoid cable bending.

Rev. 3 - Corrected material list, torque requirements, and template dimensions.



**CONSTRUCTION STANDARDS**  
ELBOW ENCLOSURE  
FEED-THROUGH

REVISIONS			
REV	DATE	ENGR	OPS
1	10/7/05	LB	AH
2	8/25/09	CM	AH
3	8/8/22	CRM	GM

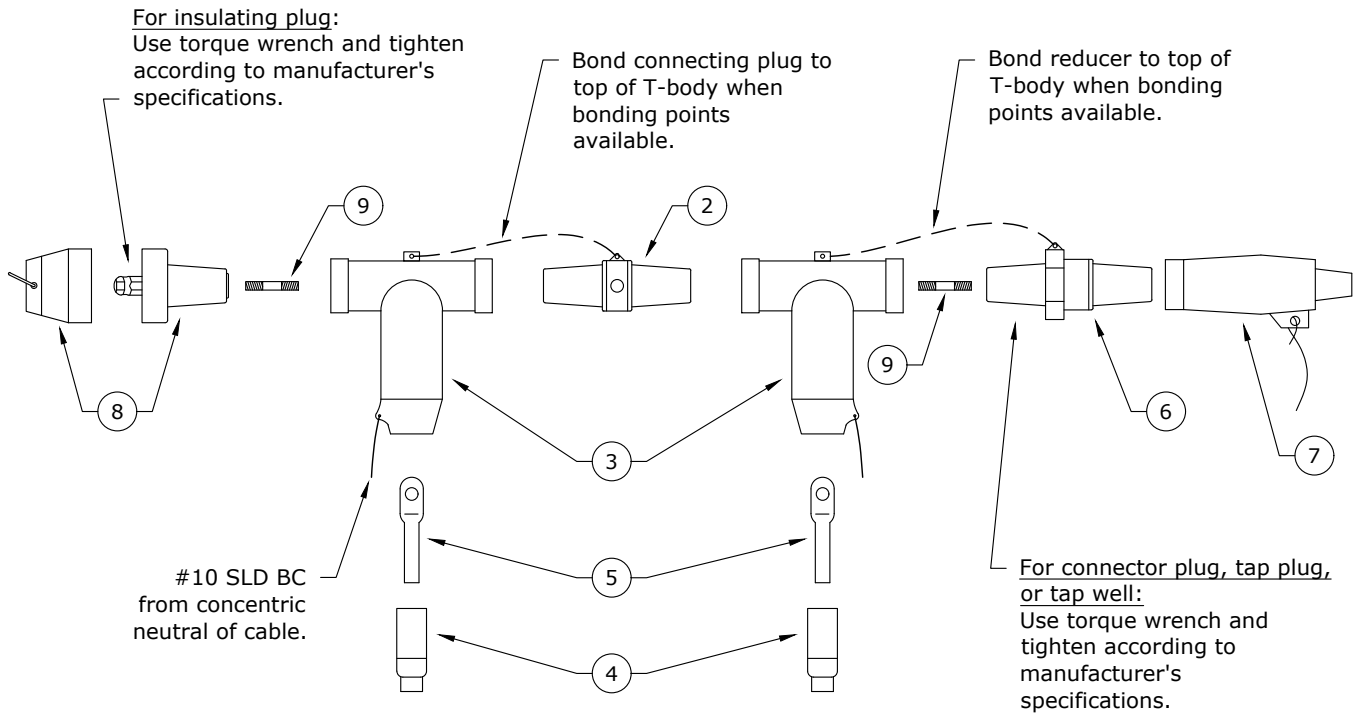
PAGE:  
1 of 2

UEE2

CAD FILE:  
UEE2

APP: LB/AH  
DATE: 9/23/04

SECTION  
1600



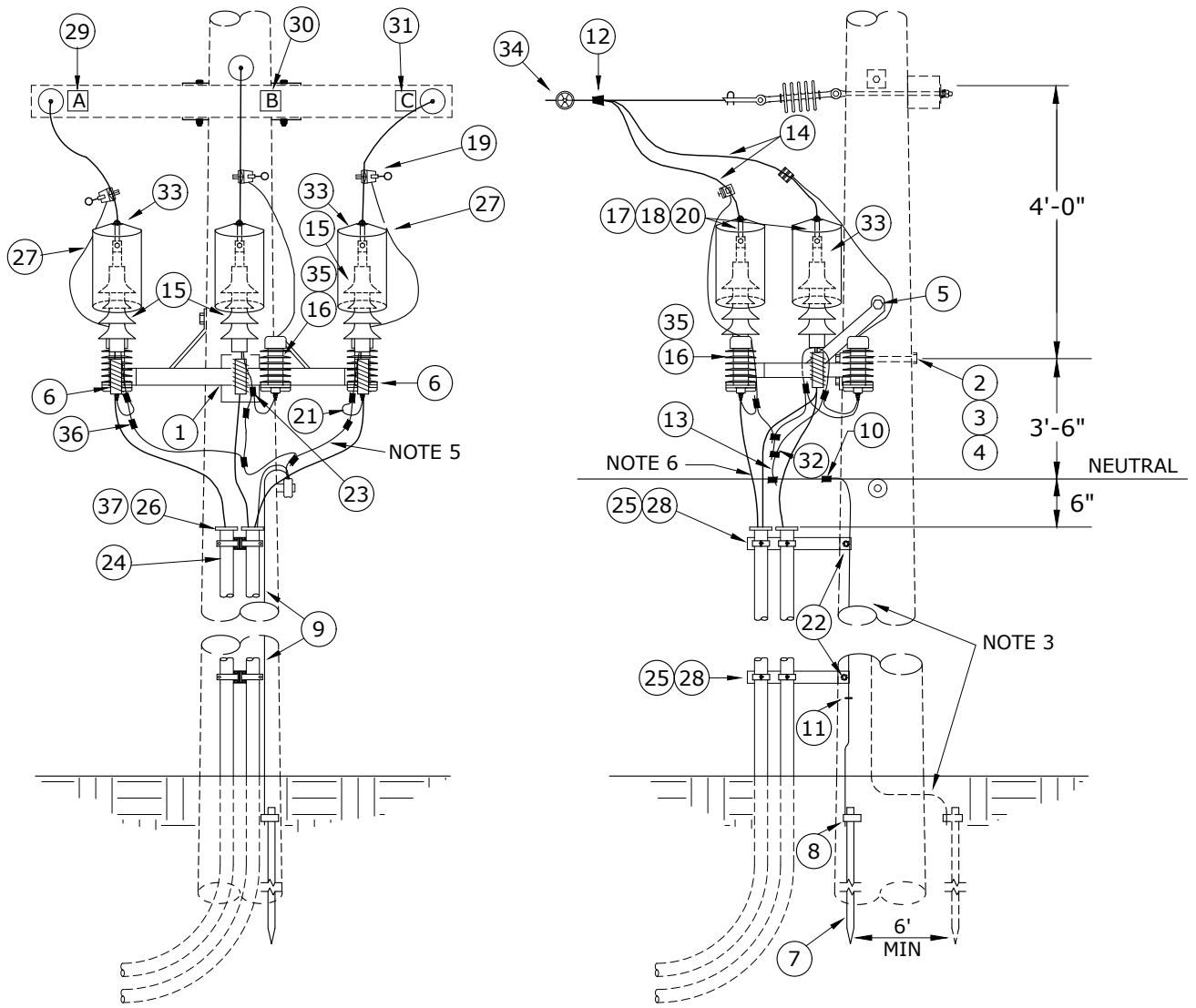
Rev. 3 - Corrected material list, torque requirements, and template dimensions.

ITEM NO.	DESCRIPTION	UEE2	
		QTY.	S/N
1	Elbow, 600A, NLB, Test Point, Kit for UEE2	3	2693
	<i>Each Kit Consists Of: (Items #2 Thru #9)</i>		
2	Plug, Connecting, 600A	1	1723
3	Elbow, 600A, T-body	2	1825
4	Adapter, Cable, 1000MCM	2	1
5	Contact, Compression, Al, 1000 MCM, Non-threaded Hole	2	941
6	Plug, Loadbreak, Reducing Tap, 600A-200A	1	1769
7	Cap, Protective Insulated, 200A	1	265
8	Plug, Basic Insulating	1	1824
9	Stud, Al, 600A T-body To Reducer Plug	2	2704 *
10	Enclosure, Elbow (EE), Fiberglass, 72"w x 49"h x 44"d	1	2213
11	Rod, Ground, 5/8" x 8'	1	1124
12	Clamp, Ground Rod, 5/8" Bronze, Large	1	282
13	Connector, Crimpet, Cu, Run & Tap 3/0 to 4/0	6	460
14	Conductor, OH, Cu, 2/0, 7-Str, Bare, Soft-Drawn, 1C	30 ft	379
15	Elbow, Sealing Kit, 1000MCM, 175 & 220 mil	6	2376
16	Connector, Crimpet, Cu, Run & Tap 1/0 to 2/0 Str	1	457



**CONSTRUCTION STANDARDS**  
ELBOW ENCLOSURE  
FEED-THROUGH

REVISIONS			
DATE	ENGR	OPS	
10/7/05	LB	AH	
8/25/09	CM	AH	
8/8/22	CRM	GM	



**Notes:**

1. UPR4 is the preferred standard. This standard is to be used for short dips such as airport dips or if other switches are nearby for isolation. See UPR4 for the recommended construction.
2. See UPR2 for grounding details.
3. All ground wire is #4 Cu equivalent covered copper-clad steel.
4. Static wire ground when required. **DO NOT** connect to neutral. See N2 for details. Engineer must call for static wire ground separately.
5. Avoid sharp turns in the arrester grounds and primary leads.
6. 2/0 CU from terminators to overhead neutral for all 1000MCM construction.

Rev 3 - Removed extra 2/0 Cu neutral for substation get-a-ways, changed to copper-clad steel grounds & added support grips and 4/0-2/0 crimpets.



## CONSTRUCTION STANDARDS

### 1000 MCM CABLE RISER

**REVISIONS**

R	DATE	ENGR	OPS
0	2/23/00	HWH	MA
1	12/29/04	LB	AH
2	1/13/10	CM	AH
3	12/9/22	CRM	GM

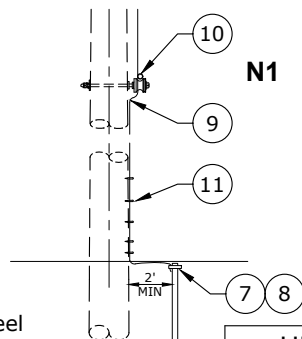
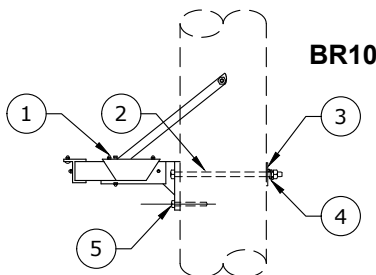
PAGE:  
1 of 2

# UPR1

CAD FILE:  
UPR1

APP:  
DATE: 6/90

SECTION  
**1600**



Rev 3 - Removed extra 2/0 Cu neutral for substation get-a-ways, changed to copper-clad steel grounds & added support grips and 4/0-2/0 crimpets.

ITEM NO.	DESCRIPTION	UPR1	
		BR10	
		QTY.	S/N
1	Bracket, Terminator, Mount, 48", 1000MCM	1	2842 *
2	Bolt, Machine, 5/8" x 14", Galv, 12,400 lb Ultimate Tensile	1	156
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole, Galv	1	1392
4	Washer, Lock, Spring, Double Coil, Galv, 5/8"	1	2217
5	Screw, Lag, 1/2" x 4 1/2", Twist Drive, Drive Point	3	1132
6	Support, Cable, 1000MCM	3	2229
ITEM NO.	DESCRIPTION	N1	
		QTY.	S/N
7	Rod, Ground, 5/8" x 8'	1	1124
8	Clamp, Ground Rod, 5/8", Small, Bronze	1	281
9	Conductor, Copper-Clad Steel, #4 Cu Equivalent, 40% Annealed, Black Jacket with Green Stripe	40*	1512*
10	Connector, H-Tap, Al/Cu, Run #2-2/0 Str - Tap #6-#1 Str	1	413
11	Staple, Ground Wire, Barbed, Galvanized, 1 1/2"	24	2707
ITEM NO.	DESCRIPTION	ADDITIONAL MATERIAL	
		QTY.	S/N
12	Connector, Tap, Wedge, Run and Tap 336 ACSR to 397 AAC	3	2501
13	Conductor, OH, 600v, Cu, 2/0, 19-Str, XLPE, 80 mil, Soft-Drawn, 1C, RHW-2	30	381
14	Conductor, OH, AAC, 397.5, 19-Str, Bare, 1C, Canna	30	367
15	Terminator, 15kV, Cold-Shrink JCN, 1000MCM	3	2225
16	Arrester, Surge, 9 kV, MOV, Riser Pole	3	58
17	Connector, Compression, Lug, 2-hole, 336 ACSR & 397 AAC	3	438
18	Connector, Compression, Lug, Al/Cu, Tin-Plated, 1000MCM to NEMA 2-Hole	3	1501
19	Clamp, Hot Line, GP1530, Line #6 Sol - 400MCM, Tap #6 Sol - 4/0 Str Cu Only	3	284
20	Bolt, 1/2" x 2", w/ Flat and Belleville Washers, Assembly	6	1389
21	Conductor, OH, Cu, #4 Solid, Bare, Soft-Drawn, 1C	10	376
22	Screw, Lag, 1/2" x 4 1/2", Twist Drive, Drive Point	6	1132
23	Connector, Crimpet, Cu, Run 3/0 - 4/0 Str, Tap #6 Sol - #2 Str	3	458 *
24	Conduit, 4" x 10', Sch 80	90	2203
25	Clamp, Standoff Bracket, 4"	9	297
26	End Bell, 4", Sch 40, Long	3	2204
27	Conductor, OH, 600v, Cu, #2, 7-Str, XLPE, 60 mil, Soft-Drawn, 1C, RHW-2	15	393
28	Bracket, Standoff, 15" w/ Stop and Brace	3	227
29	Tag, Phase A	1	1280
30	Tag, Phase B	1	1281
31	Tag, Phase C	1	1282
32	Connector, Crimpet, Cu, Run and Tap 1/0 - 2/0 Str	2 *	457
33	Guard, Wildlife, Large, OH/UG Terminators	3	1676
34	Indicator, Fault, 400A, OH, Beacon w/ Signal Flag, Electric Field Reset	3	2558
35	Guard, Wildlife, Polymer Arrester	3	2583
36	Connector, Crimpet, Cu, Run 3/0 Str - 250 Str, Tap #6 Sol - 2/0 Str	3	459 *
37	Grip, Support, 4" Conduit, 1000MCM (1.625" to 2.5")	3	2521 *



## CONSTRUCTION STANDARDS

1000 MCM CABLE RISER

### REVISIONS

Δ	DATE	ENGR	OPS
0	2/23/00	HWH	MA
1	12/29/04	LB	AH
2	1/13/10	CM	AH
3	12/9/22	CRM	GM

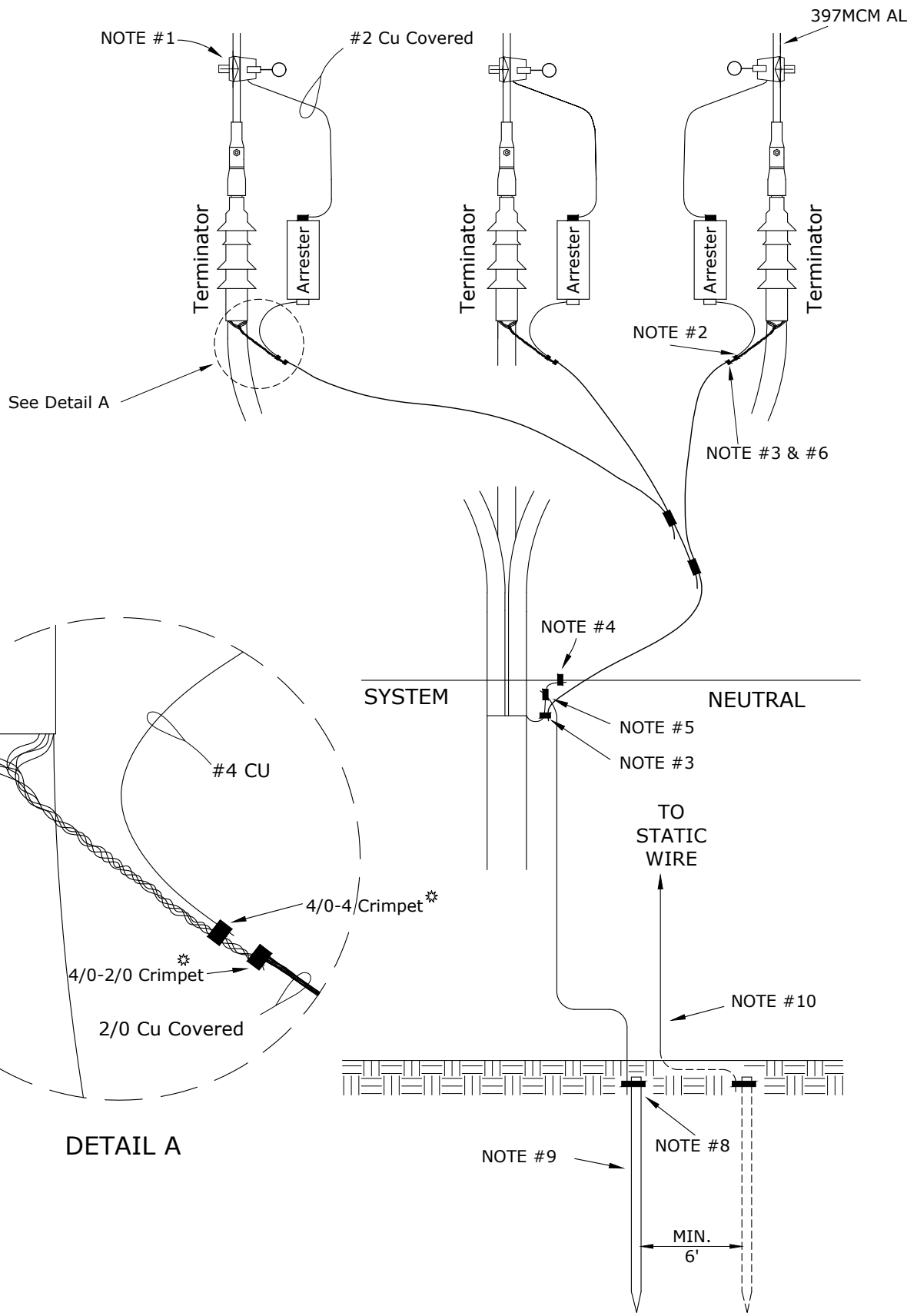
PAGE:  
2 of 2

UPR1

CAD FILE:  
UPR1

APP:  
DATE: 6/90

SECTION  
1600



Rev 2 - Updated notes for 2023 NESC and changed to 4/0-2/0 crimpet.



# CONSTRUCTION STANDARDS

## 1000 MCM CABLE RISER GROUNDING DETAIL

REVISIONS			
Δ	DATE	ENGR	OPS
0	2/23/00	HWH	MA
1	12/29/04	LB	AH
2	12/9/22	CRM	GM

PAGE:  
1 of 2

UPR2

CAD FILE:  
UPR2



APP:  
DATE: 6/90

SECTION  
1600

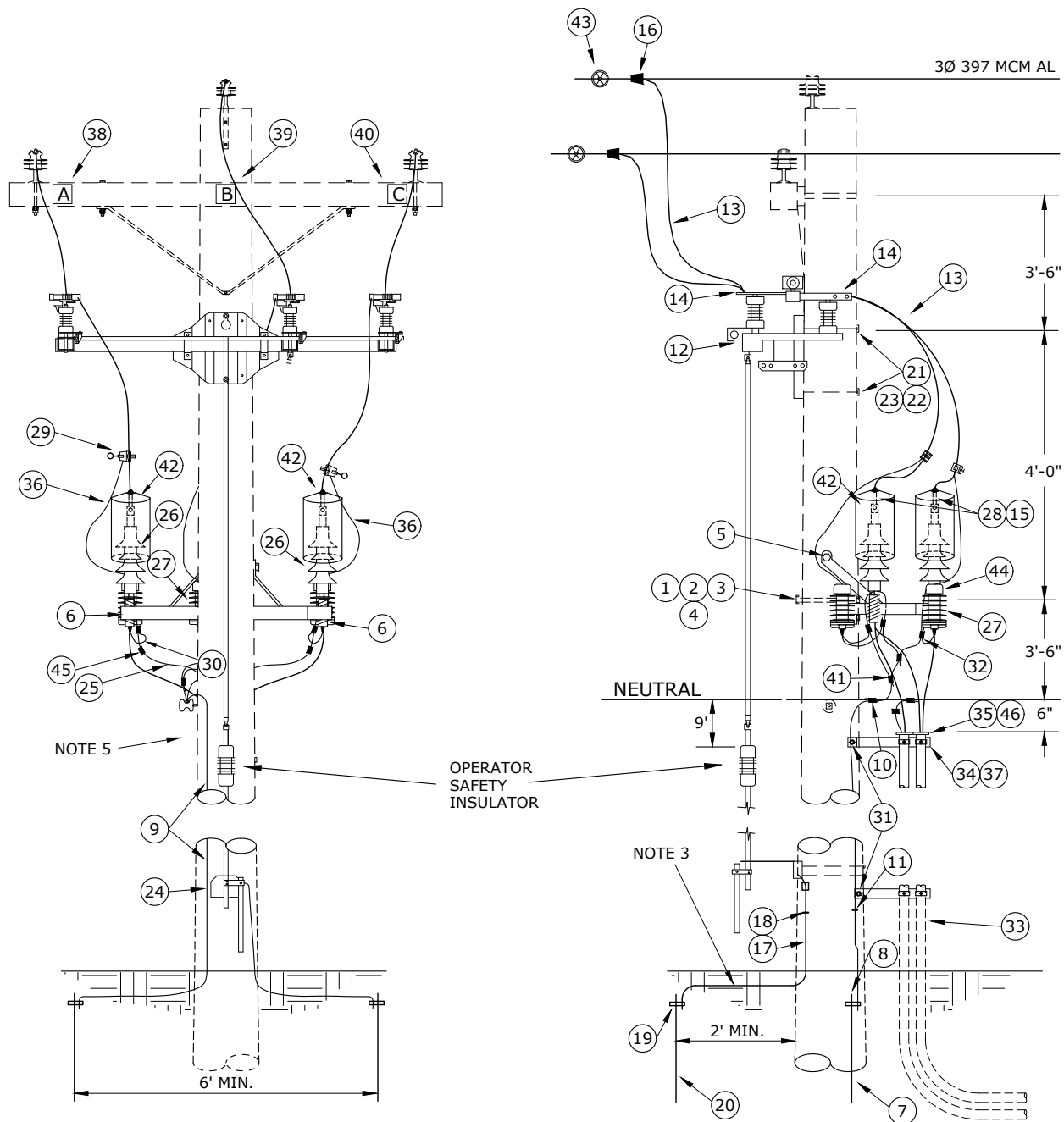
NOTES:

1. Make connections as close to terminator as possible but DO NOT make a sharp bend. Use hot line clamp for easy removal.
2. Connect surge arrester lead to concentric neutral.
3. Connect concentric neutral wires (twist together) to 2/0 stranded copper with 4/0-2/0\* crimpet. Connect separate 2/0 runs, as per drawing, from each concentric neutral to the system neutral. Use 2/0 covered conductor and train this conductor back down along the 1000MCM cable for appearance.
4. Connect 2/0 copper riser neutral to system neutral only. This riser neutral is only used for substation get-a-ways. The 2/0 Cu riser neutral is only needed on old installations where the 1000MCM had less than 1/3 neutral per phase. Any get-a-way with a full neutral does not need the additional 2/0 Cu. \*
5. Use separate ground lead for system neutral grounding connection. Any other equipment grounds may be connected to this ground lead also per NESC 092B3.
6. Do not connect arrester grounds separately to system neutral. Connect to concentric neutral as near to the terminator as possible per NESC 097B.
7. Do not ground equipment mounting bracket per NESC 123A.
8. Top of ground rod must be buried per NESC 094C2a3. \*
9. If more than one ground rod is required they must be separated by at least 6 feet per NESC 094C2a2.\*
10. Static wire ground when required. DO NOT connect to neutral. See TN1 to TN4 for static wire details.

Rev 2 - Updated notes for 2023 NESC and changed to 4/0-2/0 crimpet.

	<b>CONSTRUCTION STANDARDS</b> 1000 MCM CABLE RISER GROUNDING DETAIL		<b>REVISIONS</b>			
		DATE	ENGR	OPS		
	0	2/23/00	HWH	MA		
1	12/29/04	LB	AH			
2	12/9/22	CRM	GM			
PAGE: 2 of 2		<b>UPR2</b>	CAD FILE: UPR2		APP: DATE: 6/90	SECTION <b>1600</b>




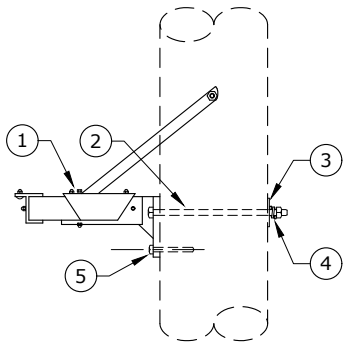


**Notes:**

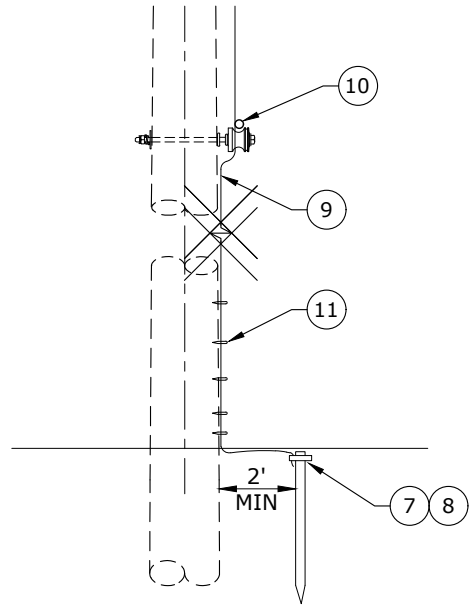
1. This is the recommended 1000 MCM riser standard. See UPR1 or UPR5 when it is not possible to install a switch.
2. See UPR2 for grounding details.
3. All ground wire is #4 Cu equivalent covered copper-clad steel.
4. Avoid sharp turns in lightning arrester grounds and primary leads.
5. The pole must be 45' Class 2 or taller.
6. Static wire ground when required. **DO NOT** connect to neutral. See N2 for details. Engineer must call for static wire ground separately.

Rev 1 - Corrected material issue, changed to copper-clad steel, and added support grips and Note #6.

	CONSTRUCTION STANDARDS		REVISIONS		
	1000MCM CABLE RISER WITH 3Ø SWITCH		DATE	ENGR	OPS
PAGE:	UPR4		APP:	CM/AH	SECTION
1 of 3			DATE:	1/13/10	1600



**BR10**



**N1**



**CONSTRUCTION STANDARDS**

1000MCM CABLE RISER  
WITH 3Ø SWITCH

REVISIONS

△ R	DATE	ENGR	OPS
1	12/9/22	CRM	GM

PAGE:  
2 of 3

**UPR4**


CAD FILE:  
UPR4

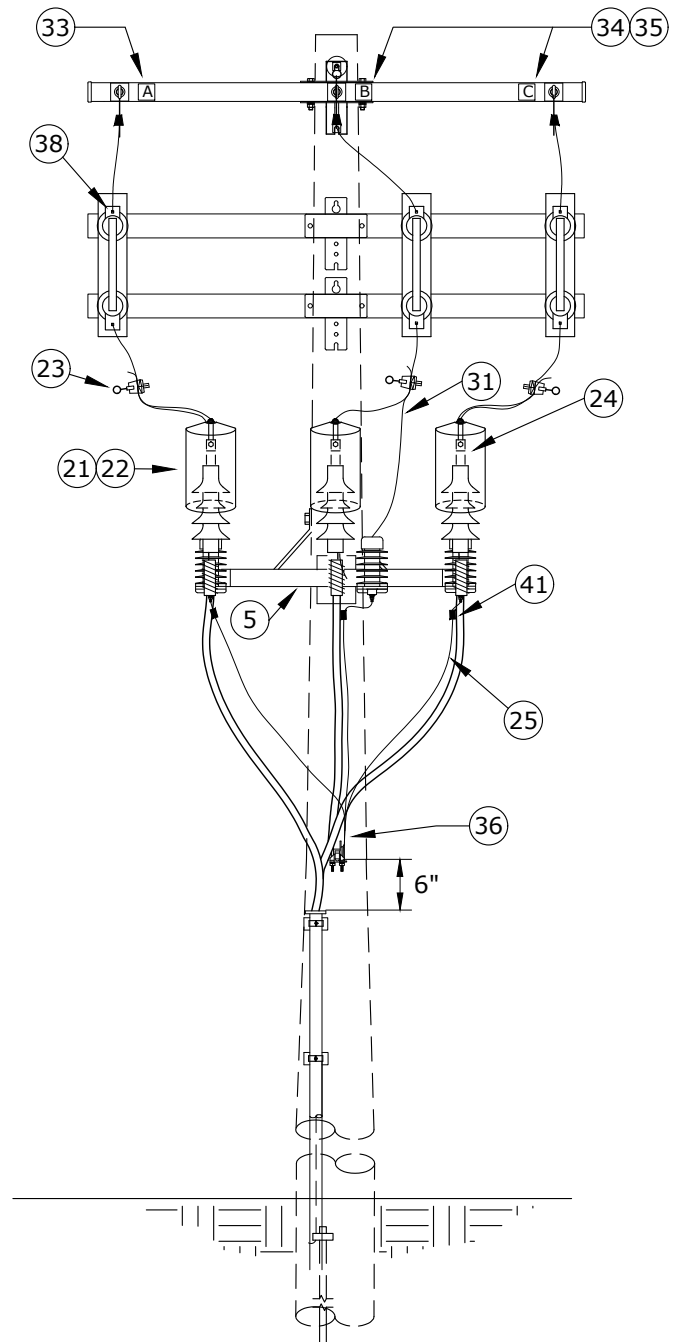
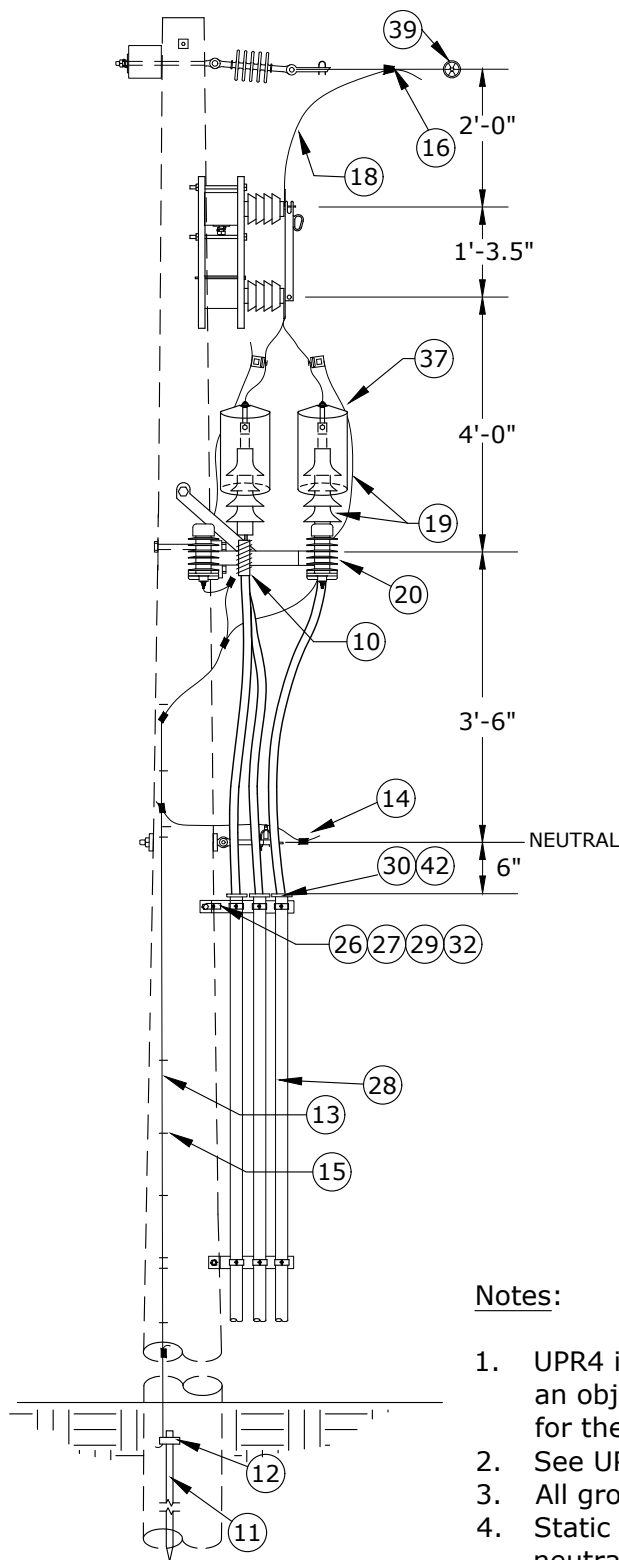
APP: CM/AH  
DATE: 1/13/10

SECTION  
**1600**

Rev 1 - Corrected material issue, changed to copper-clad steel, and added support grips and Note #6.

ITEM NO.	DESCRIPTION	UPR4	
		BR10	
		QTY.	S/N
1	Bracket, Terminator, Mount, 48", 1000MCM	1	2842 *
2	Bolt, Machine, 5/8" x 14", Galv, 12,400 lb Ultimate Tensile	1	156
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole, Galv	1	1392
4	Washer, Lock, Spring, Double Coil, Galv 5/8"	1	2217
5	Screw, Lag, 1/2" x 4 1/2", Twist Drive, Drive Point	3	1132
6	Support, Cable, 1000MCM	3	2229
ITEM NO.	DESCRIPTION	N1	
		QTY.	S/N
		7	Rod, Ground, 5/8" x 8'
8	Clamp, Ground Rod, 5/8", Small, Bronze	1	281
9	Conductor, Copper-Clad Steel, #4 Cu Equivalent, 40% Annealed, Black Jacket with Green Stripe	40*	1512 *
10	Connector, H-Tap, Al/Cu, Run #2 - 2/0 Str, Tap #6 - #1 Str	1	413
11	Staple, Ground Wire, Barbed, Galvanized, 1 1/2"	24	2707 *
ITEM NO.	DESCRIPTION	ADDITIONAL MATERIAL	
		QTY.	S/N
		12	Switch, Loadbreak, Horizontal, 900A, 15kV
13	Conductor, OH, AAC, 397.5, 19-Str, Bare, 1C, Canna	60	367
14	Connector, Compression, Lug, 2-Hole, 336 ACSR and 397 AAC	6	438
15	Bolt, 1/2" x 2", w/ Flat and Belleville Washers, Assembly	6 *	1389
16	Connector, Tap, Wedge, Run and Tap 336 ACSR - 397 AAC	3	2501
17	Conductor, Copper-Clad Steel, #4 Cu Equivalent, 40% Annealed, Black Jacket with Green Stripe	20	1512 *
18	Staple, Ground Wire, Barbed, Galvanized, 1 1/2"	5	2707 *
19	Clamp, Ground Rod, 5/8", Small, Bronze	1	281
20	Rod, Ground, 5/8" x 8'	1	1124
21	Machine Bolt, 3/4" x 16" Galv., 18,350 lbs. Ultimate Tensile	2	175
22	Washer, Curved, Cast, 4" x 4" with 13/16" Hole	2	1910
23	Washer, Lock Spring, Double Coil, Galv. 3/4"	2	2218
24	Lock, Padlock, 2" Hardened Stainless Steel Shackle	1	2564
25	Conductor, OH, 600v, Cu, 2/0, 19-Str, XLPE, 80 mil, Soft-Drawn, 1C, RHW-2	60	381
26	Terminator, 15kV, Cold-Shrink JCN, 1000 MCM	3	2225
27	Arrester, Surge, 9kV, MOV, Riser Pole	3	58
28	Connector, Compression, Lug, Al/Cu, Tin-Plated, 1000MCM to NEMA 2-Hole	3	1501
29	Clamp, Hot Line, GP 1530, Line #6 Sol - 400MCM, Tap #6 Sol - 4/0 Str Cu Only	3	284
30	Conductor, OH, Cu, #4 Solid, Bare, Soft-Drawn, 1C	10	376
31	Screw, Lag, 1/2" x 4 1/2", Twist Drive, Drive Point	9	1132
32	Connector, Crimpet, Cu, Run 3/0 - 4/0 Str, Tap #6 Sol - #2 Str	3*	458 *
33	Conduit, 4" x 10', Sch 80	90*	2203
34	Clamp, Standoff Bracket, 4"	9	297
35	End Bell, 4" Sch 40, Long	3	2204
36	Conductor, OH, 600v, Cu, #2, 7-Str, XLPE, 60 mil, Soft-Drawn, 1C, RHW-2	15	393
37	Bracket, Standoff, 15" with Stop and Brace	3	227
38	Tag, Phase A	1	1280
39	Tag, Phase B	1	1281
40	Tag, Phase C	1	1282
41	Connector, Crimpet, Cu, Run and Tap 1/0 - 2/0 Str	2 *	457
42	Guard, Wildlife, Large, OH/UG Terminators	3	1676 *
43	Indicator, Fault, 400A, OH, Beacon with Signal Flag, Electric Field Reset	3	2558
44	Guard, Wildlife, Polymer Arrester	3	2583*
45	Connector, Crimpet, Cu, Run 3/0 Str - 250 Str, Tap #6 Sol - 2/0 Str	3	459 *
46	Grip, Support, 4" Conduit, 1000MCM (1.625" to 2.5")	3	2521*

	<b>CONSTRUCTION STANDARDS</b> 1000MCM CABLE RISER WITH 3Ø SWITCH		<b>REVISIONS</b>														
	PAGE: 3 of 3	<b>UPR4</b>	CAD FILE: UPR4	<table border="1"> <tr> <th>DATE</th> <th>ENGR</th> <th>OPS</th> </tr> <tr> <td>12/9/22</td> <td>CRM</td> <td>GM</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>	DATE	ENGR	OPS	12/9/22	CRM	GM							APP: CM/AH DATE: 1/13/10
DATE	ENGR	OPS															
12/9/22	CRM	GM															



**Notes:**

1. UPR4 is the preferred standard. This standard is to be used if an object interferes w/ the switch handle of UPR4. See UPR4 for the recommended construction.
2. See UPR2 for grounding details.
3. All ground wire is #4 covered copper-clad steel.
4. Static wire ground when required. **DO NOT** connect to neutral. See N2 for static wire details. Engineer must call for static wire ground separately.
5. Avoid sharp turns in arrester grounds and primary leads.
6. 2/0 CU from terminators to overhead neutral for all 1000MCM construction.

Rev 1 - Removed extra 2/0 Cu neutral for substation get-a-ways, added 4/0-2/0 crimpet and support grips, and changed ground to Cu-clad steel grounds.



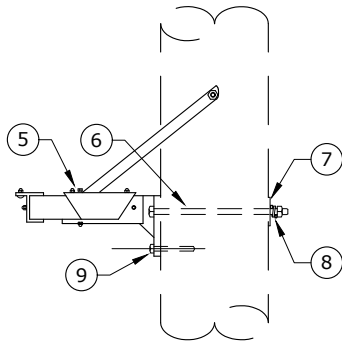
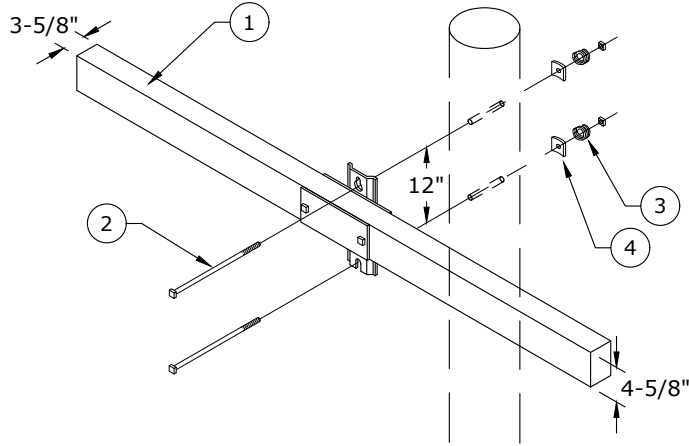
**CONSTRUCTION STANDARDS**

1000MCM CABLE RISER  
WITH 600 AMP DISCONNECTS

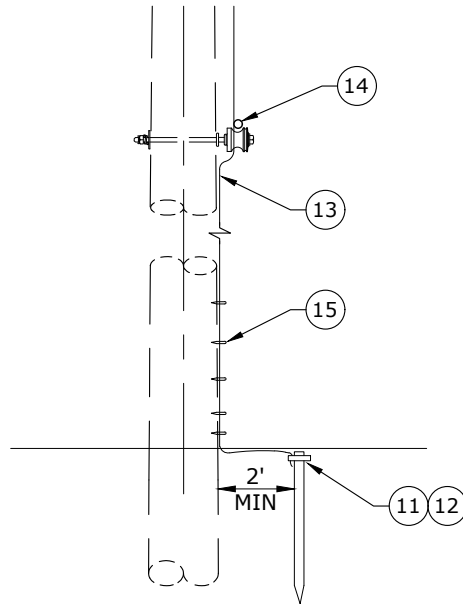
REVISIONS

DATE	ENGR	OPS
12/9/22	CRM	GM

**CR23B**



**BR10**



**N1**

Rev 1 - Removed extra 2/0 Cu neutral for substation get-a-ways, added 4/0-2/0 crimpets and support grips, and changed ground to Cu-clad steel grounds.



**CONSTRUCTION STANDARDS**  
 1000MCM CABLE RISER  
 WITH 600 AMP DISCONNECTS

REVISIONS

Δ/R	DATE	ENGR	OPS
1	12/9/22	CRM	GM

PAGE:  
2 of 3

**UPR5**

CAD FILE:  
UPR5

APP: CM/AH  
DATE: 1/13/10

SECTION  
**1600**

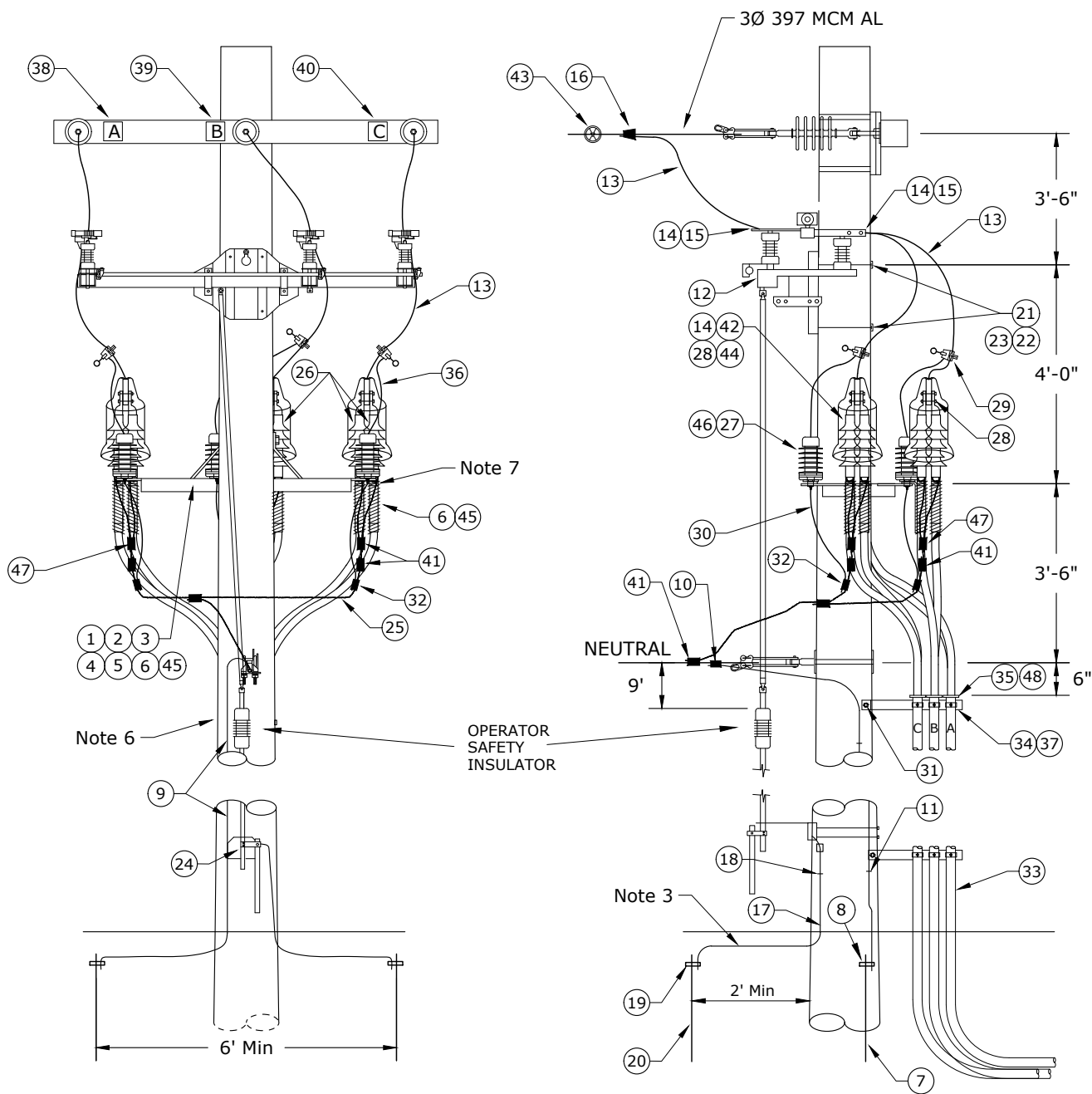
Rev 1 - Removed extra 2/0 Cu neutral for substation get-a-ways, added 4/0-2/0 crimpets and support grips, and changed ground to Cu-clad steel grounds.

		UPR5	
ITEM NO	DESCRIPTION	CR23B (2)	
		QTY	S/N
1	Crossarm, Distribution, Fiberglass, 10' Long x 3-5/8" Wide x 4-5/8" Tall	2	3031 *
2	Bolt, Machine, 5/8" x 14", Galv., 12,400 lb Ultimate Tensile	4	156 *
3	Washer, Lock, Spring, Double Coil, Galv, 5/8"	4	2217 *
4	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	4	1392 *
		BR10	
ITEM NO	DESCRIPTION	QTY	S/N
5	Bracket, Terminator, Mount, 48", 1000MCM	1	2842 *
6	Bolt, Machine, 5/8" x 14", Galv, 12,400 lb Ultimate Tensile	1	156
7	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole, Galv	1	1392
8	Washer, Lock, Spring, Double Coil, Galv, 5/8"	1	2217
9	Screw, Lag, 1/2" x 4 1/2", Twist Drive, Drive Point	3	1132
10	Support, Cable, 1000MCM	3	2229
		N1	
ITEM NO	DESCRIPTION	QTY	S/N
11	Rod, Ground, 5/8" x 8'	1	1124
12	Clamp, Ground Rod, 5/8", Small, Bronze	1	281
13	Conductor, Copper-Clad Steel, #4 Cu Equivalent, 40% Annealed, Black Jacket with Green Stripe	40*	1512 *
14	Connector, H-Tap, Al/Cu, Run #2 - 2/0 Str, Tap #6 - #1 Str	1	413
15	Staple, Ground Wire, Barbed, Galvanized, 1 1/2"	24*	2707 *
		ADDITIONAL MATERIAL	
ITEM NO	DESCRIPTION	QTY	S/N
16	Connector, Tap, Wedge, Run and Tap 336 ACSR and 397 AAC	3	2501
17	Conductor, OH, 600v, Cu, 2/0, 19-Str, XLPE, 80 mil, Soft-Drawn, 1C, RHW-2	30	381
18	Conductor, OH, AAC, 397.5, 19-Str, Bare, 1C, Canna	30	367
19	Terminator, 15kV, Cold-Shrink JCN, 1000MCM	3	2225
20	Arrester, Surge, 9 kV, MOV, Riser Pole	3	58
21	Connector, Compression, Lug, 2-Hole, 336 ACSR and 397 AAC	3	438
22	Connector, Compression, Lug, Al/Cu, Tin-Plated, 1000MCM to NEMA 2-Hole	3	1501
23	Clamp, Hot Line, GP1530, Line #6 Sol - 400MCM, Tap #6 Sol - 4/0 Str, Cu Only	3	284
24	Bolt, 1/2" x 2", w/ Flat and Belleville Washers, Assembly	6	1389
25	Conductor, OH, Cu, #4 Solid, Bare, Soft-Drawn, 1C	10	376
26	Screw, Lag, 1/2" x 4 1/2", Twist Drive, Drive Point	9	1132
27	Connector, Crimpet, Cu, Run 3/0 - 4/0 Str, Tap #6 Sol - #2 Str	3	458 *
28	Conduit, 4" x 10', Sch 80	90*	2203
29	Clamp, Standoff Bracket, 4"	9	297
30	End Bell, 4", Sch 40, Long	3	2204
31	Conductor, OH, 600v, Cu, #2, 7-Str, XLPE, 60 mil, Soft-Drawn, 1C, RHW-2	15	393
32	Bracket, Standoff, 15" with Stop and Brace	3	227
33	Tag, Phase A	1	1280
34	Tag, Phase B	1	1281
35	Tag, Phase C	1	1282
36	Connector, Crimpet, Cu, Run and Tap 1/0 - 2/0 Str	2 *	457
37	Guard, Wildlife, Large, OH/UG Terminators	3	1676
38	Disconnect, 600 Amp, Single Blade	3	2531
39	Indicator, Fault, 400A, OH, Beacon with Signal Flag, Electric Field Reset	3	2558
40	Guard, Wildlife, Polymer Arrester	3	2583
41	Connector, Crimpet, Cu, Run 3/0 Str - 250 Str, Tap #6 Sol - 2/0 Str	3	459 *
42	Grip, Support, 4" Conduit, 1000MCM (1.625" to 2.5")	3	2521*



**CONSTRUCTION STANDARDS**  
1000MCM CABLE RISER  
WITH 600 AMP DISCONNECTS

REVISIONS			
DATE	ENGR	OPS	
12/9/22	CRM	GM	



**Notes:**

1. This is the recommended 1000MCM riser standard for parallel runs.
2. See UPR2 for grounding details.
3. All ground wire is #4 Cu equivalent covered copper-clad steel.
4. Engineer must call for static wire ground separately, if needed. **DO NOT** connect to neutral. See N2 for details.
5. Avoid sharp turns in arrester ground and primary leads.
6. The pole must be 45' Class 2 or taller.
7. Install the cable positioners and arresters to the 48" equipment mounting brackets using carriage bolts provided with bracket.
8. 2/0 Cu from terminators to OH neutral for all 1000MCM.

Rev 1 - Added 4/0-2/0 crimpets and support grips.

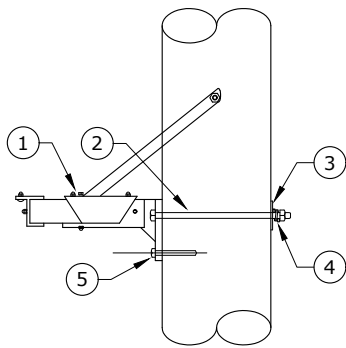


**CONSTRUCTION STANDARDS**  
 PARALLEL 1000MCM CABLE RISER  
 WITH 3Ø SWITCH

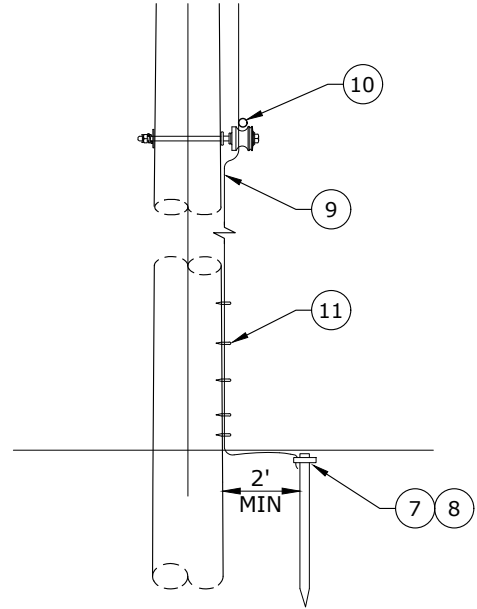
REVISIONS			
△	DATE	ENGR	OPS
1	12/9/22	CRM	GM

PAGE:	CAD FILE:	APP:	SECTION
1 of 3	UPR6	CM/DK	1600
		DATE:	
		11/2/18	



**BR10**



**N1**

Rev 1 - Added 4/0-2/0 crimpets and support grips.

