

**PPE:**

Standard T-Line PPE, including:

- Hard Hat
- Safety Glasses
- Gloves
- FR clothing

**Tools:**

- Binoculars
- Camera

**Guidance Document References:**

[TD-1001M, "Electric Transmission Preventative Maintenance Manual"](#)

**Level of Use:**

- ☐ Information
- ☒ Reference
- ☐ Continuous

## Purpose:

This job aid provides consistent evaluation of all dielectric self-supporting cable (ADSS) in transmission lines, and consistent decision-making.

The Qualified Company Representative (QCR) should use this guide to evaluate the condition of ADSS, confirm proper application, select the appropriate condition representing the deterioration level, and consistently assign the priority code.

## Condition Codes:

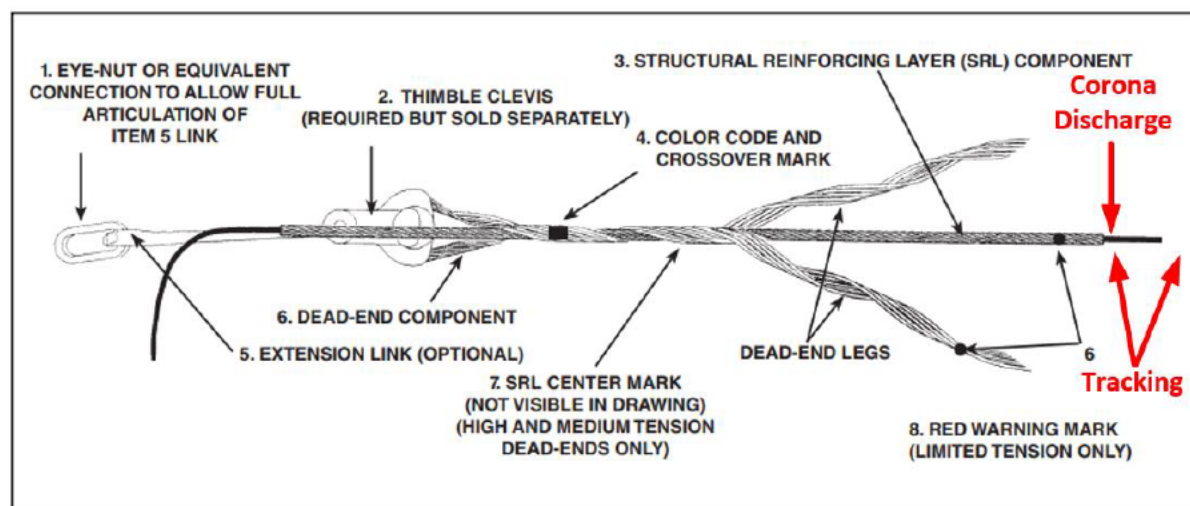
Inspect the structure using the form to record issues. Determine the condition of each item. Consider all conditions to determine the appropriate Priority Code for any Notification, if required.

- 5 = Heavy damage with safety concerns
- 4 = Heavy damage
- 3 = Moderate damage
- 2 = Light damage
- 1 = No visible damage

If the damage on the ADSS cable creates an imminent threat, the QCR must immediately notify the supervisor and the IT Emergency Network Operating Center (ENOC) at (24×7).

## ADSS Inspections

- The high electric field from transmission voltages can possibly lead to corona discharge or tracking. It can be very difficult to see these types of degradation on the cable jacket, without clear images. Corona discharge occurs right at the end of the structural reinforcing rods, while tracking occurs from the end of the rods to, typically, a few feet out.
- For transmission voltage levels of 69 kV and above, spiral vibration dampers can be a contributing factor to tracking.
  - Place vibration dampers a minimum of 4 feet away from the ends of the dead-end or suspension armor rods.
  - For voltage levels below 69 kV, there is no minimum distance requirement.
  - Adjust improperly placed corona coils to the standard installation configuration.
- Do not affix fiber splice cases and slack coils to structures with rope.
- Non-standard cable ties or non-UV rated cable ties can fail and cause fiber slack loops to drop down toward the ground, causing a hazard to the general public or vehicular traffic.
- Transmission voltage levels of 69 kV and above are considered high E-field environments, while those below 69 kV are not.



FIBERLIGN DIELECTRIC DEAD-END AND ASSOCIATED HARDWARE



## ADSS Inspections

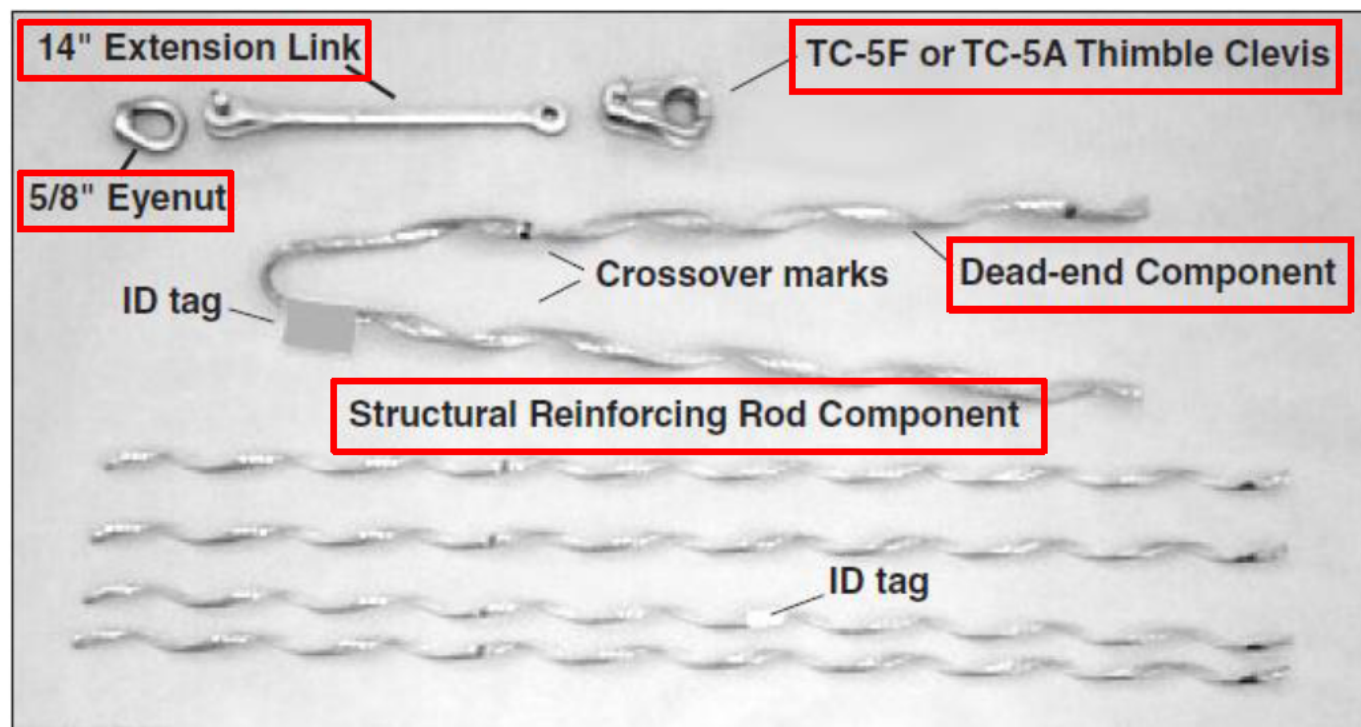
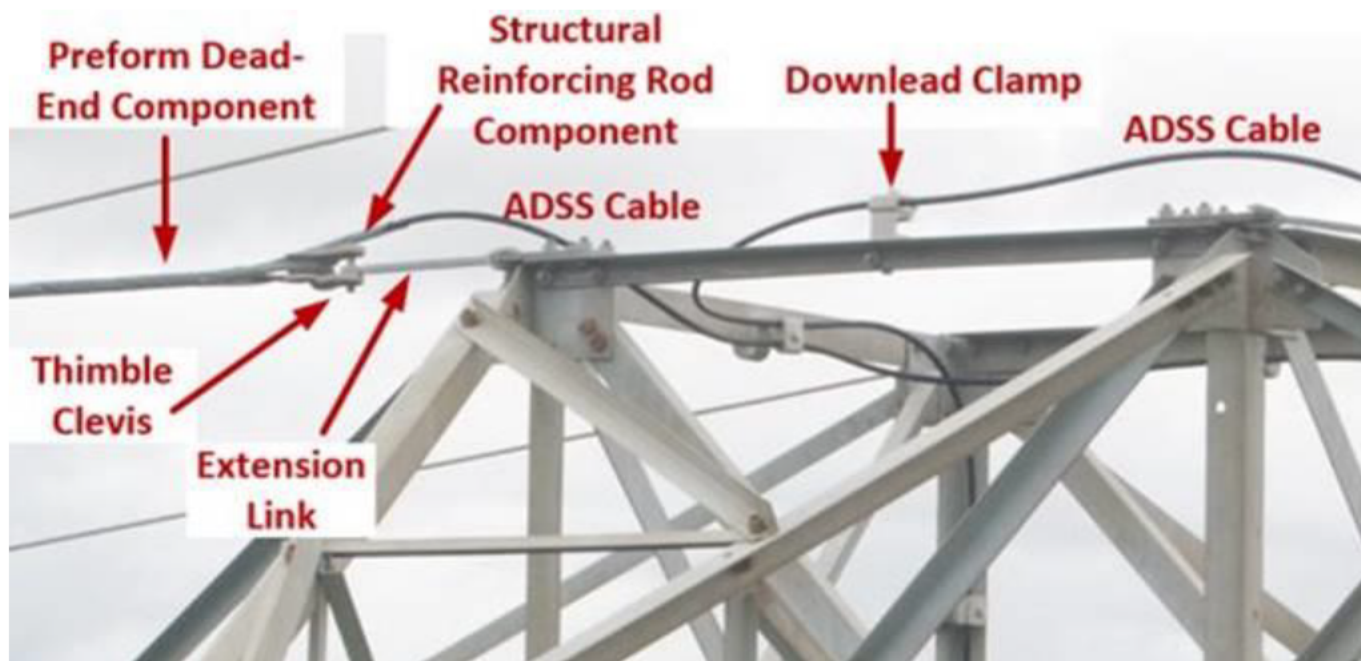
- Installation of ADSS cables is not allowed on 500 kV structures, in a dead-end or suspension configuration. Temporary emergency restoration is the only exception to this. If ADSS cables are found in this configuration, the Electric Inspection team is to reach out to the IT Inspection team to confirm.
- Sky wrap is a special kind of fiber that is wrapped around OPGW, that is now known to have problems with birds standing on the line and pecking away at the all-dielectric Sky wrap cable.
- Fiber cables are sometimes routed into a substation aerially, terminating on substation structures or stand-alone tubular steel poles or wood poles.
- [California Public Utilities Commission \(CPCU\) General Order \(G.O.\) 95, Rule 91.5](#) states that "...each communication cable that is attached to a joint use pole, shall be marked as to ownership." The internal PG&E requirement is to install a fiber label to each cable at every transmission structure, when installed in the "below-conductor" position. Fiber labels are not required to be attached to the cable, if it is installed in the above conductor position. Only one label is required at each structure; a label is not needed on each side of the structure.

