

PAC_289.41



To: Shannon Hunter, NV5

CC: Sarah Bilbao, NV5
Andrew Dressel, NV5
Kelli Gray, NV5
Jason Miller, NV5
Kevin Wedman, NV5
Mahdi Jahami, CPUC
CPUC WSD

From: Traci Schultz, PacifiCorp

RE: Data Request 3 – PacifiCorp Responses

Date: May 26, 2021

Information to support data request number two is outlined below and provided by way of attachment. Consistent with article 36 of the executed contract please treat all information provided as confidential.

Geographic Location of Initiative Activities

Please gather and provide the following:

If not already included in the data layers of the GIS files provided to the Independent Evaluator, please submit locational data detail that demonstrates where (e.g., zip code, city, crossroads, physical address), what types of actions, and dates of actions of executed 2020 Wildfire Mitigation Activities. E.g., this may include, but is not limited to:

a) Installation of covered conductor

One covered conductor project was completed - see attachment "Radio Tower Feed 5G69.KMZ" starting at facility point 06240004.01390 located at 41.2312723, -122.267190.

b) Installation of weather stations

Weather station information is provided in attachment "IE Data Request 3.xlsx" tab "3.b Weather Stations."

c) Installation of sectionalizing devices

Sectionalizing Devices information is provided in attachment "IE Data Request 3.xlsx" tab "3.c Sectionalizing Devices.""

d) Installation of wildland cameras

PacifiCorp did not install any wildland cameras as part of the 2020 Wildfire Mitigation Activities.

e) Removal of tree attachments

PacifiCorp did not remove any tree attachments as part of the 2020 Wildfire Mitigation Activities.

f) Installation of non-expulsive fuses

Non-Explosive Fuse information is provided in attachment "IE Data Request 3.xlsx" tab "3.f Non-Explosive Fuses."

Please note that PacifiCorp does not have a system wide expulsion fuse inventory and does not explicitly track all expulsion fuse replacements. However, as a circuit is rebuilt with covered conductor, PacifiCorp is replacing all expulsion fuses with non-expulsion alternatives. Therefore, as part of the implementation of covered conductor, PacifiCorp has the ability to track expulsion fuses replaced at the circuit level. To support this request, two locations were provided where expulsion fuses were replaced coincident with the 2020 covered conductor installation. However, keep in mind that this is not a stand-alone program.

g) LiDAR Inspection

PacifiCorp did not perform any LiDAR Inspections as part of the 2020 Wildfire Mitigation Activities. However, IR Inspections of OH Transmission lines were performed in 2020 as described in the [2021 WMP Update](#). Therefore, PacifiCorp has provided location specific information regarding these 2020 IR Inspections. In PacifiCorp's inspection records system, there are referred to as "ENHANCED" inspections. See "IE Data Request 3.xlsx" tab 3.g

h) Enhanced vegetation management activities

For PacifiCorp's 2020 WMP activities, the vegetation management activities are best broken down into:

- Detailed inspections of vegetation around distribution electric lines and equipment (See Section 5.3.5.2 of the 2020 WMP)
- Detailed inspections of vegetation around transmission electric lines and equipment (See Section 5.3.5.3 of the 2020 WMP)
- Fuel management and reduction of "slash" from vegetation management activities (See Section 5.3.5.5 of the 2020 WMP)

For these activities, work is planned and completed on a “circuit” or “line” basis. Therefore, to provide location specific information for the 2020 activities, the list of circuits or lines have been provided, with the assumption that the work was performed on the entire circuit where appropriate. To see these lists, see the following tabs of attachment “IE Data Request 3.xlsx” tab 3.h Distribution, tab 3.h Transmission, tab 3.h Pole Clearing:

- DIST VEG INSPECT [Detailed inspections of vegetation around distribution electric lines and equipment]
- TRANS VEG INSPECT [Detailed inspections of vegetation around transmission electric lines and equipment]
- POLE CLEARING [Fuel management and reduction of “slash” from vegetation management activities]

Circuit information or location information has been provided to correlate to the GIS data submission previously provided.

i) Pole replacements/upgrades to wood alternative poles/cross-arms/other equipment fixtures

Pole Replacement information is provided in attachment “IE Data Request 3.xlsx” tab “3.j Pole Replacements.””

PAC_289.42

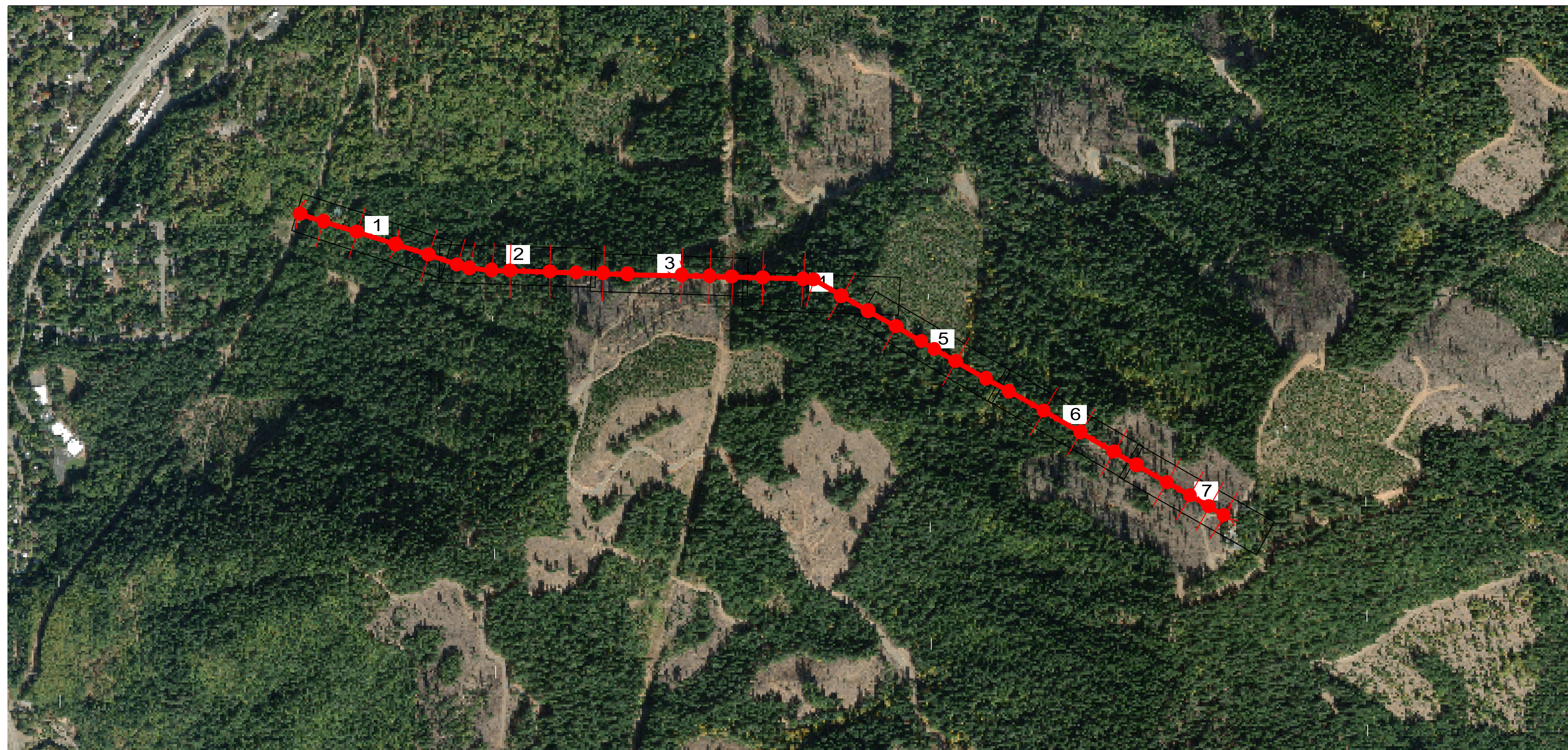
PACIFICORP - PACIFIC POWER

5G69 RADIO TOWER FEED

4/0 AWG 15KV SINGLE PHASE DISTRIBUTION



HENDRIX PROJECT: 16619
HENDRIX DESIGN: 4764
PACIFICORP WO: 6771706



REVISIONS		
REV	DATE	DESCRIPTION
0	2/14/20	INITIAL RELEASE



AERIAL CABLE SYSTEMS

53 OLD WILTON RD. ■ MILFORD, NH 03055 ■ (603) 673-2040

PROJECT NO.	16619
DESIGN NO.	4764
UTILITY NO.	6771706

PROJECT SCOPE:

THIS PROJECT WILL REPLACE A BARE SINGLE PHASE
CIRCUIT WITH A SINGLE CIRCUIT 12.47 KV 4/0 AWG
HENDRIX SPACER CABLE SYSTEM WITH 052AWA
MESSENGER. PROJECT WILL UTILIZE EXISTING POLE LOCATIONS.

PROJECT ALIGNMENT:

THIS PROJECT IS LOCATED IN DUNSMUIR, CA.
THE ALIGNMENT IS BASED OFF OF PACIFICORP
PROVIDED KML FILE. POLE FRAMING AND GUYING
SHOULD BE ADJUSTED FOR ACTUAL POLE LOCATIONS.

SURVEY:

GROUND SURVEY IS FROM USGS BEST AVAILABLE SOURCES

CLEARANCES:

CALIFORNIA GO95 TABLE 1
25 FT GROUND CLEARANCE FOR PRIMARY
15 FT GROUND CLEARANCE FOR COMM CABLES

REFERENCES

CALIFORNIA GO95
 RUS BULLETIN 1724E-200
 HENDRIX APPLICATION AND DESIGN GUIDE
 HENDRIX INSTALLATION GUIDE
 HENDRIX DESIGN SPECIFICATIONS

DESIGN CRITERIA:

POLE LINE:

- 1) THE CIRCUIT IS DESIGNED FOR IEC 60815 ZONE 2 CONTAMINATION ENVIRONMENT.
- 2) POLE LOCATIONS ARE DETERMINED BY PACIFICORP PROVIDED SURVEY DATA AND DRAWINGS
- 3) ELEVATION IS PROVIDED
- 4) X,Y COORDINATES ARE IN UTM WSG84 ZONE 10

STRUCTURE TYPES:

- 1) NEW STRUCTURES WILL BE FIBER REINFORCED POLYMER
- 2) EXISTING DISTRIBUTION POLES ARE DOUGLAS FIR

STRUCTURE LOADING:

- 1) ASSUMED GO95 HEAVY
- 2) ASSUMED MAXIMUM OPERATING TEMPERATURE OF 167 F.
- 3) ASSUMED GO95 GRADE A CONSTRUCTION
- 4) EMBEDMENT DEPTH REQUIREMENTS ARE ASSUMED 10% + 2 FT.
- 5) GUYING CALCULATIONS WILL ASSUME A STANDARD GUY STRAND SIZE – 5/16" EXTRA HIGH STRENGTH GRADE PER PAC STANDARD EG031, U.N.O.

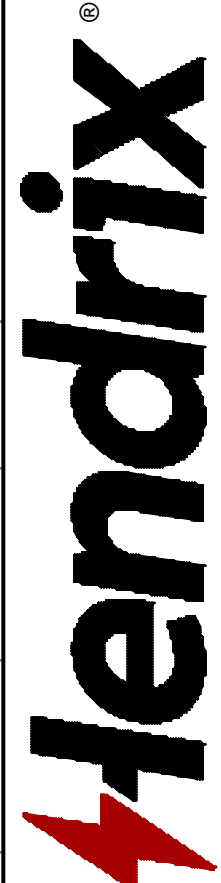
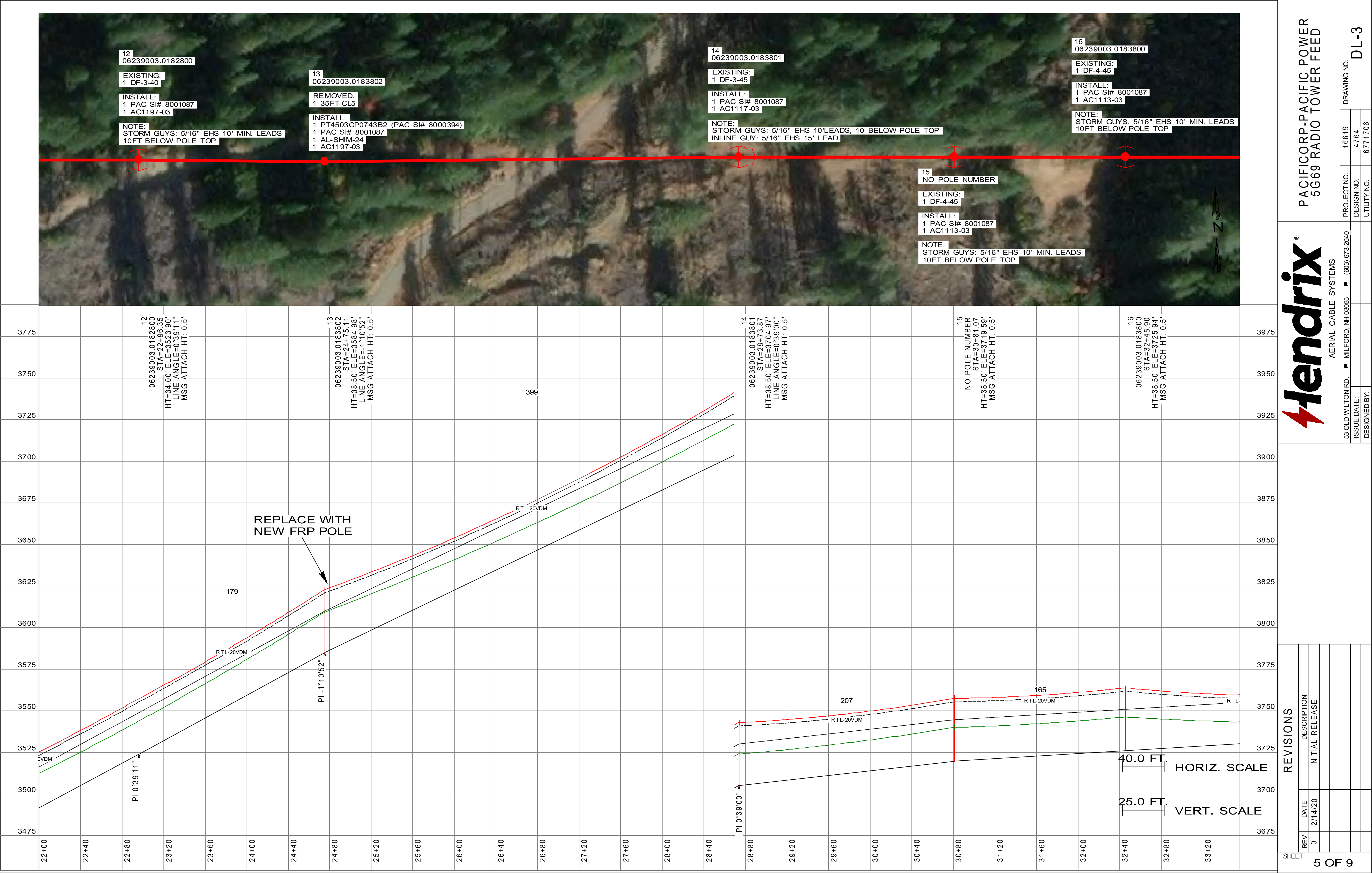
THIS PROJECT DOES NOT INCLUDE:

- 1) GUY ANCHOR SIZING
 - 2) SOIL ANALYSIS
 - 3) FOUNDATION DESIGN & ANALYSIS
 - 4) CLEARANCE CHECKS TO BUILDINGS OR OTHER STRUCTURES
 - 5) PE STAMPING
- GENERAL NOTES:

- 1) MESSENGER DESIGN TENSION IS 1600 LB INITIAL @ 60° F WITHOUT CABLES ATTACHED.
- 2) POLE GROUNDS TO BE BONDED TO EARTH WITH #4 AWG COPPER, MIN. MESSENGER GROUNDS SHOULD HAVE NO MORE THAN 25 OHMS RESISTANCE. POLES GROUNDS SHALL BE CONNECTED TO A GROUND ROD EVERY 500 FT.
- 3) LINEDUC SHALL BE INSTALLED AT TAP LOCATIONS AND DEADEND POLES.
- 4) POLES TO BE BUILT TO SPEC DESIGNATED AT EACH LOCATION, UNLESS NOTED OTHERWISE.

- A) MESSENGER ATTACHMENT HEIGHTS ARE PROVIDED FOR TOP MESSENGER ATTACHMENT POINT ON POLE IN HENDRIX CONSTRUCTION DRAWINGS. POLES TO BE BUILT TO SPEC DESIGNATED AT EACH LOCATION, U.N.O.
 - B) MINIMUM GUY LEAD LENGTHS REQUIREMENTS ARE INDICATED AT POLES. GUYS TO BE LOCATED VERTICALLY ON POLE AS INDICATED ON HENDRIX SPEC DRAWING, U.N.O.
- 5) CONDUCTOR TYPES TYPICAL TO PLAN AND PROFILE DRAWINGS.
- 6) TIE THE SPACER CABLE SYSTEM TO LIGHTNING ARRESTERS AT POINTS WHERE THE CONDUCTOR COVERING HAS BEEN REMOVED. COVERING TAPS CAN PROVIDE PARTIAL PROTECTION BUT DOES NOT NEGATE THE NEED FOR ARRESTERS IN HIGH LIGHTING AREAS. REFER TO HENDRIX INSTALLATION GUIDE FOR ADDITIONAL INFORMATION.

REVISIONS						 AERIAL CABLE SYSTEMS			PACIFICORP-PACIFIC POWER 5G69 RADIO TOWER FEED			
SHEET			2 OF 9			53 OLD WILTON RD. ■ MILFORD, NH 03055 ■ (603) 673-2040			PROJECT NO.	16619	DRAWING NO:	
						ISSUE DATE:			DESIGN NO.	4764		
						DESIGNED BY:			UTILITY NO.	6771706		



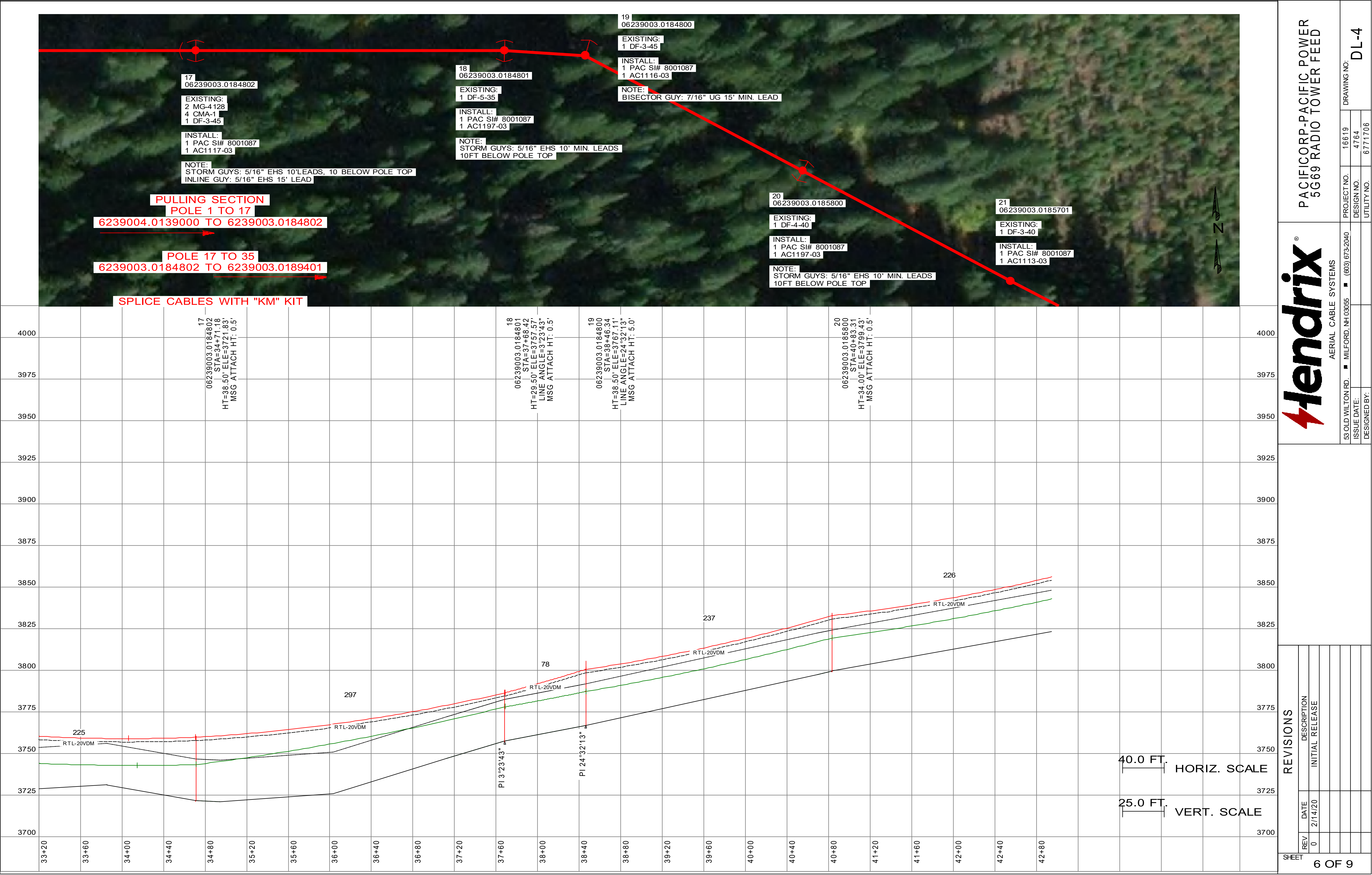
AERIAL CABLE SYSTEMS

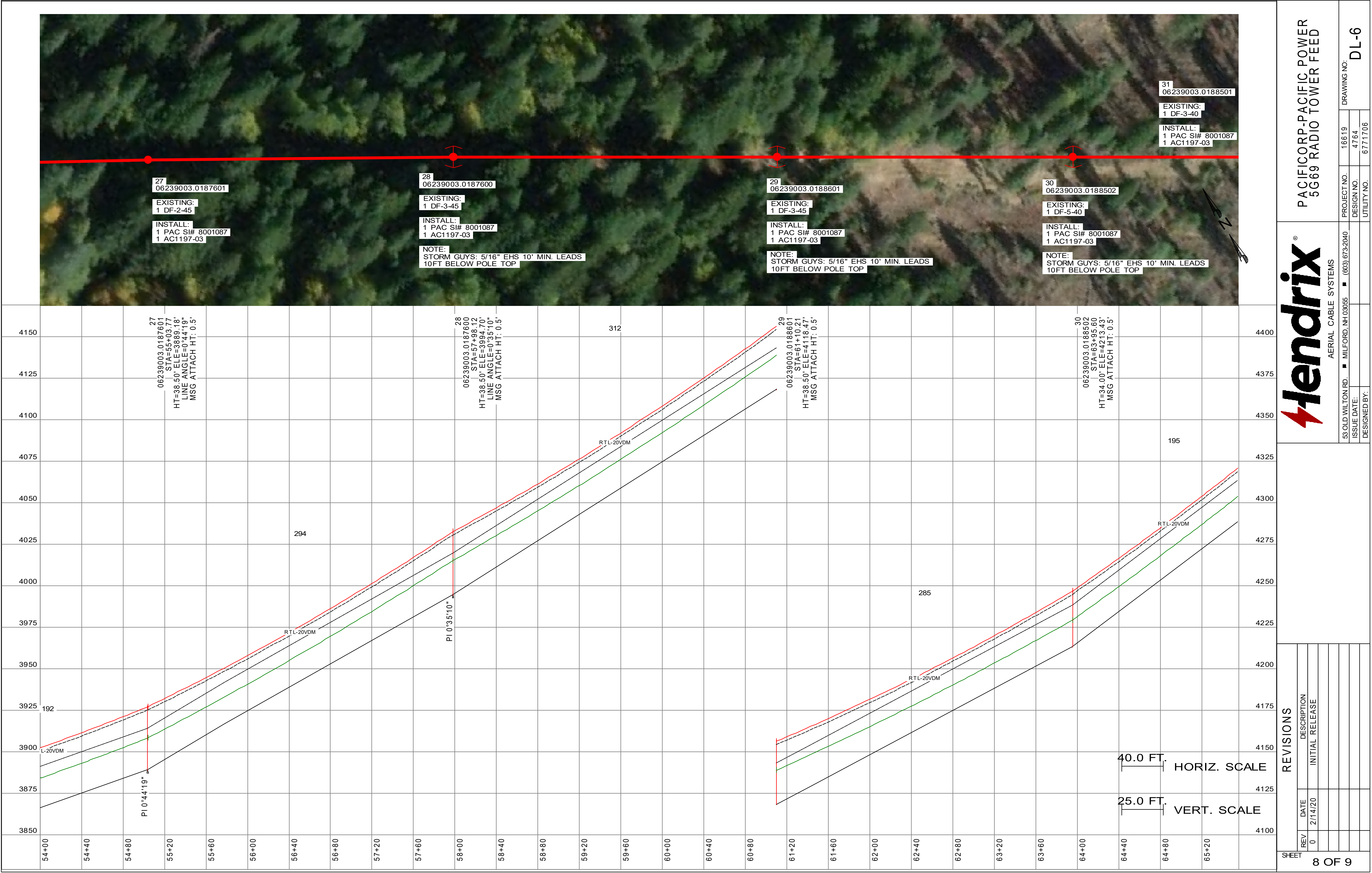
PACIFICORP-PACIFIC POWER
5G69 RADIO TOWER FEED

53 OLD WILTON RD. ■ MILFORD, NH 03055 ■ (603) 673-2040	PROJECT NO.	16619	DRAWING NO: DL-3
	DESIGN NO.	4764	
	UTILITY NO.	6771706	

REVISIONS

REV	DATE	DESCRIPTION
0	2/14/20	INITIAL RELEASE





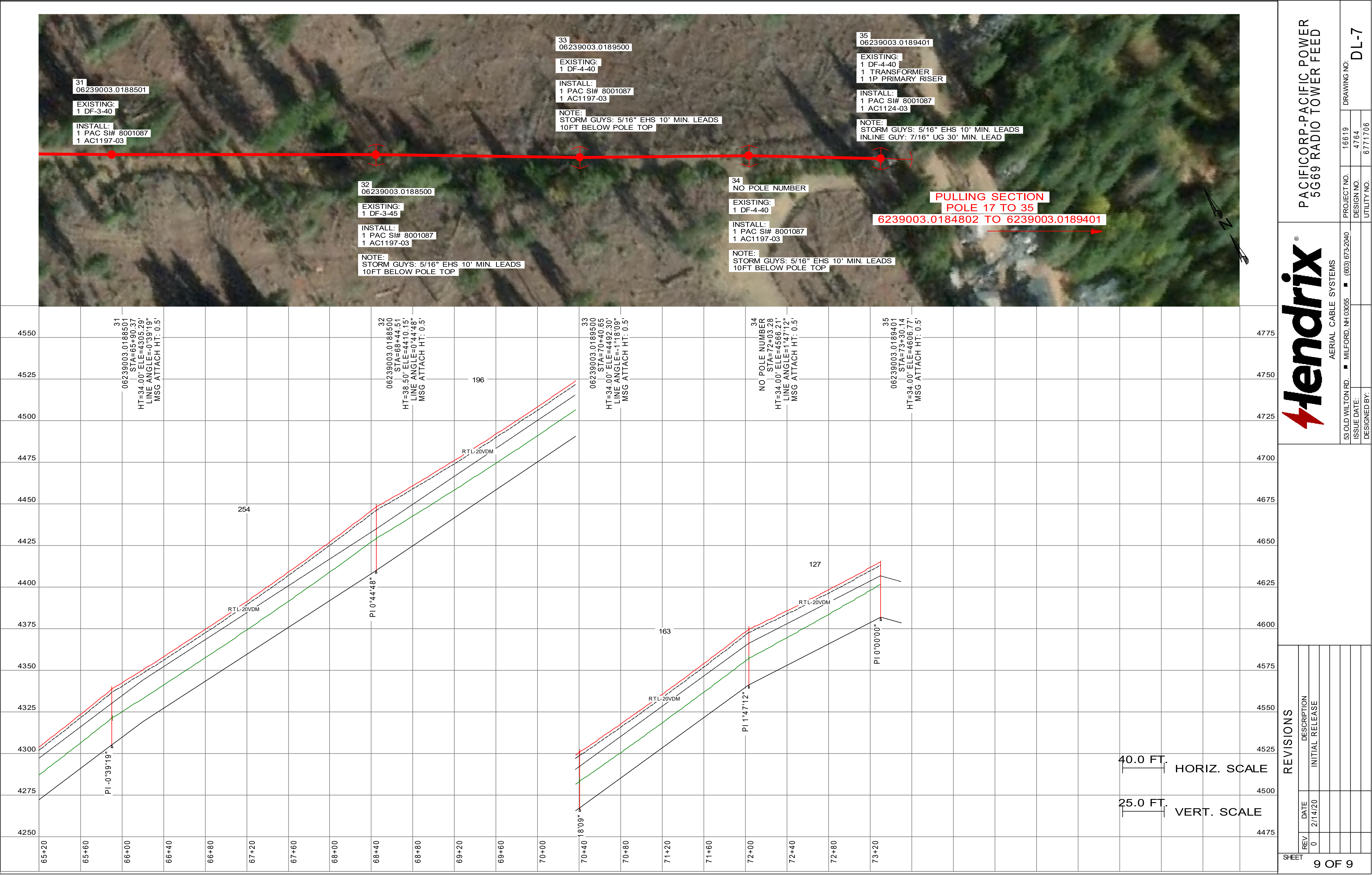
AERIAL CABLE SYSTEMS

PACIFICORP-PACIFIC POWER
5G69 RADIO TOWER FEED

PROJECT NO.	16619	DRAWING NO.	DL-6
DESIGN NO.	4764	UTILITY NO.	6771706
ISSUE DATE:			
DESIGNED BY:			

REVISIONS

REV	DATE	DESCRIPTION
0	2/14/20	INITIAL RELEASE



AERIAL CABLE SYSTEMS

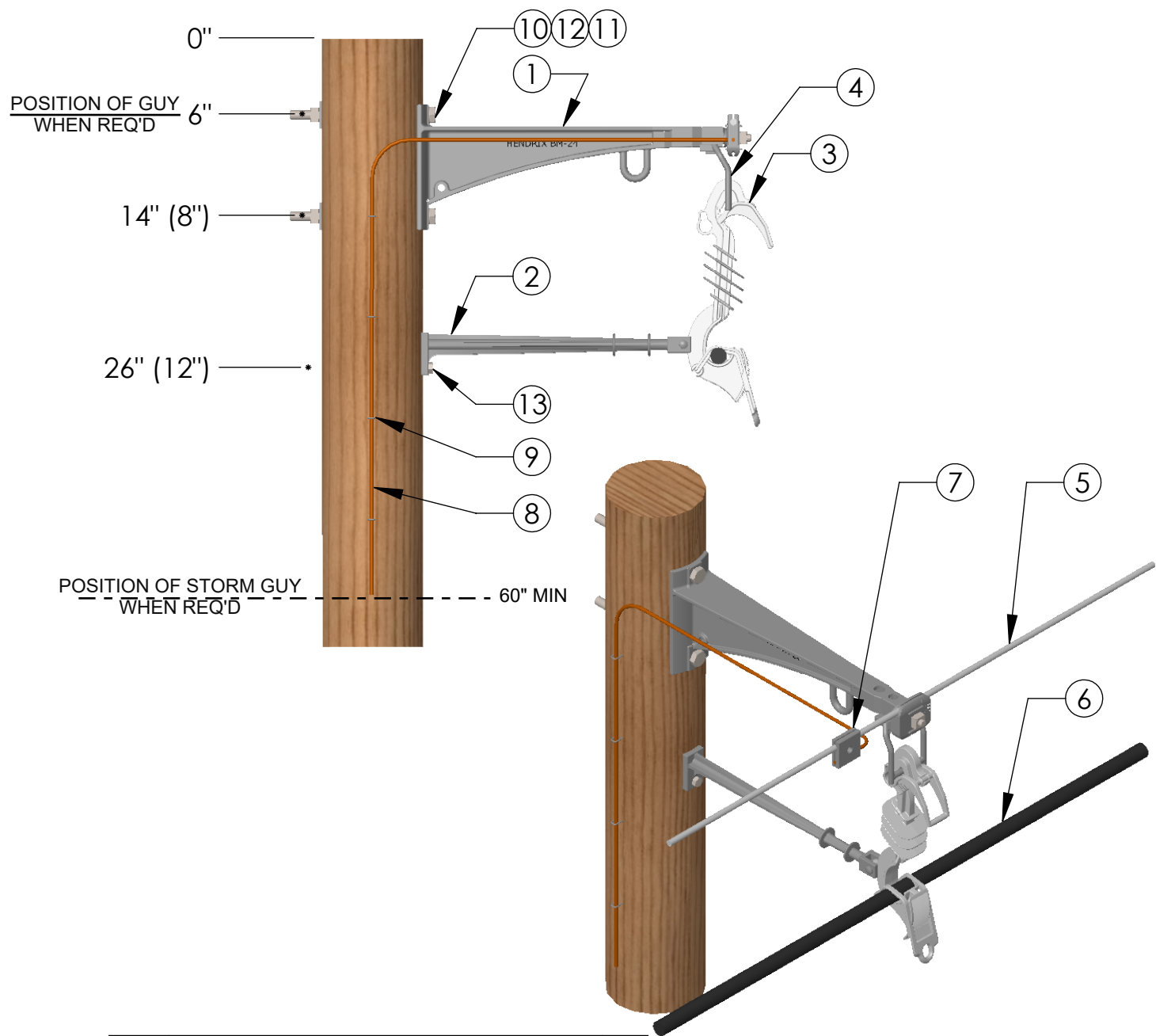
PACIFICORP-PACIFIC POWER
5G69 RADIO TOWER FEED

PROJECT NO.	16619	DRAWING NO.	DL-7
DESIGN NO.	4764	UTILITY NO.	6771706
ISSUE DATE:		DESIGNED BY:	
53 OLD WILTON RD.	MILFORD, NH 03055		

REVISIONS

REV	DATE	DESCRIPTION
0	2/14/20	INITIAL RELEASE

PAC_289.43



13	HEX HEAD LAG SCREW, 1/2" X REQ. LENGTH	No	1
12	SQUARE WASHER, 2 1/4" X 2 1/4" X 3/16" (MIN)	No	2
11	SQUARE NUT, 3/4"	No	2
10	MACHINE BOLT, 3/4" X REQ. LENGTH	No	2
9	GROUND WIRE STAPLE, COPPER CLAD OR GALVANIZED	No	AS REQ.
8	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6 AWG (MIN)	No	AS REQ.
7	CONNECTOR, SIZE AND TYPE AS REQ.	No	AS REQ.
6	HENDRIX AERIAL CABLE (SIZE AND VOLTAGE RATING AS REQ.)	Yes	AS REQ.
5	MESSENGER (SIZE AND TYPE AS REQ.)	Yes	AS REQ.
4	HENDRIX STURRUP TS-1, SUPPLIED WITH 1/2" HARDWARE	Yes	1
3	HENDRIX RTL-20V SPACER	Yes	1
2	HENDRIX BAS-24F ANTI SWAY BRACKET SUPPLIED WITH PLASTIC PIN	Yes	1
1	MESSENGER BRACKET, HENDRIX TYPE BM-24	Yes	1
ITEM	DESCRIPTION	HENDRIX SUPPLIED	QTY

VALUE IN () IS DIMENSION TO PREVIOUS HOLE

DESIGN PARAMETERS

15-35Kv
LINE ANGLE: 0-6°

TITLE
TYPICAL SINGLE PHASE TANGENT CONSTRUCTION

DRAWING NO. REV

AC1113-03

0

DATE

12/02/2016

Drawn By

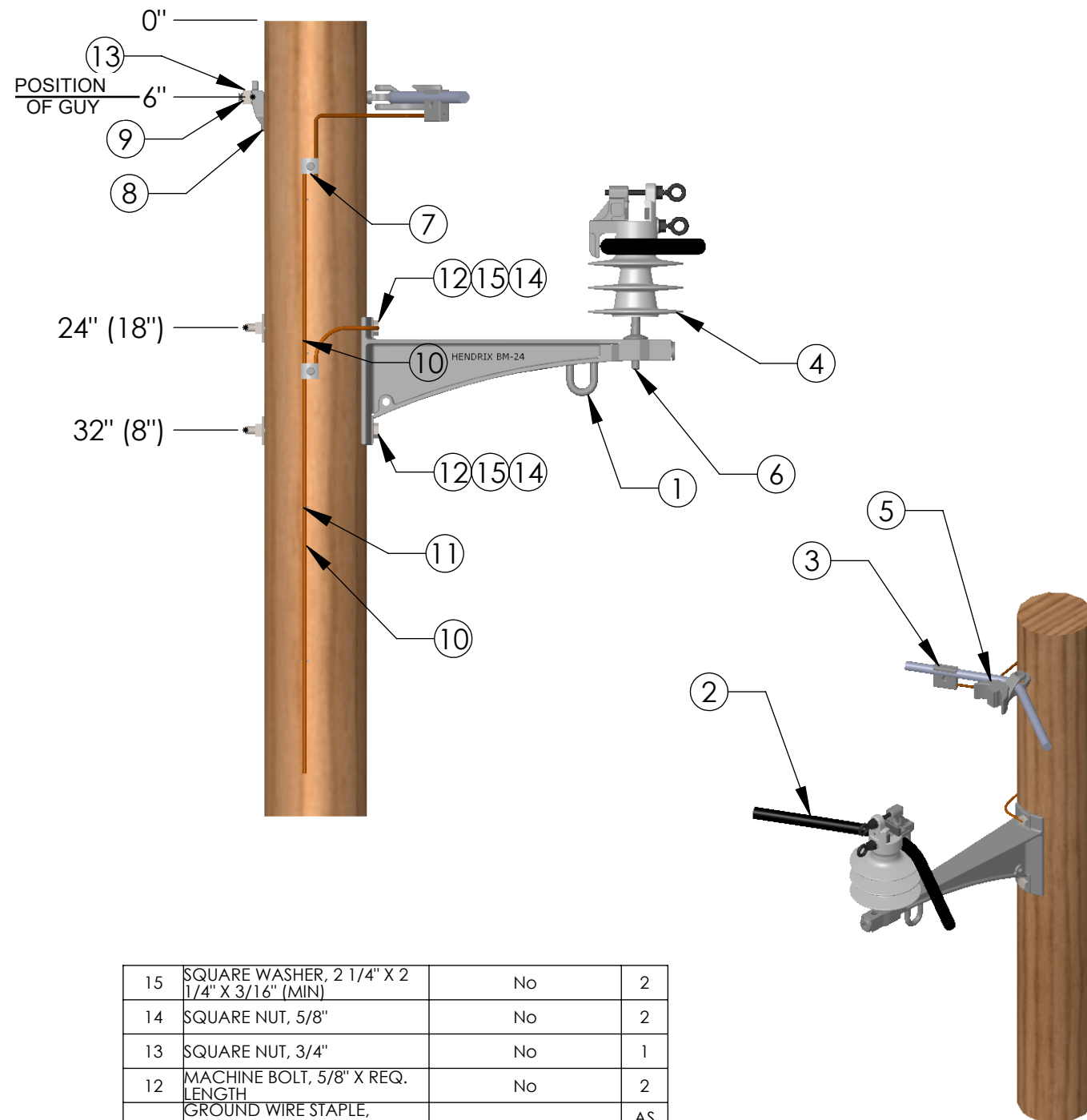
M. Sokolskiy

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A Marmon/Berkshire Hathaway Company



15	SQUARE WASHER, 2 1/4" X 2 1/4" X 3/16" (MIN)	No	2
14	SQUARE NUT, 5/8"	No	2
13	SQUARE NUT, 3/4"	No	1
12	MACHINE BOLT, 5/8" X REQ. LENGTH	No	2
11	GROUND WIRE STAPLE, COPPER CLAD OR GALVANIZED	No	AS REQ
10	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6 AWG (MIN)	No	AS REQ
9	EYE BOLT, 3/4" X REQ. LENGTH	No	1
8	GUY HOOK	No	1
7	CONNECTOR, SIZE AND TYPE AS REQ.	No	AS REQ
6	INSULATOR PIN, HENDRIX TYPE SSP-2	Yes	1
5	ANGLE CLAMP, HENDRIX TYPE PSAC-01	Yes	1
4	INSULATOR, HENDRIX HPI-35VTP	Yes	1
3	MESSANGER, SIZE AND TYPE AS REQ.	Yes	AS REQ
2	HENDRIX ARIAL CABLE, SIZE AND VOLTAGE RATING AS REQ.	Yes	AS REQ
1	MESSANGER BRACKET, HENDRIX TYPE BM-24	Yes	1
ITEM	DESCRIPTION	HENDRIX SUPPLIED	QTY

VALUE IN () IS DIMENSION TO PREVIOUS HOLE

DESIGN PARAMETERS

35Kv
LINE ANGLE: 7-60°

TITLE SINGLE PHASE ANGLE CONSTRUCTION

DRAWING NO. REV

AC1116-03

0

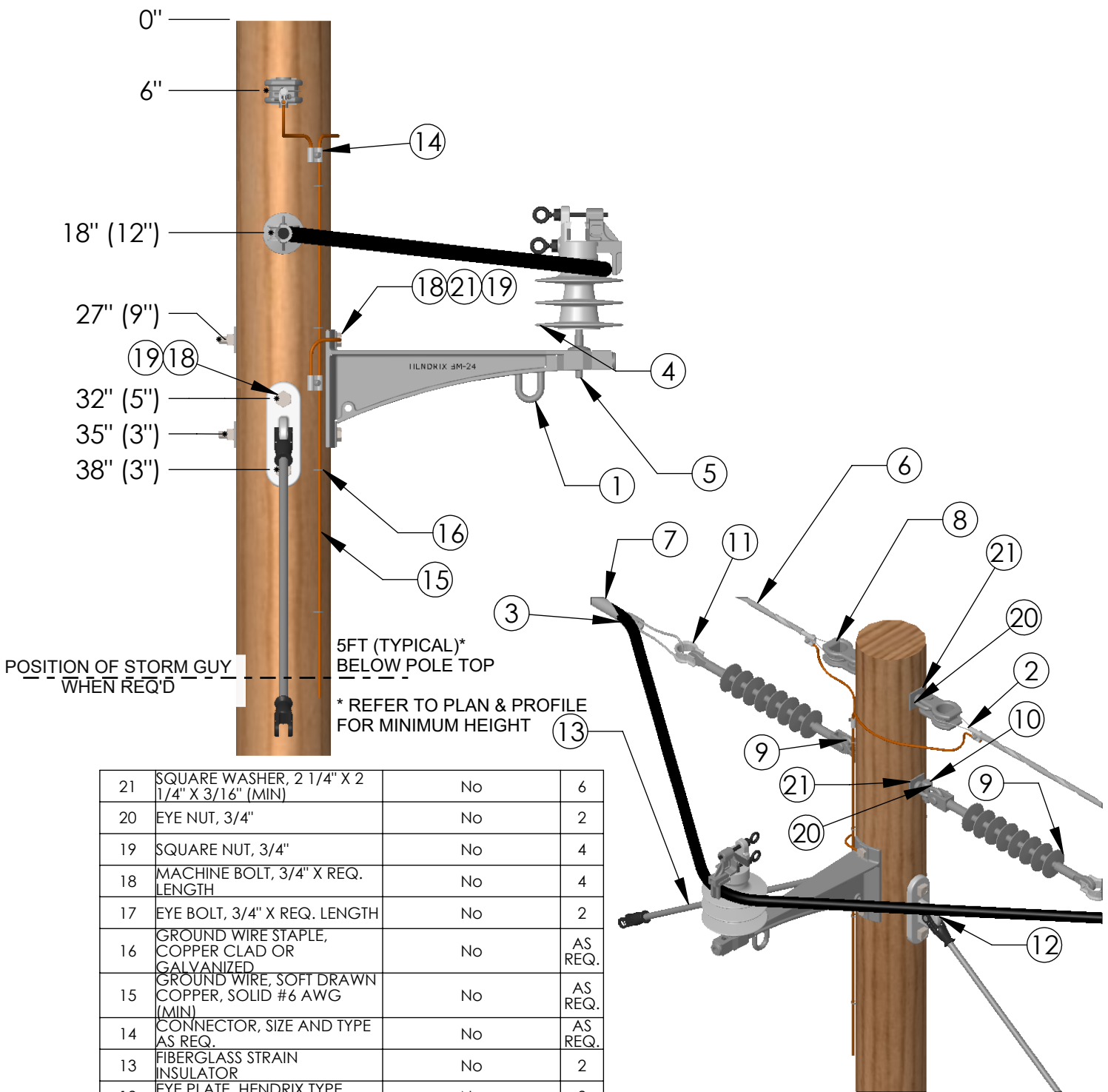
DATE
12/12/2016

Drawn By
M. Sokolskiy

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21	SQUARE WASHER, 2 1/4" X 2 1/4" X 3/16" (MIN)	No	6
20	EYE NUT, 3/4"	No	2
19	SQUARE NUT, 3/4"	No	4
18	MACHINE BOLT, 3/4" X REQ. LENGTH	No	4
17	EYE BOLT, 3/4" X REQ. LENGTH	No	2
16	GROUND WIRE STAPLE, COPPER CLAD OR GALVANIZED	No	AS REQ.
15	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6 AWG (MIN)	No	AS REQ.
14	CONNECTOR, SIZE AND TYPE AS REQ.	No	AS REQ.
13	FIBERGLASS STRAIN INSULATOR	No	2
12	EYE PLATE, HENDRIX TYPE DEAD-END-TEE-01	No	2
11	THIMBLE CLEVIS, HENDRIX TYPE TC	Yes	2
10	SHACKLE CLEVIS, HENDRIX TYPE SC	Yes	2
9	INSULATOR, DEAD END TYPE DEINS35	Yes	2
8	THIMBLE CLEVIS, HENDRIX TYPE HDTC	Yes	2
7	PRESHAPED CONDUCTOR GRIP, COATED	Yes	2
6	PRESHAPED MESSENGER GRIP	Yes	2
5	INSULATOR PIN, HENDRIX TYPE SSP-2	Yes	1
4	INSULATOR, HENDRIX HPI-35VTP	Yes	1
3	HENDRIX ARIAL CABLE, SIZE AND VOLTAGE RATING AS REQ.	Yes	AS REQ.
2	MESSENGER (SIZE AND TYPE AS REQ.)	Yes	AS REQ.
1	MESSENGER BRACKET, HENDRIX TYPE BM-24	Yes	1
ITEM	DESCRIPTION	HENDRIX SUPPLIED	QTY

VALUE IN () IS DIMENSION TO PREVIOUS HOLE

DESIGN PARAMETERS

35Kv
LINE ANGLE: N/A

TITLE
TANGENT DOUBLE DEAD END

DRAWING NO.

