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INSTALLATION DETAILS FOR ALUMINUM, ACSR, AND COPPER COVERED TREE WIRE

015195

Department: Electric T&D

Section: T&D Engineering and Technical Support

Approved by: [REDACTED]

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Rev. #05: This document replaces PG&E Document 015195, Rev. #04. For a description of the changes, see Page 8.

Purpose and Scope

This document specifies and illustrates the procedures and application of materials for installing aluminum, ACSR, and copper tree wire.

General Information

1. Prior to October 2018, all covered tree wire installed in the PG&E distribution system have high density polyethylene (HDPE) black covering material. This design of covered tree wire is no longer approved for purchase. However, it is permissible to install until existing inventory is depleted.
 - A. Revision 03 of [015195](#) has moved to the FRO manual in the Technical Library
 - B. When installing or working with HDPE tree wire, use the methods described in this document.
 1. Sealing is no longer required.
 2. Piercing connectors (tap clamps) are no longer allowed.
2. After October 2018, the covered tree wire design was changed. See Figure 1 on Page 4 for an image of the XLPE covered tree wire. Below are the design differences:
 - A. The currently approved covered tree wire has a thicker nominal covering than the previously approved covered tree wires.
 - B. The tree layers of the currently PG&E approved covered tree wire is cross-linked polyethylene (XLPE).
 - C. The color of the outer layer is gray.
 - D. The approved sizes and types of covered tree wire have changed. See document [059626](#) for specification and ordering information. Only the covered tree wire shown in document [059626](#) are to be used.
3. Use polyethylene pin insulators for all covered tree wire applications, except for 21kV installations in AA insulation areas, where 3N/3NL post insulators are required for adequate insulation.
Do not use porcelain insulators.
4. Cover all bare energized conductors including primary neutral, jumpers, and supporting hardware and connections. Use either covered jumpers or the same size covered tree wire being installed in the overhead span for jumpers. Use split wire covers listed in Table 6 of document [061149](#) for short bare sections. Consider covered underarm jumper construction whenever possible.
5. The tree-layer covering of the tree wire can be difficult to remove. The preferred method to remove the layers is to use the stripping tool shown in Figure 2 on Page 4.
 - A. The stripping tool shown in in Figure 2 on Page 4 is hot stick operable and works on all tree wire sizes.
 - B. Another approved stripping tool is shown in Figure 3 on Page 4. Its S&S part number is **2575871**. This tool has a wedge blade that strips the covering of the tree wire.
Caution: Avoid nicking the wire by not setting the blade too deep.
6. For angle limitations for triangular wood crossarm construction see document [066196](#).
7. For angle limitations for composite crossarm construction see document [068180](#).
8. For angle limitations for flat construction, for wood crossarms see document [015202](#).
9. For maximum weight span lengths for single 8'-0" wood crossarm see document [015202](#).

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10. For stringing tension for short span urban see document [015221](#).
11. For the maximum dead-end tensions in light, intermediate and heavy loading district see document [015221](#).
12. For maximum slack span length see document [061112](#).
13. For maximum span limits, for standard framing construction see document [066196](#).
14. For maximum span limits, for long span construction see document [072155](#).
15. For ampacity information see document [076251](#).