ITEM NO.	DESCRIPTION	UPR6	
		QTY.	S/N
1	Bracket, Terminator Mount, 48", 1000 MCM Cable	1	2842
2	Bolt, Machine, 5/8" x 14", Galv., 12,400 lbs Ultimate Tensile	1	156
3	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole, Galv	1	1392
4	Washer, Lock, Spring, Double Coil Galv., 5/8"	1	2217
5	Screw, Lag, 1/2" x 4 1/2", Twist Drive, Drive Point	3	1132
6	Support, Cable, 1000 MCM	3	2229
ITEM NO.	DESCRIPTION	N1	
		QTY.	S/N
7	Rod, Ground, 5/8" x 8'	1	1124
8	Clamp, Ground Rod, 5/8", Small, Bronze	1	281
9	Conductor, Copper-Clad Steel, #4 Cu Equivalent, 40% Annealed, Black Jacket with Green Stripe	40	1512
10	Connector, H-Tap, Al/Cu, Run #2 - 2/0 Str, Tap #6 - #1 Str	1	413
11	Staple, Ground, Barbed, Galvanized, 1 1/2"	24	2707



**CONSTRUCTION STANDARDS**  
PARALLEL 1000MCM CABLE RISER  
WITH 3Ø SWITCH

REVISIONS			
Δ	DATE	ENGR	OPS
1	12/9/22	CRM	GM

PAGE: 2 of 3	<b>UPR6</b>	CAD FILE: UPR6	APP: CM/DK DATE: 11/2/18	SECTION <b>1600</b>
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ITEM NO.	DESCRIPTION	UPR6	
		ADDITIONAL MATERIAL	
		QTY.	S/N
12	Switch, Loadbreak, Horizontal, 900A, 15kV	1	2432
13	Conductor, OH, AAC, 397.5, 19-Str, Bare, 1C, Canna	60	367
14	Connector, Compression, Lug, 2-Hole, 336 ACSR and 397 AAC	9	438
15	Bolt, 1/2" x 2", w/ Flat & Belleville Washers , Assembly	12	1389
16	Connector, Tap, Wedge, Run and Tap 336 ACSR - 397 AAC	3	2501
17	Conductor, Copper-Clad Steel, #4 Cu Equivalent, 40% Annealed, Black Jacket with Green Stripe	20	1512
18	Staple, Ground, Barbed, Galv, 1 1/2"	5	2707
19	Clamp, Ground Rod, 5/8", Small, Bronze	1	281
20	Rod, Ground, 5/8" x 8'	1	1124
21	Bolt, Machine, 3/4" x 16", Galv, 18,300 lb Ultimate Tensile	2	175
22	Washer, Curved, Cast, 4" x 4" w/ 13/16" Hole	2	1910
23	Washer, Lock, Spring, Double Coil Galv, 3/4"	2	2218
24	Lock, Padlock, 2" Hardened Stainless Steel Shackle	1	2564
25	Conductor, OH, 600v, Cu, 2/0, 19-Str, XLPE, 80 mil, Soft-Drawn, 1C, RHW-2	60	381
26	Terminator, 15 kV, Cold-Shrink JCN, 1000 MCM	6	2225
27	Arrester, Surge, 9 kV, MOV, Riser Pole	3	58
28	Connector, Compression, Lug, Al/Cu, Tin-Plated, 1000 MCM to NEMA 2-Hole	6	1501
29	Clamp, Hot Line, GP 1530, Line #6 Sol - 400MCM, Tap #6 Sol - 4/0 Str, Cu Only	3	284
30	Conductor, OH, Cu, #4 Solid, Bare, Soft-Drawn, 1C	10	376
31	Screw. Lag, 1/2" x 4 1/2", Twist Drive, Drive Point	6	1132
32	Connector, Crimpet, Cu, Run 3/0 - 4/0 Str, Tap #6 Sol - #2 Str	6	458 *
33	Conduit, 4" x 10', Sch 80	180	2203
34	Clamp, Standoff Bracket, 4"	18	297
35	End Bell, 4" Sch 40, Long	6	2204
36	Conductor, OH, 600v, Cu, #2, 7-Str, XLPE, 60 mil, Soft-Drawn, 1C, RHW-2	15	393
37	Bracket, Standoff, Riser, 24" with Stop and Brace	3	228
38	Tag, Phase A	1	1280
39	Tag, Phase B	1	1281
40	Tag, Phase C	1	1282
41	Connector, Crimpet, Cu, Run and Tap 1/0 - 2/0 Str	6 *	457
42	Guard, Wildlife, Large OH/UG Terminators	3	1676
43	Indicator, Fault, 400A, OH, Beacon with Signal Flag, Electric Field Reset	3	2558
44	Bolt, 1/2" x 2-1/2", w/ Flat & Belleville Washers, Assembly	6	2584
45	Support, Cable, 1000 MCM	3	2229
46	Guard, Wildlife, Polymer Arrester	3	2583
47	Connector, Crimpet, Cu, Run 3/0 Str - 250 Str, Tap #6 Sol - 2/0 Str	6	459 *
48	Grip, Support, 4" Conduit, 1000MCM (1.625" to 2.5")	6	2521*



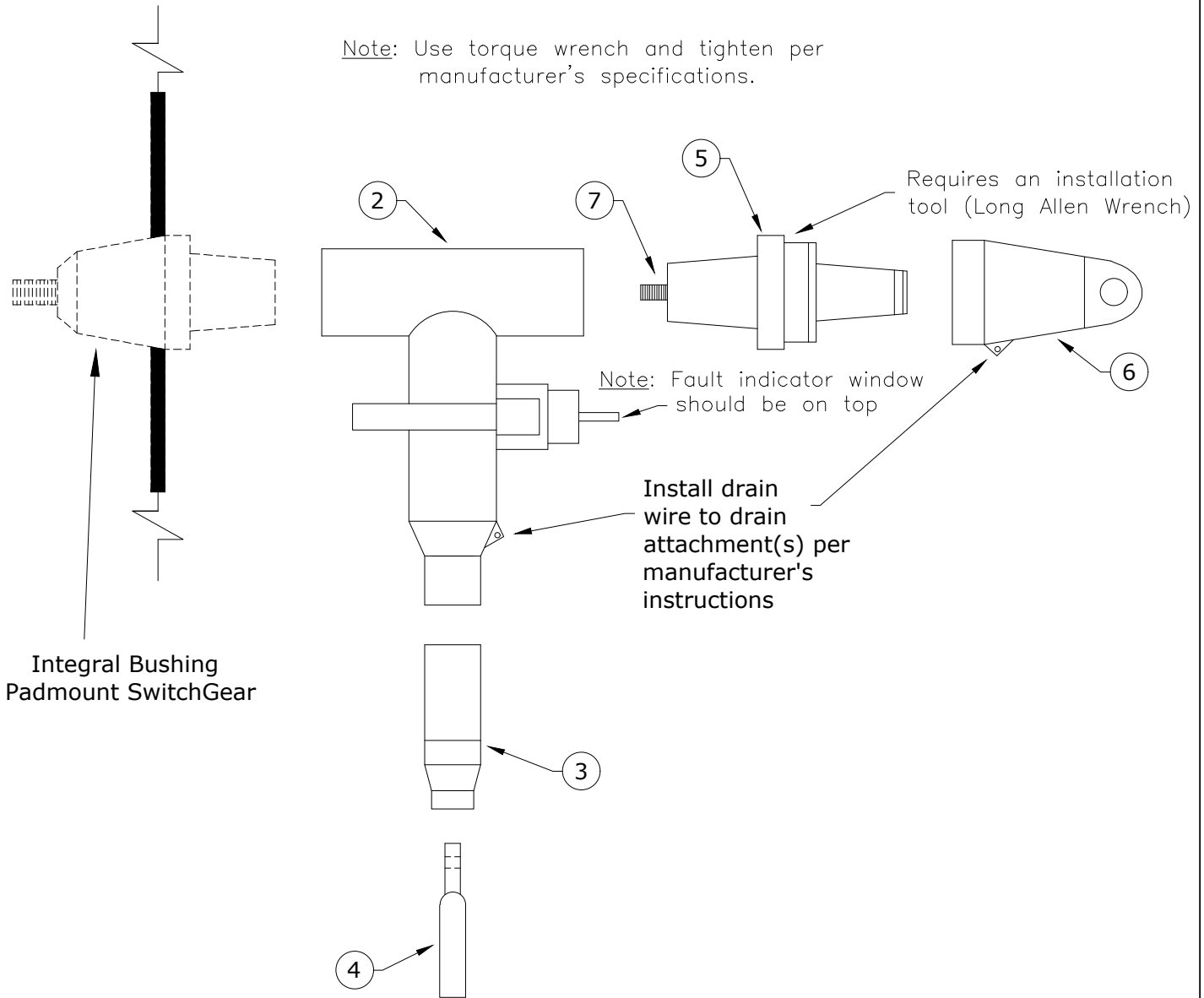
**CONSTRUCTION STANDARDS**  
 PARALLEL 1000MCM CABLE RISER  
 WITH 3Ø SWITCH

REVISIONS			
Δ	DATE	ENGR	OPS
1	12/9/22	CRM	GM

# ASSEMBLY DIAGRAM

## ONE ASSEMBLY PER 600A PHASE

Note: Use torque wrench and tighten per manufacturer's specifications.



Rev 3: Added torque requirements and material corrections.

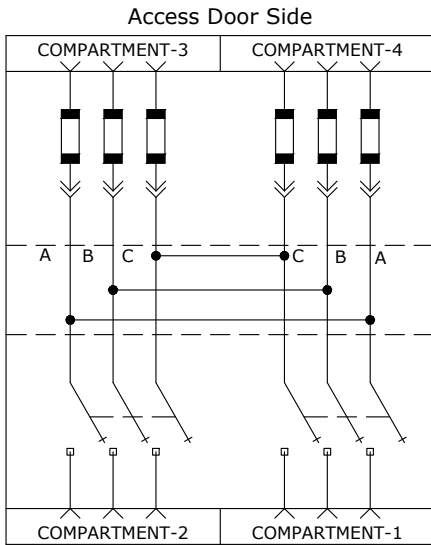
ITEM NO.	DESCRIPTION	USG1	
		QTY.	S/N
1	600A Elbow Kit For Switchgear	1	2692
	<i>Each Kit Consists Of #2 to #7:</i>		
2	Housing, Elbow, 600A	1	1825
3	Adapter, Cable, 1000 MCM	1	1
4	Contact, Compression, 1000 MCM, Al, Non-Threaded Hole	1	941
5	Plug, Loadbreak Reducing Tap, 600A-200A	1	1769
6	Cap, Protective Insulated, 200A, 15kV	1	265
7	Stud, Al, 600A, T-Body to Reducer Plug	1	2704
8	600A Elbow Sealing Kit	1	2376



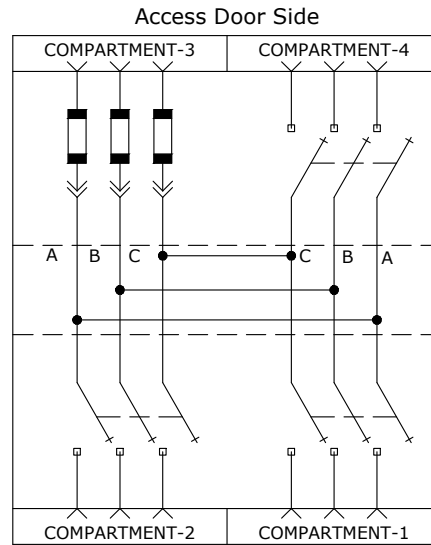
### CONSTRUCTION STANDARDS

PADMOUNT SWITCHGEAR  
600 AMP ELBOW - 1000MCM CABLE

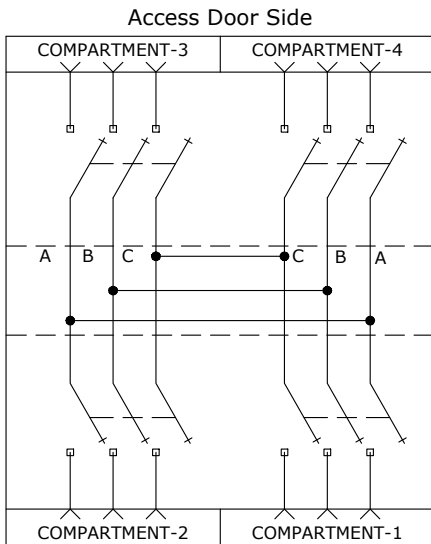
REVISIONS			
DATE	ENGR	OPS	
2/23/00	HWH	MA	
1/11/04	LB	AH	
4/29/09	CM	AH	
12/5/19	CM	GM	



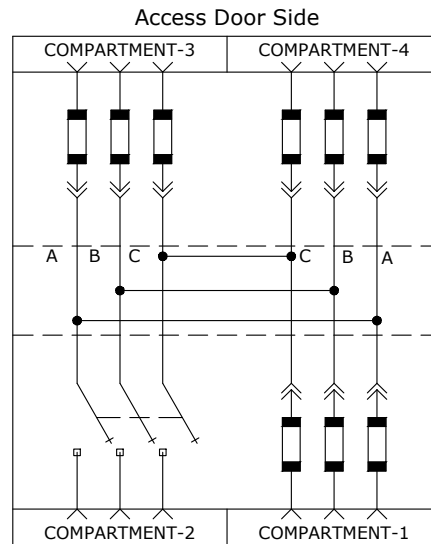
PME9



PME11



PME10



PME12

PADMOUNT DEADFRONT	PADMOUNT LIVEFRONT (Maintenance only)	600 AMP 3 $\phi$ SWITCH	200 AMP 3 $\phi$ POSITIONS
PME9	PMH9	2	2
PME10	PMH10	4	0
PME11	PMH11	3	1
PME12	PMH12	1	3

FUSE SIZE (SMU)	S/N
65E	2770
100E	2771
125E	2772

Contact Systems Engineering for proper fuse coordination.

**Notes:**

1. Material issue has the maximum number of fault indicators that may be used. Engineer to determine the actual number needed.
2. All new PMEs are ordered with the required number of 100E fuses for the configuration plus 3 spare 100E fuses.
3. If 65E or 125E fuses are required, the Engineer will have to call for the number needed plus 3 spares.

Rev. 4 - Changed to PME and PMH nomenclature, SMU fuses, removed separate fuse holders, added tie-downs, changed to 612 vault, and updated materials.



**CONSTRUCTION STANDARDS**  
 PADMOUNT SWITCHGEAR CHART  
 USE WITH STANDARD USG3

REVISIONS			
$\Delta$	DATE	ENGR	OPS
1	1/11/04	LB	AH
2	10/7/05	LB	AH
3	4/29/09	CM	AH
4	12/5/19	CM	GM

APP: HWH/MA	SECTION
DATE: 2/22/00	<b>1600</b>

Rev. 4 - Changed to PME and PMH nomenclature, SMU fuses, removed separate fuse holders, added tie-downs, changed to 612 vault, and updated materials.

**DEADFRONT (CPU Standard)**

ITEM NO.	DESCRIPTION	S/N	PME9	PME10	PME11	PME12
			QTY	QTY	QTY	QTY
1	Switch, Padmount, PME9, 2-600A Switches & 2-200A Fused Taps	2458	1	-	-	-
	PME10, 4-600A Switches	2452	-	1	-	-
	PME11, 3-600A Switches & 1-200A Fused Taps	2459	-	-	1	-
	PME12, 1-600A Switches & 3-200A Fused Taps	CONTACT STANDARDS ENGINEERING - NOT STOCKED				
2	600A Elbow Kit For Switchgear (USG1 Kit)	2692	6	12	9	3
	<i>Each Kit Consists Of #3 to #8:</i>					
3	Housing, Elbow, 600A	1825	6	12	9	3
4	Adapter, Cable, 1000 MCM	1	6	12	9	3
5	Contact, Compression, 1000 MCM, Al, Non-Threaded Hole	941	6	12	9	3
6	Plug, Loadbreak Reducing Tap, 600A-200A	1769	6	12	9	3
7	Cap, Protective Insulated, 200A, 15kV	265	6	12	9	3
8	Stud, Al, 600A, T-Body to Reducer Plug	2704	6	12	9	3
9	Elbow, Sealing Kit, 1000MCM 175 & 220 mil	2376	6	12	9	3
10	Conductor, Cu, 2/0, 1C, 7-Str, Bare, Soft Drawn	379	40	50	45	35
11	Connector, Crimpet, Cu, Run 4/0 Str, Tap 1/0 - 2/0 Str	459	6	12	9	3
12	Connector, Crimpet, Cu, Run 1/0 - 2/0 Str, Tap 1/0 - 2/0 Str	457	2	4	3	1
13	Indicator, Fault, UG, 800A, Test-Point, Voltage-Reset, 3-phase	2695	1	3	2	-
14	Elbow, 200A, LB, 1/0, 175 & 220 mil, Test Point, 15 kV, Jacket Seal	1312	6	-	3	9
15	Cap, Protective, Insulated, 200A 15 kV	265	6	-	3	9
16	Bushing, Standoff, Insulated, 200A	252	6	-	3	9
17	Connector, Crimpet, Cu, Run & Tap #2 Sol/Str (2C2)	455	6	-	3	9
18	Connector, Crimpet, Cu, Run 1/0 - 2/0 Str, Tap #8 Sol - #2 Str	456	2	-	1	3
19	Strut, Slotted, 10', 1-5/8" x 1-5/8", 12 Ga Galv	2958	1	2	2	1
20	Anchor, Sleeve, 1/2" x 3", Stainless Steel, 3/8" Thread	2959	4	8	8	4
21	Washer, Flat, 3/8", (304) Stainless Steel	1398	4	8	8	4
22	Bracket, Wall Mount, Strut, 2-Hole, Galv	2960	2	4	4	2
23	Clamp, Cable, Strut, 1000 MCM, Mount	2961	6	12	9	3
24	Bolt, Machine, 1/2" x 1", (304) Stainless Steel	130	14	16	16	14
25	Nut, Spring-Loaded, Galv, 1/2" (Unistrut)	920	14	16	16	14

**LIVEFRONT (Non-standard)**

ITEM NO.	DESCRIPTION	S/N	PMH9	PMH10	PMH11	PMH12
			QTY	QTY	QTY	QTY
1	Bolt, Machine, 1/2" x 2", SS	132	24	24	24	24
2	Clamp, Ground Rod	282	2	2	2	2
3	Conductor, 2/0 BC, 7 STR	379	50	50	50	50
4	Connector, Comp Lug YCA26-2NCU 2/0	431	6	-	3	9
5	Connector, Crimpet, 2/0 - 2/0	457	4	4	4	4
6	Rod, Ground, 5/8" x 8'	1144	2	2	2	2
7	2" x 1/2" Bolt Assembly	1389	24	24	24	24
8	Connector, Comp Lug, YA44-A3AL/CU 1000 MCM	1501	6	12	9	3
9	Vault, Concrete, 600 AMP SW, Mod. U-J-6	1541	1	1	1	1
10	Terminator, Outdoor, Molded Rubber 1/0	2214	6	-	3	9
11	Terminator, Outdoor, Butyl, 600 AMP, 1000 MCM	2225	6	12	9	3
12	Switch, Padmt, Linefront, PMH9		(#1265)	(#1264)	(#1468)	(#1471)
13	Holder, Fuse, Padmount, Livefront	745	6	-	3	9
14	Fault Indicator, 800A, Current-Reset, Beacon	2463	1	3	2	-
15	Caulk, Switchgear	2604	1	1	1	1



**CONSTRUCTION STANDARDS**  
PADMOUNT SWITCHGEAR CHART  
USE WITH STANDARD USG3

REVISIONS			
Δ	DATE	ENGR	OPS
1	1/11/04	LB	AH
2	10/7/05	LB	AH
3	4/29/09	CM	AH
4	12/5/19	CM	GM

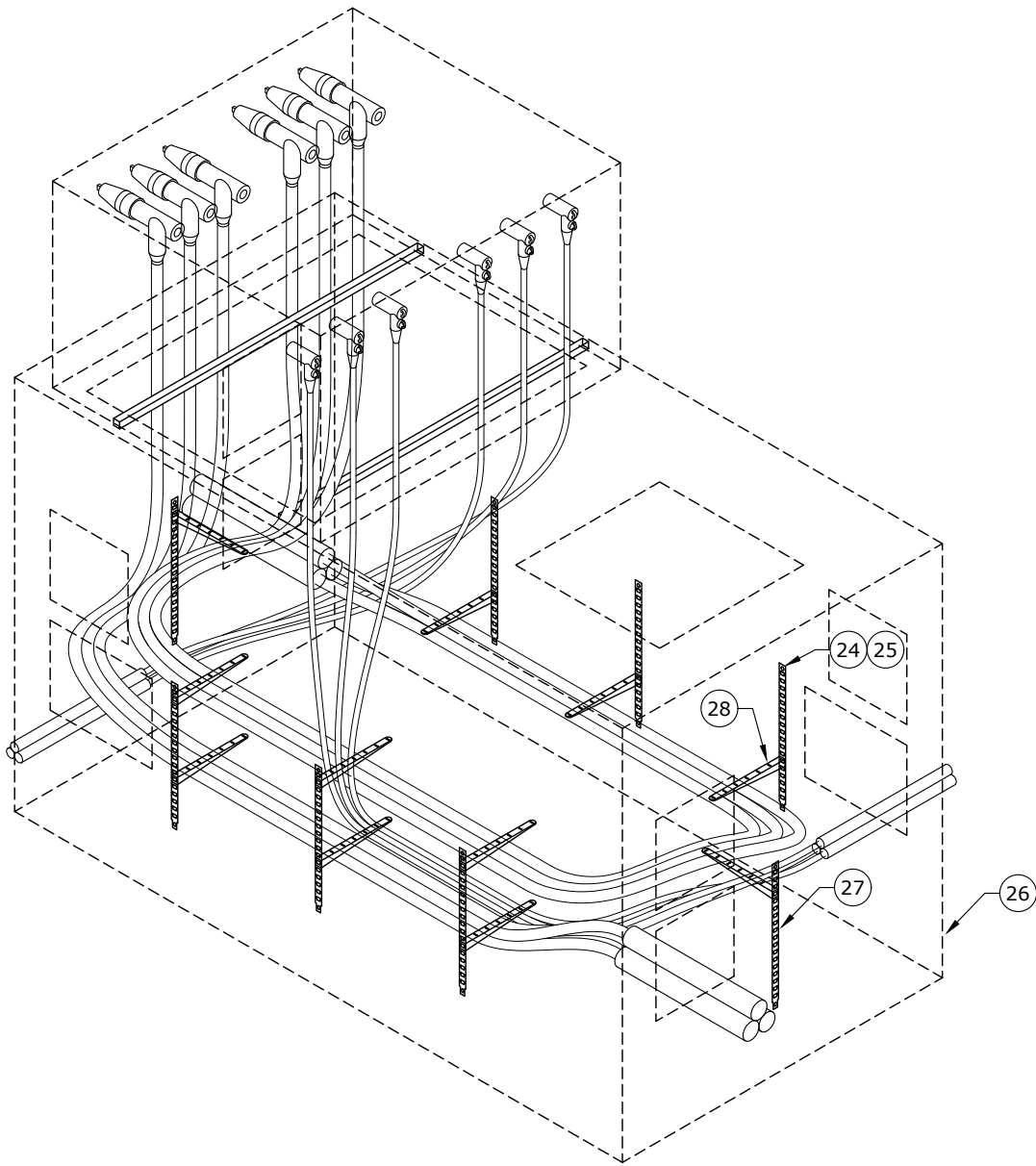
PAGE:  
2 of 2

**USG2**

CAD FILE:  
USG2

APP: HWH/MA  
DATE: 2/22/00

SECTION  
**1600**



**Notes:**

1. Cable clamps required on 600A ways and not required on 200A ways. Install strut and cable clamps after setting switchgear to precisely land elbows on bushings.
2. Seal vacant conduits with reusable expanding duct plugs.  
 2" - S/N 2955  
 4" - S/N 2943  
 Seal conduits with cable using inflatable seals.  
 2" - S/N 2952  
 4" - S/N 2943
3. For PME9 and PME12, face switchgear side with two fuse bays toward access door.
4. Engineer to call for temporary lid (S/N 2495) when switch and vault installed separately.

Rev. 4 - Fixed stock number in Note 4 for temporary lid.



**CONSTRUCTION STANDARDS**

DEADFRONT SWITCHGEAR  
 612 VAULT DETAIL  
 USE WITH STANDARD USG2

REVISIONS

△	DATE	ENGR	OPS
1	1/11/04	LB	AH
2	10/7/05	LB	AH
3	12/5/19	CM	GM
4	9/16/21	JDK	

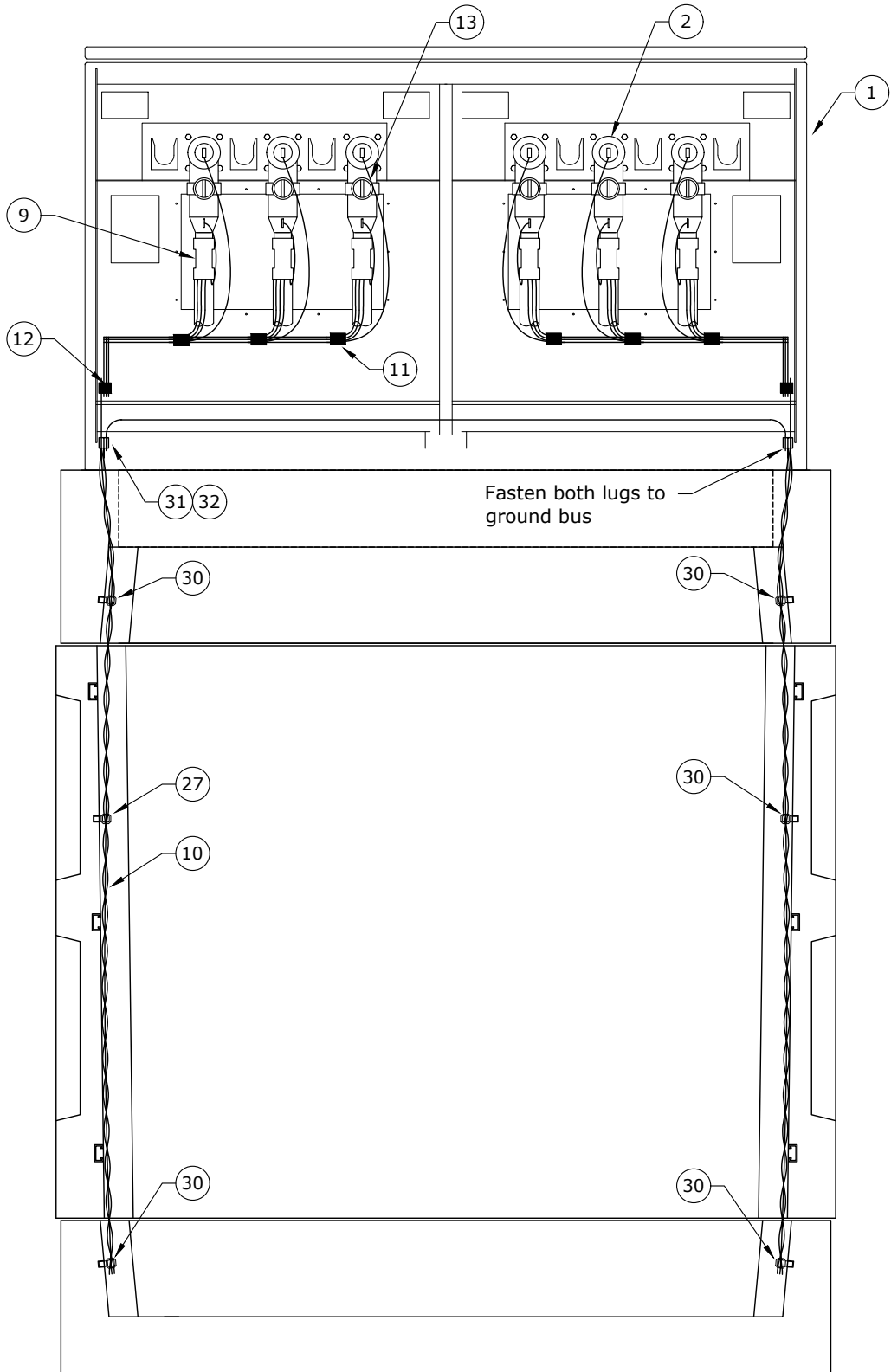
PAGE:  
1 of 6

**USG3**

CAD FILE:  
USG3

APP: HWH/MA  
 DATE: 2/22/00

SECTION  
**1600**



600A Elbow Detail

Rev. 4 - Fixed stock number in Note 4 for temporary lid.



**CONSTRUCTION STANDARDS**  
 DEADFRONT SWITCHGEAR  
 612 VAULT DETAIL  
 USE WITH STANDARD USG2

REVISIONS			
△	DATE	ENGR	OPS
1	1/11/04	LB	AH
2	10/7/05	LB	AH
3	12/5/19	CM	GM
4	9/16/21	JDK	

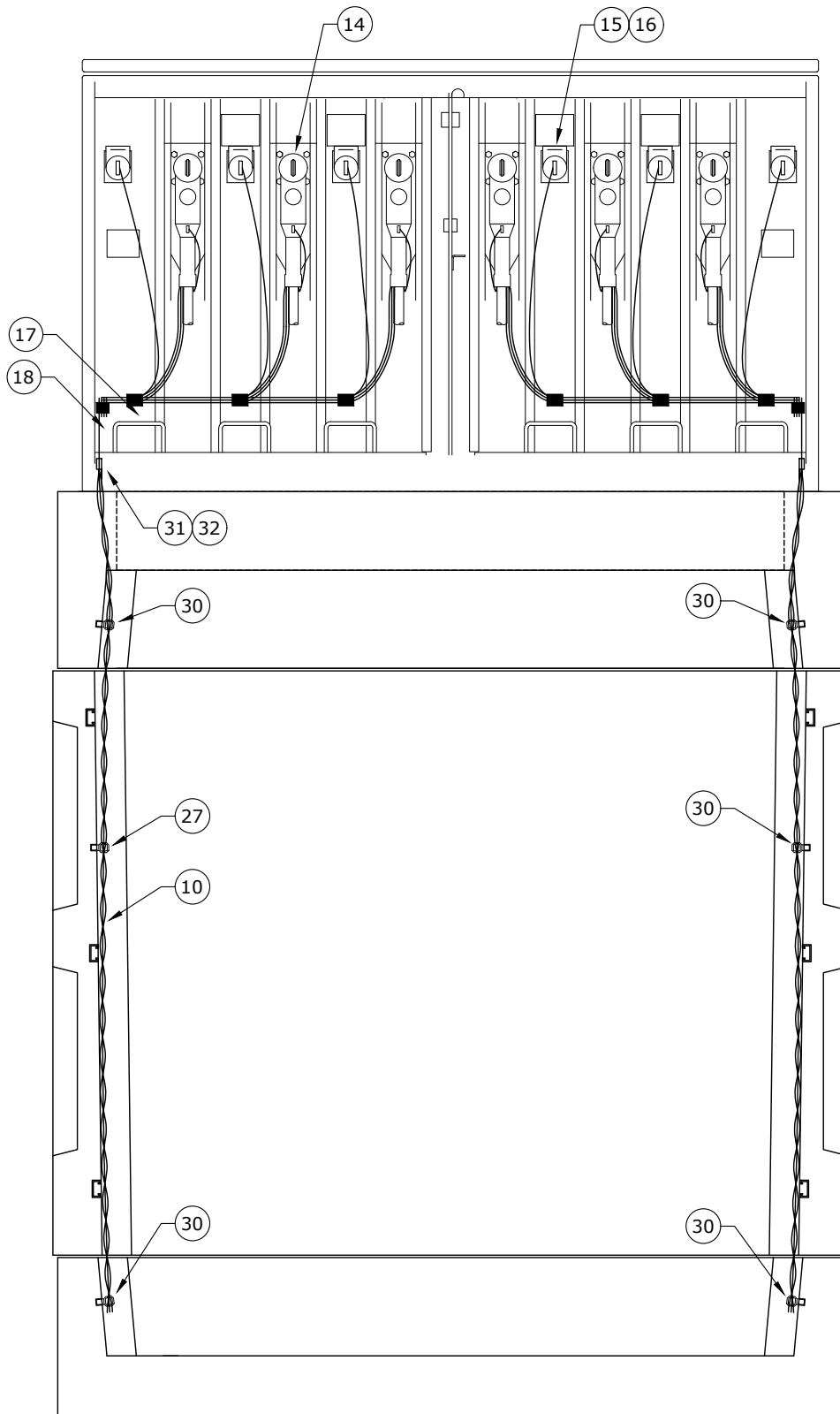
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2 of 6

**USG3**

CAD FILE:  
USG3

APP: HWH/MA  
DATE: 2/22/00

SECTION  
**1600**



200A Elbow Detail

Rev. 4 - Fixed stock number in Note 4 for temporary lid.



## CONSTRUCTION STANDARDS

DEADFRONT SWITCHGEAR  
612 VAULT DETAIL  
USE WITH STANDARD USG2

### REVISIONS

△	DATE	ENGR	OPS
1	1/11/04	LB	AH
2	10/7/05	LB	AH
3	12/5/19	CM	GM
4	9/16/21	JDK	

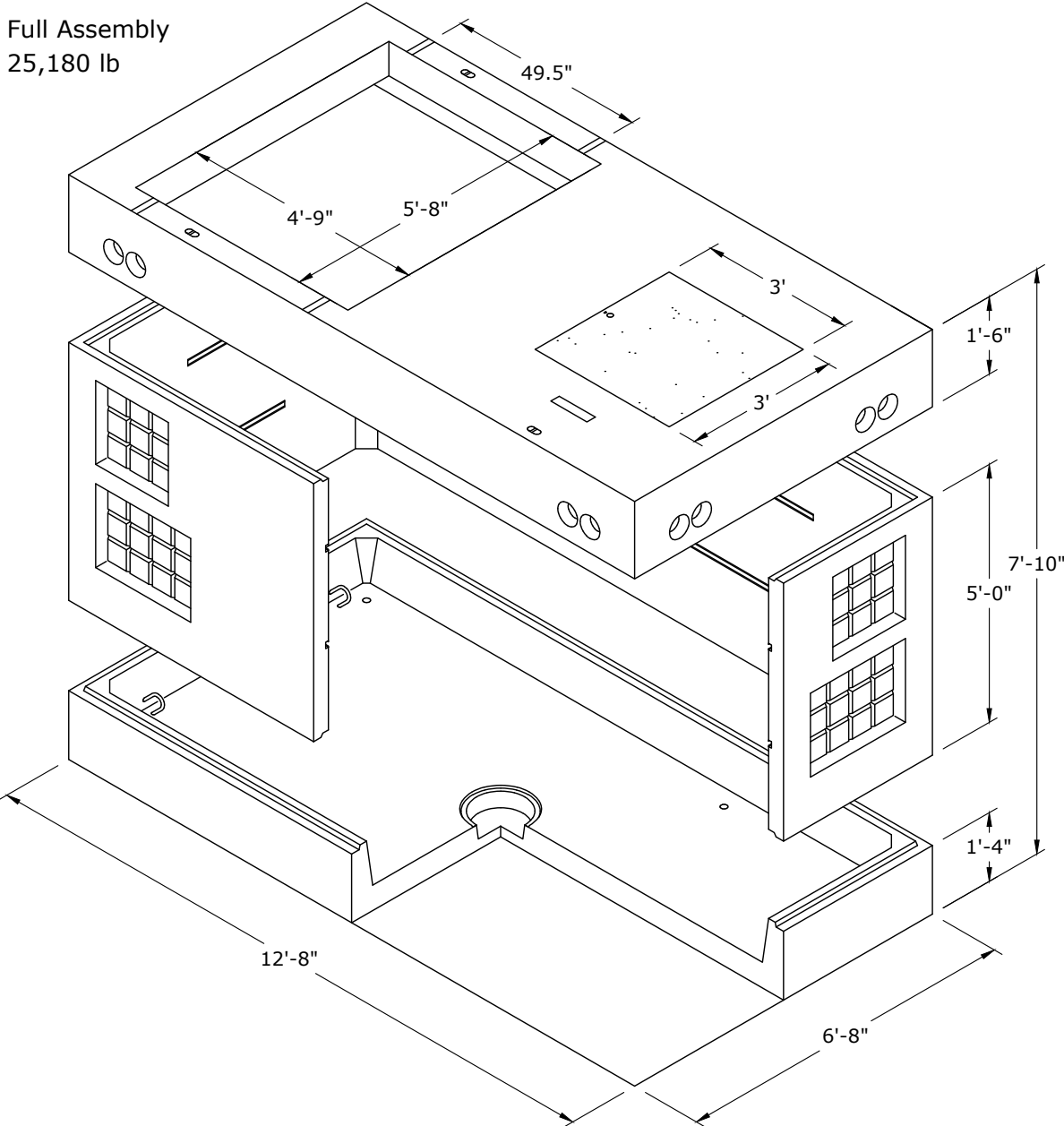
PAGE:  
3 of 6

# USG3

CAD FILE:  
USG3

APP: HWH/MA  
DATE: 2/22/00

SECTION  
**1600**



SIDE VIEW

Rev. 4 - Fixed stock number in Note 4 for temporary lid.



**CONSTRUCTION STANDARDS**

DEADFRONT SWITCHGEAR  
 612 VAULT DETAIL  
 USE WITH STANDARD USG2

REVISIONS

△	DATE	ENGR	OPS
1	1/11/04	LB	AH
2	10/7/05	LB	AH
3	12/5/19	CM	GM
4	9/16/21	JDK	

PAGE:  
4 of 6

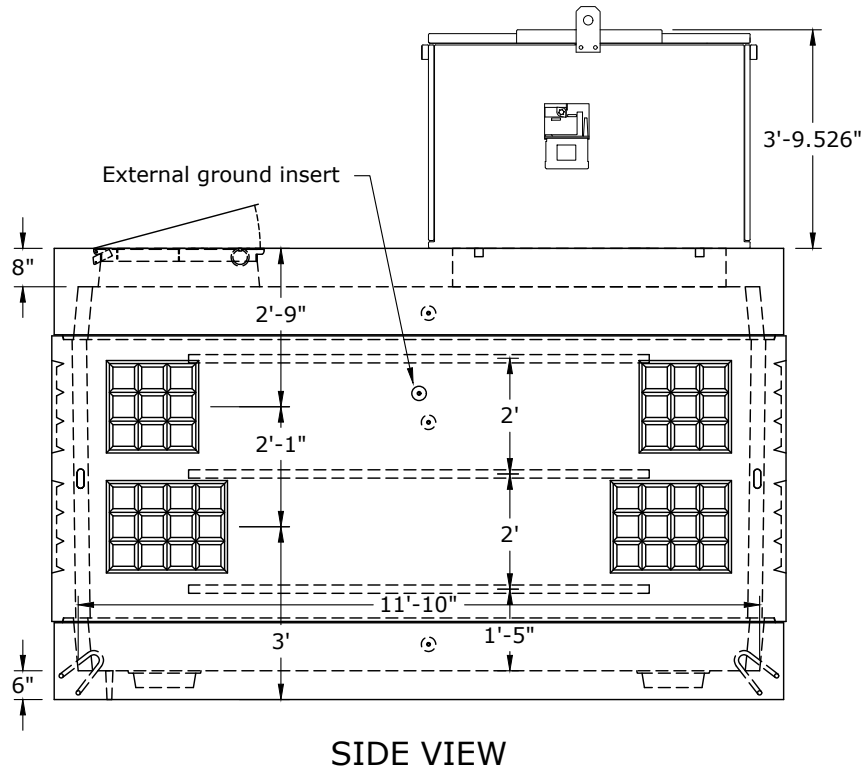
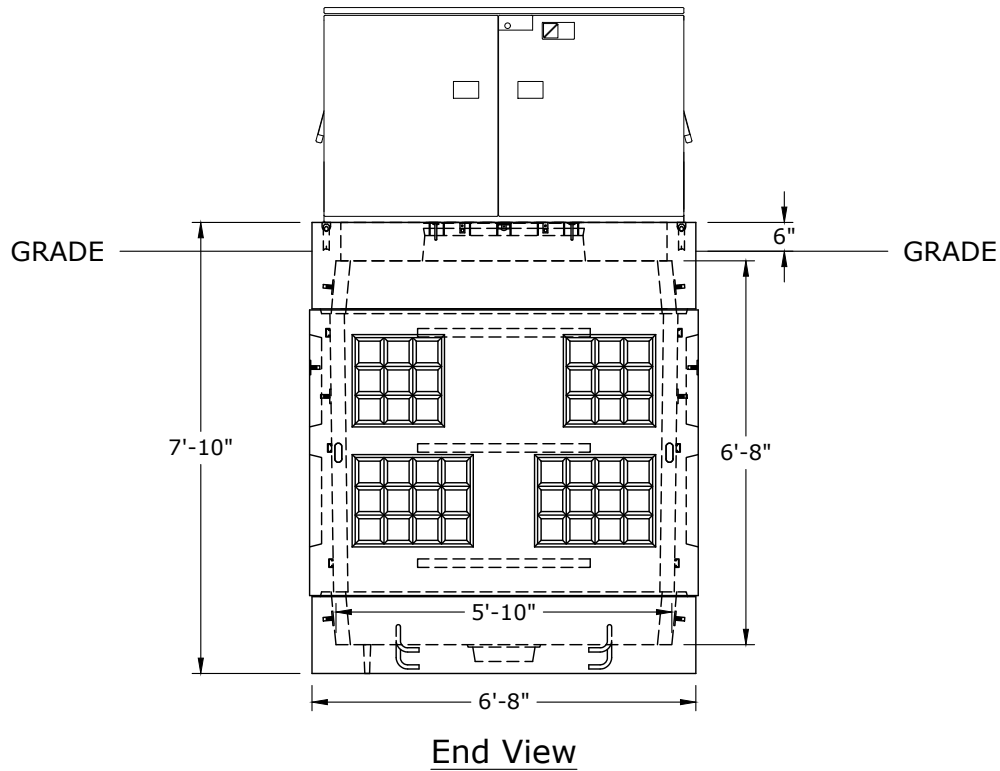
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APP: HWH/MA  
 DATE: 2/22/00

SECTION  
**1600**





Rev. 4 - Fixed stock number in Note 4 for temporary lid.



## CONSTRUCTION STANDARDS

DEADFRONT SWITCHGEAR  
612 VAULT DETAIL  
USE WITH STANDARD USG2

### REVISIONS

#	DATE	ENGR	OPS
1	1/11/04	LB	AH
2	10/7/05	LB	AH
3	12/5/19	CM	GM
4	9/16/21	JDK	

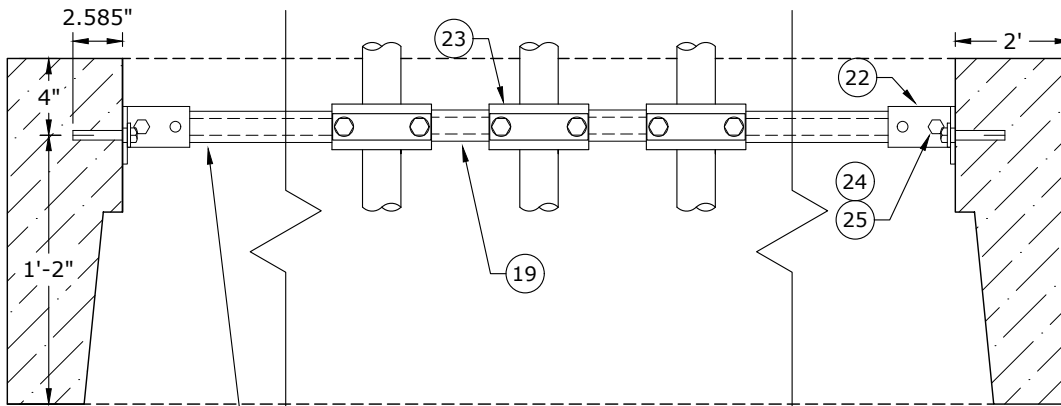
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5 of 6

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USG3

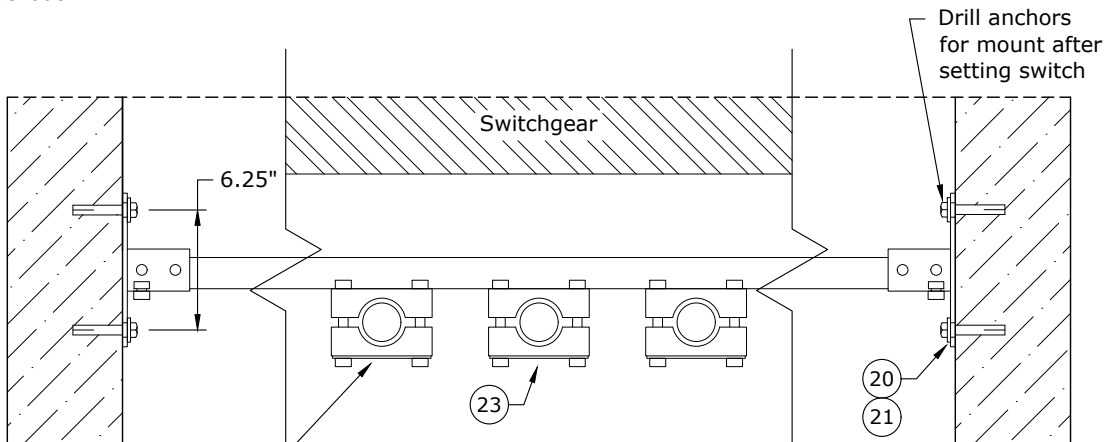
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DATE: 2/22/00

SECTION  
**1600**



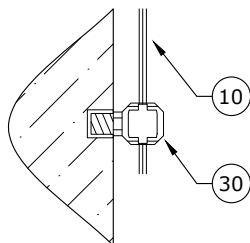
Strut must be cut to 5'-8-1/2" to fit across the lid blockout

**Cable Support Side View**

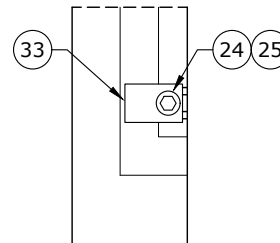


Mount cable clamps on door side of strut

**Cable Support Top View**



**UFER Ground Connection**



**Switchgear to Vault Anchoring Detail**

Rev. 4 - Fixed stock number in Note 4 for temporary lid.

ITEM NO.	DESCRIPTION	USG3	
		QTY	S/N
26	Vault, w/ Lid, 612-3LA, Ufer Ground, for PME Switchgear	1	2957
27	Rack, Cable, 30"	8	2861
28	Hook, Cable Rack, 18"	16	2863
29	Tie Wrap, Plastic, Releasable, 1/2" W x 19" L	36	2956
30	Lug, Grounding, #8 Sol - 2/0 Str, 4-Way	6	842
31	Connector, Compression Lug, Cu, 2/0 Str	4	431
32	Bolt, Washer, SS, 1/2" x 2" Assembly, w/ Si Br Nut	4	1389
33	Washer, 2" x 3" x 3/16" with 9/16" Slotted Hole	4	1415



**CONSTRUCTION STANDARDS**

DEADFRONT SWITCHGEAR  
612 VAULT DETAIL  
USE WITH STANDARD USG2

REVISIONS

Δ	DATE	ENGR	OPS
1	1/11/04	LB	AH
2	10/7/05	LB	AH
3	12/5/19	CM	GM
4	9/16/21	JDK	

PAGE:  
6 of 6

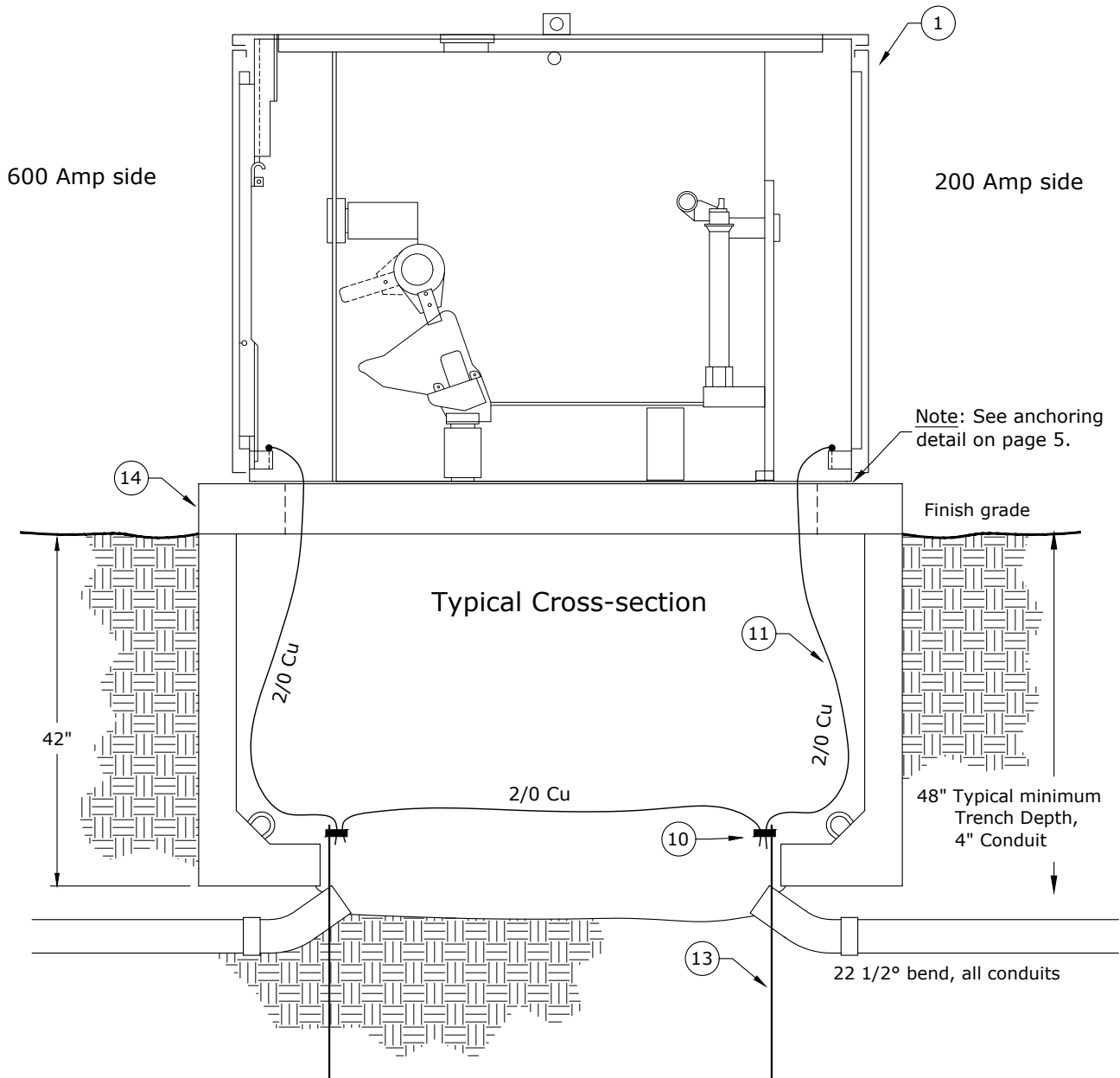
**USG3**

CAD FILE:  
USG3

APP: HWH/MA  
DATE: 2/22/00

SECTION  
**1600**

FOR MAINTENANCE ONLY OR  
WHEN STD USG3 VAULT WILL NOT FIT



- Notes:**
1. Std USG3 is the preferred vault standard for PME switchgear.
  2. Install 2 ground rods and 2/0 Cu bus loop around vault & bond to switchgear case in opposite corners.
  3. Remote indicator for fault indicator is to be installed in the upper hinged-side of door of compartment with indicator.

Rev. 2 - Combined USG 5, 6, & 7, changed to maintenance or where 612 vault does not fit & added material issue.



**CONSTRUCTION STANDARDS**

DEADFRONT SWITCHGEAR ON 774 VAULT  
FOR MAINTENANCE ONLY  
OR WHEN STD USG3 VAULT WILL NOT FIT

REVISIONS

△	DATE	ENGR	OPS
1	1/11/04	LB	AH
2	8/8/22	CRM	GM

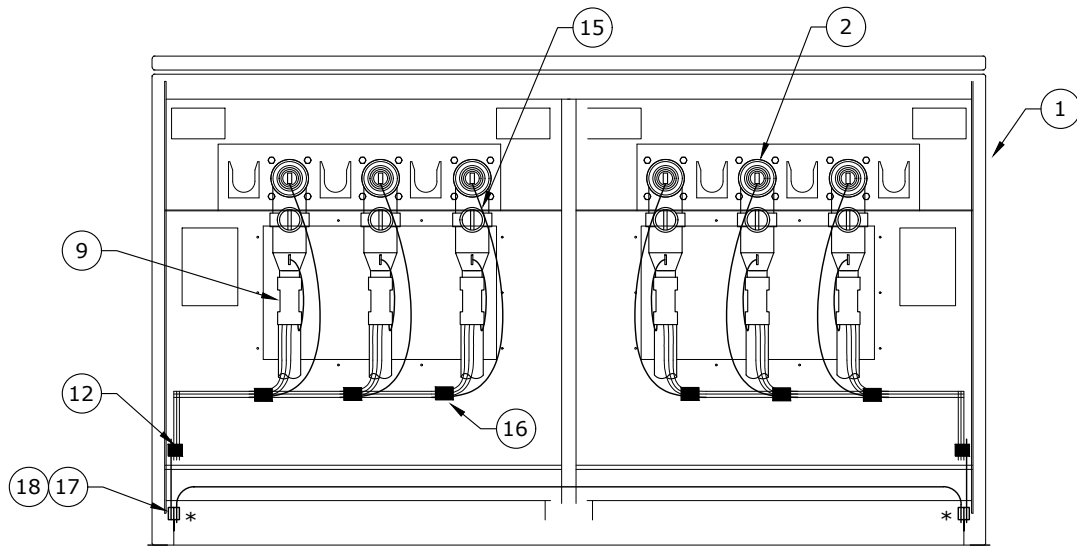
PAGE:  
1 of 6

**USG5**

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USG5

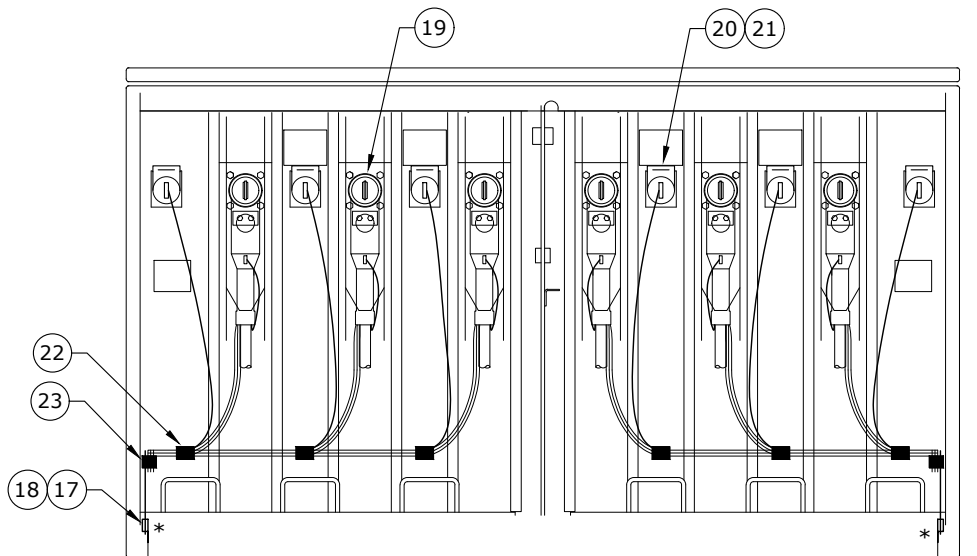
APP: HWH/MA  
DATE: 11/94

SECTION  
**1600**



**600A Elbow Detail**

\*Note: Bond concentric neutrals from cable to 2/0 Cu ground. Leave enough slack to move elbows.



**200A Elbow Detail**

Rev. 2 - Combined USG 5, 6, & 7, changed to maintenance or where 612 vault does not fit, and added material issue.



**CONSTRUCTION STANDARDS**

DEADFRONT SWITCHGEAR ON 774 VAULT  
FOR MAINTENANCE ONLY  
OR WHEN STD USG3 VAULT WILL NOT FIT

REVISIONS

Δ	DATE	ENGR	OPS
1	1/11/04	LB	AH
2	8/8/22	CRM	GM

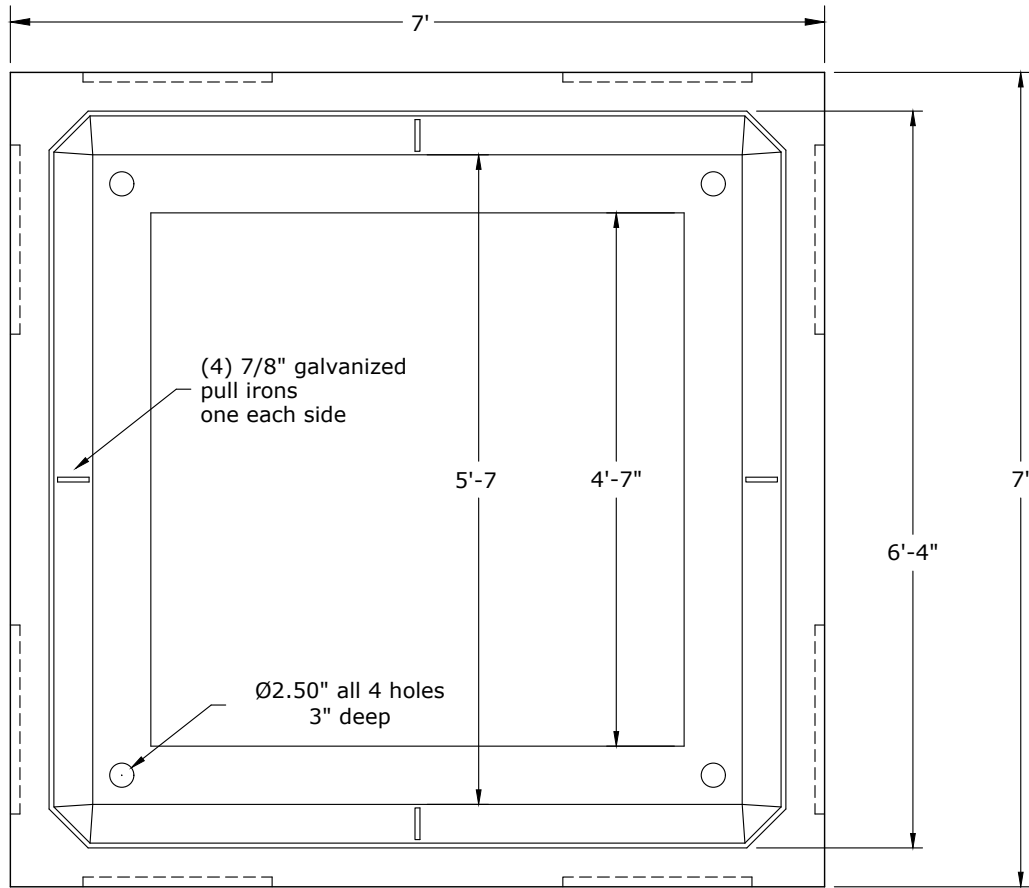
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2 of 6

**USG5**

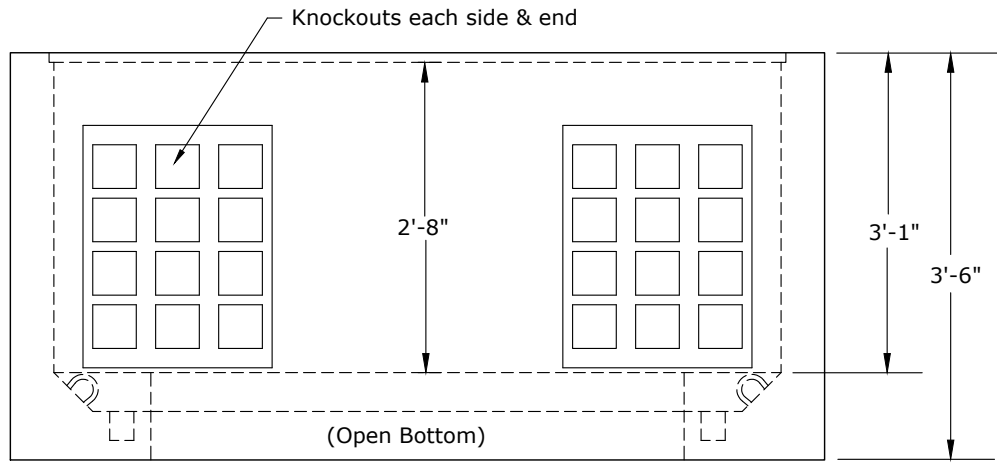
CAD FILE:  
USG5

APP: HWH/MA  
DATE: 11/94

SECTION  
**1600**



Top View (Vault Base)



Front View (Vault Base)

Base Weight - 6,040 lb

Rev. 2 - Combined USG 5, 6, & 7, changed to maintenance or where 612 vault does not fit, and added material issue.