AC1117-03

REV

0

DATE

12/13/2016

Drawn By

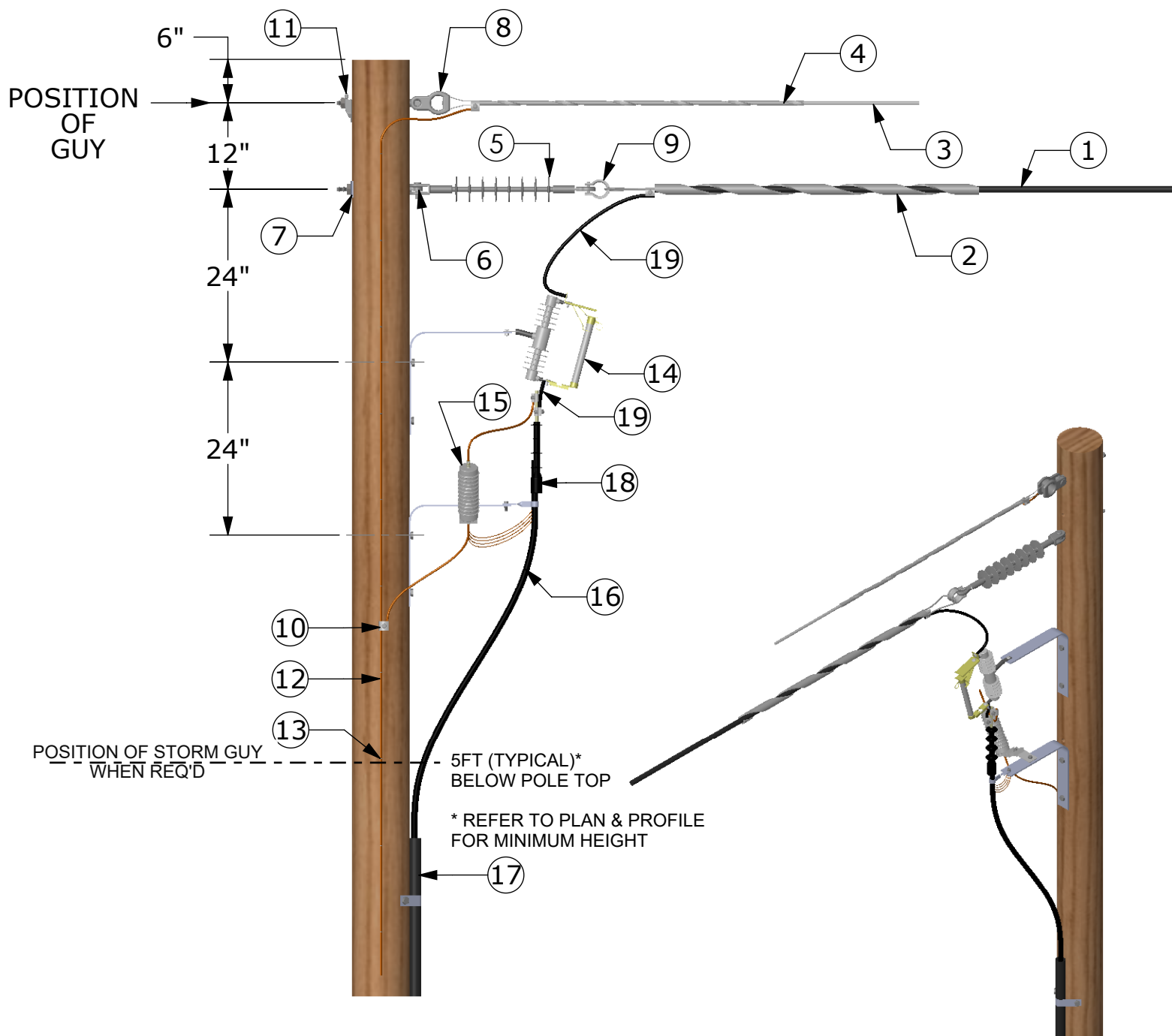
M. Sokolskiy

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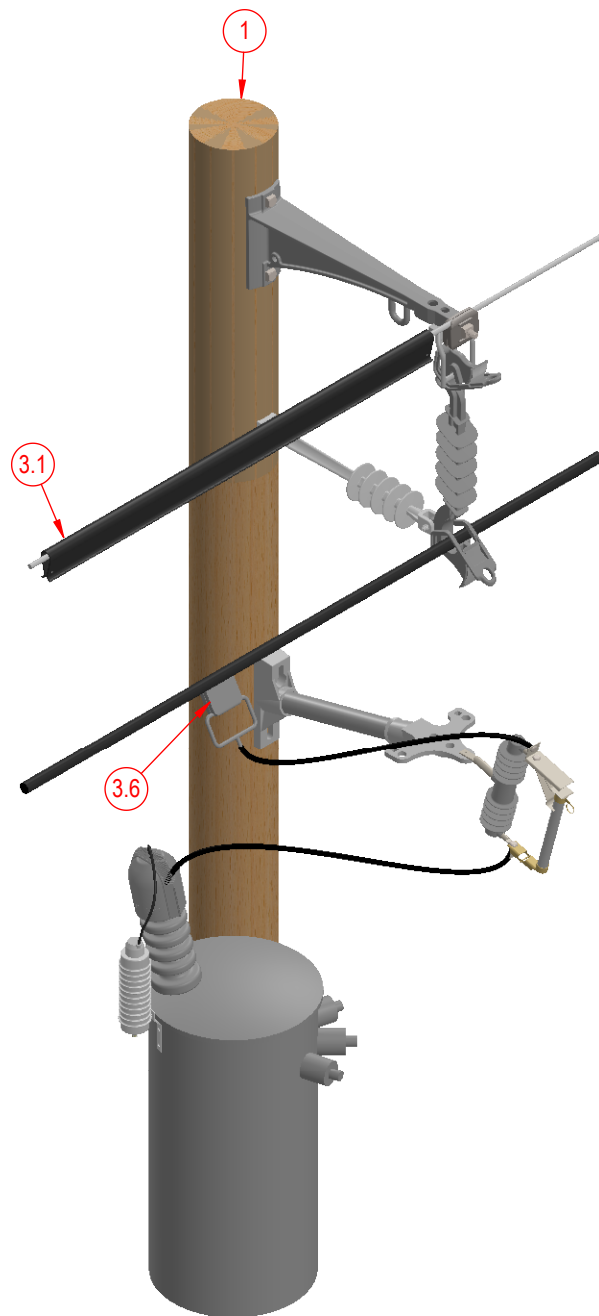
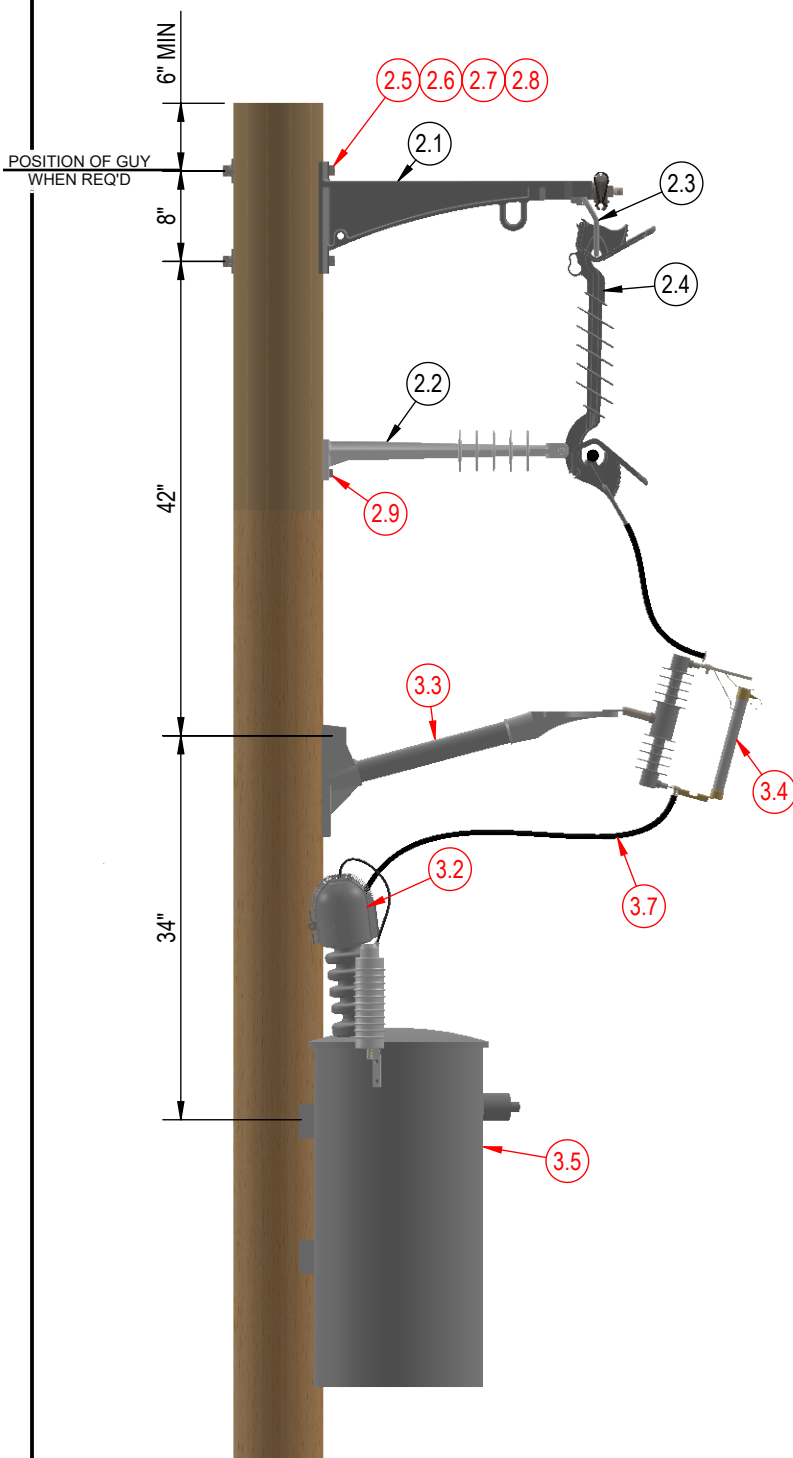


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ITEMS IN RED NOT SUPPLIED BY HENDRIX

ITEM	DESCRIPTION	QTY	DESIGN PARAMETERS
1	HENDRIX AERIAL CABLE,(SIZE AND VOLTAGE RATING AS REQ.)	AS REQ	35kV
2	PRESHAPED CONDUCTOR GRIP, COATED	1	TITLE SINGLE PHASE DEAD-END WITH UNDERGROUND RISER
3	MESSENGER, (SIZE AND TYPE AS REQUIRED)	AS REQ	
4	PRESHAPED MESSENGER GRIP	1	
5	INSULATOR, POLYMER DEAD-END TYPE 35kV	1	
6	EYE BOLT, 3/4"X REQ LENGTH	2	DRAWING NO. REV AC1124-03 3
7	SQUARE WASHER, 2-1/4" X 2-1/4" X 3/16" (MIN)	1	
8	THIMBLE CLEVIS, HENDRIX CATALOG NO. HDTC	1	DATE 11/16/11
9	THIMBLE CLEVIS, HENDRIX CATALOG NO. TC	1	
10	CONNECTORS, (SIZE AND TYPE AS REQ.)	AS REQ	 AERIAL CABLE SYSTEMS 53 OLD WILTON RD. • MILFORD, NH 03055 • 603-673-2040
11	GUY HOOK	1	
12	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6 AWG MIN	AS REQ	
13	GROUND WIRE STAPLE	AS REQ	
14	FUSED CUTOUT	1	
15	LIGHTNING ARRESTER	1	
16	UNDER GROUND RISER CABLE	AS REQ	
17	CONDUIT	AS REQ	
18	TERMINATORS	1	
19	INSULATED TAP WIRE	AS REQ	



ITEM	HENDRIX PART NUMBER	DESCRIPTION	QTY
1	POLE-XX	POLE (TYPE, CLASS & LENGTH AS REQ.)	1
2	SC-ZA1.5	35-46kV, 1-PHASE PRIMARY - TANGENT WITH ANTI-SWAY BRACKET	1
2.1	BM-24	BRACKET - TANGENT MESSENGER, 24"	1
2.2	BAS-24F	BRACKET - ANTI-SWAY, 24"	1
2.3	TS-1	STIRRUP - TANGENT BRACKET	1
2.4	RTL-20VXL	SPACER, 1 PHASE, 35KV, EXTRA LEAKAGE	1
2.5	MBLT5/8-XX	BOLT, MACHINE, 5/8" X REQ. LENGTH	2
2.6	SWSH5/8-XX	WASHER, SQUARE, 5/8" X 2-1/4"	2
2.7	LWSH5/8-XX	WASHER, SPRINGLOCK, 5/8"	2
2.8	SNUT5/8-XX	SQUARE NUT, 5/8"	2
2.9	LSCRW1/2X4-XX	SCREW, LAG, 1/2 X 4"	1
3	SC-G.01G	1-PHASE PRIMARY TAP TO SINGLE TRANSFORMER GUIDE SPACER CABLE	1
3.1	LINEDUC-00	LINE-DUC 8' SECTION (COLOR AS REQ.)	1
3.2	WG100-01	GUARD, TRANSFORMER BUSHING	1
3.3	STANDOFF-XX	BRACKET - STANDOFF (SIZE & KIND AS REQ.)	1
3.4	CUTOUT-XX	FUSED CUTOUT (TYPE & VOLTAGE RATING AS REQ.)	1
3.5	TRANSFORMER-XX	TRANSFORMER, SINGLE PHASE (KVA AND VOLTAGE RATING AS REQ.)	1
3.6	TAPCLAMP-XX	TAP CLAMP (SIZE & TYPE AS REQ.)	1
3.7	TAPWIRE-XX		1

RED ITEMS ARE NOT SUPPLIED BY HENDRIX

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AERIAL CABLE SYSTEMS

53 OLD WILTON RD. ■ MILFORD, NH 03055 ■ (603) 673-2040

DESIGN PARAMETERS:

KV CLASS: 35kV

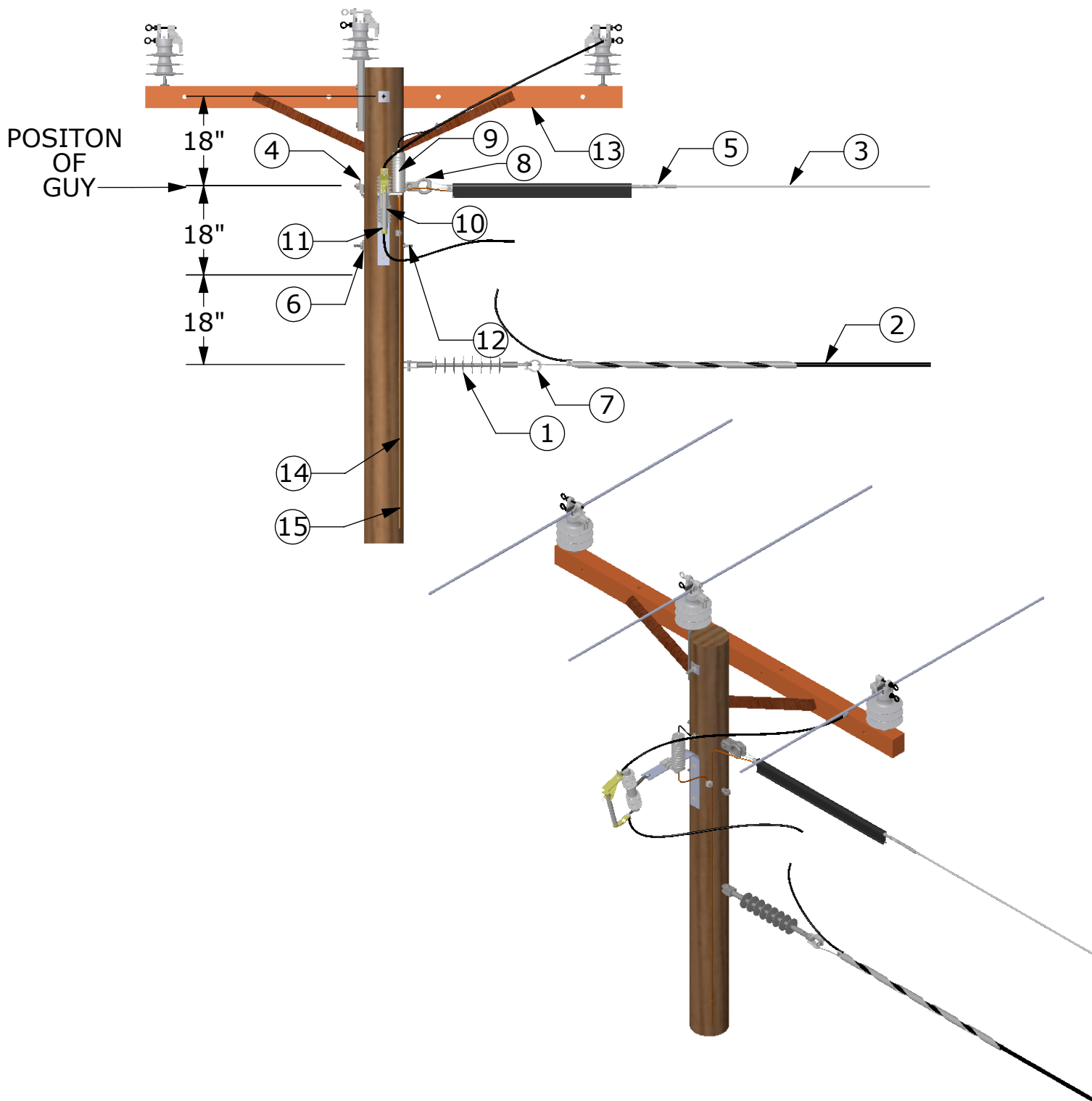
LINE ANGLE: 0°

REVISION: 0

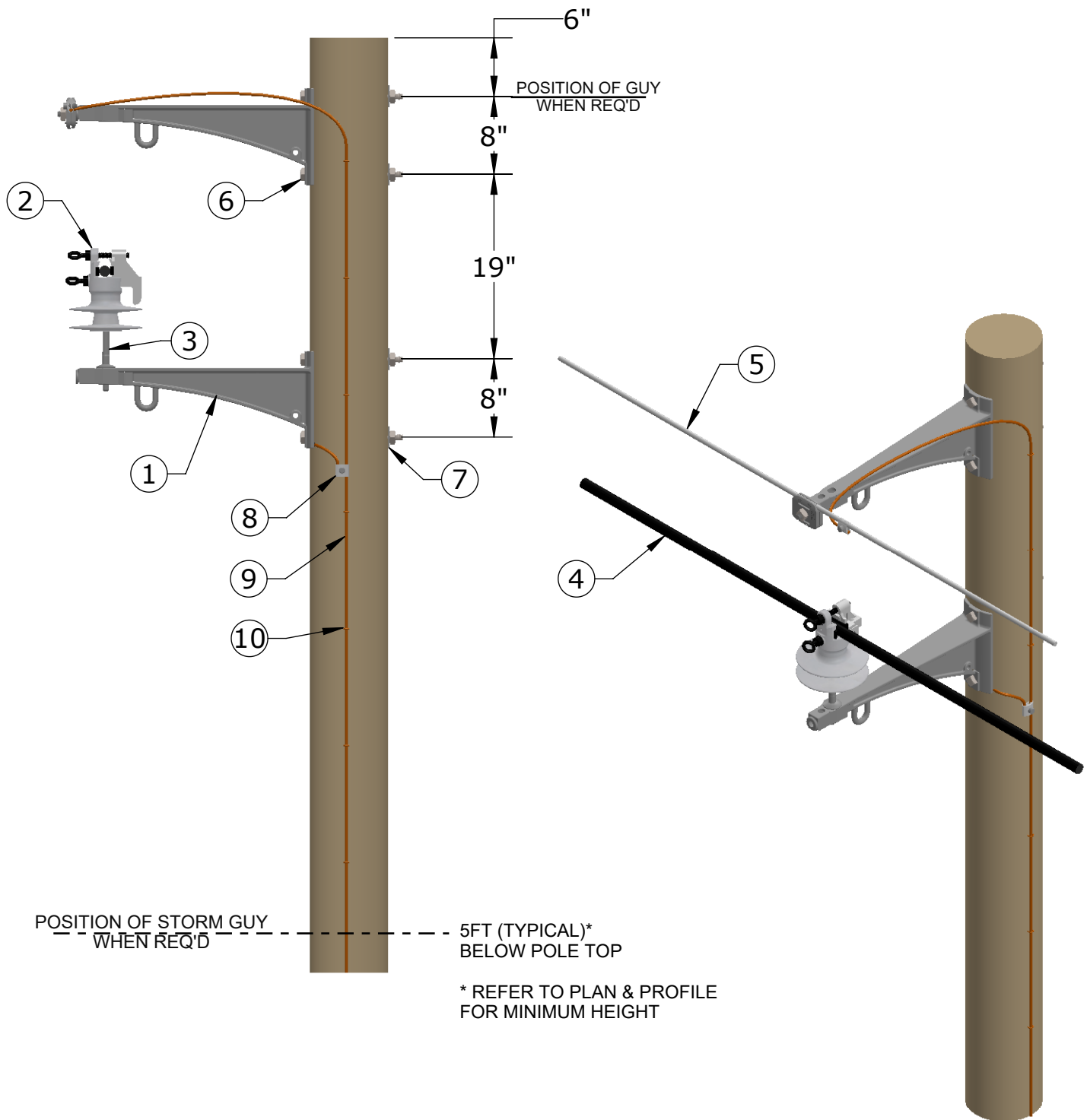
35KV, 1-PHASE PRIMARY
TANGENT
WITH ANTI-SWAY BRACKET
WITH 1-PHASE TRANSFORMER

DRAWING NO.:

AC1143-03



ITEM	DESCRIPTION	QTY	DESIGN PARAMETERS	
1	INSULATOR, POLYMER DEAD-END TYPE (35KV)	1	35kv	
2	HENDRIX AERIAL CABLE,(SIZE AND VOLTAGE RATING AS REQ.)	AS REQ	TITLE	
3	MESSENGER, (SIZE AND TYPE AS REQUIRED)	AS REQ		
4	GUY HOOK	1	TYPICAL SINGLE PHASE TAP FROM BARE WIRE	
5	PRESHAPED MESSENGER GRIP	1		
6	SQUARE WASHER, 2-1/4" X 2-1/4" X 3/16" (MIN)	2	DRAWING NO. REV	
7	THIMBLE CLEVIS, HENDRIX CATALOG NO. TC	1		
8	HEAVY DUTY THIMBLE CLEVIS, HENDRIX CATALOG NO. HDTC	1	DATE	
9	LIGHTNING ARRESTER	1		
10	FUSED CUT OUT	1	11/15/11	
11	CONNECTORS, (SIZE AND TYPE AS REQ.)	AS REQ.		
12	EYE BOLT, 3/4" X REQ LENGTH	2	SPACER CABLE SYSTEMS	
13	COVERED TAP WIRE	AS REQ.		
14	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6 AWG	AS REQ.	MARMON UTILITY LLC • 53 OLD WILTON RD. • MILFORD, NH 03055	
15	GROUND WIRE STAPLES	AS REQ.		
				



ITEMS IN RED NOT SUPPLIED BY HENDRIX

ITEM	DESCRIPTION	QTY	DESIGN PARAMETERS
1	MESSENGER BRACKET, HENDRIX TYPE BM-24	2	15-35kV
2	INSULATOR, PIN TYPE, HENDRIX HPI-25VTP	1	LINE ANGLES: 0-6°
3	INSULATOR PIN, HENDRIX SSP-2	1	TITLE
4	HENDRIX AERIAL CABLE,(SIZE AND VOLTAGE RATING AS REQ.)	AS REQ	SINGLE PHASE TANGENT CONSTRUCTION USING BM-24
5	MESSENGER, (SIZE AND TYPE AS REQUIRED)	AS REQ	DRAWING NO. REV
6	MACHINE BOLT, 5/8" X REQ. LENGTH	4	AC1197-03 0
7	SQUARE WASHER, 2-1/4" X 2-1/4" X 3/16" (MIN)	4	DATE
8	CONNECTOR, (SIZE AND TYPE AS REQ.)	2	1/29/15
9	GROUND WIRE, SOFT DRAWN COPPER, SOLID, #6 AWG MIN.	AS REQ	 AERIAL CABLE SYSTEMS 53 OLD WILTON RD. • MILFORD, NH 03055 • 603-673-2040
10	GROUND WIRE STAPLE	AS REQ	

PAC_289.44



Design: 4764 - 5G69 Radio Tower Feed

Circuit Name	Circuit Feet	Phases	Voltage	Conductor	Messenger
5G69 Radio Tower Feed	7613	1	15kV	S0040PA15G3-00	MSG052AWA007-01

POLE REPORT

AE-105-E0

* = Customer Supplied

Parts for Pole ID: 1 Utility Pole ID: 6239004.0139000		
Assembly DrawingNo: AC1171-03 ASC 35kV SP Tap - Bare 0° Hendrix		
1	MG-4128	Messenger DE Grip For 7#6 Blue 39" Long
1	TC	Thimble Clevis, Galvanized Galvanized Steel HDG ASTM A-123 Finish Rated LD 2,500 Lbs 1.14 Lbs
1	ARRESTER-XX *	LIGHTNING ARRESTER, (TYPE & RATING AS REQUIRED)
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
2	EBLT3/4-XX *	BOLT, EYE, 3/4" X REQ. LENGTH
1	FUSECUTOUT-XX *	FUSED CUTOUT (TYPE AND VOLTAGE RATING AS REQUIRED)
1	GUYATTACH-XX *	Guy Hook Attachment
0	STAPLE-XX *	GROUND WIRE STAPLE (SIZE AND TYPE AS REQUIRED)
2	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Parts for Pole ID: 2 Utility Pole ID: 6239004.0249900		
Assembly DrawingNo: AC1143-03 ASC Tangent - Trnf Tap BM-24 35kV SP 0-6° Hendrix		
1	BAS-24F	BRACKET - Anti-Sway 0-6° 24" Max Sys Vltg 46kV High Density Polyethylene 1.30 Lbs
1	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	LINEDUC-GR	Line-Duc 8' Sections Grey 3.04 Lbs
1	RTL-20VXL	Spacer 35kV Single Phase Vertical HDP G095 Leakage Distance 30 1/2 1.69 Lbs
1	TS-1	Stirrup - Tangent Bracket Ductile Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 1.55 Lbs
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
1	CUTOUT-XX *	FUSED CUTOUT (TYPE AND VOLTAGE RATING AS REQUIRED)
1	GNDASSY-XX *	GROUNDING ASSEMBLY (TYPE AS REQUIRED)
0	GNDWIRE-XX *	GROUND WIRE, COPPER #6 AWG (MIN)
2	LNUT5/8-XX *	LOCKNUT 5/8"
1	LSCRW1/2X4-XX *	SCREW, LAG, 1/2 x 4"
2	LWSH5/8-XX *	WASHER, SPRINGLOCK, 5/8"
2	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
1	POLE-XX *	POLE (TYPE, CLASS AND LENGTH AS REQUIRED)
1	STANDOFF-XX *	BRACKET - STANDOFF (SIZE & KIND AS REQUIRED)
0	STAPLE-XX *	GROUND WIRE STAPLE (SIZE AND TYPE AS REQUIRED)
2	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
1	TAPCLAMP-XX *	TAP CLAMP (SIZE AND TYPE AS REQUIRED) (CUSTOMER SUPPLIED PART)
1	TRANSFORMER-XX *	TRANSFORMER, SINGLE PHASE (KVA AND VOLTAGE RATING AS REQUIRED)
Parts for Pole ID: 3 Utility Pole ID: 6239003.0180900		
Assembly DrawingNo: AC1113-03 ASC 35kV SP Tangent - Typical 0-6° BM-24 Hendrix		
1	BAS-24F	BRACKET - Anti-Sway 0-6° 24" Max Sys Vltg 46kV High Density Polyethylene 1.30 Lbs
1	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs

1	RTL-20VXL	Spacer 35kV Single Phase Vertical HDP GO95 Leakage Distance 30 1/2 1.69 Lbs
1	TS-1	Stirrup - Tangent Bracket Ductile Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 1.55 Lbs
1	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
1	LSCRW1/2X4-XX *	SCREW, LAG, 1/2 x 4"
2	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
0	STAPLE-XX *	GROUND WIRE STAPLE (SIZE AND TYPE AS REQUIRED)
2	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)

Parts for Pole ID: 4 Utility Pole ID: 6239003.0180901

Assembly DrawingNo: AC1117-03 ASC 35kV SP DDE - Tangent 0-6° BM-24 Hendrix

1	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
2	CG-0118	CND Dead End Grip Neoprene Coated Cnd Dia Range 0.784-0.834 Blue 38"
2	HDTC	Clevis - Heavy Duty Thimble Galvanized Steel 5-1/2 H 3-1/4 W Rated LD 40,000 Lbs 2.75 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
2	MG-4128	Messenger DE Grip For 7#6 Blue 39" Long
1	SSP-2	Insulator Pin Galvanized Steel HDG ASTM A-123 Finish 9-1/2 H 2 W 1.75 Lbs 3/4" Short Shank w/1" Nylon Thread Diameter
2	TC	Thimble Clevis, Galvanized Galvanized Steel HDG ASTM A-123 Finish Rated LD 2,500 Lbs 1.14 Lbs

Parts for Pole ID: 5 Utility Pole ID: 6239003.0180800

Assembly DrawingNo: AC1197-03 ASC 35kV SP Tangent 0-6° GO95 BM-24 Hendrix

2	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
4	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
4	SNUT5/8-XX *	NUT SQUARE 5/8"
0	STAPLE-03 *	GROUND WIRE STAPLE, COPPER CLAD OR GALVANIZED
4	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)

Parts for Pole ID: 6 Utility Pole ID: 6239003.0181803

Assembly DrawingNo: AC1197-03 ASC 35kV SP Tangent 0-6° GO95 BM-24 Hendrix

2	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
4	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
4	SNUT5/8-XX *	NUT SQUARE 5/8"
0	STAPLE-03 *	GROUND WIRE STAPLE, COPPER CLAD OR GALVANIZED
4	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)

Parts for Pole ID: 7 Utility Pole ID: 6239003.0181802

Assembly DrawingNo: AC1116-03 ASC 35KV SP Angle <60 7-60° BM-24 Hendrix

1	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
1	PSAC-01	Clamp Angle Steel Hot-Dipped Galvanized Finish 7-1/4 H 4-1/2 W Rated LD 20,000 Lbs 8.25 Lbs Permanent Stringing Cast Steel Use With Msg-Pull-Grip-Asy (Bull Rope to Messenger Pulling Grip Assembly for PSAC Bull Rope Size 5/8". Fits All Hendrix Standa
1	SSP-2	Insulator Pin Galvanized Steel HDG ASTM A-123 Finish 9-1/2 H 2 W 1.75 Lbs 3/4" Short Shank w/1" Nylon Thread Diameter

0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
1	EBLT3/4-XX *	BOLT, EYE, 3/4" X REQ. LENGTH
1	GUYATTACH-XX *	Guy Hook Attachment
2	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
0	STAPLE-XX *	GROUND WIRE STAPLE (SIZE AND TYPE AS REQUIRED)
3	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)

Parts for Pole ID: 8 Utility Pole ID: 6239003.0181801

Assembly DrawingNo: AC1116-03 ASC 35KV SP Angle <60 7-60° BM-24 Hendrix

1	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
1	PSAC-01	Clamp Angle Steel Hot-Dipped Galvanized Finish 7-1/4 H 4-1/2 W Rated LD 20,000 Lbs 8.25 Lbs Permanent Stringing Cast Steel Use With Msg-Pull-Grip-Asy (Bull Rope to Messenger Pulling Grip Assembly for PSAC Bull Rope Size 5/8". Fits All Hendrix Standa
1	SSP-2	Insulator Pin Galvanized Steel HDG ASTM A-123 Finish 9-1/2 H 2 W 1.75 Lbs 3/4" Short Shank w/1" Nylon Thread Diameter
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
1	EBLT3/4-XX *	BOLT, EYE, 3/4" X REQ. LENGTH
1	GUYATTACH-XX *	Guy Hook Attachment
2	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
0	STAPLE-XX *	GROUND WIRE STAPLE (SIZE AND TYPE AS REQUIRED)
3	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)

Parts for Pole ID: 9 Utility Pole ID: 6239003.0181800

Assembly DrawingNo: AC1197-03 ASC 35kV SP Tangent 0-6° GO95 BM-24 Hendrix

2	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
4	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
4	SNUT5/8-XX *	NUT SQUARE 5/8"
0	STAPLE-03 *	GROUND WIRE STAPLE, COPPER CLAD OR GALVANIZED
4	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)

Parts for Pole ID: 10 Utility Pole ID: 6239003.0182802

Assembly DrawingNo: AC1197-03 ASC 35kV SP Tangent 0-6° GO95 BM-24 Hendrix

2	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
4	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
4	SNUT5/8-XX *	NUT SQUARE 5/8"
0	STAPLE-03 *	GROUND WIRE STAPLE, COPPER CLAD OR GALVANIZED
4	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)

Parts for Pole ID: 11 Utility Pole ID: NEW POLE 1

Assembly DrawingNo: AC1197-03 ASC 35kV SP Tangent 0-6° GO95 BM-24 Hendrix

2	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000

0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
4	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
4	SNUT5/8-XX *	NUT SQUARE 5/8"
0	STAPLE-03 *	GROUND WIRE STAPLE, COPPER CLAD OR GALVANIZED
4	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Parts for Pole ID: 12 Utility Pole ID: 6239003.0182800		
Assembly DrawingNo: AC1197-03 ASC 35kV SP Tangent 0-6° GO95 BM-24 Hendrix		
2	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
4	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
4	SNUT5/8-XX *	NUT SQUARE 5/8"
0	STAPLE-03 *	GROUND WIRE STAPLE, COPPER CLAD OR GALVANIZED
4	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Parts for Pole ID: 13 Utility Pole ID: 6239003.0183802		
Assembly DrawingNo: AC1197-03 ASC 35kV SP Tangent 0-6° GO95 BM-24 Hendrix		
2	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
4	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
4	SNUT5/8-XX *	NUT SQUARE 5/8"
0	STAPLE-03 *	GROUND WIRE STAPLE, COPPER CLAD OR GALVANIZED
4	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Parts for Pole ID: 14 Utility Pole ID: 6239003.0183801		
Assembly DrawingNo: AC1117-03 ASC 35kV SP DDE - Tangent 0-6° BM-24 Hendrix		
1	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
2	CG-0118	CND Dead End Grip Neoprene Coated Cnd Dia Range 0.784-0.834 Blue 38"
2	HDTC	Clevis - Heavy Duty Thimble Galvanized Steel 5-1/2 H 3-1/4 W Rated LD 40,000 Lbs 2.75 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
2	MG-4128	Messenger DE Grip For 7#6 Blue 39" Long
1	SSP-2	Insulator Pin Galvanized Steel HDG ASTM A-123 Finish 9-1/2 H 2 W 1.75 Lbs 3/4" Short Shank w/1" Nylon Thread Diameter
2	TC	Thimble Clevis, Galvanized Galvanized Steel HDG ASTM A-123 Finish Rated LD 2,500 Lbs 1.14 Lbs
Parts for Pole ID: 15 Utility Pole ID: NO POLE NUMBER		
Assembly DrawingNo: AC1113-03 ASC 35kV SP Tangent - Typical 0-6° BM-24 Hendrix		
1	BAS-24F	BRACKET - Anti-Sway 0-6° 24" Max Sys Vltg 46kV High Density Polyethylene 1.30 Lbs
1	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	RTL-20VXL	Spacer 35kV Single Phase Vertical HDP GO95 Leakage Distance 30 1/2 1.69 Lbs
1	TS-1	Stirrup - Tangent Bracket Ductile Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 1.55 Lbs
1	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
1	LSCRW1/2X4-XX *	SCREW, LAG, 1/2 x 4"
2	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
0	STAPLE-XX *	GROUND WIRE STAPLE (SIZE AND TYPE AS REQUIRED)
2	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"