Below are examples of the two types of labels in use.



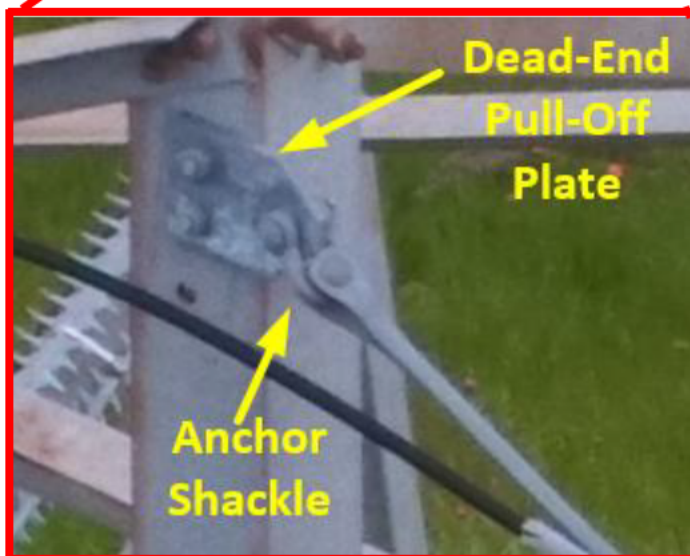
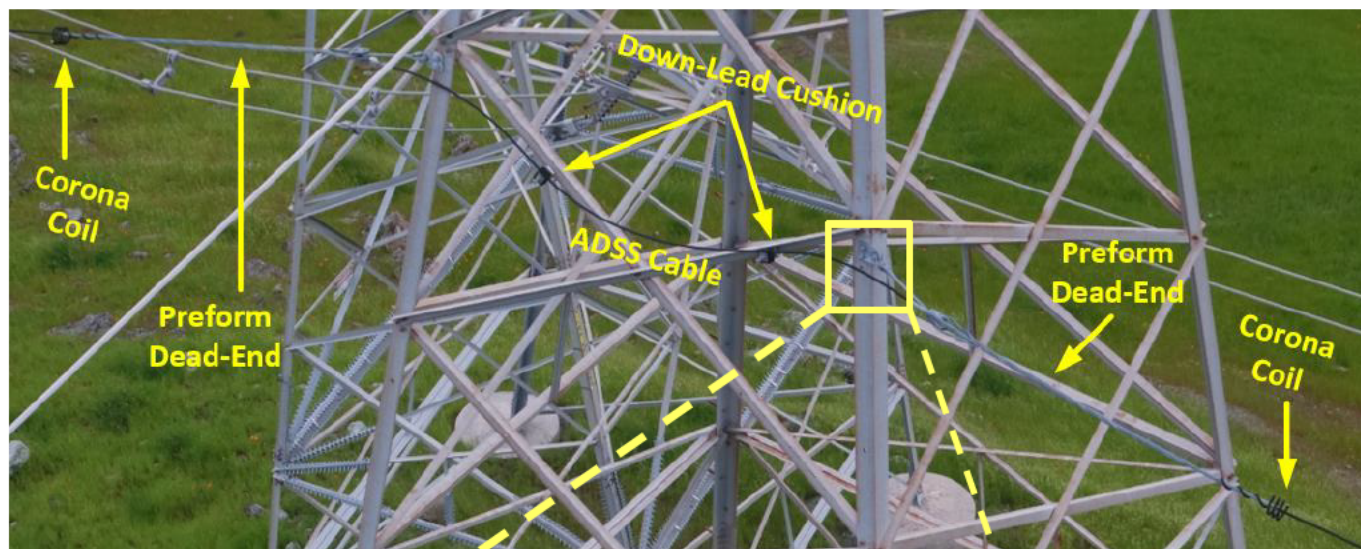
## Examples Of Correct ADSS Installations

### Above-Conductor Install



## Examples Of Correct ADSS Installations

### Below-Conductor Install





## ADSS Suspension Types

### Dielectric Support (FDS)



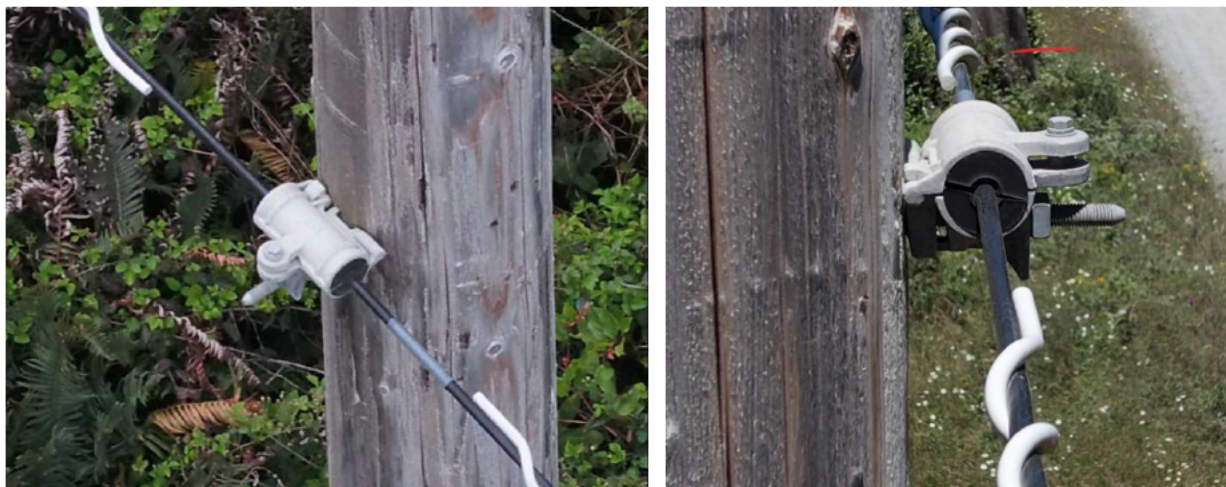
#### NOTE

The dielectric support is only allowed on 60-kV structures, with one exception.