Construction Requirements

1. Construction is to be standard triangular. Raptor construction is not necessary when installing covered tree wire as there is no issue with raptor electrocution due to bare conductor.
2. Do not strip the covered tree wire for any angle unless when using 3N or 3NL post insulators. Due to the metallic saddle/clamp, the tree wire covering has to be stripped off when using 3N or 3NL insulators. Use normal preformed bare wire ties with the bare wire on the 3N. Then, the exposed bare conductor must be covered with a split wire cover (see Document [061149](#)).
3. Mid-span splices are not allowed for new construction or reconstruction work. If needed during emergency work, use only compression splices. Use approved medium voltage fusion tape (MVFT) (material code **M390190**) or gel wrap to cover the compression splice. See Figure 7 on Page 7, and installation instructions in note 4 of this section.
4. Repair sleeves are no longer required. Per manufacturers instruction, sealing the XLPE covered tree wire against moisture is not required.
5. When installing tap or dead-end connections on covered tree wire, remove only a sufficient amount of the conductor insulation to permit installing the tap or dead-end connector over the conductor. **Always install dead-ends on bare conductor.**
 - A. Do not use piercing connectors for jumpers or taps. Use fired wedge connectors and cover any connectors and any exposed conductor with approved fired wedge covers. See Document [061149](#) and Table 2 on Page 6 of this document. The use of approved medium voltage fusion tape (MVFT) is also approved (material code **M390190**). Install the MVFT per the following instructions:
 1. Begin the MVFT installation by placing the side without the plastic backing on the surface. As the tape is wrapped around the surface, remove the plastic backing so the tape is allowed to adhere to itself.
 2. Wrap two layers of MVFT at the starting point before continuing down the surface.
 3. Continue wrapping two layers of the MVFT applying a 2/3 overlap across the surface. Use sufficient tension to provide a snug fit. Do not stretch more than 10%.
 4. Once the desired area is covered with 2/3 overlap, complete the installation with a two-layer wrap at the end.
 - B. For dead-end construction order and use one of the dead-ends as shown in Table 2 on Page 6 of this document. For further information document [028851](#).
 - C. Use the approved fire-retardant universal dead-end cover from Kaddas (material code **M180421**) to cover the dead-end. This dead-end cover works for all sizes and types of dead-ends except for the wedge dead-end for 715 Al.
 1. For 715 Al, use bolted shoes listed in Table 2 on Page 6 of this document.
 - D. The covering of the covered tree wire does not need to be removed to install an approved wire grip if sagging/pulling covered tree wire is done as indicated in Table 1 on Page 5 of this document.
 1. Figure 4 on Page 6 shows typical acceptable outer layer condition after sagging/pulling covered tree wire.
 2. Figure 5 on Page 6 shows unacceptable outer layer condition after sagging/pulling covered tree wire.
 3. Use the grips as indicated in Table 1 on Page 5 for typical tandem configuration (see Figure 6 on Page 6).
 - (a) The Klein grips shown also work with existing HDPE covered tree wire.
 - (b) The two Klein grips models shown have the same strengths. The only difference is that the 1716-71 has hot-stick provisions, but the 1716-70 does not have hot-stick provisions.

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(c) Table 1 on Page 5 shows the S&S catalog number for ordering the grips.

E. Table 2 on Page 6 shows the ordering information for components needed when installing covered tree wire.

Application of Covered tree wire

1. All new construction and reconstruction work in Tier 2 and Tier 3 Fire areas.
2. Where occasional exposure from debris, bark, palm fronds and falling branches may occur.
 - A. Covered tree wire does not have a grounded insulation shield; therefore, it does not have a voltage rating; treat this covered tree wire like bare conductors. Covered tree wire is approved for use on any PG&E electric distribution voltages (i.e. 4kV, 12kV, 17kV, 21kV).
 - B. Clearances for covered conductor are the same clearances for bare conductors. Trees must still be trimmed to maintain the same required clearance from energized covered conductors as is required for bare conductors. For further information, refer to General Order 95, Rule 35.

References	Location	Document
Strength Requirements for Wood Crossarms	OH:Framing	015202
Sags and Tensions Conductors on Wood Poles	OH:Sags	015221
Ties and Armor Rod for Copper Distribution Line Conductors	Conductors	021439
Pin, Post, Dead-End and Strain Type Insulators for Distribution Lines	OH: Conductors	022088
Dead-End and Angle Attachments for Aluminum Conductors – Distribution Lines	OH:Conductors	028851
Connectors for Aluminum Conductors on Distribution Lines	OH:Conductors	028852
Armor Rods and Ties for Aluminum Conductors	OH:Conductors	028853
Conductors for Overhead Lines	OH:Conductors	059626
General Applications of Conductors for Overhead Distribution Lines	OH:Conductors	059690
Slack Span Construction for Distribution Lines	OH:Framing	061112
Raptor-Safe Construction and Wildlife Protection	OH:Framing	061149
Standard Framing for Tangent Construction Distribution Pole Lines	OH:Framing	066196
Composite Dead-End Crossarms for Distribution Lines	OH:Framing	068180
Long Span Construction for Distribution Lines	OH:Framing	072155
Ampacity of Overhead Distribution Line Conductors ..	OH: Conductors	076251
High Molecular - High Density Polyethylene Covered Tree Wire	EMS	# 83