0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Parts for Pole ID: 16 Utility Pole ID: 6239003.0183800		
Assembly DrawingNo: AC1113-03 ASC 35kV SP Tangent - Typical 0-6° BM-24 Hendrix		
1	BAS-24F	BRACKET - Anti-Sway 0-6° 24" Max Sys Vltg 46kV High Density Polyethylene 1.30 Lbs
1	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	RTL-20VXL	Spacer 35kV Single Phase Vertical HDP GO95 Leakage Distance 30 1/2 1.69 Lbs
1	TS-1	Stirrup - Tangent Bracket Ductile Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 1.55 Lbs
1	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
1	LSCRW1/2X4-XX *	SCREW, LAG, 1/2 x 4"
2	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
0	STAPLE-XX *	GROUND WIRE STAPLE (SIZE AND TYPE AS REQUIRED)
2	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Parts for Pole ID: 17 Utility Pole ID: 6239003.0184802		
Assembly DrawingNo: AC1117-03 ASC 35kV SP DDE - Tangent 0-6° BM-24 Hendrix		
1	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
2	CG-0118	CND Dead End Grip Neoprene Coated Cnd Dia Range 0.784-0.834 Blue 38"
2	HDTC	Clevis - Heavy Duty Thimble Galvanized Steel 5-1/2 H 3-1/4 W Rated LD 40,000 Lbs 2.75 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
2	MG-4128	Messenger DE Grip For 7#6 Blue 39" Long
1	SSP-2	Insulator Pin Galvanized Steel HDG ASTM A-123 Finish 9-1/2 H 2 W 1.75 Lbs 3/4" Short Shank w/1" Nylon Thread Diameter
2	TC	Thimble Clevis, Galvanized Galvanized Steel HDG ASTM A-123 Finish Rated LD 2,500 Lbs 1.14 Lbs
Parts for Pole ID: 18 Utility Pole ID: 6239003.0184801		
Assembly DrawingNo: AC1197-03 ASC 35kV SP Tangent 0-6° GO95 BM-24 Hendrix		
2	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
4	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
4	SNUT5/8-XX *	NUT SQUARE 5/8"
0	STAPLE-03 *	GROUND WIRE STAPLE, COPPER CLAD OR GALVANIZED
4	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Parts for Pole ID: 19 Utility Pole ID: 6239003.0184800		
Assembly DrawingNo: AC1116-03 ASC 35KV SP Angle <60 7-60° BM-24 Hendrix		
1	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
1	PSAC-01	Clamp Angle Steel Hot-Dipped Galvanized Finish 7-1/4 H 4-1/2 W Rated LD 20,000 Lbs 8.25 Lbs Permanent Stringing Cast Steel Use With Msg-Pull-Grip-Asy (Bull Rope to Messenger Pulling Grip Assembly for PSAC Bull Rope Size 5/8". Fits All Hendrix Standa
1	SSP-2	Insulator Pin Galvanized Steel HDG ASTM A-123 Finish 9-1/2 H 2 W 1.75 Lbs 3/4" Short Shank w/1" Nylon Thread Diameter
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
1	EBLT3/4-XX *	BOLT, EYE, 3/4" X REQ. LENGTH
1	GUYATTACH-XX *	Guy Hook Attachment
2	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
0	STAPLE-XX *	GROUND WIRE STAPLE (SIZE AND TYPE AS REQUIRED)
3	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"

0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Parts for Pole ID: 20 Utility Pole ID: 6239003.0185800		
Assembly DrawingNo: AC1197-03 ASC 35kV SP Tangent 0-6° GO95 BM-24 Hendrix		
2	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
4	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
4	SNUT5/8-XX *	NUT SQUARE 5/8"
0	STAPLE-03 *	GROUND WIRE STAPLE, COPPER CLAD OR GALVANIZED
4	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Parts for Pole ID: 21 Utility Pole ID: 6239003.0185701		
Assembly DrawingNo: AC1113-03 ASC 35kV SP Tangent - Typical 0-6° BM-24 Hendrix		
1	BAS-24F	BRACKET - Anti-Sway 0-6° 24" Max Sys Vltg 46kV High Density Polyethylene 1.30 Lbs
1	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	RTL-20VXL	Spacer 35kV Single Phase Vertical HDP GO95 Leakage Distance 30 1/2 1.69 Lbs
1	TS-1	Stirrup - Tangent Bracket Ductile Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 1.55 Lbs
1	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
1	LSCRW1/2X4-XX *	SCREW, LAG, 1/2 x 4"
2	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
0	STAPLE-XX *	GROUND WIRE STAPLE (SIZE AND TYPE AS REQUIRED)
2	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Parts for Pole ID: 22 Utility Pole ID: 6239003.0185700		
Assembly DrawingNo: AC1113-03 ASC 35kV SP Tangent - Typical 0-6° BM-24 Hendrix		
1	BAS-24F	BRACKET - Anti-Sway 0-6° 24" Max Sys Vltg 46kV High Density Polyethylene 1.30 Lbs
1	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	RTL-20VXL	Spacer 35kV Single Phase Vertical HDP GO95 Leakage Distance 30 1/2 1.69 Lbs
1	TS-1	Stirrup - Tangent Bracket Ductile Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 1.55 Lbs
1	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
1	LSCRW1/2X4-XX *	SCREW, LAG, 1/2 x 4"
2	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
0	STAPLE-XX *	GROUND WIRE STAPLE (SIZE AND TYPE AS REQUIRED)
2	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Parts for Pole ID: 23 Utility Pole ID: 6239003.0186702		
Assembly DrawingNo: AC1113-03 ASC 35kV SP Tangent - Typical 0-6° BM-24 Hendrix		
1	BAS-24F	BRACKET - Anti-Sway 0-6° 24" Max Sys Vltg 46kV High Density Polyethylene 1.30 Lbs
1	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	RTL-20VXL	Spacer 35kV Single Phase Vertical HDP GO95 Leakage Distance 30 1/2 1.69 Lbs
1	TS-1	Stirrup - Tangent Bracket Ductile Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 1.55 Lbs
1	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
1	LSCRW1/2X4-XX *	SCREW, LAG, 1/2 x 4"
2	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
0	STAPLE-XX *	GROUND WIRE STAPLE (SIZE AND TYPE AS REQUIRED)
2	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Parts for Pole ID: 24 Utility Pole ID: 6239003.0186701		

Assembly DrawingNo: AC1113-03 ASC 35kV SP Tangent - Typical 0-6° BM-24 Hendrix		
1	BAS-24F	BRACKET - Anti-Sway 0-6° 24" Max Sys Vltg 46kV High Density Polyethylene 1.30 Lbs
1	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	RTL-20VXL	Spacer 35kV Single Phase Vertical HDP GO95 Leakage Distance 30 1/2 1.69 Lbs
1	TS-1	Stirrup - Tangent Bracket Ductile Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 1.55 Lbs
1	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
1	LSCRW1/2X4-XX *	SCREW, LAG, 1/2 x 4"
2	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
0	STAPLE-XX *	GROUND WIRE STAPLE (SIZE AND TYPE AS REQUIRED)
2	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Parts for Pole ID: 25 Utility Pole ID: 6239003.0186700		
Assembly DrawingNo: AC1197-03 ASC 35kV SP Tangent 0-6° GO95 BM-24 Hendrix		
2	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
4	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
4	SNUT5/8-XX *	NUT SQUARE 5/8"
0	STAPLE-03 *	GROUND WIRE STAPLE, COPPER CLAD OR GALVANIZED
4	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Parts for Pole ID: 26 Utility Pole ID: 6239003.0186600		
Assembly DrawingNo: AC1117-03 ASC 35kV SP DDE - Tangent 0-6° BM-24 Hendrix		
1	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
2	CG-0118	CND Dead End Grip Neoprene Coated Cnd Dia Range 0.784-0.834 Blue 38"
2	HDTC	Clevis - Heavy Duty Thimble Galvanized Steel 5-1/2 H 3-1/4 W Rated LD 40,000 Lbs 2.75 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
2	MG-4128	Messenger DE Grip For 7#6 Blue 39" Long
1	SSP-2	Insulator Pin Galvanized Steel HDG ASTM A-123 Finish 9-1/2 H 2 W 1.75 Lbs 3/4" Short Shank w/1" Nylon Thread Diameter
2	TC	Thimble Clevis, Galvanized Galvanized Steel HDG ASTM A-123 Finish Rated LD 2,500 Lbs 1.14 Lbs
Parts for Pole ID: 27 Utility Pole ID: 6239003.0187601		
Assembly DrawingNo: AC1197-03 ASC 35kV SP Tangent 0-6° GO95 BM-24 Hendrix		
2	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
4	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
4	SNUT5/8-XX *	NUT SQUARE 5/8"
0	STAPLE-03 *	GROUND WIRE STAPLE, COPPER CLAD OR GALVANIZED
4	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Parts for Pole ID: 28 Utility Pole ID: 6239003.0187600		
Assembly DrawingNo: AC1197-03 ASC 35kV SP Tangent 0-6° GO95 BM-24 Hendrix		
2	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000

0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
4	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
4	SNUT5/8-XX *	NUT SQUARE 5/8"
0	STAPLE-03 *	GROUND WIRE STAPLE, COPPER CLAD OR GALVANIZED
4	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Parts for Pole ID: 29 Utility Pole ID: 6239003.0188601		
Assembly DrawingNo: AC1197-03 ASC 35kV SP Tangent 0-6° GO95 BM-24 Hendrix		
2	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
4	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
4	SNUT5/8-XX *	NUT SQUARE 5/8"
0	STAPLE-03 *	GROUND WIRE STAPLE, COPPER CLAD OR GALVANIZED
4	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Parts for Pole ID: 30 Utility Pole ID: 6239003.0188502		
Assembly DrawingNo: AC1197-03 ASC 35kV SP Tangent 0-6° GO95 BM-24 Hendrix		
2	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
4	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
4	SNUT5/8-XX *	NUT SQUARE 5/8"
0	STAPLE-03 *	GROUND WIRE STAPLE, COPPER CLAD OR GALVANIZED
4	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Parts for Pole ID: 31 Utility Pole ID: 6239003.0188501		
Assembly DrawingNo: AC1197-03 ASC 35kV SP Tangent 0-6° GO95 BM-24 Hendrix		
2	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
4	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
4	SNUT5/8-XX *	NUT SQUARE 5/8"
0	STAPLE-03 *	GROUND WIRE STAPLE, COPPER CLAD OR GALVANIZED
4	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Parts for Pole ID: 32 Utility Pole ID: 6239003.0188500		
Assembly DrawingNo: AC1197-03 ASC 35kV SP Tangent 0-6° GO95 BM-24 Hendrix		
2	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
4	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
4	SNUT5/8-XX *	NUT SQUARE 5/8"
0	STAPLE-03 *	GROUND WIRE STAPLE, COPPER CLAD OR GALVANIZED
4	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)

Parts for Pole ID: 33 Utility Pole ID: 6239003.0189500		
Assembly DrawingNo: AC1197-03 ASC 35kV SP Tangent 0-6° GO95 BM-24 Hendrix		
2	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
4	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
4	SNUT5/8-XX *	NUT SQUARE 5/8"
0	STAPLE-03 *	GROUND WIRE STAPLE, COPPER CLAD OR GALVANIZED
4	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Parts for Pole ID: 34 Utility Pole ID: NO POLE NUMBER		
Assembly DrawingNo: AC1197-03 ASC 35kV SP Tangent 0-6° GO95 BM-24 Hendrix		
2	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
1	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
4	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
4	SNUT5/8-XX *	NUT SQUARE 5/8"
0	STAPLE-03 *	GROUND WIRE STAPLE, COPPER CLAD OR GALVANIZED
4	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Parts for Pole ID: 35 Utility Pole ID: 6239003.0189401		
Assembly DrawingNo: AC1124-03 ASC 35kV SP Dead End - Riser 0-6° Hendrix		
1	CG-0118	CND Dead End Grip Neoprene Coated Cnd Dia Range 0.784-0.834 Blue 38"
1	HDTC	Clevis - Heavy Duty Thimble Galvanized Steel 5-1/2 H 3-1/4 W Rated LD 40,000 Lbs 2.75 Lbs
1	MG-4128	Messenger DE Grip For 7#6 Blue 39" Long
1	TC	Thimble Clevis, Galvanized Galvanized Steel HDG ASTM A-123 Finish Rated LD 2,500 Lbs 1.14 Lbs
1	ARRESTER-XX *	LIGHTNING ARRESTER, (TYPE & RATING AS REQUIRED)
0	CABLE-08 *	UNDERGROUND RISER CABLE
0	CONDUIT-XX *	CONDUIT (SIZE, TYPE, & LENGTH AS REQ'D)
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
2	EBLT3/4-XX *	BOLT, EYE, 3/4" X REQ. LENGTH
1	FUSECUTOUT-XX *	FUSED CUTOUT (TYPE AND VOLTAGE RATING AS REQUIRED)
1	GUYATTACH-XX *	Guy Hook Attachment
0	STAPLE-XX *	GROUND WIRE STAPLE (SIZE AND TYPE AS REQUIRED)
1	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
1	TERMINATOR-XX *	UNDERGROUND CABLE TERMINATOR
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Parts for Pole ID: 36 Utility Pole ID: spare		
Assembly DrawingNo: AC1116-03 ASC 35KV SP Angle <60 7-60° BM-24 Hendrix		
2	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
2	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
2	PSAC-01	Clamp Angle Steel Hot-Dipped Galvanized Finish 7-1/4 H 4-1/2 W Rated LD 20,000 Lbs 8.25 Lbs Permanent Stringing Cast Steel Use With Msg-Pull-Grip-Asy (Bull Rope to Messenger Pulling Grip Assembly for PSAC Bull Rope Size 5/8". Fits All Hendrix Standa
2	SSP-2	Insulator Pin Galvanized Steel HDG ASTM A-123 Finish 9-1/2 H 2 W 1.75 Lbs 3/4" Short Shank w/1" Nylon Thread Diameter
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
2	EBLT3/4-XX *	BOLT, EYE, 3/4" X REQ. LENGTH
2	GUYATTACH-XX *	Guy Hook Attachment

4	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
0	STAPLE-XX *	GROUND WIRE STAPLE (SIZE AND TYPE AS REQUIRED)
6	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)
Assembly DrawingNo: AC1117-03 ASC 35kV SP DDE - Tangent 0-6° BM-24 Hendrix		
2	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
4	CG-0118	CND Dead End Grip Neoprene Coated Cnd Dia Range 0.784-0.834 Blue 38"
4	HDTC	Clevis - Heavy Duty Thimble Galvanized Steel 5-1/2 H 3-1/4 W Rated LD 40,000 Lbs 2.75 Lbs
2	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
4	MG-4128	Messenger DE Grip For 7#6 Blue 39" Long
2	SSP-2	Insulator Pin Galvanized Steel HDG ASTM A-123 Finish 9-1/2 H 2 W 1.75 Lbs 3/4" Short Shank w/1" Nylon Thread Diameter
4	TC	Thimble Clevis, Galvanized Galvanized Steel HDG ASTM A-123 Finish Rated LD 2,500 Lbs 1.14 Lbs
Assembly DrawingNo: AC1197-03 ASC 35kV SP Tangent 0-6° GO95 BM-24 Hendrix		
6	BM-24	BRACKET - Tangent Messenger w/MC-2 Messenger Clamp 0-6° 24" Max Sys Vltg 46kV Duct Iron ASTM A536 65-45-12 HDG ASTM A-123 Finish 20.50 Lbs
3	HPI-35VTC-01	INSL Poly 35kV VTOP 1" Pin Dia F-Neck Ceramic Insrt Gray 8 Per Box Cntry Orgn: USA Tariff Class: 8546.90.0000
0	CONNECTOR-XX *	CONNECTOR (SIZE AND TYPE AS REQUIRED)
12	MBLT5/8-XX *	BOLT, MACHINE, 5/8" X REQ. LENGTH
12	SNUT5/8-XX *	NUT SQUARE 5/8"
0	STAPLE-03 *	GROUND WIRE STAPLE, COPPER CLAD OR GALVANIZED
12	SWSH5/8-XX *	WASHER, SQUARE, 5/8 x 2-1/4"
0	WIRE-XX *	GROUND WIRE, SOFT DRAWN COPPER, SOLID #6AWG (MINIMUM)

CIRCUIT MATERIAL

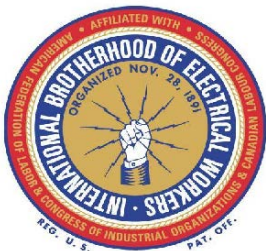
Hendrix Part #	Description	Quantity	CustSupplied
ACS0040PA15-00	Storm Kit 3P 4/0 AAC 7X PACT 15kV 75 3Lyr BLK Cbl Splice KM15-40 For 7#6AW - 052AWA MSG Grip MG-4128 Splice MS-4128	1	No
Al-Shim-24	SHIM PLATE Used with BM-14 / BM-24 when mountng to flat surfaces	3	No
KM15-40	Cold Shrink Splice Cover Kit Conductor Size Range 4/0 AWG Cable Cover Range .0150 - 0.165 Cable Diameter Range 0.800 - 1.140 15kV	1	No
LINEDUC-GR	Line-Duc 8' Sections Grey 3.04 Lbs	4	No
MSG052AWA007-01	MSGR BARE 1/0 0.486 AWA 5 Stl 2 Al LHL 1/0 AL EQV Conductivity 17,120 Strngth Lbs CTO	8200	No
RTL-20VDM	Spacer 35kV Single Phase Vertical HDP G095 MSC-2 Clamp Leakage Distance 30 1/2 2.6 Lbs	254	No
S0040PA15G3-00	Spacer Cable System Cable 4/0 AAC 7X PACT 15kV 75 3Lyr SC-CS .015 HMW 0.075 CH69 0.075 GRY 1C CTO Aerial Cable Specification	8200	No

PAC_289.45

Accident Prevention Manual

June 2019

(This manual supersedes all previous versions)



Joint Venture with:
IBEW Local 125
IBEW Local 659
UWUA Local 197



 **PACIFIC POWER**
A DIVISION OF PACIFICORP

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APM and Grounding Committee Membership:

Steve Harkin	Director of Safety & Training
Patricia Muffley	Senior Safety & Compliance Specialist
Doyle Green	Senior Safety Administrator
David Preston	Senior Safety Administrator
Michael Walters	Senior Safety & Compliance Specialist
Brian Watson	Manager, Distribution – Roseburg
Milton Buker	Director of Field Operations – Central Wires
Richard Harris	Manager, Distribution – Yreka/Mt Shasta
Jackie Carter	Manager, Procurement & Materials
Gilbert Baker	General Foreman – Albany
Jerry Ralls	General Foreman – Bend
David Lindsley	General Foreman – Coos Bay
Kevin Meeker	Meter Working Foreman – Prineville
Riley Foster	Line Foreman – Portland
John Kropholler	Line Foreman – Klamath Falls
Christan Muller	Substation Working Foreman – Albany
Chuck Cyr	Wireman Working Foreman – Yakima
Pat Lanigan	Senior Meter Relay Technician – Bend
Andy Garatea	Journeyman Meterman – Klamath Falls
Bill Miller	Meter Relay Technician – Hydro South
Ursal Miller	Journeyman Lineman – Medford
Jeff Anderson	Journeyman Serviceman – Medford
Jason Ihrig	Hydro Wireman – Hydro North

LETTER FROM: STEFAN BIRD

Dear colleagues,

At Pacific Power, safety is and always will be our most important priority, and our goal is always the same: that everyone goes home at the end of each work day uninjured and accident-free. To get there, we each must take personal responsibility for safety in our workplace, and we must work together, side by side, in trust and partnership.

This updated Accident Prevention Manual is the result of the continued partnership of our co-workers, members of the safety team, and each of our three unions. Together they produced one of our most important tools to help you do your job safely, the minimum safety standards and procedures for our workplace.

This new edition contains some important updates that were achieved through the hard work and dedication of the APM committee. Together they identified and closed gaps in the previous manual and documented improvements to help everyone work safer and smarter. To share just one example, they rewrote the procedures for doing secondary work, including improvements in PPE requirements and testing and isolating procedures.

It wasn't easy work. There was plenty of debate and sometimes even argument. But with the journeymen leading the charge to hold themselves to a higher standard, the committee came to a consensus that will help make our workplace and work practices even safer.

I'm personally very proud of the way the APM committee came together. To have three unions and Pacific Power employees and managers all pulling in the same direction is truly impressive. The output of the committee is stronger because of their collaboration and because each of the diverse individuals involved was willing to take ownership in the process.

I commend them for the important work they've done and ask each of us to approach each day with that same combination of deep personal commitment to safety and a spirit of collaboration and partnership. Because safety takes all of us, every day, pulling in the same direction.

Stefan Bird

President and CEO

Pacific Power

LETTER FROM: LOCAL – IBEW – 125

With the collaboration of IBEW Locals 125 and 659 along with UWUA 197 and Pacific Power management, the Accident Prevention Manual (APM) Committee members have again managed to retain the integrity of this essential tool. Throughout the electric utility industry, a variety of changes continue to mandate that our APM serves its purpose—to ensure that each employee can go home each day. Thanks to our APM Committee's efforts as well as industry best practices, issues, and concerns have been analyzed and discussed to decide whether changes were needed in our APM.

The APM is an extraordinary tool for ALL employees, regardless of their knowledge and experience. As more renewable projects go online, and the Company faces increased competition, our members are subject to more scrutiny than ever as they continue to work diligently to ensure hazards are mitigated and the work is performed safely. Our Union will never stand for its members being asked to deviate from any safety rule. None of you need a reminder about the inherent danger of our work, and you know that your family is depending on you to perform your work safely each day.

Pacific Power's leadership has increased its communication and collaboration, and I believe these actions provide more opportunities for our members to share their knowledge and experience as the journey to

zero accidents remains a target for all of us. There is no one-size-fits all solution to many situations that you face while working, and there is no magic answer when incidents occur to explain why they happened. What we can do is maintain a commitment to work together, put forth the effort to create an environment that has the highest of standards, and continue to trust that our brothers and sisters will work professionally and safely each day.

We have the ability to define a safety culture through our actions. We do the work and don't make excuses. We ensure that we truly are our brother's/sister's keeper, and we do everything necessary to honor the IBEW's legacy of safety. Even the most experienced member must remember the basics—make no assumptions, avoid shortcuts, work within your knowledge and skill, and communicate.

And to the members who serve on this Committee, I thank you. This is not easy work, but your passion, professionalism, and experience are needed to ensure that our future is secure while meeting today's needs. Without your leadership, it would be difficult to continue moving in the right direction. We know what behaviors we want to see from our co-workers, and we know what we expect of ourselves. Through the application of our APM, I believe that we have positive reinforcement each day and a constant reminder of how important it is that we work together. I know we are on the right path to changing

undesired behavior, and I thank you for helping us get to our goal of zero accidents.

I'm proud of the progress that we have made, but by no means, are we finished. As IBEW members, we know that our vigilance is necessary to ensure that we maintain our gains but must never rest on these successes. Please work safely each day; your family depends on it.

Fraternally,

Travis Eri
Business Manager/Financial Secretary
IBEW Local 125

LETTER FROM: LOCAL – UWUA – 197

To all members of UWUA Local 197, IBEW Local 659 and IBEW Local 125,

What you hold in your hands is a very good guideline to follow for a safer workplace. It covers many of the situations (but not all) you may run into in the course of your workday. Members representing the three Local Unions, being equals, worked together to come up with these rules and we all thank them.

What does this manual cannot do is replace common sense. Get in the habit of making safety your priority.

Come to the jobsite every day with a positive attitude, look out for one another, have fun and you will never work a in your life.

Thank you very much,

David Lindsley

President

Utility Workers Union of America Local 197

Coos Bay, Oregon

LETTER FROM: LOCAL – IBEW – 659

I sincerely appreciate our members and committee delegates who volunteered their time and effort, as well as our sister Local, IBEW 125, and UWUA 197. This joint committee, over the course of several years, by engaging in mutual trust with the Safety Department and Management, have been able to explore a common goal approach to sound safe work practices.

Over the last twenty-five years in my association with Pacific Power, I have witnessed immense positive changes in the Company's and our members' approach and attitude toward this manual.

Everyday our members demonstrate their professionalism, by making the difficult look simple, and mitigating the hazards to provide a safe work environment. This manual is a product of that effort. You won't find the answer to every scenario contained in this manual, but it does contain the tools for every member to go home safe every day.

Our very own Union was conceived during a time that subjected workers to an unconscionable death rate. From the start of the National Brotherhood of Electrical Workers the goal was to improve the lives of our brothers and sisters through safer work practices.

Working safely is a culture. We take pride in our skills and how productive we are. No one takes pride in being injured,

not speaking up, and certainly there is no pride when an injury is the result of one's lack of action.

Even with all our efforts today, we too often witness or hear of a co-worker that won't make it home that night because of an accident. The core truth about safe work practices? Safety is the duty of everyone, everywhere, every day. It never stops.

We are hands down the best at what we do. Now let's be the best at going home safe every night. It's a group effort, and we are the group to get it done.

It's our IBEW commitment to be our best every day, and it should make us proud in knowing we all share that same commitment.

Fraternally,

Mike Scarminach
Business Manager
I.B.E.W. Local Union 659

Section I – Introductions

- 1.0 All company employees shall be responsible to follow all the minimum safety standards required by Federal, State and Local authorities, whether specifically referenced in this manual or not.
- 1.1. These rules and regulations have been compiled after due consideration of safe working practices and conditions and to comply with accepted standards in the industry. References are state codes of Oregon, Washington, California and Federal Occupational Safety and Health Act (OSHA).
- 1.2. The rules which describe methods do so only as far as they affect safety and are not intended to be a complete description of the procedure for carrying out the work described.
- 1.3. When jobs are to be performed that present unusual hazards, and are possibly not covered by these rules, the foreman, or Qualified Employee who is in direct charge of the work, **shall** determine the safest methods consistent with the Company's obligation to render service to customers, and it **shall** be the policy of the Company that employees **shall not** take

exceptional personal risks to protect customer's service or Company equipment.

1.4. All personal pronouns used in this manual refer to either gender.

Section II – Definitions

2.0 The terms used in these rules shall be interpreted in the most commonly accepted sense and shall be consistent with the Electric Utility Industry.

2.1. “Shall” and “Must” are used to indicate provisions which are mandatory. **“Should”** is used to indicate provisions which are not mandatory, though preferable. If, however, work conditions permit the application of the rule, it shall be followed.

2.2. The term **“approved”** shall mean acceptable to the Company through its Safety Department.

2.3. The term **“energized”** shall mean any current conductive material upon which a voltage is present.

2.4. The term **“energized”** shall also mean any device or equipment connected to an energy source or containing residual or stored energy.

2.5. The term **“low voltage”** shall mean any conductor energized up to 600 volts.

2.6. The term **“high voltage”** shall mean any conductor energized in excess of 600 volts.

2.7. The term “**extra high voltage**” shall mean any voltage over 230,000 volts, phase to phase.

2.8. The term “**authorized**” shall mean one who is properly authorized to perform specific duties under certain conditions, or one who is carrying out orders from a responsible authority.

2.9. The term “**qualified employee**” shall mean one has received training in and has demonstrated skills and knowledge in the construction and operation of electric equipment and installations and has received the safety training to identify and avoid the hazards involved.

2.10. “**Primary area**” is an area where a worker is able to breach the accepted Minimum Approach Distance as specified in [Section 5.0](#).

2.11. The term “**clearance**” is a formal guarantee by the qualified employee or responsible dispatcher that all known sources which could energize a specific circuit or piece of equipment, either electrically, hydraulically, pneumatically, or mechanically have been opened, closed, or disconnected following approved company procedures, and that this specific circuit or equipment shall not be reconnected or prepared

for energization until the “clearance” has been cancelled. ([Refer to Section 12.9](#))

2.12. The term “**terminal clearance**” is a guarantee issued by the dispatcher/grid operator that a terminal has been de-energized and tagged out at visual open points at the normal sources, and remains that way until the person receiving the terminal clearance releases it. A terminal clearance is only given when all known possible sources for energizing the terminal have been switched open, locked if the equipment allows and tagged out. Terminals covered by terminal clearances cannot be energized through the tagged switch(s), even by the person issued the terminal clearance, until directed to do so by the controlling dispatcher/grid operator. Terminal clearances are issued to foreign utilities where PacifiCorp dispatcher/grid operators only have control of PacifiCorp’s end of a line (typically transmission lines) or when a clearance cannot be issued because the dispatcher/grid operator cannot control all locations where a circuit could be energized (typically distribution lines).

2.13. The term “**hold**” is a formal guarantee by the qualified employee or responsible dispatcher that a specific circuit or piece of equipment will not be re-energized by automatic recloser. Also, re-energizing by remote or manual controls will not be done until the person having the “hold” has been contacted and the “hold” released.

2.14. “**Lockout/Tagout**” is a formal procedure of locks, tags and documentation to assure that all possible energy sources which could energize a specific circuit or piece of equipment have been isolated following approved company procedures.

2.15. An “**energy isolating**” device is a physical device that prevents the transmission or release of energy, including, but not limited to the following: a manually operated electric circuit breaker, a disconnect switch, a manually operated switch, a slide gate, a slip blind, a line valve, blocks and any similar device with a visible indication of the position of the device. Push buttons, selector switches and other control-circuit-type devices are not energy isolating devices.

2.16. An “**energy source**” is any electrical, mechanical, hydraulic, pneumatic, chemical, nuclear, thermal or other energy source that could cause injury to personnel.

2.17. A “**Tail Board/Job Brief**” conference is: A briefing that shall cover at least the following subjects: hazards associated with the job, work procedures involved, special precautions, energy source controls, and personal protective equipment requirements.

2.18. “**Guards and Barriers**” are protective equipment that is installed on unprotected conductors; these can be made of Rubber, Plastic, or other materials. Rubber guards and barriers must be tested every 180 days. All guards and barriers shall be inspected before each use. The use of manufactures inspection, testing, cleaning, handling and storage procedures will be strictly complied with. Guards and barriers that are properly cared for are good up to the voltage rating of each piece.

2.19. “**Rubber Protective Equipment**” is rubber goods that a worker wears. Such as; rubber gloves, rubber sleeves, etc.

Section III – Responsibilities

3.0 Responsibilities

3.1. Company Responsibilities

- 3.1.1.** Throughout its system, PacifiCorp shall exercise responsibility toward safety and plan and guide an active safety program. The Company shall always promote the safest work method possible.
- 3.1.2.** The Company shall be required to provide a mandatory safety orientation and certify all new or transferred employees are familiar with this Accident Prevention Manual, prior to starting work.
- 3.1.3.** The Company shall provide and maintain required safety protective devices and instruct its workers in their proper use.
- 3.1.4.** The Company shall require its employees to observe and enforce safety rules as prescribed herein. The Company shall provide the employees training in safe work practices and methods upon their initial assignment, in hire, or transfer, before being assigned field duty.

3.1.5. The Company will make copies of procedures available to all affected employees and said procedures will be incorporated by reference into this manual.

3.1.5.1. When changes are made in this manual, adequate training will be done, in a timely manner, to ensure that the employees are conversant with these changes and they have the opportunity to learn and ask questions about them.

3.1.6. When workers report hazards, the Company shall accept the report in a cooperative manner and shall follow up to resolve the issue in a timely manner.

3.1.7. No person shall be reprimanded, disciplined, or penalized for reporting hazards, using a safer method, or participating in any safety related issue.

3.1.8. The Company shall appoint a representative to investigate all accidents of a serious nature and, where possible, take remedial steps to prevent repetition of similar accidents. When formal investigations or hearings are held on accidents of unusual severity, the Company

representative in charge of the investigation shall request the Union to designate a representative to be present and active in the investigation.

3.1.9. The Company shall provide First Aid and CPR training. (This training shall include instructions on transporting of injured personnel)

3.1.10. New construction standards and equipment shall be designed to incorporate maximum safe working conditions. Safety shall be the primary focus of new equipment.

3.2. Foreman's/Immediate Supervisory Responsibilities

3.2.1. Foremen are at all times responsible for:

3.2.1.1. The enforcement of the safety rules to the extent of taking disciplinary steps to accomplish this.

3.2.1.2. All accidents to workers under their jurisdiction, unless investigation proves that such accidents were due to conditions beyond the foreman's control.

- 3.2.2.** Foremen are responsible for all tools and equipment used by persons under their supervision. They shall make inspections of tools of workers under their supervision and inspect, or designate someone to inspect, conditions of tools and equipment under their supervision.
- 3.2.3.** Foremen shall prohibit the use of tools and equipment that are not safe for use.
- 3.2.4.** Foremen shall report to their immediate supervisor any defective or otherwise unsafe tools; equipment or vehicles and remedial action shall be taken.
- 3.2.5.** Foremen shall be responsible for the manner in which tools and equipment are used. They shall train their crews in the proper safe use of such items.
- 3.2.6.** Foremen shall be responsible for the proper use of safety devices and equipment such as road warning signs and flags, flares, barricades or any other device necessary to safeguard the workers or the general public.

3.2.7. Foremen shall request that each worker under their supervision be familiar with the safety rules contained herein and require that each worker comply with them.

3.2.8. Foremen shall arrange work so it may be done with minimum hazards, and shall be responsible for the assignment of workers to the various parts of the job to be done. Foremen shall instruct workers as to the type and voltages of circuits on or near which they work and hold a tail board conference to outline the work and hazards of the particular job.

3.2.9. Foremen shall not permit any person to work who appears to be under the influence of intoxicating or controlled substances.

3.2.10. Foremen shall be responsible for the conduct of their crews and shall not permit horseplay on the job.

3.2.11. When workers report hazards, foremen shall accept the report in a cooperative manner and follow up to resolve the issue in a timely manner.

3.2.12. No person shall be reprimanded or penalized for reporting hazards.

3.2.13. Foremen shall leave a job in as safe a condition as possible. Before leaving a job, it shall be their duty to correct, remove or arrange to give warning of any hazardous condition.

3.3. Worker's Responsibilities

3.3.1. Workers shall constantly keep in mind the safety of others as well as themselves and pay strict attention to the work at hand.

3.3.2. Workers shall use all protective devices as required, and shall exercise proper care and treatment toward such devices. Employees shall examine and determine to the best of their ability that such protective devices are safe for use.

3.3.3. Workers shall keep their personal tools and equipment in safe working condition.

3.3.4. Workers shall not indulge in horseplay or scuffle while on the job.

3.3.5. Workers shall not use intoxicating or controlled substances on the job or report for work while under their influence.

3.3.6. It shall be the duty of each worker to leave the job in as safe a condition as possible. Before

leaving a job, it shall be their duty to correct, remove or arrange to give warning of any hazardous condition.

3.3.7. All workers shall be proficient in first aid and CPR and possess a current card. New employees shall acquire the skill within sixty days of employment.

3.3.8. Workers who are required to perform work in an elevated position, or work on a crew performing such work, shall be capable of rendering structure or aerial rescue and same shall be practiced at least once in each six-month period. Practice sessions shall be arranged and documented by the Company.

3.3.9. Workers shall report all injuries immediately to their manager, or the manager in charge, or the dispatcher if manager(s) cannot be contacted and receive first aid treatment if necessary.

3.3.10. It is the duty, as well as the privilege, of every worker to report hazardous conditions. Reports shall be submitted in writing on a form provided by the Company. The status of written safety hazard reports shall be followed up to resolve the issue in a timely manner.

3.4. General Responsibilities

- 3.4.1.** When a worker or foreman in charge, finds the job assigned too difficult to be done safely, with the amount and type of personnel and equipment assigned, the worker shall request additional help or equipment which, in their opinion, is necessary to do the job safely. The worker shall not proceed with the hazardous portion of the assignment until such assistance or equipment is on the job and re-tail board has taken place.
- 3.4.2.** A worker called out after regular hours shall communicate with the dispatcher or their immediate supervisor before leaving and upon returning. Workers shall report to the dispatcher the nature of the job or trouble before proceeding with work, and upon completion of job, report back immediately. At all times, the worker shall keep in close contact with the dispatcher.
- 3.4.3.** If an employee's injuries are serious enough to require immediate medical attention, follow these guidelines:

3.4.3.1. Immediately administer first aid and stabilize the injured employee to prevent further injury.

3.4.3.2. Contact local emergency medical services for emergency medical care and transportation of the injured employee to medical facilities.

3.4.3.3. As soon as possible after the incident, report the incident to the responsible dispatcher.

3.4.3.4. If the injured employee must be transported by company vehicle, at least two employees should accompany the injured employee to the medical facility. It's important to have a second employee assisting in case the injured employee needs aid or care while being transported.

3.4.3.5. If emergency services cannot be contacted (e.g. due to the remote location, etc.), or if there are only two employees at the worksite in a remote location, one employee may use the company vehicle to transport the injured employee. Once within radio contact or cell service, local emergency medical services and the responsible dispatcher should be contacted

and arrangements should be made to meet at a rendezvous point either with the local medical services or another company employee. The employee driving should try to get this help as soon as possible.

NOTE: When working out of your local cell phone area, 911 calls may not go to the nearest EMS dispatch. Use of Company Radio/Phone to Dispatch is the preferred method.

Section IV – Protective Equipment Use, Care and Application

4.0 Personal Protective Equipment (PPE)

4.1. All safety equipment will be approved by the safety department.

4.2. Employees shall wear approved protective equipment at all times when the nature of their work or work area necessitates such protection for safe working conditions. Such protective equipment or clothing shall include, but not be limited to, safety hard hats, safety glasses, with side protection, hand protection, goggles or face shields, ear plugs or ear muffs, respirators, rubber gloves, aprons or protective coverings, fall protection and personal flotation devices.

4.2.1. Prior to use, the employee shall ensure that such protective equipment is in good repair, properly fitted or adjusted, clean and suitable for the protection required.

4.3. Workers working on or around energized conductors, equipment or moving machinery shall wear clothing that avoids danger of entanglement or electrical contact.

4.3.1. Workers shall wear clothing appropriate to the season and the kind of work being performed. Shirts or jumpers with full length sleeves rolled down, protective hard hats and safety glasses with side shields, shall be worn when working on or near energized parts or while climbing poles.

4.3.2. When work is performed within reaching distance of exposed energized parts of equipment, employees shall remove or render nonconductive all exposed conductive articles, such as key or watch chains, rings, or wristwatches or bands.

4.3.3. FR/AR rated PPE/clothing as described in the FR Clothing Policy shall be worn by employees whose job requirements could possibly expose them to the hazards of electrical arcs, or flames resulting from electrical arcs.
(2019)

NOTE: Fire resistant policies and rules may change as both parties mutually agree to more prudent practices and in compliance with state and federal OSHA requirements.

4.4. Protective devices such as rubber blankets, rubber line hose, plastic, phenolite or wood

shields, insulator covers, rubber gloves and rubber glove protectors, fuse pullers, hot sticks, grounding equipment and other special tools or devices for safety shall be provided and used when the nature of the work indicates their necessity and practicability for the protection of workers.

4.5. Adequate footwear, meeting ANSI or American Society for Testing and Materials (ASTM) with rated toe shall be worn and be utilized by all employees when: **(2019)**

4.5.1. In any occupation in which there is a danger of injury to the feet. Refer to [Company safety-toe policy](#). **(2019)**

4.5.2. When meter readers or other job classifications do not require safety footwear, substantial footwear that provides sturdy ankle support, with a traction sole that provides protection against penetration, shall be worn.

4.6. Head Protection OSHA 1910.135 Head protection must comply with Class E or ANSI Z89.1 and be utilized when:

4.6.1. In areas with a potential for injury from falling objects.

4.6.2. Hardhats designed to reduce electrical shock hazards must be worn when exposed electrical conductors that could contact the head

4.6.3. Each operator of an ATV or snowmobile shall wear an approved DOT helmet.

4.6.4. When required by the hazard assessment

4.7. Eye or eye/face protection OSHA 1910.133. Protection must comply with ANSI Z87. Such devices shall fit properly, be kept clean at all times and shall be worn when an employee is engaged in or in the vicinity of work involving hazards from the following:

4.7.1. Drilling or chipping stone, brick, concrete, paint, pipe coatings or metal.

4.7.2. Grinding, buffing or wire brushing, whether there is a guard or not.

4.7.3. Dust or flying particles.

4.7.4. Welding, cutting or burning.

4.7.5. The use of hot or dangerous substances.

4.7.6. Injurious light or heat rays.

4.7.7. While mixing or working near hazardous chemicals.

4.7.8. While operating machine tools.

4.7.9. Workers shall wear approved protection when working on any energized equipment where an electrical flash may occur or other hazardous conditions exist.

4.7.10. When required by the hazard assessment.

4.8. Hand Protection OSHA 1910.138. Hand protections must be utilized when employees are exposed to the following:

4.8.1. Skin absorption of hazardous materials

4.8.2. Severe cuts

4.8.3. Severe abrasions

4.8.4. Punctures

4.8.5. Chemicals

4.8.6. Thermal burns / harmful temperature extremes.

4.8.7. Each operator of an ATV or snowmobile shall wear appropriate gloves.

4.8.8. When required by the hazard assessment.

4.9. Hearing Protection OSHA 1910.95 - Hearing protection must be utilized when noise levels exceed safe limits.

4.10. Employees required to wear respiratory protection as a part of their work activity shall be able to obtain a face to face-piece seal and shall actually verify a seal exists each time a protective device is donned. An employee shall frequently confirm a seal exists when wearing the respiratory protection device for extended periods of time. The facial contact area of protective breathing equipment shall be clean shaven.

4.10.1. All emergency respiratory equipment shall be inspected on a monthly basis.

4.10.2. Positive pressure respirator does not require user to be clean shaven.

4.11. Fall protection (i.e. Harness, Lanyard) for workers exposed to arc flash hazards must comply with the ANSI Z359 and ASTM F887 standards.

4.12. Protective chaps shall be worn when operating a chain saw.

Exception 1: When working from a pole using the approved chain saw bracket.

Exception 2: When working from power operated aerial bucket equipment.