**Exception:** FDS installed on a structure with 69-kV voltage or greater, can remain, “only” if distribution conductors are installed above it. E-field calculations have shown that in this scenario, the E-field values are low enough for the material to function properly and not combust. The exception is only valid for existing construction, not new construction.

## ADSS Suspension Types

### Aluminum Support



### Aluminum Suspension Without Rods



#### NOTE 1

The aluminum support and aluminum suspension without rods are only allowed on 60-kV structures, with one exception.

**Exception:** Aluminum support and aluminum suspension without rods installed on a structure with 69-kV voltage or greater, can remain, “only” if distribution conductors are installed above it. E-field calculations have shown that in this scenario, the E-field values are low enough for the material to function properly and not combust. The exception is only valid for existing construction, not new construction.

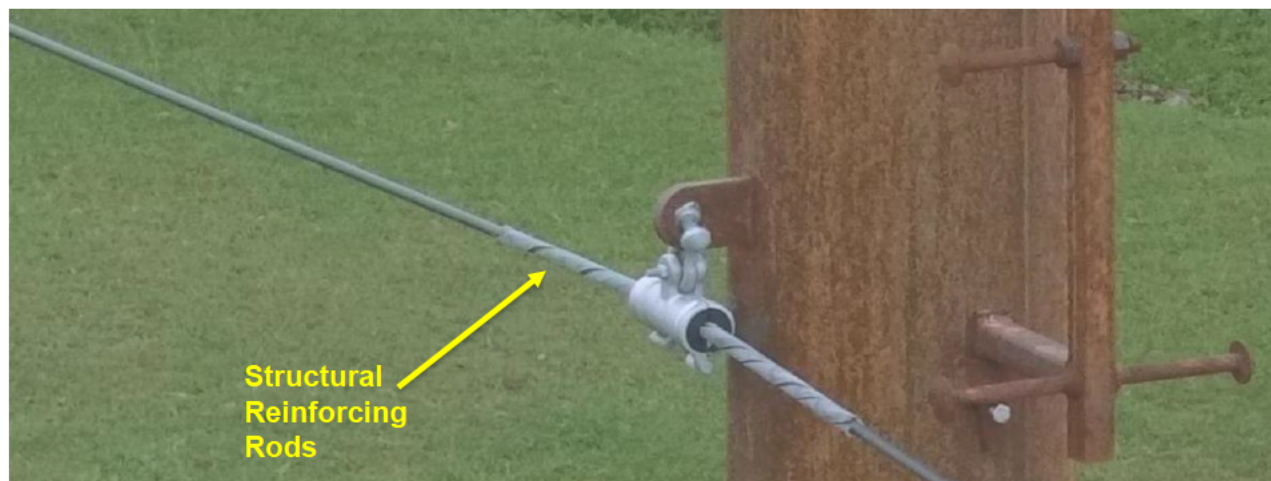
#### NOTE 2

Replace any bent through-bolts with  $\frac{3}{4}$ -inch through-bolts or space bolts.



## ADSS Suspension Types

### Aluminum Suspension with Rods



### Dielectric Suspension



#### NOTE 1

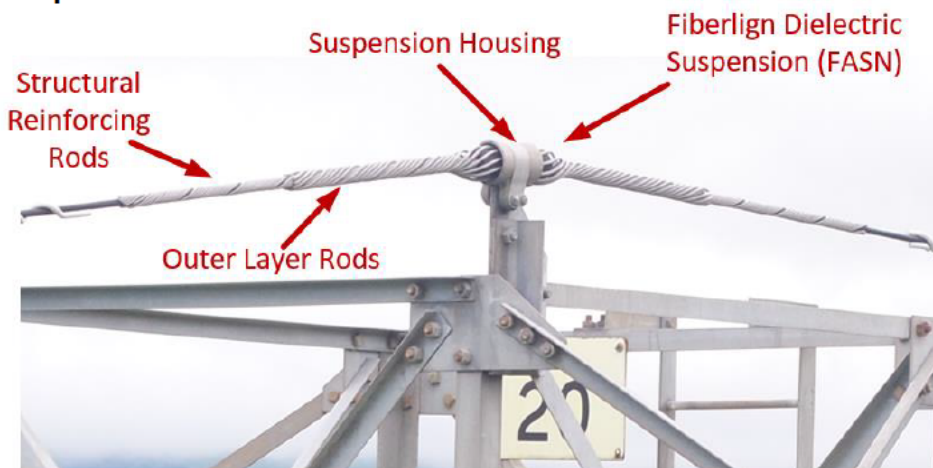
Aluminum suspensions with rods and dielectric suspension can be installed on transmission structures with line voltages of 230 kV and below.

#### NOTE 2

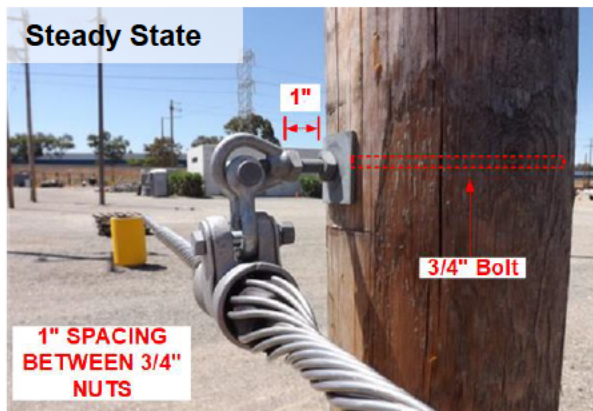
Replace any bent through-bolts with  $\frac{3}{4}$ -inch through-bolts or space bolts.