**CONSTRUCTION STANDARDS**

DEADFRONT SWITCHGEAR ON 774 VAULT  
FOR MAINTENANCE ONLY  
OR WHEN STD USG3 VAULT WILL NOT FIT

REVISIONS

Δ	DATE	ENGR	OPS
1	1/11/04	LB	AH
2	8/8/22	CRM	GM

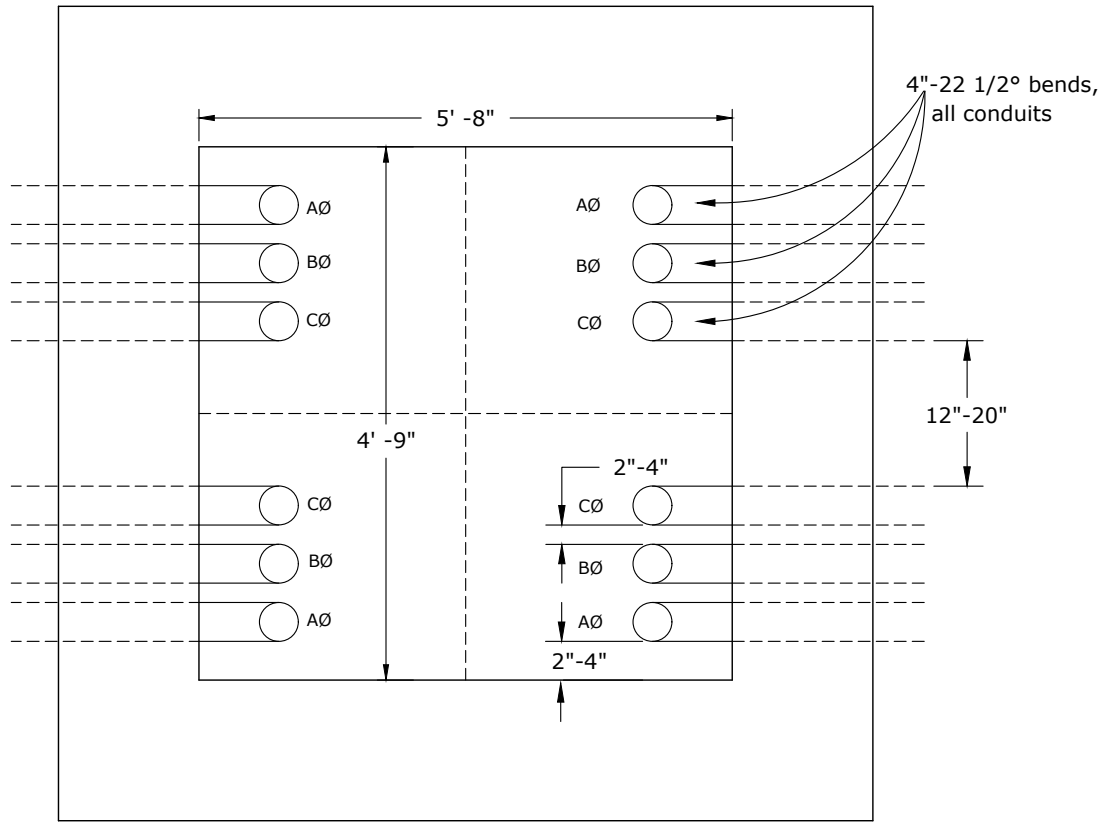
PAGE:  
3 of 6

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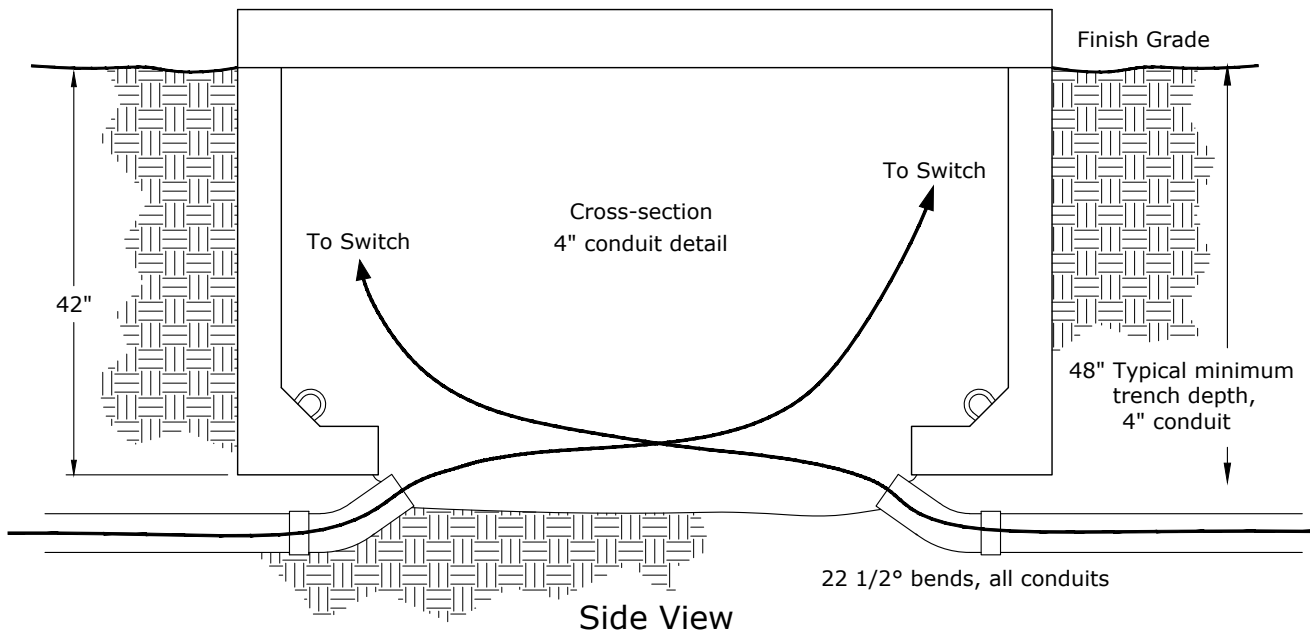
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APP: HWH  
DATE: 11/94

SECTION  
**1600**



Top View



Side View

Rev. 2 - Combined USG 5, 6, & 7, changed to maintenance or where 612 vault does not fit, and added material issue.



**CONSTRUCTION STANDARDS**

DEADFRONT SWITCHGEAR ON 774 VAULT  
FOR MAINTENANCE ONLY  
OR WHEN STD USG3 VAULT WILL NOT FIT

REVISIONS

Δ	DATE	ENGR	OPS
1	1/11/04	LB	AH
2	8/8/22	CRM	GM

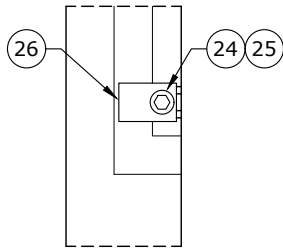
PAGE:  
4 of 6

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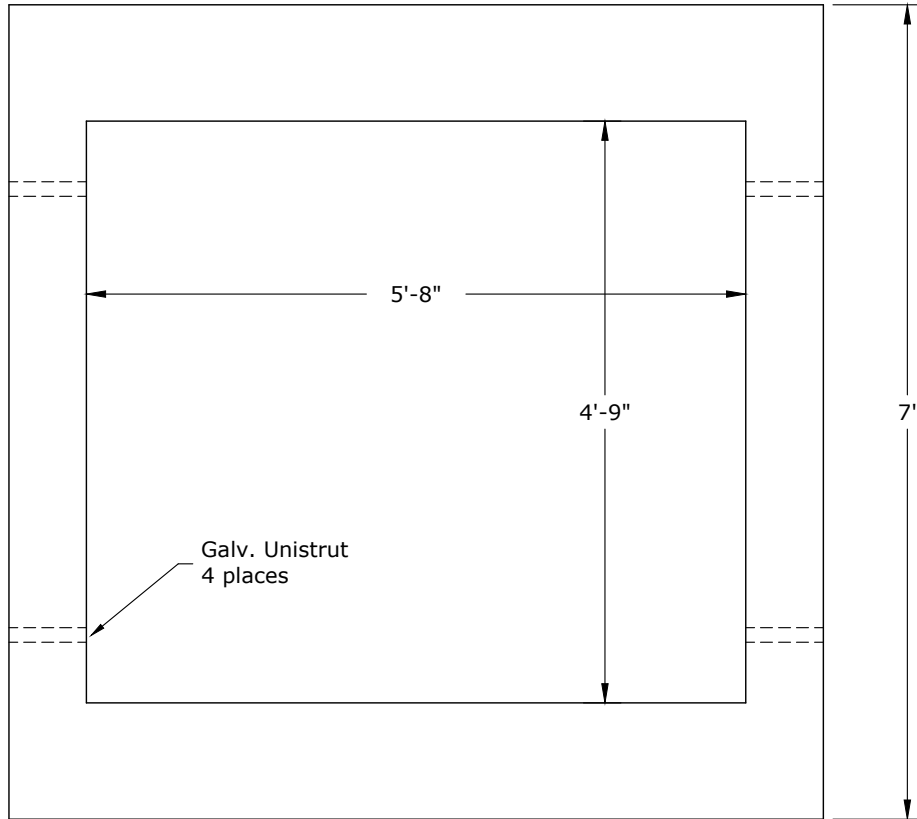
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DATE: 11/94

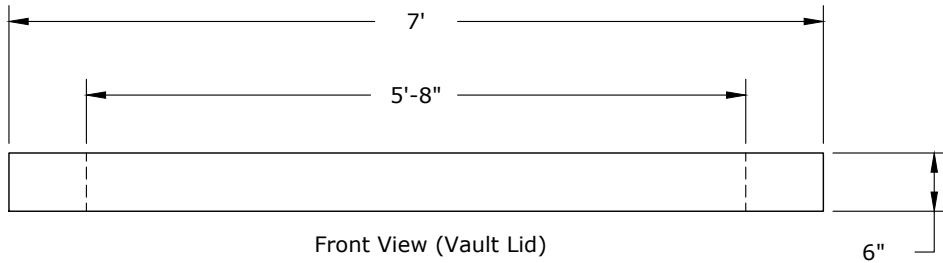
SECTION  
**1600**



**Switchgear to  
Vault Anchoring Detail**



Top View (Vault Lid)



Front View (Vault Lid)

Lid Weight - 2,740 lb

Rev. 2 - Combined USG 5, 6, & 7, changed to maintenance or where 612 vault does not fit, and added material issue.



**CONSTRUCTION STANDARDS**

DEADFRONT SWITCHGEAR ON 774 VAULT  
FOR MAINTENANCE ONLY  
OR WHEN STD USG3 VAULT WILL NOT FIT

REVISIONS

△	DATE	ENGR	OPS
1	1/11/04	LB	AH
2	8/8/22	CRM	GM

PAGE:  
5 of 6

**USG5**

CAD FILE:  
USG5

APP: HWH  
DATE: 11/94

SECTION  
**1600**

ITEM NO.	DESCRIPTION	S/N	7PME9	7PME10	7PME11	7PME12
			QTY	QTY	QTY	QTY
1	Switch, Padmt, PME 9, 2-600 A Switches & 2-200 A Fused Bays	2458	1	-	-	-
	PME 10, 4-600 A Switches	2452	-	1	-	-
	PME 11, 3-600 A Switches & 1-200 A Fused Bay	2459	-	-	1	-
	PME 12, 1-600 A Switch & 3-200 A Fused Bays	Contact Standards Engineer - Not Stocked				
2	Elbow, 600A, NLB, Test Point, Kit For USG1	2692	6	12	9	3
	Each Kit Consists Of #3 to #8:					
3	Elbow, 600 A, T-body	1825	6	12	9	3
4	Adapter, Cable, 1000 MCM	1	6	12	9	3
5	Contact, Compression, Al, 1000 MCM, Non-Threaded Hole	941	6	12	9	3
6	Plug, Loadbreak, Reducing Tap, 600A-200A	1769	6	12	9	3
7	Cap, Protective, Insulated, 200A, 15 kV	265	6	12	9	3
8	Stud, Al, 600A, T-body to Reducer Plug	2704	6	12	9	3
9	Elbow, Sealing Kit, 1000MCM, 175mil & 220mil	2376	6	12	9	3
10	Clamp, Ground Rod, 5/8" Bronze, Large	282	2	2	2	2
11	Conductor, OH, Cu, 2/0, 7-Str, Bare, Soft Drawn, 1C	379	50	50	50	50
12	Connector, Crimpet, Cu, Run & Tap 1/0 - 2/0 Str	457	2	4	3	1
13	Rod, Ground, 5/8" x 8'	1124	2	2	2	2
14	Vault, Concrete, with Lid, 774, PME Switchgear	1541	1	1	1	1
15	Indicator, Fault, UG, 800A, Test-Point, Voltage-Reset, 3 phase	2695	1	3	2	-
16	Connector, Crimpet, Cu, Run 3/0 - 250 Str, Tap #6 Sol - 2/0 Str	459	6	12	9	3
17	Connector, Compression Lug, Cu, 2/0 Str	431	4	4	4	4
18	Bolt, Hexhead, SS, 1/2" x 2" Assembly, w/ Belleville & Flat Washers	1389	4	4	4	4
19	Elbow, 200A, LB, 1/0, 175 & 220 mil, Test Point, 15 kV, Jacket Seal	1312	6	-	3	9
20	Cap, Protective, Insulated, 200A 15 kV	265	6	-	3	9
21	Bushing, Standoff, Insulated, 200A	252	6	-	3	9
22	Connector, Crimpet, Cu, Run & Tap #2 Sol/Str (2C2)	455	6	-	3	9
23	Connector, Crimpet, Cu, Run 1/0 - 2/0 Str, Tap #8 Sol - #2 Str	456	2	-	1	3
24	Bolt, Machine, 1/2" x 1", (304) Stainless Steel	130	4	4	4	4
25	Nut, Spring-Loaded, Galv, 1/2" (Unistrut)	920	4	4	4	4
26	Washer, 2" x 3" x 13/16" w/ 9/16" Slotted Hole	1415	4	4	4	4


Additional Material If Needed

Description	S/N
Lid Only for Vault, Concrete, 774, PME Switchgear	1541B
Cover, Vault, 71" x 77", Fiberglass (Temp Only)	2495

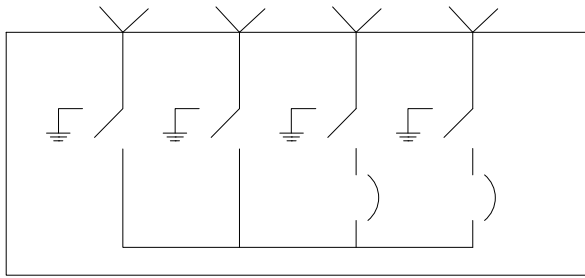
- Notes:**
1. Material issue has the maximum number of fault indicators that may be used. Engineer to determine the actual number needed.
  2. All new PMEs are ordered with the required number of 100E fuses for the configuration plus 3 spare fuses.
  3. If 65E or 125E fuses are required, the Engineer will have to call for the number needed plus 3 spares.
  4. Contact Systems Engineering for proper fuse coordination.

FUSE SIZE	S/N
65 E	661
100 E	662
125 E	663

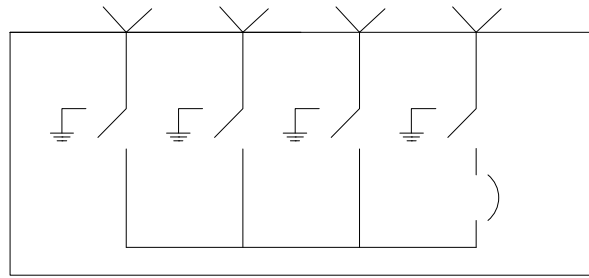
Rev. 2 - Combined USG 5, 6, & 7, changed to maintenance or where 612 vault does not fit, and added material issue.

	<b>CONSTRUCTION STANDARDS</b> DEADFRONT SWITCHGEAR ON 774 VAULT FOR MAINTENANCE ONLY OR WHEN STD USG3 VAULT WILL NOT FIT		<b>REVISIONS</b>												
			<table border="1"> <thead> <tr> <th>DATE</th> <th>ENGR</th> <th>OPS</th> </tr> </thead> <tbody> <tr> <td>1/11/04</td> <td>LB</td> <td>AH</td> </tr> <tr> <td>8/8/22</td> <td>CRM</td> <td>GM</td> </tr> </tbody> </table>	DATE	ENGR	OPS	1/11/04	LB	AH	8/8/22	CRM	GM			
	DATE	ENGR	OPS												
1/11/04	LB	AH													
8/8/22	CRM	GM													
PAGE: 6 of 6	<b>USG5</b>		CAD FILE: USG5	APP: HWH/MA DATE: 11/94	SECTION <b>1600</b>										

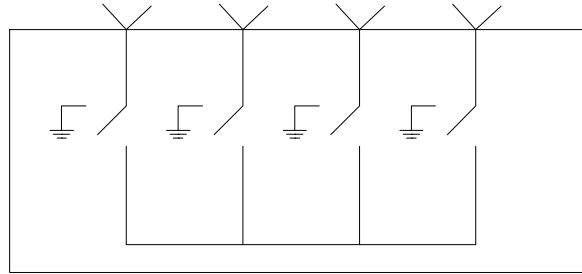




S/N 2910 - Model 422



S/N 2911 - Model 431



S/N 2924 - Model 440

BELOW GRADE SWITCH MODEL	S/N	600 AMP 3Ø SWITCH	200 AMP 3Ø FUSED POSITIONS
422	2910	2	2
431	2911	3	1
440	2924	4	0

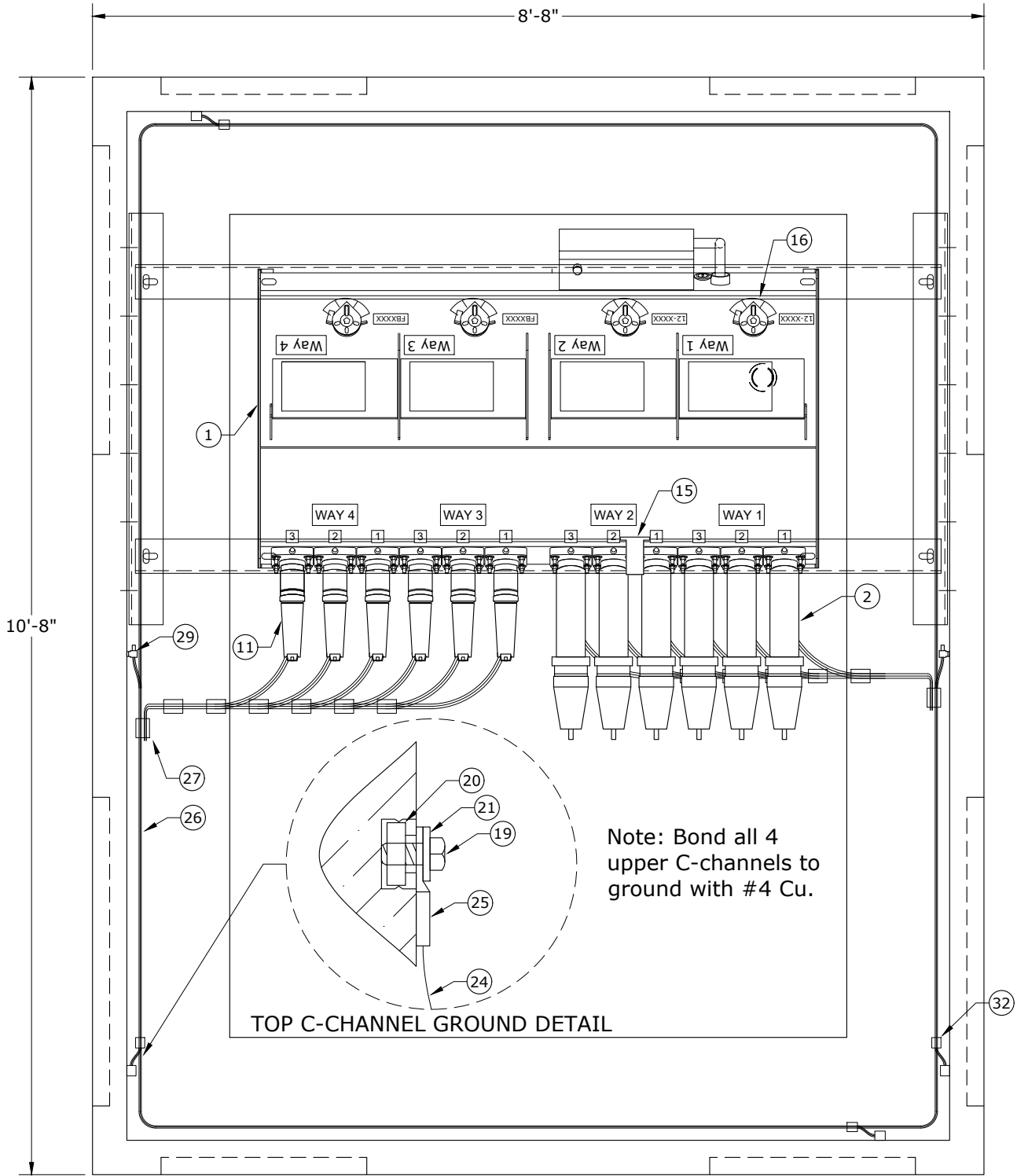
ITEM NO.	DESCRIPTION	S/N	BG422	BG431	BG440
			QTY	QTY	QTY
1	Switchgear, Below Grade, 422, 15kV, 12.5kA Isc	2910	1	-	-
	Switchgear, Below Grade, 431, 15kV, 12.5kA Isc	2911	-	1	-
	Switchgear, Below Grade, 440, 15kV, 12.5kA Isc	2924	-	-	1
2	Elbow, 600A, NLB, Test Point, Kit For USG1	2692	6	9	12
	Each Kit Consists Of Items #3 to #8:				
3	Elbow, 600A, T-body	1825	6	9	12
4	Adapter, Cable, 1000 MCM	1	6	9	12
5	Contact, Compression, Al, 1000 MCM, Non-Threaded Hole	941	6	9	12
6	Plug, Loadbreak, Reducing Tap, 600A-200A	1769	6	9	12
7	Cap, Protective, Insulated, 200A, 15 kV	265	12	12	12
8	Stud, Al, 600A, T-body to Reducer Plug	2704	6	9	12
9	Elbow, Sealing Kit, 1000MCM, 175 & 220 mil	2376	6	9	12
10	Connector, Crimpet, Cu, Run & Tap 3/0 to 4/0 Str	460	6	9	12
11	Elbow, 200A, LB, 1/0, 175 & 220 mil, Test Point, 15 kV, Jacket Seal	1312	6	3	-
12	Bushing, Feed-Thru, 200A, 15 kV	237	6	3	-
13	Connector, Crimpet, Cu, Run & Tap #2 Sol/Str (2C2)	455	6	3	-
14	Indicator, Fault, 400A, Test Point, Voltage Reset, 1Ø	2694	2	1	-
15	Indicator, Fault, 800A, Test Point, Voltage Reset, 3Ø	2695	1	2	3



**CONSTRUCTION STANDARDS**  
BELOW GRADE SWITCHGEAR  
USE WITH STANDARD USG9

REVISIONS			
DATE	ENGR	OPS	

**Note:** Switch numbers and FB number labels are made by the warehouse. Labels are black on yellow and are 4" wide by 2" high. Systems Engineering assigns the numbers.



**Grounding Detail Top View**



### CONSTRUCTION STANDARDS

BELOW GRADE SWITCHGEAR  
VAULT DETAIL  
USE WITH STANDARD USG8

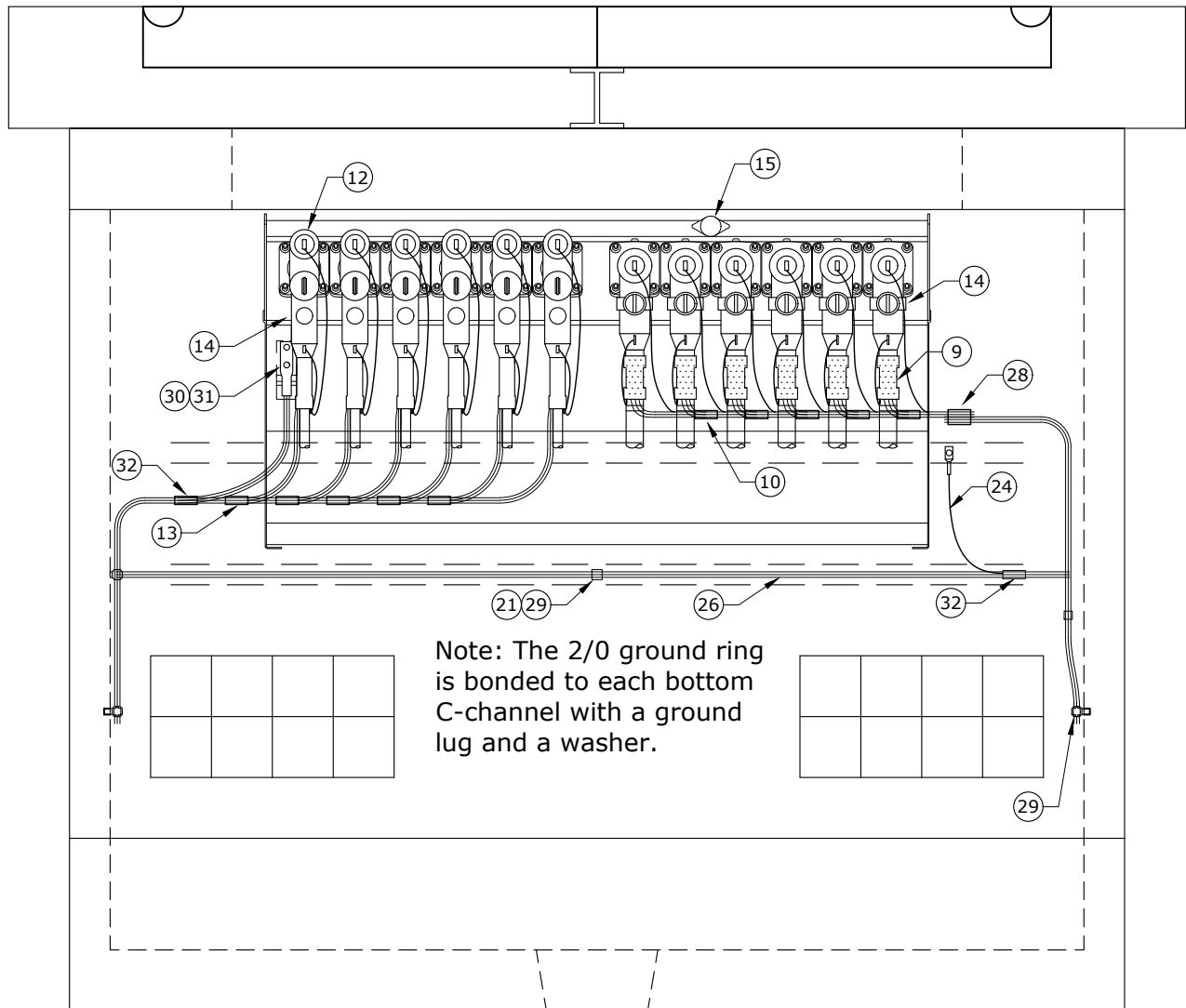
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1 of 7

## USG9

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△	DATE	ENGR	OPS

APP: CRM/GM      SECTION  
DATE: 8/8/22      1600



Note: The 2/0 ground ring is bonded to each bottom C-channel with a ground lug and a washer.

Grounding Detail Back View

**Note:** This drawing is for model 422. For all models, keep 200A elbow concentrics separate from 600A elbow concentrics.



**CONSTRUCTION STANDARDS**

BELOW GRADE SWITCHGEAR  
VAULT DETAIL  
USE WITH STANDARD USG8

PAGE:  
2 of 7

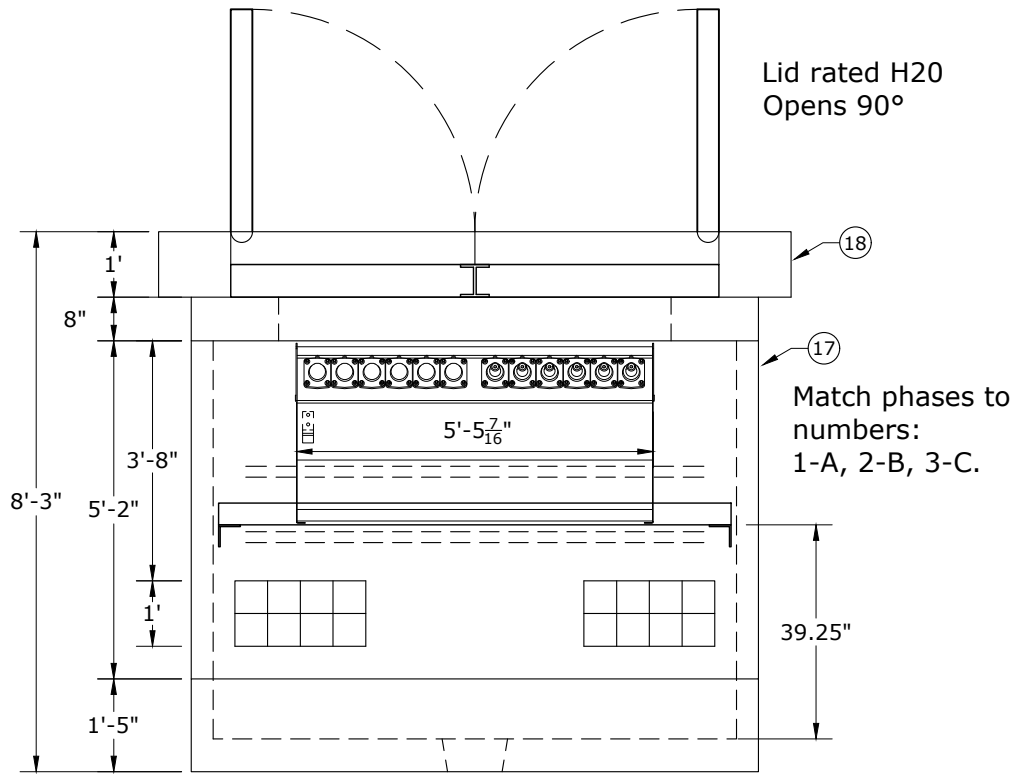
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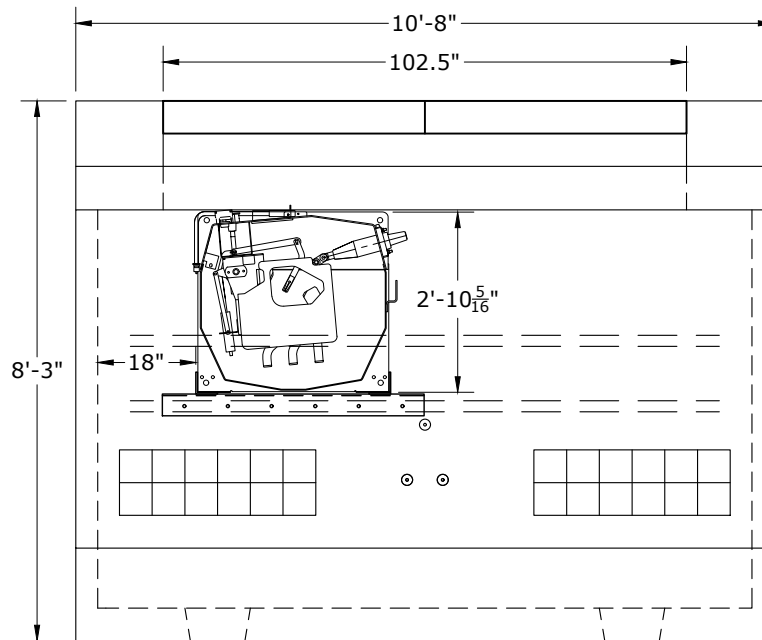
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△	DATE	ENGR	OPS

APP: CRM/GM  
DATE: 8/8/22

SECTION  
**1600**



Back View



Side View

Notes:

1. Use the bottom outermost conduits first so that remaining vacant conduits are accessible for future cable pulling and orderly cable training. Seal vacant conduits with reusable expanding duct plugs (S/N 2943). Seal conduits with cable using inflatable seals (S/N 2944).
2. Install feed-thru bushings in each 200 A bushing well.



**CONSTRUCTION STANDARDS**

BELOW GRADE  
VAULT DETAIL  
USE WITH STANDARD USG8

PAGE:  
3 of 7

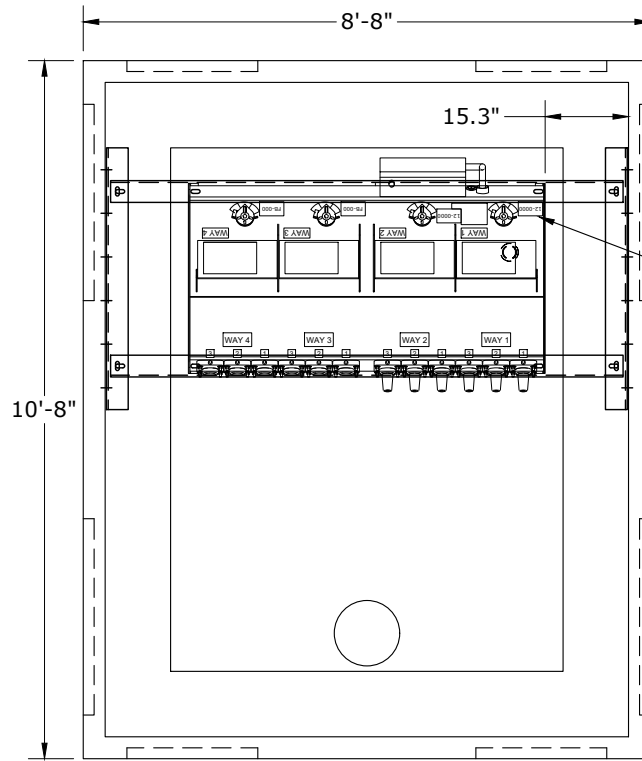
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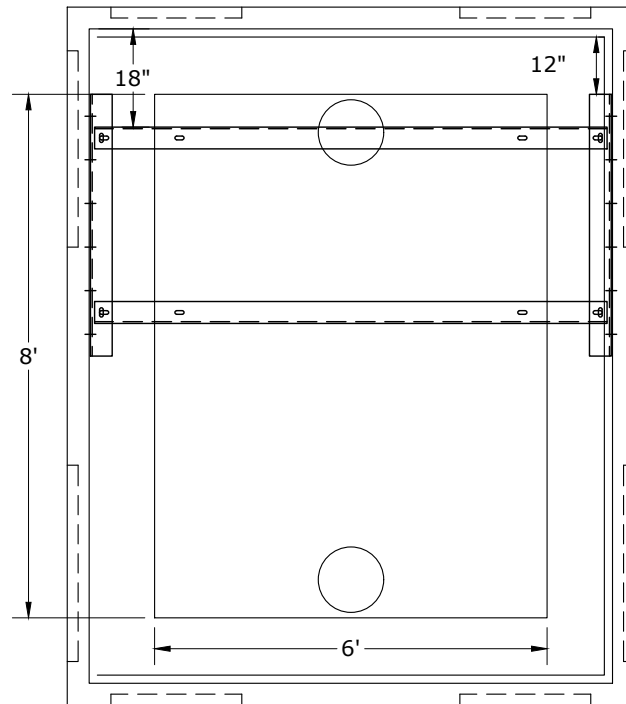
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DATE: 8/8/22

SECTION  
**1600**



See Systems Engineering for switch and fuse bay numbers.

Vault Base With Switch



Vault Base Top View



**CONSTRUCTION STANDARDS**

BELOW GRADE SWITCHGEAR  
VAULT DETAIL  
USE WITH STANDARD USG8

PAGE:  
4 of 7

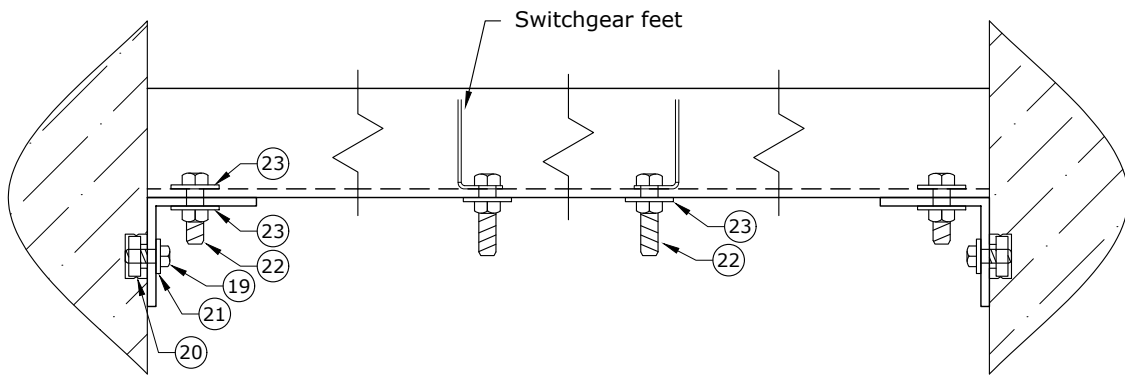
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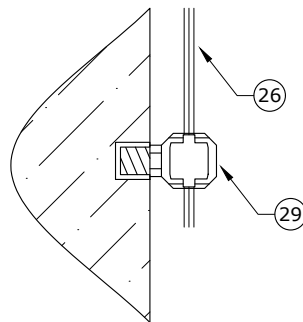
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APP: CRM/GM  
DATE: 8/8/22

SECTION  
**1600**



Switchgear Support Assembly



Ufer Ground Connection Detail



**CONSTRUCTION STANDARDS**

BELOW GRADE SWITCHGEAR  
VAULT DETAIL  
USE WITH STANDARD USG8

PAGE:  
5 of 7

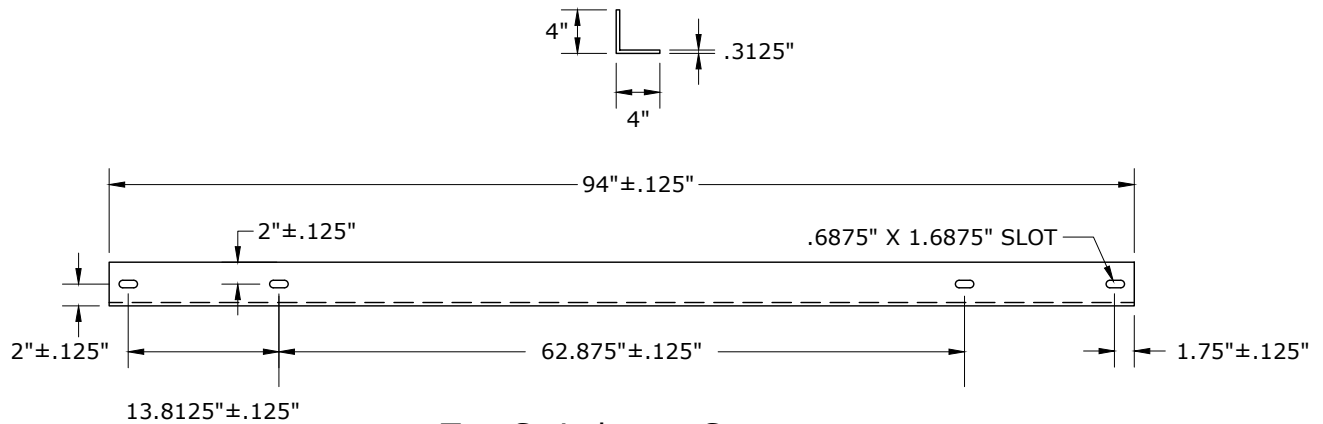
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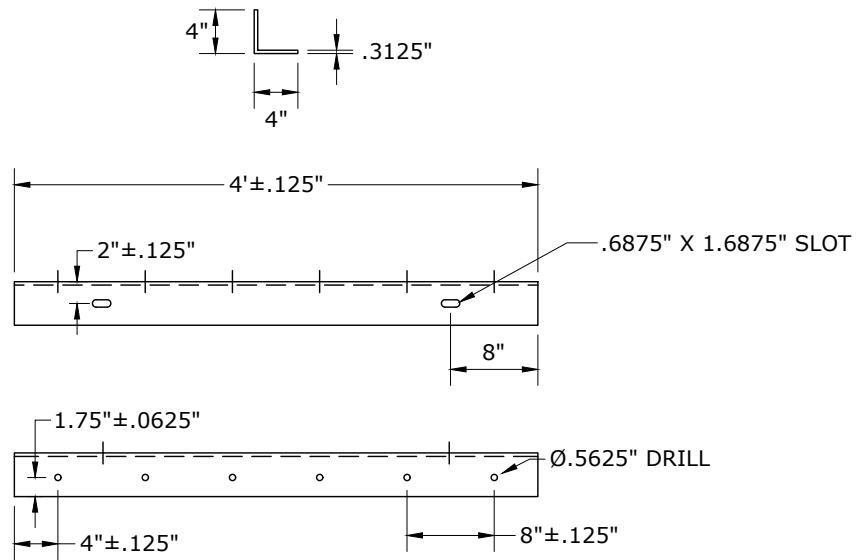
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△	DATE	ENGR	OPS

APP: CRM/GM  
DATE: 8/8/22

SECTION  
**1600**



**Top Switchgear Support**



**Bottom Switchgear Support**

- Notes:**
1. These dimensions are for a Utility Vault 8'x10' with tapered walls.
  2. These supports are not part of CPU inventory and must be fabricated at a machine shop.



**CONSTRUCTION STANDARDS**

BELOW GRADE SWITCHGEAR  
VAULT DETAIL  
USE WITH STANDARD USG8

PAGE:  
6 of 7

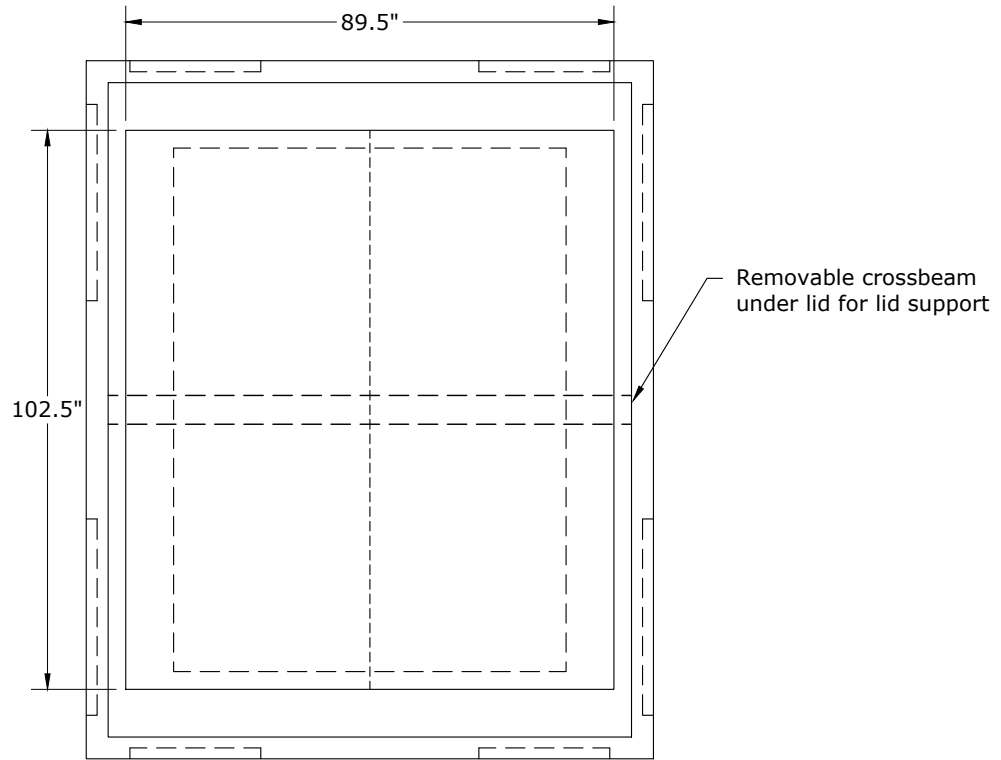
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REVISIONS			
△	DATE	ENGR	OPS

APP: CRM/GM  
DATE: 8/8/22

SECTION  
**1600**



Top View With Lid

Note: See USG8 for items #1-16.

ITEM NO.	DESCRIPTION	USG9	
		QTY	S/N
17	Vault, 810. w/o Lid, Below Grade Switch	1	2793
18	Lid, (2) 3' x 8' Doors, 810 Vault, Below Grade Switch	1	2794
19	Bolt, Machine, 1/2" x 1-1/2" SS	12	131
20	Nut, Spring-Loaded Galv. 1/2"	16	920
21	Washer, Flat, 1/2", SS	20	2610
22	Bolt, Machine 5/8" x 2" Galv., 12,400 lbs Ultimate Tensile	8	149
23	Washer, Flat Round, Galv., 5/8"	16	1395
24	Conductor, OH, BSDC, #4, 1C 7 Str	35	377
25	Connector, Compression Lug, #4 Cu	8	2548
26	Conductor, OH, BSDC, 2/0, 1C 7 Str	60	379
27	Connector, Crimpet, Cu, 2/0 to 2/0	6	457
28	Connector, Crimpet, Cu, 2/0 to 4/0	1	459
29	Lug, Grounding, #8 SLD - 2/0 Str 4 Way	6	842
30	Connector, Compression Lug, Cu 2/0 Str	1	431
31	Bolt, Washer, SS, 1/2" x 2" Assembly, w/ Si Br Nut	2	1389
32	Connector, Crimpet, Cu, 1/0-2/0 to #6-#2	6	456



**CONSTRUCTION STANDARDS**

BELOW GRADE SWITCHGEAR  
VAULT DETAIL  
USE WITH STANDARD USG8

REVISIONS

△	DATE	ENGR	OPS

PAGE:  
7 of 7

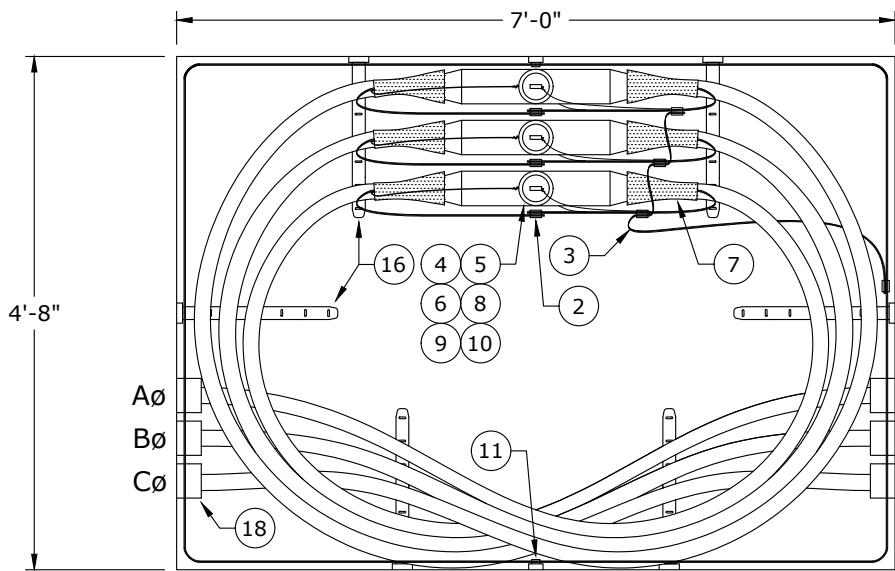
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APP: CRM/GM  
DATE: 8/8/22

SECTION  
**1600**



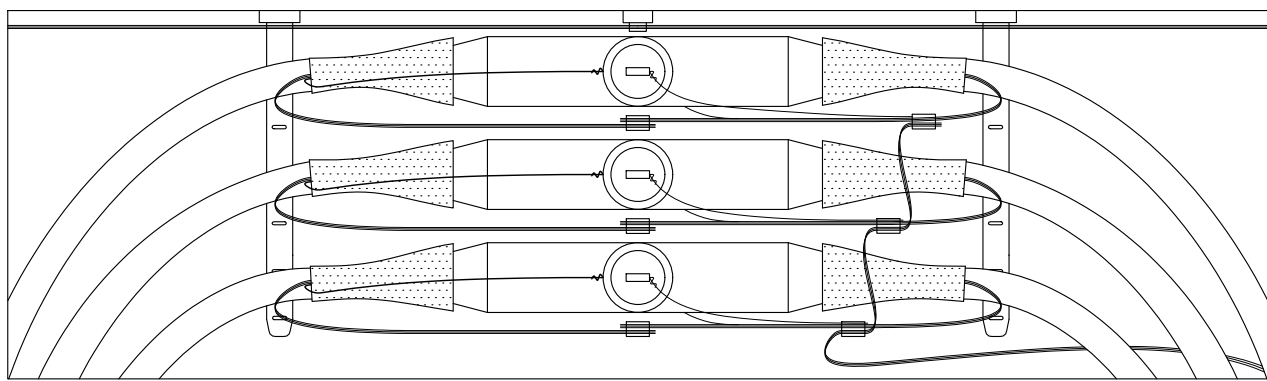


Aø & Cø may be swapped on both ends

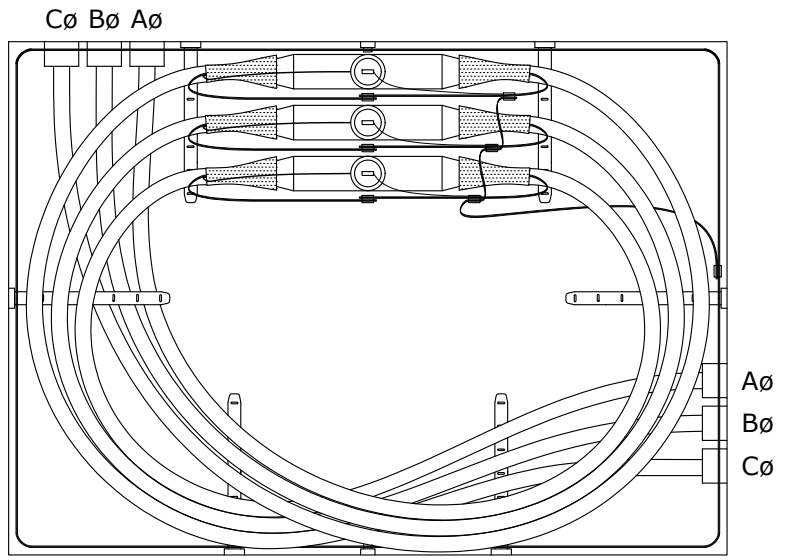
Note: Ensure cables maintain at least 14.5" minimum bend radius

Note: CO2 cartridges for seals (#18) are in free issue.  
Inflation tool is in Tool Room.

Top View



Grounding Detail



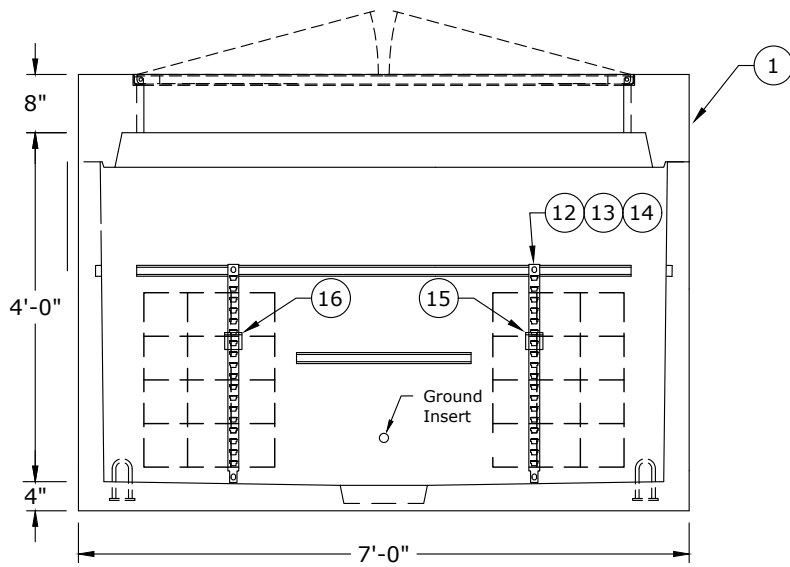
Alternate Configuration



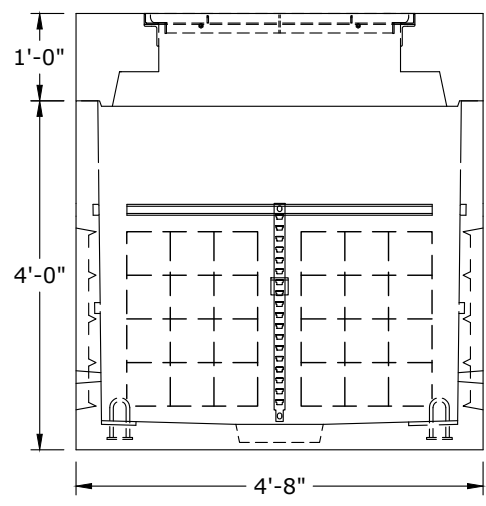
CONSTRUCTION STANDARDS

1000MCM SPLICE PIT  
FLUSH-MOUNT

REVISIONS			
Δ	DATE	ENGR	OPS



Front View (Inside)



Side View (Inside)

ITEM NO.	DESCRIPTION	USP	
		QTY.	S/N
1	Vault, 575LA, Flush-Mount J-Box or EE, Ufer Ground, Non-Slip Lid	1	2722
2	Connector, Crimpet, Cu, Run & Tap 1/0 - 2/0 Str	7	457
3	Conductor, OH, Cu, 2/0, 7-str, Bare, Soft-Drawn, 1C	30	379
4	Extender, 1000MCM Cable	3	2766
5	Plug, Basic Insulating	3	1824
6	Contact, Compression, Al, 1000MCM, Non-Threaded Hole	6	941
7	Elbow, Sealing Kit, 1000MCM 175 & 220 Mil	6	2376
8	Adapter, Cable, 1000MCM	6	1
9	Plug, Loadbreak, Reducing Tap, 600A-200A	3	1769
10	Cap, Protective, Insulated, 200A	3	265
11	Lug, Grounding, #8 Sol - 2/0 Str, 4-Way	2	842
12	Bolt, Machine, 1/2" x 1-1/2" SS	6	131
13	Nut, Spring-Loaded, Galv, 1/2" (Uni-strut)	6	920
14	Washer, Flat, 1/2", 18-8, Stainless Steel	6	2610
15	Bracket, Mounting, Vault, 30"	6	2861
16	Arm, Vault, Cable, 18"	6	2863
17	Tie Wrap, Plastic, Releasable, 1/2" W x 19" L	21	2956
18	Seal, 4" Conduit, Inflatable (Up to 2 Cables)	6	2944



**CONSTRUCTION STANDARDS**  
1000MCM SPLICE PIT  
FLUSH-MOUNT

REVISIONS			
DATE	ENGR	OPS	

APP: CRM/GM	SECTION
DATE: 8/8/22	<b>1600</b>

# **1610**

## **VAULT ROOM**

3/15/2010

**N** COVR Customer-Owned Vault Room Requirements

**N** New Standard  
**R** Redrawn Standard  
**C** Changed Standard  
**~** No Change

# Scope

This standard documents requirements for customer-owned vault rooms containing equipment owned, operated, and maintained by Clark Public Utilities.


# In This Standard

<u>TOPIC</u>	<u>SEE PAGE</u>
CODE REQUIREMENTS	1
VAULT ROOM AVAILABILITY	2
VAULT ROOM LOCATION	2
CIRCUIT DESIGN CRITERIA	2
VAULT ROOM GENERAL REQUIREMENTS	3
PULLING EYES	5
TRANSFORMERS	6
VIBRATION DAMPERS	8
J-BOXES	9
SWITCHES	9
CABLE AND CABLE RACKING	13
DUCT SYSTEMS	15
GROUNDING	15
SYSTEM PROTECTION	15
PERSONNEL ACCESS	16
SIGNAGE	16
FIRE DETECTION AND SUPPRESSION	18
OIL CONTAINMENT	18
VENTILATION	18
LIGHTING AND OUTLETS	20
APPROVAL DRAWINGS	20

# Code Requirements

Vault rooms shall be designed and constructed so they will be considered separate buildings under IBC 705. The vault room shall meet the requirements of NEC Article 450, Part III. Raceways shall be designed and constructed so they will be considered outside the building under NEC 230.6.

Nothing in this standard shall be interpreted to conflict with the regulations of the State of Washington or other regulatory bodies that have jurisdiction.

	<h2>CONSTRUCTION STANDARDS</h2> <p>CUSTOMER-OWNED VAULT ROOM REQUIREMENTS</p>		<b>REVISIONS</b>		
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PAGE: 1 of 20	<h1>COVR</h1>	CAD FILE: COVR	APP: DATE:	CM/AH 2/1/10	SECTION <b>1610</b>

# Vault Room Availability

Clark Public Utilities' preferred design is to use padmounted equipment installed outdoors. Equipment installed in a vault room is only allowed if the customer demonstrates that an outdoor installation is physically impractical, an undue hardship, or required by a government authority. Aesthetics alone is not adequate justification.

Approval for use of a vault room must be obtained from the Clark Design Engineer prior to submitting a vault room design for review.