4.13. Rubber Protective Equipment

4.13.1. When an employee is required to work on or within MAD of any unprotected conductors that are or may become energized at more than 50 volts and less than 600 volts between phases, they shall take the following precautions:

4.13.1.1. They shall wear approved rubber gloves during the time they are working on such conductor, or

4.13.1.2. They shall cover, with approved devices, any adjacent unprotected conductor that could be touched by any part of their body, and use insulated and rated tools.

Note: Use of rubber gloves is recognized as best practice.

4.13.1.3. Conductors which are properly insulated for the voltages, to which they are energized, shall be considered as an effective barrier to protect the employees and **MAD** need not apply.

Note: Consideration should be given to de-energizing the meter socket before performing work.

4.13.1.4. It is understood that while performing tests, (i.e.: voltage checks, rotation checks, CT testing ECT) multiple phases may be left unprotected. It is considered acceptable to perform tests using the following practices:

4.13.1.4.1. All appropriate PPE are used.

4.13.1.4.2. Test equipment shall be insulated for the voltages being worked.

4.13.1.4.3. Care will be taken to minimize exposure to unprotected energized equipment.

4.13.2. When for any reason a worker is required to work on, or within the MAD of any unprotected conductor that is or may become energized at more than 600 volts and less than 5,000 volts between phases, they shall take the following precautions:

4.13.2.1. They shall wear approved rubber gloves during the time they are working on such conductor or within reach of another worker who is working on such conductor.

4.13.2.2. They shall cover with rubber hose, hoods, blankets, line tubes or other approved devices, any adjacent conductor that could be touched by any part of their body. While installing the aforementioned, they shall use rubber gloves or an approved hot stick applicator tool.

4.13.2.3. It is not considered the best practice to wear rubber gloves when climbing a pole; however, linemen shall have the gloves available and put them on before reaching a position where they could, under any condition, touch an energized conductor of high voltage. They shall not remove the gloves until they are entirely out of reach of these conductors.

- 4.13.2.4.** Expired rubber goods shall not be used.
- 4.13.3.** High voltage rubber gloves shall be used as protection for accidental contact only on primary voltages 5000 volts and above and shall not be used to apply cover on voltages above 5000 volts.
- 4.13.4.** Rubber gloves shall be tested in the Company approved test laboratory at least once every sixty days. New rubber goods shall be tested in the company approved test lab, before distribution to the employees.
- 4.13.5.** Rubber gloves shall be inspected by the person using them each time before starting a job.
- 4.13.6.** Workers using gloves shall frequently apply an approved “air test” to the gloves.
- 4.13.7.** Any rubber gloves known or suspected to be defective shall not be used.
- 4.13.8.** Rubber gloves shall at all times be worn with approved cover gloves provided for that purpose.
- 4.13.8.1.** Low voltage gloves may be worn without protectors if additional dexterity is needed.

4.13.9. Rubber gloves shall be carried in a protector bag provided for that purpose when they are not in use.

4.13.10. Rubber gloves shall be assigned to each lineman or any other person required to handle conductors that are, or may become, energized at more than 50 volts.

4.13.11. All groundmen, reel-tenders, or others who may handle wire being strung near, over, or through energized conductors shall wear rubber gloves.

4.13.12. Rubber gloves, line hose, insulator covers or blankets shall not be vulcanized or patched.

4.13.13. Rubber blankets, line hose and hoods shall be tested in the approved test laboratory at least once every six months.

4.13.14. Rubber line hose, hoods and blankets shall be inspected by the user each time before using on a new job and sent in for special testing if suspected of being defective. They shall be tagged indicating “defective.”

4.13.15. All rubber protective equipment shall be stored in vehicles in such a manner as to be free from damage or cuts. Blankets shall be rolled and stored in approved containers provided for that purpose. They shall also be wiped clean and dry before storing.

4.13.16. Rubber blankets shall not be used where a person would stand upon them, unless adequate covers are provided so that they will not be damaged.

4.13.17. Rubber protective equipment should not be left on conductors for periods of time that can cause excessive corona reaction. They should be removed and later reinstalled if necessary.

4.14. Guards and Barriers

4.14.1. Unsafe areas immediately adjacent to a place of work shall be identified by barriers, signs or some other suitable method.

4.14.1.1. Danger area signs and barricades shall be designated by predominant red color.

4.14.1.2. Caution area signs and barricades shall be designated by predominant yellow color.

4.14.2. When workers are working in, on or immediately adjacent to a street, highway or any other road that has a traffic hazard, or when any Company vehicle impairs the road clearance, approved warning devices shall be displayed to warn vehicular traffic. These devices shall be placed where they are fully visible to traffic from each direction.

4.14.3. Employees exposed to traffic shall wear high visibility colored outer garment (i.e. Colors equivalent to strong red, strong orange, strong yellow, strong yellow-green or fluorescent versions of these colors are acceptable) or high visibility reflective vest. For night time work high visibility retro-reflective garments Class 3 shall be worn.

Note: Washington standards require Retro Reflective Outer Garments.

4.14.3.1. Flaggers shall wear a high visibility retro-reflective vest at all times. High visibility vest and garments will be provided when necessary.

Note: In Washington follow the state Flagging Garment Standards.

4.14.4. Signs and barricades shall be removed immediately upon completion of the job requirement.

4.14.5. Approved barricades shall be used when gratings are removed.

4.14.6. Gratings shall be tied off before removing to prevent accidental dropping to area below.

4.14.7. When working on or above gratings, suitable covering shall be used to cover the grating in order to prevent materials from dropping to a lower level.

4.15. Hot Line Tools

4.15.1. All hot line tools shall be of an approved type.

4.15.1.1. A hot stick must be long enough for the user to maintain the required minimum approach distance from an energized conductor, energized apparatus, energized device or any energized equipment and promote good body mechanics.

4.15.1.2. There is no minimum length requirement for hot sticks.

4.15.1.3. Existing hot sticks may not be altered in any way.

- 4.15.1.4.** Stored hot line tools must be inspected and in a “ready to use” condition.
- 4.15.2.** Hot line tools shall be carefully handled and kept in a dry place in first-class condition and they shall be wiped clean prior to use with an approved wiping cloth.
- 4.15.3.** Hot line tools shall be kept in separate special storage compartments when carried on vehicles, or be contained in protector bags provided.
- 4.15.4.** Hot line tools shall not be laid directly on the Ground.
- 4.15.5.** Hot line tools shall be removed from trucks and placed in a drying area when they have become wet.
- 4.15.6.** Hot line tools shall be kept in a condition so that the surface finish is free from scratches or abrasions which would allow the insulating qualities to be reduced.
- 4.15.7.** Hot line tools shall be removed from service at least every two years and inspected, cleaned, tested and treated and/or waxed according to manufacturer’s recommendations, and the appropriate tag affixed.

4.15.8. Defective hot line tools shall be removed from service, discarded or tagged for repair, refinished and tested.

4.15.9. Hot line tools shall at all time, be handled by hand or with the use of a line, and shall never be thrown from or to the ground or to another person.

4.15.10. Hot line tools shall be used when it is necessary to work on conductors energized at more than 5,000 volts.

4.15.11. Rope coming in contact with energized conductors of 600 volts or greater shall be of approved hot line type. It shall be rated for the voltage for which it is being used. It shall only be used for hot line work. It shall be kept as free as possible from dirt and moisture. All manufactures recommendations shall be followed for care, use and maintenance.

4.15.12. Hot line tools shall not be used when rain, fog or any other factor is sufficient to reduce their insulating qualities to the extent that the worker can feel leakage.

4.15.13. Rubber gloves should not be worn while using hot line tools. **(This precaution is intended to allow a person to feel leakage before it may become dangerous.)**

Section V – Minimum Approach Distances (MADs)

5.0 Minimum Approach Distances (MADs)

5.1. Employees shall assure themselves that the minimum approach distances listed below, can be maintained under all circumstances from their person, tools or equipment to the uncovered live parts on which they are not working, UNLESS the applicable protective measures contained in these rules have been complied with, i.e. covering the conductor.

Minimum Approach Distances (MAD)- Oregon					
Nominal Voltage in kilovolts, (phase to phase)	0 to 3000 feet elevation			3000 feet to 5000 feet elevation	
	Phase to Phase Exposure		Phase to Ground Exposure	Phase to Phase Exposure	Phase to Ground Exposure
	Values are rounded up to the nearest inch				
0.05 to 1.0	Avoid Contact		Avoid Contact	Avoid Contact	Avoid Contact
1.1 to 15.0	2 ft. - 2 in		2 ft. - 1 in	2 ft. - 4 in	2 ft. - 3 in
15.1 to 36.0	2 ft. - 7 in		2 ft. - 4 in	2 ft. - 9 in	2 ft. - 6 in
36.1 to 46.0	2 ft. - 10 in		2 ft. - 7 in	3 ft. - 3 in	2 ft. - 9 in
46.1 to 72.5	3 ft. - 6 in		3 ft.	3 ft. - 9 in	3 ft. - 2 in
72.6 to 121	4 ft. - 3 in		3 ft. - 2 in	4 ft. - 6 in	3 ft. - 4 in
138 to 145	4 ft. - 11 in		3 ft. - 7 in	5 ft. - 2 in	3 ft. - 10 in
161 to 169	5 ft. - 8 in		4 ft.	6 ft.	4 ft. - 3 in
230 to 242	7 ft. - 6 in		5 ft. - 3 in	7 ft. - 11 in	5 ft. - 7 in
245 to 262	12 ft. - 6 in		8 ft. - 6 in	13 ft. - 2 in	9 ft.
500 to 550	18 ft. - 1 in		11 ft. - 3 in	19 ft.	11 ft. - 10 in
765 to 800	26 ft.		14 ft. - 11 in	27 ft. - 4 in	15 ft. - 8 in

Minimum Approach Distances (MAD)- Washington						
Nominal Voltage in kilovolts, (phase to phase)	0 to 3000 feet elevation			3000 feet to 5000 feet elevation		
	Phase to Phase Exposure		Phase to Ground Exposure	Phase to Phase Exposure		Phase to Ground Exposure
Values are rounded up to the nearest inch						
0.00 to 0.30	Avoid Contact		Avoid Contact	Avoid Contact		Avoid Contact
0.301 to 0.750	1 ft.		1 ft.	1 ft. - 1 in		1 ft. - 1 in
0.751 to 15	2 ft. - 3 inch		2 ft. - 2 in	2 ft. - 5 in		2 ft. - 4 in
15.1 to 36.0	2 ft. - 10 in		2 ft. - 7 in	3 ft.		2 ft. - 9 in
36.1 to 46.0	3 ft. - 2 in		2 ft. - 9 in	3 ft. - 4 in		2 ft. - 11 in
46.1 to 72.5	3 ft. - 11 in		3 ft. - 3 in	4 ft. - 2 in		3 ft. - 5 in
72.6 to 121	4 ft. - 3 in		3 ft. - 5 in	4 ft. - 6 in		3 ft. - 4 in
138 to 145	4 ft. - 11 in		3 ft. - 7 in	5 ft. - 2 in		3 ft. - 10 in
161 to 169	5 ft. - 8 in		4 ft.	6 ft.		4 ft. - 3 in
230 to 242	7 ft. - 6 in		5 ft. - 3 in	7 ft. - 11 in		5 ft. - 7 in
345 to 362	12 ft. - 6 in		8 ft. - 6 in	13 ft. - 2 in		9 ft.
500 to 550	18 ft. - 1 in		11 ft. - 3 in	19 ft.		11 ft. - 10 in
765 to 800	26 ft.		14 ft. - 11 in	27 ft. - 4 in		15 ft. - 8 in

Minimum Approach Distances (MAD)- California						
Nominal Voltage in kilovolts, (phase to phase)	0 to 3000 feet elevation			3000 feet to 5000 feet elevation		
	Phase to Phase Exposure		Phase to Ground Exposure	Phase to Phase Exposure		Phase to Ground Exposure
Values are rounded up to the nearest inch						
0.05 to 1.0	Avoid Contact		Avoid Contact	Avoid Contact		Avoid Contact
1.1 to 15.0	2 ft. - 2 in		2 ft. - 1 in	2 ft. - 4 in		2 ft. - 3 in
15.1 to 36.0	2 ft. - 7 inch		2 ft. - 4 in	2 ft. - 9 in		2 ft. - 6 in
36.1 to 46.0	2 ft. - 10 in		2 ft. - 7 in	3 ft. - 3 in		2 ft. - 9 in
46.1 to 72.5	3 ft. - 6 in		3 ft.	3 ft. - 9 in		3 ft. - 2 in
72.6 to 121	4 ft. - 3 in		3 ft. - 2 in	4 ft. - 6 in		3 ft. - 4 in
138 to 145	4 ft. - 11 in		3 ft. - 7 in	5 ft. - 2 in		3 ft. - 10 in
161 to 169	5 ft. - 8 in		4 ft.	6 ft.		4 ft. - 3 in
230 to 242	7 ft. - 6 in		5 ft. - 3 in	7 ft. - 11 in		5 ft. - 7 in
245 to 262	12 ft. - 6 in		8 ft. - 6 in	13 ft. - 2 in		9 ft.
500 to 550	18 ft. - 1 in		11 ft. - 3 in	19 ft.		11 ft. - 10 in
765 to 800	26 ft.		14 ft. - 11 in	27 ft. - 4 in		15 ft. - 8 in

Section VI – Overhead

6.0 Overhead

6.1. Rubber gloves, line hose, rubber blankets and other approved protective equipment shall be considered as adequate barriers when used on voltages of less than 5,000 volts between phases. No uncovered portion of the body may breach the minimum approach distance of any uncovered conductor that is not being worked on. While working in the energized primary area the two man rule shall apply.

6.2. Special protective guards, barriers, and so forth, when installed and which are designed for voltages above 5,000 volts, shall be considered as providing adequate working distance for lines over 5,000 volts. Workers shall avoid contact, compression or distortion of protective guards and barriers.

6.3. Secondary Voltages (2019)

6.3.1. Low Voltages (2019)

6.3.1.1. Voltages between 50 – 600 volts will be considered low voltages. **(2019)**

6.3.1.2. Work on energized low voltages shall be performed by an electrically qualified journeyman or a qualified apprentice (under the supervision of a journeyman). **(2019)**

6.3.1.3. Low voltage conductors shall be considered energized until isolated from all known sources of energization and tested with an approved voltmeter. **(2019)**

6.3.1.4. When working on energized low voltages, the worker shall wear appropriate PPE, should cover all second points of contact, and ensure all other energized conductor and parts not being worked are covered within the immediate work area. The use of insulated tools is recommended while working on energized low voltage circuits. **(2019)**

6.3.1.5. When working on de-energized low voltage circuits, all known sources of energization (i.e. solar, wind, generator...) shall be isolated and tested with an approved voltmeter to confirm it is de-energized and back feed does not exist. Place “do not operate” tag on isolation device, if appropriate. **(2019)**

6.3.1.6. If unable to isolate and test low voltage circuits to be worked, then the worker must consider the circuit to be energized and follow appropriate rules and work methods. **(2019)**

Note: It is recommended to arrange for an outage for working on 480 voltage, add new service conductor or upgrading existing conductors on pad mounted transformers. Extreme caution shall always be used when performing work on energized 480 volts. **(2019)**

Note: It is understood that while performing tests, (i.e. voltage checks, rotation checks, CT testing, etc.) multiple phases may be left unprotected. Refer to section [10.4.1.](#) **(2019)**

6.4. Secondary voltage may be checked at the secondary bushing of an overhead transformer, (only when approaching from below while aloft in a bucket) primary rubber gloves shall be worn.

6.5. When it is necessary to patrol lines during the day or night and when road conditions, weather conditions or other factors make it impossible to patrol safely with one employee, additional help shall be provided as required to perform the job safely.

Note: In Washington State, while on patrol at night and operating a motor vehicle on public highways, there shall be two employees, at least one of whom shall be a journey level lineman or otherwise a competent or qualified electrical employee.

6.6. All work involving conductors energized at potentials of 5,000 volts or greater shall be done only with the use of approved hot line tools. Employees shall not rubber glove voltages greater than 5kV.

6.7. Only journeymen or qualified apprentices (under the direct supervision of a journeyman) may perform work on conductors energized at high voltages.

6.8. When work is done, on or near energized high voltage circuits where hazards may exist and the foreman deems necessary they shall request the responsible dispatcher to place hold tags on the breaker control switch, and disable the recloser and check open the bypass switch if the breaker is so equipped.

6.9. Work on de-energized lines shall not be started until the Line and Equipment are identified, isolated, tested and grounded according to

section 15 (Grounding) of this manual. Equipotential grounding is the safest and preferred method of personal protective grounding.

Note: All points of isolation shall be tagged “Do Not Operate”.

6.10. Two journeymen, or one journeyman and a qualified apprentice, shall work together on the same pole or structure when working on or within reach of conductors that are, or may become, energized at voltages in excess of 600 volts between phases. (Two separate poles or structures may be considered as one for the purpose of this rule provided both workers can step to the other pole or structure safely without having to descend to the ground to do so.) One of them shall serve principally as a standby and be in a position to render assistance if needed. In no case, when working in pairs, shall they work simultaneously on energized conductors of different phases.

6.10.1. Exceptions to the two-man rule apply when hot sticks or switch sticks are used to do the following:

6.10.1.1. When re-fusing circuits or equipment with a hot stick.

6.10.1.2. When operating switches by means of operating handles or switch sticks.

6.10.1.3. Where a life or the public safety is in immediate danger, one worker may remove only the immediate hazard if no other workers are immediately available.

6.10.1.4. Placing or removing hot line clamps in connection with re-fusing distribution transformers.

6.10.1.5. Opening or replacing of hot line taps on single phase lines not under load where jumpers are short enough to be safely controlled and the worker does not violate the minimum approach distance.

6.11. Tree trimming immediately adjacent to primary circuits shall be done by crews of not less than two journeymen, or two qualified tree-trimmers, or one journeyman and a qualified tree trimmer.

6.12. The following precautions are to be observed by every worker when working on or near energized parts.

6.12.1. The employee shall thoroughly understand the work to be accomplished and their part in the work to be done before starting a job.

6.12.2. The employee shall be certain of their position, making sure that their footing and support are solid, so that the employee may not fall or slip against energized equipment.

6.12.3. The employee shall not touch an exposed, ungrounded, energized part with their bare hands; the employee shall be insulated from grounds whenever possible.

6.12.4. Prior to the worker making contact with a transformer mounting rack or similar rack for mounting equipment, they will verify the rack is not energized.

6.13. Each person shall inspect wires, poles, steps, fixtures, ladders, supports or similar items to make sure that they are in a safe condition before going on structures.

- 6.14.** Before starting work on energized lines or equipment, workers shall make a preliminary examination to determine existing conditions and obtain accurate information as to the voltages and position of circuits to be worked.
- 6.15.** Circuits shall be properly phased out before they are paralleled or released for service after any work that may have caused change to correct phase alignment. Approved electrical testing equipment should be used.
- 6.16.** Before a worker climbs a pole, the worker shall make every effort to assure the pole is safe. Before starting to strip a pole or change the strain on the pole by additions or removals, it shall be adequately guyed or supported unless it is definitely known that the butt of the pole is sound and that it is set into the ground sufficiently to be safe.
- 6.17.** When unusual jobs are performed that present abnormal hazards, the primary responsibility of the person in charge shall be as “safety watcher.” If their duties prevent the worker from watching the position of the workers, they shall designate another person to watch the position of the workers to advise them when they may be

getting into a dangerous situation.

6.17.1. The “safety watcher,” so designated, shall have no other job duty to perform while the employee is assigned to “safety watching.” The workers being watched shall be the judge as to the qualifications of the employee designated as “safety watcher.”

6.17.2. Safety Watcher shall be capable of performing rescue of the worker being watched.

6.18. When the neutral conductor is located in the primary position, it shall be considered energized at the primary voltage unless grounded at that structure being worked.

6.19. Stringing or Removing Conductors:

6.19.1. When stringing or removing wire over or alongside other high voltage conductors, means shall be taken to avoid making electrical contact and the following practices shall be observed:

6.19.1.1. Conductors shall be strung one at a time unless adequate tension reels or other positive methods are used to prevent slacking of lines being pulled.

- 6.19.1.2.** Bare wires being strung or removed shall be adequately grounded between the reel point and the first possible point where the wire being strung or removed could contact energized high voltage wires.
- 6.19.1.3.** Approved grounds shall be installed before snubbing or dead ending wires.
- 6.19.1.4.** Conductors shall be snubbed or dead ended at both ends before subsequent wires are strung, unless the pulling equipment is sufficiently anchored for the strain and a positive dog is available to lock-up the rope drum.
- 6.19.1.5.** A lineman or experienced worker under supervision of a lineman shall be left in charge of the reels as a reel-tender.
- 6.19.1.6.** Reel trucks shall be grounded. Reel tenders shall be provided with and use a suitable insulated platform on which to stand and shall wear approved rubber gloves. When the reel tender or tensioner is operated from the equipment, no insulated platform or rubber gloves are required except for emergency exit.

6.19.1.7. All workers handling conductors being strung or removed and which pass near, through or over energized high voltage conductors shall wear rubber gloves.

6.19.1.8. Conductors shall be strung or removed with a dry rope of adequate strength used as a running or trailing line unless adequate barriers are used to prevent accidental contact. In replacing a conductor with a new or larger conductor, the conductor being removed shall not be used to pull in the new conductor unless it can be reasonably established that the conductor being removed is of adequate strength.

Exception: An exception to the grounding requirements of these rules is when the conductor being strung or removed is treated as a conductor that is energized at the voltage to which it is exposed.

6.20. Series Street Light Circuits

6.20.1. Series street light circuits shall be considered as energized circuits of high voltage. They shall be regarded at all times as energized regardless of the time of day, unless opened, tagged and grounded in the approved manner.

6.20.2. The voltage shall be considered as being that of the highest voltage of conductors occupying one or more crossarms on which the series street lighting circuit is run, unless the open circuit voltage of the street light circuit is higher; then that voltage shall prevail.

6.20.3. When work is performed on non-energized parts of series street light fixtures, such as glassware or lamps, rubber gloves shall be worn if the circuit is “on.”

6.20.4. High-line telephone circuits shall be considered to be energized up to 5,000 volts, except where such circuits are so protected as to prevent them from becoming energized at high voltage.

6.21. Crew Size

(These rules relative to crews, are intended to be a general guide.)

6.21.1. Safety is not always determined by size of crew. Circumstances or conditions may prevail at times, which necessitate the modification, in a greater or lesser degree of the rules outlined. The following jobs are normally considered unsafe for less than a three-journeyman crew. (A

qualified hot apprentice may be substituted for a journeyman).

6.21.1.1. String or remove a third conductor in any hot circuit above 600 Volts.

6.21.1.2. Set or remove poles through or above an energized three-wire circuit in primary area.

6.21.1.3. Dead end hot primary conductors.

6.21.1.4. Change primary cross arms hot where unusual circumstances exist, such as angle poles, crossarms located in three-wire primary area. Primary buck arm or when the control of the conductor necessitates the use of a mechanical lifting device. The use of aerial equipment shall not create an exception to the two-man rule.

6.21.2. When a foreman or worker in charge finds the job assigned too difficult to be done safely, with the amount and type of personnel and equipment assigned, the worker shall request additional help or equipment which, in their opinion, is necessary to do the job safely. They shall not proceed with the hazardous portion of the assignment until such assistance or equipment is on the job and

re-tailboard has taken place.

6.21.3. If any employee is exposed to energized primary conductor and equipment, at least two journeymen shall be present when installing and removing electrical equipment, such as transformers, capacitors, reclosers and regulators.

6.22. Mechanical Jumpers

6.22.1. Mechanical Jumpers that are not certified, when energized shall be considered as any other unprotected conductor, unless otherwise covered with approved devices: i.e. Blankets and guts.

6.22.2. Certified Mechanical Jumpers which are properly insulated, properly maintained and tested every 180 days for the voltage which they are energized, shall be considered as an effective barrier to protect employees and section 5.0 need not apply.

6.22.2.1. Certified Mechanical jumpers are considered insulated for accidental contact only. Workers shall avoid contact, compression or distortion of Certified Mechanical jumpers.

6.22.2.2. When handling energized Certified Mechanical jumpers, it shall be done with approved hot line tools only.

6.22.2.3. Insulated Certified Mechanical jumpers shall only be considered as such if all the following applies:

6.22.2.3.1. Certified Mechanical jumpers shall be insulated for the voltage which they are tested

6.22.2.3.2. Certified Mechanical jumpers shall be tested in a Company approved test lab every 180 days

6.22.2.3.3. Certified Mechanical jumpers shall be inspected each time before each use.

6.22.2.3.4. Protective bags shall be placed over the heads, or other approved methods as to protect the cable from any sharp object.

6.22.2.3.5. At all times Certified Mechanical jumpers shall be stored in an approved storage container.

6.23. Insulator Cleaning:

6.23.1. All insulator washing equipment shall be kept clean and free of contamination.

6.23.2. Potable water shall be used for washing insulators.

6.23.3. Solid stream nozzles shall not have orifices larger than 1/4 inch.

6.23.4. In order to wash energized insulators with a solid stream or fog nozzle, the nozzle should not at any time be in contact with grounded or any metal parts of racks or fence or be closer to the insulator than distances shown as follows:

Line	1/4"	3/16"
Voltage	Orifice	Orifice
0.6 – 15 KV	8 Feet	6 Feet
15.5 – 46 KV	10 Feet	8 Feet
46.1 – 75 KV	12 Feet	9 Feet
75.1 – 169 KV	16 Feet	12 Feet

6.23.5. When cleaning insulators with dry powder, static electric charge may develop in the connecting hose. Workers shall take appropriate safety precautions when this condition exists.

Section VII – Underground

7.0 Underground

These rules concerning underground distribution systems are intended as minimum safety standards.

ALL OTHER STANDARDS IN THIS MANUAL, WHERE APPLICABLE, SHALL BE CONSIDERED AS PART OF THIS SECTION.

- 7.1.** At least two journeymen or one journeymen and a qualified hot apprentice are required for switching energized primary elbows or when handling energized U.R.D. primary cables.
- 7.2.** Any lines normally energized at high voltages or any equipment attached thereto which has been removed from service for the purpose of workers performing work thereon, shall be considered energized until such lines or equipment have been properly Grounded.
- 7.3.** UG cables retain a capacitive charge after switching or testing. Grounding removes the capacitive charge.
- 7.4.** ENERGIZED elbow terminators and fuses shall

be removed and installed by use of approved hot sticks ONLY.

7.5. While working on or near energized primary UG conductor, the [Minimum Approach Distances](#) and procedures shall be followed.

7.5.1. U.R.D. cables which are properly insulated for the voltages, to which they are energized, shall be considered as an effective barrier to protect the employees and section 5.0 need not apply.

7.5.2. Workers shall take adequate precautions to avoid physical contact with energized U.R.D. cable by using approved procedures and/or protective devices.

7.5.3. When handling energized U.R.D. primary cables, the work shall be done with approved tools and/or procedures.

7.6. Continuity of the neutral should be maintained at all times, unless each ends of both the conductor and neutral of this section of cable has been isolated.

7.7. Isolating, testing and grounding UG cable shall be regarded as clearing a circuit.

7.8. When energized underground equipment is unlocked and opened, it shall be directly attended by a qualified worker. At all other times, it shall be closed and locked.

7.8.1. Appropriate PPE's, including rubber gloves, shall be worn when opening any underground equipment energized at primary voltage.

7.8.2. Properly trained Estimators and Site Agents are permitted to open pad mount transformers and switch cabinets with **no exposed primary**. These individuals shall not break the plane of the equipment.

7.8.3. Only Journeyman Linemen, Hydro Operators, Meterman, Wireman, Substation Journeyman, Meter Relay Techs., may open live front primary equipment.

7.9. When splicing or connecting energized conductors of secondary voltage in a ditch, trench or an unsafe wet condition exists; two journeymen or one journeyman and a qualified apprentice shall be required.

7.10. Secondary Voltages (2019)

7.10.1. Low Voltages (2019)

7.10.1.1. Voltages between 50 – 600 volts will be considered low voltages. **(2019)**

7.10.1.2. Work on energized low voltages shall be performed by an electrically qualified journeyman or a qualified apprentice (under the supervision of a journeyman). **(2019)**

7.10.1.3. Low voltage conductors shall be considered energized until isolated from all known sources of energization and tested with an approved voltmeter. **(2019)**

7.10.1.4. When working on energized low voltages, the worker shall wear appropriate PPE, should cover all second points of contact, and ensure all other energized conductor and parts not being worked are covered within the immediate work area. The use of insulated tools is recommended while working on energized low voltage circuits. **(2019)**

7.10.1.5. When working on de-energized low voltage circuits, all known sources of energization (i.e. solar, wind, generator...) shall be isolated and tested with an approved voltmeter to confirm it is de-energized and backfeed does not exist. Place “do not operate”

tag on isolation device, if appropriate. **(2019)**

7.10.1.6. If unable to isolate and test low voltage circuits to be worked, then the worker must consider the circuit to be energized and follow appropriate rules and work methods. **(2019)**

Note: It is recommended to arrange for an outage for working on 480 voltage, add new service conductor or upgrade existing conductors on pad mounted transformers. Extreme caution shall always be used when performing work on energized 480 volts. **(2019)**

Note: It is understood that while performing tests, (i.e. voltage checks, rotation checks, CT testing, etc.) multiple phases may be left unprotected. Refer to section [10.4.1.](#) **(2019)**

7.11. When working on transformer secondary bushings, pedestals, terminal boxes and splice boxes, the conductor shall be de-energized unless all conducting parts other than the part being worked on can be adequately covered.

7.12. Bayonet fuses shall not be closed into suspected faults or overloads.

7.13. All underground primary elbows shall be installed on a bushing when there is any possibility of the circuit becoming energized.

7.14. Every possible precaution shall be exercised to make sure of the correct identity (voltage, circuit, phase, etc.) of the cable or apparatus to be worked upon and other circuits which could become involved with the work.

7.15. The cable or apparatus shall be considered energized until it has been:

7.15.1. Tested by use of an approved voltage detection device.

7.15.2. Grounded from all possible sources of power including transformer secondary back feed.

7.15.3. When cable in a trench is to be cut, it shall be tested with a cable spike tool or hot cutters from a remote location.

7.15.4. Where multiple cables exist in an excavation, cables other than the one being worked on shall be physically covered with approved guard or barriers when necessary.

7.16. No new piece of cable or switching device shall be energized until it has been positively identified by tags or other approved marking procedures.

7.17. No piece of equipment shall be energized until all terminals, cables, and positions have been safe ended, or otherwise protected in a way that would prevent a short circuit, ground, or personal contact.

Section VIII – Substations

8.0 Substations

- 8.1.** At all substations/switch stations, a log shall be kept of all operating activities.
- 8.2.** All switching that affects field conditions outside the substation, whenever possible, shall be done over the company radio.
- 8.3.** All employees entering a substation shall immediately report their presence and purpose to the responsible dispatcher.
- 8.4.** Substations shall be kept clean and orderly and materials stored properly.
- 8.5.** Before starting work on energized equipment, workers shall make a preliminary investigation to determine what conditions exist and obtain information from the foreman or other person in charge as to the voltages and positions of circuits on which work is to be done.
- 8.6.** Particular care shall be taken of the capacitive effect of capacitors, transformers and other high voltage apparatus, the discharge from which may be dangerous.

8.7. Workers shall get in the clear until switching is done when it becomes necessary for switching to be done on equipment near or adjacent to that on which employees are working.

8.8. No metal equipment or materials should be carried on the shoulders of workers when working in substations or in sections of buildings used as substations or on the roofs of substations, or in switchyards.

8.9. At least two journeymen or a journeyman and a qualified apprentice are required for work on:

8.9.1. Energized equipment located in indoor switch galleries and bus compartments.

8.9.2. And for work on de-energized equipment adjacent to equipment energized at voltages over 600 volts.

8.10. When employees are working adjacent to conductors energized at high voltage, the foreman or worker in charge shall check the hazards and, if the working conditions and proximity of energized conductors to the employees working require it, workers shall provide guards and barriers and assign a

qualified safety watcher to warn the employees working of any impairment of [minimum approach distances](#), or other possible hazards. **(2019)**

- 8.11.** Disconnecting switches shall be operated with approved hot sticks.
- 8.12.** When working on a mechanism, all energy sources shall be controlled.
- 8.13.** When work is to be done on automatic or supervisory controlled equipment, equipment shall be under the control of the maintenance crew in coordination with the responsible dispatcher.
- 8.14.** Handles for manual operation of circuit breakers shall not be left in their sockets except when closing the breakers. The handles shall be removed as soon as the breaker is closed.
- 8.15.** Safety devices shall not be disabled or blocked.
- 8.16.** Electrical clearances on apparatus, which can be energized above 600 volts, shall be given in accordance with the clearance procedure in [Section 12.9.2.](#)

- 8.17.** When opening, closing, racking in, racking out, breakers in metal clad switchgear, the use of remote operation **SHALL** be used, when it is available. When this method is not available, other options should be considered, based on each type of switch/breaker being operated. Switchmen shall use all appropriate PPEs.
- 8.18.** As studies are conducted and Arc Flash ratings are determined, FR/AR clothing suitable to meet the Arc Flash rating of the equipment which is being operated shall be worn. **(2019)**
- 8.19.** Substation class bushings and insulators exceeding 25 KV may be used as a tie-off point or anchor for fall restraint and/or work positioning.

Section IX – Transmission

9.0 Transmission

(This is a place holder, left “BLANK” for future use)

Section X – Customer Metering

10.0 Customer Metering

10.1. FR/AR clothing as described in APM [section 4.3.3](#) shall apply. **(2019)**

10.2. Appropriate footwear as described in the APM, shall be worn see [section 4.5](#)

10.3. When working on energized customer metering, employees shall wear hard hats, safety glasses, low voltage rubber gloves and shall wear approved face shields unless such use of face shield creates an additional hazard.

10.4. When installing or removing a meter from an energized socket, employees shall wear hard hats, safety glasses, low voltage rubber gloves and shall wear approved face shields unless such use of face shield creates an additional hazard.

Note: Consideration should be given to de-energizing the meter socket before performing work.

10.4.1. It is understood that while performing tests, (i.e. voltage checks, rotation checks, CT testing, etc.) multiple phases may be left unprotected. It is considered acceptable to perform tests using

the following practices.

- 10.4.1.1.** All appropriate PPE are used.
- 10.4.1.2.** Test equipment shall be insulated for the voltages being worked.
- 10.4.1.3.** Care will be taken to minimize exposure to unprotected energized equipment.
- 10.4.1.4.** When an employee is not in immediate control of energized equipment all energized parts shall be covered with appropriate protective covers to secure and protect energized parts from being accessed by the public.
- 10.5.** When reconnecting a meter, worker shall check load side terminals for back feed before placing meter in socket.
- 10.6.** When installing meters on a new service, workers shall check line and load terminals for voltage, check load side terminals for continuity to ground. Check main disconnect open if accessible, and open line side bridge nuts if equipped before setting meter. Close bridge nuts and torque all to specifications.

- 10.7.** An employee will assess possible hazards before entering customer's property or work site.
- 10.8.** It is the duty, as well as the privilege, of every worker to report hazardous conditions. Reports shall be submitted in writing on a form provided by the Company. The status of written safety hazard reports shall be followed up to resolve the issue in a timely manner.
- 10.9.** Current Transformer secondaries shall be shunted before removing instrument rated meters or working on the circuit. If current transformers cannot safely be shunted, the service shall be de-energized prior to any work being performed or all load removed from circuit.

Section XI – Generation

11.0 Generation

- 11.1.** At all generation plants, a log shall be kept of all operating activities.
- 11.2.** All employees entering a generation plant shall immediately report their presence and purpose to the responsible dispatcher/hydro control operator. **(2019)**
- 11.3.** Generation plants shall be kept clean and orderly and materials stored properly.
- 11.4.** Before starting work on energized equipment, workers shall make a preliminary investigation to determine what conditions exist and obtain information from the foreman or other person in charge as to the voltages and positions of circuits on which work is to be done.
- 11.5.** Particular care shall be taken of the capacitive effect of capacitors, transformers and other high voltage apparatus, the discharge from which may be dangerous.

- 11.6.** Workers shall get in the clear until switching is done when it becomes necessary for switching to be done on equipment adjacent to that on which employees are working.
- 11.7.** At least two journeymen or a journeyman and a qualified apprentice are required for work on energized equipment located in indoor switch galleries and bus compartments, and for work on energized equipment adjacent to equipment energized at voltages over 600 volts.
- 11.8.** Disconnecting switches shall be operated with approved hot sticks.
- 11.9.** When working on a mechanism, all energy sources shall be controlled.
- 11.10.** When work is to be done on automatic or supervisory controlled equipment, equipment shall be set under the control of the maintenance crew in coordination with the responsible dispatcher/hydro control operator. **(2019)**
- 11.11.** Handles for manual operation of circuit breakers shall not be left in their sockets except when closing the breakers. The handles shall be

removed as soon as the breaker is closed.

11.12. When employees are working adjacent to conductors energized at high voltage, the foreman or worker in charge shall check the hazards and, if the working conditions and proximity of energized conductors to the employees working require it, the employee shall provide guards and barriers and assign a qualified safety watcher to warn the employees working of any impairment of [minimum approach distances](#), or other possible hazards.

11.13. When cranes are used for lifting refer to [Section 13.25](#).

11.14. All plant grounding practices shall be done in accordance with [section 15 \(Grounding\)](#) of this manual. **(2019)**

11.15. All Personal Protective Equipment shall be used as required per [section 4](#).

11.16. Guardrail barriers shall be provided around machinery and energized equipment where there is a hazard to employees or the public.

11.17. Approved metal containers with safety lids shall be used for temporary storage of oily waste or rags.

11.18. When work is being performed on any Hydro generation plant equipment connected to or containing energy sources or at Hydro non-generating facilities, work shall not be started until a tagout or lockout is in effect. All tag outs or lockouts will be in accordance with the current Hydro Generation Tagout Procedure. Subsequent versions addressing future changes will be discussed and mutually agreed to prior to any implementation. Both parties agree to adhere to any Federal or State law regarding tagouts or lockouts.

11.19. When opening, closing, racking in, racking out, breakers in metal clad switchgear, the use of remote operation **SHALL** be used, when it is available. When this method is unavailable, other options should be considered, based on each type of switch/breaker being operated. Switchmen shall use all appropriate PPEs.

11.20. As studies are conducted and ARC Flash ratings are determined, FR/AR clothing suitable to meet the ARC Flash rating of the switch/breaker being operated shall be worn.
(2019)

11.21. Substation class bushings and insulators exceeding 25 KV may be used as a tie-off point or anchor for fall restraint and/or work positioning.

Section XII - Switching

12.0 Switching

- 12.1.** All switching that affects field conditions outside the substation, whenever possible, shall be done over the company radio.
- 12.2.** High voltage rubber gloves will be worn when operating all gang-operated air brake switches.
- 12.3.** Any switching on transmission lines and any switching within a substation must be done upon the instruction of the dispatcher responsible for the area in which the switch is located.
- 12.4.** The introduction of automated switching or any other technology providing for automated or remote switching of high voltage lines, equipment or apparatus shall not supersede any normal safety practices requiring visual checks by personnel involved with associated work.
- 12.5.** Where life or property is endangered, such switches as **may** be required to de-energize the circuit or circuits involved may be opened. The person opening them shall immediately report their actions and the necessity therefore to the responsible dispatcher.

12.6. Workers shall first contact the responsible dispatcher before preparing a circuit for hold or restoring a circuit to normal.

12.6.1. Non-Supervisory Controlled Breakers: To prepare a circuit for a “hold,” the bypass shall be checked opened, the reclosure disabled and shall be tagged “Do Not Operate” for the worker.

12.6.2. Supervisory Controlled Breakers: To prepare a circuit for a “hold,” the responsible dispatcher shall disable the recloser via supervisory control and the supervisory control point shall be tagged (made inoperable by supervisory control). The Dispatch Center diagram board or the EMS system and substation breaker control switch/point shall be tagged “Do Not Operate” to the recipient of the hold.

12.6.3. Supervisory Controlled Breakers with Tagging Relay: To prepare a circuit for a “hold”, the responsible dispatcher shall disable the recloser via supervisory control, displaying the “do not operate” tag, and the supervisory control point shall be tagged (made inoperable by supervisory control). The name of the recipient of the hold will be recorded at the dispatch office

and in the station log book by the qualified person, verifying the tagging relay flag and other conditions required for the hold.

NOTE: The committee recognizes that technology will be able to verify the conditions required for the issuing of a hold and with mutual consent, the present methods will be revised to reflect those changes.

NOTE: In the event that something should happen which renders it impossible to contact the individual who has a hold on a given circuit or piece of equipment, that hold may be released only by order of the supervisor or general foreman over the person having the hold. Such order may be verbal but shall be followed immediately by a written order to the dispatcher.

12.7. Closing Feeder Circuit Breakers for Test

12.7.1. This is when a breaker **can be closed for test**, by dispatch order, after conferring with employees working on the line and checking with 911 and other emergency agencies.

12.7.1.1. Feeder breaker equipped with a re-closing relay goes to “lockout” on one operation in conjunction with a trip-close-trip operation of a

transmission line.

12.7.1.2. Breaker equipped with re-closing relay with “hold” issued goes to lockout on one operation and the person issued the hold releases the hold, and confirms workmen are in the “clear”.

12.7.2. When a feeder breaker **shall not be closed** for a test without visual inspection of station apparatus, patrolling of line, or crew verification.

12.7.2.1. Breaker **equipped** with re-closing relay goes through its normal re-close sequence with time targets.

12.7.2.2. Breaker **not equipped** with, or disabled re-closing relay goes to lockout on one operation. (Typical of an all “**UNDERGROUND**” circuit).