## Examples of Correct ADSS Installations

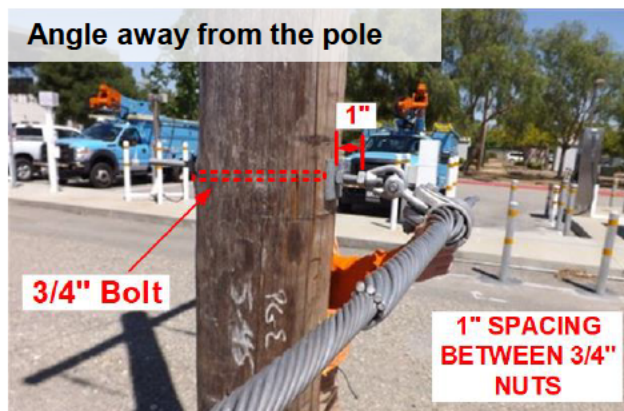
### Dielectric Suspension



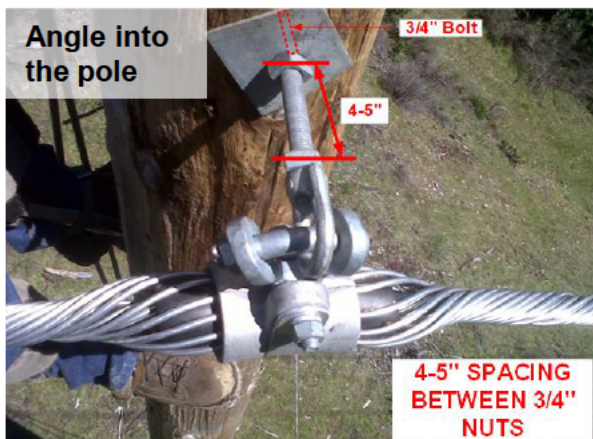
#### Steady State



#### Angle away from the pole



#### Angle into the pole



#### Back of pole

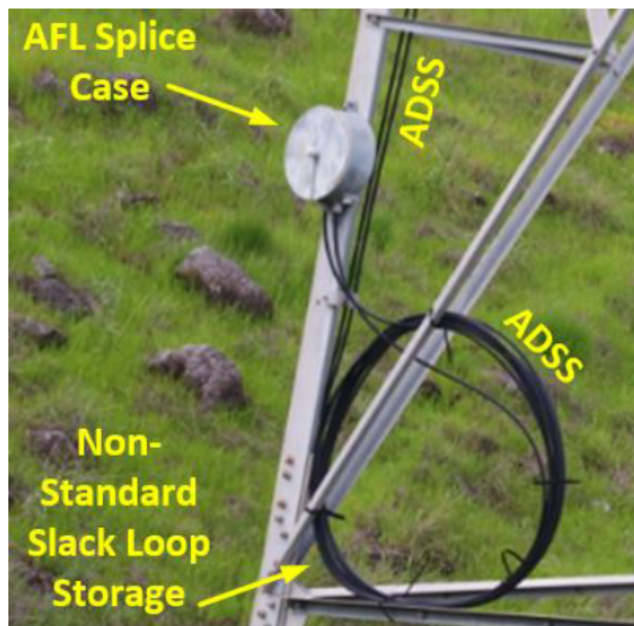
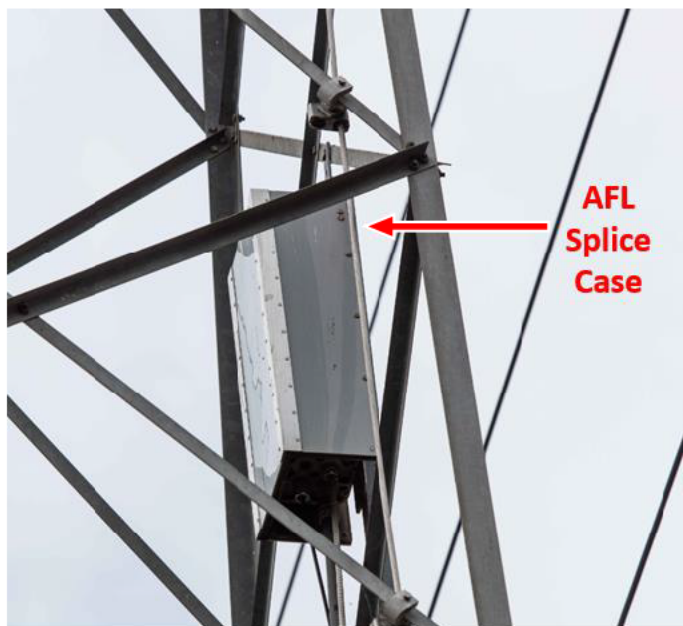
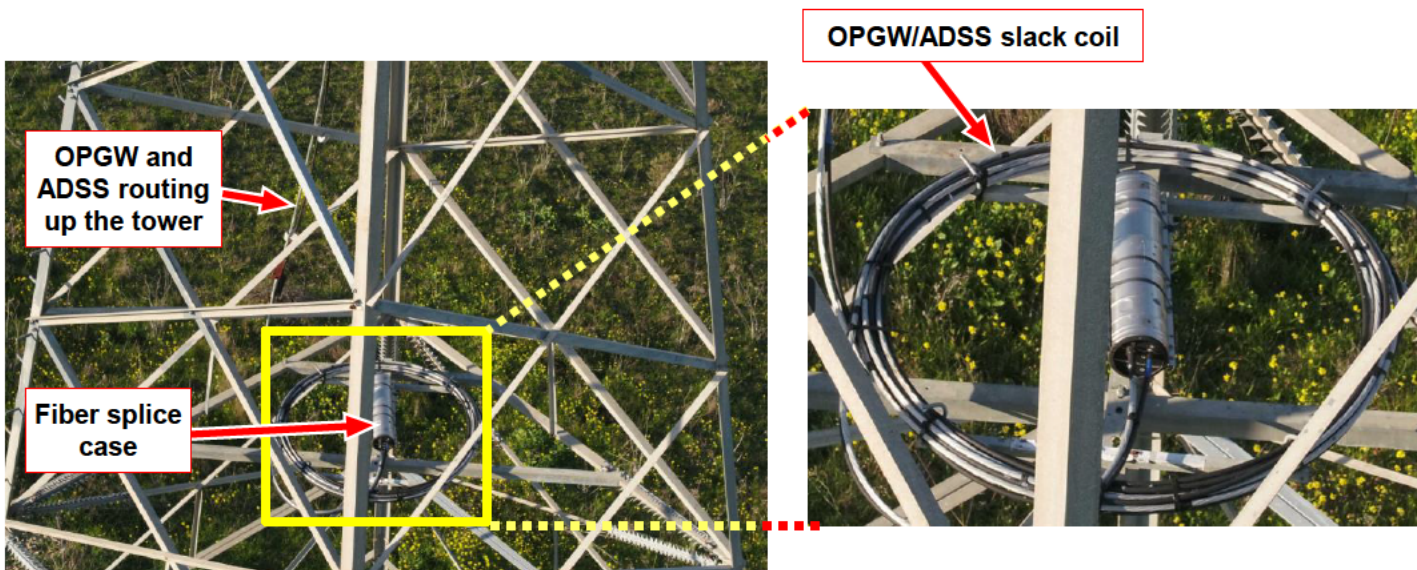


### NOTE

Anytime a dielectric suspension is installed on wood poles, use a 3/4-inch through-bolt – NOT the typical 5/8-inch through-bolt.



## ADSS Lattice Tower Splice Case Mount



## ADSS Tubular Steel Pole Splice Case Mount



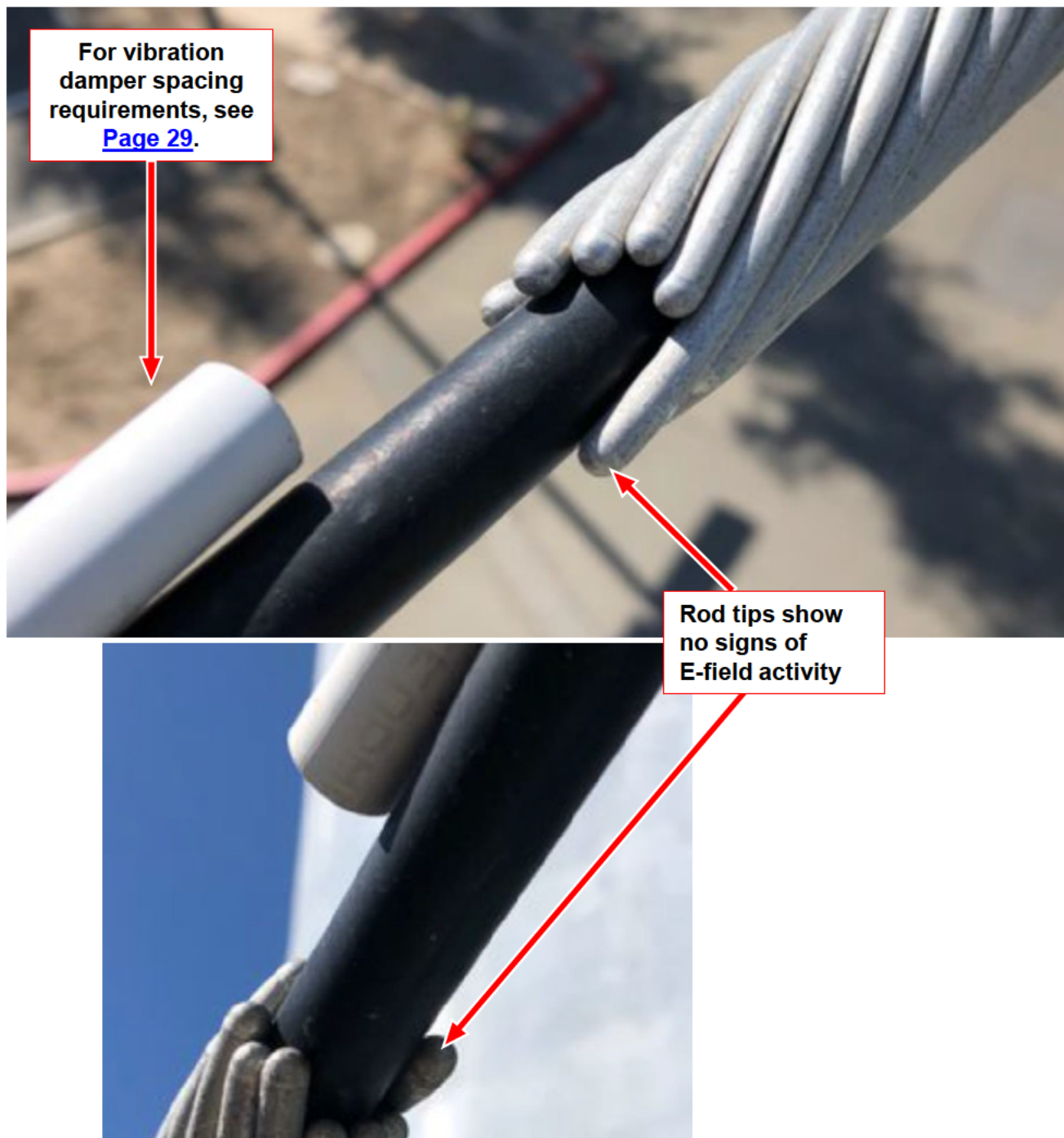
## ADSS Wood Pole Splice Case Mount





## ADSS Cable With No Signs Of E-Field Damage

In the image below, the ADSS cable shows no signs of corona discharge or tracking. The cable jacket is smooth. When E-field activity is present, the rod tips of the armor rods typically turn black from the arcing. In the image below, the rod tips are “clean,” and no black marks are present.