# Vault Room Location




All vault room locations must be reviewed and approved by the Clark Construction Design Engineer. Vault rooms should be located at grade level adjacent to the exterior wall or under the sidewalk that is closest to Clark's existing distribution system. All vault rooms must have direct access with a boom truck.

In all cases, the location shall be accessible by a door, removable wall, or ceiling to an outside location where Clark can reach the transformer, switchgear and related equipment for installation, maintenance and replacement. The customer shall provide a location where Clark crews will have 24-hour access to operate the equipment.

# Circuit Design Criteria

Equipment installed in a vault room shall not serve any other buildings.

The equipment inside the vault room shall have the ability to be de-energized from outside the vault room without causing a permanent outage to other customers. The intent of this is to be able to de-energize the vault room in case of a fire or other hazardous circumstance.

	<b>CONSTRUCTION STANDARDS</b> CUSTOMER-OWNED VAULT ROOM REQUIREMENTS		REVISIONS			
				DATE	ENGR	OPS
						
PAGE: 2 of 20	<b>COVR</b>		CAD FILE: COVR	APP: CM/AH DATE: 2/1/10	SECTION <b>1610</b>	

# Vault Room General Requirements

## What is Allowed in the Vault Room

- Equipment, pipes, ducts, wires, and other fixtures allowed in a vault room shall be a necessary part of the Clark electrical installation. All items must be approved by the Clark Construction Design Engineer.
- No foreign fixtures may pass through a vault room or a cable room. This includes water or sewer pipes, or any other equipment that may require inspection or service by the customer.
- Vault rooms shall not be accessible to unqualified personnel.
- Vault rooms shall not be used as temporary or permanent storage spaces.
- All metering equipment and customer equipment, other than service conductors or bus, shall be located outside of the vault room.




## Clark Public Utilities Responsibilities

- Test and energize new facilities
- Terminate primary cables in any energized facilities
- Upon energizing the facilities, Clark will assume ownership of and maintain all primary cables and conduits, transformers, junction boxes, and other primary voltage equipment.

## Customer Responsibilities

- Approval for use of a vault room must be obtained from the Clark Design Engineer prior to submitting a vault room design for review.
- The customer is responsible for providing and installing all facilities.
- All materials must comply with Clark technical standards and be supplied from Clark's material list by an approved distributor.
- All Clark primary voltage facilities must be installed per Clark technical standards by a contractor on Clark's list of approved electrical contractors.

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	<b>CONSTRUCTION STANDARDS</b> CUSTOMER-OWNED VAULT ROOM REQUIREMENTS		REVISIONS			
				DATE	ENGR	OPS
						
PAGE: 3 of 20	<b>COVR</b>		CAD FILE: COVR	APP: CM/AH DATE: 2/1/10	SECTION <b>1610</b>	

The customer will provide, install, and maintain the following:

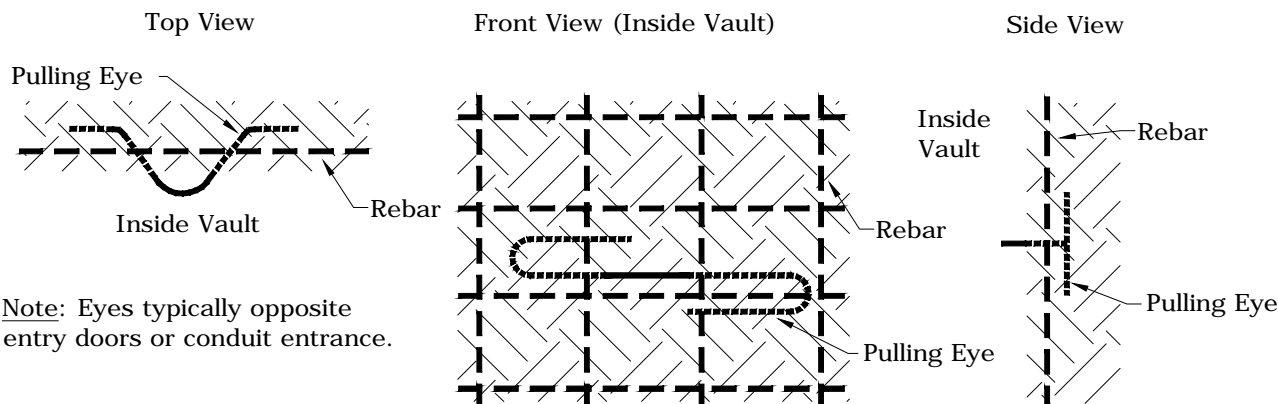
Vault Room Requirement	Customer General Responsibilities
Location, Design, Layout, and Access	<ul style="list-style-type: none"> <li>• Vault room located either inside or on the exterior of the building constructed as specified in NEC 450, Section III, Transformer Vaults.</li> <li>• Personnel and equipment access doors.</li> <li>• Restricted room access to qualified utility workers only. See WAC 295-45-035.</li> <li>• Smooth floor surface for rolling/sliding of equipment if access for installation and removal is not directly above transformer.</li> </ul>
Fire Detection/ Suppression	<p>Fire detection equipment (smoke and temperature).</p> <ul style="list-style-type: none"> <li>• Portable ABC fire extinguisher outside access door(s).</li> <li>• Any additional equipment or systems required by local fire officials.</li> <li>• Clark does not allow water fire suppression in vault rooms.</li> <li>• Adequate ventilation for cooling of equipment.</li> </ul>
Ventilation	<ul style="list-style-type: none"> <li>•</li> </ul>
Ground Bus	<ul style="list-style-type: none"> <li>• Ground bus for equipotential zone.</li> </ul>
Oil Containment	<ul style="list-style-type: none"> <li>• Oil containment sills, sumps, oilwater separators, drains, and valves</li> </ul>
Duct and Cable Racking	<ul style="list-style-type: none"> <li>• Inserts, ducts, or knockouts in the wall for entrance and termination of ducts for primary cable, and Clark Communications cables.</li> <li>• Pulling inserts/hooks for installation of cables.</li> <li>• Racking for primary and secondary service cables.</li> </ul>
Lighting and Outlets	<ul style="list-style-type: none"> <li>• Room lighting, emergency lighting, and convenience outlets.</li> </ul>
Service Conductors	<ul style="list-style-type: none"> <li>• All service cables, rigid bus, and supports up to the point of interconnection.</li> </ul>
Approval Drawings	<ul style="list-style-type: none"> <li>• Drawings for approval by Clark Public Utilities Construction Design Engineer.</li> </ul>
Seismic	<ul style="list-style-type: none"> <li>• All electrical systems, components, and elements, including supporting structures and attachments, shall be installed in accordance with the International Building Code (IBC), Section 1621.</li> </ul>
Noise and Vibration	<ul style="list-style-type: none"> <li>• The vault room shall be designed so the noise and vibration from the transformer, fans, and other equipment, is not objectionable to the tenants of the building.</li> </ul>
Signage	<ul style="list-style-type: none"> <li>• Customer to install "Warning" and "Danger" signs provided by Clark</li> <li>• Switch rooms shall be labeled w/ switch number provided by Clark</li> <li>• Transformer rooms shall be permanently marked w/ 2" phenolic numbers and letters (i.e. Transformer 1234-2500.)</li> </ul>
Keys	<ul style="list-style-type: none"> <li>• The customer will provide all copies of keys to Clark.</li> <li>• The customer will <u>not</u> keep copies of any keys to the vault room.</li> </ul>



**CONSTRUCTION STANDARDS**  
CUSTOMER-OWNED VAULT ROOM  
REQUIREMENTS

REVISIONS			
△	DATE	ENGR	OPS
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# Pulling Eyes



Note: Eyes typically opposite entry doors or conduit entrance.

Pulling Eyes Shown Embedded in Concrete Vault Walls Behind Reinforcing Steel

Pulling eyes are required in Clark's vaults. Pulling eye number, location, and height shall be determined and approved by the Clark Construction Design Engineer. The location of pulling eyes should be chosen to facilitate moving electrical equipment, including cable, to be located in or removed from the vault.

Minimally, but without duplication, pulling eyes for rigging equipment shall be installed as follows:

- opposite the entry door (one);
- adjacent to the entry door (one);
- centered on each wall without a center door;
- opposite each conduit entrance at approximately the same height (one);
- adjacent to one side of each conduit entrance (one);
- for vaults with ceiling hatches for transformer installation and removal, pulling eyes should be installed adjacent to the hatches (two); and
- similarly, for conduits entering through the ceiling or the floor, pulling eyes should be installed adjacent and opposite the conduit entrances (two).

Locations for pulling eyes can vary depending on the vault plan and configuration (entry door, conduit entrance, hatch, and transformer locations). Clark prefers that pulling eyes on walls shall be at a height of 26 inches from the floor although for conduit entrances, the height of the pulling irons should approximately match the height of the conduits. If the vault is constructed of concrete blocks, eyes may be floor-mounted.

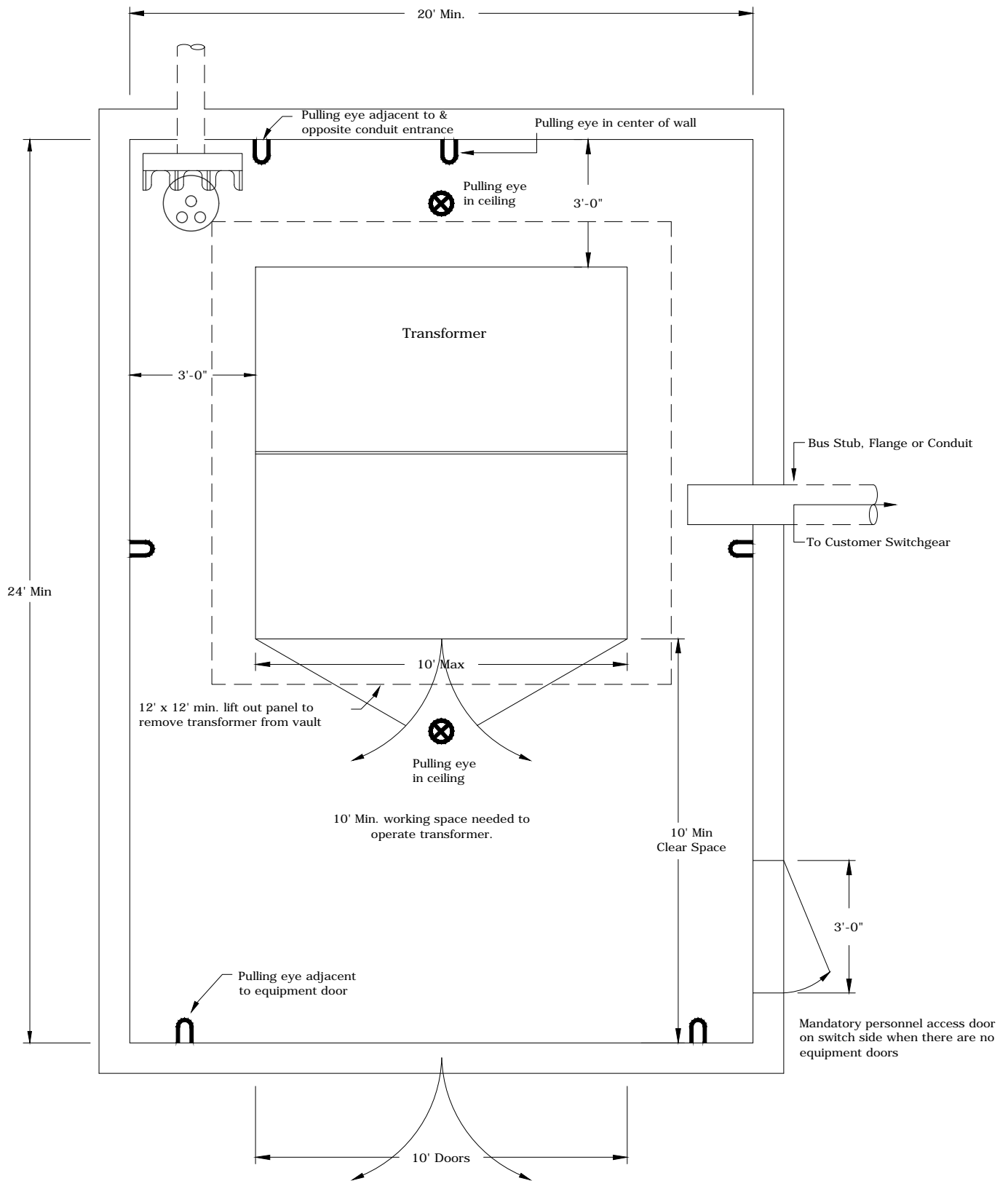
Pulling eyes shall be installed with the following requirements:

- Pulling eyes shall be made of stainless steel.
- Pulling eye installation shall be rated and labeled in the vault as 10,000 pounds pulling strength.
- Install pulling eyes behind concrete reinforcing rebar steel (Note: spacing and size of rebar to be determined by a licensed civil engineer.).





Figure 1: Transformer vault room (top view)



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**CONSTRUCTION STANDARDS**  
 CUSTOMER-OWNED VAULT ROOM  
 REQUIREMENTS  
 COVR

REVISIONS			
△	DATE	ENGR	OPS
△			
APP:	CM/AH	SECTION	
DATE:	2/1/10	1610	



## J-Boxes

When space is not available for the normal exterior junction vault, junction bushings may be installed on a wall in a separate vault room. Use of interior junction bushings should be avoided whenever possible to reduce access times during emergency conditions.

If junction boxes are installed in a vault room, the space must be designed to accommodate the following:

- The junction bushings shall be mounted 36 inches above the floor
- The cables shall be racked on the wall and not laid on the floor. The cables shall be secured to the racking. The racking shall be supplied and installed by the customer. The racking must be approved by Clark's Standards Engineer.
- The portions of the cables close to the elbow shall be free to move and not be trapped under other cables.
- There shall be enough slack to easily move the elbows from the junction bushings to the stand-off brackets. The cable shall not come out of the floor directly below the junction bushings because this does not provide adequate slack.
- The cables may approach the racking from above, or below, or a combination.
- A 10-foot by 10-foot working space shall be provided in front of the junction bushings.

## Switches

The preferred design when switches are required to serve a new customer is to have them set outside the building and above ground (padmounted). If they cannot be located outside of the building, they must be placed in a vault room separate from the transformer. The switches required for vault rooms are the S&C "Vista" switch.




Transformers greater than 1500kVA will require a S&C "Vista" switch, whether inside or outside the building, for system protection.

### Room Dimensions and Clearances

Vault rooms for switches shall be a minimum of 24' x 15'. The minimum ceiling height shall be 12'. Vault rooms shall provide a minimum working space of 10 feet deep and 8 feet wide from the control panel side of the switch, and 3 feet on the sides. The minimum equipment entry door side shall be 10' x 10'.

The room shall be a minimum of 8 feet from the floor to the cable racks above. See Figures 3 and 4.

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	<b>CONSTRUCTION STANDARDS</b> CUSTOMER-OWNED VAULT ROOM REQUIREMENTS COVR		REVISIONS			
				DATE	ENGR	OPS
						
PAGE: 9 of 20	<b>COVR</b>		CAD FILE: COVR	APP: CM/AH DATE: 2/1/10	SECTION <b>1610</b>	

**Installing and Removing the Switch**

The preferred method of installing and removing the switch is by a boom truck. The door shall be 10' x 10'. The vault room can be open on top to the outside or have a minimum 10' x 10' opening for a S&C "Vista" switch obtained by removing an access.

- The opening or hatch and switch must be in a location on the property where it is accessible by lift equipment that is owned by Clark or its normal utility contractor.
- The hatch must be equipped with Clark's standard lifting inserts or the customer shall provide any non-standard lifting devices for use with the rigging of a mobile crane.
- The entire access hatch, if one piece, or each section, must weigh 15,000 pounds or less.

Note: The customer is responsible for removal and replacement of any seals or coverings in preparation for installation or removal of equipment.

**Equipment Door**

If equipment shall be installed and removed through a wall, the minimum access door required is 10 feet wide by 10 feet high.

**Multiple Switches**

If multiple switches are required to serve a facility, they will be placed in separate rooms to keep an equipment failure from damaging or limiting access to the other equipment.

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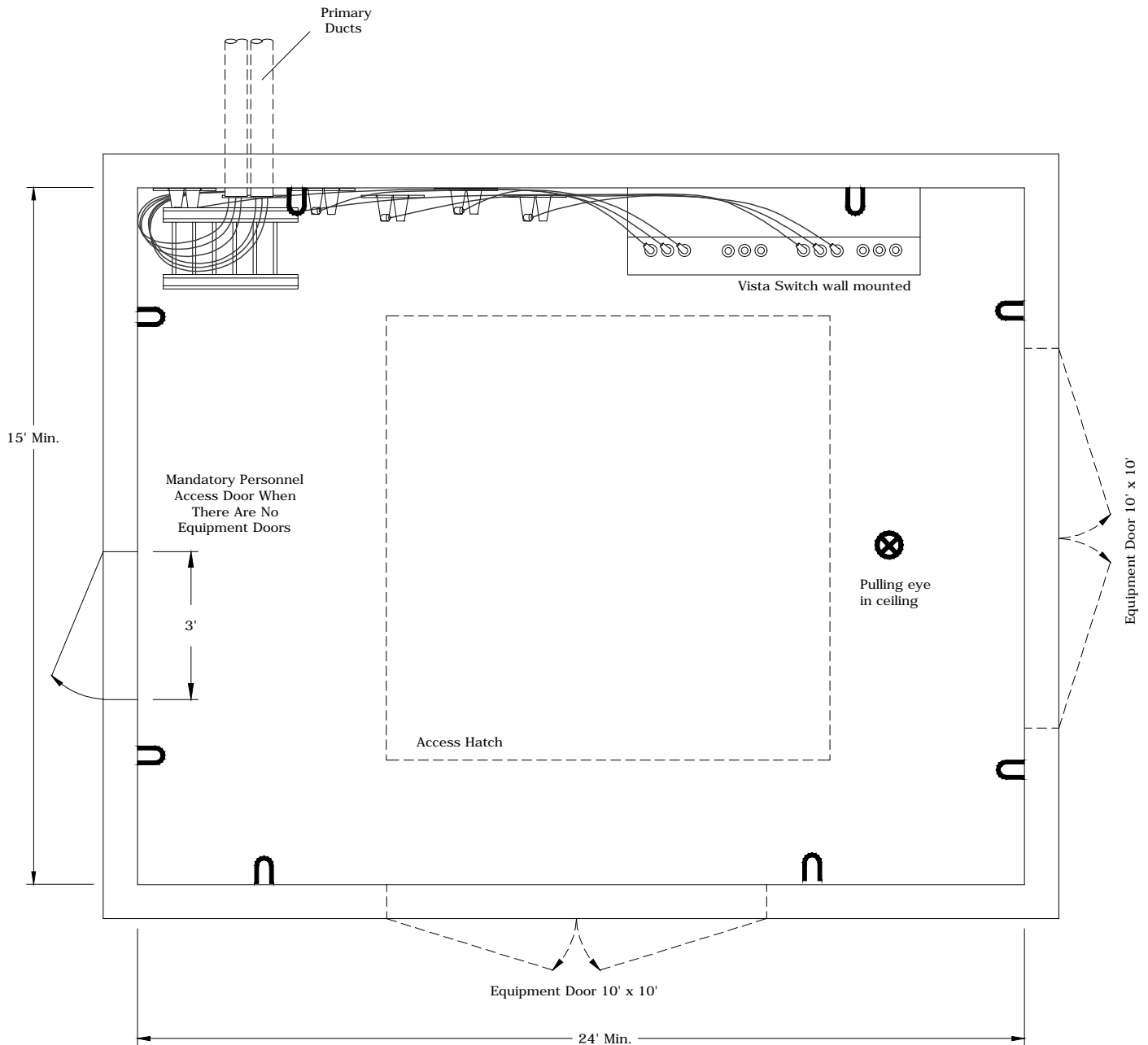
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PAGE: 10 of 20	<b>COVR</b>		CAD FILE: COVR	APP: DATE:	CM/AH 2/1/10	SECTION <b>1610</b>

Figure 3: Vista Switch Vault Room (Top View)



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**CONSTRUCTION STANDARDS**  
 CUSTOMER-OWNED VAULT ROOM  
 REQUIREMENTS  
 COVR

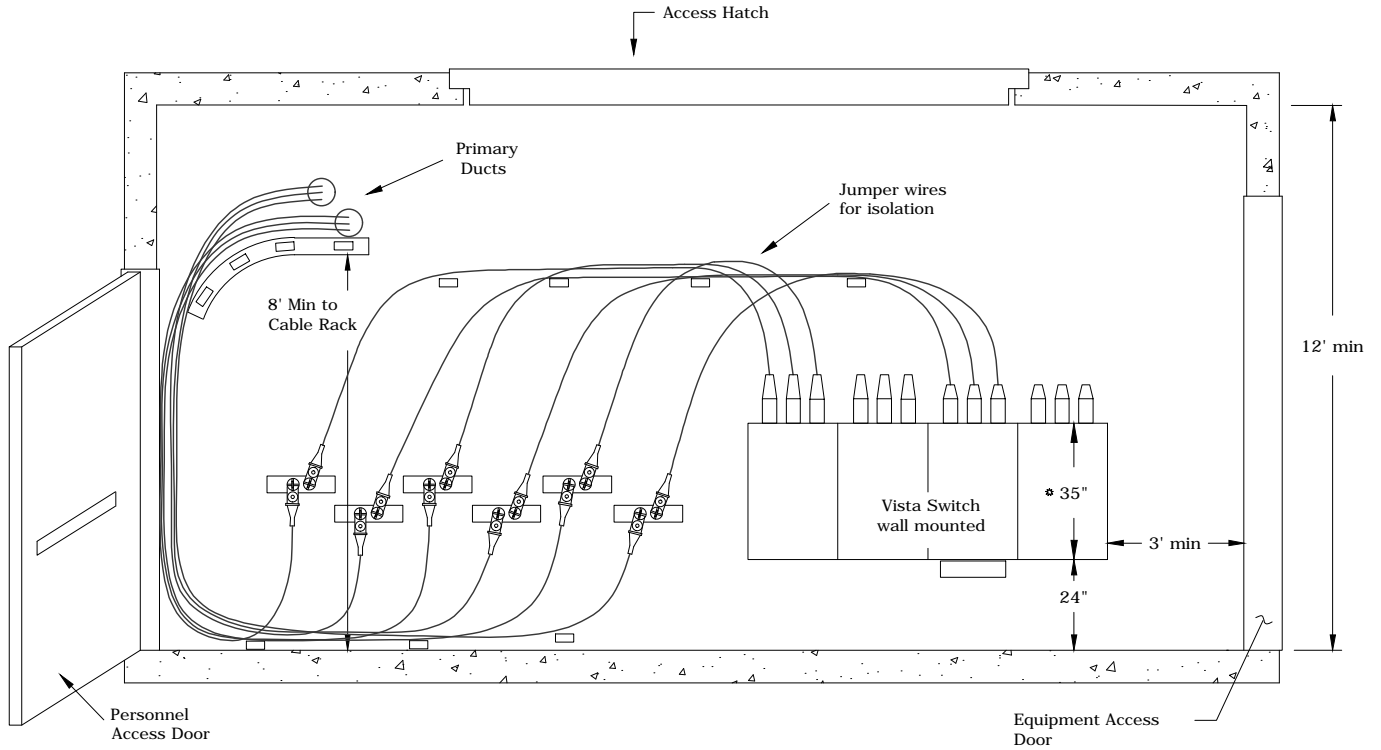
PAGE:  
11 of 20

**COVR**

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APP:	CM/AH	SECTION	
DATE:	2/1/10	1610	

Figure 4: Vista Switch Vault Room (Side View)



\* Tank is 35" wide. Anchor brackets are 37" apart.



**CONSTRUCTION STANDARDS**  
 CUSTOMER-OWNED VAULT ROOM  
 REQUIREMENTS  
 COVR

REVISIONS			
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APP:	CM/AH	SECTION	
DATE:	2/1/10	1610	

# Cable and Cable Racking

## Responsibilities

Customer's Responsibilities	Clark's Responsibilities
Furnish, install, and maintain the service cables.	Maintain the primary voltage cables.
Furnish all conduit and racking inside the building required to bring the primary and service conductors to the switchgear and/or transformer.	
Furnish and install the primary 1/0 cables.	Furnish and install the primary 1000MCM cables.
Terminate 1/0 cable	Terminate 1000MCM cable

**Cable Bending Radius**      The minimum bending radius of any primary or secondary cable shall not be less than 36 inches.

**Clearance**      Space shall be provided for entry and training of the primary and secondary cables.

**Service Conductors**      The service cables must be completely supported to keep the weight of the cables from damaging the transformer secondary bushings.

The customer supplies the service conductors to the secondary lugs of the transformer and terminates.

The number of available secondary transformer connections is 8 conductors per phase.

Conduits opening to the building interior shall be firestopped. To ensure oil containment, secondary conduits shall be installed a minimum of 24 inches above the vault floor. Figure 5 shows a typical detail for encasing ducts entering through the vault floor.

Continued on next page



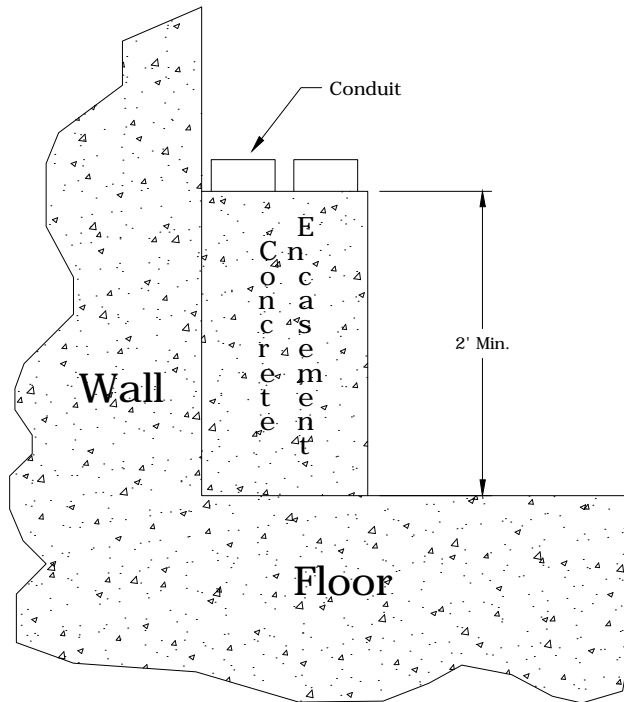
	<b>CONSTRUCTION STANDARDS</b> CUSTOMER-OWNED VAULT ROOM REQUIREMENTS COVR		REVISIONS			
				DATE	ENGR	OPS
PAGE: 13 of 20	<b>COVR</b>		CAD FILE: COVR	APP:    CM/AH DATE:    2/1/10	SECTION <b>1610</b>	



Figure 5: Encasing Ducts For Oil Containment



**CONSTRUCTION STANDARDS**  
 CUSTOMER-OWNED VAULT ROOM  
 REQUIREMENTS  
 COVR

PAGE:  
14 of 20

**COVR**

CAD FILE:  
COVR

REVISIONS			
△	DATE	ENGR	OPS
△			
APP:	CM/AH	SECTION	
DATE:	2/1/10	1610	

# Duct Systems

## Responsibilities

<u>Customer's Responsibility</u>	<u>Clark's Responsibility</u>
<ul style="list-style-type: none"> <li>• Provide a primary duct system from the vault room(s) to a location outside the facility as specified by Clark.</li> <li>• Provide raceways for Clark conductors that meet the requirements of NEC 230.6.</li> <li>• Sealing the exterior of all ducts or inserts for ducts where they penetrate through the outside of the building or vault rooms.</li> <li>• Firestop all conduits leaving the vault room except 1000MCM conduits.</li> </ul>	<ul style="list-style-type: none"> <li>• Design the duct system to be used by specifying the type, size, location, and number of conduits</li> <li>• Firestop all 1000MCM conduits leaving the vault room</li> </ul>



## Grounding

The customer is responsible for installing a ground bus along the back wall of the vault room.

- The ground bus will be a 4/0 copper conductor.
- The ground bus will be located 1 foot above the floor and must not cross any access doors.
- The ground bus shall be tied to the building's grounding electrode system and building reinforcing structure to create an equal potential zone in the vault room. This requires inspection by Clark prior to pouring concrete.  
The ground bus shall be tapped to each piece of equipment (not daisy-chained),
- so the ground wire to one piece of equipment can be cut without leaving other pieces of equipment ungrounded.

## System Protection

Clark will provide overcurrent protection for the primary side of the transformer but does not provide any protection on the secondary side of the transformer for the customer's service cables.

	<b>CONSTRUCTION STANDARDS</b> CUSTOMER-OWNED VAULT ROOM REQUIREMENTS COVR		REVISIONS			
				DATE	ENGR	OPS
PAGE: 15 of 20	<b>COVR</b>		CAD FILE: COVR	APP: CM/AH DATE: 2/1/10	SECTION <b>1610</b>	

# Personnel Access Door to Transformers and Switches

A direct and unobstructed rescue/escape route through a personnel access door shall be provided from every working space where an operator will stand when he/she operates a switch in or on a sealed piece of equipment (a S&C "Vista" switch or a 200-amp elbow on a piece of equipment). The personnel access door allows 24-hour access to the vault room from outside the building. The access shall meet NESC Section 113.

- Doors shall be designed for Clark's Substation lock cores or have a Vinter Changeable Hasp installed to accept a Clark padlock with a 3/8-inch shank.  
Personnel access doors can be a standard size (3' x 6'8" min).
- All standard-size access doors into the vault room shall open outward and shall
- be equipped with panic bars, pressure plates or other devices that are normally latched but open under simple pressure.  
Equipment access doors (hinged or roll-up) must be a minimum of 10 feet wide.
- Bollards may be required to protect access to the vault room.
- 

## Signage

All vault rooms shall have "Warning" signs on the outside of all access doors and "Danger" signs on the inside of all access doors in accordance with ANSI Z535. Clark will provide the signs to the customer. The customer is responsible for installing them at a height of 5' to the top of the sign from the floor.

The customer will provide and install 2" phenolic numbers and letters 3" below the "Warning" sign with the name of the equipment and the equipment number. Clark will provide the switch number label. See Figures 6 and 7.

If a roll-up door is used for equipment access, the "Warning" signs, "Danger" signs, and phenolic letters and numbers can be placed on the concrete wall on the side of the door at the same heights. Placards will be used instead of adhesive signs.

Continued on next page


	<b>CONSTRUCTION STANDARDS</b> CUSTOMER-OWNED VAULT ROOM REQUIREMENTS COVR		REVISIONS			
			△	DATE	ENGR	OPS
	PAGE: 16 of 20	<b>COVR</b>		CAD FILE: COVR	APP: DATE:	CM/AH 2/1/10

Figure 6: Outside of Access Doors to Vault Room

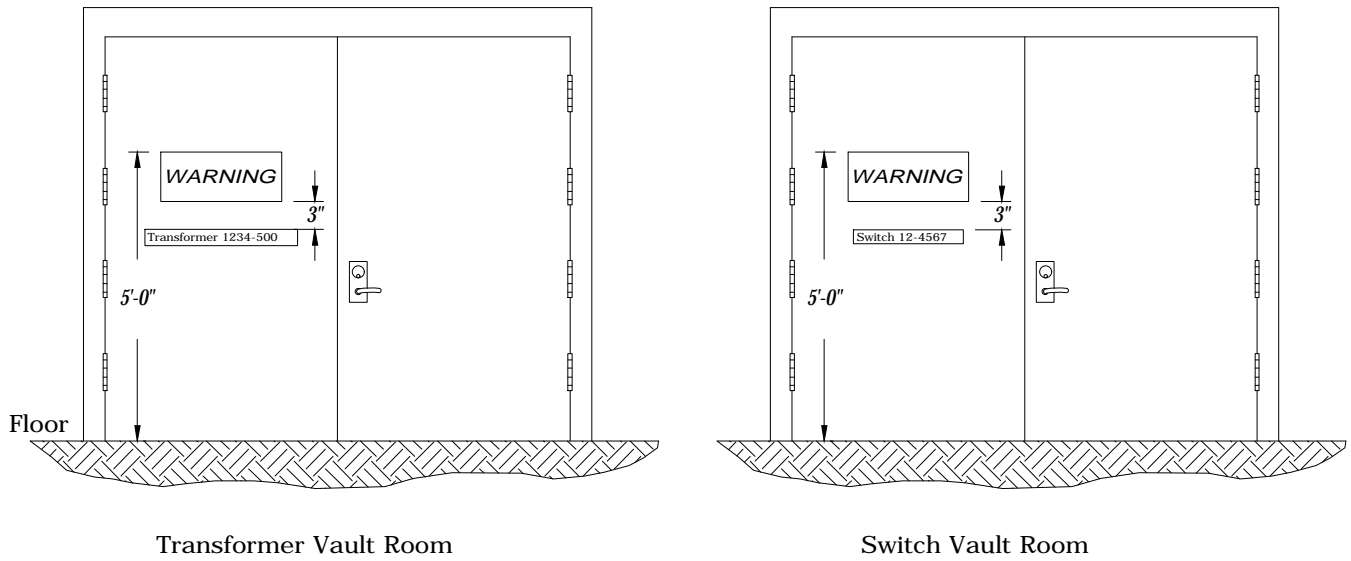
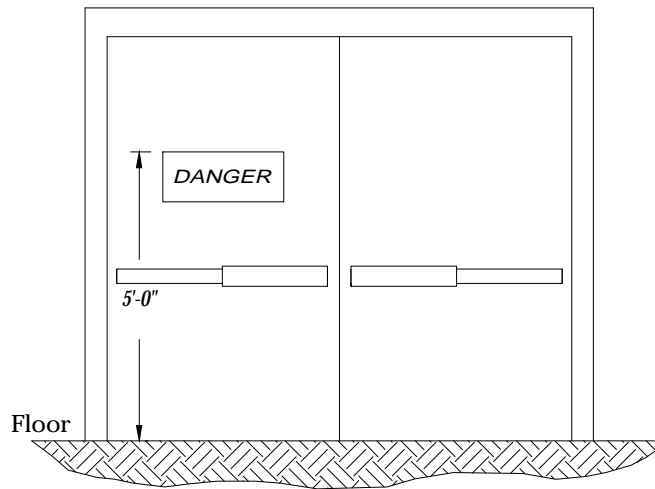


Figure 7: Inside of Access Doors to Vault Room



**CONSTRUCTION STANDARDS**  
 CUSTOMER-OWNED VAULT ROOM  
 REQUIREMENTS  
 COVR

REVISIONS			
△	DATE	ENGR	OPS
△			
APP:	CM/AH	SECTION	
DATE:	2/1/10	<b>1610</b>	

# Fire Detection and Suppression

## Requirements for Customer-owned Vault Rooms

The vault room shall be built to meet the NEC 450 Section III and the IBC 705. A portable ABC-rated fire extinguisher shall be located outside each personnel access door. The customer is responsible for keeping the fire extinguisher up to date.

Fire detection equipment (smoke and temperature) shall be located where they can be tested and maintained without climbing over or on top of transformers or switches.

## Water Sprinkler Systems in Vault Rooms

Electrical fires and oil fires are not easily controlled by sprinklers. Water sprayed on burning oil can cause frothing and boilover. If the capacity of the containment system is exceeded, flaming oil can overflow and expand the scope of a fire. For these reasons, Clark does not recommend water sprinkler systems in vault rooms.

If the local fire department requires a sprinkler system in the room, a containment system shall be installed that is sized to adequately handle the water volume of the room's sprinkler system, plus the volume of oil of the transformer.

# Oil Containment

The transformer vault room shall include an oil containment system that can store 500 gallons of oil.


Floor drains are not allowed in Clark's vault rooms. Removable or breakable sills may be required at each access door.

# Ventilation

## Natural Circulation

The preferred method of ventilation is natural circulation to the outside air. The minimum net clear area required for natural ventilation is 3 square inches for each kVA of transformer capacity (see Table 3). Only the area of the opening shall be included in this calculation and not the area occupied by a screen or grating if present. All the ventilation area may be in the ceiling or along the walls, but not within 2' of the floor.

Continued on next page

	<b>CONSTRUCTION STANDARDS</b> CUSTOMER-OWNED VAULT ROOM REQUIREMENTS COVR		REVISIONS		
			△	DATE	ENGR
PAGE: 18 of 20		<b>COVR</b>	CAD FILE: COVR	APP: CM/AH DATE: 2/1/10	SECTION <b>1610</b>

**Forced-Air**

If natural ventilation to the outside air is not available, forced ventilation will be provided. The minimum cubic feet per minute (c.f.m.) of airflow will be 1.6 times the transformer capacity in kVA (shown in Table 3). Forced ventilation will be controlled by a thermostat set to come on at 86 degrees Fahrenheit and turn off at 140 degrees Fahrenheit. If the room temperature exceeds 140 degrees Fahrenheit, an alarm shall sound in the building management system. All ventilation openings to the inside of the building will be supplied with automatically closing fire dampers. All ventilation openings will be to the outside of the building to prevent smoke damage.

**Airflow Factor Formula**

The c.f.m. airflow factor of 1.6 times the kVA was obtained using the following formula:

$$Q = \frac{(3.16 \times WL)}{(t_i - t_o)}$$


- Where:
- Q = Rate of air transfer in c.f.m.
  - WL= Transformer full load loss in watts
  - t<sub>i</sub> = Maximum allowable temperature in vault or 140°F (40°C)
  - t<sub>o</sub> = Incoming ambient air temperature or 86°F (30°C)

**Table 3**

Minimum net clear opening required for natural ventilation or c.f.m. for forced ventilation

Transformer (kVA)	Natural Ventilation		Forced Ventilation
	(Sq Ft)	(Sq In)	(C.F.M.)
300	6.25	900	480
500	10.41	1500	800
750	15.63	2250	1200
1000	20.82	3000	1600
1500	31.23	4500	2400
2000*	41.64	6000	3200
2500*	52.05	7500	4000

\* Require S&C "Vista" switch for system protection.

	CONSTRUCTION STANDARDS		REVISIONS			
	CUSTOMER-OWNED VAULT ROOM REQUIREMENTS COVER		△	DATE	ENGR	OPS
	PAGE: 19 of 20		COVER		APP:	CM/AH
		CAD FILE: COVER		DATE: 2/1/10	1610	

# Lighting and Outlets

These are the requirements for lighting and outlets in vault rooms:

- All four sides of the equipment shall be illuminated.
- Vault room lighting shall be provided at a rate of 3 watts per square foot of floor space.
- The light switch shall be located inside the vault room next to the personnel access doorway.
- Emergency lighting shall be provided as specified in the NEC-700, Emergency Systems.
- A 120-volt duplex convenience receptacle shall be provided on two opposite walls of the vault.
- The customer shall provide an additional convenience outlet to power a communication enclosure required by Clark Public Utilities for supervisory and data acquisition controls for switch rooms.
- All branch lighting and outlet circuits serving the vault room shall be tied to the facility's emergency generator panel.



# Approval Drawings

The customer shall be responsible for providing detailed construction drawings, for Clark Public Utilities' approval, outlining:

- The dimensions, layout, and location within the building of vault rooms, given in both plan and profile
- Load bearing capabilities of all areas subject to equipment loads
- Access doors
- Oil containment
- Ventilation
- Lighting and outlets
- Knockouts or inserts for Clark's ducts entering the vault
- Grounding system.
- Fire detection system and fire extinguisher location.
- Fire rating of vault room walls, floor, ceiling and doors/hatches
- Equipment removal plan if not by boom truck through an exterior door or through an opening or access hatch directly over the equipment.
- Customer's secondary bus system and supports
- Support system for primary cable runs

## Responsibilities

Customer Design Responsibilities	Clark's Design Responsibilities
Shall provide the vault room drawings during the preliminary design stage of the project.	Shall review and approve vault room design drawings in a timely fashion.

	<b>CONSTRUCTION STANDARDS</b> CUSTOMER-OWNED VAULT ROOM REQUIREMENTS COVR		<b>REVISIONS</b>			
				DATE	ENGR	OPS
PAGE: 20 of 20	<b>COVR</b>		CAD FILE: COVR	APP: DATE:	CM/AH 2/1/10	SECTION <b>1610</b>

# 1700

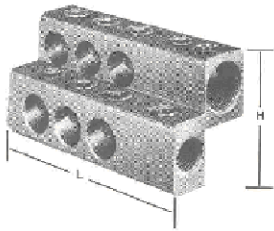
## UNDERGROUND SECONDARY

5/13/2024

- ~ UB30-UB60 Basic Units - Underground Secondary
- C UE18,UE38 Secondary J-Box 17" x 30" x 18" Deep (Light Duty)  
Secondary J-Box 24" x 36" x 18"
- C UED6 Secondary Pedestal Assembly
- ~ US-1 UG Secondary Splice
- C US6,US7 Padmount Transformer Assembly 1Ø Secondary
- ~ US35-US38 Secondary Connectors 3Ø Padmount Transformer

- N** New Standard
- R** Redrawn Standard
- C** Changed Standard
- ~ No Change





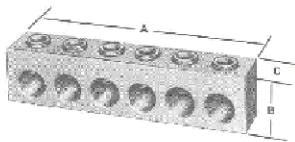
### Single Phase Padmount Transformer Terminal

UB30's	Material Descriptions	TDM #	Const. Spec.
	Connector PTL 4-250 UG Al/Cu 6 to 4/0	1439	UB30
	Connector PTL 4-350 UG Al/Cu 6 to 350	539	UB31
	Connector PTL 6-250 UG Al/Cu 6 to 4/0	540	UB32
	Connector PTL 6-350 UG Al/Cu 6 to 350	541	UB33
	Connector PTL 6-500 UG Al/Cu 2 to 500	542	UB34



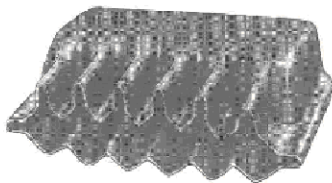
### Three Phase Padmount Transformer Terminal

See US35 through US40 for Three Phase Padmount Transformer Terminals



### Pedestal and Junction Box Connector

UB50's	Material Descriptions	TDM #	Const. Spec.
	Connector PTL 4-250 UG Al/Cu 6 to 4/0	527	UB50
	Connector PTL 4-350 UG Al/Cu 6 to 350	528	UB51
	Connector PTL 4-500 UG Al/Cu 2 to 500	529	UB52
	Connector PTL 6-250 UG Al/Cu 6 to 4/0	530	UB53
	Connector PTL 6-350 UG Al/Cu 6 to 350	531	UB54
	Connector PTL 6-500 UG Al/Cu 2 to 500	532	UB55
	Connector PTL 6-750 UG Al/Cu 350 to 750	533	UB56
	Connector PTL 8-500 UG Al/Cu 2 to 500	534	UB57
	Connector PTL 8-750 UG Al/Cu 2 to 750	535	UB58



### PTL, PET, PED Cover

UB60's	Material Descriptions	TDM #	Const. Spec.
	Cover, Connector 4-350 UG	573	UB60
	Cover, Connector 6-500 UG	574	UB61
	Cover, Connector 8-500 UG	575	UB62
	Cover, Connector 8-750 UG	576	UB63



## CONSTRUCTION STANDARDS

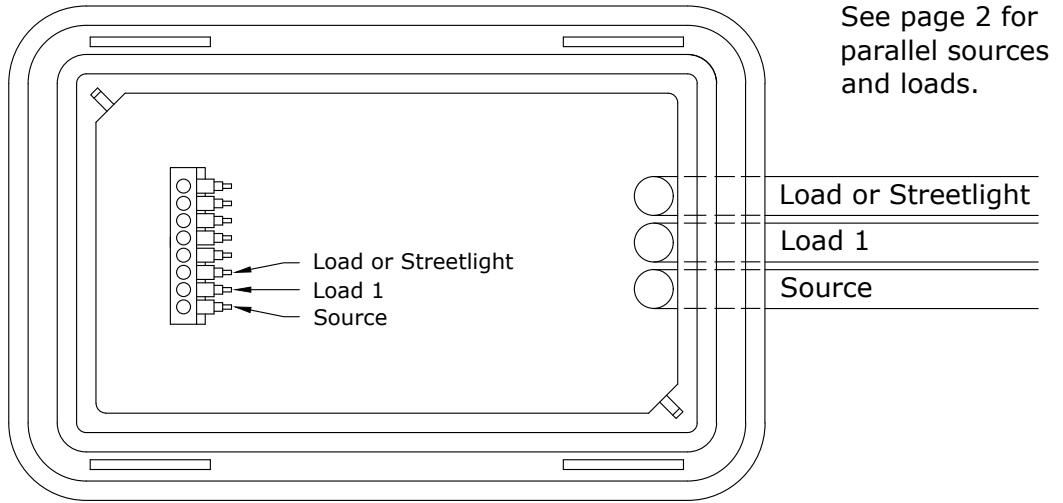
### BASIC UNITS UNDERGROUND SECONDARY

PAGE:  
1 of 1

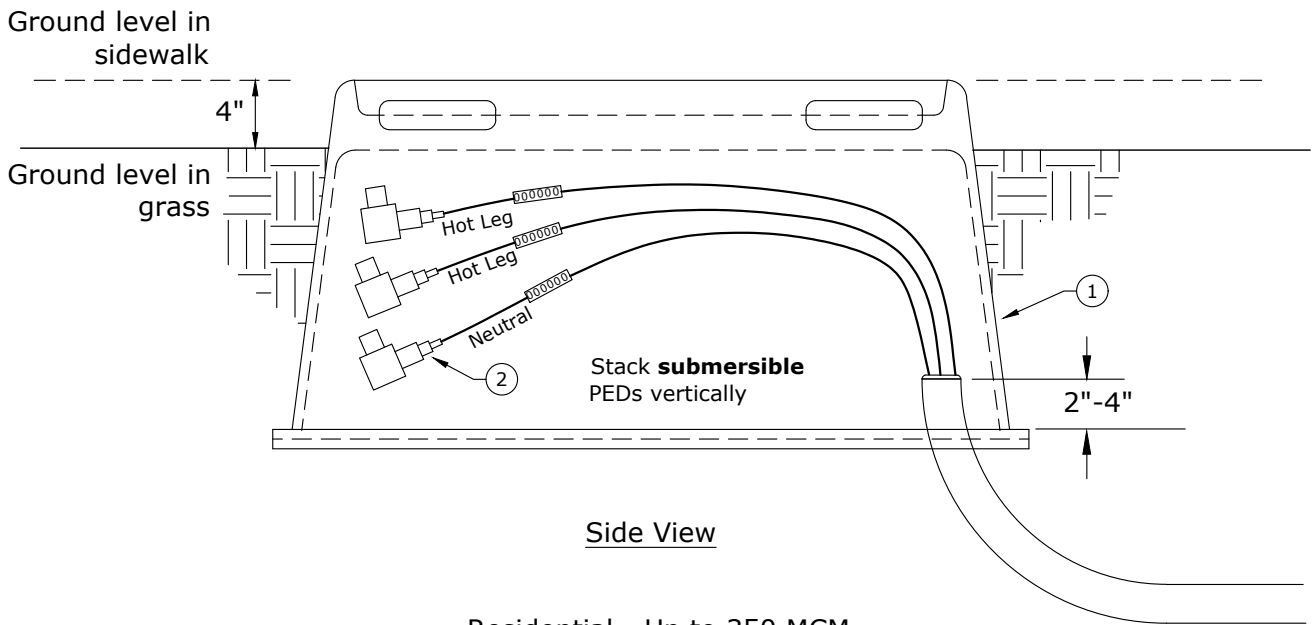
UB30, UB40, UB50, UB60

CAD FILE:  
UB30

REVISIONS			
△	DATE	ENGR	OPS
3	8/16/02		
△ REDRAWN IN CAD			
APP:	ELM	SECTION	
DATE:	1/22/80	1700	



Top View



Side View

Residential - Up to 350 MCM  
Commercial - Up to 500 MCM

**Notes:**

1. Do not install S/N 2556 in streets, alleys, or highways.
2. Cut all cables long enough to allow makeup to be done above the box top with cables in an approximately vertical position.
3. Bend cables down after makeup so that lid can be installed.
4. Use silicone grease on all allen wrench plugs and cable boots (both ends).
5. If additional depth is needed, place one box upside down, bolt the 2 boxes together and salvage one lid. (S/N 2556 only).

Rev. 7 - Added drawing for parallel source and loads.



**CONSTRUCTION STANDARDS**

SECONDARY JUNCTION BOX  
17" x 30" x 18" DEEP (LIGHT DUTY)  
24" x 36" x 18" DEEP (HEAVY DUTY)

REVISIONS

DATE	ENGR	OPS
4 10/29/18	KJP	
5 6/24/19	JDK	
6 12/2/19	KJP	
7 12/9/22	CRM	GM

PAGE:  
1 of 2

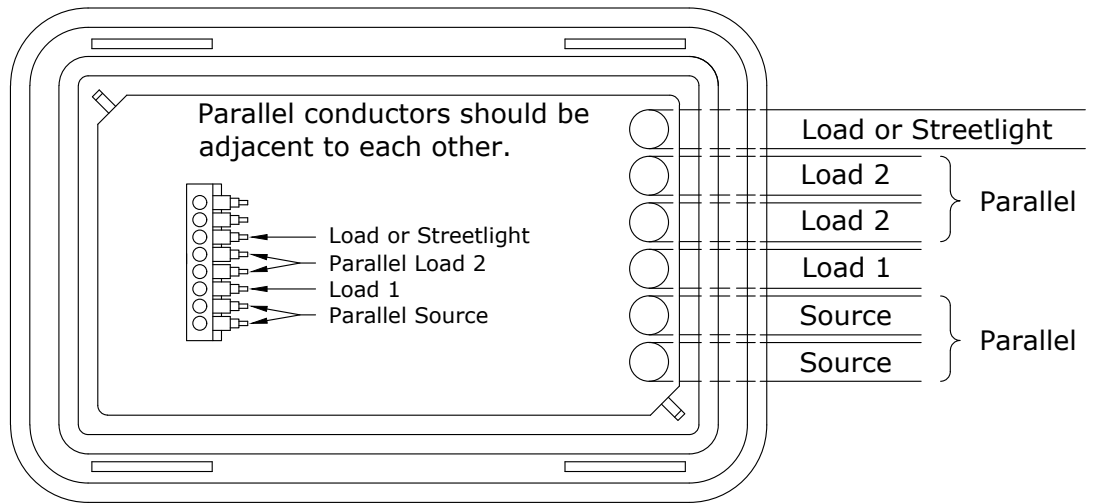
**UE18,UE38**

CAD FILE:  
UE18

APP: GGW/RWG  
DATE: 4/92

SECTION  
**1700**

Zip tie ONE tag around each set of parallel cables.



Top View  
**Parallel Source and Loads**

Occasional Traffic Areas (S/N 2556):

- Rated 10,000 pounds
- This box is NOT for use in streets, alley or highways. Do NOT use in driveways if location is part of the normal traveled way

Heavier Traffic Areas (S/N 2608):

- Rated 20,000 pounds
- This box is 24" x 36" x 18"
- May be used in alleys or driveways-only rated 20k
- Do NOT use in streets or highways

Rev. 7 - Added drawing for parallel source and loads.

ITEM NO	DESCRIPTION	UE18	
		QTY	S/N
1	Box, Junction, Secondary, Composite, Light Duty (10k lb) with Cover, 17" x 30" x 18" with Pentabolts	1	2556
2	Connector, Submersible, Sec., 8 Position, #12 to 500 MCM Al/Cu	3	2264
ITEM NO	DESCRIPTION	UE18H	
		QTY	S/N
1	Box, Junction, Secondary, Composite, Heavy Duty (20k lb) with Cover, 24" x 36" x 18" with Pentabolts	1	2608
2	Connector, Submersible, Sec., 8 Position, #12 to 500 MCM Al/Cu	3	2264
ITEM NO	DESCRIPTION	UE38	
		QTY	S/N
1	Box, Junction, Secondary, Composite, Light Duty (10k lb) with Cover, 17" x 30" x 18" with Pentabolts	1	2556
2	Connector, Submersible, Sec., 8 Position, #12 to 500 MCM Al/Cu	4	2264
ITEM NO	DESCRIPTION	UE38H	
		QTY	S/N
1	Box, Junction, Secondary, Composite, Heavy Duty (20k lb) with Cover, 24" x 36" x 18" with Pentabolts	1	2608
2	Connector, Submersible, Sec., 8 Position, #12 to 500 MCM Al/Cu	4	2264



**CONSTRUCTION STANDARDS**

SECONDARY JUNCTION BOX  
17" x 30" x 18" DEEP (LIGHT DUTY)  
24" x 36" x 18" DEEP (HEAVY DUTY)

PAGE:  
2 of 2

**UE18,UE38**

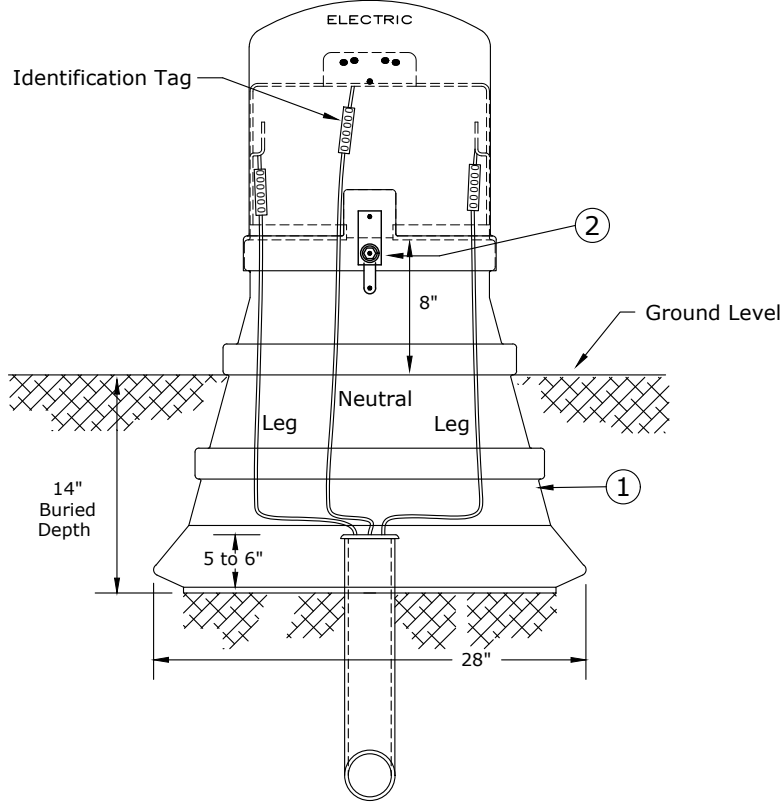
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UE18

REVISIONS			
Δ	DATE	ENGR	OPS
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5	6/24/19	JDK	
6	12/2/19	KJP	
7	12/9/22	CRM	GM

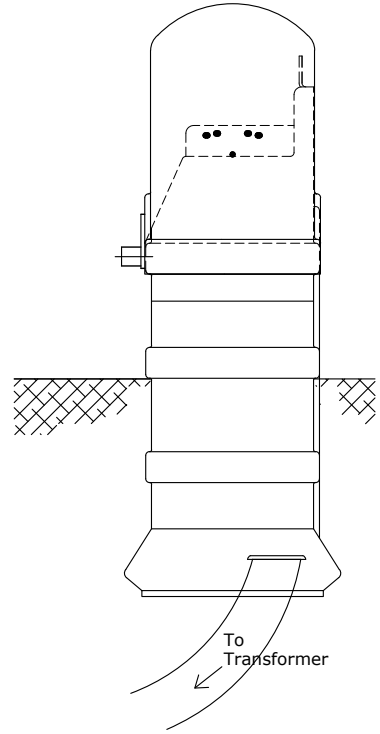
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DATE: 4/92

SECTION  
**1700**

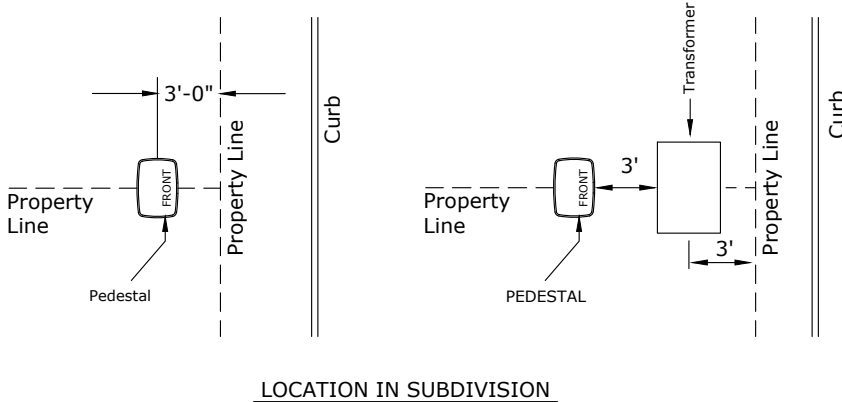
**FRONT VIEW**



**SIDE VIEW**



- Notes: 1.) Leave slack in wire to allow for settling.  
 2.) Recommended torque for connectors: 23-38 ft-lb



**FOR 480V SERVICE**

<b>WARNING</b>	<b>NOTICE</b>
<p><b>Hazardous voltage inside. Will shock, burn, or cause death.</b></p> <p>If unlocked or open <b>Immediately call Clark Public Utilities 360-952-3000.</b></p>	<p>We need room to work safely on this electrical supply source.</p> <p>Please keep shrubs and structures 3 ft. away from all sides.</p> <p>Obstructions cause delays when restoring electric service.</p>
<b>480Volts</b>	<b>CAUTION</b>
	<p>UNDERGROUND POWER CABLES ARE LOCATED IN THIS AREA. CALL BEFORE YOU DIG</p>

Add S/N 794 "480 VOLTS" Label to "WARNING" label when pedestal is used for 480 V service.