12.7.2.3. Breaker locks out when restrictions are in place during fire season.

12.8. Closing Transmission Line for Test

12.8.1. Once a formal line patrol has been initiated, employees involved in the patrol shall notify the dispatcher of their involvement and the dispatcher will then notify them before the line is

energized.

12.9. Clearances

12.9.1. Clearances for work on or in contact with transmission lines and equipment or circuits in stations which may be energized at 600 volts or higher are to be handled by the responsible dispatcher and the switchman and workers as follows:

12.9.1.1. The worker may obtain a clearance from the dispatcher having jurisdiction, before working on or coming in contact with distribution circuits.

12.9.1.2. A person desiring a clearance to work on a transmission line or station equipment shall contact the responsible dispatcher, identify themselves, obtain the name of the dispatcher, identify the circuit or equipment on which the clearance is desired, then state the limits of the circuit or equipment on which the clearance is desired. They shall perform no work on the circuit until a clearance has been definitely issued to the worker by the dispatcher. Except for emergency work this will, in most cases, be done using the "Compass" outage request system.

12.9.1.3. Orders for planned work shall be written out and at a minimum be checked by at least one other dispatcher before being given to the switchman, and not when they are issued.

12.9.1.4. The dispatcher shall never grant a clearance on a circuit or a piece of equipment before all necessary protective tags have been applied and their own records of such clearances are clear and complete. Before considering any circuit or equipment to be de-energized for purposes of issuing a clearance, the dispatcher shall assure themselves that all switches which could possibly energize a circuit or equipment have been opened, locked or blocked and tagged. Only a visible air gap shall be regarded as clearing the circuit.

12.9.1.5. Clearances can only be issued or returned. **They cannot be transferred.**

12.9.1.6. A clearance switching order is mandatory when instructing a switchman to open and tag or check open and tag any switch, circuit breaker, disconnect or jumper which, if closed, could energize a circuit upon which a clearance is to be issued.

12.9.1.7. A clearance switching order is mandatory when instructing a switchman to remove a tag and close any switch, circuit breaker, disconnect or jumper that would energize a circuit upon which a clearance has been issued and cancelled.

12.9.1.8. All switching, clearance orders, “clearances”, “terminal clearances” and “holds” given by the responsible dispatcher, shall be clear and concise. They shall be given, verbally and written down by the switchman or an approved hard copy. In either case the instructions shall be repeated back to the dispatcher and mutually agreed to. The order shall use proper nomenclature for the equipment and be specific.

12.9.1.9. Clearance switching orders and clearances shall not be relayed through another person, unless no other means of communication is possible.

12.9.1.10. Whenever possible, a switch shall be tagged for the person taking the clearance. It is permissible to tag for the dispatcher.

12.9.1.11. In issuing the clearance to the worker or foreman in charge of the job, the dispatcher will state the circuit or equipment that has been cleared for them, the limits of the clearance, inform them of any shorts and grounds that have been applied, advise them to use their own shorts and grounds and state the time the clearance was issued.

12.9.1.12. Before beginning work on any equipment or structure, the foreman in charge of the work shall see that all members of the crew are familiar with the status of the equipment, what part if any is energized, location of the grounds, what the limits of the working space are, and what open switches disconnect the equipment from the source of supply. If for any reason there is an interruption in the work where the employees leave the job, before work is resumed the same formality of checking and making the crew members familiar with conditions shall be followed as at the beginning of the job.

12.9.1.13. The person taking the clearance must stay on the job and have workers under their direct observation. If the work spreads

beyond such distances, additional clearances are required.

Exception: A clearance issued to de-energize and ground a line for the sole purpose of making it safe for foreign contractor construction near the line, and where no work is to be performed on the line, **does not** require the person taking the clearance to remain on-site as a Safety Watcher unless conditions dictate the need. If the employee taking the clearance thinks a safety watcher is necessary and the operations manager does not, the operations manager will accept the responsibility, in writing.

12.9.1.14. When the work has been completed and the portable shorts and grounds removed, the worker or foreman to whom the clearance was issued will report to the dispatcher that the worker is clear of the line or equipment and has removed their shorts and grounds. If changes have been made to the circuit, they should also report this. The workers must not again contact the circuit or equipment without requesting and receiving another clearance.

12.9.1.15. In the event that something should happen which renders it impossible to contact an individual who has a clearance(s) on a given circuit or piece of equipment, that clearance(s) may be released only by the written order of the supervisor or general foreman having jurisdiction over the person issued the clearance. Such written order shall be placed with the dispatcher, who may then order the tags removed, and the circuit or equipment energized.

12.9.2. Terminal Clearances on distribution circuits outside a substation are to be handled in accordance with instructions issued by the dispatcher for that area. These instructions will be based on the complexity of the system and the hazards involved, and will require as a minimum, that a visible air gap to be provided and that switches providing the air gap are open, and/or locked, if applicable.

Note: Some devices like single blade disconnects cannot be locked and tagged for the worker or foreman taking the “Terminal Clearance”.

12.9.2.1. The distribution circuits which have generation facilities connected beyond the substation shall require coordination between the field operations person in charge and the responsible dispatcher before “Terminal Clearances” are given to workers or foremen.

12.9.3. The station operator or dispatcher on duty is responsible for the operation of a station which the employee attends and the stations under their jurisdiction. No employee shall enter, operate controls, change the position of switches, apply portable shorts and grounds, remove covers to relays, meters or controls or perform tests or adjustments to equipment located in production, transmission or distribution stations without first securing permission from the responsible dispatcher.

12.9.4. Work on underground “get-away” within substation fences shall require a clearance that includes the Riser Pole disconnects or jumpers, the circuit breaker bus side disconnects and the circuit breaker bypass switch.

12.10. Metal Enclosed Switchgear

12.10.1. When opening, closing, racking in, racking out, breakers in metal clad switchgear, the use of remote operation **SHALL** be used, when it is available. When this method is unavailable, other options should be considered, based on each type of switch/breaker being operated. Switchmen shall use all appropriate PPEs.

12.10.2. As studies are conducted and ARC Flash ratings are determined, FR/AR clothing suitable to meet the ARC Flash rating of the switch/breaker being operated - shall be worn.
(2019)

Section XIII – Transportation

13.0 Transportation

- 13.1.** Each operator of a motor vehicle must possess a proper state motor vehicle driver's license and have it on their person while operating a Company vehicle.
- 13.2.** The operation and inspection of motor vehicles shall conform to the applicable state and federal laws and standards.
- 13.3.** When lowering or raising outriggers on any piece of equipment, the operator shall make a verbal announcement to all personal in the area, of the operation.
- 13.4.** No operator shall lower or raise outriggers without a clear view of riggers being operated or operator has a safety watch who has a clear view of the outrigger, being operated.
- 13.5.** Each operator of the Company-owned vehicle shall have an understanding of the owner/operators manual, placards and warning devices and drive/operate such vehicle with due regard for the safety of pedestrians, other operators and Company personnel and property. The operator

shall exercise courtesy at all times.

- 13.6.** Each operator shall daily check the motor vehicle for which the employee is responsible, and shall not operate it when steering gear, brakes, wheels or other controlling parts are not in safe and proper operating condition. Unsafe conditions shall be reported for remedy and equipment taken out of service and tagged.
- 13.7.** Each operator of company owned motor vehicles, shall check daily the tires, brakes, horn, windshield wipers, headlights, tail lights, stoplights, directional turn lights, steering gear, fire extinguisher and first-aid kit to ascertain whether they are in proper operating condition.
- 13.8.** All aerial man lift equipment, and equipment designed to lift or move materials, shall have an operators manual, specific to that equipment, located in or on that equipment. Each day, prior to use said equipment shall be inspected and tested in accordance with the manufacturers recommendations.

13.9. Each operator of company owned motor vehicles shall be responsible for displaying warning flags or lights while hauling objects which project from rear of truck or trailer.

13.9.1. A 2nd qualified employee **shall** assist the operator when hauling and/or positioning objects that present an undue hazard to the public.
Examples could include:

13.9.1.1. Positioning or hauling poles or;

13.9.1.2. Narrow roadways / congested worksites or;

13.9.1.3. When the operator deems necessary.

13.10. Each Company owned motor vehicle shall carry an approved first-aid kit and fire extinguisher in a properly marked location.

13.11. Workers shall not board or depart from a moving vehicle, and shall not ride on sides or top or hang on rear while in motion.

13.12. Vehicles shall not be loaded beyond safe seating capacity.

13.13. All drivers/passengers shall wear seat belts where provided, while riding in moving vehicle.

- 13.14.** Gasoline and Diesel fuels shall be hauled only in properly labeled approved safety metal containers.
- 13.15.** Loads on vehicles/trailers shall be secured.
- 13.16.** Traffic warning devices, including warning lights shall be used on each vehicle where the work assignment requires their use and displayed where there is an impairment of vehicular or pedestrian traffic.
- 13.17.** Worker shall remove tools, including climbers before entering a vehicle.
- 13.18.** Motors of vehicles shall be off while refueling.
- 13.19.** Electronic communication devices shall not be used while vehicle is being refueled. (i.e., cell phone, radios, PDAs, GPSs, etc.).
- 13.20.** When it is necessary to patrol lines during the day or night and when road conditions, weather conditions or other factors make it impossible to patrol safely with one employee, additional help shall be provided as required to perform the job safely.

Note: In Washington State, while on patrol at night and operating a motor vehicle on public highways, there shall be two employees, at least one of whom shall be a journey level lineman or otherwise a competent or qualified electrical employee.

13.21. Firearms/weapons shall not be permitted on any company vehicle except by special permission from the Safety Department.

13.21.1. A line-gun is considered a tool.

13.22. Drivers shall not back any vehicle unless they have verified that a pathway free of obstructions exists. Verification can be made by:

13.22.1. Visually verifying a clear pathway free of obstructions or;

13.22.2. Walking around vehicle to ensure a clear pathway free of obstructions or;

13.22.3. An observer signals that it is safe to back the vehicle.

13.23. Operators of company vehicles shall take appropriate measures to stabilize their vehicles when parked. Appropriate measures shall include the use of parking brake (except in extreme

adverse cold weather) and could include the use of chocks or other measures. The use of chocks is mandatory for the following:

13.23.1. Unattached trailers at all times.

13.23.2. Equipment with secondary equipment permanently attached to the power unit, (i.e. Booms, Diggers, Reels, Aerial lifts, Cranes etc.), while in use.

Exception: When equipment is supported by the outriggers.

13.23.3. Chocks shall be used in pairs.

13.23.4. When parked on an incline, one chock per side, placed to the downhill side of each rear wheel.

13.24. Power Operated Mobile Aerial Man-lift Equipment.

13.24.1. No procedure herein described shall be in violation of any existing rules or safe work practice relative to work normally performed from a pole or a structure.

- 13.24.2.** Daily visual inspection of insulating devices on aerial equipment shall be made to determine that insulation is in proper condition.
- 13.24.3.** The manufacturer's load limits on aerial man lift equipment shall not be exceeded.
- 13.24.4.** Operation of all controls shall be checked daily through their maximum working range and operation shall be suspended if any malfunction is revealed.
- 13.24.5.** Aerial equipment shall be visually inspected for defects each day prior to use. Boom straps for extraction and bucket rescue shall be inspected daily and replaced as necessary.
- 13.24.6.** A complete inspection and maintenance schedule shall be followed in accordance with the manufacturer's recommendation and a manual shall be kept on each unit.
- 13.24.7.** Approved flashing warning lights shall be displayed on vehicles having aerial equipment.
- 13.24.8.** Aerial equipment shall not be operated closer than our [minimum approach distances](#), to any high voltage energized lines or equipment unless:

13.24.8.1. An insulated barrier is installed between the energized part and the aerial equipment.

Exception: Approved Hot Line attachments may operate closer than minimum approach distances.

13.24.9. Aerial man lift equipment shall have both upper and lower controls. Upper controls shall be within easy reach of the operator. Lower controls shall provide for overriding the upper controls. Controls shall be plainly marked as to their function. Lower control shall not be operated unless permission has been obtained from the worker in the lift, except in the case of an emergency. The location of the controls shall afford the operator a clear and unimpaired view of the equipment and workers.

13.24.10. Worker operating controls must be insulated from ground when working equipment in energized areas. All workers shall take extreme caution before contacting the equipment.

13.24.11. Workers working in aerial man lift equipment shall wear full body harness with shock absorbing or fall restraint lanyard where applicable.

13.24.11.1. Climbers shall not be worn while performing work from an aerial piece of equipment.

13.24.12. When a boom is maneuvered over a street or highway in such a manner as to impair clearance for vehicular traffic, flagman/flagmen shall be used.

13.24.13. When a boom or equipment is maneuvered near railroad tracks a safety watch shall be used to ensure a minimum of 25 feet of clearance is maintained from the nearest railroad track. Any work that requires the boom or equipment to be within 25 feet of a railroad track must include coordination with the appropriate railroad entity to ensure the safety of both Pacific Power and railroad employees. **(2019)**

Note: Any work within 10 feet of TriMet railway in Portland must include coordination with TriMet to verify safety requirements and working rules are met. **(2019)**

13.24.14. Moving aerial man lift equipment from one job to another with the boom elevated is prohibited.

- 13.24.15.** When moving short distances, such as for tree trimming, stringing lights, or for similar jobs, the boom may be left in position after a check for clearance and terrain.
- 13.24.16.** The use of aerial equipment shall not create an exception to the two-man rule. The presence of a second lineman in a position to operate the equipment controls, observe and render immediate assistance.
- 13.24.17.** The use of aerial man lift equipment shall not create an exception to other safety rules in the manual.
- 13.24.18.** Trailers shall meet federal and state requirements for their intended use and safety devices such as lights, brakes and safety chains and chocks shall be checked and utilized.
- 13.24.19.** Trailers shall be kept in a condition so that the decks are free as possible from debris and oil, so that secure footing is available.
- 13.24.20.** Workers shall not ride on a trailer unless it is a trailer which requires a worker to brake, steer or distribute material at a job site and is designed for such.

13.25. Power Operated Equipment:

13.25.1. Power operated equipment shall be designed to meet all federal and state requirements.

13.25.2. Power equipment shall be operated only by authorized and qualified persons.

13.25.3. When winches, trucks, cranes, or tractors are being used to raise poles or equipment, pulling wire, pulling slack or similar operations, the operator shall stay at the controls and not leave them until the motor is stopped or the load is in a secure position. When under or near energized high voltage lines, equipment shall be operated under direct supervision of a journeyman as a safety watcher.

13.25.3.1. Winch lines shall be frequently inspected and if defective they shall be repaired or replaced. Slings shall be visually inspected prior to each use and if defective they shall be removed from service.

13.25.4. When power equipment is used and signals are required, one person shall give the signals, and any relaying of signals shall be done

only by designated persons. Visual signals in general are preferable to oral instruction.

13.25.5. When power equipment is used, all persons shall keep clear of pulling line under tension, sheaves, winch gears, overhead loads and booms being raised or lowered. When necessary to work under or near overhead loads and booms being raised or lowered, extreme caution shall be taken.

NOTE: STAY OUT OF THE BITE

13.25.6. Power equipment, when stringing, removing wire or working near energized conductors, shall be adequately grounded in an approved manner to protect workers in case the equipment is accidentally energized.

13.25.7. Mechanical equipment shall not be operated closer than our minimum approach distances, (see distances in [section 5](#)) to any high voltage energized lines or equipment unless:

13.25.7.1. An insulated barrier is installed between the energized part and the mechanical equipment.

Exception: Approved Hot Line attachments may operate closer than minimum approach distances.

13.25.8. Workers shall not ride on power operated equipment unless occupying a seat or secured position designed for such purposes. Safety belts shall be utilized.

13.25.9. Before moving power operated equipment, check to see that all persons are clear of equipment.

13.25.10. Approved rigging methods shall be used for all lifts.

13.25.11. Forklifts shall be operated with the forks lowered when empty. When loaded, care shall be taken that the load is secure and the operator shall have unobstructed view in the direction of travel.

13.25.12. Operators must complete a forklift training course before operating a forklift.

13.25.13. Seatbelts must be worn when operating forklifts.

13.25.14. Hard hats must be worn while operating forklifts when any part of the lifted load extends above the drivers head or when operating in an area that requires the use of a hardhat.

13.25.15. Boating shall be performed in accordance with all state boating regulations.

13.25.16. A pre-launch inspection of the boat shall be conducted.

Section XIV – Tools

14.0 Tools

- 14.1.** The company shall provide training/instruction on all tools and equipment before their initial use, and periodic training as required by regulation or manufacture recommendation. This training may include a proficiency test or demonstration of proficiency based on the complexity of the tool.
- 14.2.** All tools and equipment shall comply with state and federal standards.
- 14.3.** Defective tools shall not be used.
- 14.4.** Tools and equipment shall only be used for the purpose for which they were designed and should not be strained beyond safe working limits. Safety devices shall not be disabled or blocked.
- 14.5.** Tools, equipment and materials shall be handled or elevated and lowered, from poles or structures by the use of a hand line and/or bags. They shall never be thrown.

- 14.6.** Chisels and knives shall always be sheathed when sent up or down a pole.
- 14.7.** Hand axes, saws, chisels, or other sharp tools shall be kept in compartments when transported on vehicles and/or should have guards on their sharp edges.
- 14.8.** Body belts, safety straps, climbers, harnesses and other personal tools shall be kept in safe condition as a responsibility of the person using or owning such tools. They shall be subject to semi-annual inspection by foremen or other competent persons designated to inspect.
- 14.9.** Gaffs shall be more than 1 1/4 inches in length.
- 14.10.** A lineman shall carry only belt tools in their tool belt. Belt tools are those tools for which the lineman's belt is designed. Small tools carried in belts shall be placed so they present the least danger of coming in accidental contact with live parts or where they hinder the use of the D-ring and no open knife shall be carried except in a scabbard.

- 14.11.** Tools, equipment and materials shall not be left unsecured on tops of poles, crossarms or structures.
- 14.12.** Body belts and straps shall not be stored with sharp-edged tools.
- 14.13.** Ladders shall be inspected before each use. Ladders with broken or missing rungs, broken or cracked side rails, or broken latches shall not be used and shall be tagged (Dangerous, “Do Not Use”) and removed from service. Ladders and platforms shall not be loaded in excess of the working loads for which they are designed.
- 14.14.** Each portable extension type ladder shall be equipped with safety feet and properly secured when possible.
- 14.15.** Straight ladders shall be of sufficient length to permit a worker to reach their work from not higher than the third step from the top. On step ladders, workers shall not stand on the top of the ladder.
- 14.16.** Ladders and platforms shall not be loaded in excess of the working loads for which they are designed.

Note: Only one employee at a time shall be on an extension or stepladder, except in emergencies unless designed for two persons.

14.17. Portable metal ladders, metal scaffolding or ladders with continuous vertical metal reinforcement, are prohibited where electrical hazard is involved, with the exception of hook type ladders.

14.18. Hook type ladders shall be equipped with safety chains and ropes. When using hook type ladders, the safety chain shall be used and workers shall be belted in an approved manner.

14.19. All ladders shall be ascended and descended by facing the ladder. Ladders shall be secured at the top when there is any possibility of their slipping or sliding.

14.20. All scaffolding shall be erected and maintained in accordance with state and federal standards. All scaffolding will use a three (3) tiered tagging system to convey the condition of the scaffold. A green tag shall convey to all users that the scaffolding is properly constructed and safe for full use. The green tag must be signed each day by a competent person indicating the

scaffolding has been inspected and is ready for use. A yellow tag shall convey to all users that the scaffolding is not complete and may have limited use allowed with fall protection and other restrictions noted on tags. A red tag would indicate to all users that the scaffolding is unsafe for use and **NOT TO BE USED**. Any scaffolding without the tagging must be investigated and tagged prior to use.

14.21. Hand axes, draw knives and power saws shall not be used on overhead pole work when the worker is supported by a standard safety strap.

Exception: When a chainsaw bracket is used or when workers are supported by a cut proof safety strap.

14.22. Workers shall not use metal measuring tapes, brass bound rules, or wire bound hose when working on or near energized equipment or lines.

14.23. Hand lines and their fittings shall be of sufficient strength (min 645 lbs. working strength) to lower a worker in an emergency and one hand line shall always be in position on the pole or

structure when working on energized lines or equipment.

Exception: Single journeyman assignment doing routine work.

14.24. While operating electric tools, precaution shall be taken to protect the workers as follows:

14.24.1. Three-wire cords.

14.24.2. Two-wire cords may be used when the source is isolated or double insulated tools are used.

14.24.3. Ground fault interrupter shall be used in conjunction with three conductor cord in wet or grounded areas.

14.24.4. Inspections shall be conducted as required by the OSHA assured grounding program.

14.25. Portable electric tools shall not be raised or lowered from structures while connected to the power source and shall not be connected until ordered by the worker using the tool.

14.26. The Company shall request the Union to designate a representative to the Company's Safety Tool Advisory Committee.

Section XV – Grounding

15.0 Grounding

15.1. Introduction

15.1.1. Worker protection consists of two components: A System Ground, and a Work Site Equipotential Zone (EPZ). The System Ground is a safety procedure designed to keep the equipotential work zone from becoming energized any longer than necessary in the event the circuit or equipment becomes energized. The EPZ ensures that workers are protected in case of an energization of the work area. The System Ground and the EPZ may be at the same location or the System Ground may be remote from the work area. It is important to understand that BOTH components shall be in effect while work is being performed and are inherent to provide the worker with the maximum protection currently available.

15.1.2. There are many reasons a circuit may become energized. **Some examples are:**

15.1.2.1. Human error

15.1.2.2. Accidental contact

15.1.2.3. Lightning

15.1.2.4. Back feed

15.1.2.5. Inductive/Capacitive changes

15.1.2.6. Induction

15.1.2.7. Testing

15.1.2.8. Equipment failure

15.1.3. These methods have been compiled from the latest sources of information throughout the electrical industry. They represent the safest measures that can be taken given the current knowledge available. As practices and methods are refined and altered, new procedures will be incorporated into this document.

15.2. Grounding Definitions

15.2.1. Ground: A conductive body, usually earth, to which electrical potential is referenced.

15.2.2. System Ground: An intentional connection between the earth and a normally current carrying conductor. This connection shall have sufficient ampacity to conduct the maximum fault current

that may occur if the conductor becomes energized.

15.2.2.1. The purpose of the System Ground is to ensure that the conductor is de-energized by activation of the system protective devices, thus limiting the time of energization to a matter of acceptable cycles.

15.2.2.2. One of the following may be used as a System Ground:

15.2.2.2.1. System neutral

15.2.2.2.2. Grounded static wire

15.2.2.2.3. Substation ground grid

15.2.2.2.4. Grounded structures (metallic tower leg, grounded tower footing)

15.2.2.2.5. Pole/Structure ground attached to a system neutral or static wire

15.2.2.2.6. Anchor rod

15.2.2.2.7. Temporary driven ground rod

15.2.3. Equipotential Zone: A worksite protective area that places all conductive components, including people, at the same electrical potential.

This is accomplished by connecting those components (conductors, guy wires, pole grounds, anchors, overhead ground/shield/static wires, equipment, etc.) together with EPZ cables.

15.2.3.1. The purpose of the EPZ is to limit the current flow through conductive components and limit the voltage drop across them to an acceptable level.

15.2.3.2. It is recommended that the EPZ be bonded to an acceptable System Ground at the work site if one is available. If an acceptable System Ground is not available at the work site, then it may be established at a location remote from the work site.

15.2.4. Acceptable level: Less than 100mA - Less than 100 volts. (IEEE Electrical Shock and Safety Standards)

15.2.5. Personal Protection: The application of the Equipotential Zone and System Grounds.

15.2.6. System Grounding Equipment:

15.2.6.1. A system of approved grounds which include adequate size cables, clamps, ferrules, connectors, portable bus, and cluster bars.

15.2.6.2. Ground switch

Note: All are designed and suitable for carrying fault current and grounding conductive objects as outlined in this manual.

15.2.7. EPZ Equipment:

15.2.7.1. A system of approved EPZ cables which include adequate size cables, clamps, ferrules, connectors, and cluster bars.

15.2.7.2. All are designed and suitable for carrying fault current and grounding conductive objects as outlined in this manual.

15.2.8. Shall, Must, Should: Shall and must are used to indicate provisions which are mandatory. Should is used to indicate provisions which are not mandatory, though preferable. If, however, work conditions permit the application of the rule, it shall be followed.

15.2.9. Magnetic Field: The current flowing in an energized circuit produces a magnetic field which in turn induces a current and voltage in parallel conductors and shield wires. With one ground on the parallel wires, the magnetic field induces a voltage in the de-energized line that increases

with distance from the ground on the de-energized wires.

15.2.10. Circulating Current: When a second ground is placed on the de-energized wires a closed loop is formed in the de-energized circuit and a circulating current may flow. Multi-grounded shield wires will naturally form induction loops as they are grounded at each structure. Every precaution must be taken during ground installations, the work process, and removal of grounds to prevent workers from getting any part of the body between a conductor or shield wire and the ground path outside of an equipotential zone. A loop is formed in any of the following situations:

15.2.10.1. When the ground switches at both line terminals are closed.

15.2.10.2. When a personal protective ground is applied at a work site on the line and either one or both of the terminal ground switches are closed.

15.2.10.3. When personal protective grounds are applied at two or more different work sites on the line.

15.2.10.4. When a personal protective ground is applied to an insulated shield wire section which is grounded at only one end of the section.

15.2.10.5. When there are multi-grounded shield wires.

15.2.11. Electric Field: When there is no ground on a parallel wire, the electric field around nearby energized conductors produce high potentials at the work site. Large or long ungrounded objects are hazardous to people on the ground and in the air. The voltage of the energized circuit produces an electric field which charges the parallel conductors and shield wires which produce a voltage in the de-energized circuit. This is called capacitive coupling. This charge is readily drained off the wire by a ground.

15.2.12. Voltage Gradients: When a ground fault occurs on a power line, voltage is impressed on the “grounded” object faulting the line. The voltage to which this object rises depends largely on the voltage on the line, the impedance of the faulted conductor, and the impedance to “true” or “absolute” ground represented by the object. If the object causing the fault represents a relatively

large impedance, the voltage impressed on it is essentially the phase-to-ground system voltage. However, even faults to well-grounded transmission towers or substation structures can result in hazardous voltages. The degree of the hazard depends upon the magnitude of the fault current and the time of exposure. The dissipation of voltage from the object faulting the line is called the ground potential gradient or voltage gradient. Voltage drops associated with this dissipation of voltages are called ground potentials or voltage gradients. **See example:** [See 15.11.5.](#)

15.2.13. Step Potential: The voltage between the feet of a person standing near an energized grounded object. It is equal to the difference in voltage between two points at different distances from the grounded object (the ground electrode). For worker protection this distance is usually assumed to be about three feet, or the distance between a worker's feet while in a walking configuration. A person could be at risk of injury during a fault simply by standing near the grounding point. **See example:** [See 15.19](#)

15.2.14. Touch Potential: The voltage between the energized object and the feet of a person in

contact with the object. It is equal to the difference in voltage between the object (which is at a distance of 0 feet) and a point some distance away, usually assumed to be about three feet, or the distance a worker could touch an object while standing on the ground. **See example:** [See 15.19](#)

15.2.15. Transferred Touch Potential: The voltage between the energized object and the feet of a person standing on the ground while making contact with the energized object (the ground electrode) through a conductive medium such as the frame or winch line of a vehicle that has been bonded to the grounding electrode. The same applies to a worker with no worksite protection who is contacting a conductor that is grounded at some remote distance. This voltage may be much higher than the “touch potential” due to the greater distance between the worker and the ground electrode.

15.2.16. Capacitive Coupling (Sometimes referred to as “Electrostatic Coupling): Because of the capacitive couplings between each of the live conductors and each of the de-energized ones, a voltage is induced in the de-energized conductors. The induced voltage

depends on the operating voltage and on the relative location of the live phases, and can be hazardous to workers. If the de-energized line were grounded at one point, the induced current that would flow is directly proportional to the exposed length of the two lines. Connection of a single grounding cable to a line subject to capacitive coupling does not present any great difficulty. On the other hand, removal of such a ground can result in a long arc, which may be quite distressing to an unprepared person manipulating the grounding cable. Tests have shown that the length of the arc is quite unpredictable, depending on the initial current flowing, the voltage after the arc is extinguished, the prevailing weather, and the speed of withdrawal of the grounding clamp.

15.2.17. Magnetic Coupling (Sometimes referred to as a “Transformer Coupling”): Due to inductance between each of the live and each of the de-energized phases, a loaded live line induces a voltage in an adjacent parallel de-

energized line due to the magnetic field surrounding it. If the de-energized circuit is grounded at two or more locations either through line ground switches or protective grounds, a circulating current through the grounds that may be in the order of several hundred amps for long, closely coupled, lines may result. This can result in recovery voltages and currents that make it very difficult to remove the grounds and that may be disturbing to the worker. Switching devices and appropriate work methods should be available to cope with such situations; should they arise.

15.2.18. Bonding: Connecting two or more conductive components together with an adequate conductive cable or wire. The function of bonding is to remove the differences of potential between those components.

15.2.19. Fault Current: Current that flows from a source through a conductor to a point where there is a conductive connection between that conductor and earth, and back through the earth to the source. The lower the resistance of the

entire circuit, the higher the fault current.

15.3. EPZ/Grounding Cables and System Ground Sources

15.3.1. The following are the minimum EPZ/Grounding cable sizes for personal protection:

15.3.1.1. Distribution: **2/0 Cu**

15.3.1.2. Distribution underground: **1/0 Cu (†)**

15.3.1.3. Substation: **4/0 Cu**

15.3.1.4. Transmission: **4/0 Cu and 2/0 Cu (*)**

15.3.1.5. Conductive Bolt (**)

15.3.1.6. Generator Stations

(*) - 2/0 Cu approved for use on 1/0 Cu or smaller wire. Parallel 2/0 Cu is equivalent to one 4/0 Cu.

(*) - 2/0 is acceptable under certain applications, see specifications in [section 15.14.](#)

(†) - Live front grounding equipment is available for obsolete underground systems, contact the Safety Department.

(**) A conductive bolt shall be a one inch galvanized

bolt or a half inch “Grade 5” non-coated bolt. A Ball-stud may be used in place of a conductive bolt.

15.3.2. The construction of the System Grounding and Equipotential Zone cables, at minimum, is clarified by the following:

15.3.2.1. All EPZ/grounding cables will be made from copper stranded grounding cables.

15.3.2.2. The ferrules will have threaded ends with a clear heat shrink over the pressed connection and end of the cable.

15.3.2.3. The jacket of the cable can be either yellow or clear.

15.3.2.4. Grounding clamps for overhead distribution (2/0 cables) shall be capable of carrying 27,000 amps for 15 cycles or 20,000 amps for 30 cycles. (ASTM F855-1990)

15.3.2.5. Grounding clamps for overhead transmission, substation and generating stations (4/0 cables) shall be capable of carrying 43,000 amps for 15 cycles or 30,000 amps for 30 cycles.

(ASTM F855-1990)

15.3.3. If an EPZ/Grounding cable has been or is suspected of being subjected to a fault, it shall be taken out of service, visually checked and electrically tested before reuse.

15.3.4. EPZ/grounding cables shall be kept clean and in good condition and should be stored in the truck bin or in bags.

15.3.5. When paralleling 2/0 Cu EPZ/Grounding cables, they must be of equivalent length and terminations.

15.3.6. When installing EPZ/Grounding cables for personal protection the EPZ shall be created at the work site and the System Ground shall be installed to the best available ground source identified in the list below:

15.3.6.1. System neutral

15.3.6.2. Grounded static wire

15.3.6.3. Substation or Generating Station ground grid

15.3.6.4. Grounded structures (metallic tower leg, grounded tower footing)

15.3.6.5. Pole/structure ground attached to a system neutral or static wire

15.3.6.6. Anchor rod

15.3.6.7. Temporary driven ground rod

Note: Temporary ground rods may be the only available ground source on unshielded wood, fiberglass or concrete pole construction and used only when no other ground source is practical or available.

Note: If used, install temporary ground rods a minimum of 30 feet away from the work area (if practical) and barricade to minimize the hazard to personnel on the ground caused by step and touch potential.

15.4. General Practices

15.4.1. The standard method of protection for the worker is installing System Grounds and creating an EPZ.

15.4.2. System Grounding will protect the worker against possible injury from potentially hazardous voltage by limiting the duration of voltage rise at the work site in the event of line energization.

15.4.3. The purpose of an EPZ/Grounding procedure is to provide personal protection for the worker on de-energized power lines or equipment.

15.4.4. Where several work sites are involved, an EPZ shall be created at each worksite so that each has the capacity to protect a worker against the maximum available fault current for the line segment being worked on.

15.4.5. An EPZ shall be used when working on de-energized power lines or equipment except when work activities such as testing the circuits or fault locating requires the temporary removal of personal protection. Personal protection shall be replaced as soon as such testing and fault locating are completed.

15.4.6. Clearance/Terminal Clearance: If a clearance/terminal clearance is required before beginning any work on a de-energized line or equipment, obtain a clearance/terminal clearance from the Dispatcher/Grid Operator or other authorized party assuring that the line or equipment is open and has been de-energized or isolated from all known sources of energy, and that all known potential sources have been

tagged.

Note: Any switches in the line between the work area EPZ and System Ground must be closed and remain closed during the time the Clearance/Terminal Clearance is in effect.

15.4.7. Where energized parallel lines are present, proper consideration shall be given to the effects of induction. If the test for a de-energized circuit leaves any doubt, the Dispatcher shall be contacted before any attempt is made to install EPZ/Grounding cables.

15.4.8. Voltage Detection: When existing power lines or equipment are taken out of service to be worked on, they must be **isolated, tested and verified de-energized with a voltage detection device** (Best Practice). If a voltage detection device is not available, fuzzing the line with a hot line tool equipped with a minimum 10" piece of metal on the contacting end is acceptable as a last resort. Be certain that the line is actually de-energized before the work is started. This also applies to new lines when the construction has progressed to the point when the line can actually be energized from any source.

15.4.9. Inspection: Each EPZ/Grounding cable set shall be thoroughly inspected and electrically tested annually. Prior to each use pay specific attention to the following:

15.4.9.1. Check the condition of the cable at each ferrule.

15.4.9.2. Ability of the clamps to close tightly.

15.4.9.3. General mechanical condition of the hardware.

15.4.9.4. All connections, nuts and bolts, or clamps and ferrules are to be inspected for tightness.

15.4.9.5. The covering on EPZ/Grounding cables is not electrically rated insulation. It is only protection for the stranded conductors. Wherever additional insulation is necessary, approved cover-up protection equipment shall be applied.

15.4.10. Installation Procedure

15.4.11. Create a low resistance connection.

15.4.11.1. Ensure all connection points are clean and tight.

15.4.11.2. All EPZ/Grounding cables will be

connected at the ground end first when installing.

15.4.11.3. Protective grounding jumpers shall be removed in reverse order of installation, with the farthest jumper removed first.

15.4.11.4. All EPZ/Grounding clamps shall be installed and/or removed from conductors with an approved hot stick.

15.4.11.5. When applying the EPZ/Grounding cables to conductors, care must be taken to stay clear of the cables. The practice of holding the cable near the base of the hot stick to lighten the load on the head of the stick is discouraged.

15.4.11.6. Coiling in service EPZ/Grounding cables increases impedance and should be avoided.

15.4.11.7. Hotline clamps are not approved grounding clamps

15.4.12. Restrict movement of protective grounding cables.

15.4.12.1. The strong magnetic fields produced when large currents flow in EPZ/Grounding cables can cause the cables to whip violently.

15.4.12.2. EPZ/Grounding cable lengths shall be kept as short as possible and arranged in such a manner as to minimize the possibility of injury from cable movement in the event the line/equipment is energized.

15.4.13. Shield Wires

15.4.13.1. When work is performed in proximity to a shield wire an EPZ connection must be made to the shield wire(s). See **MAD** [section 5](#) for approach distance of insulated shield wires.

15.5. Grounding Procedures Exceptions

15.5.1. Creating an EPZ with a System Ground is the safest and preferred method of personal protection. In certain circumstances, however, this method is impractical and other methods may be used.

EXCEPTION 1: When creating an EPZ and installing System Grounding is impractical or more hazardous than working on the lines or equipment without grounds, the grounds may be omitted provided that all work is done as if the line or equipment were energized.

EXCEPTION 2: If through the tailboarding process

the qualified worker in charge determines that including only the phase to be worked on in the EPZ is as safe as multiphase EPZ, the qualified worker shall assure this procedure is thoroughly understood by the crew and take every precaution to keep workers on the ground away from the structure or any other item that is bonded to the EPZ system. Minimum safe working clearances shall apply to all other unprotected phases.

EXCEPTION 3: Working without Grounds: For employees to work on lines or equipment as de-energized the lines or equipment shall be de-energized and System grounded/EPZ'd under the provisions of this Accident Prevention Manual.

15.5.2. However, if the qualified worker in charge can demonstrate and document through the tailboard process that the installation of a System Ground and Work-Site EPZ is impracticable or that the conditions resulting in the installation of a System Ground and Work-Site EPZ, would present greater hazards than working without a System Ground/Work-Site EPZ, the lines and equipment may be treated as de-energized provided ALL of the following conditions are met:

15.5.2.1. All switches, disconnectors, jumpers, taps and other means through which known sources of electric energy may be supplied to the particular lines and equipment have been opened, rendered inoperable (unless its design does not so permit), and tagged to indicate that employees are at work.

15.5.2.2. All automatically and remotely controlled switches that could cause the opened disconnecting means to close shall also be tagged at the point of control. The automatic or remote control feature shall be rendered inoperable, unless its design does not so permit.

15.5.2.3. Tags shall prohibit operation of the disconnecting means and shall indicate that employees are at work.

15.5.2.4. There is NO possibility of contact with another energized source.

For example: The lines or equipment to be worked do not cross over or under other energized lines or equipment.

15.5.2.5. The hazard of induced voltage is not present.

15.5.2.6. The lines and equipment to be worked on are tested to ensure they are de-energized.

One example of the use of this exception could be multiple spans of wire down, completely removed from any source or possible back feed, no energized crossings, and no chance of induction. While clearing and preparing this wire to be put back up it is impractical to ground and create an equipotential zone. (This may include demolition or new construction)

15.6. Grounding During Stringing Operations

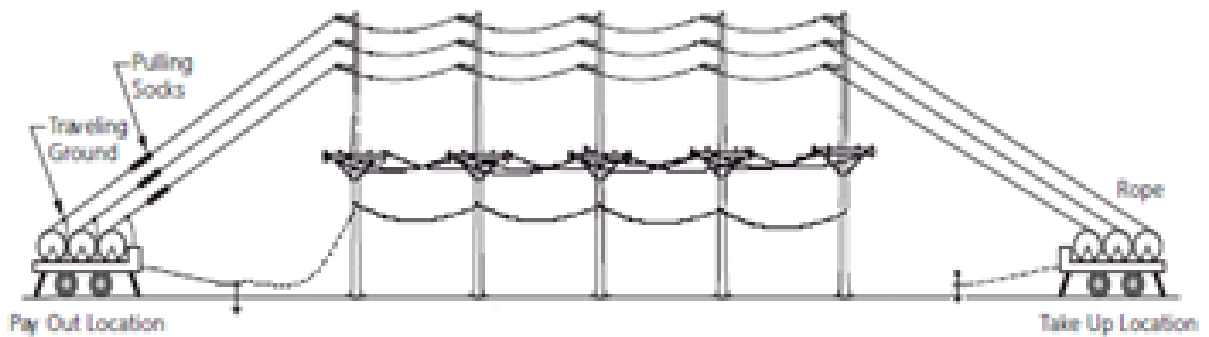
15.6.1. When a conductor is being strung in or removed, and there exists the possibility that it could come into contact with lines energized in excess of 600 volts or receive an induced voltage from lines energized in excess of 600 volts, the following requirements must be observed:

15.6.1.1. Ground equipment per [section 15.15](#) on “Mechanical Equipment Grounding”.

15.6.1.2. A traveling ground shall be installed ahead of tensioning equipment and bonded to the tensioning equipment with an approved grounding cable. When an existing conductor or a conductive pulling line is used to pull in new conductor, a traveling ground shall be installed and bonded to the pulling equipment with an approved grounding cable. Conductor being pulled with rope shall be grounded at the pulling end as soon as it can be reached from the ground or provisions shall be made to insulate or isolate the worker.

15.6.1.3. When the stringing operation has been completed, or if work is to be done on the conductors before the stringing operation has been completed, the conductors shall be grounded before the traveling grounds are removed.

15.6.1.4. When stringing over or adjacent to energized circuits, all circuit breaker reclosing devices shall be disabled.