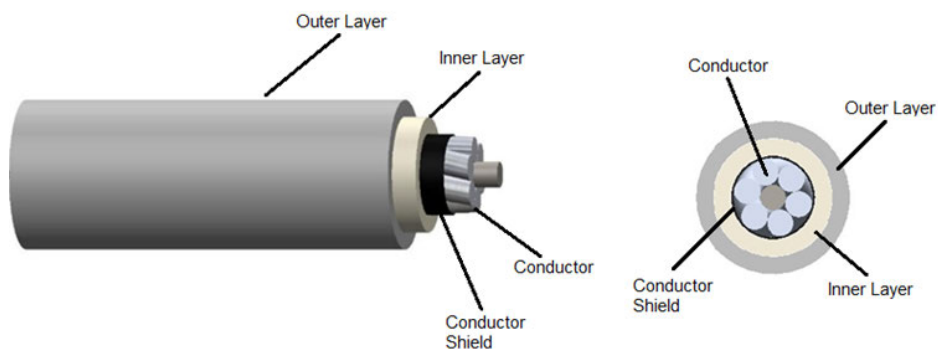
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Figure 1
Example of three-Layer XLPE Covered tree wire

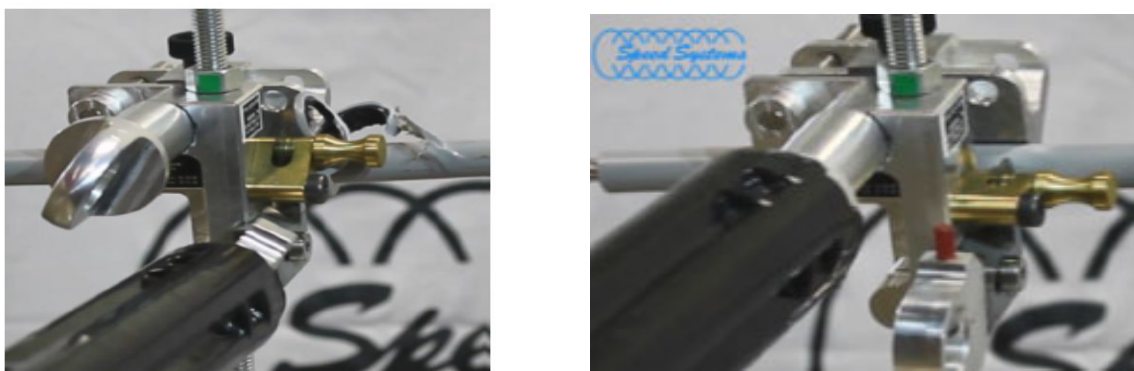


Figure 2
2900-LS Model Covered Tree Wire Stripping Tool



Figure 3
1542-2CL Stripping Tool, Alternative to the 2900-LS Model

Installation Details for Aluminum, ACSR, and Copper Covered Tree Wire**Table 1 Wire Grip Information for Sagging/Pulling Covered Tree Wire**

Cable Size (AWG or Kcmil) ²	Strands	Nominal outside Diameter over Outer Layer (inches)	Maximum Sagging/Pulling Tension (pounds)	Approved Manufacturer	Grip Part Number	S&S Catalog Number	Method of Installation
#2 HD Cu	7	0.642	< 1,000 ¹	Klein	1659-40	200261	Single Grip
			< 1,000		1716-70 or 1716-71	2867247 2913509	Two Grips in Tandem
1/0 ACSR	6/1	0.748	< 1,000 ¹		1659-40	200261	Single Grip
			≥ 1,000		1716-70 or 1716-71	2867247 2913509	Two Grips in Tandem
397.5 AAC	19	1.074	< 1,000 ¹		1659-50	200262	Single Grip
			≥ 1,000		1716-70 or 1716-71	2867247 2913509	Two Grips in Tandem
715.5 AAC	37	1.344	≥ 1,000		1716-70 or 1716-71	2867247 2913509	Single Grip

¹ Maximum sagging tension grip can handle.

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Figure 4
Typical Acceptable after Sagging Outer Layer Condition