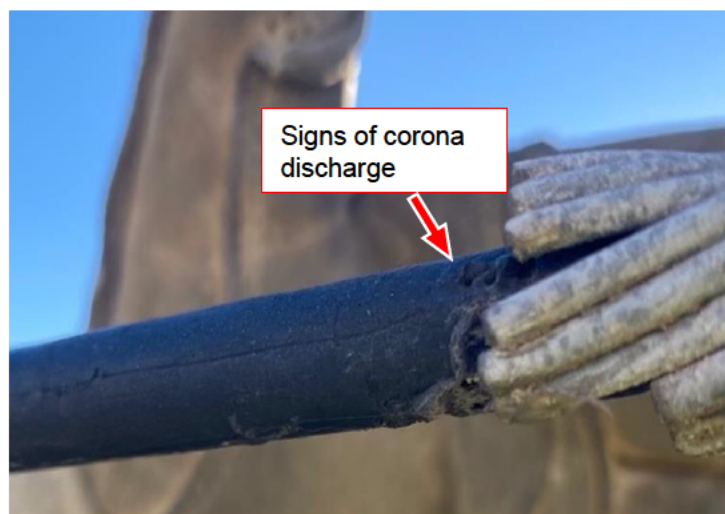
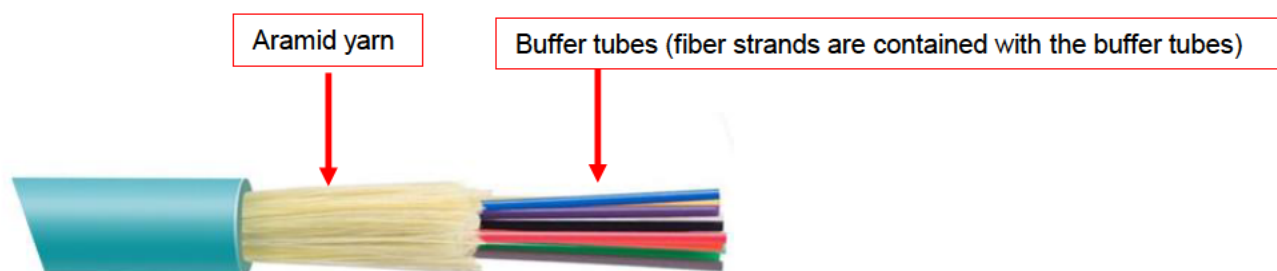


## ADSS Cable With E-Field Damage

Over time, the electric field burns through the cable jacket, causing a cable breach. Once the cable has been breached, there are two conditions that accelerate the degradation of the cable:

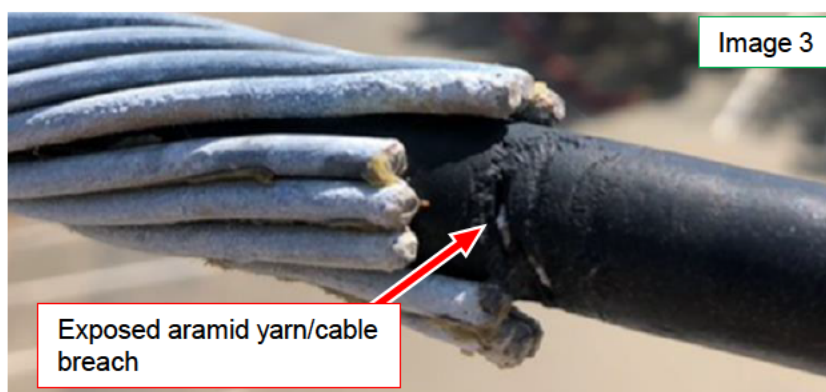
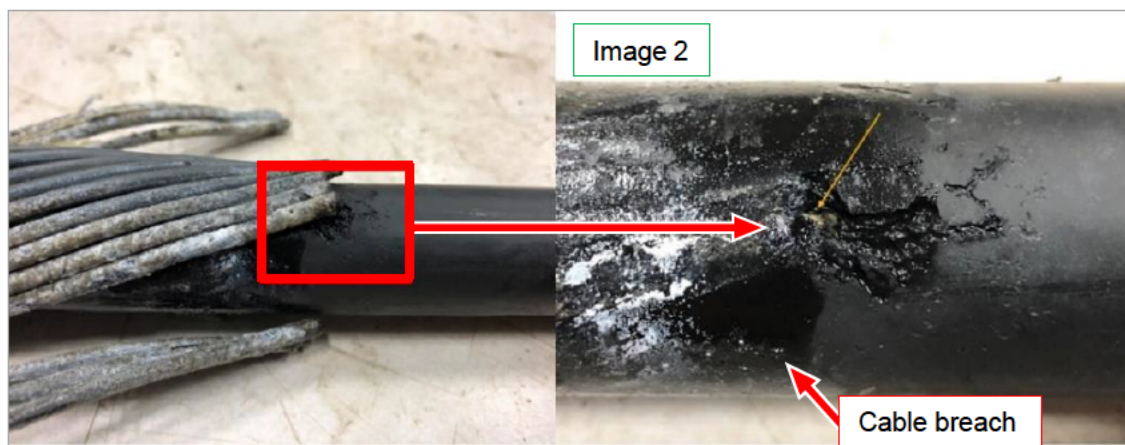
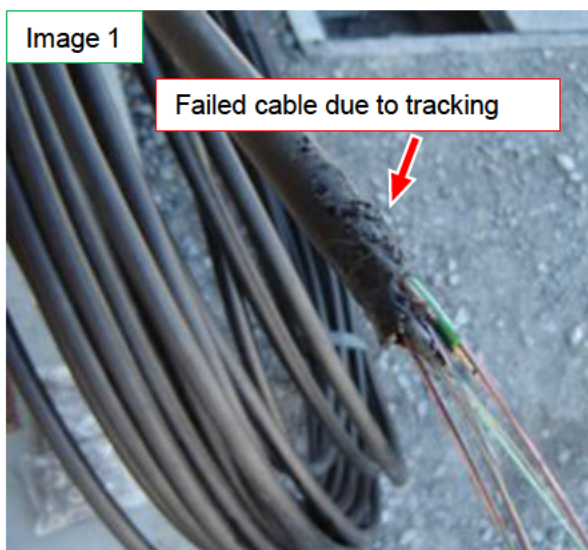
1. **Water Ingress:** Once water enters the cable, the tracking effect can start internally, where the cable will burn from the inside out. Once the aramid yarn is damaged/burnt through, the integrity of the cable is compromised, to the point where it will separate and eventually completely pull apart and fail.
2. **Aramid Yarn Degradation:** The part of the fiber cable that provides support, protection, and tensile strength is commonly referred to as Kevlar, which is a brand of aramid yarn. Aramid yarn is not UV-rated. Once exposed to the sun, it slowly degrades, changing from a yellow color to a white color. As it degrades, the cable loses its ability to self-support – eventually it will pull apart and fail.

Below are examples of tracking and corona discharge.