15.7. New Construction

15.7.1. New lines or equipment may be considered de-energized and worked as such where:

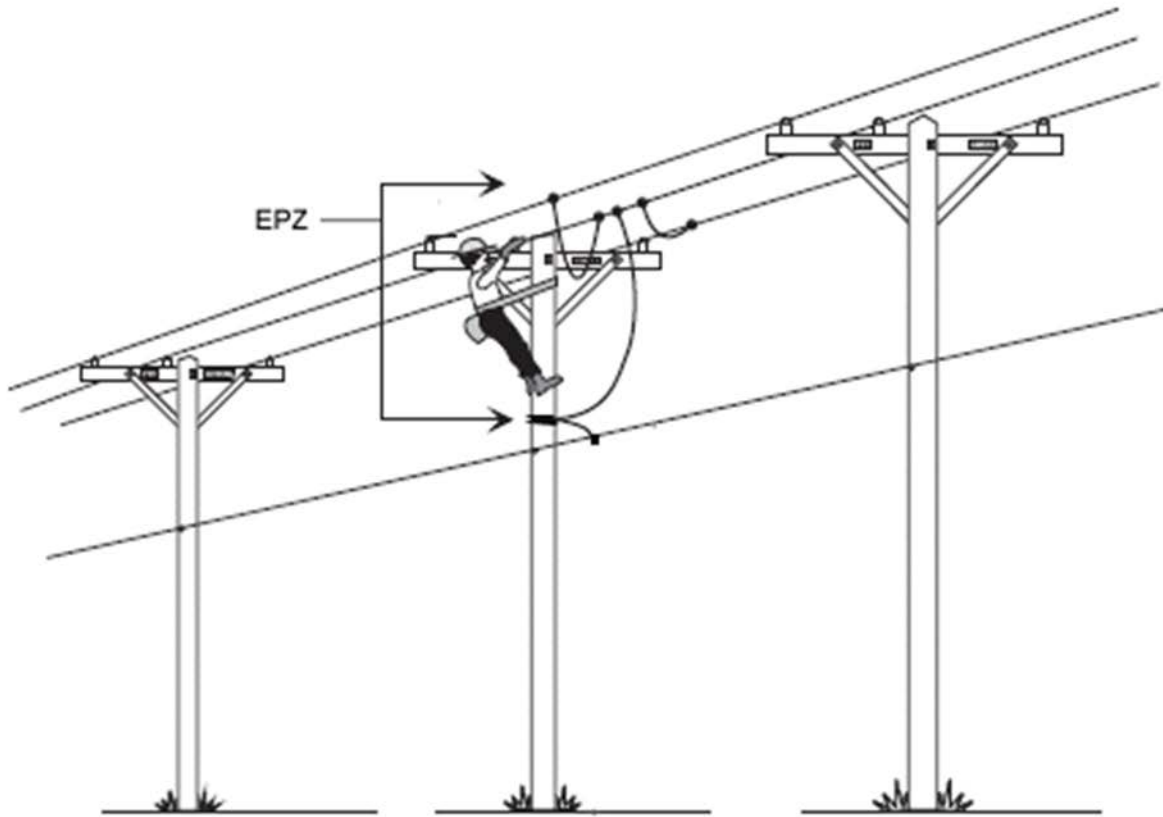
15.7.1.1. The lines or equipment are grounded, or

15.7.1.2. The hazard of induced voltages is not present and adequate clearances or other means are implemented to prevent contact with energized lines or equipment and the new lines or equipment.

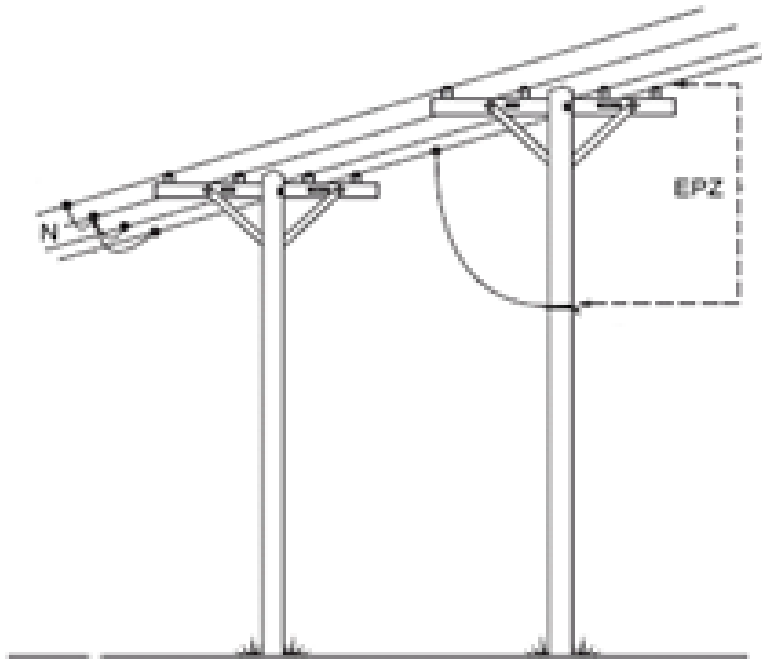
15.8. Overhead Distribution

15.8.1. This section is designed to describe situations that may be unique to overhead distribution installations. The General Practices outlined in other sections of this manual may also apply.

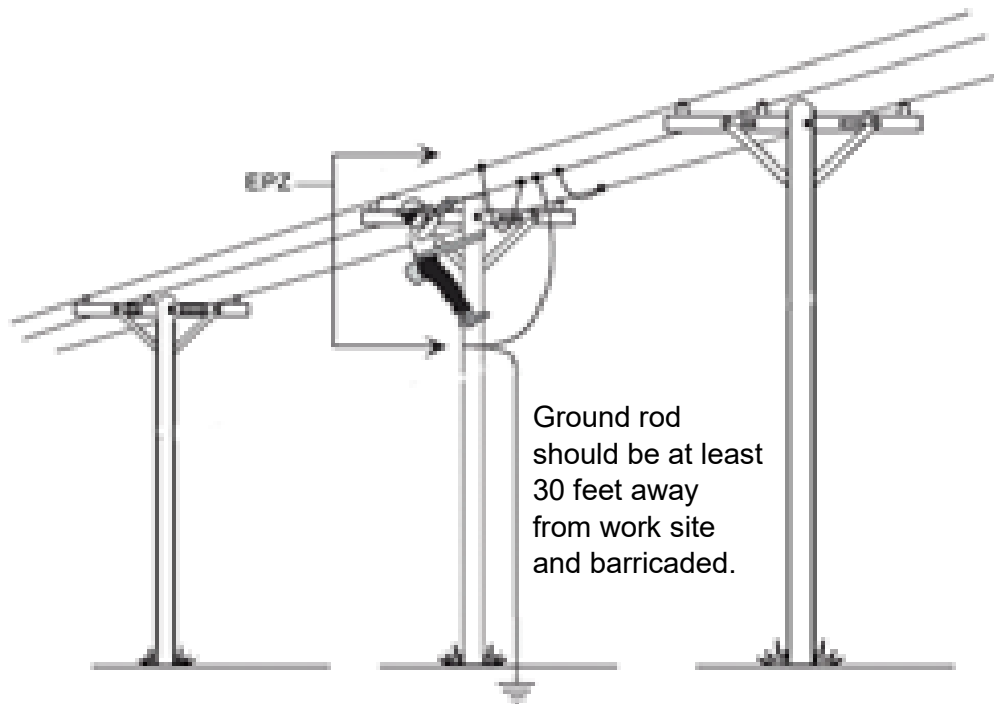
- 15.8.2.** When working on grounded conductor(s) an EPZ shall be created.
- 15.8.3.** All connections shall be made from the ground end first and removed in reverse order.
- 15.8.4.** When simultaneous contact can be made between a grounded conductor and non-metallic poles/structures, an EPZ shall be installed below the worker and out of reach of the ground help.
- 15.8.5.** Clamps must be tightened to assure a good electrical connection and to prevent the clamps from being "blown off" by mechanical force. If the clamp contains set screws, they shall be tightened securely.



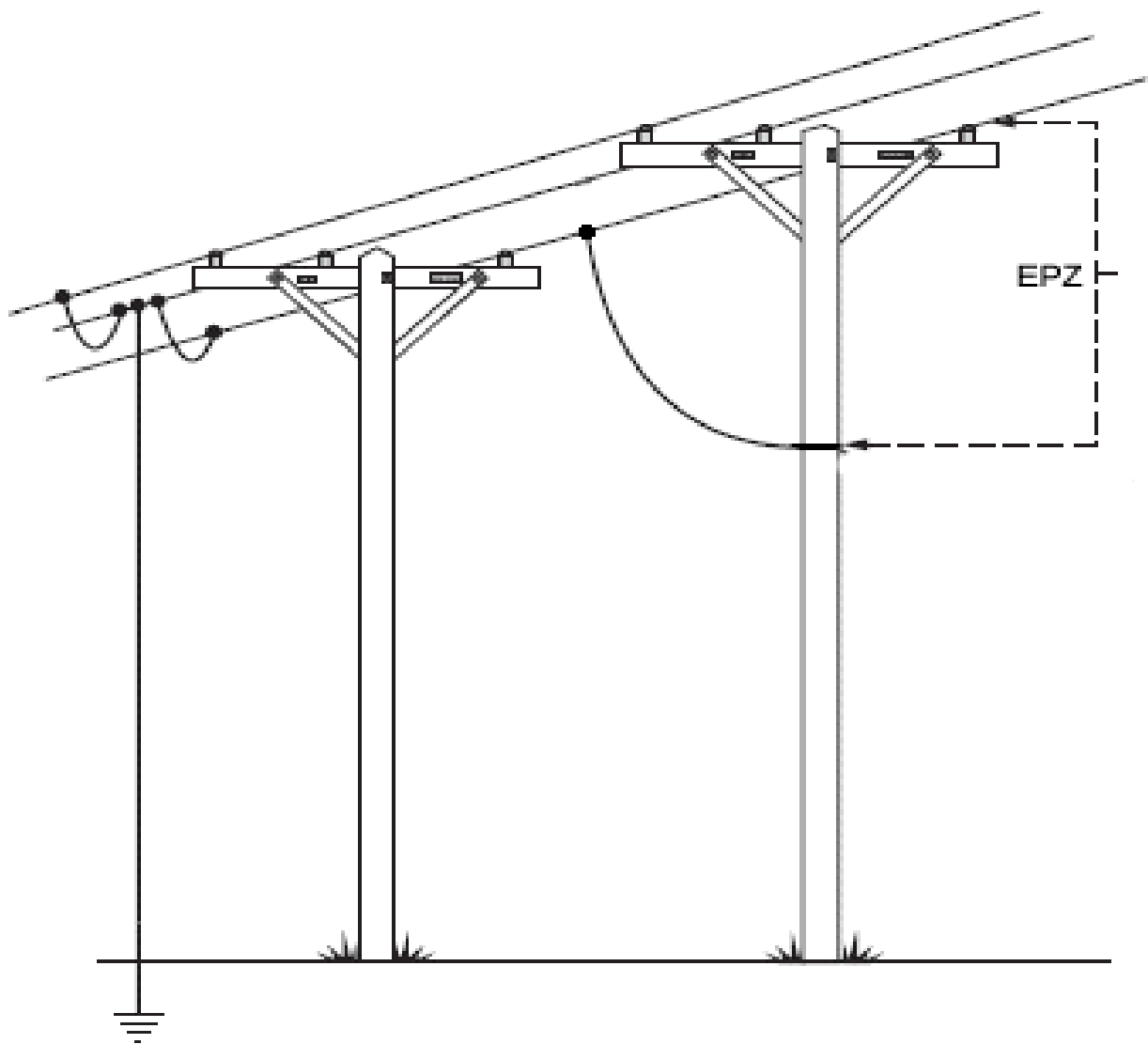
Typical 3 Phase Grounded WYE



3 Phase WYE with Remote System Ground



Typical 3 Phase Delta



3 Phase Delta with Remote System Ground

15.9. Underground Distribution

15.9.1. This section is designed to describe situations that may be unique to underground installations. The General Practices outlined in other sections of this manual may also apply.

15.9.2. All conductors of the section of the circuit to be worked on shall be opened and grounded at the closest opening points on all sides of the work location.

15.9.3. The conductors shall be electrically tested before grounding an underground circuit.

15.9.4. Before cutting into an assumed de-energized and grounded cable, it shall be pierced with a cable penetrating clamp or cut with hot cutters from a remote position to avoid injury in the event the cable is energized.

15.9.5. Personal protective equipment shall be worn by workmen operating fault-locating equipment. This protection is necessary as fault-locating equipment cannot be used on circuits with protective grounds installed.

15.9.6. To eliminate step and touch hazards to workers in contact with the cable, or near a de-

energized and grounded cable, workers shall follow one of the following procedures:

- 15.9.6.1.** Insulate from any possible potential difference between the cable and earth.
- 15.9.6.2.** Isolate from any possible potential difference between the cable and earth by isolating the primary conductor and the concentric neutral conductor.
- 15.9.6.3.** Isolate from any possible potential difference between the cable and earth by isolating the primary conductor and maintaining the concentric neutral at the worksite.
- 15.9.6.4.** Consider the integrity of the concentric neutral when connecting and disconnecting.
- 15.9.7.** Workers can **insulate** from any possible potential difference between grounded cables and earth by using one or a combination of insulated rubber gloves, insulated footwear, insulated platforms, or insulated mats.
- 15.9.8.** Workers can **isolate** from any possible potential difference through a grounded cable by first grounding both ends of the cable by an approved method, then removing both cable

grounds and disconnecting the cable's concentric neutral from the system neutral. Any connection of the concentric neutral to other cables must be eliminated, such as bare concentric neutrals lying on or in contact with other cables.

15.9.9. Workers can **isolate** the work site by first grounding both ends of the cable by an approved method, then removing the ground and parking the elbow on an insulating parking bushing. At the worksite the concentric neutral shall be maintained by use of an approved underground grounding cable. See illustration in [section 15.10.4.](#)

15.10. Grounding Elbow Procedure

15.10.1. The following grounding procedure for pad mounted transformers may be used for other types of equipment.

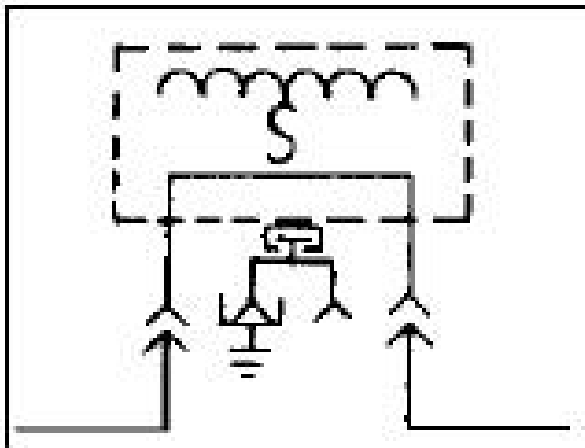
15.10.2. Scope: The following procedure may be used to ground an U.G. primary cable at a single phase pad mount transformer using the grounding elbow system. This procedure is intended to be an example of the basic operation of the grounding elbow system such as would be used after the system has been sectionalized in

preparation for fault locating. Variations of this procedure will be required in different situations, but the basic procedure is the same.

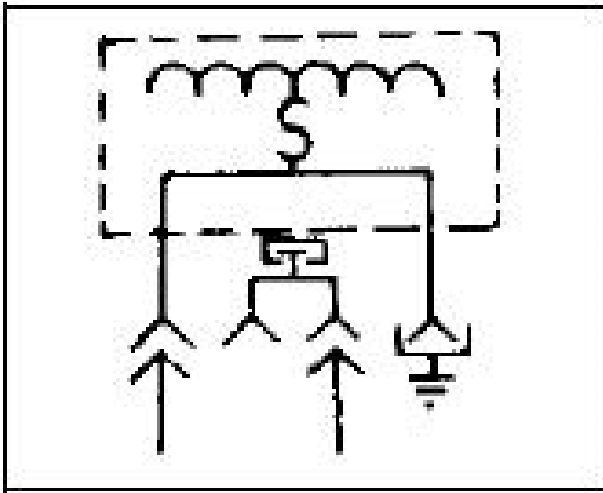
15.10.3. General Grounding Elbow Procedure

15.10.3.1. Step 1 – Identify and isolate cable to be grounded.

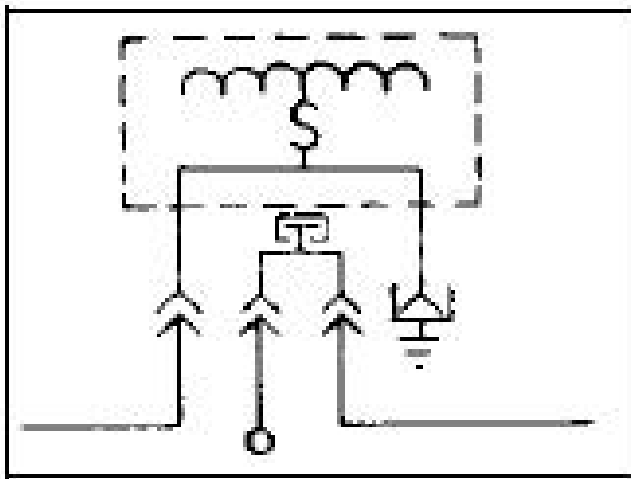
15.10.3.2. Step 2 – Secure feed-through stand-off to bracket on transformer. Connect ground leads from grounding elbow, and protective cap to system ground. A rated grounding clamp may be used to connect the ground lead on the grounding elbow to the system ground. Install protective cap on portable feed-through using the bushing furthest from the cable to be grounded.



15.10.3.3. Step 3 – Transfer the elbow on the cable to be grounded from the transformer bushing to the uncapped bushing of the feed-through. Remove protective cap from the feed-through and install on the open transformer bushing.



15.10.3.4. Step 4 – Using a voltage testing device, test the open bushing of the feed-through to verify the cable is de-energized.



15.10.3.5. Step 5 - Plug grounding elbow into the portable feed through. Proceed to the other end of the cable and repeat this procedure.

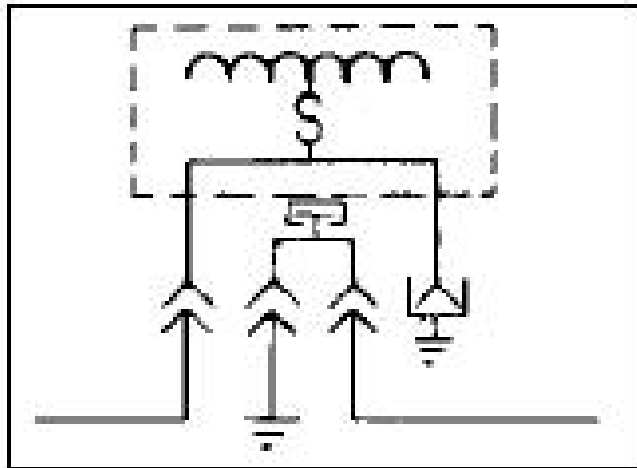
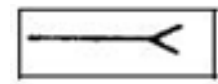


Diagram Legend

Elbow



Bushing



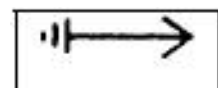
Protective Cap



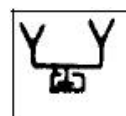
Voltage Testing Device



Grounding Elbow



Portable Feed – Through on Parking Stand



Note: A rated grounded stand-off bushing may be used after verifying by a test that the cable is de-energized.

Note: Live front grounding equipment is available; contact the Safety Department.

Note: Use appropriate sized components for the system you are working on.

15.10.4. Concentric Neutral Jumper

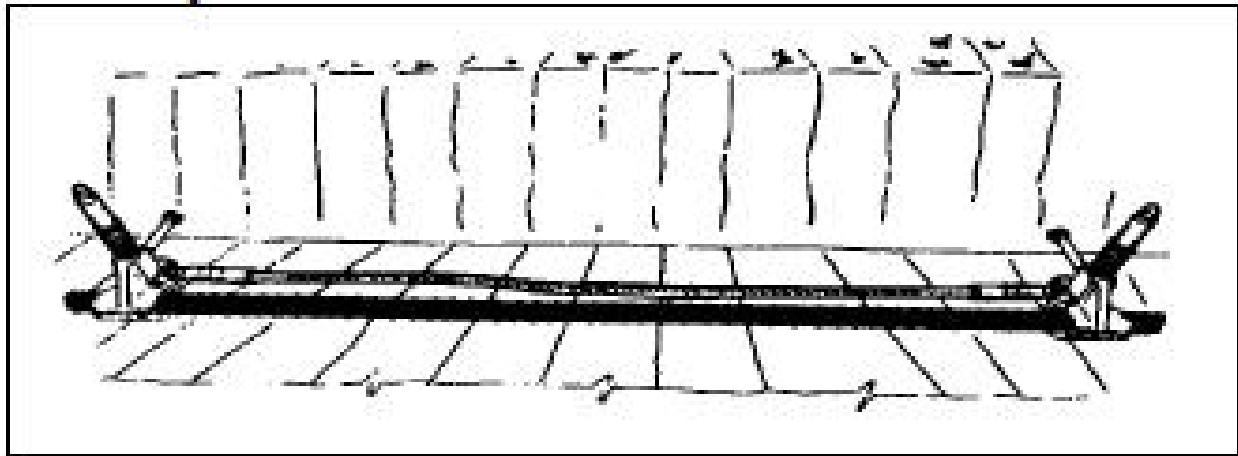
15.10.4.1. In order to ensure a continuous system neutral while repairing a faulted cable, a concentric neutral jumper **should** be installed prior to cutting the system neutral as shown below. When concentric neutral has been completely **isolated**, the concentric neutral jumper does not need to be installed. [See section 15.9.8. \(2019\)](#)

15.10.4.2. The concentric neutral ground set is intended to protect workers from currents traveling on system neutrals. This does not create an equipotential zone. Ground mat may be used to create an equipotential zone.

Caution: Tighten the clamps two complete turns after contacting the system neutral. **DO NOT** tighten

grounding clamps such that the concentric strands become imbedded into the semi-conductive jacket of the cable.

UG Concentric Neutral Example



15.11. Transmission

15.11.1. This section is designed to describe situations that may be unique to transmission systems. The General Practices outlined in other sections of this manual may also apply.

15.11.2. Clearance Request Procedures

15.11.2.1. Parallel lines, particularly double circuit transmission lines with one side de-energized, will increase the hazard of potential difference to installation and removal of grounds, caused by the closer coupling of the parallel lines. The electric field coupling (electrostatic

coupling) is dependent upon the magnitude of the voltage on the energized parallel line. The magnetic field coupling (electromagnetic coupling) is dependent upon the magnitude of the current flowing in the parallel line.

15.11.2.2. Significant hazards exist when applying or removing personal protective grounds on transmission lines containing circuit compensating devices such as series capacitors or shunt reactors. The person taking the clearance must first determine if the line contains either of these circuit devices so that the effects can be minimized. Therefore, the clearance taker should adhere to the following steps:

15.11.2.2.1. Series Capacitors: Request the dispatcher to isolate or bypass the capacitors from the line.

15.11.2.2.2. Shunt Reactors: Request the dispatcher to isolate the high side winding from the line.

15.11.3. Ground Switches

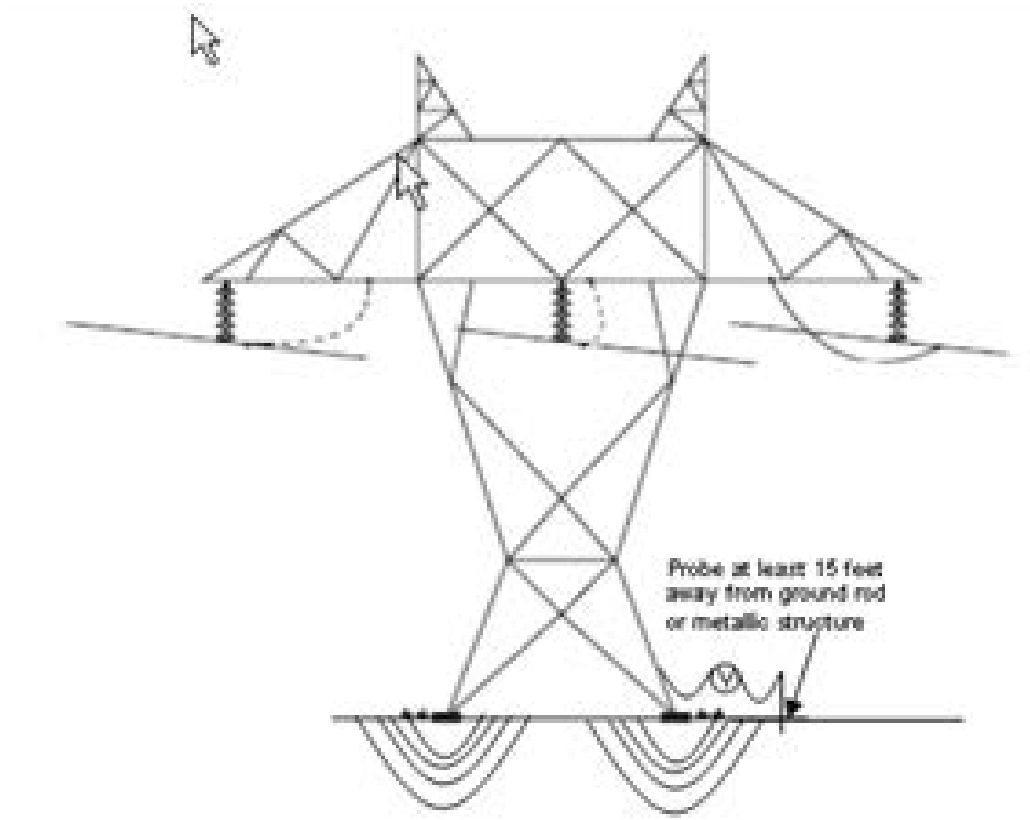
- 15.11.3.1.** Ground switches have been installed for many years on both terminals of some transmission lines. If available, a ground switch may be used as the System Ground with an EPZ created at the work site. Studies have shown that magnetic field induction between parallel transmission lines can be hazardous due to the induced voltage and current.
- 15.11.3.2.** Having more than one ground source on a line may result in a hazardous condition known as circulating current.
- 15.11.3.3.** If there is a problem installing or removing grounds at the work site because of induced currents and voltage, one ground switch should be closed, if possible.
- 15.11.3.4.** Before closing a ground switch, the line should be tested and verified to be de-energized with an approved voltage detection device if possible.
- 15.11.3.5.** When a ground switch will be used as the system ground, the ground switch shall be closed and included as part of the switching.

When there are multiple ground switches available, use the best source available.

15.11.4. Field Application

15.11.4.1. When a System Ground is established at a field location, system grounding cables shall be installed so that all phases are effectively bonded together in a multi-phase "short" and connected to ground. Transmission system grounding of only one phase of a multi-phase circuit is prohibited.

15.11.4.2. EPZ with remote System Ground: If the System Ground has been established remote from the worksite, the application of the EPZ to one phase is permissible. **(2019)**



EPZ with Remote System Ground Multi-Phase EPZ Optional

15.11.5. Grounding Procedures

15.11.5.1. After obtaining the required clearance, use the following procedures to apply EPZ/Grounding cables at the work site.

Note: When creating an EPZ at the worksite that includes metallic structures and other equipment at the ground level. You may be creating step and touch potential hazards for personnel at the ground level. The step and touch potential should be monitored by

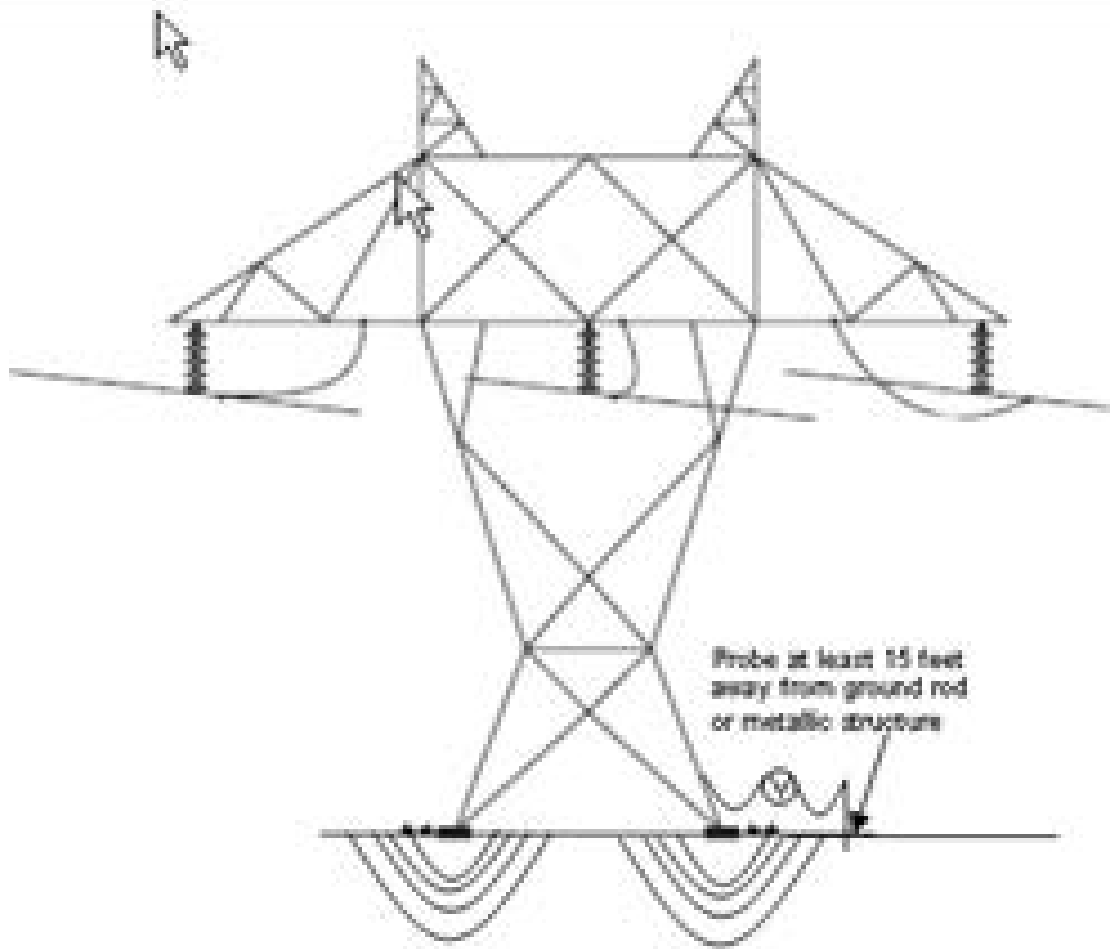
use of approved step and touch monitor or use of a voltmeter. The steps to set up the monitoring system are: **(2019)**

15.11.5.1.1. Drive a metallic ground probe approximately 15 feet from the working ground or tower legs to a depth of 18 to 24 inches. The probe shall be 3/8" to 5/8" in diameter.

15.11.5.1.2. Connect multi-meter lead or step and touch monitor to ground probe. **(2019)**

15.11.5.1.3. Set multi-meter to highest AC voltage range or power on the step and touch monitor, see manufacturer's instructions. **(2019)**

15.11.5.1.4. Connect other lead to tower leg using appropriate PPE or hot stick. **(2019)**



Measuring Step and Touch Potential at Metallic Structure.

15.11.5.2. Once the monitoring system is in place proceed with installing the EPZ/Grounding cables.

15.11.5.3. Once the EPZ/Grounding cables are in place, check the step and touch potential with the monitoring system to determine the potential hazard. If using multi-meter make voltage measurement by changing multi-meter range as

required or use the step and touch monitor. Hereafter, the line conductors and all attached leads and conductive parts, including the metallic ground probe, shall be treated as parts of the circuit/EPZ. Workers aloft shall stay aloft and workers on the ground shall take care to avoid contact with the tower leg and equipment at ground level, including the voltage monitoring system. The monitoring system may display a voltage. The magnitude of the displayed voltage will determine which work procedure will be followed. **(2019)**

15.11.5.3.1. Voltage under 100 Volts: Work may proceed normally without extra protective measures. Workers may wear, at their own option, insulating gloves and protectors to avoid minor shocks. **(2019)**

15.11.5.3.2. Voltages between 101 and 499 Volts: All workers exposed to step and touch potential must wear insulating gloves with protectors and take special care to avoid inadvertent body contact with the tower leg and equipment at ground level, including the voltage monitoring system. **(2019)**

15.11.5.3.3. Voltages over 500 Volts: After all practical efforts have been made to reduce the voltage to its lowest level, remove the protective grounds and follow normal hot-line procedures. For tasks where hot-line techniques are not practical, approved alternative methods should be considered for accomplishing the work.

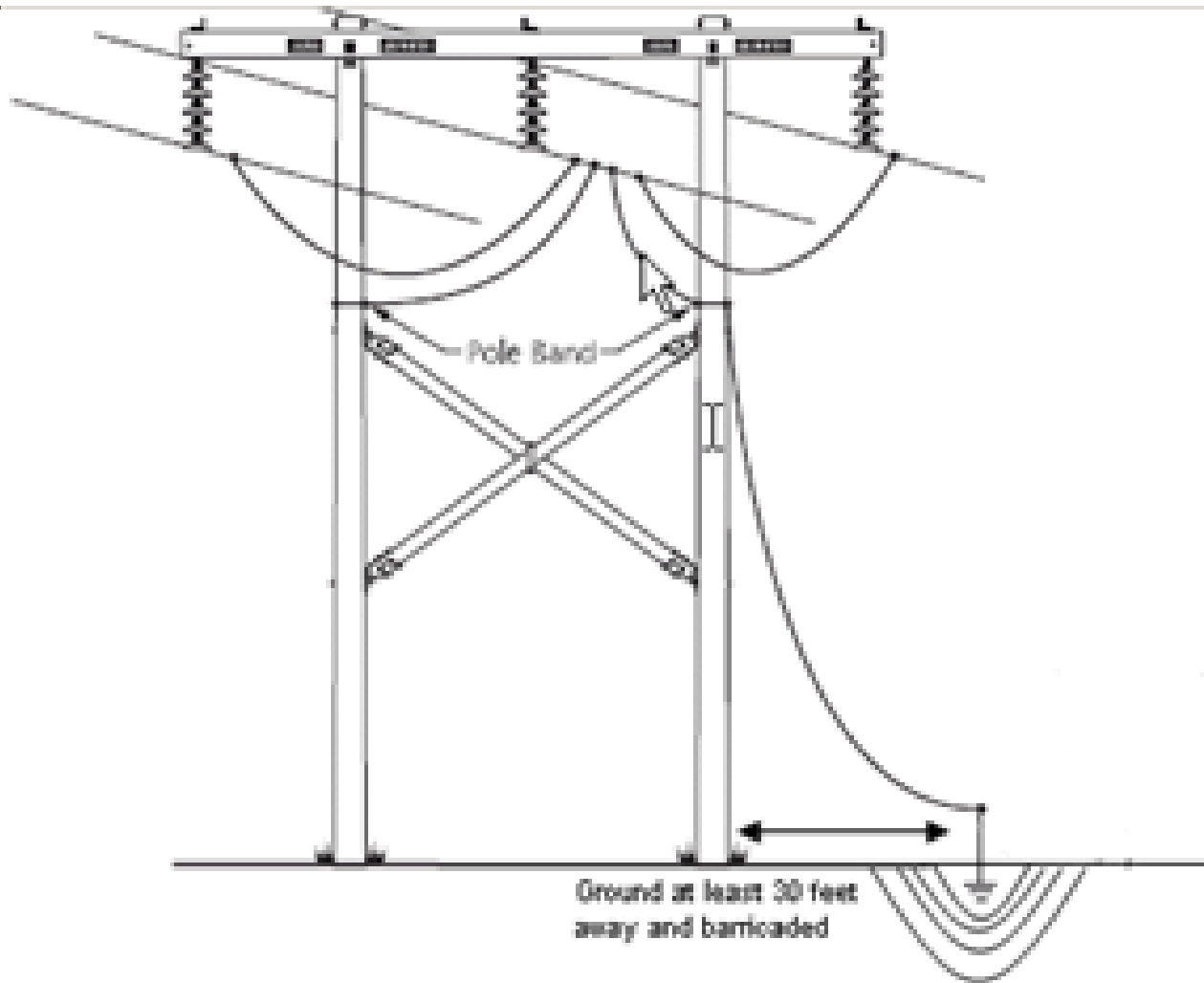
15.11.5.3.4. Methods of reducing step and touch potentials (voltage gradient) at the worksite.

15.11.5.3.4.1.Open ground switches at the line terminals if multiple grounds are on the line to reduce the step and touch potential. See [section 15.11.4.](#)

15.11.5.3.4.2.Sectionalize. Open sectionalizing disconnects and open jumpers if possible. Opening or closing bolted jumpers is subject to the work procedures outlined in general procedures.

15.11.5.3.4.3.Isolate from the line any capacitors or reactors on the line.

15.11.5.3.5. Insulating Gloves: Insulating gloves and protectors must be worn if monitoring system leads are changed, reconnected or removed while EPZ/Grounding cables are attached to any conductors. **(2019)**



EPZ/System Ground at Two Pole Structure

15.12. Metallic Structures

15.12.1. This section is designed to describe situations that may be unique to metallic structures. The General Practices outlined in other sections of this manual may also apply.

15.12.2. When creating an EPZ and/or System Ground on lattice tower structures a flat-face clamp shall attach the EPZ/Grounding cable to a structural member. On metallic pole structures a conductive bolt shall be screwed into the grounding nut provided on the pole for this purpose and one end of the EPZ/Grounding cable shall be attached to this bolt. Removable pole steps or ladders such as those used on metallic poles are not acceptable ground sources.

15.12.3. When working around metallic structures, care should be taken by ground personnel to minimize contact with the structure to reduce the hazard caused by step and touch potential. [See section 15.11.5.3 \(2019\)](#)

15.13. Bundled Conductor

15.13.1. When establishing an EPZ/System Ground on bundled conductors ensure all sub-

conductors in a bundled-phase conductor are bonded. Attach the EPZ/Ground connection to one conductor in the bundled phase. *Pay special attention to maintaining all conductors at the same potential.*

15.14. Substation and Generating Plants (2019)

15.14.1. This section is designed to describe situations that may be unique to substations and generating plants. The General Practices outlined in other sections of this manual may also apply.

15.14.2. Before any EPZ/Grounding cables can be attached, a proper clearance, terminal or lockout/tagout shall be obtained and the circuit, equipment or apparatus shall be tested to determine that it is de-energized. Then EPZ/Grounding cables shall be applied.

15.14.3. It is recognized that in many cases, the standard lengths will be longer than required for some jobs. Therefore, it is imperative that the excess lead be secured by whatever means necessary.

15.14.4. In single transformer substations, under 12.5 MVA, 4/0 or equivalent grounds on the high side and 2/0 grounds on the low side of the equipment being worked on will be sufficient.

15.14.5. There may be instances where the choice of 2/0 or 4/0 grounds is not clearly defined. In these cases, the determination, through the tailboard process, of which ground sets to use, will be left to the qualified worker in charge, bearing in mind that worker protection is of paramount importance.

15.14.6. Where lines terminate in substations, they shall be treated in accordance with the applicable Transmission and Distribution section of this manual.

15.14.7. Substations and generating plants normally have a grounding system that bonds all of the equipment to a common ground grid. It is still best practice to create an EPZ at the work location by grounding/bonding the high voltage components directly to the equipment being worked on to eliminate the unknown connections in the ground grid system. Where the ground grid is questionable or wood construction exists, the

creation of an EPZ may require additional EPZ/Grounding cables or other processes to create an adequate EPZ.

15.14.8. Testing

15.14.8.1. All grounding procedures shall be followed prior to testing.

15.14.8.2. Certain tests are performed on substation/generation equipment that requires the removal of one or both sets of grounds. These tests may include ductoring, meggering, sequence indicating, double testing, current transformer polarity tests or any other test that requires employees to work in an area capable of becoming energized at over 600 volts. **(2019)**

15.14.8.3. CAUTION: Test leads shall be connected to the test equipment first and disconnected from the test equipment last.

15.14.8.4. If the equipment to be tested is connected to a line section, the equipment under test shall be isolated from the line (and the line shall remain grounded) or the test shall be conducted with the grounds in place.

15.14.8.5. Once testing has been completed, any grounds removed shall be replaced before work continues.

15.14.9. A portable grounding bar may be used in substations.

15.14.9.1. It provides the necessary space to park grounding clamps where adequate ground mat pigtail leads are not available or bus size is larger than the grounding heads.

15.14.10. Where equipment such as line traps, CTs, or other similar equipment that is connected in series with the line are removed or disconnected, electrical continuity shall be maintained across the open with jumpers or additional EPZ/Grounding cables.

15.15. Mechanical Equipment Grounding and Bonding

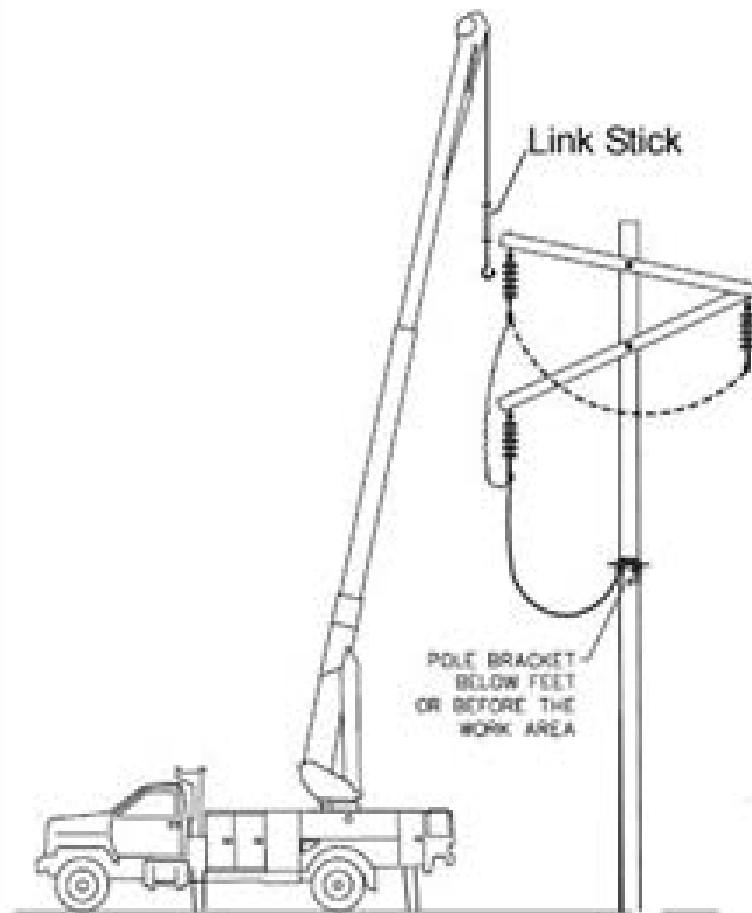
15.15.1. When and when not to bond equipment to the EPZ is a complex issue that has many things to take into consideration. Any conductive object that could create a difference in potential that is brought into the EPZ must be bonded to the EPZ to protect the workers in the EPZ. When

a piece of equipment is bonded to the EPZ then you bring the risk of step and touch potential to the ground personnel.