Rev. 4 - Removed ground rod for BDR.



**CONSTRUCTION STANDARDS**  
 SECONDARY PEDESTAL ASSEMBLY

REVISIONS			
	DATE	ENGR	OPS
1	4/26/04	LB	AH
2	3/12/20	KJP	
3	12/9/22	CRM	GM
4	6/7/23	CSB	

PAGE:  
1 of 3

**UED6**

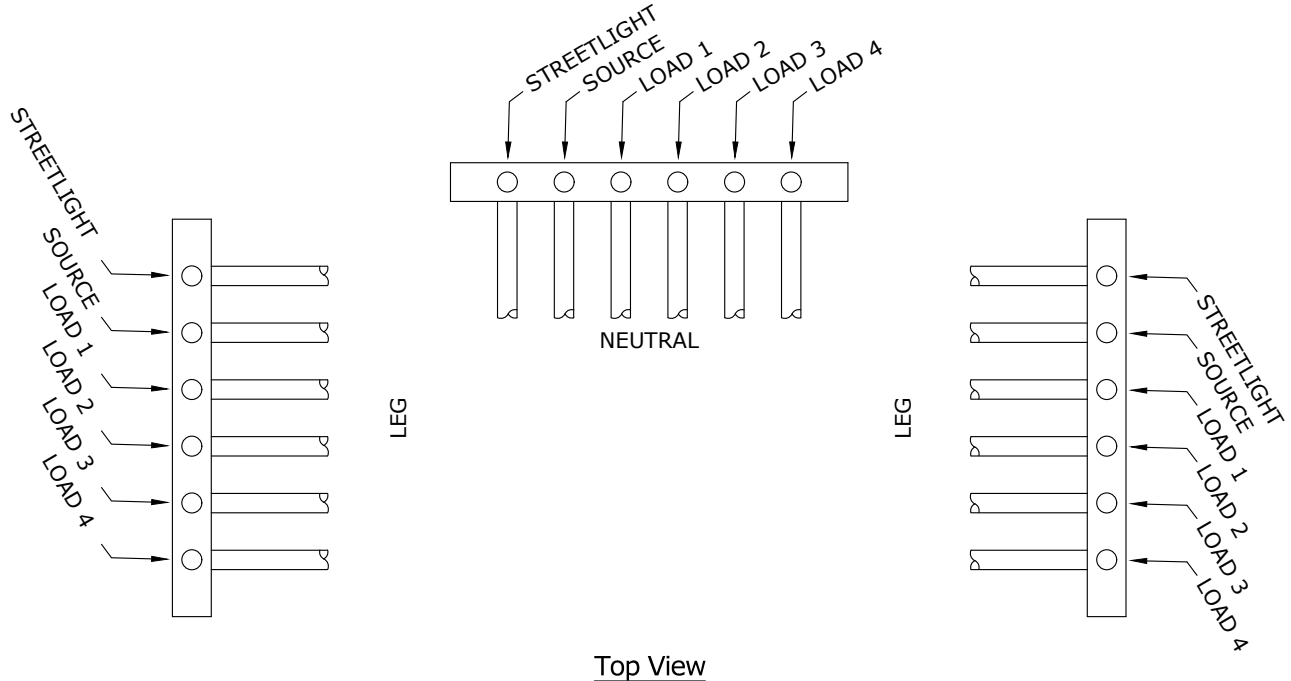
CAD FILE:  
UED6

APP: HWH/ELM  
DATE: 1980

SECTION  
**1700**

**DO NOT Cut Zip Ties off Plastic PED Covers**  
**Zip Ties MUST Be Reinstalled**

Back of Pedestal



Top View

**Recommended torque: 23-38 ft-lb**  
**Do NOT Use Impact Driver/Wrench**

- Notes: 1.) Maximum cable size is 350 MCM.  
 2.) Minimum cable size is #10.  
 3.) Maximum of 6 triplex cables.

Rev. 4 - Removed ground rod for BDR.

ITEM NO	DESCRIPTION	UED6	
		QTY	S/N
1	Pedestal, Secondary, Above Ground, W/ Connectors and Covers *	1	2562
2	Lock, Equipment *	1	837



**CONSTRUCTION STANDARDS**  
 SECONDARY PEDESTAL ASSEMBLY

REVISIONS			
Δ	DATE	ENGR	OPS
1	4/26/04	LB	AH
2	3/12/20	KJP	
3	12/9/22	CRM	GM
4	6/7/23	CSB	

PAGE:  
2 of 3

**UED6**

CAD FILE:  
UED6

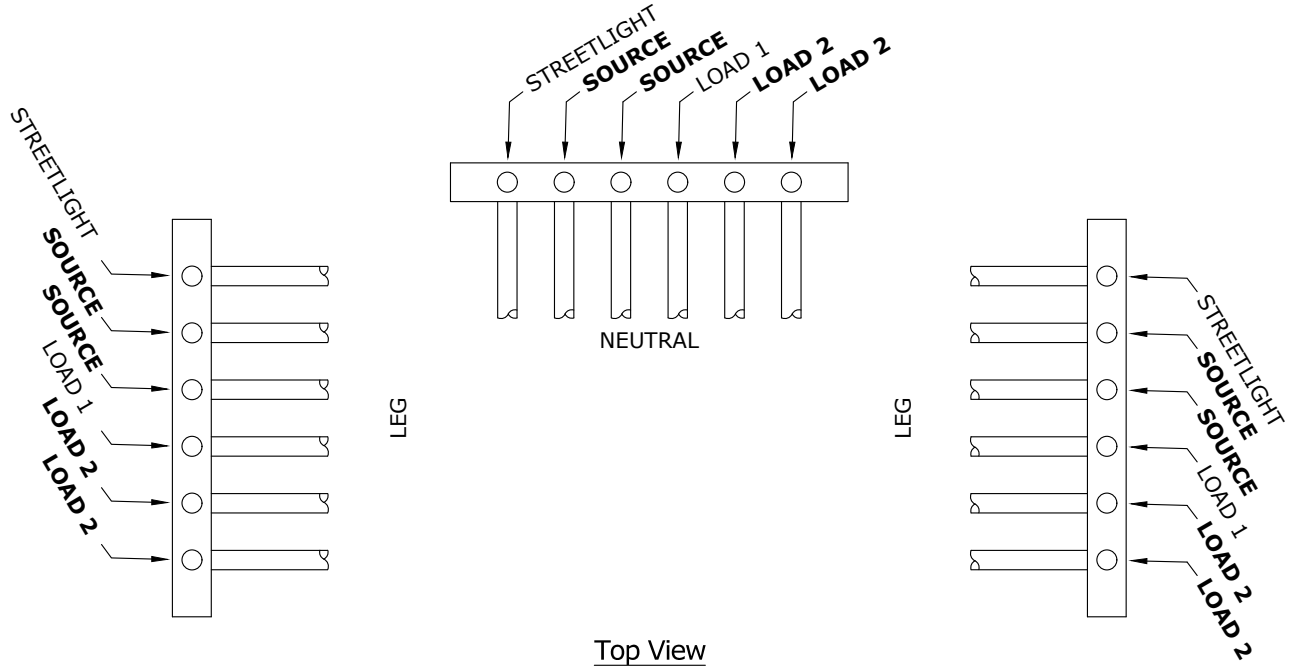
APP: HWH/ELM  
DATE: 1980

SECTION  
**1700**

**DO NOT Cut Zip Ties off Plastic PED Covers**  
**Zip Ties MUST Be Reinstalled**

Zip tie ONE tag around each set of parallel cables

Back of Pedestal



Top View

**Parallel Source and Loads**

**Recommended torque: 23-38 ft-lb**  
**Do NOT Use Impact Driver/Wrench**

- Notes: 1.) Maximum cable size is 350 MCM.  
 2.) Minimum cable size is #10.  
 3.) Maximum of 6 triplex cables.

Rev. 4 - Removed ground rod for BDR.

ITEM NO	DESCRIPTION	UED6	
		QTY	S/N
1	Pedestal, Secondary, Above Ground, W/ Connectors and Covers *	1	2562
2	Lock, Equipment *	1	837



**CONSTRUCTION STANDARDS**  
 SECONDARY PEDESTAL ASSEMBLY  
 PARALLEL SOURCE AND LOADS

REVISIONS			
DATE	ENGR	OPS	
4/26/04	LB	AH	
3/12/20	KJP		
12/9/22	CRM	GM	
6/7/23	CSB		

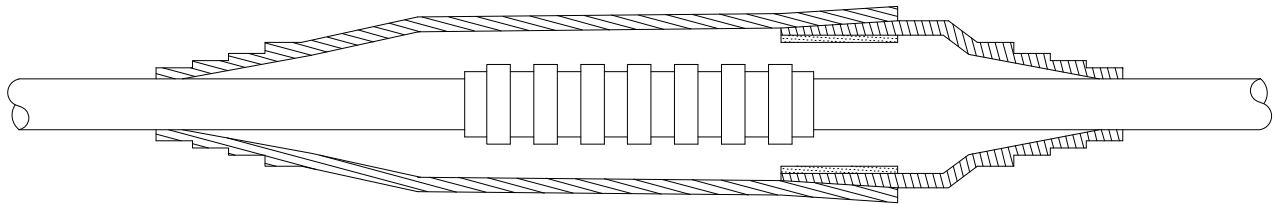
PAGE:  
3 of 3

**UED6**

CAD FILE:  
UED6

APP: HWH/ELM  
DATE: 1980

SECTION  
**1700**



APPLY SILICONE GREASE TO CABLES FOR EASE OF ASSEMBLY.

NOTES:

1. THIS SPLICE IS FOR ANY 600 VOLT OR LESS APPLICATION.
2. THIS SPLICE CAN BE DIRECTLY BURIED OR USED IN A HAND HOLE OR VAULT.
3. OTHER SIZES ARE AVAILABLE FOR SPECIAL APPLICATIONS.

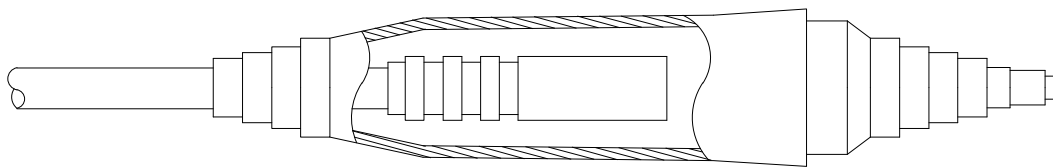
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US-1

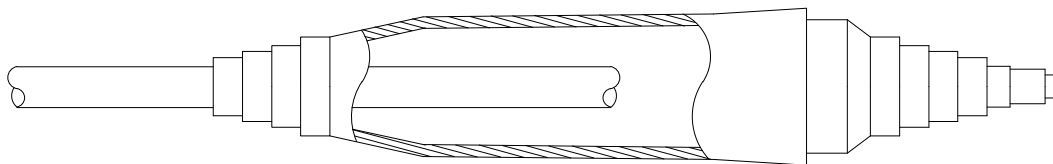
ITEM	QTY.	DESCRIPTION	SIN
1	1	SPLICE KIT, 600V, U.G.	1215
2	1	CONNECTOR, SLEEVE	#

WIRE SIZE	#SIN
2/0 AL	1166
4/0 AL	1167
350 AL	1169
2/0-4/0 AL	1454
4/0-350 AL	1455

OTHER USES



HALF-READY SPLICE



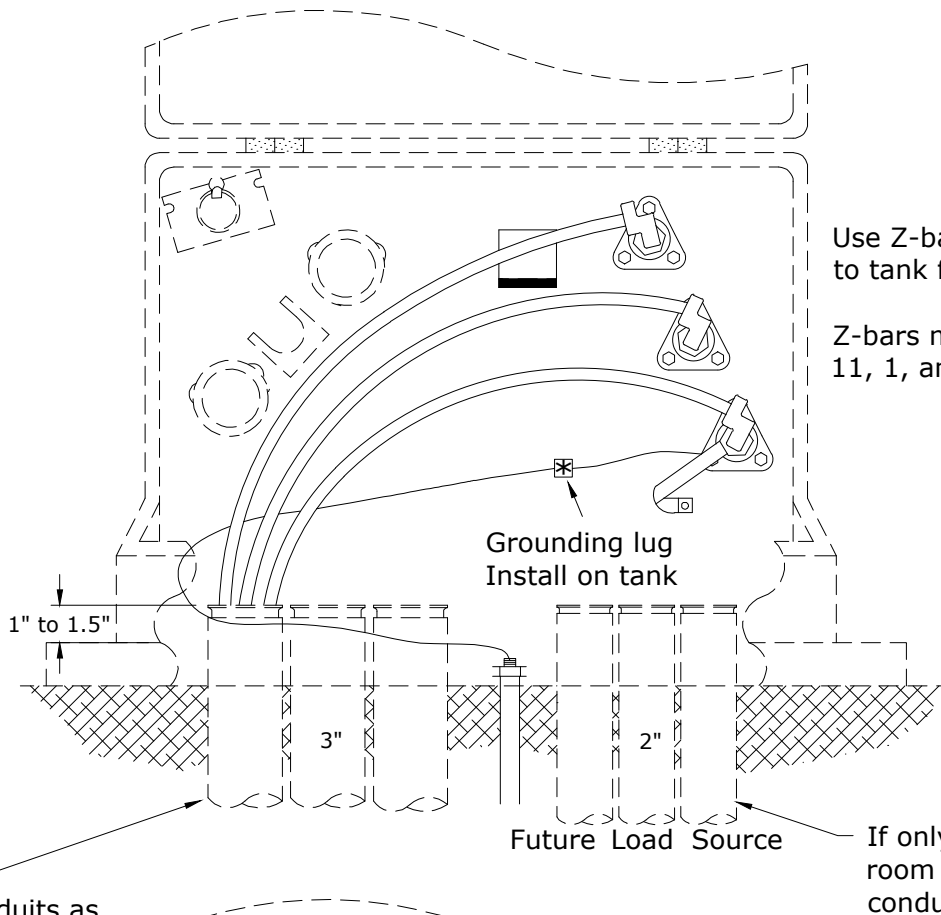
CABLE CAP



CONSTRUCTION STANDARDS  
UNDERGROUND SECONDARY  
SPLICE

REVISIONS

DATE	ENGR	OPS
2/23/00	HWH	MA



Use Z-bar positions nearest to tank first.

Z-bars must be oriented at 11, 1, and 1 o'clock.

Grounding lug  
Install on tank

1" to 1.5"

3"

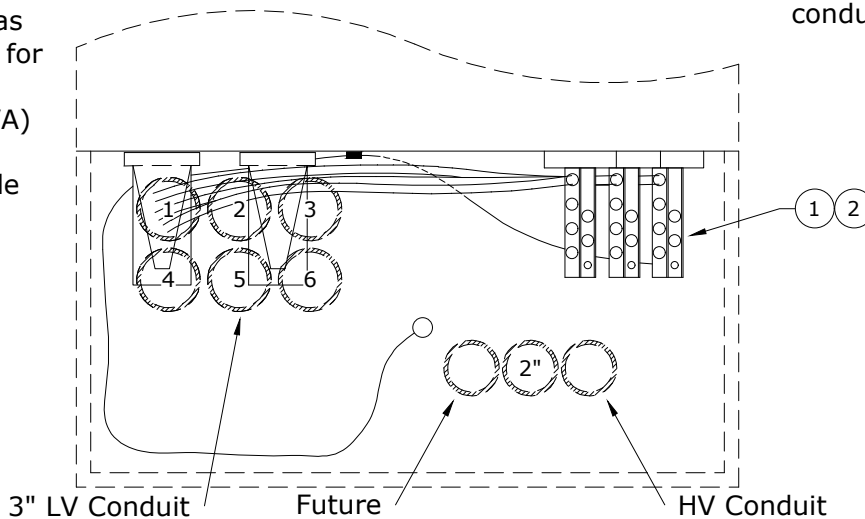
2"

Future Load Source

If only source, leave room for future load conduit

Secondary conduits as needed (Maximum 4 for 25 and 50 kVA - Maximum 6 for 75kVA)

Start Makeup of Cable in Back Conduits Left to Right



3" LV Conduit

Future

HV Conduit

TOP VIEW OF PAD WINDOW

- Notes:**
1. Use Std US6 for 25 to 75 kVA padmounts with 5/8" stud.
  2. Use Std US7 for 100 kVA padmounts with 1" stud.

Rev 3: Added US7 for 100 kVA padmount 1" stud for Z-bar connector, and updated drawing for maximum conduits.

ITEM NO.	DESCRIPTION	US6		US7	
		QTY.	S/N	QTY.	S/N
1	Connector, Z-bar, Al/Cu, 6-Position, #2-500MCM, w/ Streetlight Position	3	2265	3	2318
2	Cover, Connector, Z-bar, 6-Position	3	2266	3	2266



**CONSTRUCTION STANDARDS**  
PADMOUNT TRANSFORMER ASSEMBLY  
SINGLE PHASE SECONDARY

REVISIONS			
Δ	DATE	ENGR	OPS
1	2/23/00	HWH	MA
2	12/29/04	LB	AH
3	5/8/24	DK	

PAGE:  
1 of 1

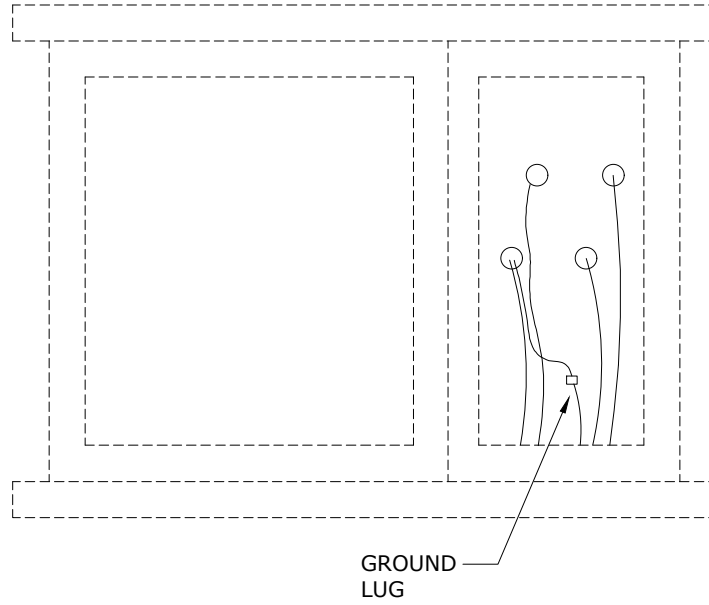
**US6,US7**

CAD FILE:  
US6,US7

APP: GGW/BG  
DATE: 4/1988

SECTION  
**1700**





US35  
US36

**Notes:**

1. This specification covers 3ø padmounted transformers 75 through 1500 kVA, 120/208 V and 277/480 V.
2. Conductor size range is 1/0 through 750 kcmil.
3. See Std UT30-UT32 - Underground Transformers - Section 1400 for mounting arrangement.

Rev. 2 - Removed US37 & 38 due to secondary bushing leaks and clearance problems in secondary compartment of transformer.

ITEM NO.	DESCRIPTION	US35	
		QTY.	S/N
1	Connector, PET, 6-750 Al/Cu 1/0 to 750	4	2129
2	1/2" Belleville Assembly, SS 2" Bolt and Washers W/ Bronze Nut	4	1389
3	Cover, Connector, 6-750	4	2176

ITEM NO.	DESCRIPTION	US36	
		QTY.	S/N
1	Connector, PET, 6-750 Al/Cu 1/0 to 750	4	2129
2	1/2" Belleville Assembly, SS 2 1/2" Bolt and Washers W/ Bronze Nut	4	2584
3	Cover, Connector, 6-750	4	2176



**CONSTRUCTION STANDARDS**  
SECONDARY CONNECTORS  
THREE PHASE PADMOUNT TRANSFORMERS

REVISIONS			
DATE	ENGR	OPS	
11/12/10	KJP		
9/21/21	JDK		

APP: HWH/MA	SECTION 1700
DATE: 2/23/00	

PAGE:  
1 of 1

**US35-US38**

CAD FILE:  
US35

# 1790

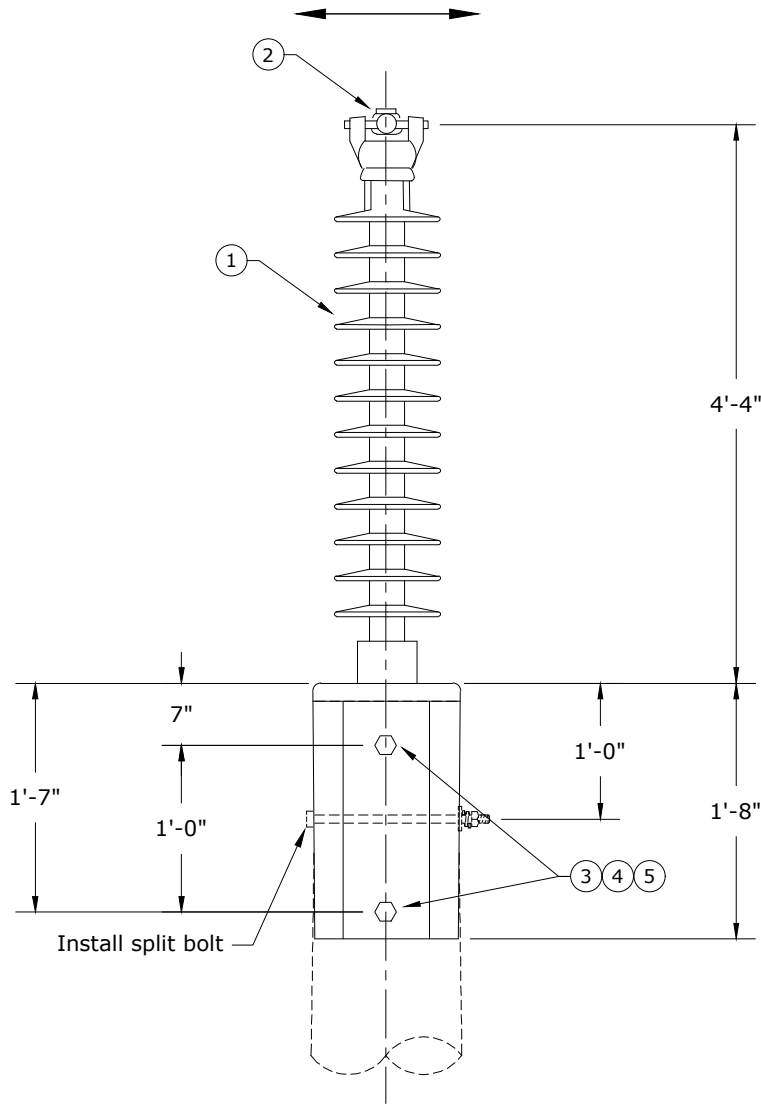
## TRANSMISSION BASIC UNITS

12/30/2020

~	TPR1, -LC	Vertical Line Post Insulator
~	TPR2, -LC	Horizontal Line Post Insulator
<b>C</b>	TPR3, -LC	Double Horizontal Line Post Insulator
~	TPR4, -P	Suspension Insulator Swing Corner
~	TPR5	Deadend Assembly 336 ACSR to 900 ACSR Bare
~	TPR5P	Deadend Assembly 1557 ACSR/TW
<b>C</b>	TPR6	Double Deadend Assembly 336 ACSR to 900 ACSR Bare
<b>N</b>	TPR6P	Double Deadend Assembly 1557 ACSR/TW

<b>N</b>	New Standard
<b>R</b>	Redrawn Standard
<b>C</b>	Changed Standard
~	No Change

**ULTIMATE CANTILEVER  
3180 lb**



**Note:** For 336 ACSR or 397 AAC bare, use Std TPR1LC.

Rev. 3 - Updated Ultimate Cantilever rating.

ITEM NO.	DESCRIPTION	TPR1		TPR1LC *	
		QTY.	S/N	QTY.	S/N
1	Insulator, Line Post Vertical, 115kV, 3180 lb Ultimate Cantilever	1	2345	1	2345
2	Clamp, Clamptop, 795 AAC to 1557 ACSR/TW Bare	1	317	1	316
3	Bolt, Machine, 7/8" x 16", Galv., 25,400 lb Ultimate Tensile	2	1901	2	1901
4	Washer, Curved, Cast, 4" x 6"	2	1911	2	1911
5	Washer, Lock, Spring, Double Coil, Galv., 7/8"	2	2351	2	2351



**CONSTRUCTION STANDARDS**

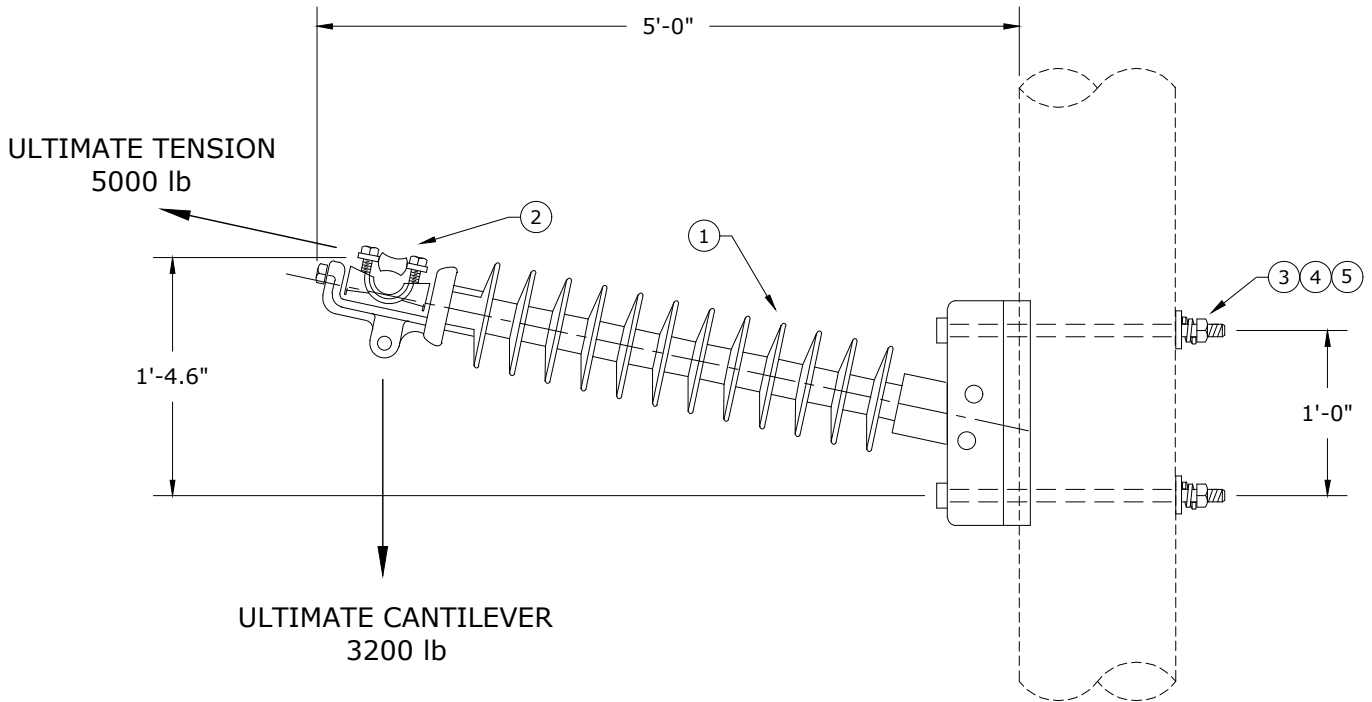
115kV TRANSMISSION BASIC UNITS  
VERTICAL LINE POST INSULATOR  
795 AAC TO 1557 ACSR/TW BARE

PAGE:  
1 of 1

**TPR1,TPR1LC**

CAD FILE:  
TPR1

REVISIONS			
△	DATE	ENGR	OPS
1	3/28/02	HWH	DLK
2	1/4/17	CM	DK
3	5/4/20	JK	
△			
APP:		SECTION	
DATE: 8/1/01		1790	



**Note:** For 336 ACSR or 397 AAC bare, use Std TPR2LC.

Rev. 3 - Updated Ultimate Cantilever rating.

ITEM NO.	DESCRIPTION	TPR2		TPR2LC *	
		QTY.	S/N	QTY.	S/N
1	Insulator, Line Post Horizontal, 115kV, 3200 lb Ultimate Cantilever	1	2346	1	2346
2	Clamp, Clamptop, 795 AAC to 1557 ACSR/TW Bare	1	317	1	316
3	Bolt, Machine, 7/8" x 16", Galv., 25,400 lb Ultimate Tensile	2	1901	2	1901
4	Washer, Curved, Cast, 4" x 6"	2	1911	2	1911
5	Washer, Lock, Spring, Double Coil, Galv., 7/8"	2	2351	2	2351



### CONSTRUCTION STANDARDS

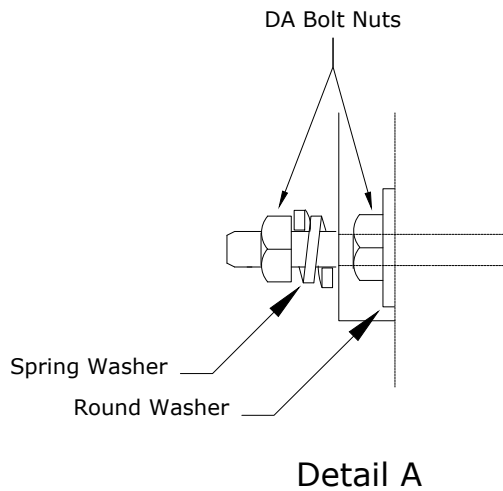
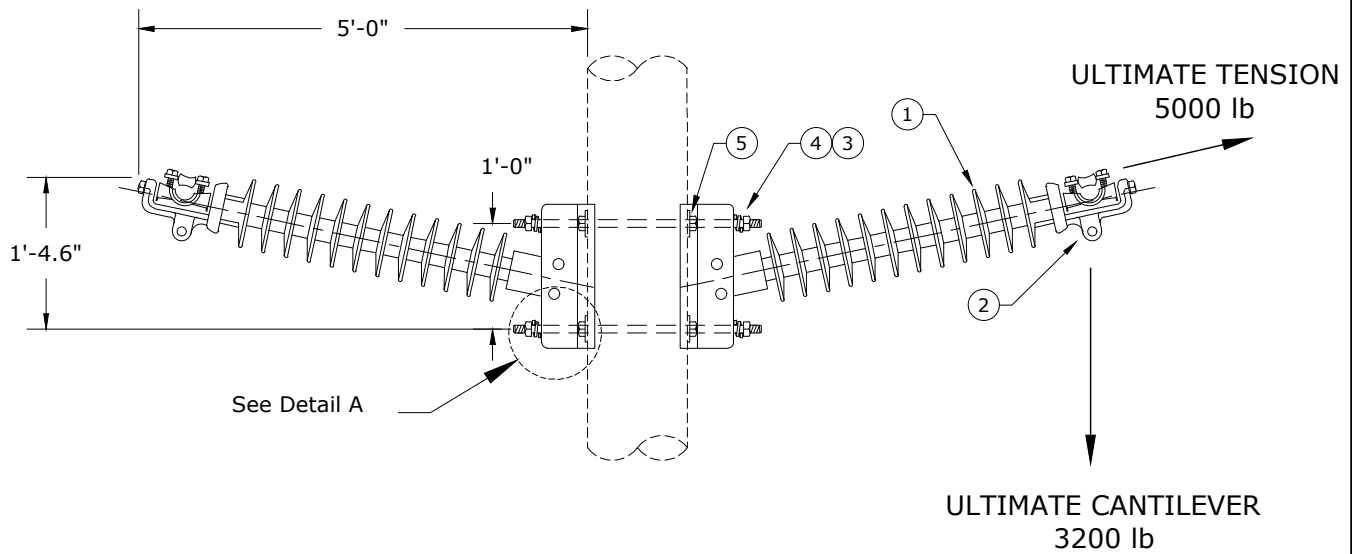
115kV TRANSMISSION BASIC UNITS  
HORIZONTAL LINE POST INSULATOR  
795 AAC TO 1557 ACSR/TW BARE

PAGE:  
1 of 1

**TPR2, TPR2LC**

CAD FILE:  
TPR2

REVISIONS			
Δ	DATE	ENGR	OPS
1	2/22/00	REDRAWN	IN CAD
2	1/4/17	CM	DK
3	5/4/20	JK	
Δ			
APP:		SECTION	
DATE: 1/31/82		1790	



**Note:** For 336 ACSR or 397 AAC bare, use Std TPR3LC.

Rev. 4 - Changed machine bolts to DA bolts.

ITEM NO.	DESCRIPTION	TPR3		TPR3LC	
		QTY.	S/N	QTY.	S/N
1	Insulator, Line Post Horizontal, 115kV, 3200 lb Ultimate Cantilever	2	2346	2	2346
2	Clamp, Clamptop, 795 AAC to 1557 ACSR/TW Bare	2	317	2	316
3	Bolt, Double Arm, 7/8" x 26", Galv, 25,400 lb Ultimate Tensile	2	2983 *	2	2983 *
4	Washer, Lock, Spring, Double Coil, Galv, 7/8"	4 *	2351	4 *	2351
5	Washer, Flat Round, Galv, 7/8" *	4	2978	4	2978



**CONSTRUCTION STANDARDS**  
 115kV TRANSMISSION BASIC UNITS  
 DOUBLE HORIZONTAL POST INSULATORS  
 795 AAC TO 1557 ACSR/TW BARE

REVISIONS			
Δ	DATE	ENGR	OPS
1	3/28/02	HWH	DLK
2	1/4/17	CM	DK
3	5/4/20	JK	
4	12/28/20	KJP	

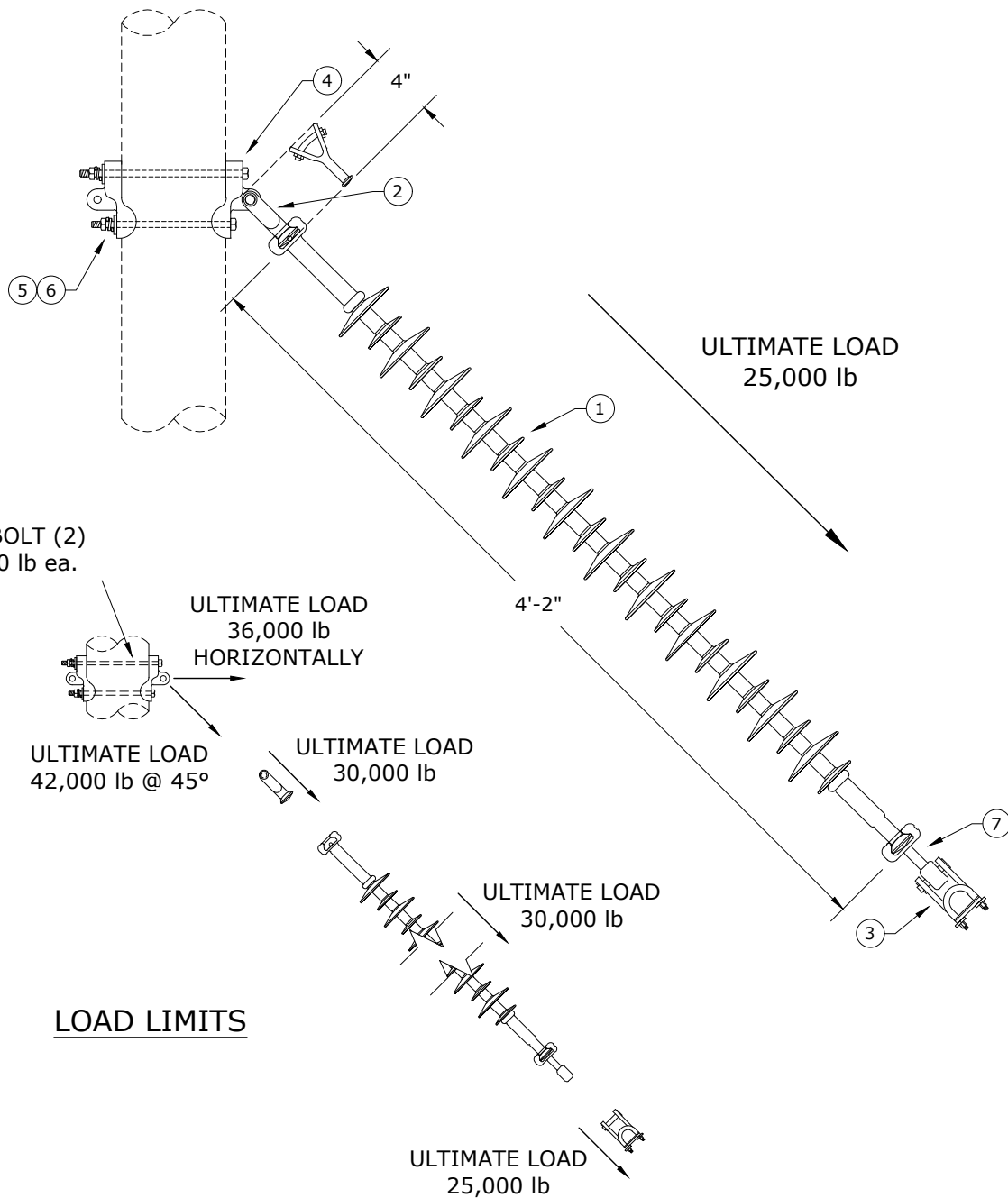
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1 of 1

**TPR3,TPR3LC**

CAD FILE:  
TPR3

APP: LB/AH  
DATE: 8/1/01

SECTION  
**1790**



**LOAD LIMITS**

**Note:** For 1557 ACSR/TW bare, use Std TPR4P.

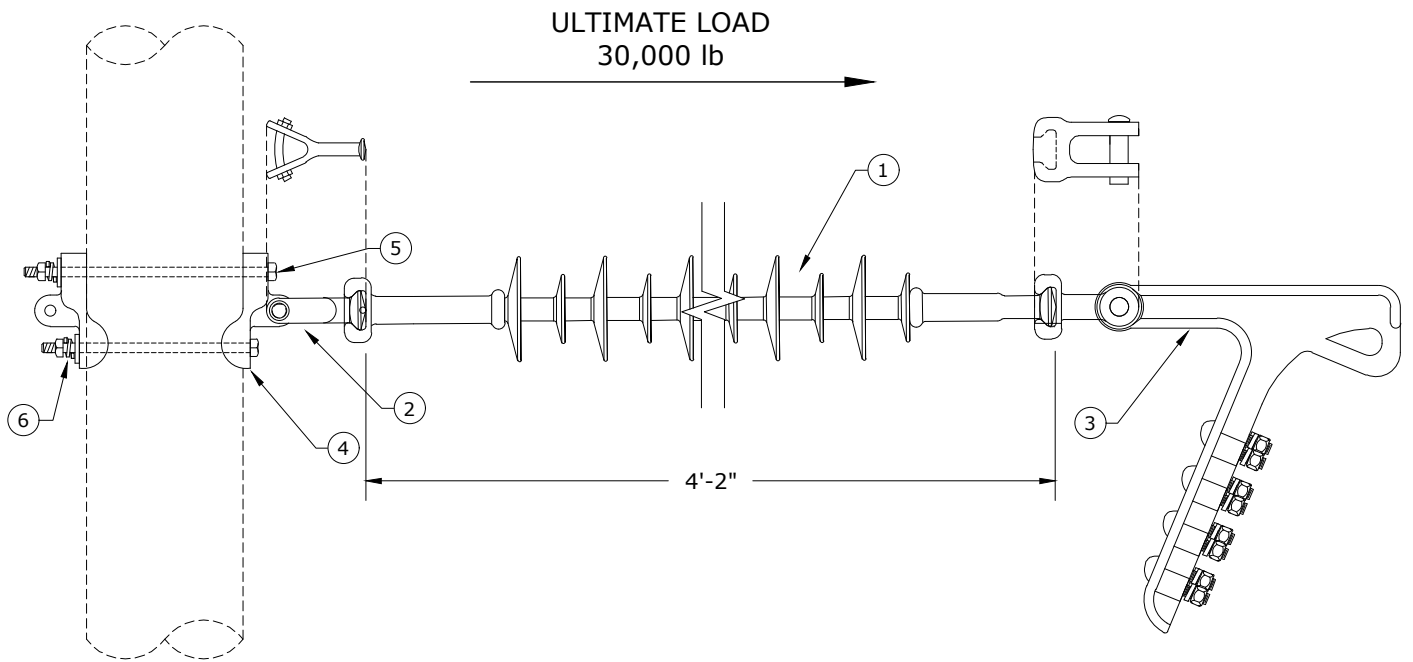
Rev. 3 - Updated suspension clamp rating.

ITEM NO.	DESCRIPTION	TPR4		TPR4P	
		QTY.	S/N	QTY.	S/N
1	Insulator, Suspension, Polymer, 115kV, 30,000 lb Ultimate	1	2350	1	2350
2	Clevis, Y-Ball, 30,000 lb Ultimate	1	320	1	320
3	Clamp, Suspension, 336 ACSR To 900 ACSR Bare, 25,000 lb Ultimate *	1	307	1	308
4	Plate, Pole Eye, 36,000 lb Ultimate	2	1908	2	1908
5	Bolt, Machine, 7/8" x 16", Galv., 25,400 lb Ultimate	2	1901	2	1901
6	Washer, Lock, Spring, Double Coil, Galv., 7/8"	2	2351	2	2351
7	Socket/Eye, 13/16" Eye, 1" Wide Base	1	1681	1	1681

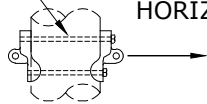


**CONSTRUCTION STANDARDS**  
 115kV TRANSMISSION BASIC UNITS  
 SUSPENSION INSULATOR-SWING CORNER  
 336 ACSR TO 900 ACSR BARE

REVISIONS			
Δ	DATE	ENGR	OPS
1	3/28/02	HWH	DLK
2	1/4/17	CM	DK
3	2/11/19	KJP	



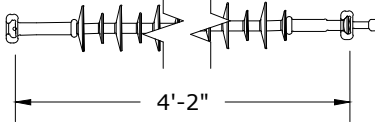
7/8" BOLT (2)  
25,400 lb ea



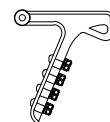
ULTIMATE LOAD  
36,000 lb  
HORIZONTALLY

ULTIMATE LOAD  
30,000 lb

ULTIMATE LOAD  
30,000 lb



ULTIMATE LOAD  
30,000 lb



### LOAD LIMITS

**Note:** For 1557 ACSR/TW bare, use Std TPR5P.

Rev. 2 - Deleted TPR5A w/ split bolt, updated materials, and added note.

ITEM NO.	DESCRIPTION	TPR5	
		QTY.	S/N
1	Insulator, Suspension, Polymer, 115kV, 30,000 lb Ultimate	1	2350
2	Clevis, Y-Ball, 30,000 lb Ultimate	1	320
3	Clamp, Strain, 336 ACSR to 900 ACSR, Deadend, 30,000 lb Ultimate	1	2467
4	Plate, Pole Eye, 36,000 lb Ultimate	2	1908
5	Bolt, Machine, 7/8" x 16", Galv., 25,400 lb Ultimate	2	1901
6	Washer, Lock, Spring, Double Coil, Galv., 7/8"	2	2351



## CONSTRUCTION STANDARDS

115kV TRANSMISSION BASIC UNITS  
DEADEND ASSEMBLY  
336 ACSR TO 900 ACSR BARE

PAGE:  
1 of 1

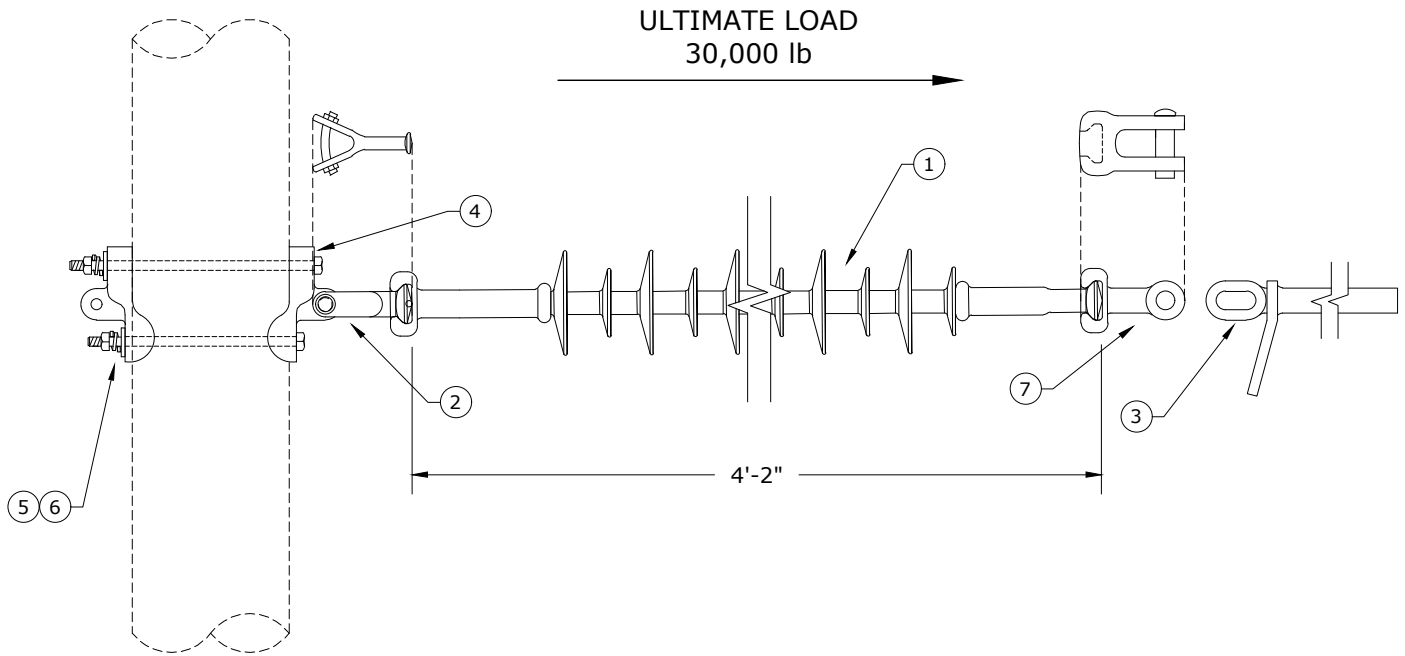
TPR5

CAD FILE:  
TPR5

REVISIONS			
DATE	ENGR	OPS	
3/28/02	HWH	DLK	1
8/23/17	CM	DK	2

APP:	SECTION
DATE: 8/1/01	1790



Rev. 1 - Changed from TSVDE-P to TPR5P.

ITEM NO.	DESCRIPTION	TPR5P	
		QTY.	S/N
1	Insulator, Suspension, Polymer, 115kV, 30,000 lb Ultimate	1	2350
2	Clevis, Y-Ball, 30,000 lb Ultimate	1	320
3	Deadend Compression, W/ Jumper, Terminal Pad, 1557 ASCR/TW	1	2421
4	Plate, Pole Eye, 36,000 lb Ultimate	2	1908
5	Bolt, Machine, 7/8" x 16", Galv., 25,400 lb Ultimate	2	1901
6	Washer, Lock, Spring, Double Coil, Galv., 7/8"	2	2351
7	Clevis, Socket, 30,000 lb Ultimate	1	333



## CONSTRUCTION STANDARDS

115kV TRANSMISSION BASIC UNITS  
DEADEND ASSEMBLY  
1557 ASCR/TW

PAGE:  
1 of 1

**TPR5P**

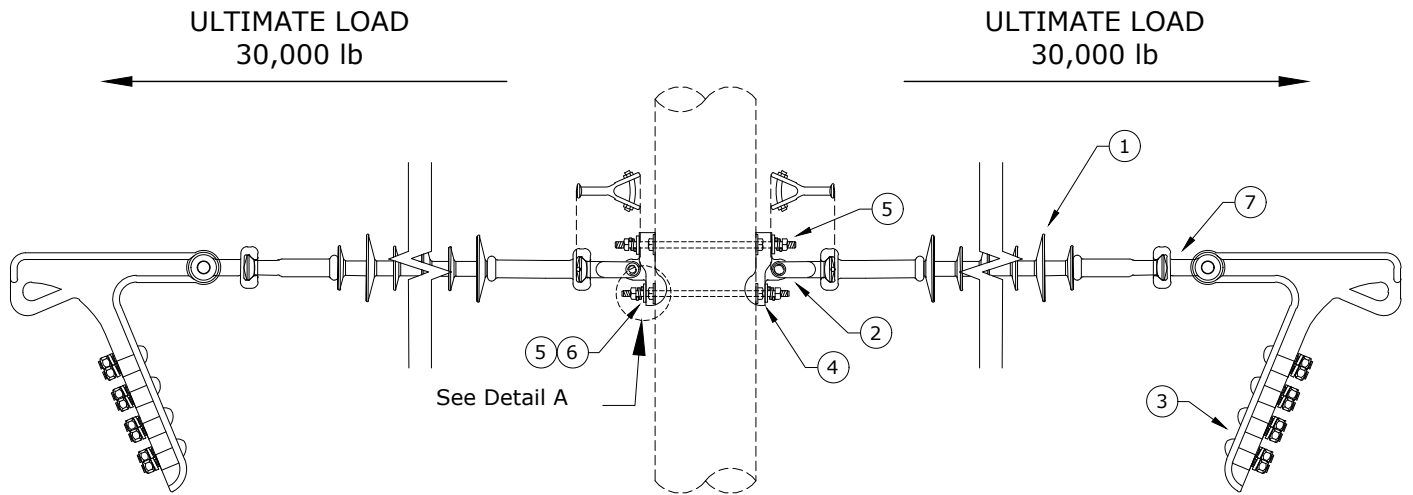
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TPR5P

REVISIONS			
DATE	ENGR	OPS	
1/4/17	CM	DK	

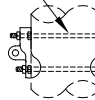
  

APP:	SECTION
DATE: 5/6/1996	1790





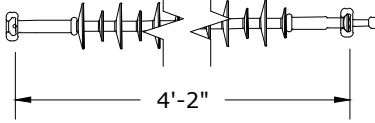
7/8" BOLT (2)  
25,400 lb ea



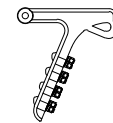
ULTIMATE LOAD  
36,000 lb  
HORIZONTALLY

ULTIMATE LOAD  
30,000 lb

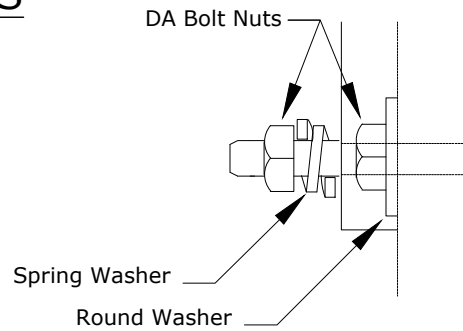
ULTIMATE LOAD  
30,000 lb



ULTIMATE LOAD  
30,000 lb



### LOAD LIMITS



Detail A

**Note:** For 1557 ACSR/TW bare, use Std TPR6P.

Rev. 1 - Changed machine bolts to DA bolts.

ITEM NO.	DESCRIPTION	TPR6	
		QTY.	S/N
1	Insulator, Suspension, Polymer, 115kV, 30,000 lb Ultimate	2	2350
2	Clevis, Y-Ball, 30,000 lb Ultimate	2	320
3	Clamp, Strain, 336 ACSR to 900 ACSR, D.E., 30,000 lb Ultimate	2	2467
4	Plate, Pole Eye, 36,000 lb Ultimate	2	1908
5	Bolt, Double Arm, 7/8" x 20", Galv, 25,400 lb Ultimate *	2	2980*
6	Washer, Lock, Spring, Double Coil, Galv, 7/8"	4*	2351
7	Socket/Eye, 13/16" Eye, 1" Wide Base	2	1681
8	Washer, Flat Round Galv, 7/8" *	4	2978



## CONSTRUCTION STANDARDS

115kV TRANSMISSION BASIC UNITS  
DOUBLE DEADEND ASSEMBLY  
336 ACSR TO 900 ACSR BARE

PAGE:  
1 of 1

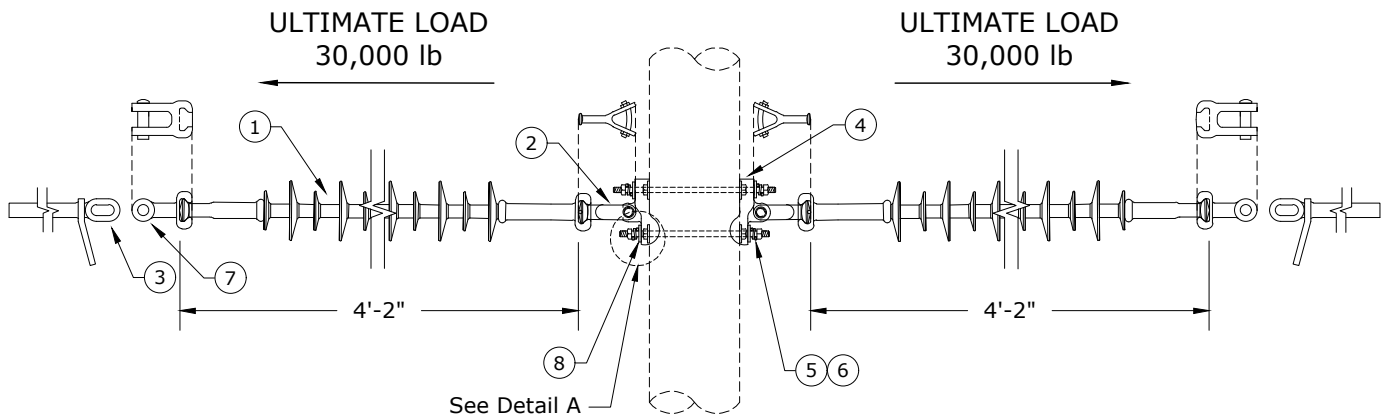
TPR6

CAD FILE:  
TPR6

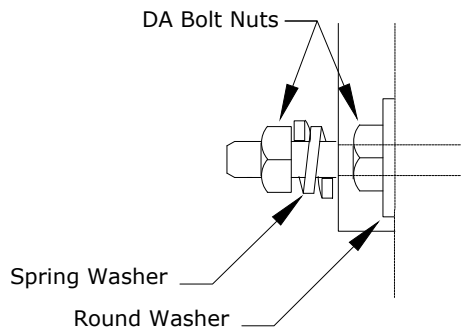
REVISIONS			
DATE	ENGR	OPS	
12/28/20	KJP		

APP: CM/DK	SECTION
DATE: 1/4/17	1790



## LOAD LIMITS



Detail A

ITEM NO.	DESCRIPTION	TPR6P	
		QTY.	S/N
1	Insulator, Suspension, Polymer, 115kV, 30,000 lb Ultimate	2	2350
2	Clevis, Y-Ball, 30,000 lb Ultimate	2	320
3	Deadend Compression, W/ Jumper, Terminal Pad, 1557 ACSR/TW	2	2421
4	Plate, Pole Eye, 36,000 lb Ultimate	2	1908
5	Bolt, Double Arm, 7/8" x 20", Galv, 25,400 lb Ultimate	2	2980
6	Washer, Lock, Spring, Double Coil, Galv, 7/8"	4	2351
7	Clevis, Socket, 30,000 lb Ultimate	2	333
8	Washer, Flat Round Galv, 7/8"	4	2978



## CONSTRUCTION STANDARDS

115kV TRANSMISSION BASIC UNITS  
DOUBLE DEADEND ASSEMBLY  
1557 ACSR/TW

### REVISIONS

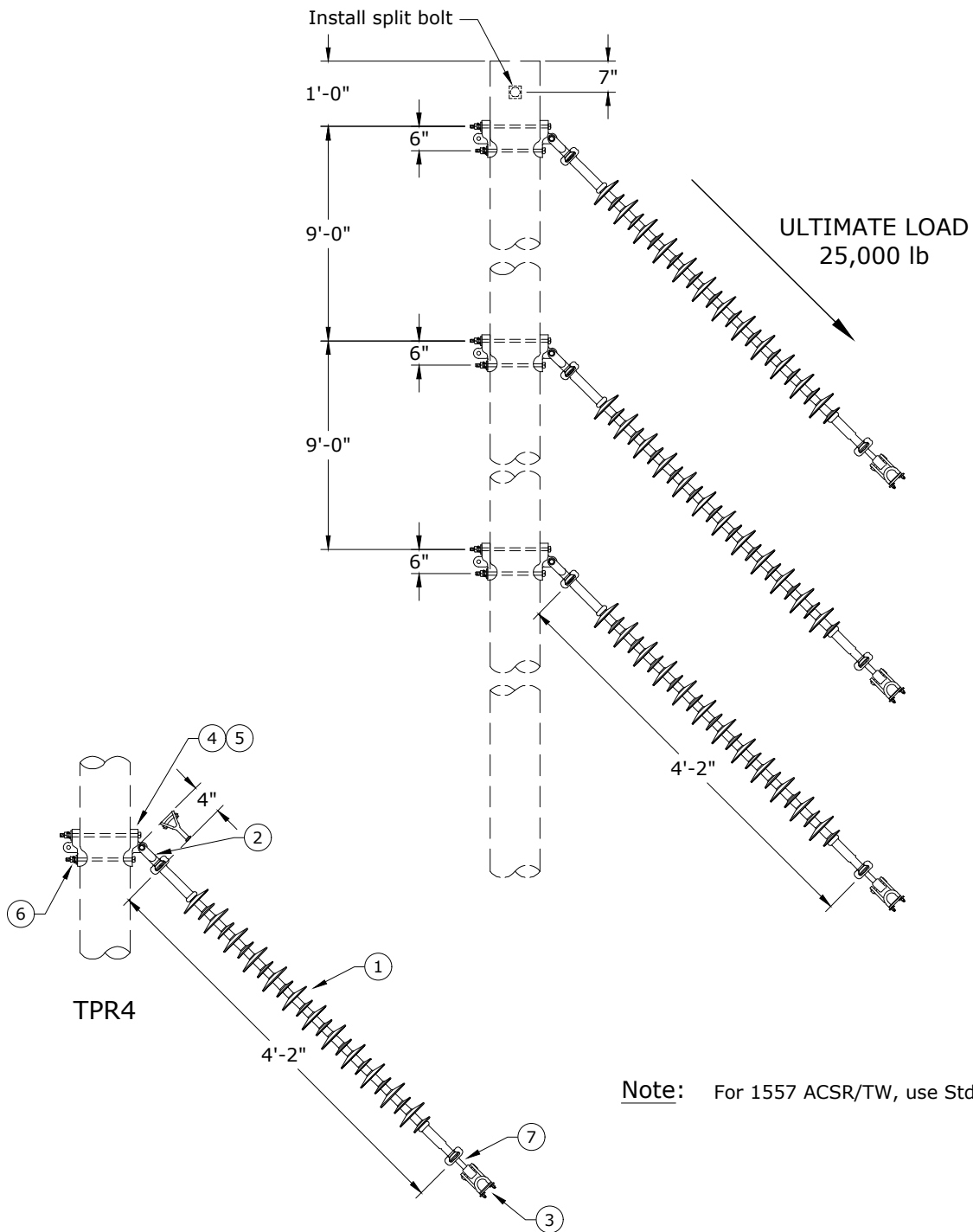
	DATE	ENGR	OPS
▲			

# 1800 TRANSMISSION

12/30/2020

~	TC22, -P	115kV Vertical Turn - 30° to 60°
C	TC25, -LC, -P	115kV Vertical Double Deadend - 0°
~	TC41, -P	115kV Vertical Deadend
~	TC44, -P	115kV Vertical Double Deadend - 60° to 90°
~	TFT1,TFT1LC	115kV Flat Top
C	THPA, -LC	115kV Twiggy - 0° to 4°
C	THPB, -LC	115kV Reverse Twiggy - 5° to 20°
C	TSW, -P	115kV Opposing Phase Vertical Switch
~	TV21, -LC	115kV Opposing Phase w/Post Top
~	TV22, -LC	115kV Opposing Phase - 0° to 4°
~	TV23, -LC	115kV Vertical - 0° to 10°
~	TV24, -LC	115kV Vertical w/Post Top - 0° to 4°
~	TV25	115kV Vertical - 11° to 30°

**N** New Standard  
**R** Redrawn Standard  
**C** Changed Standard  
**~** No Change



**Note:** For 1557 ACSR/TW, use Std TC22P.

Rev. 2 - Updated material, removed static wire, and added note.