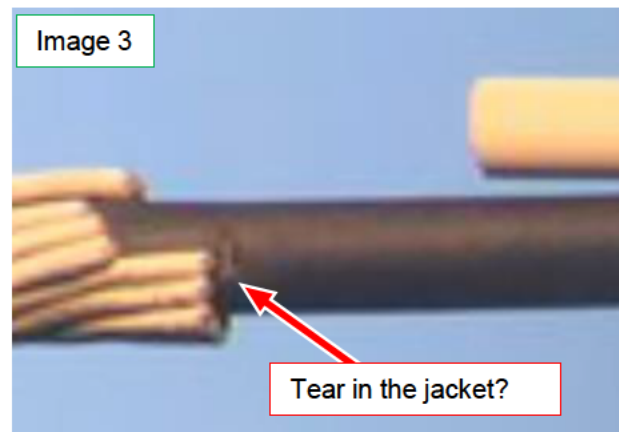
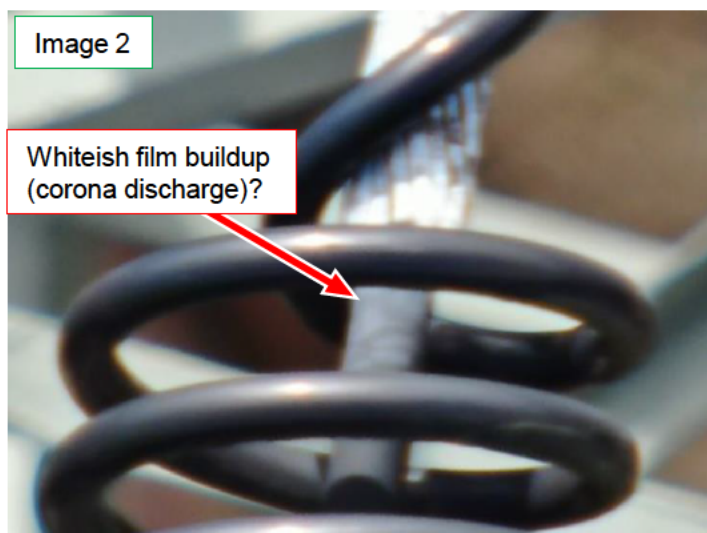
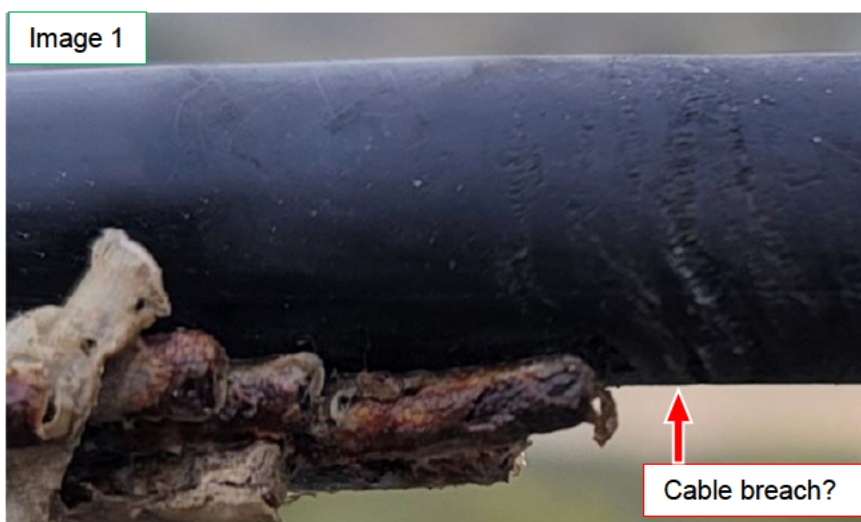
## ADSS Cable With E-Field Damage (Continued)

Damage caused by corona discharge can be difficult to see at times, as it can occur right underneath the armor rod tips, as shown below in the Image 2.



## Quality of Drone Imagery or Angle of Image

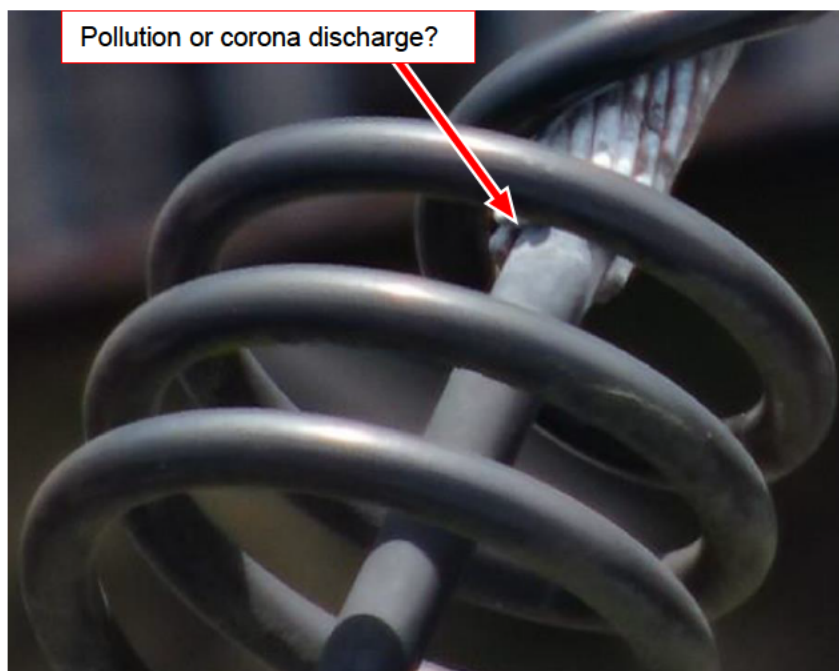
- E-field degradation typically occurs on top of the cable or on the sides, but it can occur anywhere on the surface of the cable. In Image 1, there are signs of degradation on the jacket, but it is hard to tell what is happening on the bottom of the cable.
- Sometimes the drone image becomes too blurry when zoomed in, making it hard to tell if the cable jacket is damaged or not, as shown in Images 2 and 3.
- It may be necessary to send a field crew out to perform an up-close inspection or to re-fly the drone to focus specifically on the fiber cable to gather clearer images.
- Re-flight follows existing Cannot Inspect (CNI) process.





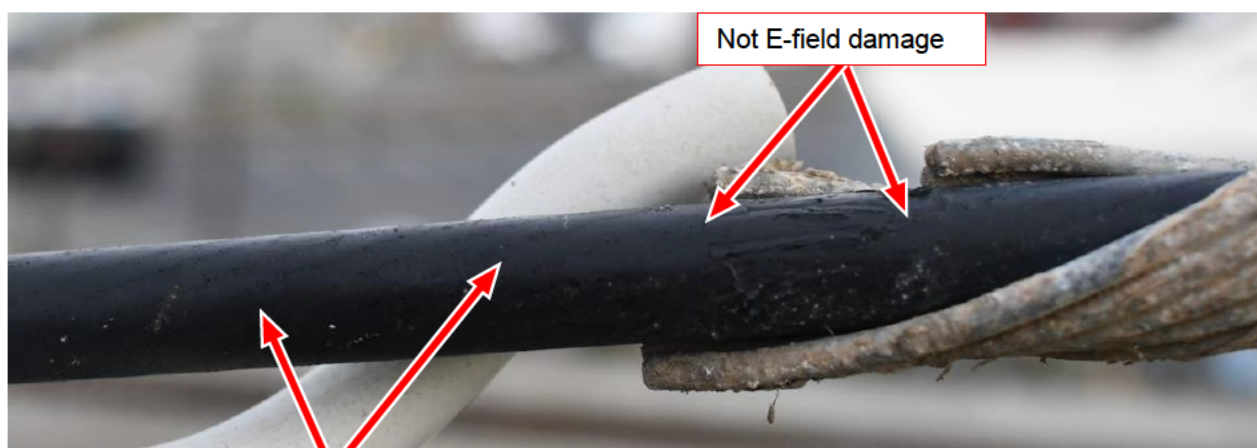
## Pollution/Sediment Build Up on Cable Jacket or Corona Discharge

- Early sign of corona discharge can be a whiteish film that builds up at the end of the armor rods. However, this can be confused with sediment build-up on the cable jacket or even bird droppings.
- Consistent rainfall helps to wash away sediment build-up, which is generically called “pollution.” It can be difficult to determine if any E-field damage is present, due to pollution buildup.
- It may be necessary to have a crew wipe the cable jacket down to remove any pollution buildup and then perform an up-close inspection to assess if any E-field damage is present. Take up-close photos for review by the EO and IT Inspection teams.



## Fiber Cable Jacket Irregularities That Are Not E-Field Damage

- In the two images below, there are helical “patterns” on the jacket, where the preform rods were originally installed, removed, and then repositioned. Do not confuse these with E-field degradation.
- On the right side of the first image, it appears that a sliver of the jacket has been removed/scrapped off somehow. It is not known what could have caused this. This is not E-field damage.