Note: When a piece of equipment is bonded to the EPZ then you bring the risk of step and touch potential to the ground personnel. In this case an approved monitoring system should be used, [refer to 15.11.5.](#) (2019)

15.15.2. Take the example of a crane with a metallic load line. This would require the crane be bonded to the EPZ. The final connection between the crane and the EPZ should be made with a hot stick as there could be a difference of potential, especially where there are parallel circuits. By bonding to the EPZ you bring the danger of step and touch potential to the ground. Therefore, the crane needs to be guarded or barricaded and no one should get on or off the equipment without providing an insulating means to do so. In extreme conditions where there are parallel lines it may not even be safe to approach the equipment because of electro-magnetic and electro-static coupling and the resulting step and touch potentials. Installing driven ground rods may make the situation worse where there are

parallel lines as this creates a second ground which creates electro-magnetic coupling. A best practice may be to keep the crane isolated from the EPZ and the line by the use of isolating links and line covers (Even though the covers may not be rated for the nominal voltage that the line operates at, the voltage possible when the line is grounded is limited by the fault current and the impedance of the System Ground and won't reach the voltage rating of the cover). By doing this the workers in the air are protected from an object at another potential coming into their EPZ and the step and touch potentials are not brought to the ground. The crane should still not be touched or approached unless it is well away from the EPZ/Line as any part of the crane that is not isolated that contacts the line or the EPZ could bring step and touch potential to the ground.



Isolating Equipment from the Overhead EPZ

15.15.3. Another example would be equipment with an isolating boom section. It would not be necessary to bond the equipment chassis to the EPZ because the isolating section of the boom provides isolation between the EPZ and other potential differences. The un-isolated portion of the boom must stay clear of the EPZ/Line or this could expose the workers on the ground to a step and touch potential. So as you can see

attempting to mitigate one risk may create another. If the only option is to bond the equipment to the EPZ, then the best practice would be to keep the time you have the equipment bonded to the EPZ to a minimum. Ensure that all members of the crew understand that even though a piece of equipment is bonded and grounded, it may still have a voltage difference (don't be lulled into a false sense of security by the old motto: "If it's not grounded, it's not dead"). Even if it is grounded, it may not be "dead". Guard or barricade all such equipment as a warning for workers on the ground.

15.15.4. Working adjacent to energized circuits. The issues to be considered when working near energized circuits are to minimize the chance of accidental contact with the energized circuit. The main defense is to not encroach **MAD**. If **MAD** needs to be approached then the second defense is to cover the exposed energized circuits. If there is a risk of accidental contact that cannot be adequately controlled with these methods, the equipment needs to be connected to an adequate System Ground and all accessible equipment bonded. An example of this would be the stringing

section of the [APM 6.21.1.6](#). The public also needs to be protected by guarding or barricading the equipment. The purpose of the System Ground is to minimize the time the equipment is energized.

15.15.5. The insulated portion of the boom may encroach the minimum approach distance but not the bucket. The insulated portion of the boom will not contact the conductor.

15.16. Special Situations

15.16.1. Dead-end Structures: When working on dead-end structures where the circuit has been opened by disconnecting or cutting jumpers, the EPZ shall include both sides of the work area.

15.16.2. Conductor Splicing: When conductor splices are being installed, the EPZ shall include both sides of the work area.

15.16.3. Repairing or Splicing De-energized Conductors at Ground Level

15.16.3.1. Lowering Conductor: Install the EPZ/Grounding Cable(s) on the conductor at each structure from which conductor is to be lowered. Leave the EPZ/Grounding cable(s)

attached while lowering, repairing, and reinstallation of the conductor.

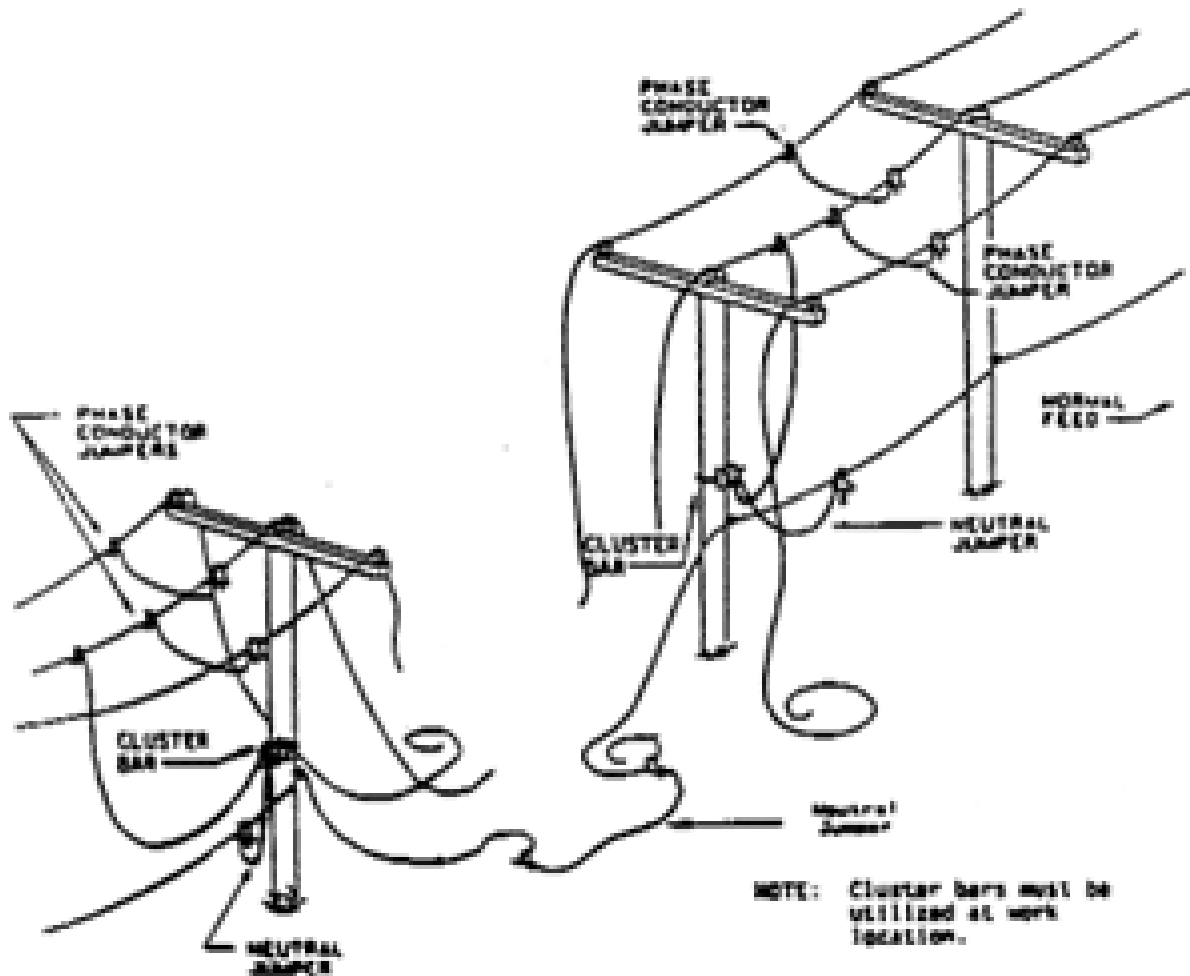
15.16.3.2. When work is performed on conductors normally energized above 600v, which have been removed from their normal overhead location because of high winds, ice, trees, etc., system grounds shall be installed on both sides of the work location.

15.16.3.3. Ground Level Work: When working grounded conductor(s) at ground level:

15.16.3.3.1. Workers shall insulate themselves from the conductor with rubber gloves, or;

15.16.3.3.2. An EPZ shall be create, or;

15.16.3.3.3. See exceptions in [Section 15.5](#)



Repairing or Splicing De-energized Conductors at Ground Level

15.17. Capacitor Grounding

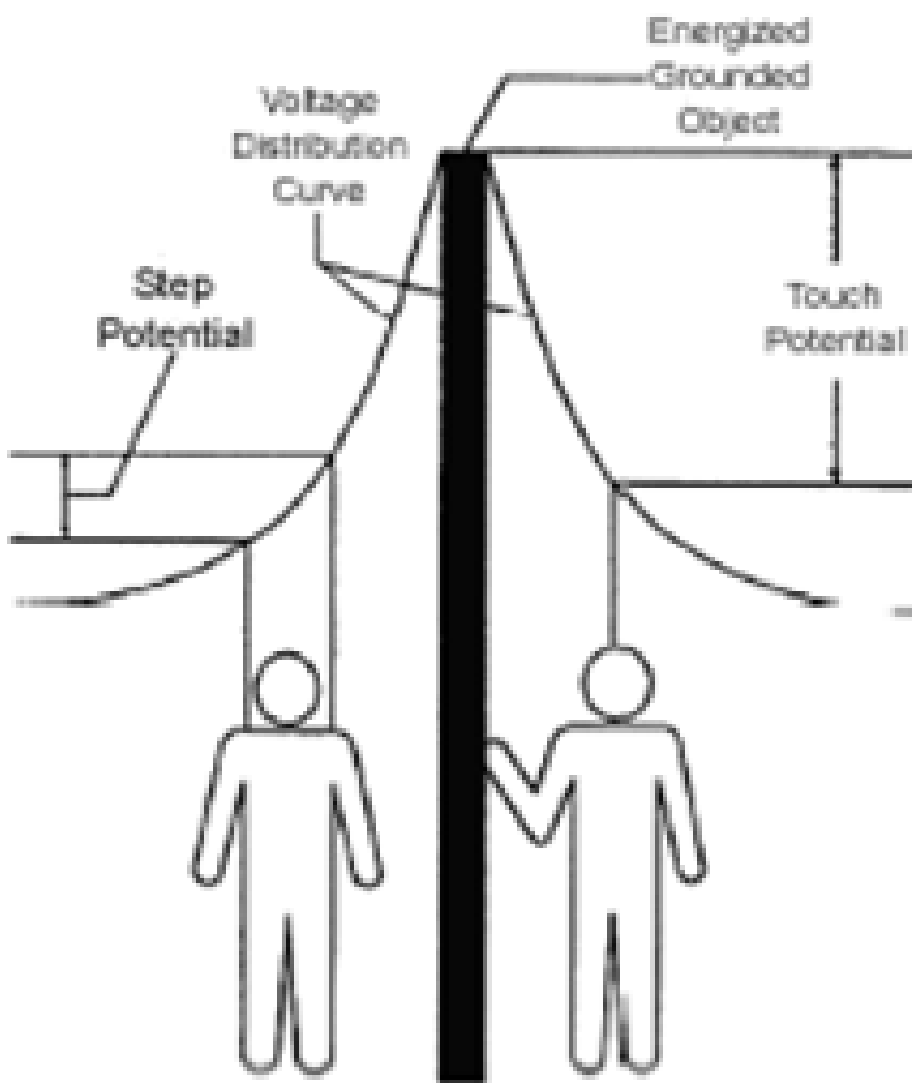
15.17.1. When capacitors are taken out of service for inspection or to be worked on, they shall be disconnected from the voltage sources; workers SHALL WAIT **FIVE MINUTES** for any residual charge to drain; workers shall then short and ground the capacitor terminal before working on

capacitor.

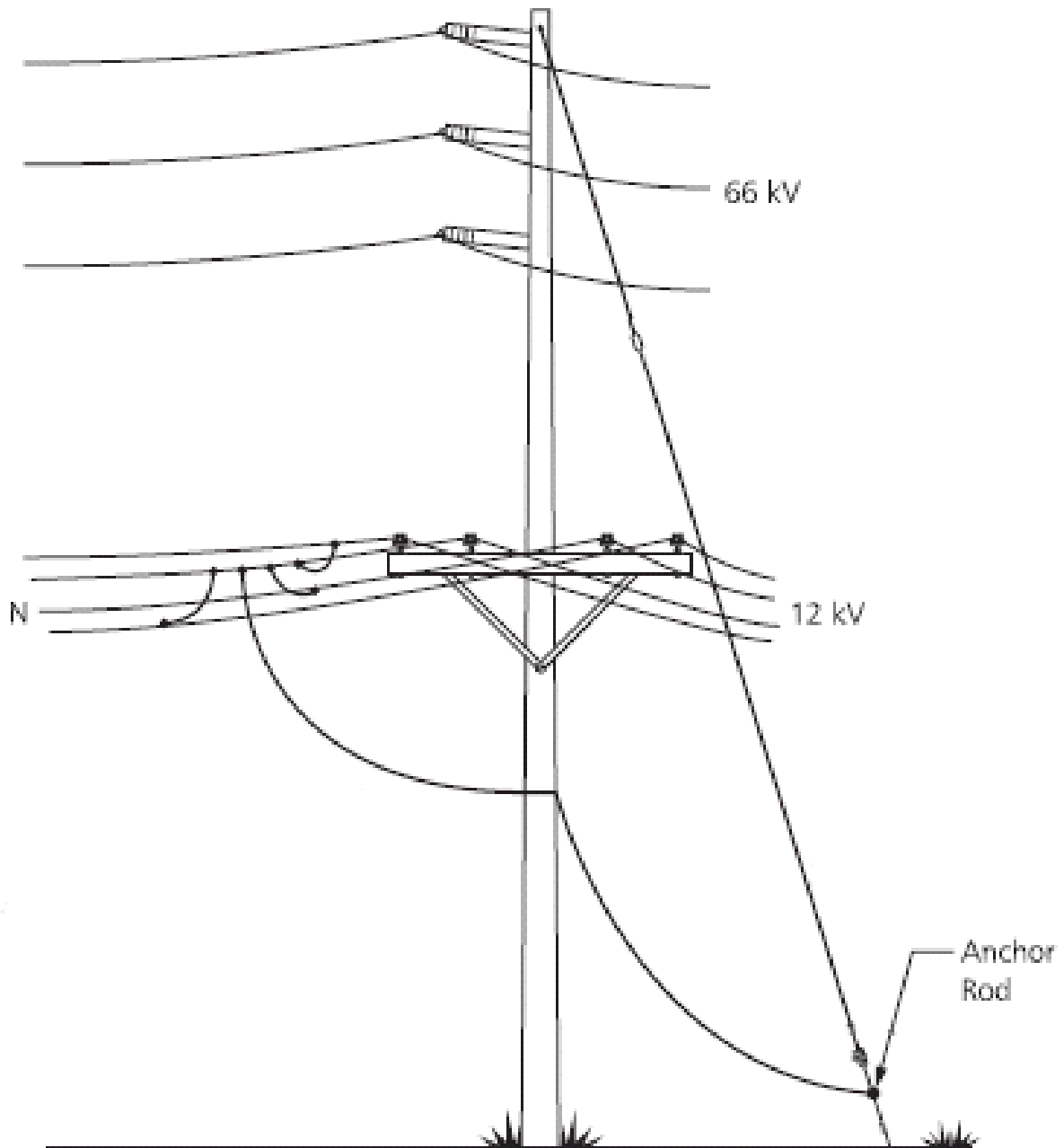
15.17.2. Capacitor shall remain shunted during transport and storage.

15.18. Wind Farms

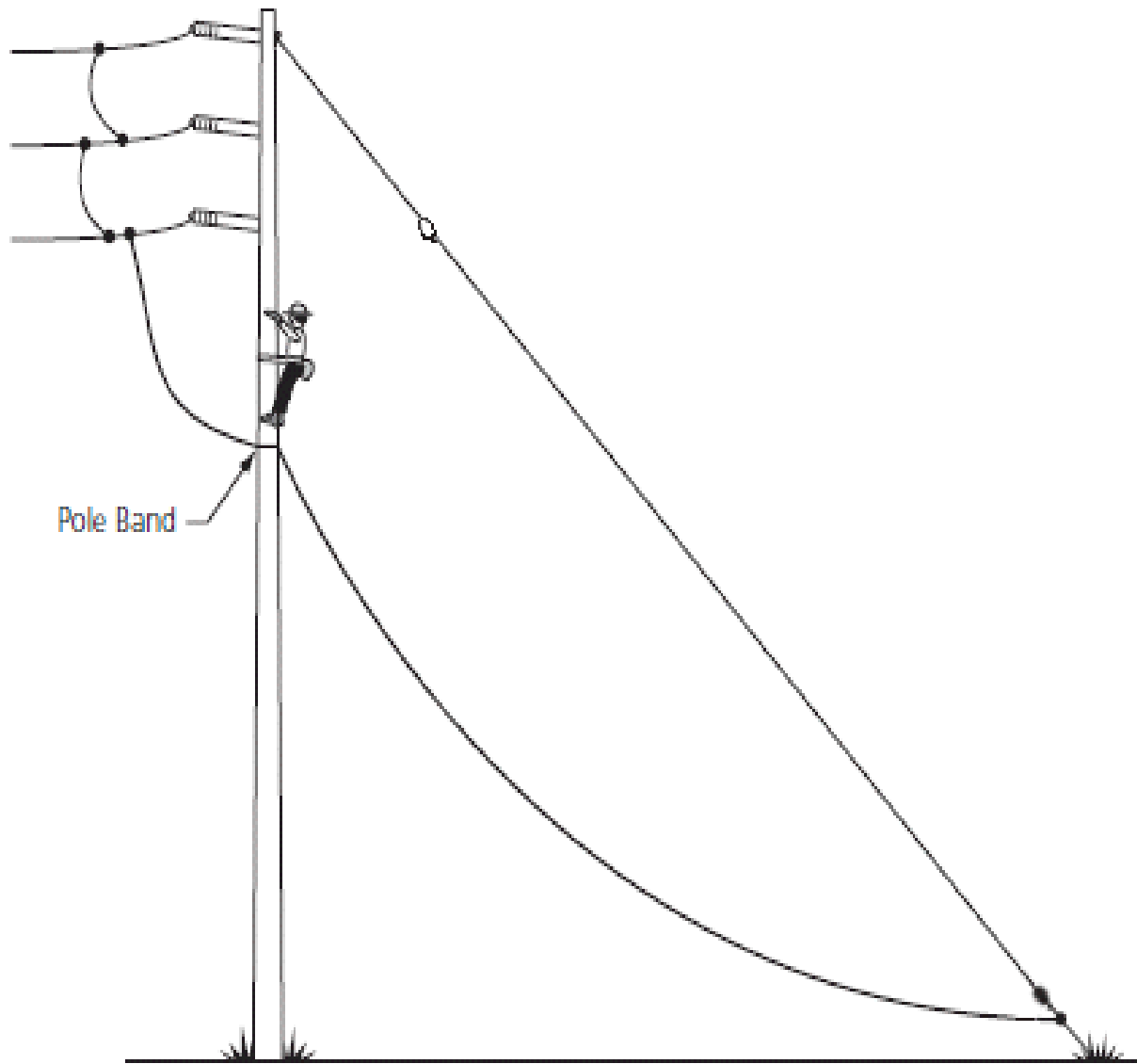
15.19. Examples



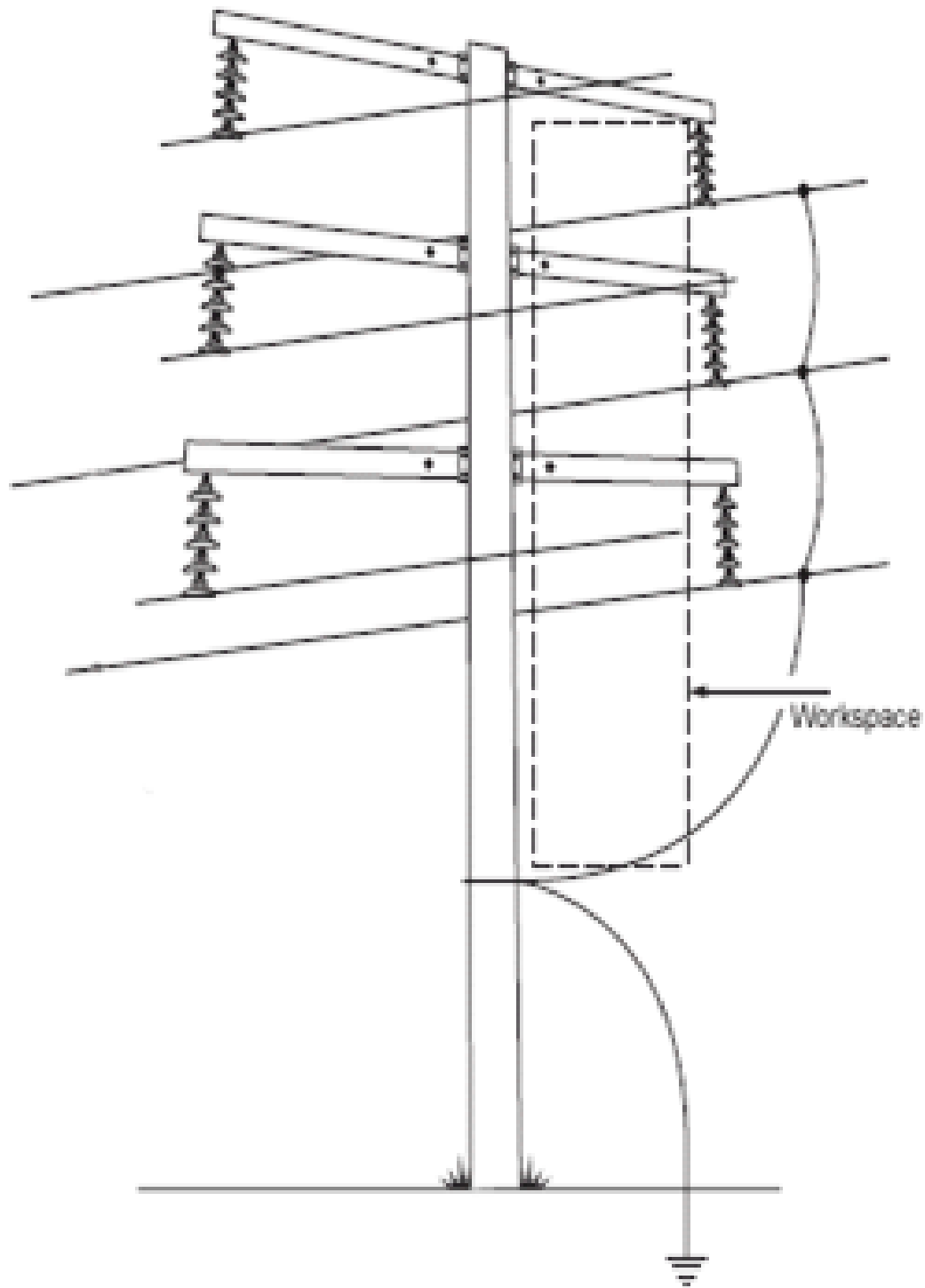
Step and Touch Potential



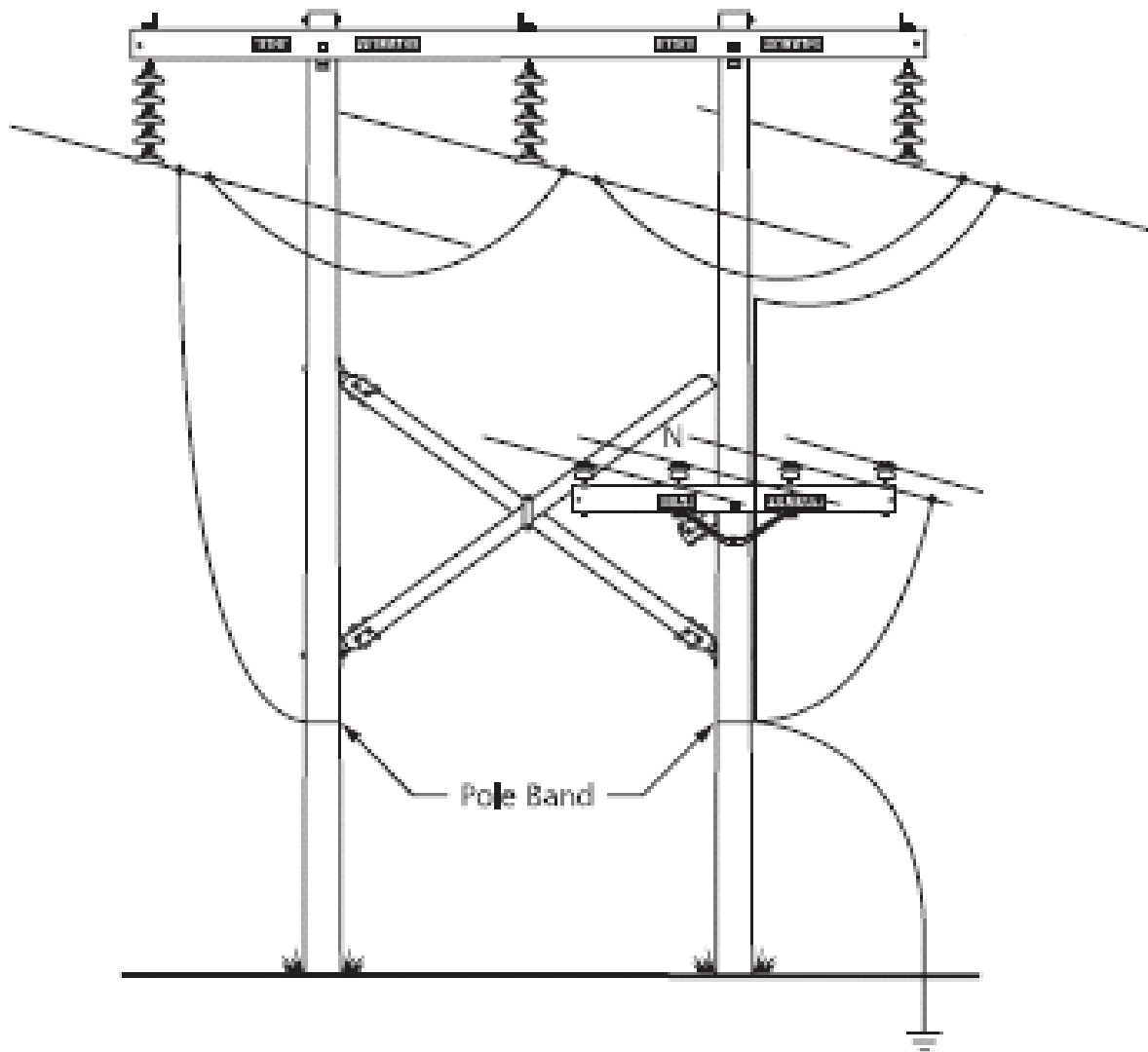
Distribution Connected to Anchor Rod



Transmission Connected to Anchor Rod



Vertical Double Circuit One Side Energized
Maintain MAD to Energized Conductors



Transmission with Energized Under Build

Section XVI – Other

16.0 Other

16.1. Tree Trimming Operation

16.1.1. Chipper equipment shall be provided with a substantial housing which will be capable of effectively retaining broken chipper knives or foreign material.

16.1.2. Chipper tables shall be of sufficient length or guarded to prevent reaching chipper blades.

16.1.3. Any chipper equipment to be repaired or adjusted shall be shut down, and shall be provided with a positive means to prevent accidental starting.

16.1.4. Battery leads shall be removed, and guards shall be installed over exposed adjacent blades when replacing, adjusting or sharpening chipper blades.

16.1.5. When chipper is in operation, at least one worker in addition to the operator shall be in the immediate vicinity.

- 16.1.6.** A shutoff switch shall be installed within convenient reach of the workers feeding the chipper.
- 16.1.7.** All required personal protective equipment shall be worn by all workers in the immediate area while chipper is in operation.
- 16.1.8.** Care shall be taken that no foreign objects are fed into the chipper blades.
- 16.1.9.** Rescue procedures for people working above ground shall be established by the employer, and provided with the pole top rescue/aerial rescue training. Note: An adequate amount of tree hooks and skids must be available.
- 16.1.10.** Tree trimming immediately adjacent to primary circuits shall be done by crews of not less than two journeymen, or two qualified tree trimmers, or one journeyman and a qualified tree trimmer.
- 16.1.11.** All equipment, including ropes and lines upon which a worker must rely for their safety, shall be inspected by the worker each day before use.

- 16.1.12.** Climbing ropes shall have a minimum diameter of 1/2 inch and be constructed of a synthetic fiber with a minimum normal breaking strength of 5,400 pounds when new or equivalent or greater strength and durability. Maximum working elongation (elasticity) shall not exceed 7 percent at a load of 540 pounds (10 percent minimum breaking strength).
- 16.1.13.** Climbing ropes shall not be used to lower limbs or other parts of trees or to raise or lower equipment.
- 16.1.14.** Rope shall be stored away from all cutting edges and sharp tools. Corrosive chemicals, gas and oil shall be kept away from rope.
- 16.1.15.** Climbing spurs shall be of the tree-climbing type and be equipped with gaff guards.
- 16.1.16.** Pole pruners, pole saws, and other similar tools shall be dielectrically rated.
- 16.1.17.** Power saws weighing more than fifteen pounds (service weight) that are used in trees shall be supported by a separate line except when used from an aerial-lift device.

16.1.18. All equipment shall be operated by qualified personnel only.

16.2. Compressed Air and Gases

16.2.1. Compressed gas cylinders can be heavy and awkward; special handling equipment and/or multiple personnel should be used when moving cylinders.

16.2.2. Quick coupling hose connectors shall be of the approved self-locking type or the coupling fitting shall be secured before the hose is subject to pressure.

16.2.3. Oil or grease shall not be allowed to come in contact with valves or regulators of oxygen cylinders.

16.2.4. Compressed gas cylinders shall be securely stored in designated areas in a cool, dry, shady place in an upright position. Dissimilar gases shall not be stored together. Empty cylinders shall be stored separately. If cylinders are stored indoors, the room shall be well ventilated. Oxygen cylinders shall be stored at least 20 feet from fuel cylinders or any combustible material, such as grease or oil, or separate with an

approved fire wall. Caps provided for valve protection shall be kept in place unless the cylinder is in use. Tighten caps only hand tight. Do not insert a tool into the cap to tighten or loosen it.

16.2.5. Portable gas cylinders shall not be exposed to excessive heat, sparks or flames.

16.2.6. Compressed gasses shall not be used from a cylinder or manifold unless an approved pressure regulating device is installed on the cylinder or manifold and then only for their intended use.

16.2.7. Compressed gas cylinders shall be clearly marked as to contents.

16.2.8. Compressed air or gas cylinder cover caps shall not be used to lift cylinders.

16.2.9. When compressed air is used for cleaning purposes, it shall be limited to 30 PSI or shall be used with approved air nozzles.

16.2.10. Compressed air shall not be blown directly on any person.

16.2.11. When transporting cylinders in a vehicle, they shall be braced on at least two sides, with

the cylinders secured to the vehicle in an upright position. Cylinders of inert gas may be transported in a horizontal position, provided that special compartments, racks or adequate blocking are used to prevent cylinder movement and that valve protection caps are in place.

16.3. Explosives

16.3.1. All blasting shall be done in accordance with the company approved PacifiCorp Blasting Manual, by employees who have received the authorized training.

16.3.2. Two trained employees shall work together while handling explosives; one shall act as an observer.

16.4. Hazardous Materials

16.4.1. Safety data sheets are available for those chemicals on site by utilizing the phone number or the on line system.

16.4.2. Containers for storing chemicals shall be clearly labeled to identify the contents. Neutralizing agents shall be noted where applicable.

16.4.3. Workers handling acids, caustics, corrosive or toxic chemicals shall keep their sleeves rolled down, wear adequate aprons, gloves, eye and face protection as required, and shall take precautions to prevent personal injury. They shall also become familiar with the location of eye wash fountains and showers and verify ready for use before starting work.

16.4.4. Gasoline and diesel fuels shall only be in properly labeled approved metal safety containers.

16.4.5. Storing of oil waste or rags shall be prohibited unless approved metal containers with safety lids are provided and used for such storage.

16.4.6. Workers shall wear approved respiratory devices and safety goggles when transferring chemicals from sacks or containers to mixing tanks.

16.5. Radio Frequency (RF)

16.5.1. Employees exposed to radio frequency (RF) from telecommunication equipment owned and operated by PacifiCorp and other companies shall comply with requirements set forth by the

Federal Communications Commission (FCC) and the Power Delivery RF Safety Plan.

16.5.2. Employees involved in work associated with telecommunication equipment shall be trained, familiar with safety and monitoring equipment, and know how to conduct work in a safe manner.

16.6. Fiber Optic Cable/Transmitters

16.6.1. Employees involved in work associated with Fiber Optic Cable/Transmitter shall be trained and familiar with safety procedures and know how to conduct work in a safe manner.

16.6.1.1. Workers should never look into the end of a fiber optic cable or termination point.

16.6.1.2. Workers should be aware of safety issues associated with proper disposal of glass shards when handling fiber optic cable.

16.7. Trenching and Excavation

16.7.1. All trenching and excavation shall be done in accordance with each state's OSHA regulations.

16.7.2. The OSHA regulations must be on site when performing trenching and/or excavation work.

16.8. Fire Suppression Equipment

16.8.1. Workers shall be responsible for fire protection equipment in their work area.

16.8.2. Fire extinguishers and other fire-fighting equipment shall be inspected at regular prescribed intervals. Portable fire extinguishers shall be recharged or replaced immediately after use.

16.8.2.1. Dry powder fire extinguishers shall not be used on energized primary circuits.

16.8.3. Fire protection equipment, such as hoses, extinguishers, etc., shall be used only for their intended purpose.

16.8.4. After a CO₂ or halon fire protection system has discharged into an enclosed room or compartment, no one shall enter unless they are trained in the use of and wearing approved self-contained breathing apparatus or until the room/compartment has been thoroughly ventilated and tested with an approved oxygen deficiency tester.

16.8.5. First stage of firefighting is the responsibility of all employees.

16.9. Confined Space

16.9.1. Work shall not begin in confined spaces until workers have met requirements in the applicable CONFINED SPACE ENTRY PROGRAM.

16.9.2. A "confined space" is a space that:

16.9.2.1. Is large enough and so configured that an employee can bodily enter and perform assigned work and

16.9.2.2. and has limited or restricted means for entry or exit,

16.9.2.3. and is not designed for continuous employee occupancy.

16.9.3. It may contain known or potential hazards, such as accumulation of flammable or toxic atmospheres or oxygen deficiency due to inadequate ventilation.

16.9.4. Examples of "Confined Spaces" (May include, but are not limited to the following):

16.9.4.1. Vaults: A vault is an enclosure or room, above or below ground, with installed equipment, such as transformers, switchgear, transfer switches, or junctions.

16.9.4.2. Manholes: A manhole is a below grade enclosure with installed equipment such as junctions or switchgear which can be operated from above ground. Load break elbows are normally angled toward the entrance to allow operation through the opening. Accessibility into manholes with energized circuits where only one entrance is available must be determined by personnel at the scene.

16.9.4.3. Pull Boxes: Pull boxes are below grade enclosures with no installed equipment other than cable and splices.

16.9.4.4. Circuit Breakers

16.9.4.5. Transformers

16.9.4.6. Scroll Cases

16.9.4.7. Penstocks

16.9.4.8. Synchronous Condensers

16.9.5. Subsequent versions addressing future changes will be discussed and mutually agreed to prior to any implementation. Both parties agree to adhere to any Federal or State Law regarding Confined Spaces.

16.10. Batteries

16.10.1. Workers shall not smoke or bring an open flame within storage battery enclosures.

16.10.1.1. Flashlights of nonmetallic case construction shall be used to inspect battery cells.

16.10.1.2. A finger ring or wristwatch shall not be worn while working on storage batteries.

16.10.1.3. An employee shall wear rubber gloves, rubber apron and face shield when handling or working on batteries.

16.10.1.4. When installing, maintaining, removing and/or repairing station battery banks, an approved irrigating agent (eye wash) will be readily available. The eye wash station shall be located within 25 ft. of the work being performed. The eye wash stations must have at least 15 minute continuous “Hands Free” flow.

16.11. Welding

- 16.11.1.** Follow all applicable established welding procedures.
- 16.11.2.** Where required hot work (Welding, torch cutting, grinding, etc.) permit procedures must be followed.
- 16.11.3.** All welding operations must provide protection to members of the public and other workers from injurious light from welding operations. Welding operation equipment must provide protection to workers from tripping and other housekeeping hazards.
- 16.11.4.** Proper ventilation to protect the person welding and those in surrounding areas must be established before beginning welding operations.
- 16.11.5.** Workers performing hot work must wear proper protective clothing and personal protective equipment required for the work. The face, eyes, body, hands and respiratory system must be protected.

Section XVII – Hand Signals

17.0 Hand Signals

STANDARD SIGNALS FOR LINE WORK AND HOISTING EQUIPMENT



1. TAKE UP OR GO AHEAD



2. SLOW CAUTION



3. STOP



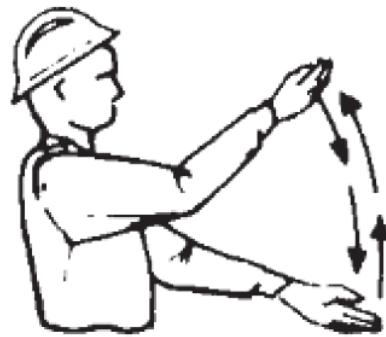
4. SLACK OFF

No.1. This signal is used to indicate the direction of pull. Faster or slower motions of this signal are used to indicate speeds other than caution or slow speeds. Where there is a choice of conductors to be pulled, this signal is given with one of the indicating signals No. 7 to 12 inclusive.

No.2. This signal always follow either No.1 or No.4 and is an indication of slow speed for caution. This signal must be given continuously while the pull is being made at a slow speed and is to be terminated by either giving the No.1, No.4 (depending on direction) or the No.4 signal.



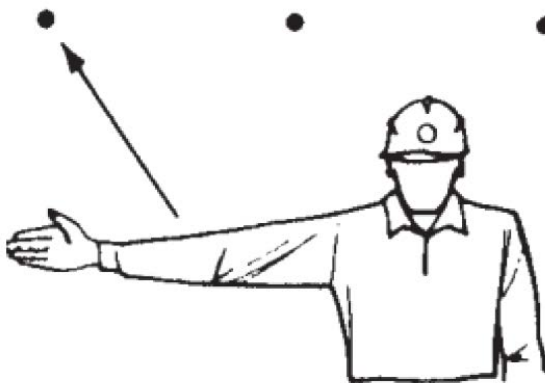
5. THAT IS ALL



6. CUT LOOSE

No.4. This signal is used to indicate the direction of pull and used in slacking or lowering as No.1 is used for taking up.

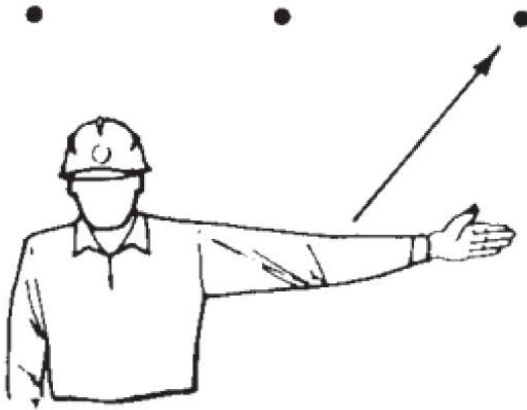
7. HORIZONTAL
CONDUCTORS



8. HORIZONTAL
CONDUCTORS



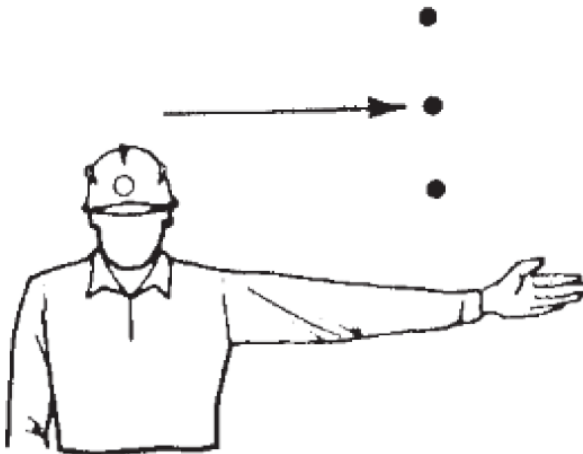
9. HORIZONTAL
CONDUCTORS



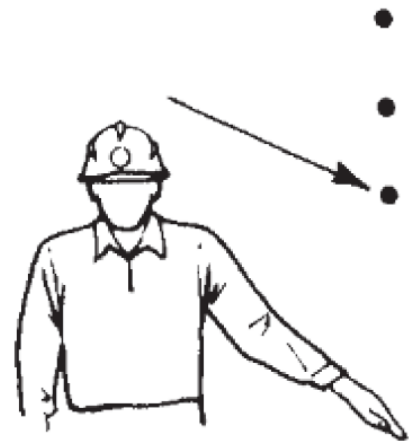
10. VERTICAL
CONDUCTORS



11. VERTICAL
CONDUCTORS



12. VERTICAL
CONDUCTORS



No.7 and 12. These signals are always used in connection with either No.1 or No.4 and are given at the same time as either No.1 or No.5 is given. In using No.10, No.11 and No.12 the man's arm on the wire side to be pulled is used for the indicating signal.