ITEM NO.	DESCRIPTION	TC22		TC22P *	
		TPR4(3)		TPR4P(3)	
		QTY.	S/N	QTY.	S/N
1	Insulator, Suspension, Polymer, 115kV, 30,000 lb Ultimate	3	2350	3	2350
2	Clevis, Y-Ball, 30,000 lb Ultimate	3	320	3	320
3	Clamp, Suspension, Socket, 336 ACSR To 900 ACSR Bare, 25,400 lb Ult	3	307	3	308
4	Plate, Pole Eye, Heavy, 36,000 lb Ultimate	6	1908	6	1908
5	Bolt, Machine, 7/8" x 16", Galv., 25,400 lb Ultimate Tensile	6	1901	6	1901
6	Washer, Lock, Spring, Double Coil, Galv., 7/8"	6	2351	6	2351
7	Socket/Eye, 13/16" Eye, 1" Wide Base	3	1681	3	1681



### CONSTRUCTION STANDARDS

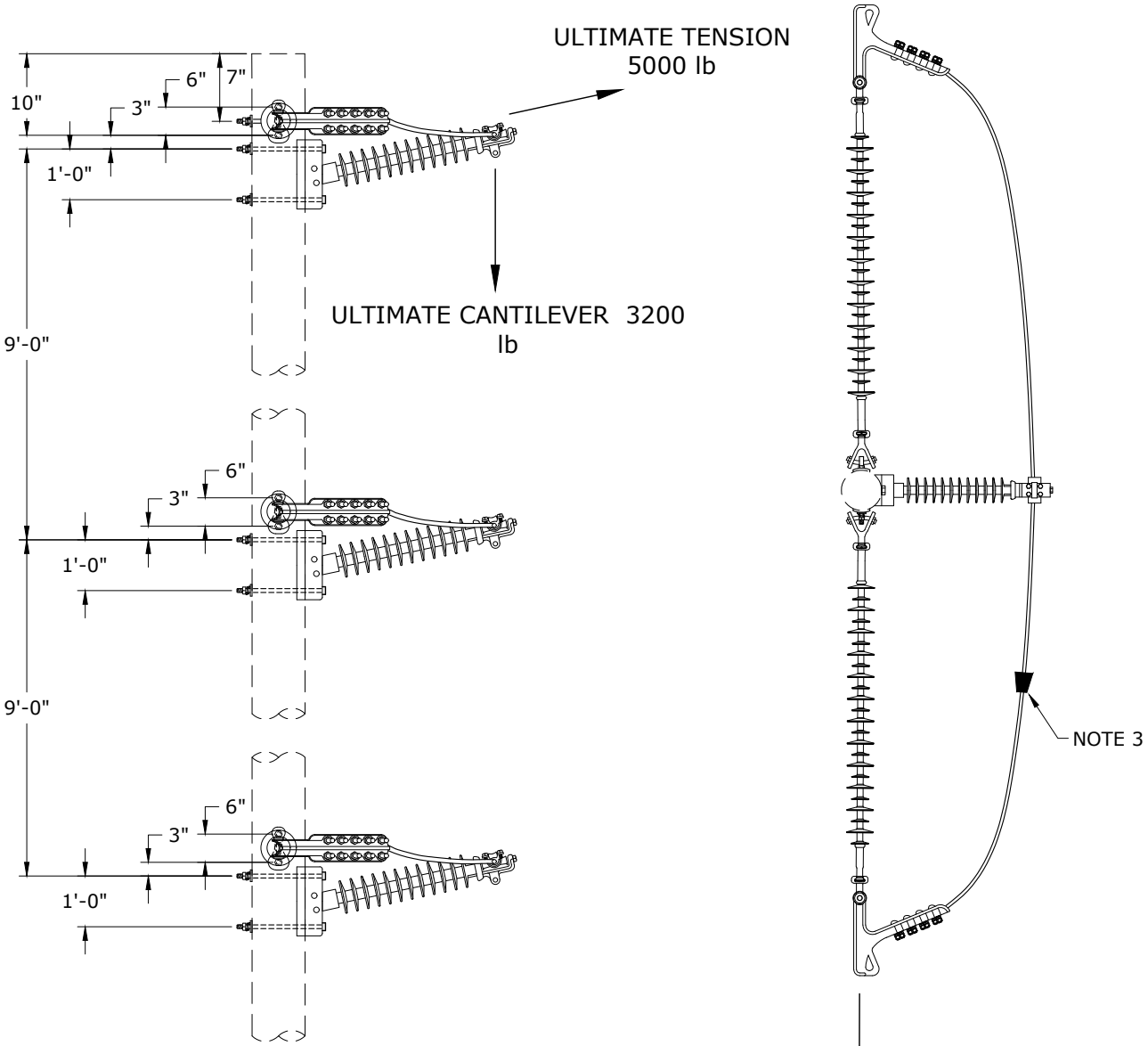
115kV TRANSMISSION  
 VERTICAL TURN-30° TO 60°  
 336 ACSR TO 900 ACSR BARE

PAGE:  
1 of 1

**TC22, TC22P**

CAD FILE:  
TC22

REVISIONS			
△	DATE	ENGR	OPS
1	8/01	REDRAWN	IN CAD
2	8/23/17	CM	DK
△			
APP:		SECTION	
DATE: 8/5/66		1800	



- Notes:**
1. For 336 ACSR & 397 AAC, use Std TC25LC.
  2. For 1557 ACSR/TW, use Std TC25P.
  3. Call for connectors for jumpers separately:

Wire Size	S/N	Qty	Type
336	2501	3	Wedge
397	2501	3	Wedge
795	2477	3	Wedge
900	2451	3	Compression
1557	2778	3	Compression

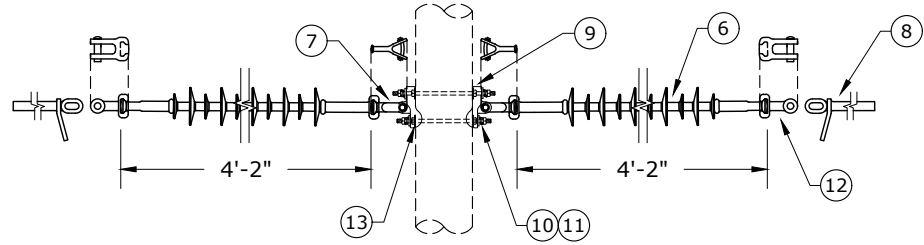
Rev. 4 - Changed machine bolts to DA bolts.



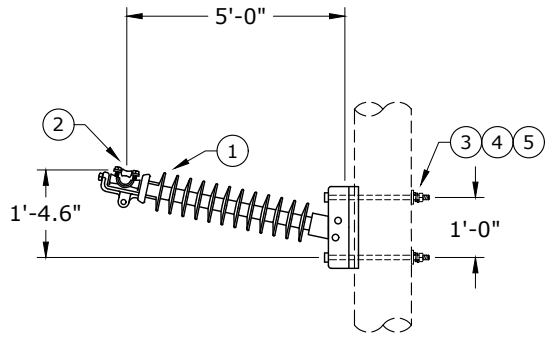
**CONSTRUCTION STANDARDS**  
 115KV TRANSMISSION  
 VERTICAL DOUBLE DEADEND  
 795 AAC TO 900 ACSR BARE

REVISIONS			
△	DATE	ENGR	OPS
1	8/01	REDRAWN	IN CAD
2	8/23/17	CM	DK
3	5/4/20	JK	
4	12/28/20	KJP	

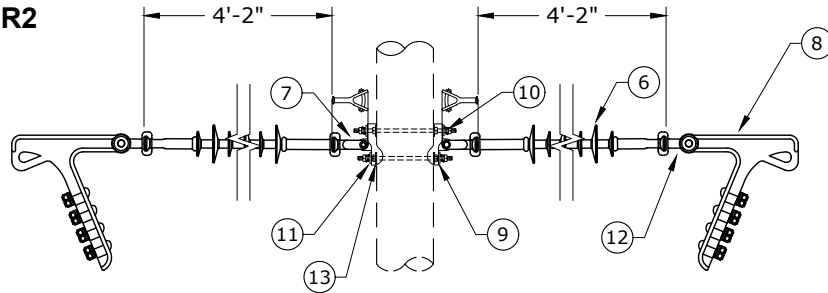
PAGE: 1 of 2	TC25,TC25LC,TC25P	CAD FILE: TC25	APP: PS/RW DATE: 2/70	SECTION 1800
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**TPR6P**



**TPR2**



**TPR6**

Rev. 4 - Changed machine bolts to DA bolts.

ITEM NO.	DESCRIPTION	TC25		TC25LC*		TC25P *	
		TPR2 (3)		TPR2LC (3)		TPR2 (3)	
		QTY.	S/N	QTY.	S/N	QTY.	S/N
1	Insulator, Line Post Horz, 115kV, 3200 lb Ult Cantilever	3	2346	3	2346	3	2346
2	Clamp, Clamptop, 795 AAC To 1557 ACSR/TW Bare	3	317	3	316	3	317
3	Bolt, Machine, 7/8" x 16", Galv, 25,400 lb Ultimate	6	1901	6	1901	6	1901
4	Washer, Curved, Cast, 4" x 6"	6	1911	6	1911	6	1911
5	Washer, Lock, Spring, Double Coil, Galv, 7/8"	6	2351	6	2351	6	2351
ITEM NO.	DESCRIPTION	TPR6(3)		TPR6(3)		TPR6P(3)	
		QTY.	S/N	QTY.	S/N	QTY.	S/N
		6	Insulator, Suspension, Polymer, 115kV, 30,000 lb Ultimate	6	2350	6	2350
7	Clevis, Y-Ball, 30,000 lb Ultimate	6	320	6	320	6	320
8	Clamp, Strain/ Deadend, Compression	6	2467	6	2467	6	2421
9	Plate, Pole Eye, 36,000 lb Ultimate	6	1908	6	1908	6	1908
10	Bolt, Double Arm, 7/8" x 20", Galv, 25,400 lb Ultimate	6	2980	6	2980	6	2980
11	Washer, Lock, Spring, Double Coil, Galv, 7/8"	12	2351	12	2351	12	2351
12	Socket/Eye, 13/16" Eye, 1" Wide Base/ Clevis, Socket	6	1681	6	1681	6	333
13	Washer, Flat Round Galv, 7/8"	12	2978	12	2978	12	2978



**CONSTRUCTION STANDARDS**

115KV TRANSMISSION  
VERTICAL DOUBLE DEADEND  
795 AAC TO 900 ACSR BARE

REVISIONS

Δ	DATE	ENGR	OPS
1	8/01	REDRAWN	IN CAD
2	8/23/17	CM	DK
3	5/4/20	JK	
4	12/28/20	KJP	

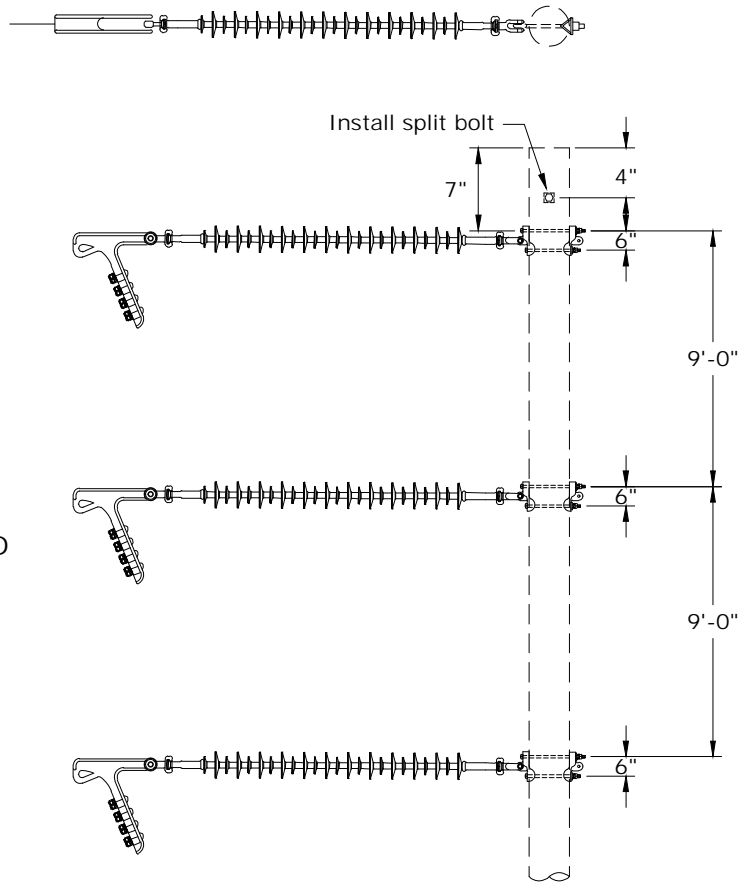
PAGE:  
2 of 2

TC25,TC25LC,TC25P

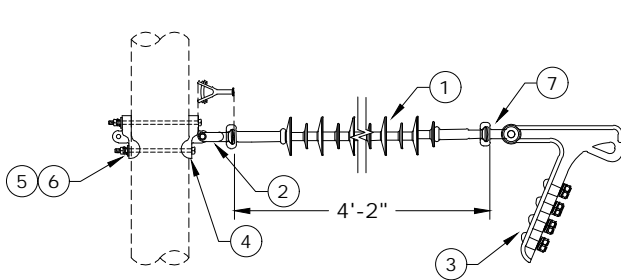
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APP: PS/RW  
DATE: 2/70

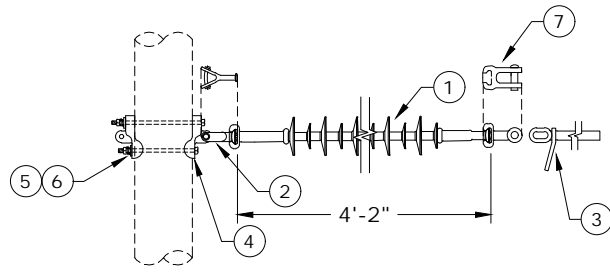
SECTION  
1800



ULTIMATE LOAD  
30,000 lb



**TPR5**



**TPR5P**

Note: For 1557 ACSR/TW, use Std TC41P.

Rev. 2 - Updated material, removed static wire, added note and TC41P.

ITEM NO.	DESCRIPTION	TC41		TC41P	
		TPR5 (3)		TPR5P (3)	
		QTY.	S/N	QTY.	S/N
1	Insulator, Suspension, Polymer, 115kV, 30,000 lb Ultimate	3	2350	3	2350
2	Clevis, Y-Ball, 30,000 lb Ultimate	3	320	3	320
3	Clamp, Strain, 336 ACSR To 900 ACSR Bare, D.E., 30,000 lb Ultimate	3	2467	3	2421
4	Plate, Pole Eye, 36,000 lb Ultimate	6	1908	6	1908
5	Bolt, Machine, 7/8" x 16", Galv., 25,400 lb Ultimate Tensile	6	1901	6	1901
6	Washer, Lock, Spring, Double Coil, Galv., 7/8"	6	2351	6	2351
7	Socket/Eye, 13/16" Eye, 1" Wide Base	3	1681	3	333



**CONSTRUCTION STANDARDS**

115kV TRANSMISSION  
VERTICAL DEADEND  
336 ACSR TO 900 ACSR BARE

PAGE:  
1 of 1

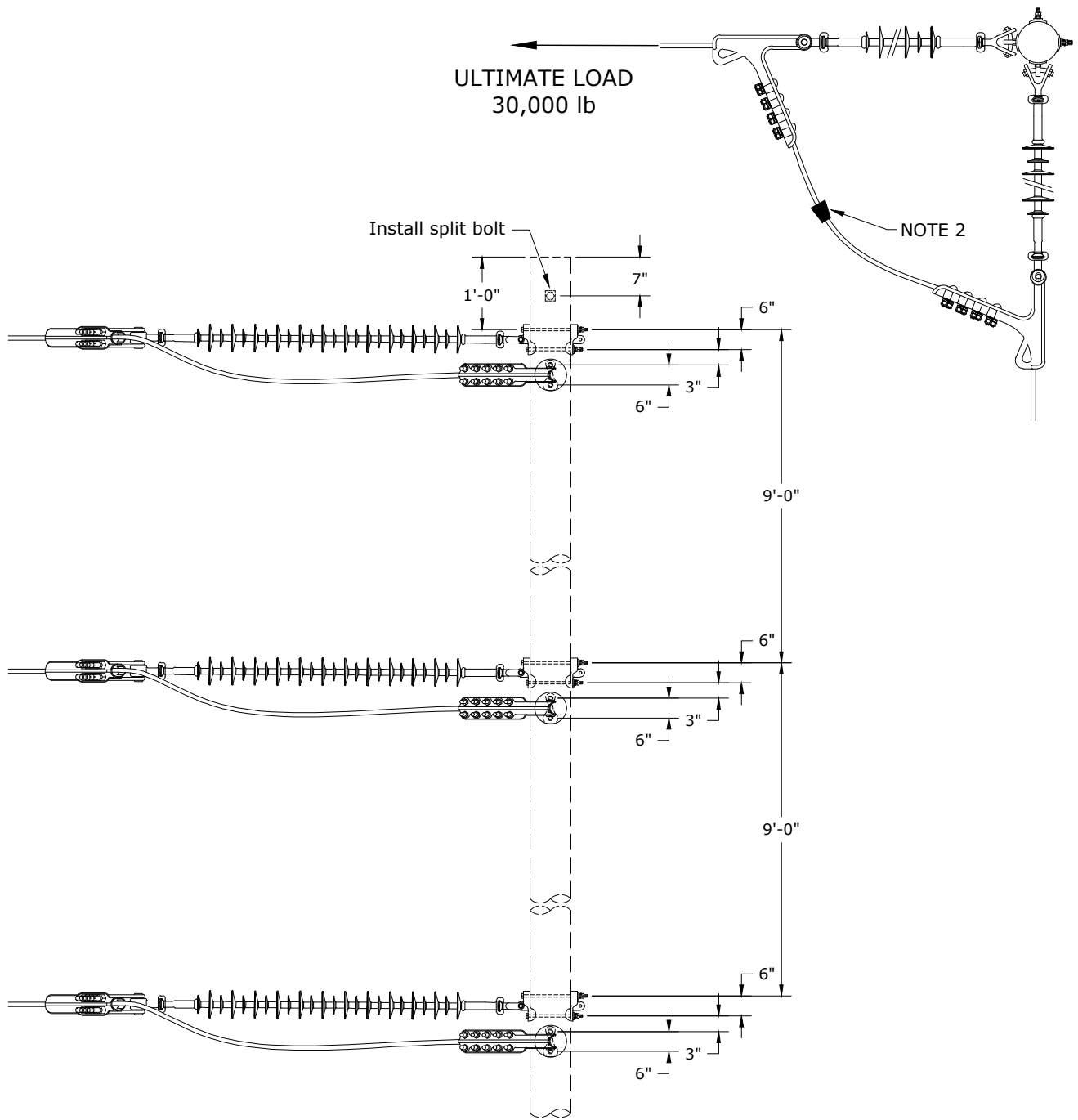
**TC41, TC41P**

CAD FILE:  
TC41

REVISIONS			
DATE	ENGR	OPS	
8/01	REDRAWN	IN CAD	1
8/23/17	CM	DK	2

APP:  
DATE: 8/5/66

SECTION  
**1800**



- Notes:**
1. For 1557 ACSR/TW, use Std TC44P.
  2. Call for connectors for jumpers separately:

Wire Size	S/N	Qty	Type
336	2501	3	Wedge
397	2501	3	Wedge
795	2477	3	Wedge
900	2451	3	Compression
1557	2778	3	Compression

Rev. 2 - Updated material, removed static wire, added note and TC44P.



## CONSTRUCTION STANDARDS

115kV TRANSMISSION  
 VERTICAL DOUBLE DEADEND-60° TO 90°  
 336 ACSR TO 900 ACSR BARE

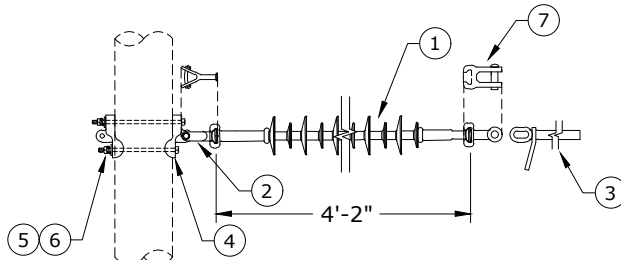
PAGE:  
1 of 2

# TC44, TC44P

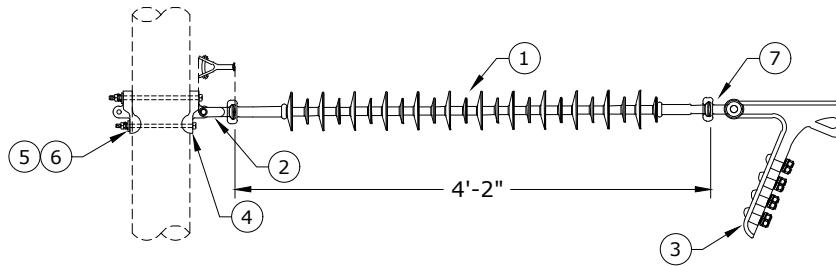
CAD FILE:  
TC44

REVISIONS			
△	DATE	ENGR	OPS
1	8/01	REDRAWN	IN CAD
2	8/23/17	CM	DK
△			
APP:		SECTION	
DATE: 8/5/66		1800	





**TPR5P**



**TPR5**

Rev. 2 - Updated material, removed static wire, added note and TC44P.

ITEM NO.	DESCRIPTION	TC44		TC44P *	
		TPR5 (6)		TPR5P (6)	
		QTY.	S/N	QTY.	S/N
1	Insulator, Suspension, Polymer, 115kV, 30,000 lb Ultimate	6	2350	6	2350
2	Clevis, Y-Ball, 30,000 lb Ultimate	6	320	6	320
3	Clamp, Strain, 336 ACSR To 900 ACSR Bare, D.E., 30,000 lb Ultimate	6	2467	6	2421
4	Plate, Pole Eye, 36,000 lb Ultimate	12	1908	12	1908
5	Bolt, Machine, 7/8" x 16", Galv., 25,400 lb Ultimate Tensile	12	1901	12	1901
6	Washer, Lock, Spring, Double Coil, Galv., 7/8"	12	2351	12	2351
7	Socket/Eye, 13/16" Eye, 1" Wide Base	6	1681	6	333



**CONSTRUCTION STANDARDS**

115kV TRANSMISSION  
 VERTICAL DOUBLE DEADEND-60° TO 90°  
 336 ACSR TO 900 ACSR BARE

PAGE:  
2 of 2

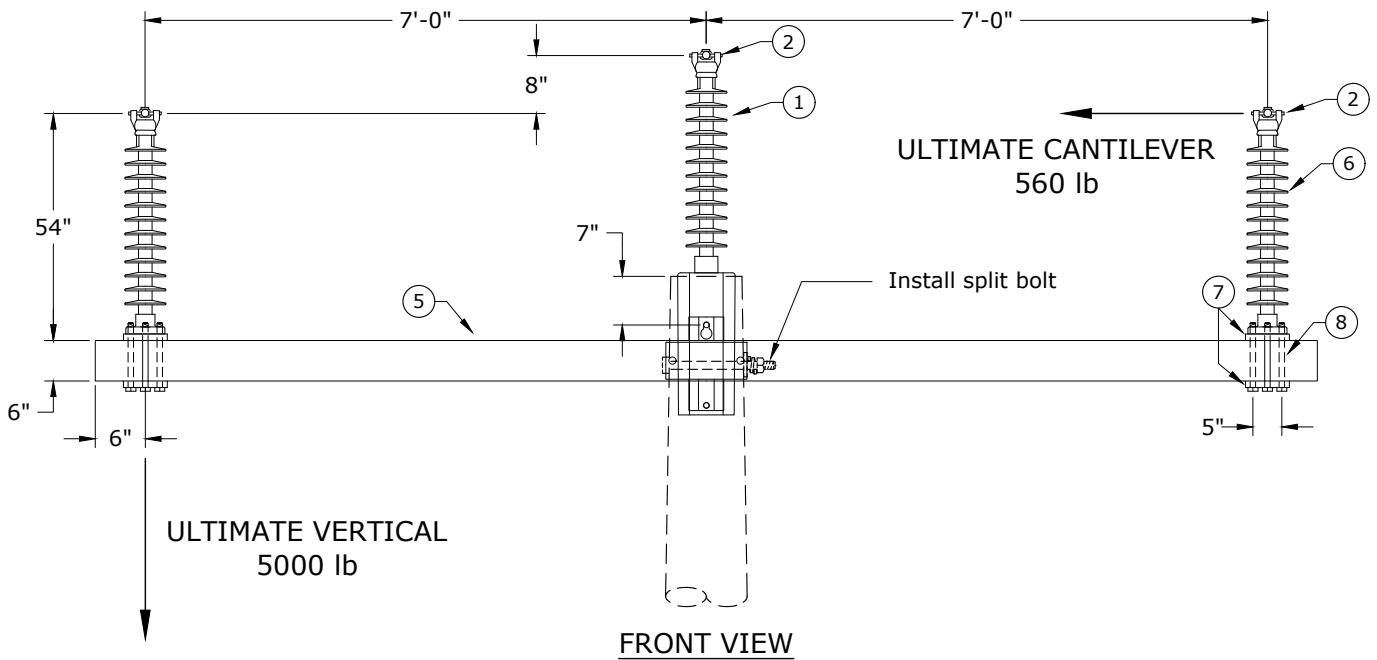
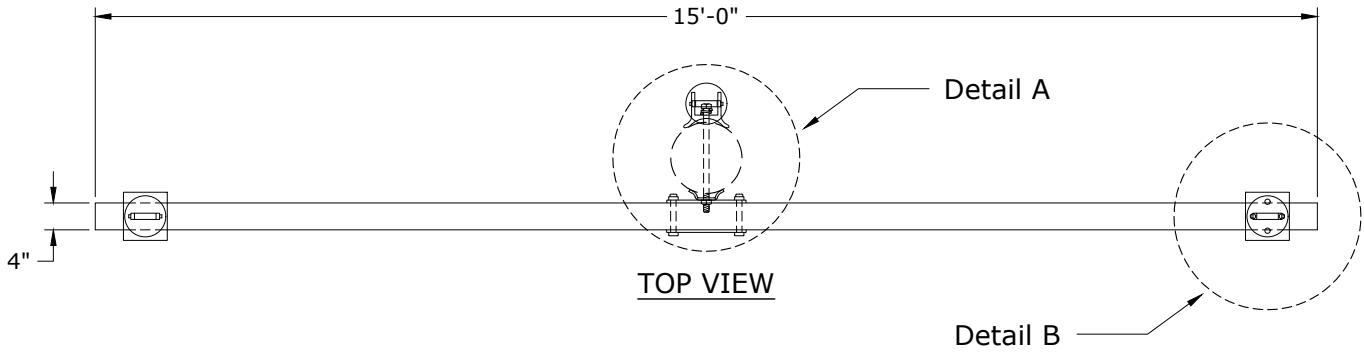
**TC44, TC44P**

CAD FILE:  
TC44

REVISIONS			
Δ	DATE	ENGR	OPS
1	8/01	REDRAWN	IN CAD
2	8/23/17	CM	DK

APP:	SECTION
DATE: 8/5/66	<b>1800</b>



**CONSTRUCTION STANDARDS**

115kV TRANSMISSION  
 FLAT TOP  
 795 AAC TO 1557 ACSR/TW

REVISIONS			
Δ	DATE	ENGR	OPS

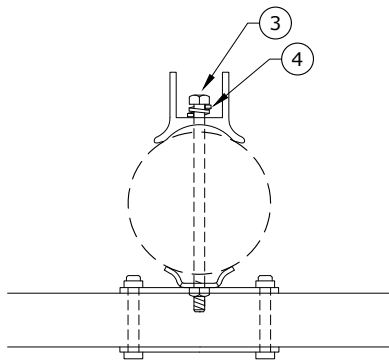
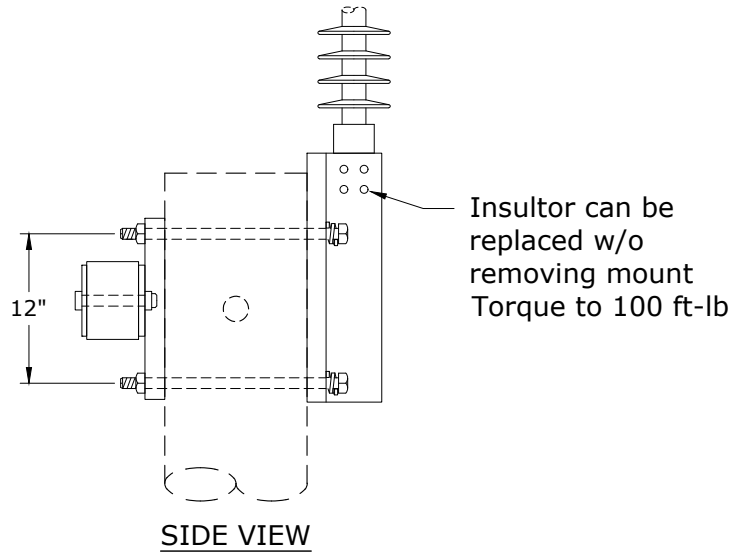
PAGE:  
1 of 2

**TFT1, TFT1LC**

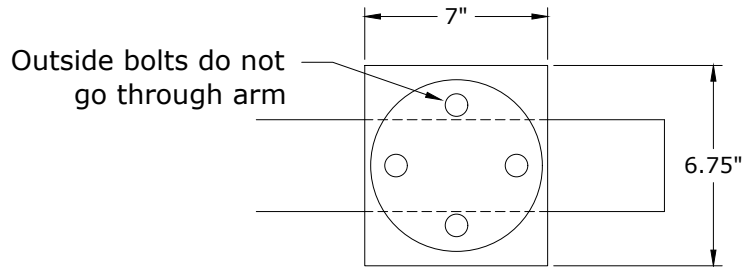
CAD FILE:  
TFT1

APP: CM/GM  
DATE: 11/19/20

SECTION  
**1800**



Pole Top Assembly



Arm-Plate Assembly

**Note:** For 336 ACSR and 397 AAC, use Std TFT1LC.

ITEM NO.	DESCRIPTION	TFT1		TFT1LC	
		QTY.	S/N	QTY.	S/N
1	Insulator, 115kV, Polymer, Vertical Line Post, 3,180 lb Ultimate Cantilever, Pole-Top Mt	1	2345	1	2345
2	Clamp, Wire, Clamptop, 2,800 lb Ultimate Body Strength	3	317	3	316
3	Bolt, Machine, 7/8" x 16", Galv., 25,400 lb Ultimate Tensile	2	1901	2	1901
4	Washer, Lock, Spring, Double Coil, Galv., 7/8"	2	2351	2	2351
5	Arm, Cross (Transmission), Fiberglass, 15' x 4" x 6"	1	2918	1	2918
6	Insulator, 115kV, Polymer, Vertical Line Post, 3,180 lb Ultimate Cantilever, Flat Mount	2	2916	2	2916
7	Plate, 115kV Insulator, 1/2" Thick, 5" Diameter Bolt Circle	4	2917	4	2917
8	Bolt, Machine, 5/8" x 10", Galv., 12,400 lb Ultimate Tensile	8	154	8	154



**CONSTRUCTION STANDARDS**

115kV TRANSMISSION  
FLAT TOP  
795 AAC TO 1557 ACSR/TW

REVISIONS

Δ	DATE	ENGR	OPS

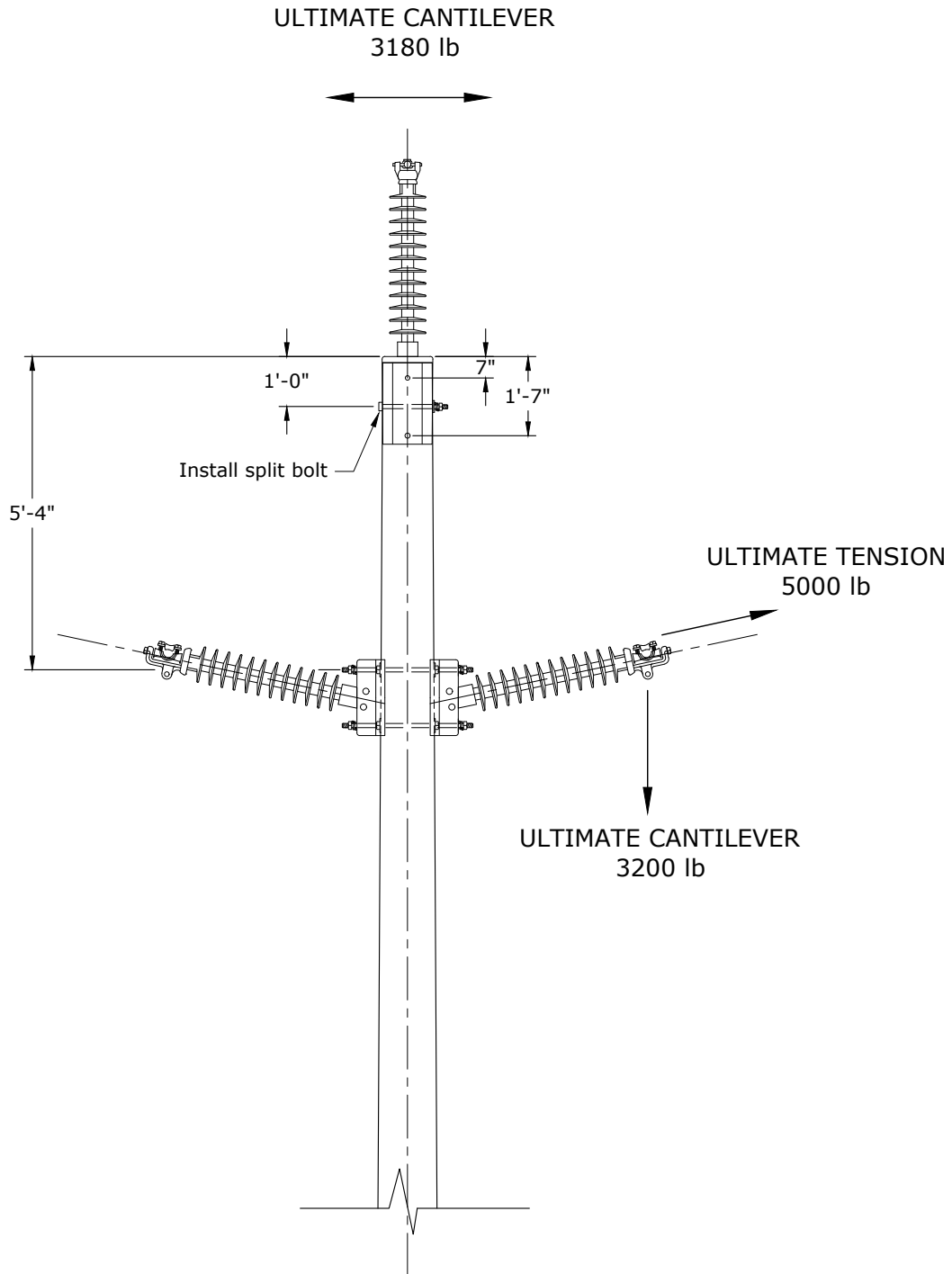
PAGE:  
2 of 2

**TFT1, TFT1LC**

CAD FILE:  
TFT1

APP: CM/GM  
DATE: 11/19/20

SECTION  
**1800**



**Note:** For 336 ACSR and 397 AAC, use Std THPALC.

Rev. 3 - Changed machine bolts to DA bolts.



### CONSTRUCTION STANDARDS

115KV TRANSMISSION  
 TWIGGY FRAMING-0° TO 4°  
 795 AAC TO 1557 ACSR/TW

#### REVISIONS

△/R	DATE	ENGR	OPS
0	3/02	REDRAWN	IN CAD
1	8/23/17	CM	DK
2	5/4/20	JK	
3	12/28/20	KJP	

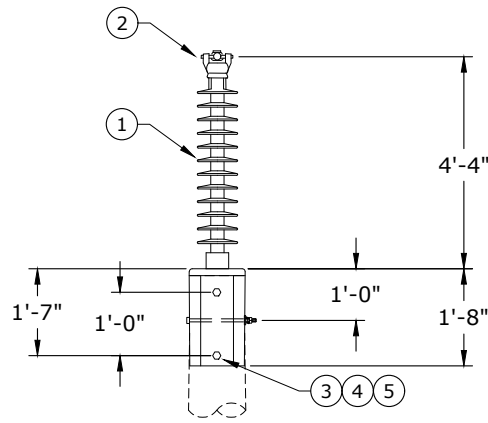
PAGE:  
1 of 2

**THPA, THPALC**

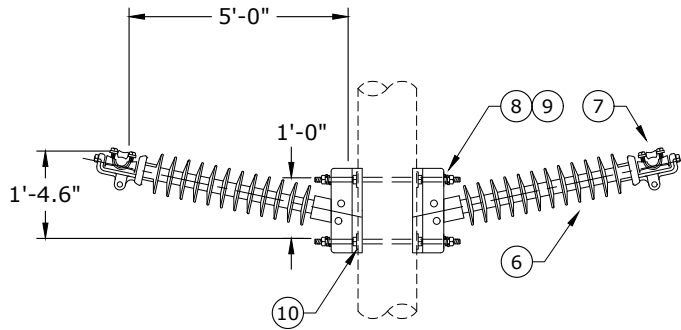
CAD FILE:  
THPA

APP: TRO  
DATE: 8/96

SECTION  
**1800**



**TPR1**



**TPR3**

Rev. 3 - Changed machine bolts to DA bolts.

ITEM NO.	DESCRIPTION	THPA TPR1		THPALC TPR1LC	
		QTY.	S/N	QTY.	S/N
1	Insulator, Line Post Vertical, 115kV, 3180 lb Ultimate Cantilever	1	2345	1	2345
2	Clamp, Clamptop, 795 AAC To 1557 ACSR/TW Bare	1	317	1	316
3	Bolt, Machine, 7/8" x 16", Galv, 25,400 lb Ultimate Tensile	2	1901	2	1901
4	Washer, Curved, Cast, 4" x 6"	2	1911	2	1911
5	Washer, Lock, Spring, Double Coil, Galv, 7/8"	2	2351	2	2351
ITEM NO.	DESCRIPTION	TPR3		TPR3LC	
		QTY.	S/N	QTY.	S/N
6	Insulator, Line Post Horizontal, 115kV, 3200 lb Ultimate Cantilever	2	2346	2	2346
7	Clamp, Clamptop, 795 AAC To 1557 ACSR/TW Bare	2	317	2	316
8	Bolt, Double Arm, 7/8" x 26", Galv, 25,400 lb Ultimate Tensile	2	2983	2	2983
9	Washer, Lock, Spring, Double Coil, Galv, 7/8"	4	2351	4	2351
10	Washer, Flat Round, Galv, 7/8"	4	2978	4	2978



**CONSTRUCTION STANDARDS**

115kV TRANSMISSION  
TWIGGY FRAMING-0° TO 4°  
795 AAC TO 1557 ACSR/TW

REVISIONS

Δ	DATE	ENGR	OPS
0	3/02	REDRAWN	IN CAD
1	8/23/17	CM	DK
2	5/4/20	JK	
3	12/28/20	KJP	

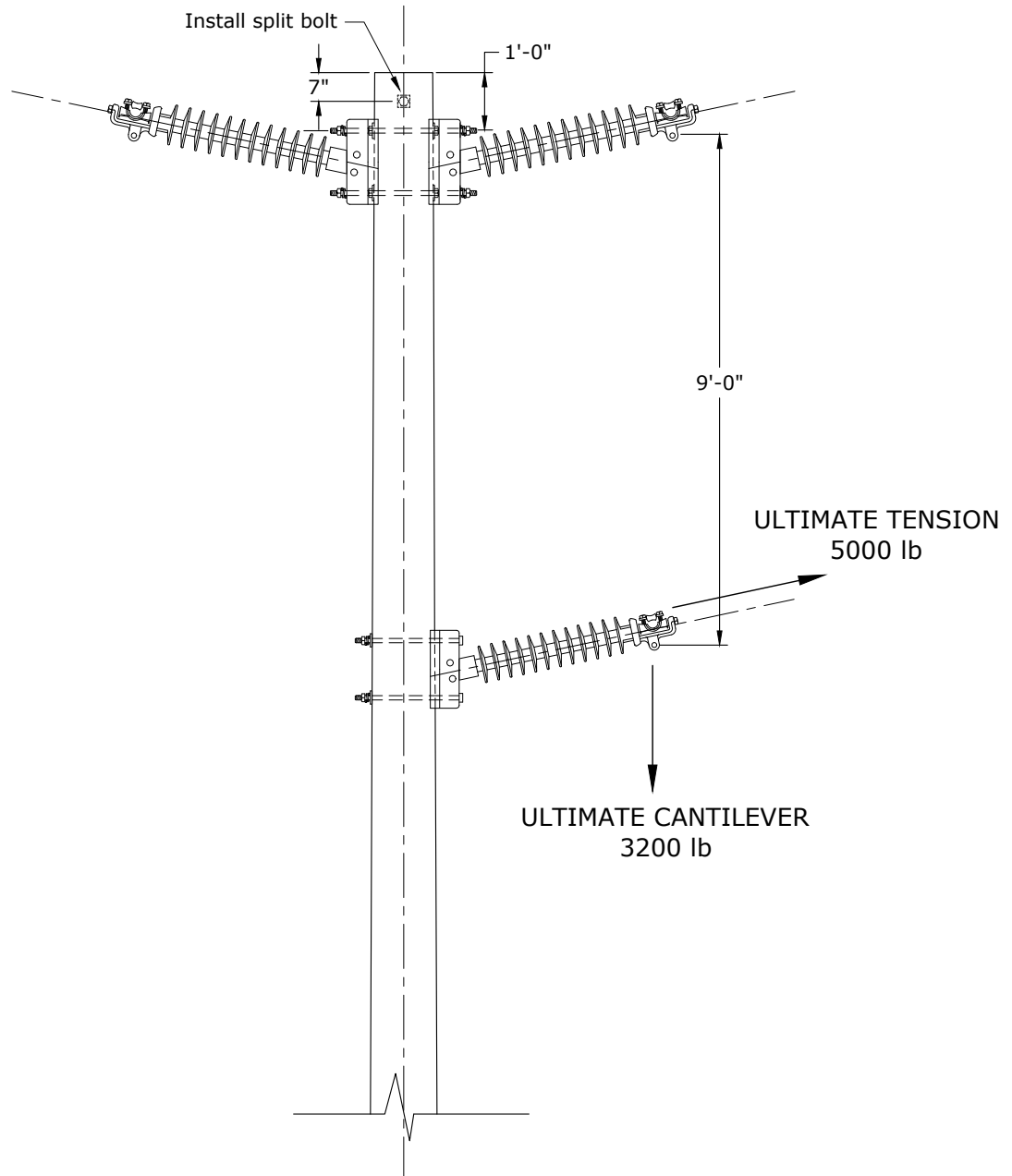
PAGE:  
2 of 2

**THPA, THPALC**

CAD FILE:  
THPA

APP: TRO  
DATE: 8/96

SECTION  
**1800**



**Note:** For 336 ACSR and 397 AAC, use Std THPBLC.

Rev. 2 - Changed machine bolts to DA bolts.



## CONSTRUCTION STANDARDS

115KV TRANSMISSION  
 REVERSE TWIGGY-5° TO 20°  
 795 AAC TO 1557 ACSR/TW

### REVISIONS

△	DATE	ENGR	OPS
1	5/4/20	JK	
2	12/28/20	KJP	

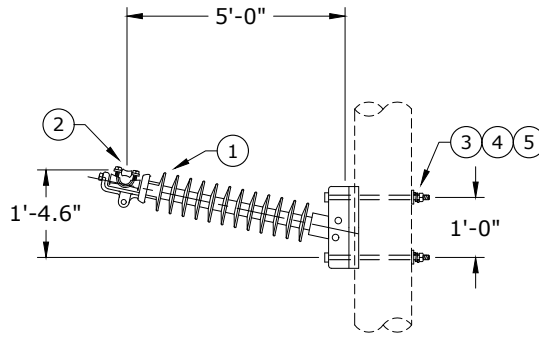
PAGE:  
1 of 2

**THPB, THPBLC**

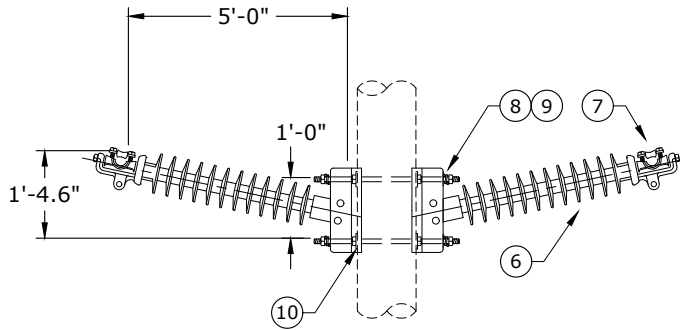
CAD FILE:  
THPB

APP: CM/DK  
DATE: 8/23/17

SECTION  
**1800**



**TPR2**



**TPR3**

Rev. 2 - Changed machine bolts to DA bolts.

ITEM NO.	DESCRIPTION	THPB TPR2		THPBLC TPR2LC	
		QTY.	S/N	QTY.	S/N
1	Insulator, Line Post Horizontal, 115kV, 3200 lb Ultimate Cantilever	1	2346	1	2346
2	Clamp, Clamptop, 795 AAC To 1557 ACSR/TW Bare	1	317	1	316
3	Bolt, Machine, 7/8" x 16", Galv, 25,400 lb Ultimate Tensile	2	1901	2	1901
4	Washer, Curved, Cast, 4" x 6"	2	1911	2	1911
5	Washer, Lock, Spring, Double Coil, Galv., 7/8"	2	2351	2	2351
ITEM NO.	DESCRIPTION	TPR3		TPR3LC	
		QTY.	S/N	QTY.	S/N
6	Insulator, Line Post Horizontal, 115kV, 3200 lb Ultimate Cantilever	2	2346	2	2346
7	Clamp, Clamptop, 795 AAC To 1557 ACSR/TW Bare	2	317	2	316
8	Bolt, Double Arm, 7/8" x 26", Galv, 25,400 lb Ultimate Tensile	2	2983	2	2983
9	Washer, Lock, Spring, Double Coil, Galv, 7/8"	4	2351	4	2351
10	Washer, Flat Round, Galv, 7/8"	4	2978	4	2978



**CONSTRUCTION STANDARDS**

115KV TRANSMISSION  
REVERSE TWIGGY-5° TO 20°  
795 AAC TO 1557 ACSR/TW

REVISIONS

Δ	DATE	ENGR	OPS
1	5/4/20	JK	
2	12/28/20	KJP	

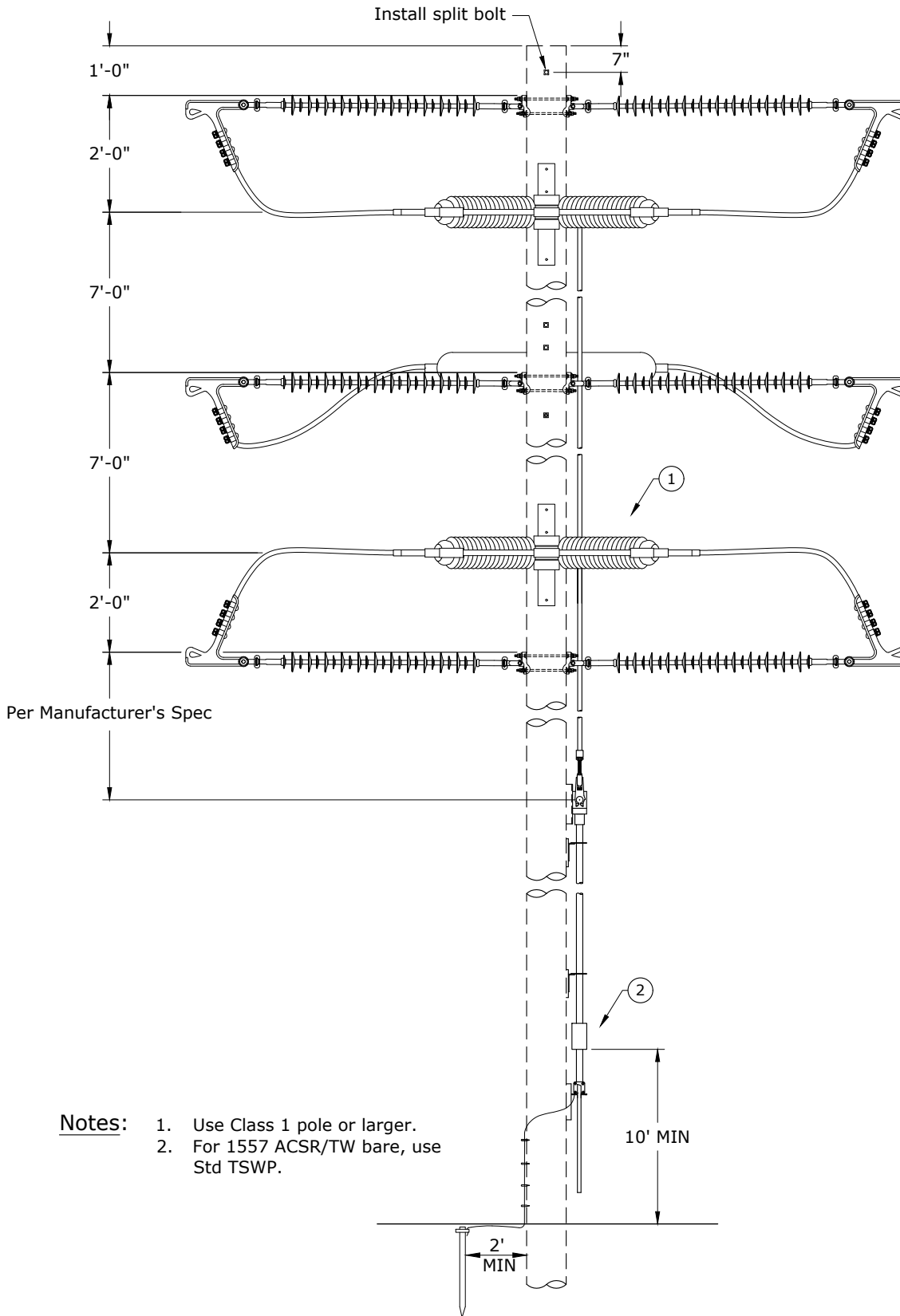
PAGE:  
2 of 2

**THPB, THPBLC**

CAD FILE:  
THPB

APP: CM/DK  
DATE: 8/23/17

SECTION  
**1800**



- Notes:**
1. Use Class 1 pole or larger.
  2. For 1557 ACSR/TW bare, use Std TSWP.

Rev. 5 - Changed machine bolts to DA bolts.



## CONSTRUCTION STANDARDS

115kV TRANSMISSION  
 OPPOSING PHASE VERTICAL SWITCH  
 336 ACSR TO 900 ACSR

### REVISIONS

△	DATE	ENGR	OPS
2	3/24/72	RHJ	
3	11/7/73	CMK	
4	8/23/17	DK	
5	12/29/20	KJP	

PAGE:  
1 of 2

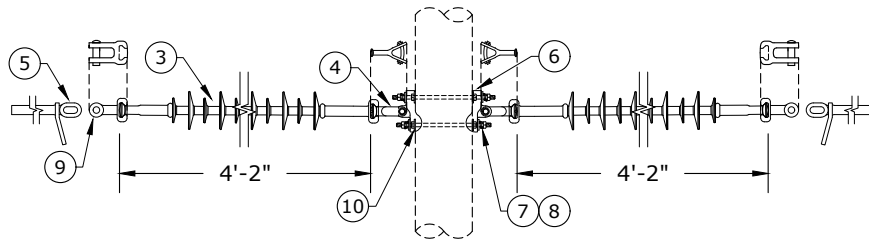
**TSW, TSWP**

CAD FILE:  
TSW

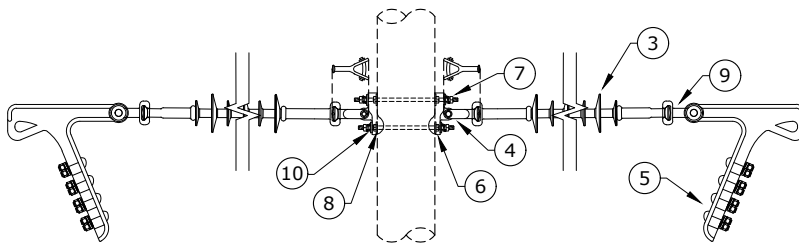
APP: PS/RV  
DATE: 2/66

SECTION  
**1800**

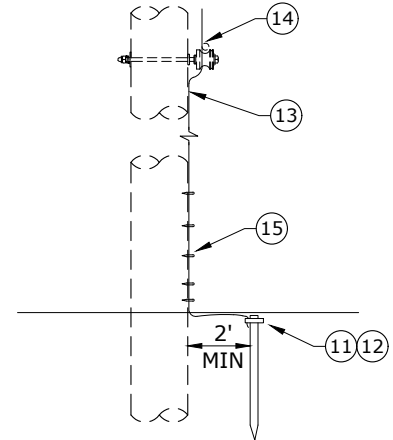




**TPR6P**



**TPR6**



**N1**

Rev. 5 - Changed machine bolts to DA bolts.