## ADSS Condition Levels and Impact

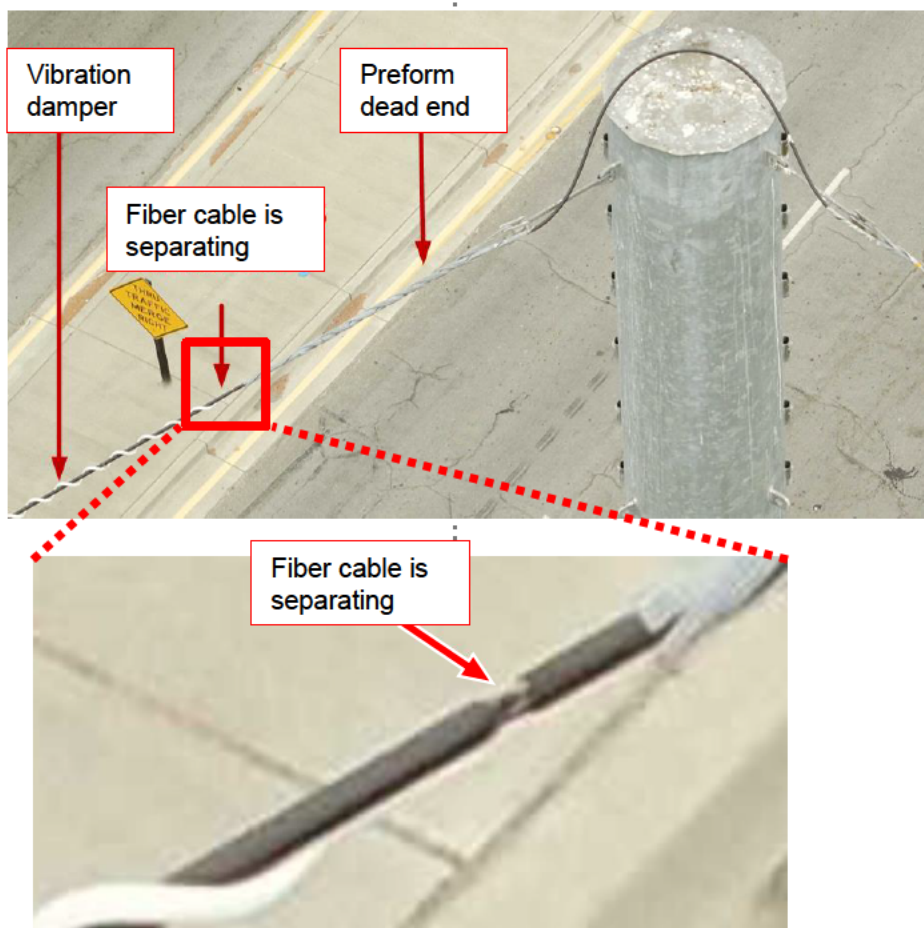
### Condition 5

#### Damaged/Separating/Cable Breach

ADSS cable (E-field damage, vandalism, vehicular contact)

#### Actions:

1. Initiate SAP Notification, Priority Code A.
2. T-Line to make the situation safe with preform safety snubs.
  - If the situation cannot be made safe and cable removal is the only option, contact IT immediately, so that IT can notify the appropriate lines of business and 3rd party customers of the emergency outage.
3. Notify IT by calling the ENOC at [REDACTED].
  - Document the date, time, and the name of the person at the ENOC who took the call.
  - Capture this information in the comments field of the SAP notification.
4. Take close-up photos of the condition found.

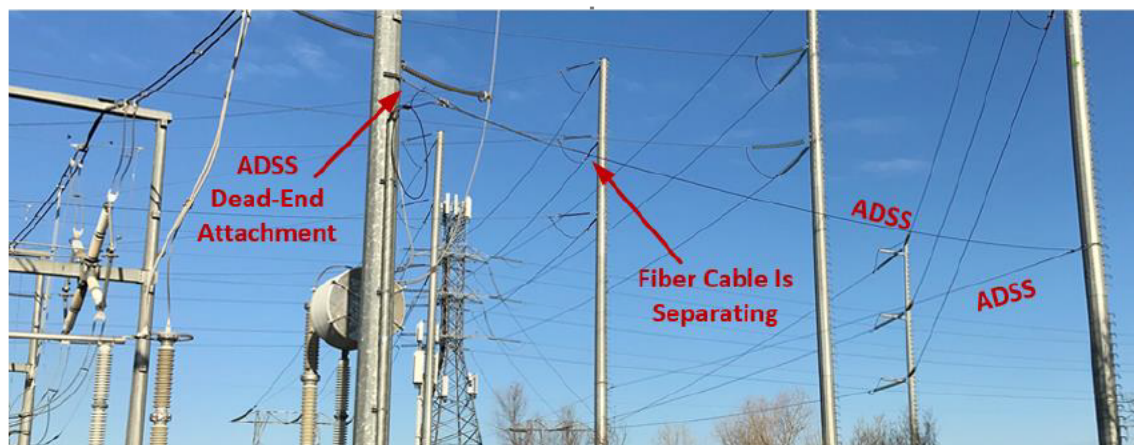


## ADSS Condition Levels and Impact (continued)

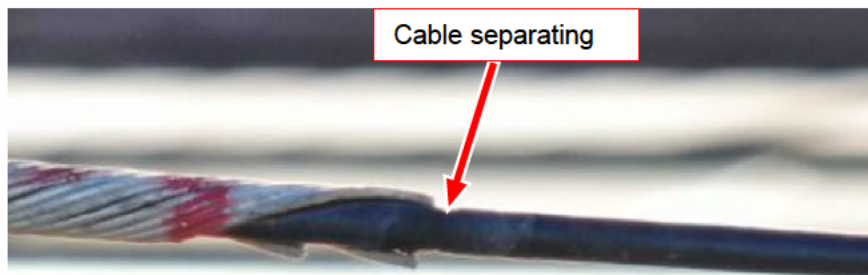
Condition 5

**Damaged/Separating/Cable Breach**  
ADSS cable (continued)

### 8 Mile Substation



### Oakland Schnitzer Steel Area



## ADSS Condition Levels and Impact (continued)

Condition 5

**Damaged/Separating/Cable Breach**  
ADSS cable (continued)

**E-field Damage:** Cable jacket has been breached; blue buffer tube is exposed, as well as the orange aramid yarn. Cable separation and complete failure will occur.



**Vehicular Contact:** It is believed that a vehicle carrying something tall "caught" the cable and tore it longitudinally; aramid yarn is exposed. Cable has been breached; cable separation and complete failure will occur.



**Vandalism:** A section of the outer jacket has been removed, exposing the orange aramid yarn. Once the aramid yarn degrades, cable separation and complete failure will occur.

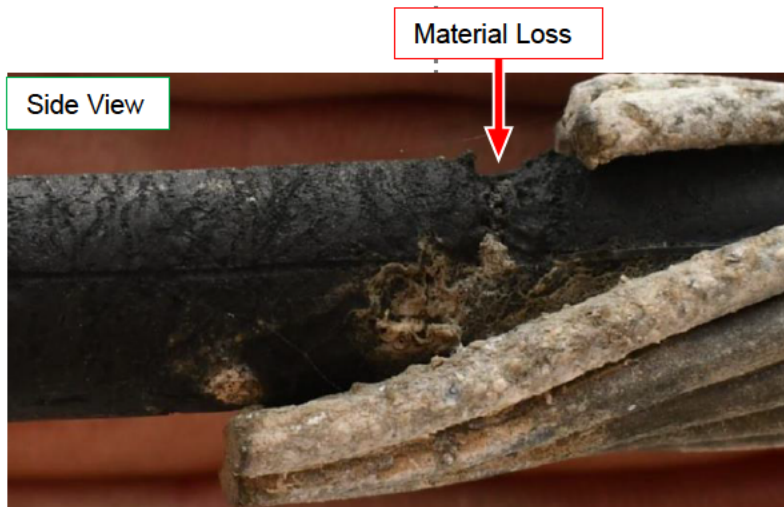
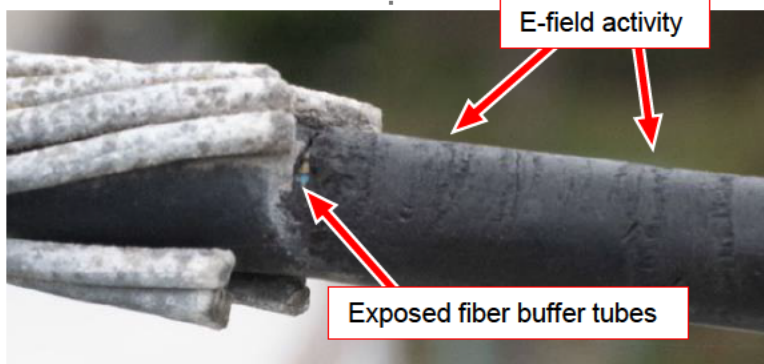


## ADSS Condition Levels and Impact (continued)

Condition 5

### Damaged/Separating/Cable Breach

ADSS cable (continued)



## ADSS Condition Levels and Impact (continued)

Condition 5

**Damaged/Separating/Cable Breach**  
ADSS cable (continued)

### NOTE

Sometimes one image is not good enough to show the severity of the damage to the cable. The side views below do not show the extent of the damage, as well as the top view does.