Figure 5
Typical Unacceptable after Sagging Outer Layer Condition

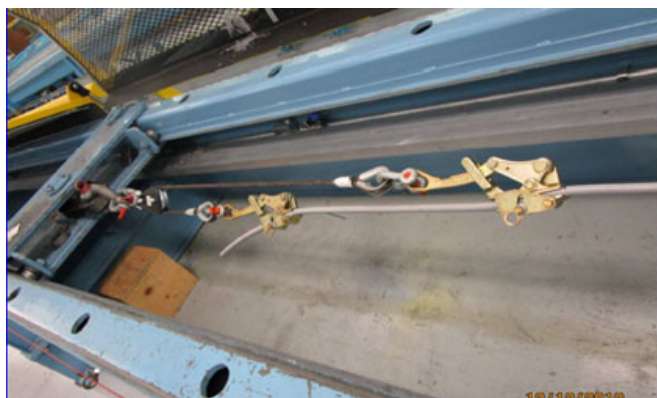


Figure 6
Typical Tandem Configuration Shown for Klein Grip 1716-71

Table 2 Material Codes for Coated Metal Ties, Dead-Ends, Gel-Wrap, Connector Cover, and Installation Tool for Installing XLPE Covered Tree Wire

Cable Size (AWG or Kcmil)	Strands	Coated Metal Top Tie Material Code	Coated Metal Side Tie Material Code	Dead-End			Gel-Wrap	Fired Wedge Connector Covers	Preferred Stripping Tool
				Automat-ic	Wedge ²	Bolted Shoe			
#2 HD Cu	7	180461	180466	184974	N/A	N/A	602578	180459	2884593
1/0 ACSR	6/1	180462	180467	184345	180225	184437	602578	180459	2884593
397.5 AAC	19	180464	180469	180417	180224	184424	602579	180460	2884593
715.5 AAC	37	180465	180470	N/A	Do not Use	184425	602579	180460	2884593
							602580 ¹		2884593

¹ Only use when using AFL splices.

² Do not use wedge in corrosion districts. In those districts use, automatic or bolted shoes dead-end.

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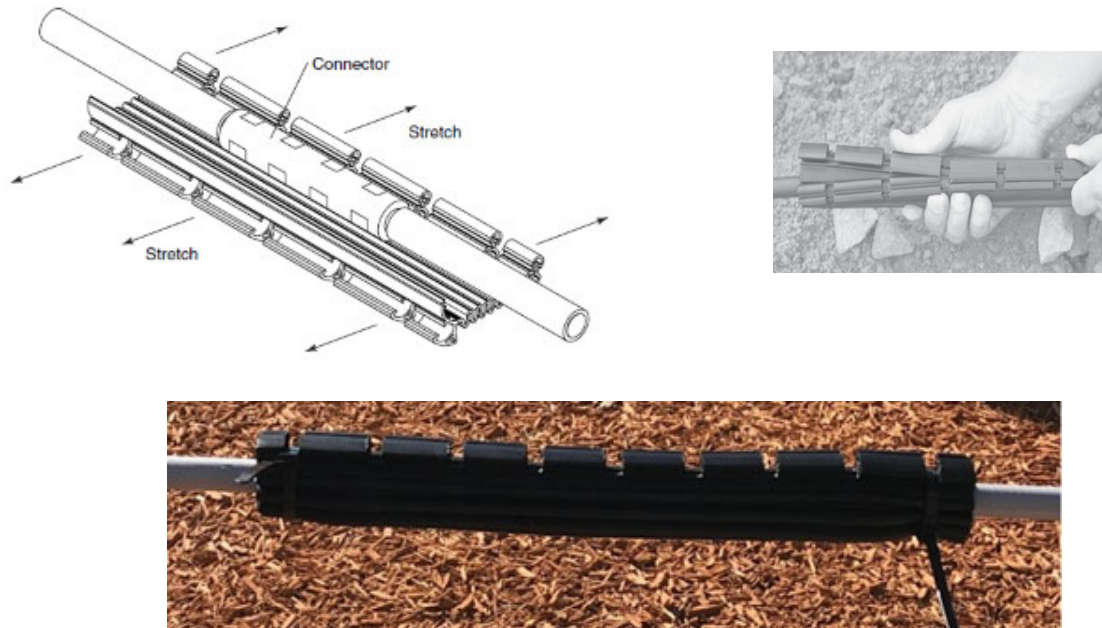


Figure 7
Gel-Wrap to Cover Compression Splices

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Revision Notes

Revision 05 has the following changes:

1. **General Information :**

Updated Notes 1, 3, 4, 5.B, 6, 7, 8 on Page 1. Deleted Note 10, renumbered notes.
Revised Note 12 on Page 2.

2. Construction Requirements :

Revised Note 2 and Note 3 on Page 2. Corrected Note 5.A and 5.C on Page 2.

3. Added Reference document on Page 3.

[Slack Span Construction for Distribution Lines](#) [OH:Framing](#) [061112](#).

4. Corrected Table 2 on Page 6.