ITEM NO.	DESCRIPTION	TSW SWITCH		TSWP SWITCH	
		QTY	S/N	QTY	S/N
1	Switch, AB Vert. 1200A 115kV, Phase Over Phase	1	1273	1	1273
2	Insulator, Control Rod, 2" IPS	1	2989	1	2989
ITEM NO.	DESCRIPTION	TPR6 (3)		TPR6P (3)	
		QTY	S/N	QTY	S/N
3	Insulator, Suspension, Polymer, 115kV, 30,000 lb Ultimate	6	2350	6	2350
4	Clevis, Y-Ball, 30,000 lb Ultimate	6	320	6	320
5	Clamp, Strain/ Deadend, Compression	6	2467	6	2421
6	Plate, Pole Eye, 36,000 lb Ultimate	6	1908	6	1908
7	Bolt, Double Arm, 7/8" x 20", Galv., 25,400 lb Ultimate	6	2980	6	2980
8	Washer, Lock, Spring, Double Coil, Galv, 7/8"	12	2351	12	2351
9	Socket/Eye, 13/16" Eye, 1" Wide Base/ Clevis, Socket	6	1681	6	333
10	Washer, Flat Round Galv, 7/8"	12	2978	12	2978
ITEM NO.	DESCRIPTION	N1		N1	
		QTY	S/N	QTY	S/N
11	Rod, Ground, 5/8" x 8'	1	1124	1	1124
12	Clamp, Ground Rod, 5/8", Small, Bronze	1	281	1	281
13	Conductor, Copper-Clad Steel, #4 Cu Equivalent	36	1512	36	1512
14	Connector, H-Tap, Al/Cu, Run #2-2/0 Str - Tap #6-#1 Str	1	413	1	413
15	Staple, Ground Wire, Barbed, Galv, 1 1/2"	24	2707	24	2707



**CONSTRUCTION STANDARDS**

115KV TRANSMISSION  
OPPOSING PHASE VERTICAL SWITCH  
336 ACSR TO 900 ACSR

REVISIONS

Δ	DATE	ENGR	OPS
2	3/24/72	RHJ	
3	11/7/73	CMK	DK
4	8/23/17	DK	
5	12/29/20	KJP	

PAGE:  
2 of 2

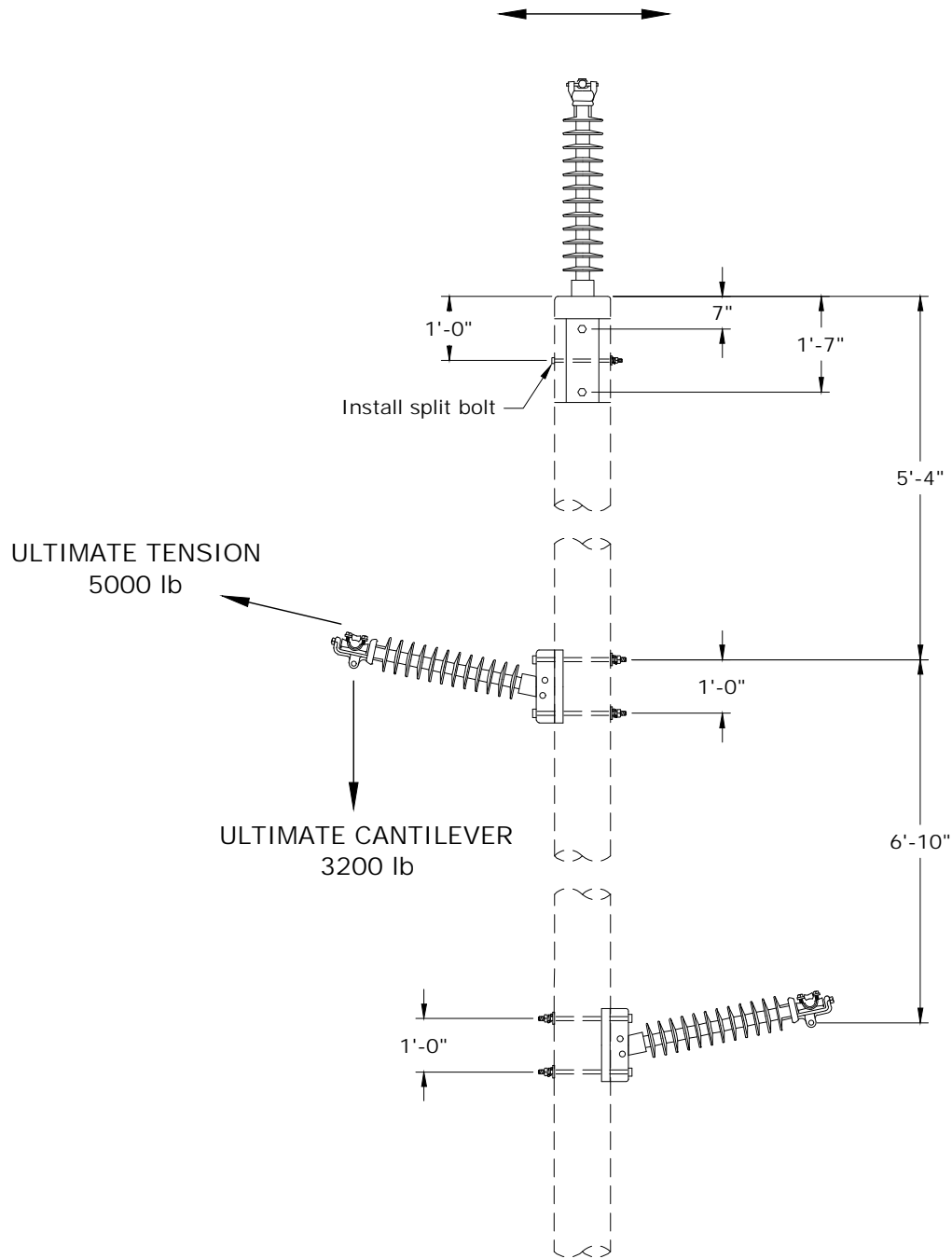
**TSW, TSWP**

CAD FILE:  
TSW

APP: PS/RV  
DATE: 2/66

SECTION  
**1800**

ULTIMATE CANTILEVER  
3180 lb



Note: For 336 ACSR and 397 AAC, use Std TV21LC.

Rev. 2- Updated Ultimate Cantilever rating.



CONSTRUCTION STANDARDS

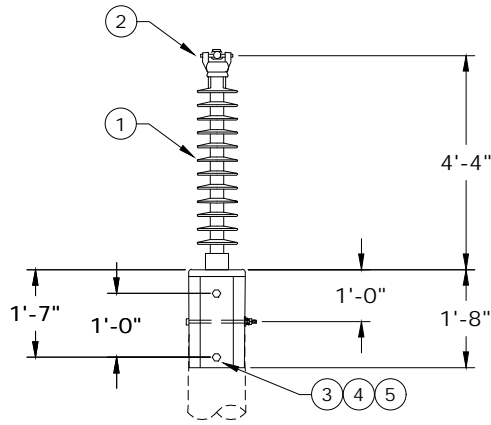
115kV TRANSMISSION  
OPPOSING PHASE W/ POST TOP  
795 AAC TO 1557 ACSR/TW

PAGE:  
1 of 2

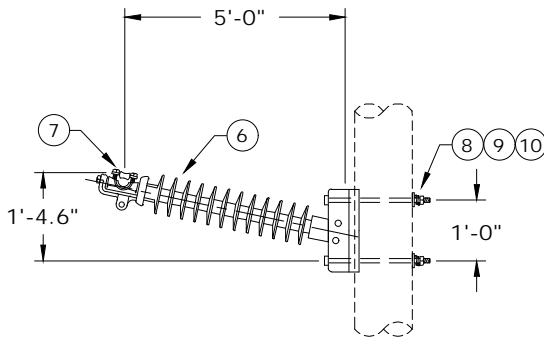
TV21, TV21LC

CAD FILE:  
TV21

REVISIONS			
△	DATE	ENGR	OPS
0	8/01	REDRAWN	IN CAD
1	8/23/17	CM	DK
2	5/4/20	JK	
△			
APP:		SECTION	
DATE: 2/68		1800	



**TPR1**



**TPR2**

Rev. 2- Updated Ultimate Cantilever rating.

ITEM NO.	DESCRIPTION	TV21 TPR1		TV21LC* TPR1LC	
		QTY.	S/N	QTY.	S/N
1	Insulator, Line Post Vertical, 115kV, 3180 lb Ultimate Cantilever	1	2345	1	2345
2	Clamp, Clamptop, 795 AAC To 1557 ACSR/TW Bare	1	317	1	316
3	Bolt, Machine, 7/8" x 16", Galv., 25,400 lb Ultimate Tensile	2	1901	2	1901
4	Washer, Curved, Cast, 4" x 6"	2	1911	2	1911
5	Washer, Lock, Spring, Double Coil, Galv., 7/8"	2	2351	2	2351

ITEM NO.	DESCRIPTION	TPR2 (2)		TPR2LC (2)	
		QTY.	S/N	QTY.	S/N
6	Insulator, Line Post Horizontal, 115kV, 3200 lb Ultimate Cantilever	2	2346	2	2346
7	Clamp, Clamptop, 795 AAC To 1557 ACSR/TW Bare	2	317	2	316
8	Bolt, Machine, 7/8" x 16", Galv., 25,400 lb Ultimate Tensile	4	1901	4	1901
9	Washer, Curved, Cast, 4" x 6"	4	1911	4	1911
10	Washer, Lock, Spring, Double Coil, Galv., 7/8"	4	2351	4	2351



**CONSTRUCTION STANDARDS**

115kV TRANSMISSION  
OPOOSING PHASE W/ POST TOP  
795 AAC TO 1557 ACSR/TW

PAGE:  
2 of 2

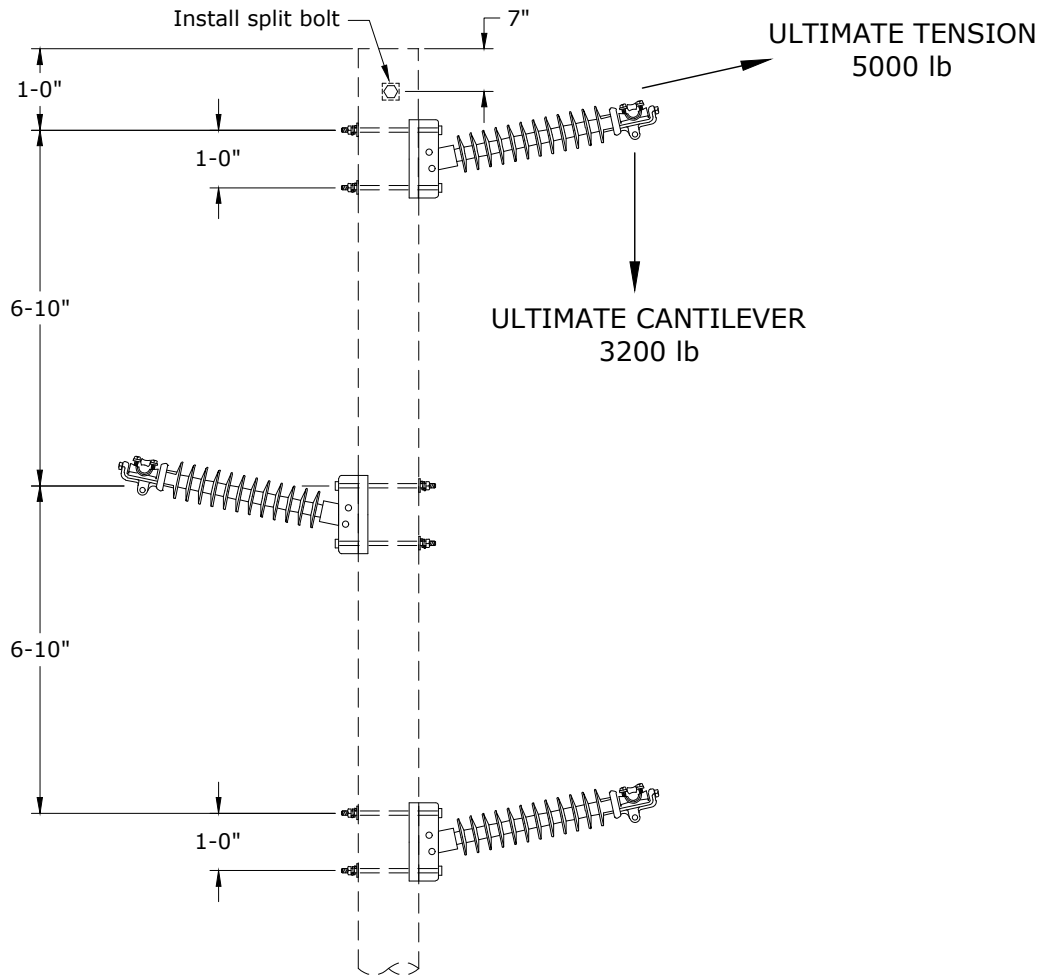
**TV21, TV21LC**

CAD FILE:  
TV21

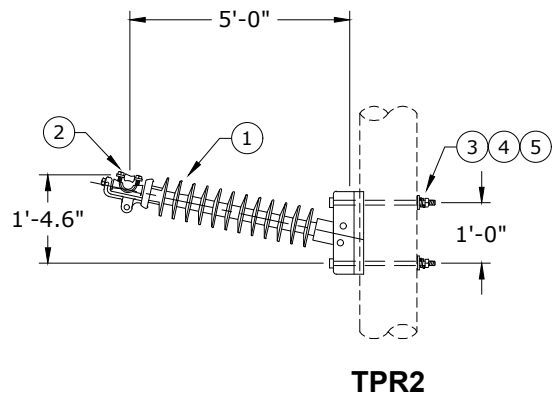
REVISIONS			
DATE	ENGR	OPS	
8/01	REDRAWN	IN CAD	
8/23/17	CM	DK	
5/4/20	JK		

APP:	SECTION
DATE: 2/68	1800



**Note:** For 336 ACSR and 397 AAC, use Std TC22LC.



Rev. 2- Updated Ultimate Cantilever rating.

ITEM NO.	DESCRIPTION	TV22		TV22LC	
		TPR2 (3)		TPR2LC (3)	
		QTY.	S/N	QTY.	S/N
1	Insulator, Line Post Horizontal, 115kV, 3200 lb Ultimate Cantilever	3	2346	3	2346
2	Clamp, Clamptop, 795 AAC To 1557 ACSR/TW Bare	3	317	3	316
3	Bolt, Machine, 7/8" x 16", Galv., 25,400 lb Ultimate Tensile	6	1901	6	1901
4	Washer, Curved, Cast, 4" x 6"	6	1911	6	1911
5	Washer, Lock, Spring, Double Coil, Galv., 7/8"	6	2351	6	2351

**TPR2**



## CONSTRUCTION STANDARDS

115kV TRANSMISSION  
OPPOSING PHASE-0° TO 4°  
795 AAC TO 1557 ACSR/TW

PAGE:  
1 of 1

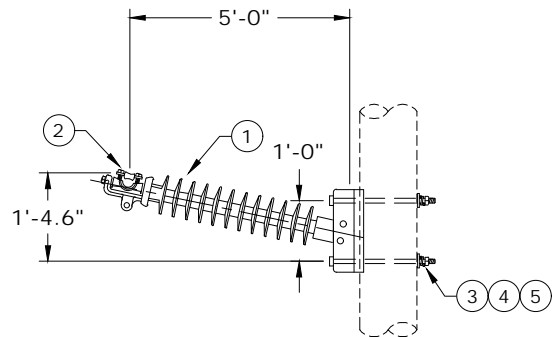
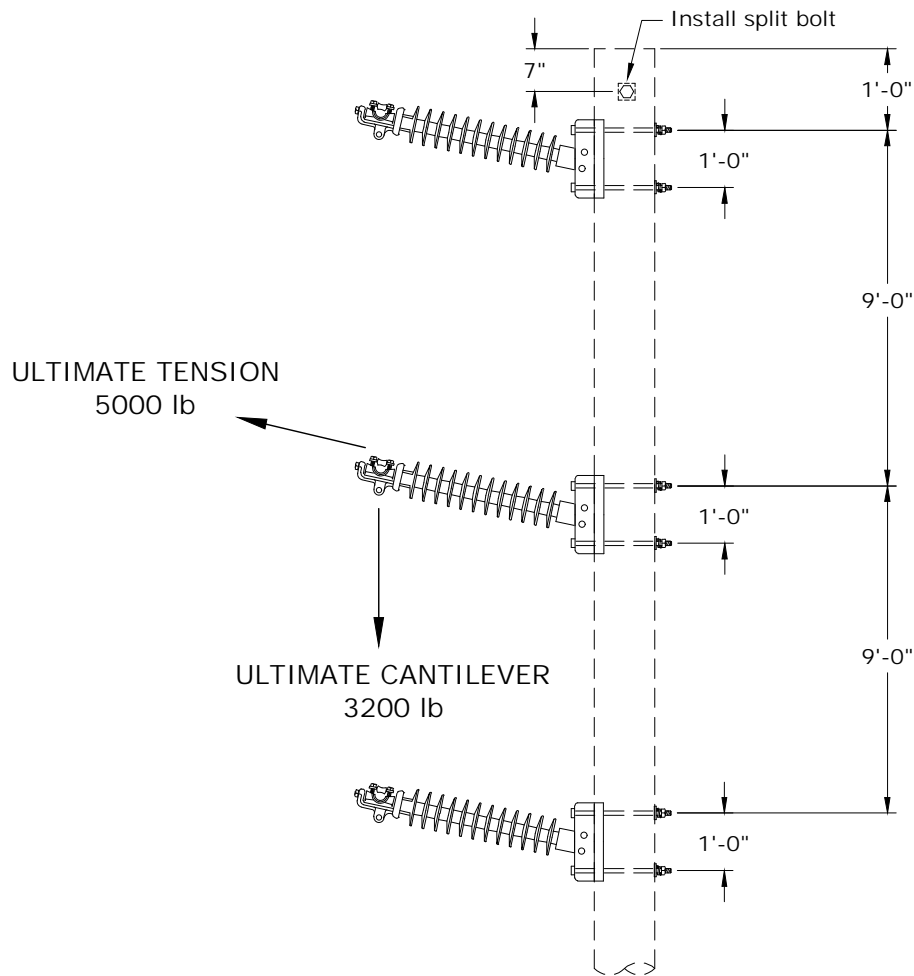
**TV22,TV22LC**

CAD FILE:  
TV22

REVISIONS			
DATE	ENGR	OPS	
8/01	REDRAWN	IN CAD	
8/23/17	CM	DK	
5/4/20	JK		

APP:  
DATE: 1/77

SECTION  
**1800**



Note: For 336 ACSR and 397 AAC, use Std TV23LC.

**TPR2**

Rev. 2- Updated Ultimate Cantilever rating.

ITEM NO.	DESCRIPTION	TV23		TV23LC	
		TPR2 (3)		TPR2LC (3)	
		QTY.	S/N	QTY.	S/N
1	Insulator, Line Post Horizontal, 115kV, 3200 lb Ultimate Cantilever	3	2346	3	2346
2	Clamp, Clamptop, 795 AAC To 1557 ACSR/TW Bare	3	317	3	316
3	Bolt, Machine, 7/8" x 16", Galv., 25,400 lb Ultimate Tensile	6	1901	6	1901
4	Washer, Curved, Cast, 4" x 6"	6	1911	6	1911
5	Washer, Lock, Spring, Double Coil, Galv., 7/8"	6	2351	6	2351



**CONSTRUCTION STANDARDS**

115kV TRANSMISSION  
VERTICAL-0° TO 10°  
795 AAC TO 1557 ACSR/TW

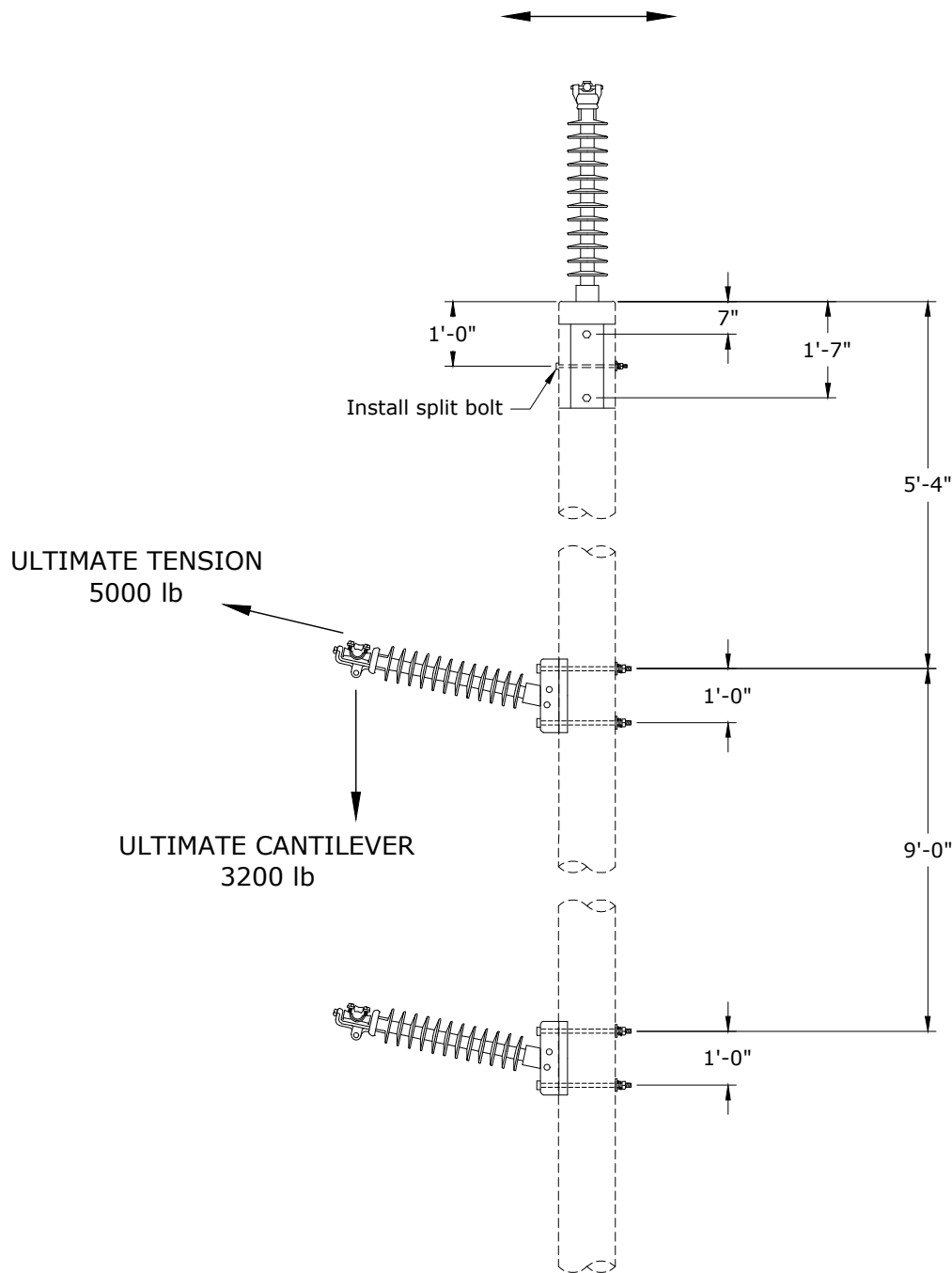
PAGE:  
1 of 1

**TV23, TV23LC**

CAD FILE:  
TV23

REVISIONS			
Δ	DATE	ENGR	OPS
0	8/01	REDRAWN	IN CAD
1	8/23/17	CM	DK
2	5/4/20	JK	
APP: _____			
DATE: 8/5/66			SECTION <b>1800</b>

ULTIMATE CANTILEVER  
3180 lb



Note: For 336 ACSR and 397 AAC, use Std TV24LC.

Rev. 2 - Updated Ultimate Cantilever rating.



CONSTRUCTION STANDARDS

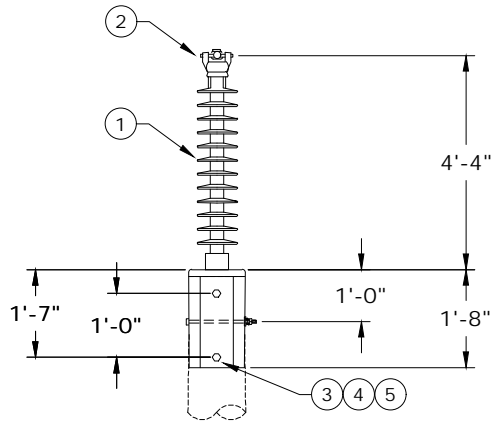
115kV TRANSMISSION  
VERTICAL W/ POST TOP  
795 AAC TO 1557 ACSR/TW

PAGE:  
1 of 2

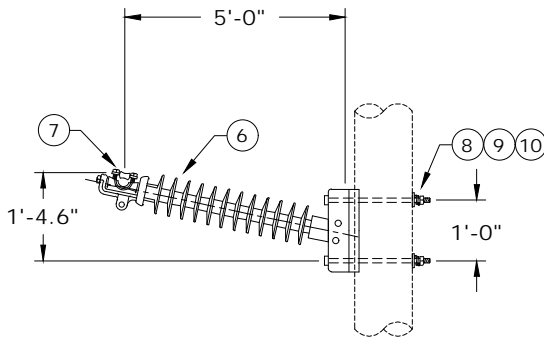
TV24,TV24LC

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TV24

REVISIONS			
DATE	ENGR	OPS	
8/01	REDRAWN	IN CAD	
8/23/17	CM	DK	
5/4/20	JK		
APP:		SECTION	
DATE: 2/66		1800	



**TPR1**



**TPR2**

Rev. 2 - Updated Ultimate Cantilever rating.

ITEM NO.	DESCRIPTION	TV24 TPR1		TV24LC TPR1LC	
		QTY.	S/N	QTY.	S/N
1	Insulator, Line Post Vertical, 115kV, 3180 lb Ultimate Cantilever	1	2345	1	2345
2	Clamp, Clamptop, 795 AAC To 1557 ACSR/TW Bare	1	317	1	316
3	Bolt, Machine, 7/8" x 16", Galv., 25,400 lb Ultimate Tensile	2	1901	2	1901
4	Washer, Curved, Cast, 4" x 6"	2	1911	2	1911
5	Washer, Lock, Spring, Double Coil, Galv., 7/8"	2	2351	2	2351

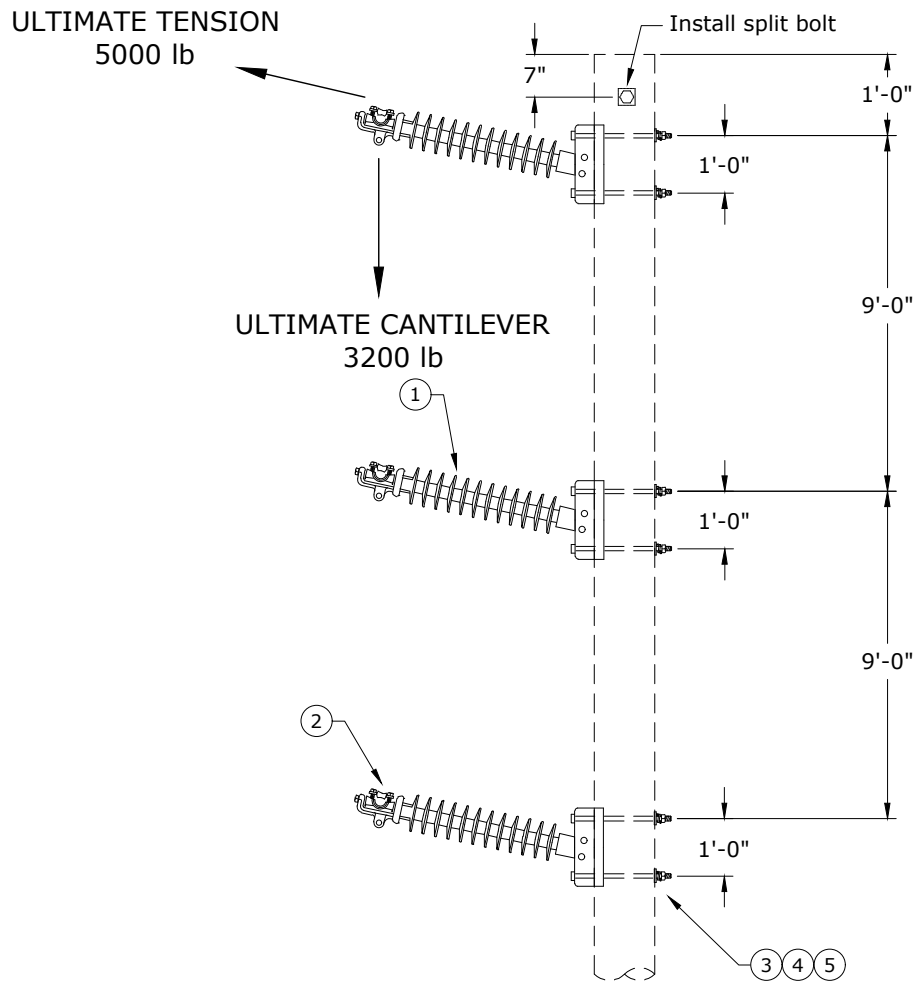
ITEM NO.	DESCRIPTION	TPR2 (2)		TPR2LC (2)	
		QTY.	S/N	QTY.	S/N
6	Insulator, Line Post Horizontal, 115kV, 3200 lb Ultimate Cantilever	2	2346	2	2346
7	Clamp, Clamptop, 795 AAC To 1557 ACSR/TW Bare	2	317	2	316
8	Bolt, Machine, 7/8" x 16", Galv., 25,400 lb Ultimate Tensile	4	1901	4	1901
9	Washer, Curved, Cast, 4" x 6"	4	1911	4	1911
10	Washer, Lock, Spring, Double Coil, Galv., 7/8"	4	2351	4	2351



**CONSTRUCTION STANDARDS**

115kV TRANSMISSION  
VERTICAL W/ POST TOP  
795 AAC TO 1557 ACSR/TW

REVISIONS			
Δ	DATE	ENGR	OPS
0	8/01	REDRAWN	IN CAD
1	8/23/17	CM	DK
2	5/4/20	JK	
APP: _____			
DATE: 2/66		SECTION <b>1800</b>	



Rev. 1 - Updated Ultimate Cantilever rating.

ITEM NO.	DESCRIPTION	TV25	
		QTY.	S/N
1	Insulator, Line Post Horizontal, 115kV, 3200 lb Ultimate Cantilever	3	2346
2	Clamp, Strain, 336 ACSR to 1557 ACSR/TW	3	2467
3	Bolt, Machine, 7/8" x 16", Galv., 25,400 Ultimate Tensile	6	1901
4	Washer, Curved, Cast, 4" x 6"	6	1911
5	Washer, Lock, Spring, Double Coil, Galv., 7/8"	6	2351



### CONSTRUCTION STANDARDS

115KV TRANSMISSION  
 VERTICAL-11° TO 30°  
 336 ACSR TO 1557 ACSR/TW

PAGE:  
1 of 1

## TV25

CAD FILE:  
TV25

#### REVISIONS

REVISION	DATE	ENGR	OPS
1	5/4/20	JK	

APP:	CM/DK	SECTION
DATE:	8/23/17	1800



# 1910

## JOINT USE

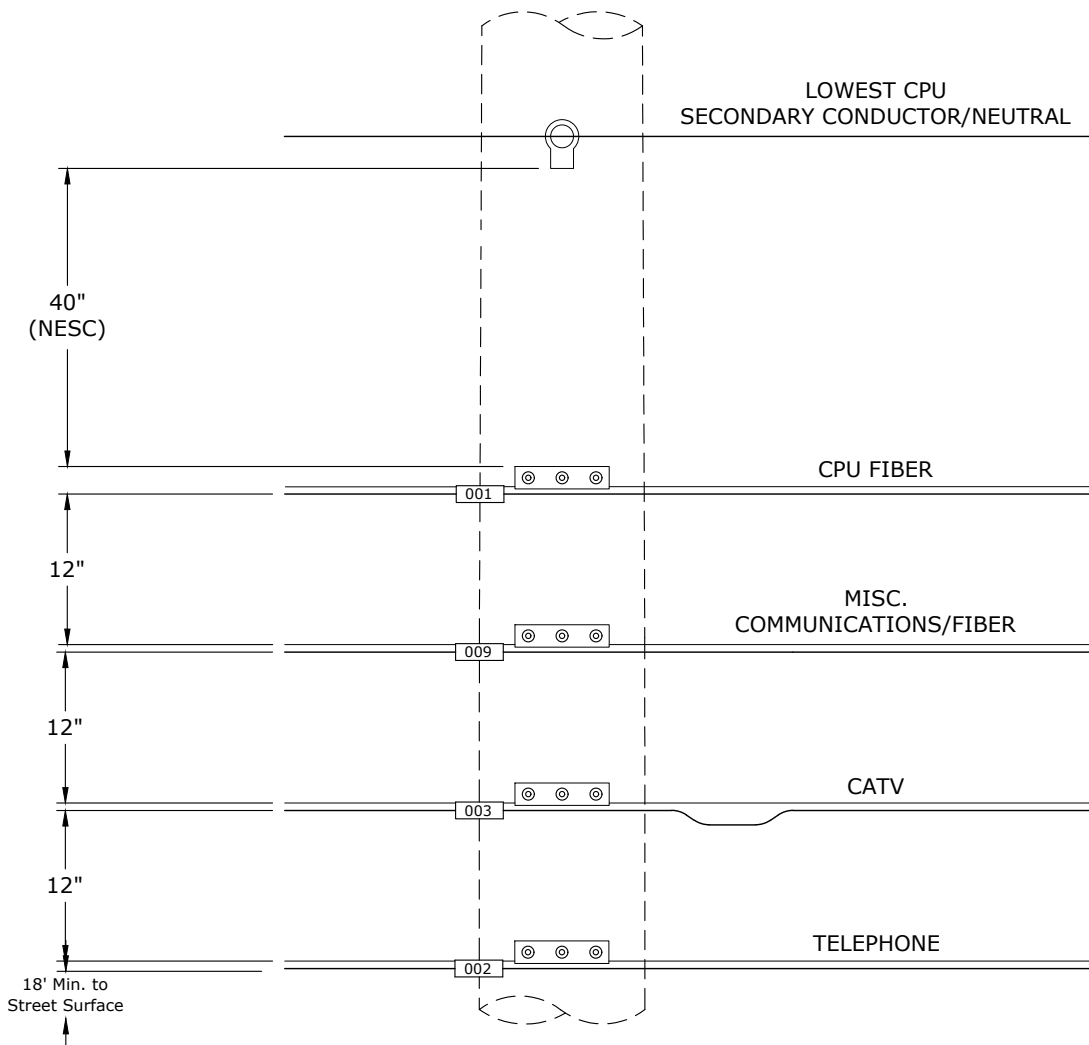
3/13/2023

~	JU1	Joint Use Labeling
<b>C</b>	JU2	Joint Use Pole Attachment Guidelines
~	JU3	Joint Use Temporary (30 Day) Attachment
~	JU4	Joint Use Guidelines for Communication Antenna Attachments


<b>N</b>	New Standard
<b>R</b>	Redrawn Standard
<b>C</b>	Changed Standard
~	No Change

**STANDARD UTILITY POLE  
ATTACHMENTS**  
(Typical Pole Details, Not to Scale)

1. Identification of attachments is necessary to assist in repair of third party or storm damage to cables, equipment cabinets, conduit and other pole attachments.
2. Nothing herein shall be construed so as to require CPU to tag or label any electrical distribution circuit or facilities. The tagging requirement for CPU pertains to fiber optic and other communications facilities.
3. Tags shall be applied to each attachment on every pole. A separate tag shall be attached to each fiberglass crossarm by the communications company that installed it.
4. Tag shall be securely attached and clearly visible from the ground.
5. Acceptable tags are Tech Products "Everlast" 1-inch tags with type ELHY numbers and PH 103 holder or Almetek Series 1001 E-Z tags with type UE-H 1-inch black numbers on yellow background with TH-3P holder or equivalent approved by CPU.
6. Tags shall be applied on all new construction and whenever work is being done on existing plant.




Rev. 15 - Added 027 Zing Broadband.

	<b>CONSTRUCTION STANDARDS</b>		<b>REVISIONS</b>			
	JOINT USE JOINT USE LABELING		△	DATE	ENGR	OPS
	PAGE: 1 of 2	<b>JU1</b>	CAD FILE: JU1	APP: KJP	SECTION <b>1910</b>	
			△	DATE: 12/02/03		

## Standard Utility Pole Attachment Identification Codes

001	Clark Public Utilities Fiber
002	(Was Qwest before bought out by CenturyLink)
003	Comcast
004	Ziply Fiber
005	TDS Telecom
006	Lumen
007	NocTel Communications
008	Structured Cabling
009	ZAYO
010	Lumen National
011	Clark County Information Services
012	WSDOT
013	City Of Vancouver
014	Wave/Astound
015	City of Battleground
016	City of Ridgefield
017	Eman Networks (out of business)
018	City of Camas
019	NoaNet
020	Silver Star Telecom
021	Wave/Astound
022	MCIMETRO
023	Port of Ridgefield
024	AT&T
025	Ridgefield School District
026	La Center School District
027	Zing Broadband

Rev. 15 - Added 027 Zing Broadband.

	<b>CONSTRUCTION STANDARDS</b>			REVISIONS			
	JOINT USE JOINT USE LABELING			APP: KJP	SECTION		
	<b>JU1</b>			DATE: 12/02/03			<b>1910</b>
	PAGE: 2 of 2			CAD FILE: JU1			
			DATE	ENGR	OPS		
			12	7/21/20	JDK		
			13	12/1/21	DRK		
			14	12/15/22	DRK		
			15	11/6/23	DRK		

# 1. Reference Standards

All clearances between conductors and climbing/working space requirements and construction shall meet the minimum requirements of the latest editions of the Washington Administrative Code (WAC) 296 or the National Electrical Safety Code (NESC) whichever is greater.

# 2. Definitions

**CPU** - Clark Public Utilities

**Joint Ownership** - Refers to poles which are jointly owned by CPU and CenturyLink.

**Third Party** - Any communication company (except CenturyLink) that attaches to a CPU/CenturyLink jointly-owned pole.

**Supply Space** - The vertical space on a pole that is occupied by the electric supply conductors and/or hardware. The bottom of the supply space is the bottom of the lowest supply-owned equipment.

**Communications Space** - The vertical space on a pole below the 40-inch separation space which is occupied by communication lines (as defined by the NESC, communication lines include, but are not limited to, telephone, CATV, and fiber optic lines).

**Communication Worker Safety Zone** - The vertical space (40 inches per NESC 235C4) on a pole separating the supply space and the communications space. This space is intended to provide a safe working clearance for workers in the communication space.

**Pole Face** - The side or half of the pole that contains the pole gain.

**Pole Gain** - The notch in the pole that contains the pole manufacturing information. The pole gain is located 10 feet from the butt of the pole.

# 3. General Attachment Requirements

## 3.1. Laminated Poles

Attachment to laminated poles must be approved by CPU Engineering to ensure the pole is strong enough for the additional load.

## 3.2. Cables and Guys

Communication lines shall be attached to the same side of the pole as the power neutral conductor. If the power neutral conductor is on a primary crossarm, communication cables shall be installed on the road side of the pole (See Figure 3.1).

Communication lines shall be tensioned or guyed in a way that does not alter the angle of existing structures or change the sag characteristics of power conductors.

Communication companies must provide their own anchor. Anchors must be a minimum of 5 feet apart. The communication anchor shall be between the pole and the CPU anchor. \* If the 5 foot spacing is not possible, or a sidewalk guy is needed, the communication company will contact CPU for an engineering review of the anchor strength. If there is sufficient strength, permission will be given to the communication company to attach to the CPU anchor.

All guys shall have strain insulators and yellow guy markers installed.

## 3.3. Pole Drilling

Field drilled pole holes shall be treated with CPU-approved wood preservative.

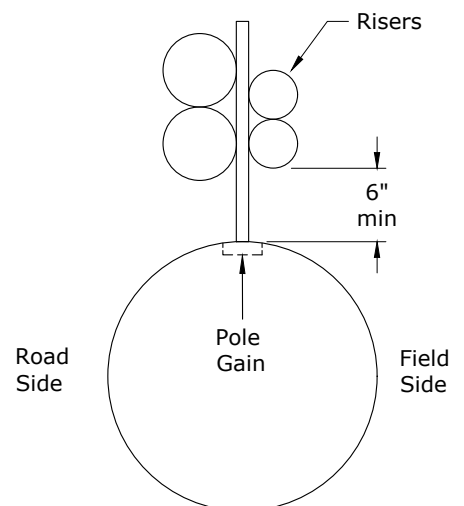


Figure 3.1

Rev. 3 - Added language that comm anchor shall be between pole & CPU anchor, and restricting comm risers on switch poles.



## CONSTRUCTION STANDARDS

### JOINT USE POLE ATTACHMENT GUIDELINES

REVISIONS			
Δ	DATE	ENGR	OPS
1	5/15/06	LB	AH
2	12/7/17	CM	DK
3	3/7/23	CM	GM
APP: LB/AH		SECTION	
DATE: 12/02/03		1910	

### 3.4. Equipment Mounting

Through bolt ends shall not protrude more than two inches beyond the nut on the other side of the pole. Attachments to steel poles shall be banded. Galvanized surfaces damaged during attachment shall be recoated.

### 3.5. Risers

Communication cables transitioning from overhead to underground shall be mounted in riser conduits. Conduit must be a minimum of schedule 40 PVC and shall be gray. Risers shall not be installed on poles with distribution or transmission switches.\*

Communication risers shall be installed on the pole face (see Figure 3.1). All risers shall be installed in conduit and mounted on 10 1/2 inch standoff brackets to provide a minimum 6 inch clearance from the pole. Existing standoff brackets shall be used when available. If new brackets are needed, the communications company shall provide and install brackets as approved by CPU. The lower most bracket shall be no lower than 8 feet above ground line. The top bracket shall be 6" below the top of the riser. The middle bracket shall be halfway between the top and bottom bracket (see Figure 3.2).

The 40" communication worker safety space must be maintained between the lowest exposed secondary (including drip loops or the top of the conduit) and the highest communication attachment (see Figure 3.3). Contact CPU Engineering regarding source and riser for communication power supplies.

### 3.6. Enclosures

Communication enclosures and power supplies shall not be mounted on any CPU pole or installed within 6 feet of the pole.

### 3.7. Grounding

Conductive communications messengers shall be bonded when CPU pole grounds are present. The pole ground shall not be cut or damaged when connecting communication company grounds. If a CPU pole ground is not present, the communication company will run its own pole ground and install its own ground rod.

### 3.8. Decorative Object Attachments

All decorative object attachments, such as banners, hanging flower baskets or Christmas lights, require CPU approval.

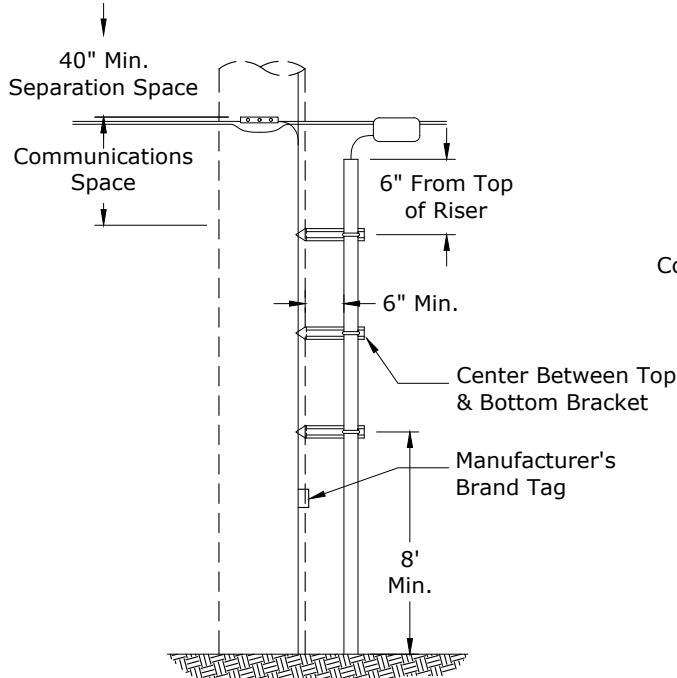


Figure 3.2

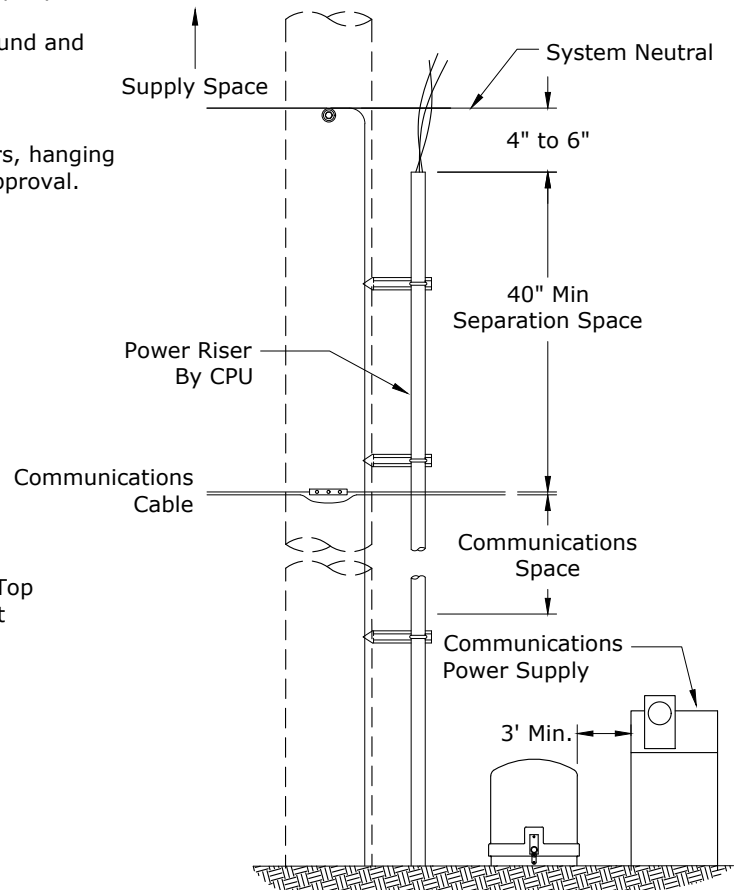


Figure 3.3

Rev. 3 - Added language that comm anchor shall be between pole & CPU anchor, and restricting comm risers on switch poles.



## CONSTRUCTION STANDARDS

JOINT USE  
POLE ATTACHMENT GUIDELINES

REVISIONS			
NO.	DATE	ENGR	OPS
1	5/15/06	LB	AH
1	12/7/17	CM	DK
3	3/7/23	CM	GM

PAGE:  
2 of 9

JU2

CAD FILE:  
JU2

APP: LB/AH  
DATE: 12/02/03

SECTION  
1910

## 4. Clearance Requirements

### 4.1. Distribution Clearances at Supports

A minimum clearance of 40 inches must be maintained between the bottom of the supply space and the top of the communication space. The supply space begins at the bottom of the lowest piece of supply equipment. Supply equipment includes, but is not limited to, neutral and secondary clevises, bare and insulated secondary wires (except for streetlight wire drip loops), guy hardware and equipment platforms (see Figure 4.1 - Figure 4.4).

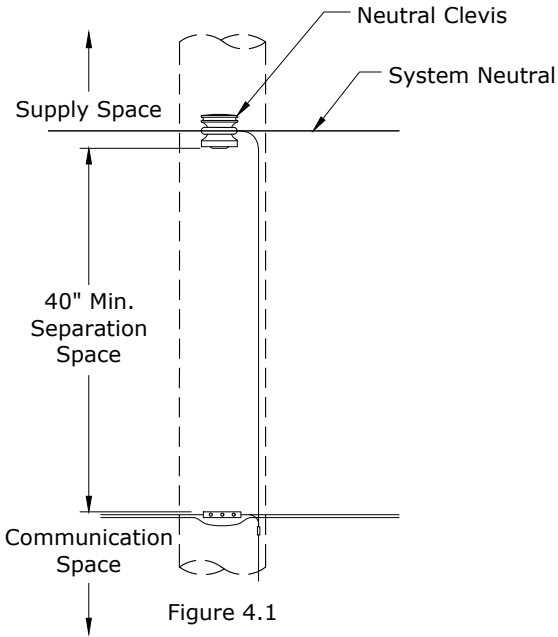


Figure 4.1

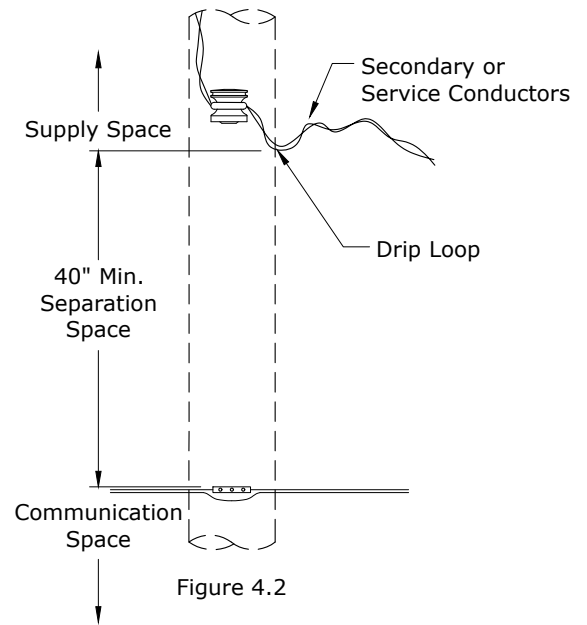


Figure 4.2

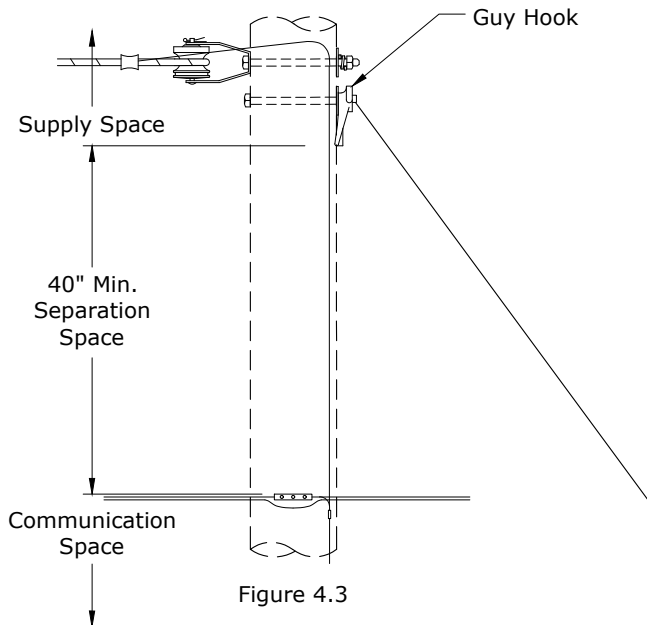


Figure 4.3

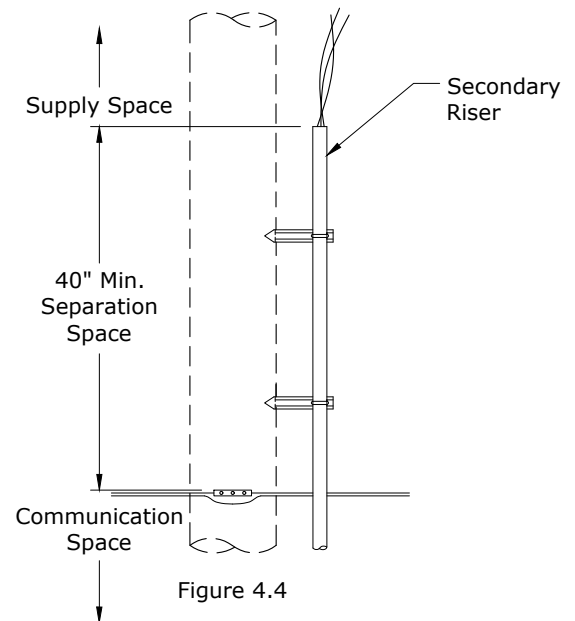


Figure 4.4

Rev. 3 - Added language that comm anchor shall be between pole & CPU anchor, and restricting comm risers on switch poles.



## CONSTRUCTION STANDARDS

JOINT USE  
POLE ATTACHMENT GUIDELINES

### REVISIONS

Δ	DATE	ENGR	OPS
1	5/15/06	LB	AH
2	12/7/17	CM	DK
3	3/7/23	CM	GM

PAGE:  
3 of 9

JU2

CAD FILE:  
JU2

APP: LB/AH  
DATE: 12/02/03

SECTION  
1910

#### 4.1. Distribution Clearances at Supports (CONTINUED)

If the primary and neutral conductors are mounted on a crossarm at the same level and there is no other supply equipment mounted below the primary arm, then the minimum clearance between the supply conductors and the communication space is 7 feet (see Figure 4.5).

Note: When working near energized wires, equipment or parts, refer to WAC 296 for minimum clearance requirements.

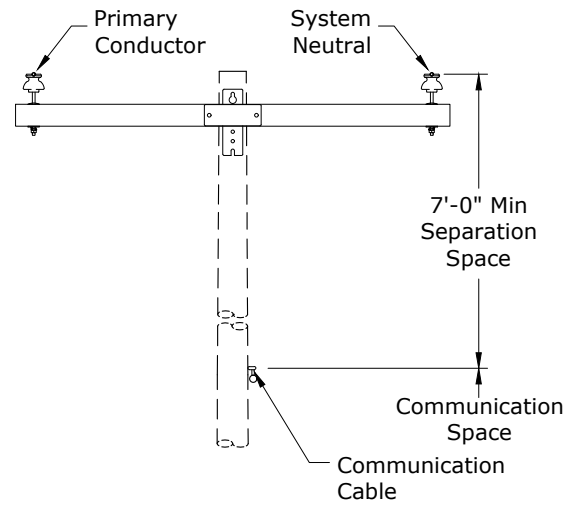


Figure 4.5

#### 4.2. Midspan Distribution Clearances

Midspan clearance between the supply space and the communications space at any point in the span cannot be less than 30 inches from effectively grounded neutral conductors (NESC 238B) and 5 feet 3 inches from primary conductors (see Figures 4.6 & 4.7).

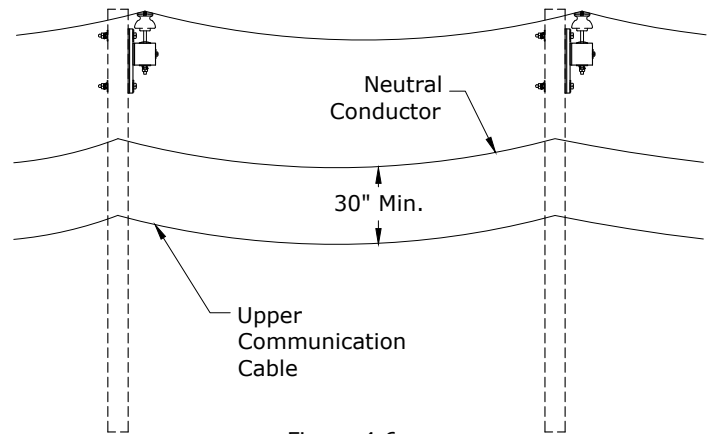


Figure 4.6

#### 4.3. Transmission Clearances

Clearances on transmission poles that have no distribution underbuild will be reviewed and approved by CPU engineering and stipulated on the attachment permit.

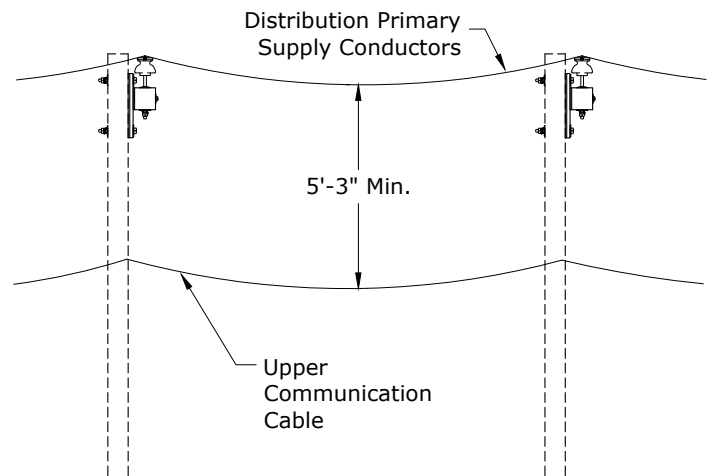


Figure 4.7

Rev. 3 - Added language that comm anchor shall be between pole & CPU anchor, and restricting comm risers on switch poles.