HOIST SIGNALS



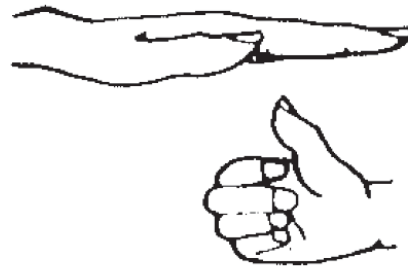
13. HOIST
Hand Closed;
Thumb up.



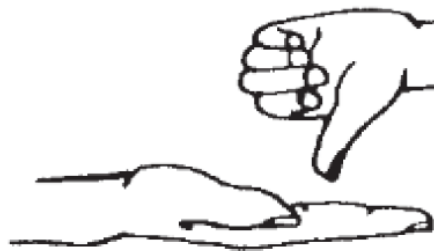
14. LOWER
Hand Closed;
Thumb down.



15. STOP
Hand open



16. TAKE UP SLOWLY
Hand closed;
Thumb up – with
other hand above.



17. LOWER SLOWLY
Hand closed; thumb down – with
other hand below.



18. STINGER
EXTENDED –
(Hydraulic Extension)
hand closed, two
fingers up.



19. STINGER
RETRACTED –
(Hydraulic Extension)
hand closed; two fingers
down.



20. BOOM UP – Arm
extended horizontally,
palm up fist closed –
raise extended arm
upward.



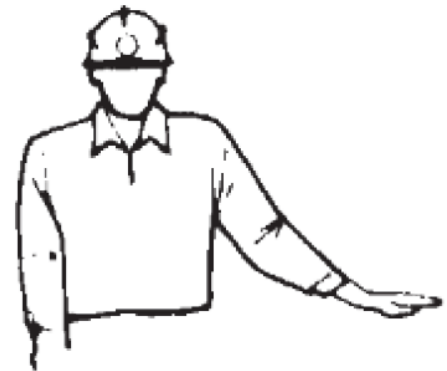
21. BOOM DOWN – Arm
Extended horizontally,
palm down fist closed
– lower extended arm
downward.



22. JACKS DOWN –
Both arms down
at an angle,
palms down.



23. RIGHT JACK DOWN



24. LEFT JACK DOWN

NOS. 13 THRU 24 ARE SIGNALS TO BE USED ONLY WHEN SIGNALMAN IS WITHIN 50 FEET OF THE TRUCK OPERATOR.

STANDARD HAND SIGNALS FOR POWER PRODUCTION AND CRANES



1. USE LOAD LINE
Tap fist on head; then use regular signals.



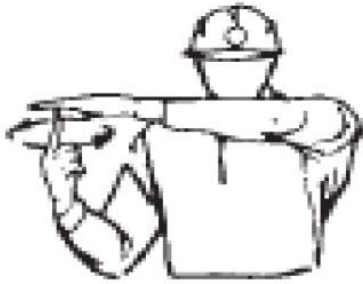
2. USE WHIP LINE
Tap elbow with one hand; then use regular signals.



3. RAISE THE LOAD



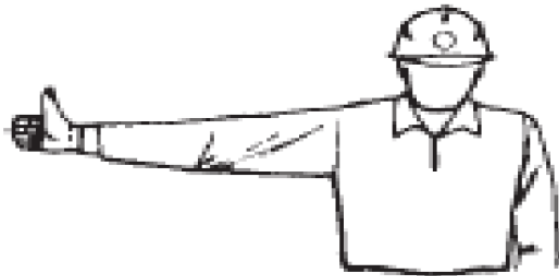
4. LOWER THE LOAD



5. RAISE THE
LOAD SLOWLY



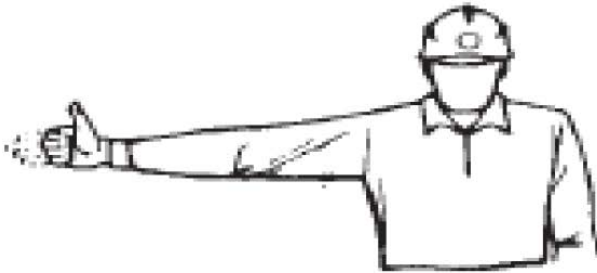
6. LOWER THE
LOAD SLOWLY



7. RAISE THE BOOM



8. LOWER THE BOOM



9. RAISE THE BOOM AND
LOWER THE LOAD –
Extend thumb upward
and flex fingers in and out
as long as load
movement is desired.



10. LOWER THE BOOM
AND RAISE THE LOAD –
Extend thumb downward
and flex fingers in and out
as long as load movement
is desired.



11. SWING – Extend arm, with forefinger indicating direction or swing.



12. STOP – Extend forearm and hand in horizontal position and make a slicing motion.



13. EMERGENCY STOP



14. DOG EVERYTHING



15. TRAVEL (Both Tracks)
Use both fists, making a circular motion indicating direction of travel: forward or backward



16. TRAVEL (One Track)
Lock the track on side indicated by raised fist. Travel opposite track in direction indicated by circular motion of fist.



17. EXTEND BOOM –
(Telescoping Booms)
Both fists in front of
body with thumbs
pointing inward.



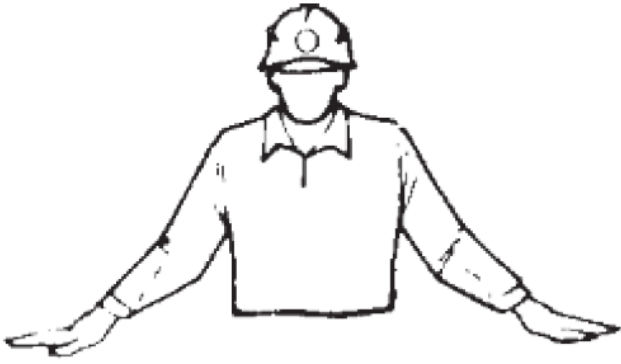
18. RETRACT BOOM –
(Telescoping Booms)
Both fists in front of
body with thumbs
pointing toward each
other.



19. EXTEND BOOM
(Telescoping booms)
One hand signal. One
fist in front of chest
with thumb tapping
chest.



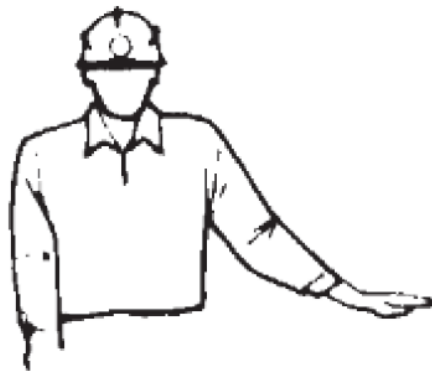
20. RETRACT BOOM
(Telescoping booms)
One hand signal. One
fist in front of chest,
thumb pointing
outward and heel of fist
tapping chest.



21. JACKS DOWN –
Both arms down at
an angle, palms
down.



22. RIGHT JACK
DOWN.



23. LEFT JACK
DOWN.

NOTICE

**REPORT ALL ---- LOST TIME, ELECTRICAL CONTACTS,
POTENTIAL FLASHES AND POTENTIAL LOST TIME
INCIDENTS**

TO:

Portland Control Center (PCC) 503-262-4949

OR

Salt Lake Control Center (SCC) 801-220-6930

PAC_289.46



DP 550 Fuse, Power, SMU-20, 14.4 kV

(For use in 15 kV switchgear.)

RCMS Code: BA

DP 550			
Rating	SI#	Curve	Code
1	2213007	115-2	P
3K	2213106	165-2	O
5E	2213114	153-2	N
7E	2213122	153-2	M
15E	1005377	119-2	L
25E	1010701	119-2	A
40E	1007160	119-2	C
50E	1007162	119-2	D
65E	2200038	119-2	E
80E	2214110	119-2	F
100E	1005385	119-2	G
125E	2213205	119-2	H
150E	2200046	119-2	I
175E	2214111	119-2	J
200E	2200228	119-2	K
Rating	SI#	Switchgear Manufacturer and Type	Code
Blade	8004650	S&C PME Deadfront	Q
Blade	8004608	S&C PMH Live Front	R
Blade	8004608	FedPac PSE Deadfront	R

Notes

The SMU-20 fuse unit requires end fittings for installation. These are usually included with the switchgear or fusing cabinet. End fittings should be reused but for new applications may be specified using EM 960 A, B or E.

Bladed assemblies are supplied with end fittings permanently attached.



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PAC_289.47



DP 55I Fuse, Power, SMU-20, 25 kV

(For use in 25 kV switchgear.)

RCMS Code: BA

DP 551			
Rating	SI#	Curve	Code
1	2213858	115-2	P
3K	8728744	165-2	O
5E	0986555	153-2	N
15E	2200434	119-2	L
20E	2200442	119-2	M
25E*	2200459	119-2	A
30E	2200467	119-2	B
40E	2200475	119-2	C
50E	2200483	119-2	D
65E	2213965	119-2	E
80E	2213981	119-2	F
100E	2214005	119-2	G
125E	2214104	119-2	H
150E	2214203	119-2	I
175E*	2214302	119-2	J
200E*	2214401	119-2	K
Rating	SI#	Switchgear Manufacturer and Type	Code
Blade	8004649	S&C PME Deadfront	Q
Blade	8004648	S&C PMH Live Front	R
Blade	8004648	FedPac PSE Deadfront	R

* Item not listed in information standard

Notes

The SMU-20 fuse unit requires end fittings for installation. These are usually included with the switchgear or fusing cabinet. End fittings should be reused but for new applications may be specified using EM 960 A, B or E.

Blade assemblies are supplied with end-fittings permanently attached.



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PAC_289.48



DP 553 Fuse, Power, SMU-20, 35 kV

(for use in 35 kV switchgear)

RCMS Code: BA

DP 553				
Rating	SI#	Curve	Code	
15E	0795591	119-2	L	•
20E	7889644	119-2	M	
30E	9600319	119-2	N	

Note: The SMU-20 fuse unit requires end fittings for installation. These are usually included with the switchgear or fusing cabinet. End fittings should be reused but for new applications may be specified using EM 960 A or B.



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PAC_289.49



EA 500 Pole-Mounted Weather Monitoring Station

RCMS Code: BA

EA 500			—
Description	SI #	Code	•
Weather Station			
Complete wildfire weather station with fuel temperature and moisture with cellular communication	8004599	A	
Complete wildfire weather station with fuel temperature and moisture with satellite communication	8004600	B	
Complete wildfire weather station with cellular communication	8004601	C	
Complete wildfire weather station with satellite communication	8004602	D	
Cellular communication fuel temperature accessories			
Fuel moisture wood dowel (replacement)	8004603	E	
Fuel temperature stick (replacement)	8004604	F	
Wind speed/direction sensor with cable	8005993	G	
HD Alpine propeller, coated and ice phobic	8005994	H	
Temperature/RH sensor with 30-foot sensor cable	8005995	I	
Rain gauge, weather station with cable	8005996	J	
Fuel moisture sensor with 50-foot sensor cable	8005997	K	
Fuel temperature sensor with 50-foot cable	8005998	L	
Shield, solar radiation, temp/RH sensor	8006074	M	
Sensor, temperature/RH with no sensor cable	8006076	N	

Scope

Pole-mounted weather monitoring stations are utilized to provide the company with data on local weather conditions to aid in operational decision-making.

These weather stations are installed on company transmission or distribution poles and transmit data to a weather monitoring service utilizing cellular or satellite services. Satellite service shall only be utilized if cellular service is not available at the installation location. The stations are powered by a solar panel and battery installed in the control box.

General

Installation of weather stations shall be coordinated with the weather station equipment provider / monitoring service to ensure data provided by the station is incorporated into the monitoring program. The specific weather station monitoring equipment is provided by the weather monitoring service provider. Street light mast, grounding, and miscellaneous mounting hardware and installation of the station are provided by the company. The weather monitoring service provider shall coordinate and provide ongoing cellular or satellite communication services.

Weather stations shall be located to provide data representative of the immediate area weather conditions. Locations shielded from wind or precipitation shall be avoided. Certain installations may be designated for

EA 500 Pole-Mounted Weather Monitoring Station

installation of ground-mounted fuel moisture and temperature monitoring devices. Locations selected shall minimize the probability of theft or damage of these devices.

Newer models have antenna located inside the box and there are no external antenna to install on mast arm.

Figure 1 shows a typical installation of a weather station without fuel monitoring devices.

Figure 2 shows typical fuel monitoring devices.



Figure 1—Typical Weather Station Installation



Figure 2—Typical Fuel Monitoring Device

Installation

Weather stations and supporting equipment shall be installed on company transmission or distribution poles as specified.

The solar panel shall be oriented in a general southerly direction to maximize energy absorption. The cellular / satellite antennae shall be oriented to obtain maximum signal strength.

Instrument cables from the equipment mounted on the streetlight mast shall be run inside the streetlight mast to the control box.

For stations where fuel moisture and temperature monitoring equipment is to be installed, the monitoring devices shall be placed in an unobtrusive location in the general vicinity of the pole base that is representative of local ground and vegetation cover. The cable from the monitor shall be direct buried.

Use 1/2" mold (SI# 6137806) with staples (SI 6470603) over sensor cable from ground up to the mast to protect it from damage and be in compliance with codes. If it is difficult to bury the sensor cable, use a 2" split PVC conduit, SI# 1006049, to cover it.

Clearances

Distances shown in Figures 4 through 8 are required by GO-95 and NESC and must be followed. Any deviation from such clearances are not allowed.

All installations require a grounding system to bond devices. If there is no grounding available, ensure it is added during the installation.

On a unigrounded system where no system neutral is available, contact the area engineer for correct grounding , based on the possibility of arresters on that pole.

Maintenance

Weather stations require periodic maintenance: Wind speed / temperature and relative humidity gauges shall be calibrated annually. Batteries located inside the control box shall be replaced on a three-year cycle or as needed. For stations equipped with fuel temperature and moisture sensors, the wood dowels mounted on the sensors shall be replace annually.

Table I—List of Materials

NO.	SI#	Description
1	8004599	Complete wildfire weather station with fuel and cell phone communication
2	8004602	Complete wildfire weather station with fuel and satellite communication
3	8004603	Complete wildfire weather station for areas with cell phone communication
4	8004604	Complete wildfire weather station for areas with satellite communication
5	8004600	Fuel moisture wood dowel (replacement)
6	8004601	Fuel temperature stick (replacement)
7	1008030	ARM,MAST,ST LT,6'SPAN,32"RISE,2.5"DIA, AL
8	6211106	BOLT,MACH,5/8" X 12",XARM,GALV
9	6269104	WASHER,SQ,CURVED,2.25"X2.25",11/16" HOLE
10	6279707	WASHER,SPRING,5/8",DOUBLE HELIX
11	6459804	SCREW,LAG,1/2" X 4-1/2",PILOT POINT
12	6137806	MOLDING,GRD,1/2" X 3/16" X 8',PLSTC,#6
13	6470603	STAPLE,GRD,MOLDING,1/2"X2",PVC MOLDING
14	4634903	CONN,C-TAP,CU,#6SOL-#4STR,#6SOL/STR,COMP
15	1700250	BRACKET, CONDUIT, EXTENSION
16	1006049	CONDUIT, PVC, 2", SPLIT DUCT, 10'

Figure 3 provides a visual aid of additional required hardware not available in the system. This hardware can be obtained from a local hardware store. Each of the three brackets require two sets of bolts.

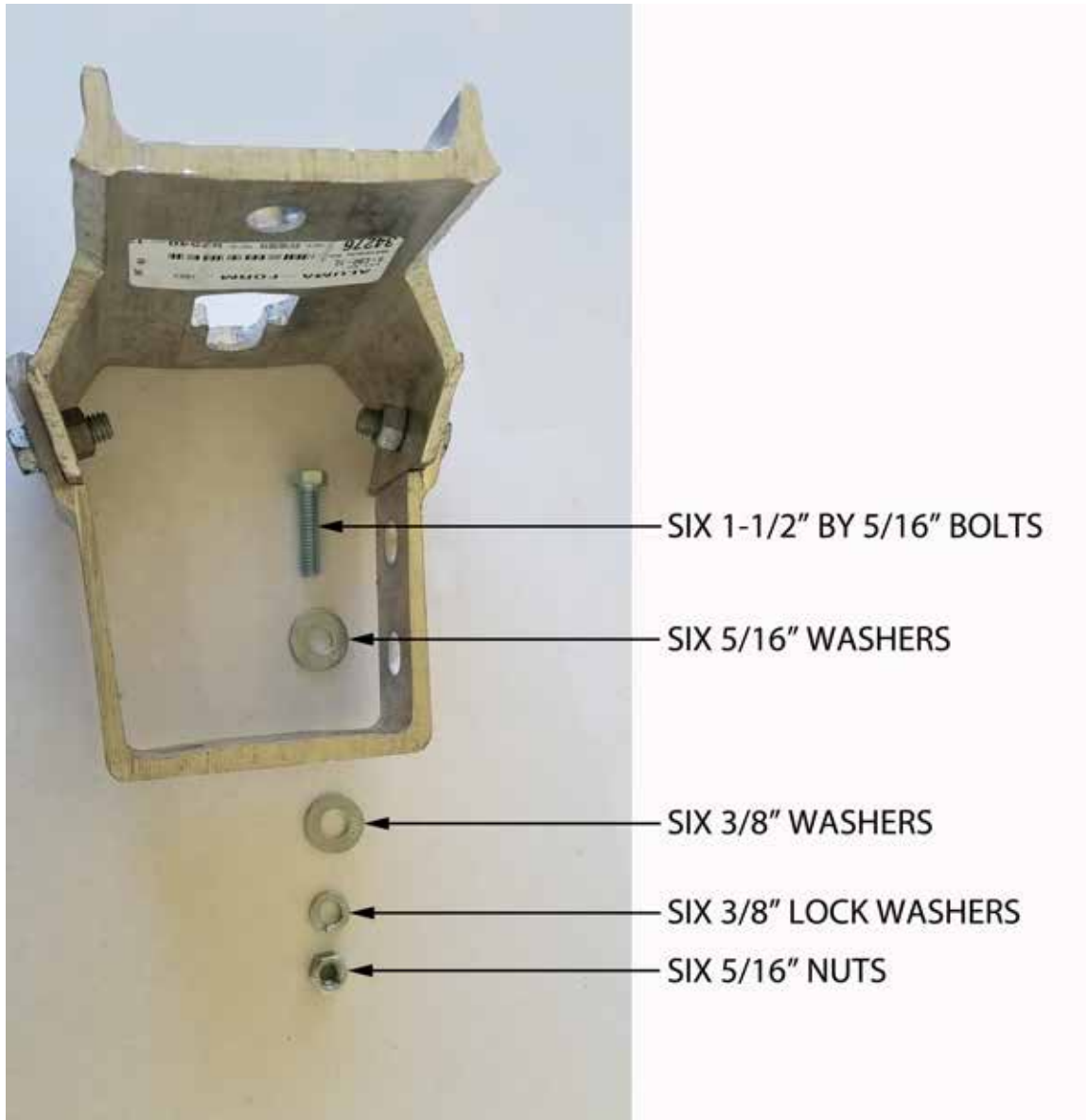


Figure 3—Additional Required Hardware

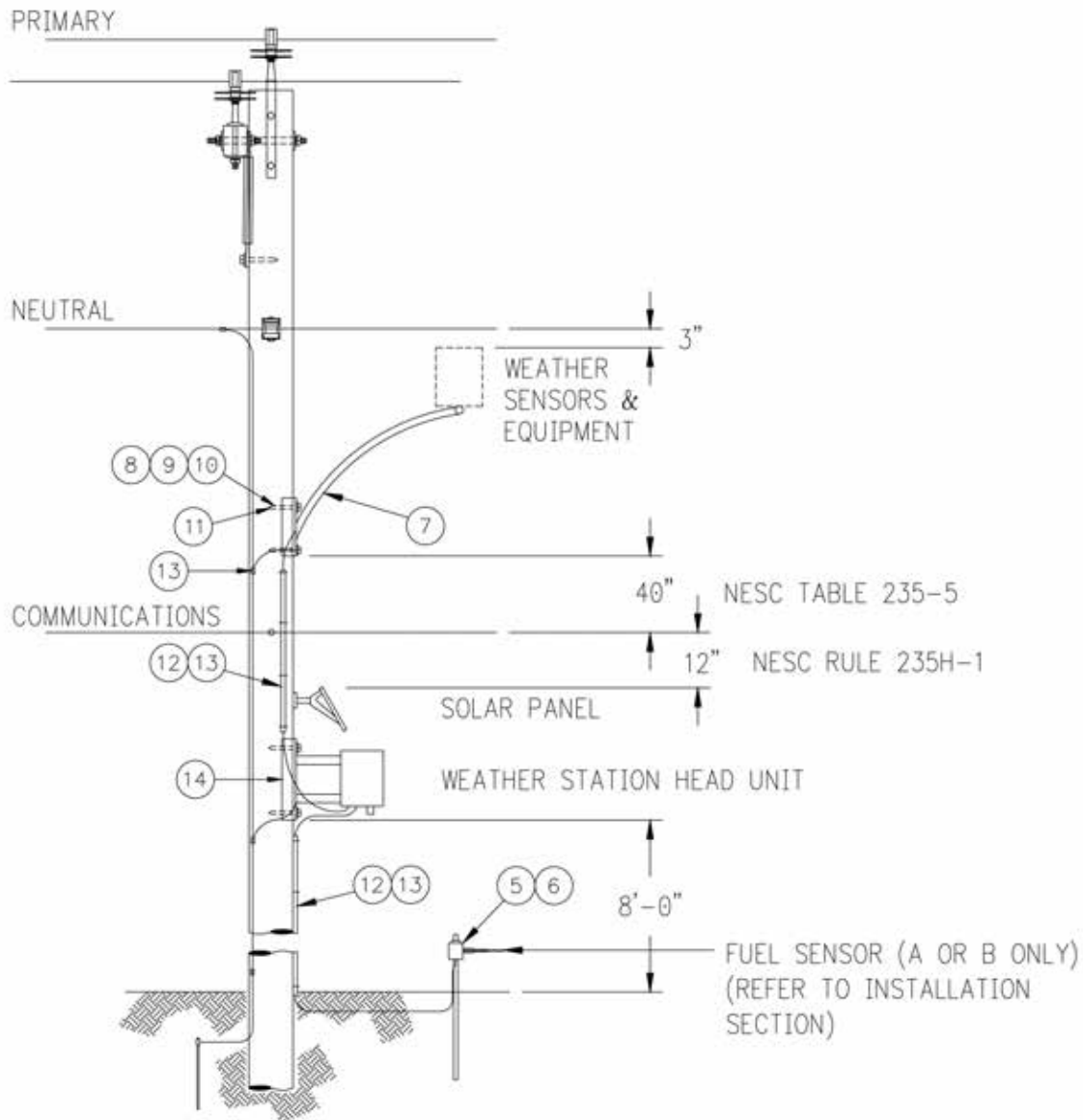


Figure 4—Weather Station, Below Neutral

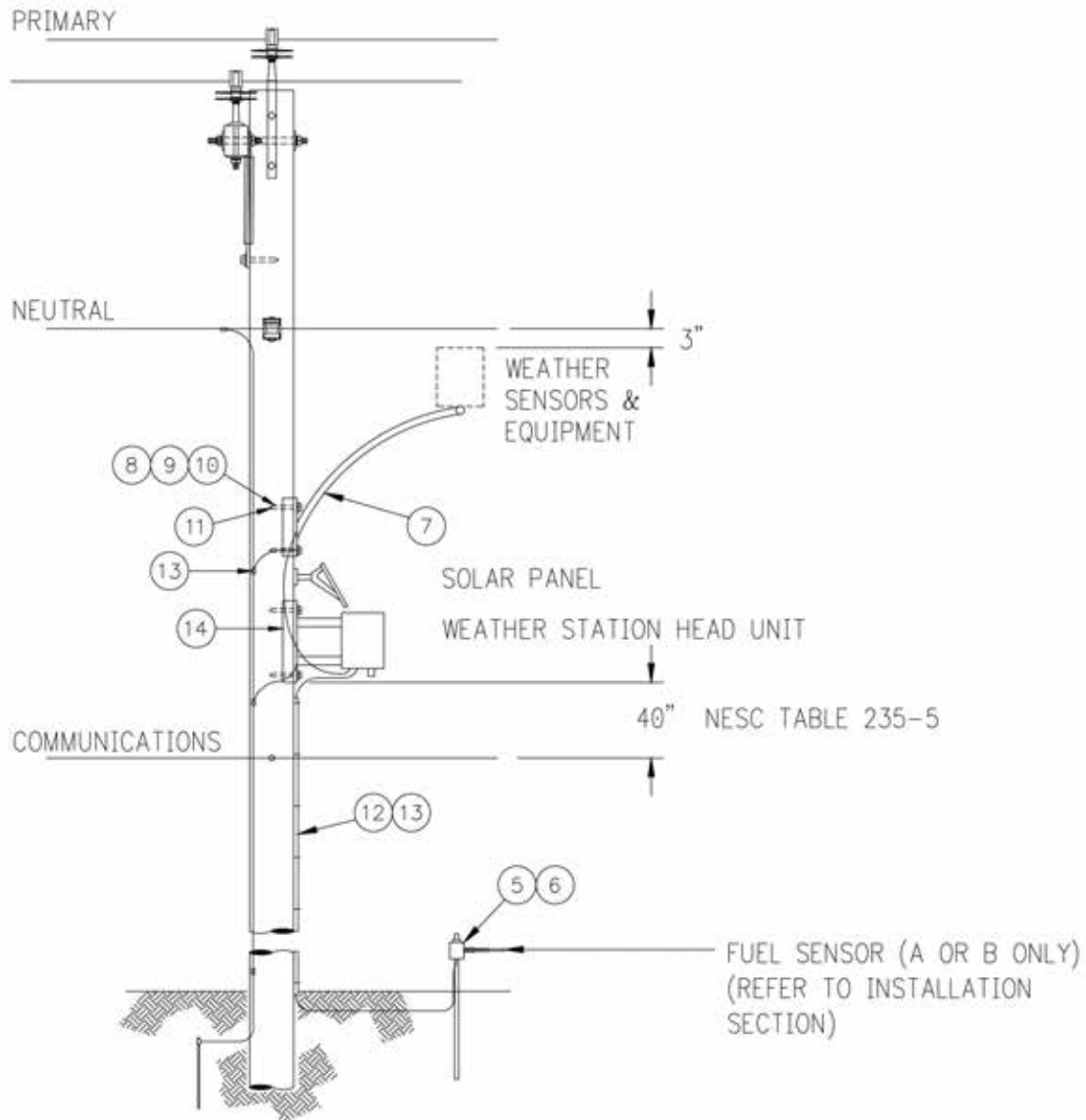


Figure 5—Weather Station and Collector, Below Neutral

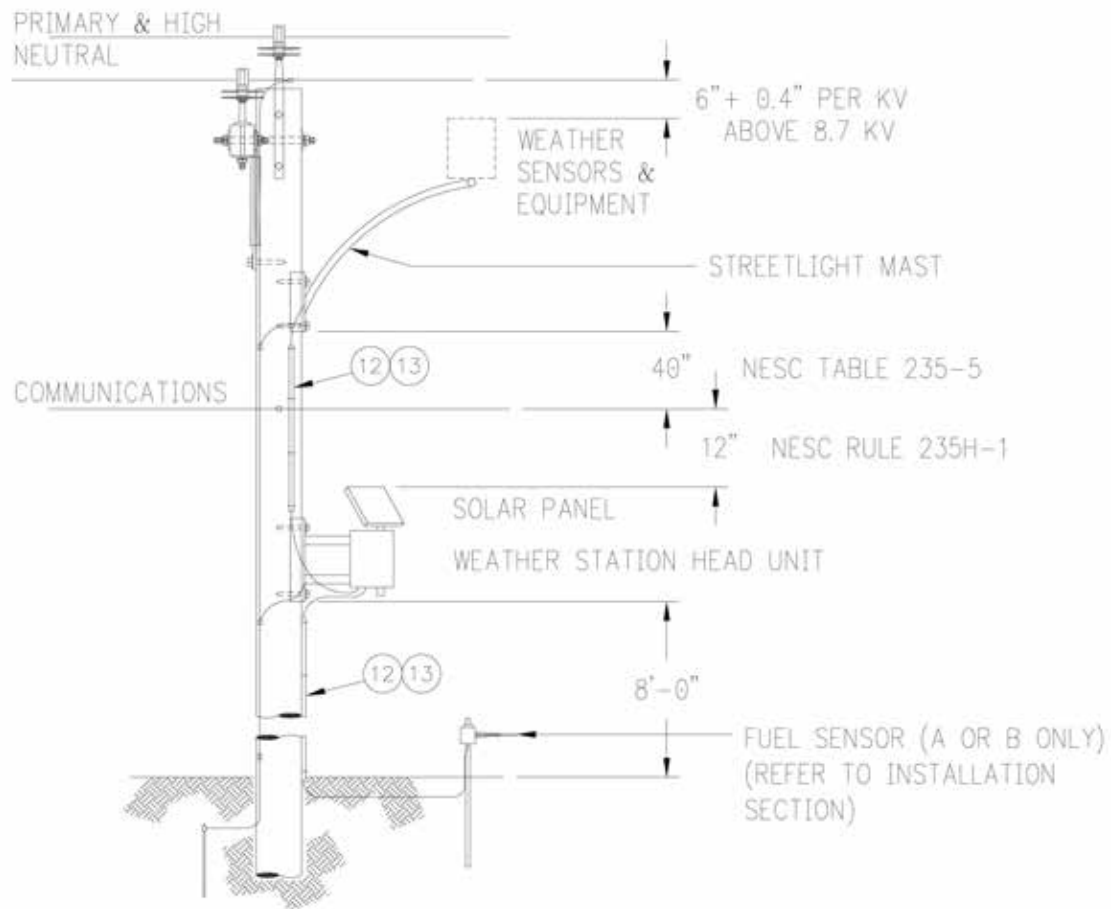


Figure 6—Weather Station, Primary and High Neutral

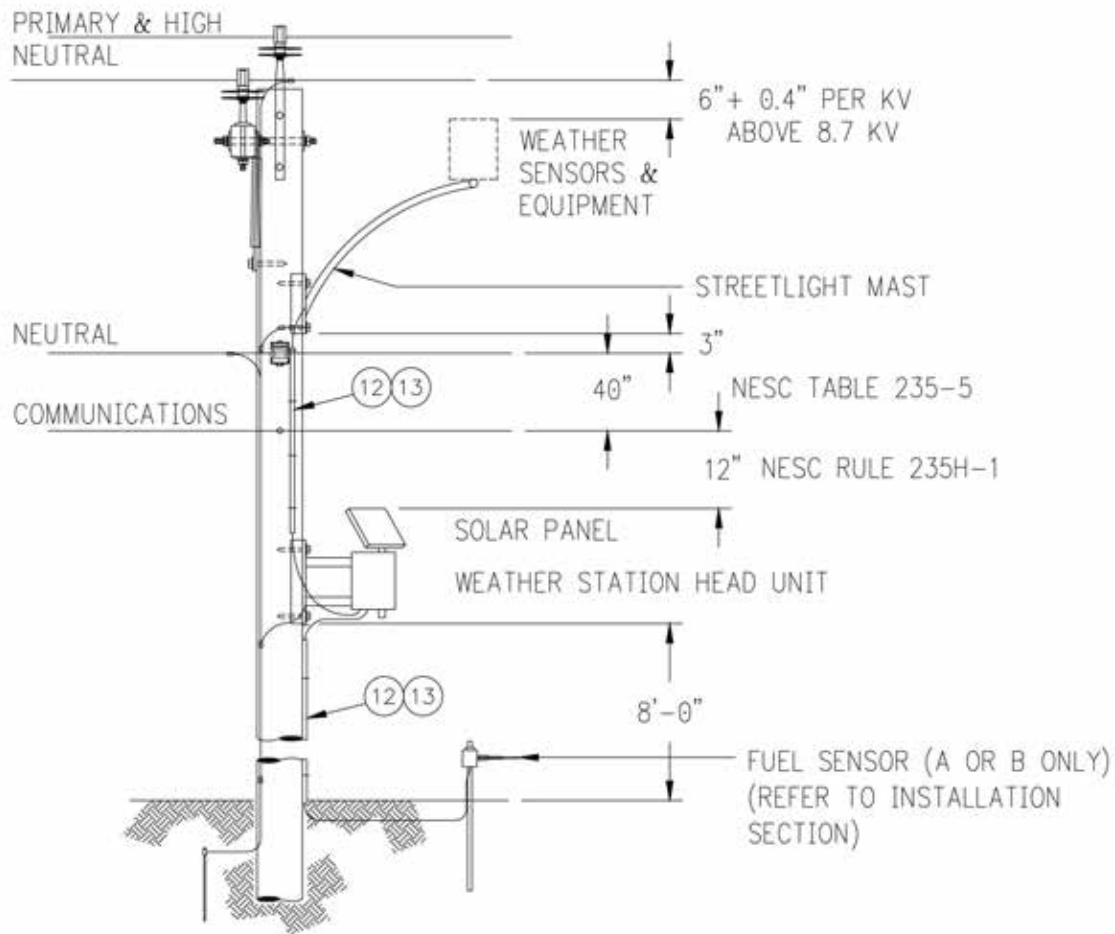


Figure 7—Weather Station, Primary

Note:

Forty inches (40") can be reduced to 30" if there is no secondary present and if the neutral is effectively grounded, per NESC Table 235-5, Note 5.

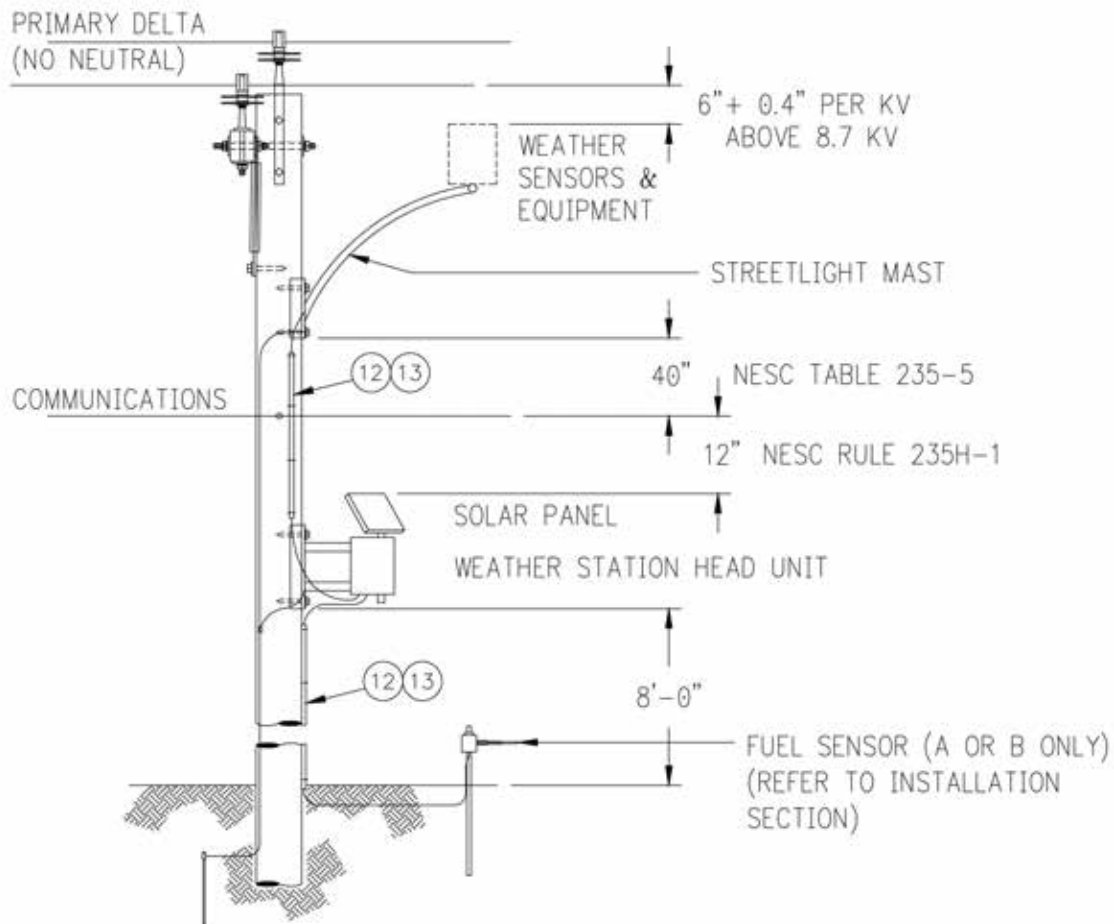


Figure 8—Weather Station, No Neutral

PAC_289.50

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EB—Poles

Information Standards

Standard	Title	Revised
EB 001	Poles—General Information	3 Jul 13
EB 011	Poles—Class Selection	26 Aug 11
EB 021	Poles—Setting Information	13 Feb 18
EB 031	Poles—Setting Depth	24 Feb 00
EB 041	Poles—Alternate to Wood	3 May 18
EB 051	Pole—Running Angle Structure, Steel	22 Dec 16
EB 061	Pole, Steel—Self-Supporting Deadend Structure	26 Jun 14
EB 101	Poles—Dimensional Data	14 May 19
EB 111	Poles—Weight Table	7 Oct 95
EB 131	Poles—Cribbing	7 Oct 95
EB 141	Poles—Reinforcing	14 Nov 14
EB 171	Poles—Predrilled Holes	11 Dec 17
EB 321	Poles—Preservative Treatment	13 May 93
EB 331	Poles—Fire Protection	6 Aug 20

Installation Standards

EB 401	Pole, Wood	28 Sep 16
EB 403	Pole, Fiberglass	11 Mar 21
EB 407	Pole—Running Angle Steel Structure	3 Sep 13
EB 408	Pole, Steel, Self-Supporting Deadend, Direct Buried	3 Sep 13

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Standard	Title	Revised
<u>EB 409</u>	Pole, Self-Supporting, Stub	28 May 20
<u>EB 410</u>	Pole Types for Attaching Cellular Antennas	26 Feb 19
<u>EB 421</u>	Reinforcer, Steel	14 Oct 03
<u>EB 425</u>	Pole-Top Extensions for Wood Poles	19 Mar 20
<u>EB 431</u>	Preservative Treatment—Field-Drilled Hole and Pole-Top Cuts	4 Mar 10
<u>EB 441</u>	Dowel, Preservative-Treated	23 Mar 95
<u>EB 451</u>	Preservative Treatment—Pole, Groundline	19 Jul 17
<u>EB 456</u>	Setting Foam—Pole	27 Dec 18
<u>EB 458</u>	Pole—Woodpecker Repair	16 Jun 11
<u>EB 461</u>	Tag—Fumigated Pole	13 May 93
<u>EB 471</u>	Cover Cap—Pole	6 Mar 12
<u>EB 501</u>	Pole Footing—Swamp	24 May 11
<u>EB 701</u>	Reinforcer, Galvanized Steel	14 Dec 04
<u>EB 711</u>	Bracket, Pole Splint, 1/4-Inch	21 Oct 04
<u>EB 721</u>	Strap, Galvanized, 3-Inch-Wide, 16-Gauge	21 Oct 04
<u>EB 731</u>	Reinforcer, Steel	19 Oct 16
<u>EB 736</u>	Pole—Protection Unit	20 Apr 17
<u>EB 741</u>	Strapping, Galvanized, 2-Inch Wide, Heavy Duty (0.06")	19 Jul 95
<u>EB 751</u>	Seal, Galvanized, Heavy-Duty	19 Jul 95
<u>EB 752</u>	Reinforcer, Pole, Safety Cap	15 May 96
<u>EB 761</u>	Plank, Treated Timber, 4" x 16" x 30"	19 Jul 95

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Standard	Title	Revised
<u>EB 77I</u>	Fitting, Push Guy, Galvanized, Universal Angle	19 Jul 95
<u>EB 79I</u>	Band, Pole-Stubbing, 12-Gauge	29 Nov 99
<u>EB 80I</u>	Washer, Half-Oval, Stubbing	19 Jul 95
<u>EB 81I</u>	Gain, Pole-Stubbing	19 Jul 95
<u>EB 82I</u>	Anchor, Expansion, Pole Key	16 Oct 08
<u>EB 83I</u>	Fill, Gravel, 3/4" Rock	31 Jul 95
<u>EB 84I</u>	Stub, Steel, Self-Supporting	14 Jul 20

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PAC_289.51

EB 001 Poles—General Information

Scope

This standard provides general information on the selection, tagging, and treatment of distribution poles.

General

The overhead distribution system is highly visible to the public, and its appearance is of concern to the company. Therefore, care should be taken in selecting and siting poles.

1. Selection: The principal factors involved in the selection of poles are height and class. Stock item numbers for poles identify them by length and class. Poles for urban primary construction normally will be Classes 3 and 4. Poles for rural primary construction normally will be Class 4 or stronger (Class 3, 2, or 1).
2. Identification: All poles received from the supplier shall exhibit identification tags to show species, length, year treated, class, the type of preservative, and the supplier.
3. Treatment: Douglas fir, southern yellow pine and lodgepole pine poles are full-length-treated; western red cedar poles are butt-treated for sites east of the Cascades, and full-length-treated for use on the west side of the Cascades.
4. Pole-Top Holes: Some poles will be predrilled before treatment to ensure longer life by reducing premature decay that results from lack of treatment during field drilling.
5. Groundline Holes: Some pole species will be bored at the groundline zone, three feet above and three feet below ground line, prior to treatment to improve the effectiveness of preservative treatments.
6. Pole Top Cut Off: If a larger treated pole is cut off to be used as a guy stub or other support structure, the pole top must be treated and a cover cap installed (see EB 471, Cover Cap—Pole).
7. Pole in Concrete: A wood pole may not intentionally be installed in concrete since concrete retains moisture and its higher pH can result in wood decay. Also, poles installed in concrete can be extremely difficult to inspect.

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