## CONSTRUCTION STANDARDS

JOINT USE  
POLE ATTACHMENT GUIDELINES

### REVISIONS

Δ	DATE	ENGR	OPS
1	5/15/06	LB	AH
2	12/7/17	CM	DK
3	3/7/23	CM	GM

PAGE:  
4 of 9

JU2

CAD FILE:  
JU2

APP: LB/AH  
DATE: 12/02/03

SECTION  
1910

#### 4.4. Streetlight Clearances

Provided certain minimum clearances are met, streetlights may be mounted in the communication worker safety zone or below the communication space. When streetlights are mounted above communication cables, a minimum of 12 inches of clearance must be maintained between the top of the communication space and the bottom of the streetlight drip loop. This may be reduced to 3 inches if the drip loop is covered and a non-conductive covering extending at least 2 inches beyond the drip loop. A minimum of 40 inches of clearance must be maintained between the top of the communication space and the bottom of the streetlight mast arm. This may be reduced to 4 inches if the mast arm is effectively grounded (see Figure 4.8 and NESC 238C).

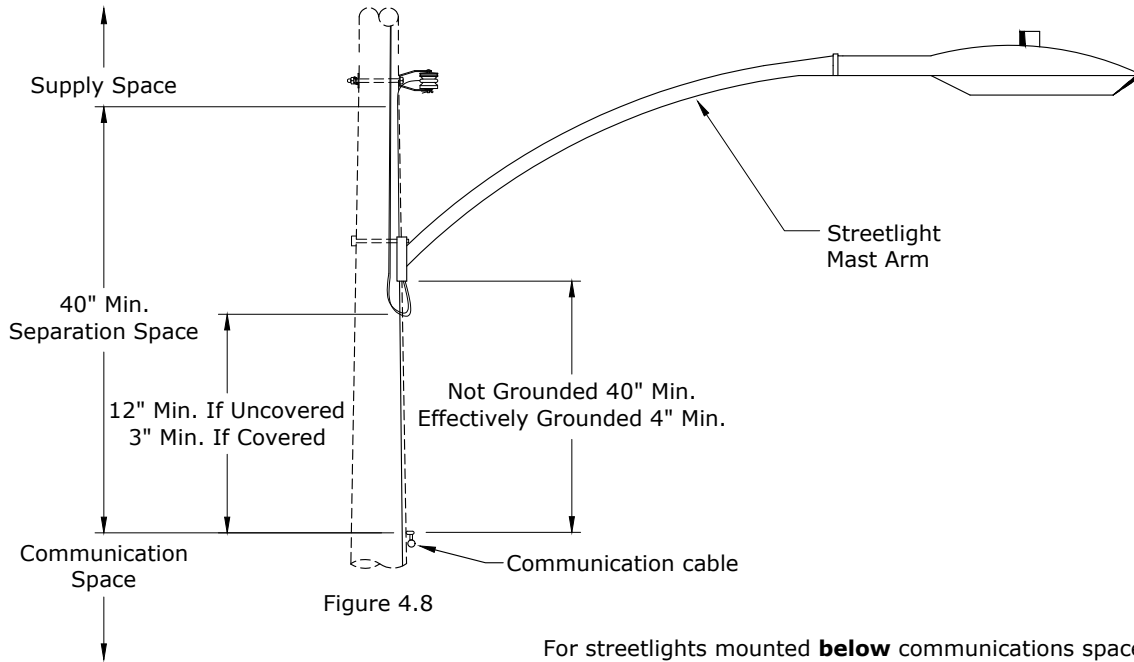


Figure 4.8

For streetlights mounted **below** communications space, a minimum of 40 inches of clearance must be maintained between the bottom of the communication space and the top of the streetlight bracket. This may be reduced to 4 inches if the mast arm is effectively grounded. A minimum of 40 inches of clearance must be maintained between the bottom of the communication space and uncovered streetlight conductors. A protective moulding will be used to cover energized streetlight conductors passing through the communication space (see Figure 4.9).

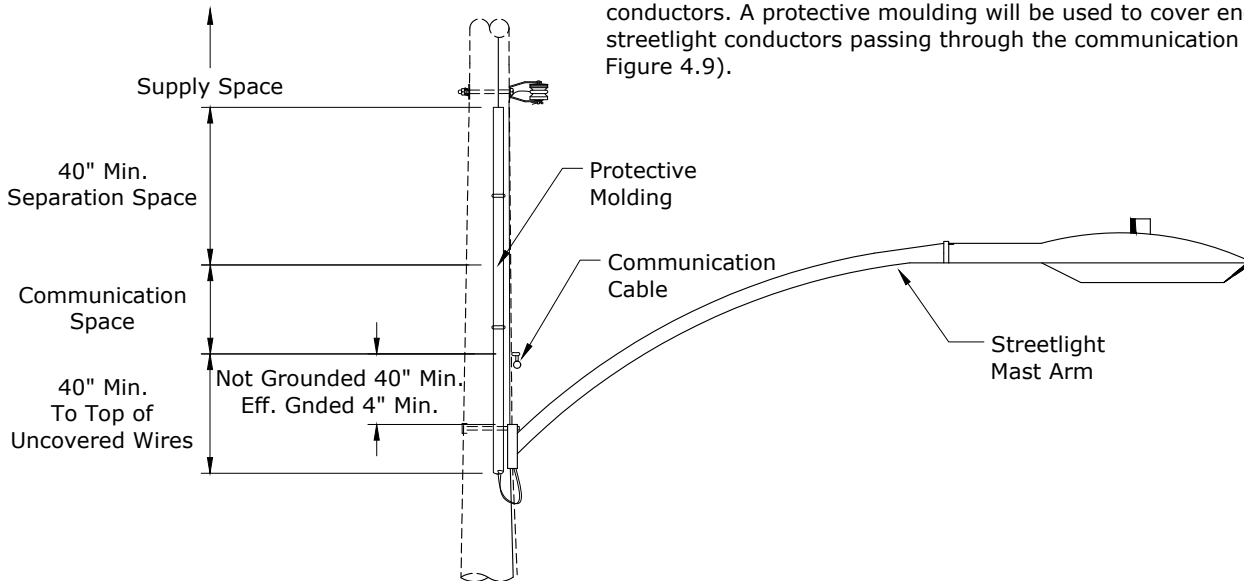


Figure 4.9

Rev. 3 - Added language that comm anchor shall be between pole & CPU anchor, and restricting comm risers on switch poles.



## CONSTRUCTION STANDARDS

JOINT USE  
POLE ATTACHMENT GUIDELINES

REVISIONS			
Δ	DATE	ENGR	OPS
1	5/15/06	LB	AH
2	12/7/17	CM	DK
3	3/7/23	CM	GM

PAGE:  
5 of 9

JU2

CAD FILE:  
JU2

APP: LB/AH  
DATE: 12/02/03

SECTION  
1910



### 4.5. Service Entrance Clearance

Communication service drops shall have a minimum 12 inch clearance from CPU service drops at any point in the span down to their point of attachment at the customer's service entrance (see Figure 4.10 and Figure 4.10A). This applies to service entrance attachments at buildings and meter poles. Minimum clearance at a CPU service pole or distribution pole is 40 inches (See Figure 4.10B).

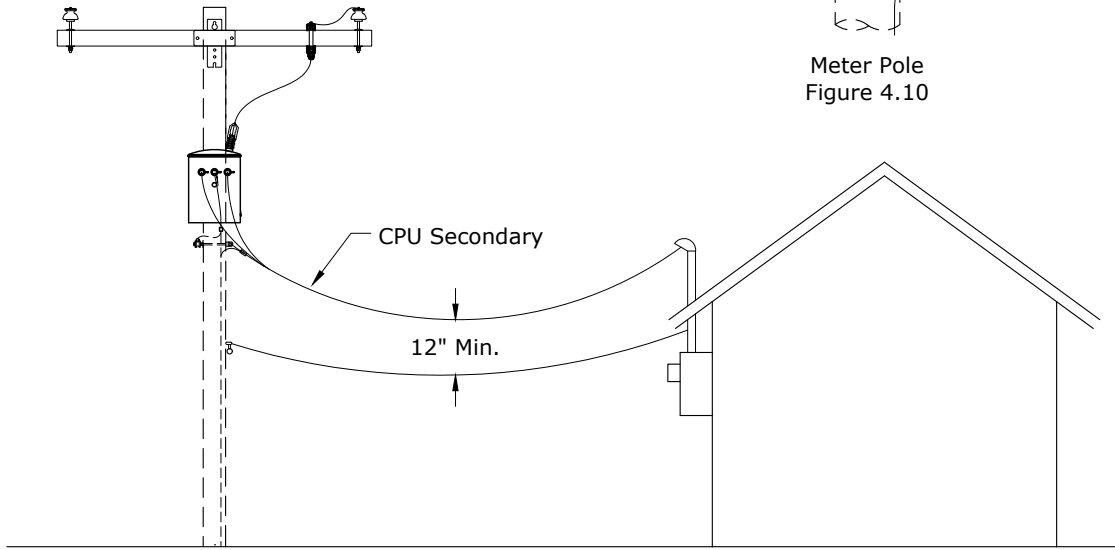
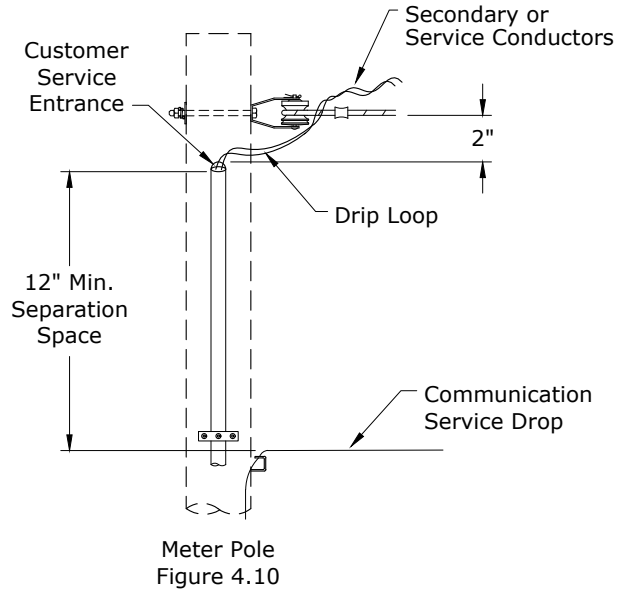


Figure 4.10A

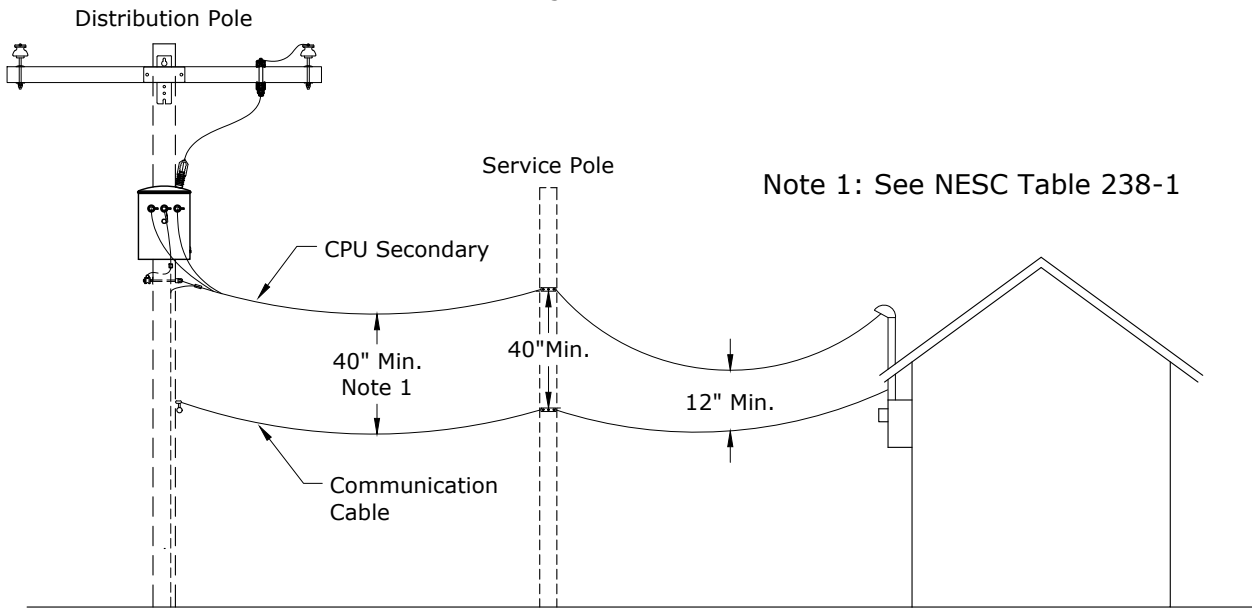


Figure 4.10B

Rev. 3 - Added language that comm anchor shall be between pole & CPU anchor, and restricting comm risers on switch poles.



## CONSTRUCTION STANDARDS

JOINT USE  
POLE ATTACHMENT GUIDELINES

REVISIONS			
Δ	DATE	ENGR	OPS
1	5/15/06	LB	AH
2	12/7/17	CM	DK
3	3/7/23	CM	GM

PAGE:  
6 of 9

JU2

CAD FILE:  
JU2

APP: LB/AH  
DATE: 12/02/03

SECTION  
1910

#### 4.6. Climbing Space

To provide adequate clearances on the pole for safe ascent and descent by line personnel, a clear climbing space of 24 inches between communication cables must be provided (see Figure 4.11). This space must extend 40 inches above and below the limiting cables (see Figure 4.11A). The climbing space may be rotated around the pole for continued climbing if the climbing spaces in different quadrants overlap.

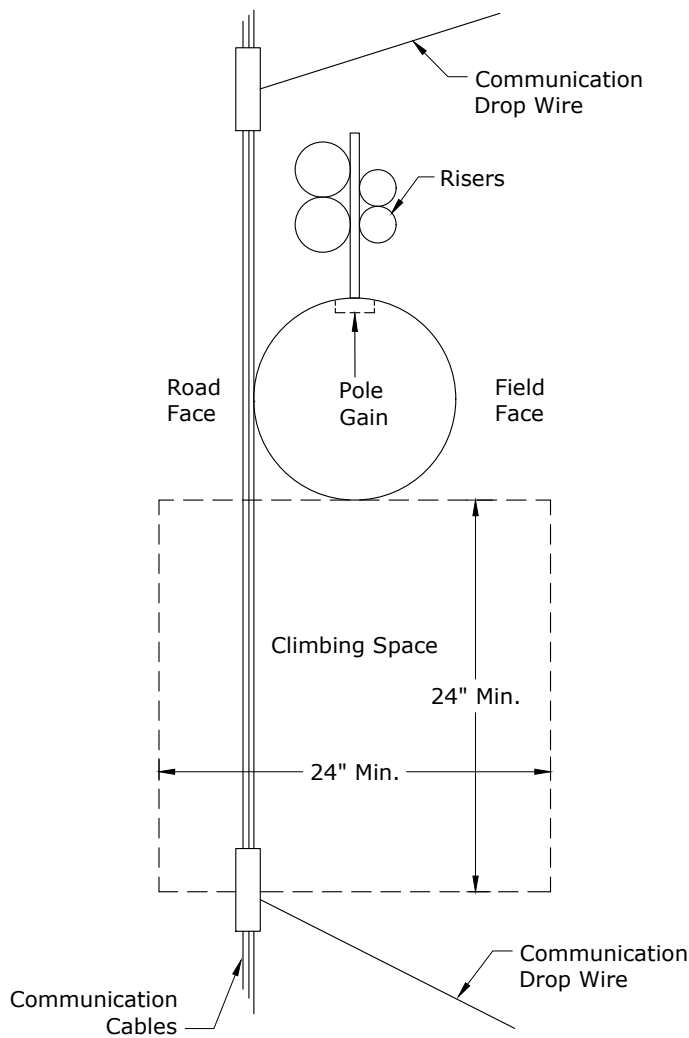


Figure 4.11

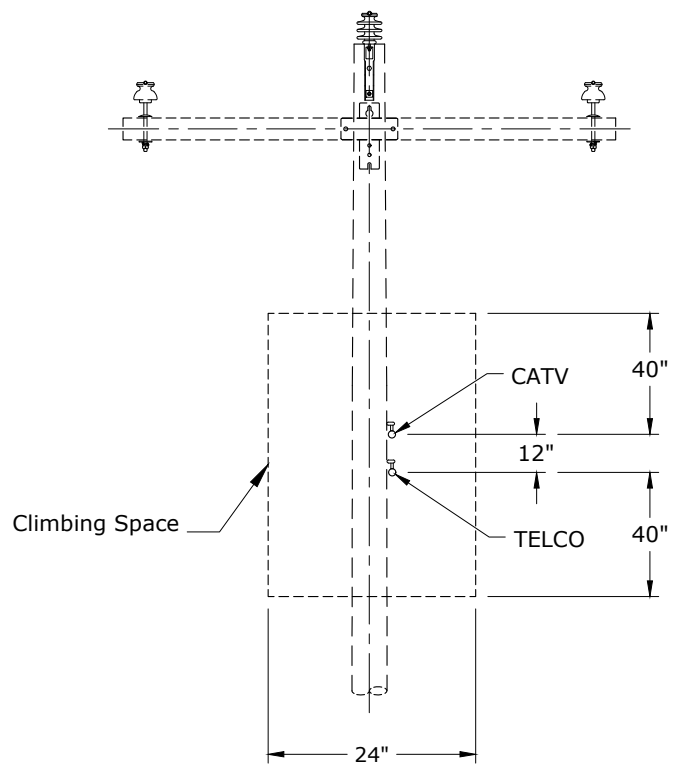


Figure 4.11A

Rev. 3 - Added language that comm anchor shall be between pole & CPU anchor, and restricting comm risers on switch poles.



## CONSTRUCTION STANDARDS

JOINT USE  
POLE ATTACHMENT GUIDELINES

### REVISIONS

REV	DATE	ENGR	OPS
1	5/15/06	LB	AH
2	12/7/17	CM	DK
3	3/7/23	CM	GM

PAGE:  
7 of 9

JU2

CAD FILE:  
JU2

APP: LB/AH  
DATE: 12/02/03

SECTION  
1910

## 5. Pole Space Allocation

### 5.1. Jointly-Owned CPU or CenturyLink Poles

Some distribution poles in CPU's system are jointly owned. CPU, CenturyLink and third party communication attachments on typical 45 foot joint distribution poles are shown in Figure 5.1.

A 4-foot space is reserved to third party communication attachments. This space extends from 23 feet to 27 feet above grade. No third party attachments shall be made above or below this space. A 12-inch clearance shall be maintained between attachments in this space. New attachments must be made at the highest available position in the communication space.

### 5.2. Boxing-In

Boxing-in CPU's poles shall be avoided, if possible. If boxing-in is necessary, the communication company will request approval from CPU before the boxing-in attachment is constructed. CPU reserves the right to refuse any requests for boxing-in a jointly owned pole.

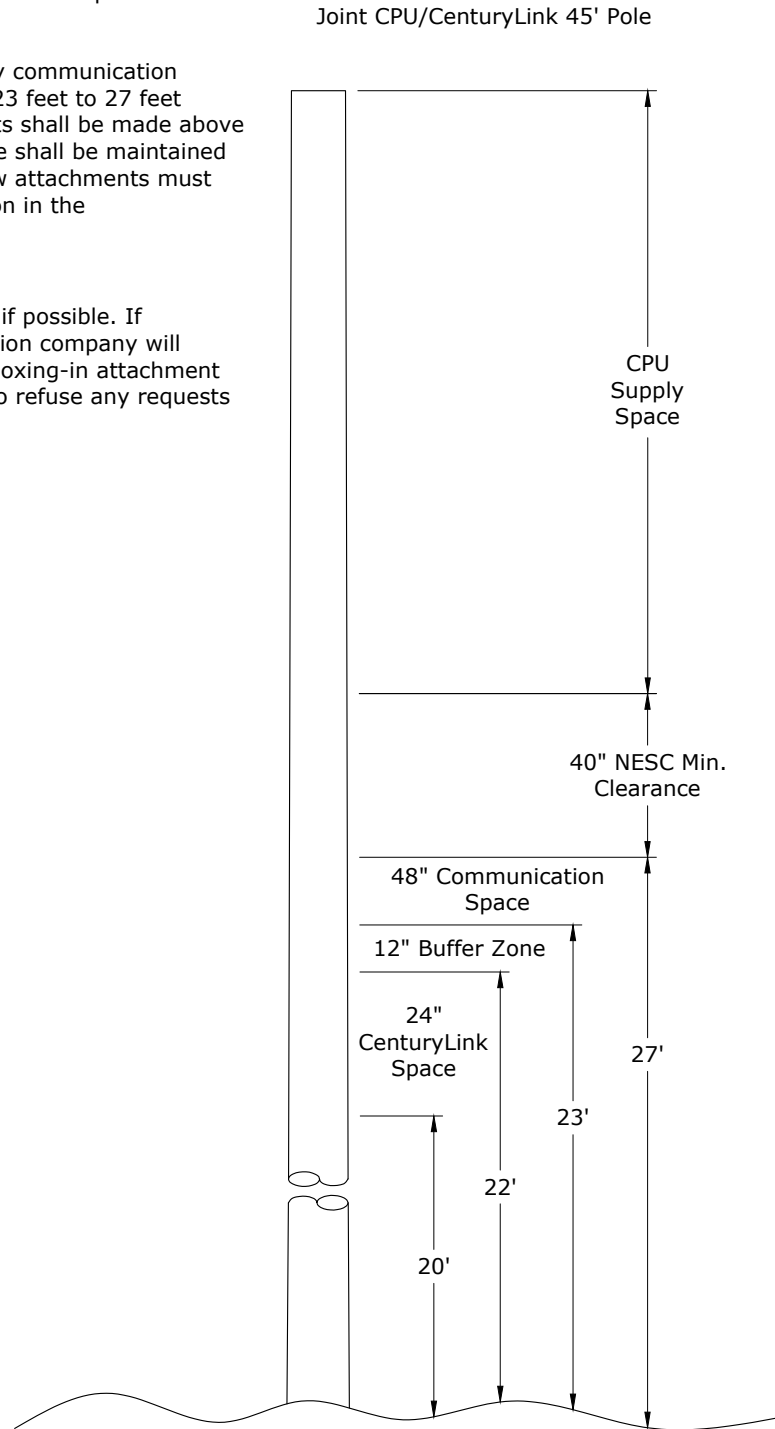


Figure 5.1

Rev. 3 - Added language that comm anchor shall be between pole & CPU anchor, and restricting comm risers on switch poles.



## CONSTRUCTION STANDARDS

### JOINT USE POLE ATTACHMENT GUIDELINES

#### REVISIONS

Δ	DATE	ENGR	OPS
1	5/15/06	LB	AH
2	12/7/17	CM	DK
3	3/7/23	CM	GM

PAGE:  
8 of 9

JU2

CAD FILE:  
JU2

APP: LB/AH  
DATE: 12/02/03

SECTION  
1910

### 5.3. CPU Solely-Owned Distribution Poles

Some CPU distribution poles and most of the CPU transmission poles are 100% CPU-owned. All communication company attachments on these poles are subject to the CPU Pole Attachment Agreement. Space allocation on a new 45-foot CPU-owned pole is shown in Figure 5.2.

A 7-foot space is reserved for third party communication attachments. This space extends from 20 feet to 27 feet above grade. No non-CPU communication attachments shall be made above or below this space. A 12-inch clearance shall be maintained between attachments in this space. New attachments must be made at the highest available position in the communication space with the exception of telephone attachments. Telephone cables shall be attached at the lowest available position in the communications space that provides adequate clearance and is consistent with telephone attachments on adjacent joint-owned CPU/CenturyLink poles.

### 5.4. Boxing-In

Boxing-in CPU's poles shall be avoided, if possible. If boxing-in is necessary, the communication company will request approval from CPU before the boxing-in attachment is constructed. CPU reserves the right to refuse any requests for boxing-in a CPU owned pole.

CPU Owned 45' Pole

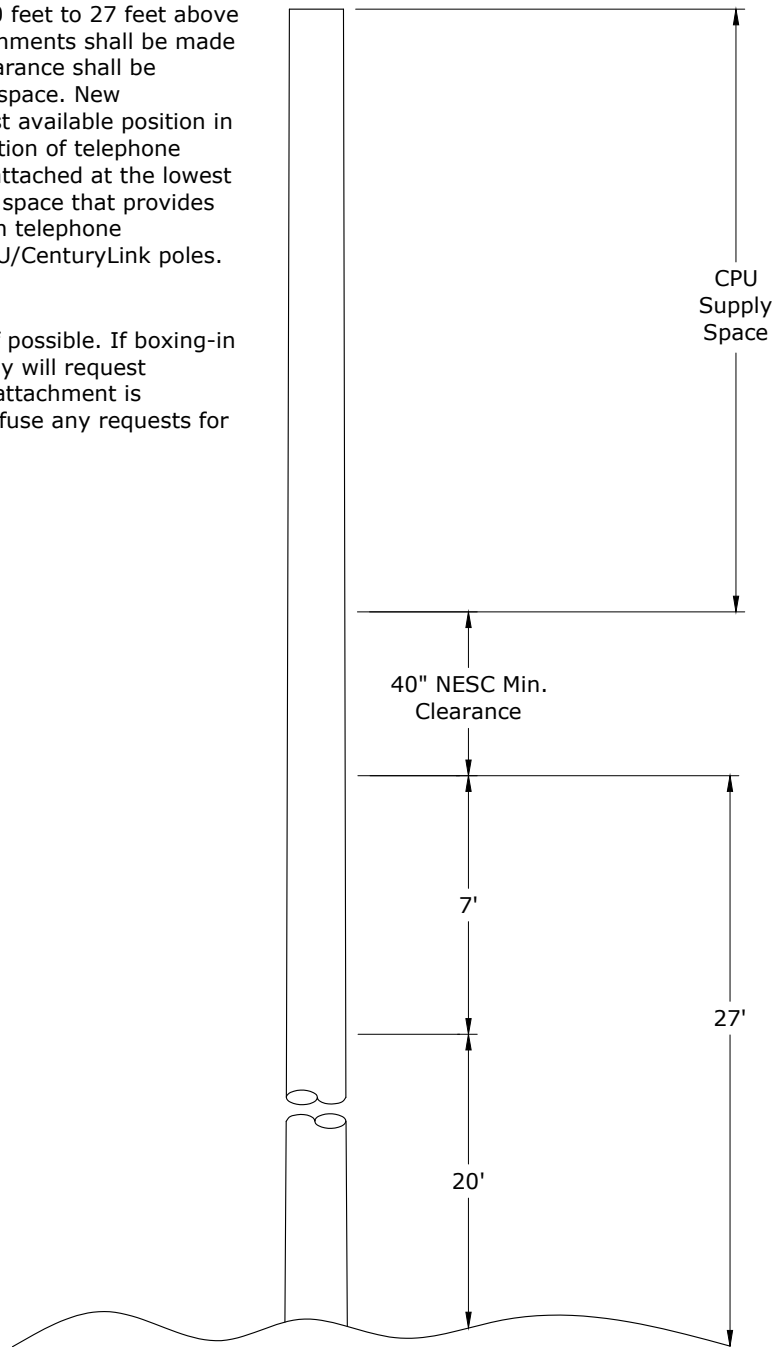


Figure 5.2

Rev. 3 - Added language that comm anchor shall be between pole & CPU anchor, and restricting comm risers on switch poles.



## CONSTRUCTION STANDARDS

### JOINT USE POLE ATTACHMENT GUIDELINES

REVISIONS			
△	DATE	ENGR	OPS
1	5/15/06	LB	AH
2	12/7/17	CM	DK
3	3/7/23	CM	GM

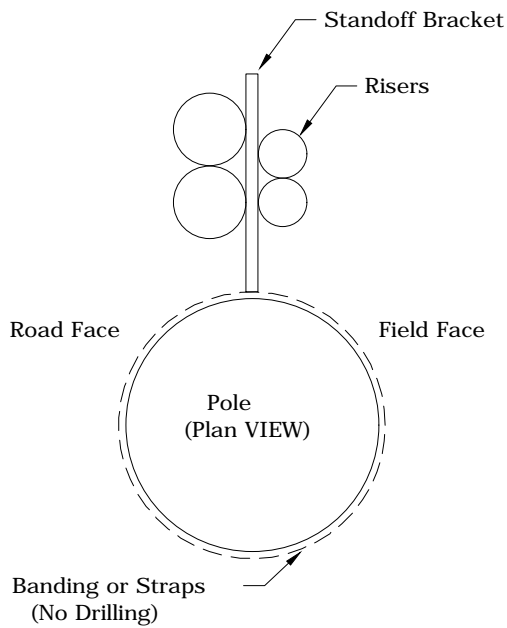
PAGE:  
9 of 9

JU2

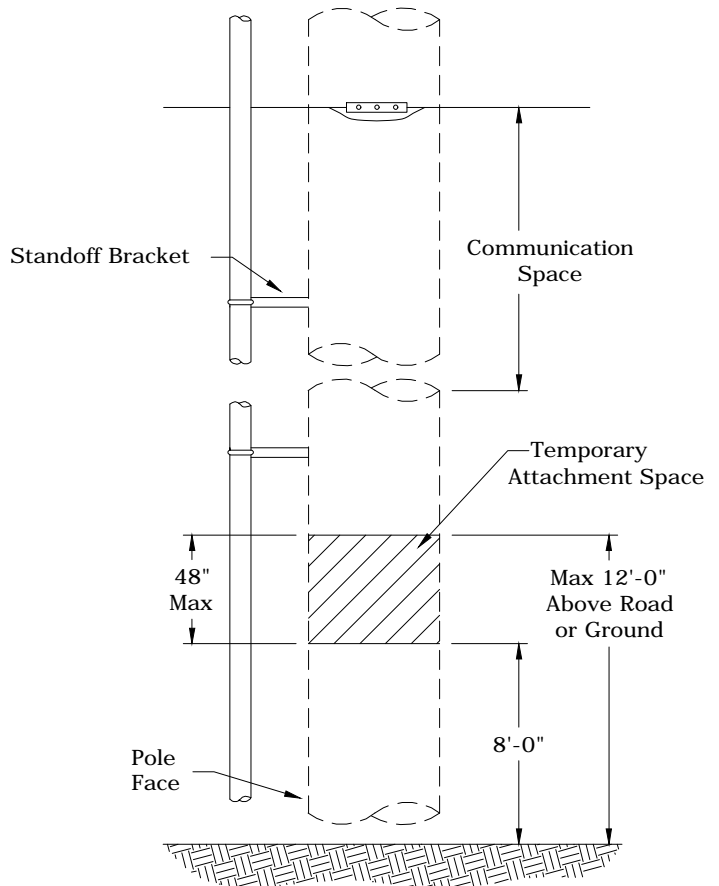
CAD FILE:  
JU2

APP: LB/AH  
DATE: 12/02/03

SECTION  
1910



Plan View



Elevation View

Note: OK to remove camera from pole if needed to climb.

	<b>CONSTRUCTION STANDARDS</b> JOINT USE TEMPORARY (30 DAY) ATTACHMENT		REVISIONS		
				DATE	ENGR
	PAGE: 1 of 1	<b>JU3</b>	CAD FILE: JU3	APP: CM/AH DATE: 10/17/08	SECTION <b>1910</b>

# 1. General

This standard covers the following wireless communication antenna assemblies: Macrocell and small cell antennas installed on the pole. All installations must meet all requirements of the National Electric Safety Code (NESC), Clark Public Utilities' (CPU's) Construction Standards, and all regulations of the State of Washington and other regulatory bodies that have jurisdiction.

# 2. Macrocell


## 2.1. Location

- A. Antenna installations will be allowed in commercial/industrial areas of Clark County. Due to aesthetic considerations and the effect on property value, macrocell antennas may not be allowed in residential neighborhoods.
- B. Antenna installations will require a taller pole than the existing pole. Several jurisdictions within Clark County have height restrictions.
  - Clark County Ordinance 40.260.250 covers unincorporated Clark County. A pole being replaced for an antenna can only be 20 feet taller than the existing pole. The antenna and lightning rods are included in this additional 20 feet.
  - The City of Vancouver Municipal Code, Title 20.890 (as of 1/26/2004), allows the new pole to be 15 feet taller than the existing. The antenna is included in this 15 feet. There is also an additional 10 feet above the 15 feet that is allowed for lightning rods or FAA required lighting.
- C. The antenna company will be responsible for getting any zoning clearance, building permit(s), and any other applicable permits where required.

## 2.2. Design

- A. Each antenna installation will be a unique design. The pole design will be done by the CPU Design Engineer. The antenna company shall supply the CPU Design Engineer with the following information when applying for service:
  - The pole number and location that the antenna company would like the antenna installed on,
  - The antenna array wind loading in the transverse and longitudinal directions under all NESC Heavy Loading conditions,
  - Total weight of the antenna assembly without ice and with 1/2" coating of ice,
  - The location above ground of the resulting load vector,
  - Electrical loading, and
  - Means of disconnecting the service.
- B. All antenna installations in the supply space must have a quick means of RF radiation disconnect for emergency work on the pole by utility or communication workers. Such means of disconnect will also prevent backup sources from energizing the antenna. For normal maintenance work, Clark or the communication company will contact the antenna company to schedule the de-energization of the antenna.

Rev. 2 - Updated for small cell antennas and Clark Co. Ordinance change.

	<b>CONSTRUCTION STANDARDS</b> JOINT USE GUIDELINES FOR COMMUNICATION ANTENNA ATTACHMENTS		REVISIONS											
			<table border="1"> <thead> <tr> <th>DATE</th> <th>ENGR</th> <th>OPS</th> </tr> </thead> <tbody> <tr> <td>7/28/14</td> <td>KJP</td> <td></td> </tr> <tr> <td>12/19/19</td> <td>CM</td> <td>GM</td> </tr> </tbody> </table>	DATE	ENGR	OPS	7/28/14	KJP		12/19/19	CM	GM		
	DATE	ENGR	OPS											
7/28/14	KJP													
12/19/19	CM	GM												
PAGE: 1 of 8	<b>JU4</b>		CAD FILE: JU4	APP: CM/AH DATE: 2/24/11	SECTION <b>1910</b>									



## 2.2. Design (Continued)

- C. Antennas shall be installed and operated in a manner that communication and electrical workers can perform normal work on their respective facilities without requiring special training or knowledge of RF antennas. Electrical workers shall not need to wear RF detectors to warn them of potentially changing levels of EMF exposure when performing normal work on the electrical system. All antennas in the supply space will be on steel poles. The cables for the antenna will come up the inside of the pole. Since existing steel poles were designed only for the load they were originally installed for, most likely the pole will have to be replaced with a stronger one for the antenna installation. Drilling to mount the antenna on an existing steel pole will weaken the pole shaft and may result in corrosion. Steel poles with static wire cannot be used for antenna installations.
- D. Poles that shall be avoided are
- Poles with existing antennas,
  - Poles with switches,
  - Poles with risers,
  - Poles that will be used for risers in the future,
  - Poles with transformers,
  - Poles with capacitor banks,
  - Poles with regulators,
  - Poles with reclosers,
  - Deadend poles,
  - Poles with static wire,
  - Poles with extreme angles,
  - Poles at a traffic intersection,
  - Streetlight poles, and
  - Poles inaccessible by truck.
- E. The antenna company will be responsible for performing a TOWAIR (or Landing Slope Facility Calculator) study. TOWAIR allows antenna structure owners to determine whether their structures are close enough to an airport or heliport to require an aeronautical study by the Federal Aviation Administration (FAA) and registration with the FCC. If it is determined that the designated structure must be registered, an Antenna Structure Registration (ASR) number must be obtained from the FCC. This number is required in order for the antenna company to begin construction at the site. If the FAA determines that the structure must be painted or lighted, the antenna company will be responsible for the painting or lighting.
- F. All antenna equipment cabinets, boxes, and enclosures shall be clearly marked with
- The antenna equipment owner's name,
  - A 24-hour contact phone number, and
  - Identifying alpha/numeric designation that the antenna owner can associate with the installation address, type of equipment, and function.
- G. The antenna company shall ensure the appropriate OSHA-required radio-frequency radiation hazard warning sign(s) are installed.

## 2.3. Clearance

- A. The minimum clearance from distribution or transmission to the antenna is shown in Figure 1.
- B. Communication equipment cabinets must not block access to the pole. The preferred location is on adjacent private property, if possible, at least 25 feet away from the pole. Conduits shall be run underground between the pole and the cabinet.

Rev. 2 - Updated for small cell antennas and Clark Co. Ordinance change.

	<h1>CONSTRUCTION STANDARDS</h1> <p>JOINT USE GUIDELINES FOR COMMUNICATION ANTENNA ATTACHMENTS</p>		<b>REVISIONS</b>		
		DATE	ENGR	OPS	
	1	7/28/14	KJP		
	2	12/19/19	CM	GM	
PAGE: 2 of 8	<h2>JU4</h2>		CAD FILE: JU4	APP: CM/AH DATE: 2/24/11	SECTION <b>1910</b>

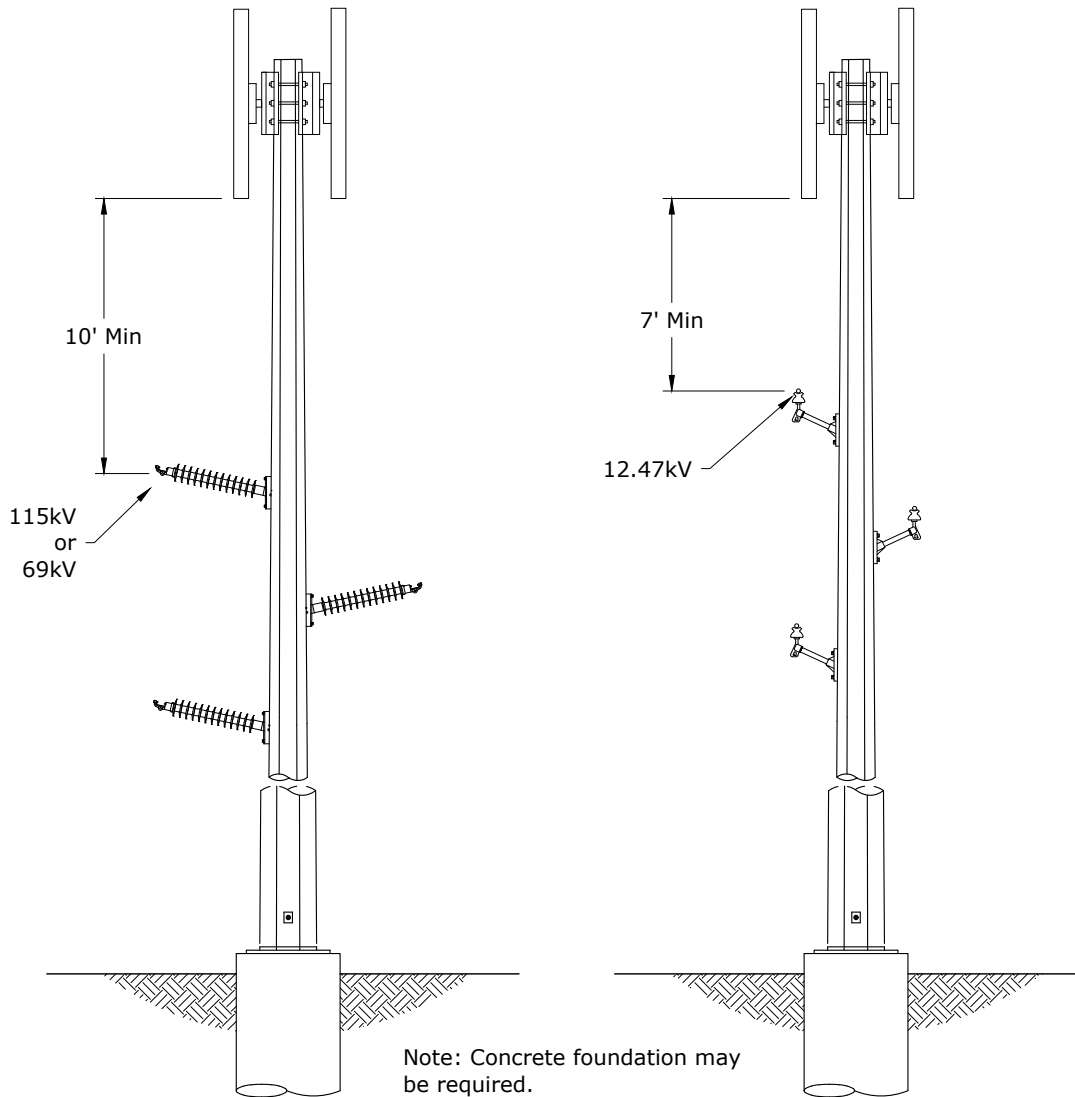



Figure 1: Macrocell clearances.

## 2.4. Installation & Maintenance

- A. Antennas located in the supply space shall be installed and maintained by qualified line workers only. The antenna company will have to coordinate with CPU on all installation and maintenance work.
- B. The antenna company must notify the surrounding landowners of the pole modifications prior to installation.

Rev. 2 - Updated for small cell antennas and Clark Co. Ordinance change.

	<b>CONSTRUCTION STANDARDS</b> JOINT USE GUIDELINES FOR COMMUNICATION ANTENNA ATTACHMENTS			<b>REVISIONS</b>			
	PAGE:	<b>JU4</b>		CAD FILE:	APP:	CM/AH	SECTION
	3 of 8			JU4	DATE:	2/24/11	1910





### 3. Small Cell on Poles\*

#### 3.1. Location

- A. The preferred poles for small cell antenna installations in order of preference are
1. Secondary pole,
  2. Wood streetlight pole, and
  3. Distribution pole
- B. Poles that are restricted and require special consideration are
- Poles with secondary risers,
  - Poles reserved for CPU risers,
  - Poles with one transformer,
  - Deadend poles,
  - Poles with extreme angles (30° or more),
  - Poles at a traffic intersection,
  - Decorative streetlight poles,
  - Fiberglass or aluminum streetlight poles, and
  - Transmission poles with or without distribution.
- C. Poles that shall be avoided are
- Poles with primary risers,
  - Poles with existing antennas,
  - Poles with switches,
  - Poles with transformer banks,
  - Poles with capacitor banks,
  - Poles with regulators,
  - Poles with reclosers, and
  - Poles inaccessible by truck.
- D. The antenna company will have to obtain easements from the property owner for any poles on private property.
- E. The antenna company shall consider proximity to residential structures, aesthetics, and effects on property values. Proposed sites that will be closer than 30' to a residential building or 50' to a school building shall be subject to additional review by CPU. Installations on poles directly in front of a residence should be avoided when other possibilities are available.
- F. The antenna company will be responsible for getting any zoning clearance, building permit(s), and any other applicable permits where required.

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	<b>CONSTRUCTION STANDARDS</b> JOINT USE GUIDELINES FOR COMMUNICATION ANTENNA ATTACHMENTS		<b>REVISIONS</b>			
				DATE	ENGR	OPS
			1	7/28/14	KJP	
		2	12/19/19	CM	GM	
PAGE: 4 of 8		<b>JU4</b>		CAD FILE: JU4		
		APP: CM/AH		SECTION <b>1910</b>		
		DATE: 2/24/11				

### 3.2. Design

- A. Each antenna installation will be a unique design. Antennas shall be installed in the supply space only. The pole design will be done by an engineering firm licensed and registered in Washington State and hired by the antenna company. The antenna company shall supply the CPU Design Engineer with the following information when submitting for a Site License Agreement (SLA):
- The pole number and location that the antenna company would like the antenna installed on
  - The size, weight, and color of all equipment in the proposal
  - The antenna and associated equipment wind loading in the transverse and longitudinal directions under all NESC Heavy Loading conditions
  - Total weight of the antenna and associated equipment without ice and with 1/2" coating of ice
  - The location above ground of the resulting load vector
  - Electrical loading
  - Means of disconnecting the service
- B. Small cell antennas and mounting bracket will be no higher than 42". The antenna diameter will be no more than 16".
- C. Equipment should be installed on the roadside of the pole. If this is not possible, other locations may be used with CPU's prior approval. Each piece of equipment must be no more than 42" high x 24" wide x 18" deep and must be installed below the communication space between 10 feet and 18 feet above groundline (see Figure 2). Climbing space must be maintained as specified in WAC 296-45-045. There shall be no more than two pieces of equipment for a total volume of 12 cu ft. The equipment must be between 4 inches and 6 inches off of the pole surface and must fit within one pole quadrant as shown in Figure 3. See Std. JU2 - Joint Use Pole Attachment Guidelines for required clearances. Meters, when used, must be padmounted at least 6 feet from the pole.
- D. Antennas and pole-mounted equipment shall be Light Gray Number 70, Munsell Notation 5BG 7.0/0.4 unless otherwise approved or required by CPU.

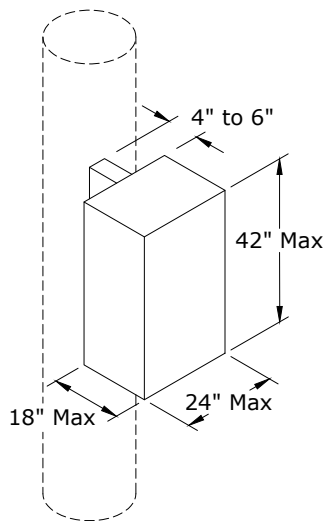


Figure 2: Allowable size of equipment below communication space.

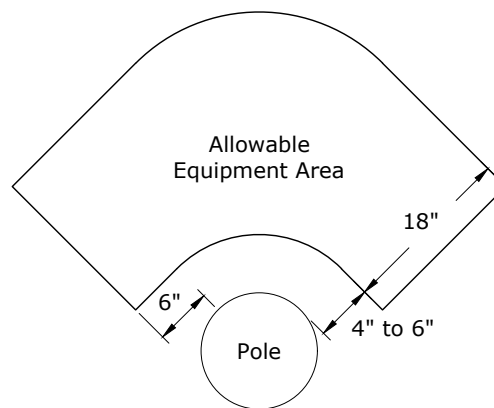



Figure 3: Allowable equipment area below communication space.

Rev. 2 - Updated for small cell antennas and Clark Co. Ordinance change.

	<b>CONSTRUCTION STANDARDS</b>		REVISIONS		
	JOINT USE GUIDELINES FOR COMMUNICATION ANTENNA ATTACHMENTS		DATE	ENGR	OPS
	PAGE: 5 of 8	<b>JU4</b>	CAD FILE: JU4	APP: CM/AH	SECTION
			DATE: 2/24/11		

3.2. Design (Continued)

- E. For installations in the supply space see Figure 4 and Figure 5. The existing pole may need to be replaced with a taller or stronger pole. Pole-top extensions will not be allowed.
- F. All antenna equipment cabinets, boxes, and enclosures shall be clearly marked with
  - The antenna equipment owner's name,
  - 24-hour contact phone number,
  - Identifying alpha/numeric designation that the antenna owner can associate with the installation address, type of equipment, and function, and
  - SLA numbers (decals provided by CPU).
- G. The antenna company shall ensure the appropriate OSHA-required radio-frequency radiation hazard warning sign(s) are installed.
- H. No antennas or equipment will be allowed in the communication worker safety zone per the NESC.
- I. All risers, except those above the primary conductors, shall be mounted on standoff brackets that provide a minimum of 6 inches between the surface of the conduit and the pole. U-guard risers are not allowed. The first standoff bracket must be at least 8' above grade per NESC. Standoffs shall not be closer together than 8' unless one is necessary to support the end of a conduit. Existing standoffs are to be used if present.

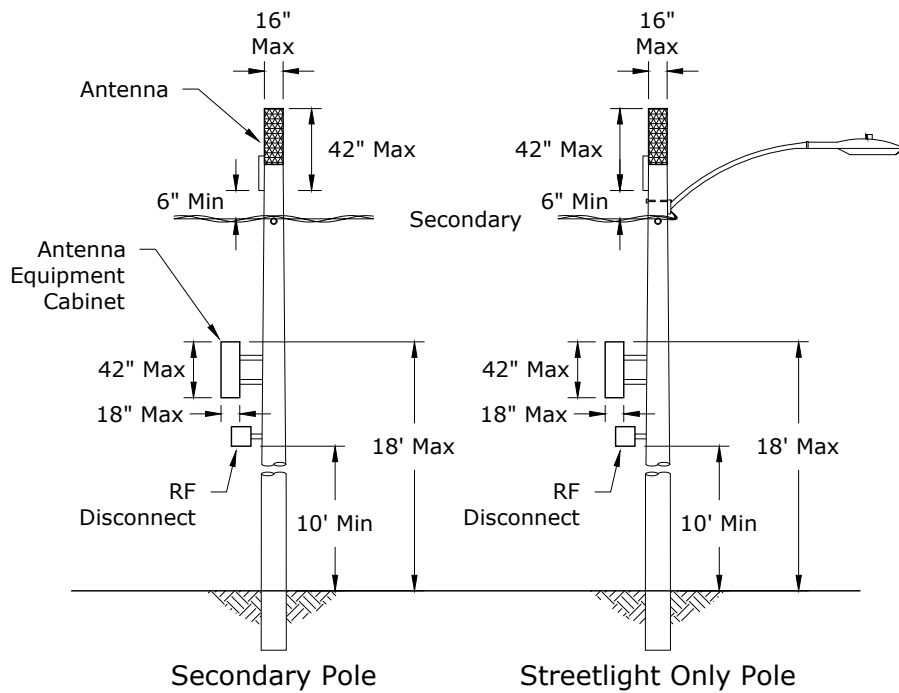


Figure 4: Small cell antenna installation clearances on secondary poles.

Note: Other antenna and mounting styles may be acceptable. Clearances shown shall remain.

Rev. 2 - Updated for small cell antennas and Clark Co. Ordinance change.

	CONSTRUCTION STANDARDS		REVISIONS		
	JOINT USE GUIDELINES FOR COMMUNICATION ANTENNA ATTACHMENTS		DATE	ENGR	OPS
	PAGE: 6 of 8	JU4	CAD FILE: JU4	1 7/28/14 KJP	2 12/19/19 CM
			APP: CM/AH	SECTION 1910	
			DATE: 2/24/11		

### 3.2. Design (Continued)

- J. All riser cables shall be in conduit. No more than three conduits per pole shall be used. All conduits shall be
  - 3 inches or less in diameter, and
  - Gray, UL-listed, Schedule 80 PVC.
- K. Communication equipment cabinets located on the ground shall not block access to the pole and are required to be at least 6 feet away from the pole. Conduits shall be run underground between the pole and the cabinet.

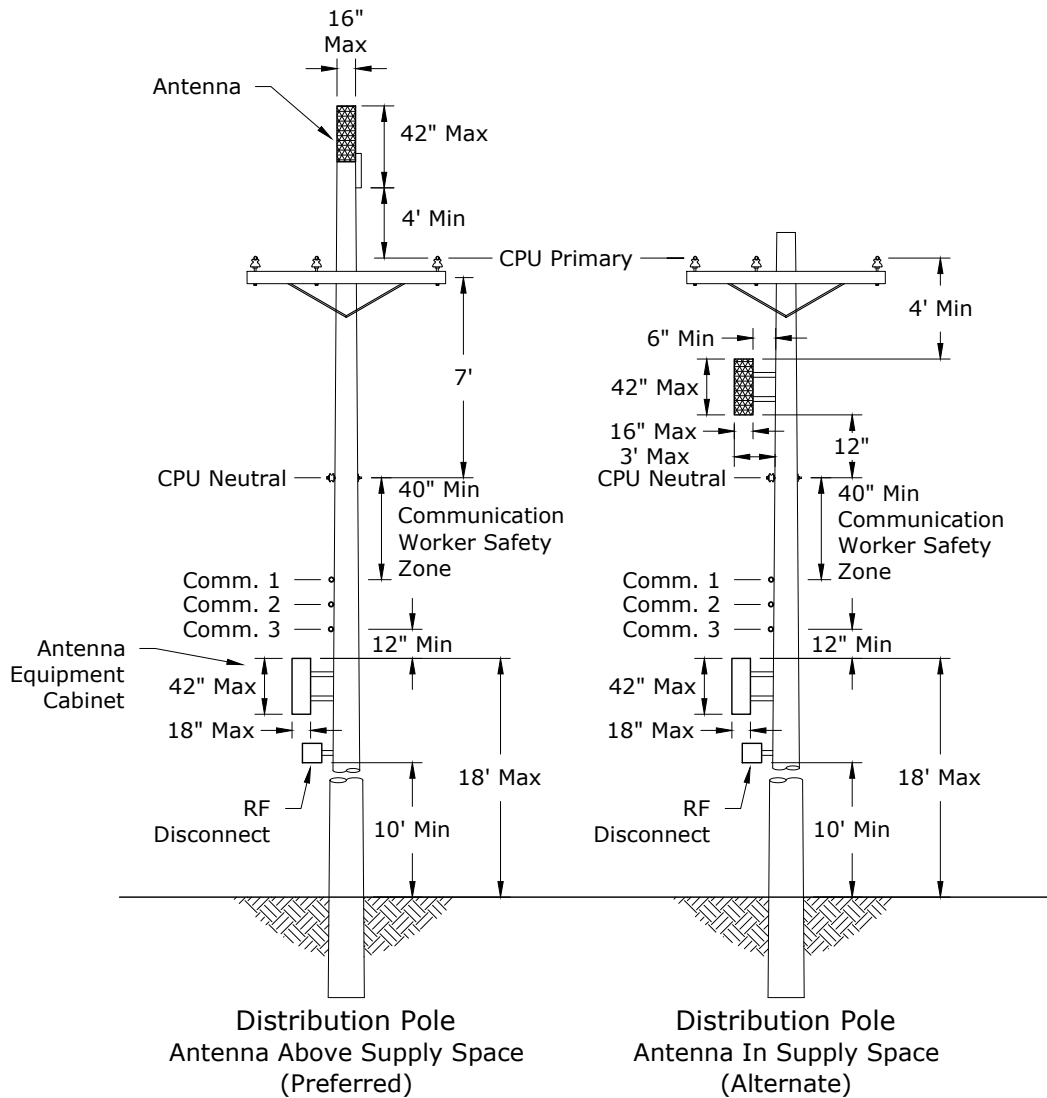



Figure 5: Small cell antenna installations in the supply space.

Note: Other antenna and mounting styles may be acceptable. Clearances shown shall remain.

Rev. 2 - Updated for small cell antennas and Clark Co. Ordinance change.

	<h2>CONSTRUCTION STANDARDS</h2> <p>JOINT USE GUIDELINES FOR COMMUNICATION ANTENNA ATTACHMENTS</p>		<b>REVISIONS</b>											
	PAGE: 7 of 8	<h1>JU4</h1>		CAD FILE: JU4	<table border="1"> <thead> <tr> <th>DATE</th> <th>ENGR</th> <th>OPS</th> </tr> </thead> <tbody> <tr> <td>7/28/14</td> <td>KJP</td> <td></td> </tr> <tr> <td>12/19/19</td> <td>CM</td> <td>GM</td> </tr> </tbody> </table>	DATE	ENGR	OPS	7/28/14	KJP		12/19/19	CM	GM
	DATE	ENGR	OPS											
7/28/14	KJP													
12/19/19	CM	GM												
			APP: CM/AH	SECTION <b>1910</b>										
			DATE: 2/24/11											



3.2. Design (Continued)

- L. All antenna installations must have a quick means of RF radiation disconnect for emergency work on the pole by utility or communication workers. Such means of disconnect will also prevent backup sources from energizing the antenna. The disconnect on the pole must be clearly marked "RF Disconnect." Antennas shall be installed and operated in a manner that communication and electrical workers can perform normal work on their respective facilities without requiring special training or knowledge of RF antennas. Electrical workers shall not need to wear RF detectors to warn them of potentially changing levels of RF exposure when performing normal work on the electrical system.

3.3. Installation & Maintenance

- A. Small cell installations should be as neat and condensed as possible. Lessees shall be responsible for installing each new type of installation on a pole in CPU's training yard prior to permitting for such types of installations on CPU's poles. To be the same type the antenna, equipment cabinet, disconnect, and mounting hardware must be the same and located in the same area of the pole as those that will be permitted. It is not necessary that they have the same heights from ground measurements. Each must include conduits that will be installed. The wires, fibers or cables installed between the equipment and the antenna on an installation may be required at CPU's discretion. Lessee may provide a location where the same type is currently installed and operating that is within 30 driving miles of CPU's border instead of installing one in the training yard.
- B. Antennas located in the supply space shall be installed and maintained by qualified line workers only. The antenna company will have to coordinate with CPU on all installation and maintenance work.
- C. The antenna company must notify the surrounding landowners of the pole modifications prior to installation.
- D. The pole may not be shaved or cut. Equipment mounts must be sized to account for variation in wood pole dimensions.
- E. Field drilled pole holes shall be treated with CPU-approved wood preservative.
- F. No storage loops of wires shall be allowed.
- G. Area between equipment and the pole surface is to remain clear for climbing safety.

Rev. 2 - Updated for small cell antennas and Clark Co. Ordinance change.

	<b>CONSTRUCTION STANDARDS</b> JOINT USE GUIDELINES FOR COMMUNICATION ANTENNA ATTACHMENTS		<b>REVISIONS</b>		
		DATE	ENGR	OPS	
	1	7/28/14	KJP		
	2	12/19/19	CM	GM	
PAGE: <b>8 of 8</b>	<b>JU4</b>		CAD FILE: <b>JU4</b>	APP: CM/AH DATE: 2/24/11	SECTION <b>1910</b>