Top View



East View



West View





## ADSS Condition Levels and Impact (continued)

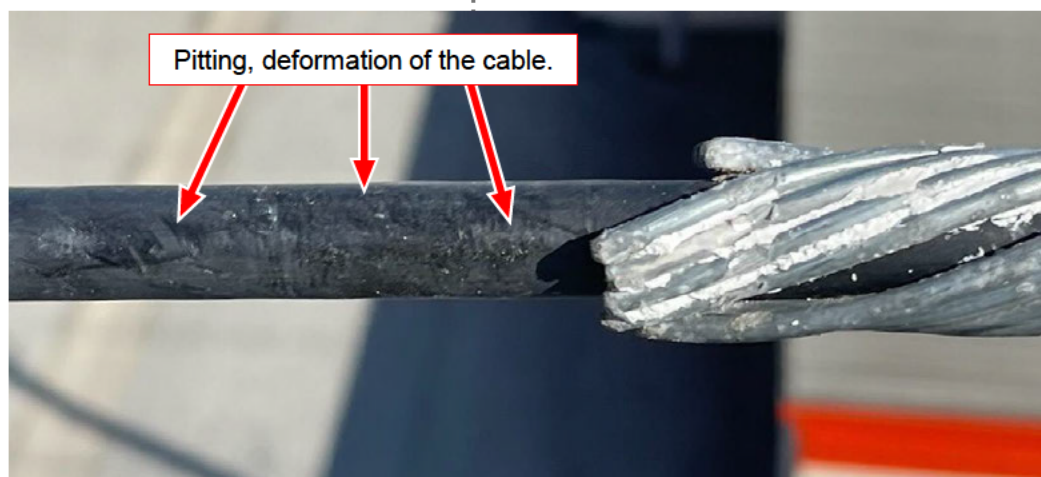
### Condition 4

#### Signs of E-Field Damage ADSS cable (Tracking or Corona Discharge).

No signs of a cable breach.

#### Action:

1. Initiate SAP Notification, Priority Code E (3 months)
2. Install preform safety snub.
3. Take close-up photos of the condition found.



#### NOTE 1

If signs of E-field damage are present, conduct an up-close inspection of the cable to determine the severity of the degradation and whether the cable has been breached.

#### NOTE 2

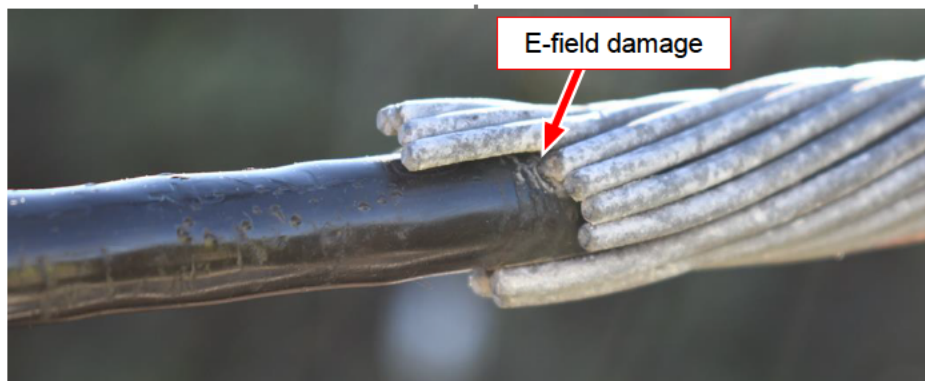
The up-close inspection can be done from a bucket truck; or a drone can be sent out to take more focused images.

## ADSS Condition Levels and Impact (continued)

Condition 4

### Signs of E-Field Damage

ADSS cable (continued)



## ADSS Condition Levels and Impact (continued)

Condition 4

### Signs of E-Field Damage

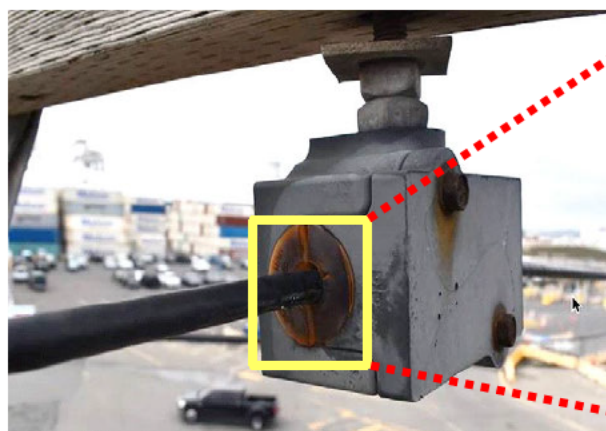
**Non-Standard Installation** of suspension/tangent support on structure with line voltage of 69 kV and above.

#### NOTE

- Installation of the dielectric support and aluminum suspension without rods is not allowed on structures with a voltage greater than 60 kV.
- In the image below, it appears that there are signs of electric activity, burning of the dielectric insert. The manufacturer specifies that this type of suspension can burn if installed in high electric fields.
- It is possible that a fire burning right underneath this structure could have caused this damage.
- See Pages 6, 7, and 8 for reference and exception.

### Action:

1. Initiate SAP Notification, Priority Code E (3 months).
2. ET assesses the condition of the fiber cable to determine if it has been damaged.
3. If the cable is damaged, send images to the IT Inspection team for review and assessment of next steps.
4. Install preform safety snubs, as required.
5. Take close-up photos of the condition found.





## ADSS Condition Levels and Impact

Condition 4

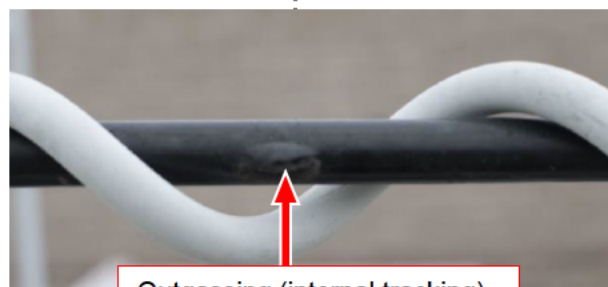
### Signs of “Outgassing” on ADSS cable.

#### NOTE

- A bubbling cable jacket could be a sign of internal tracking, where the cable is burning from the inside out. This would occur if there is a cable breach and water has entered the cable. If this is the case, the breach must be found and sealed up.
- It is possible that a fire burning right underneath this structure could have caused this damage.
- IT may coordinate with ET to have a crew climb the tower for up-close photos, to review and work with IT on a plan of action. During this time, the S5 tag will remain in staging.

### Action:

1. Initiate SAP Notification, Priority Code E (3 months).
2. Install preform safety snub out passed the last bubble in the cable, by several feet.
3. Take close-up photos of the condition found.



Outgassing (internal tracking)



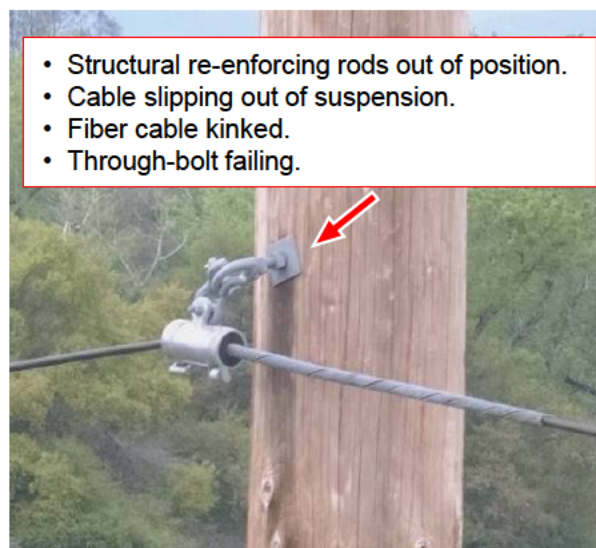
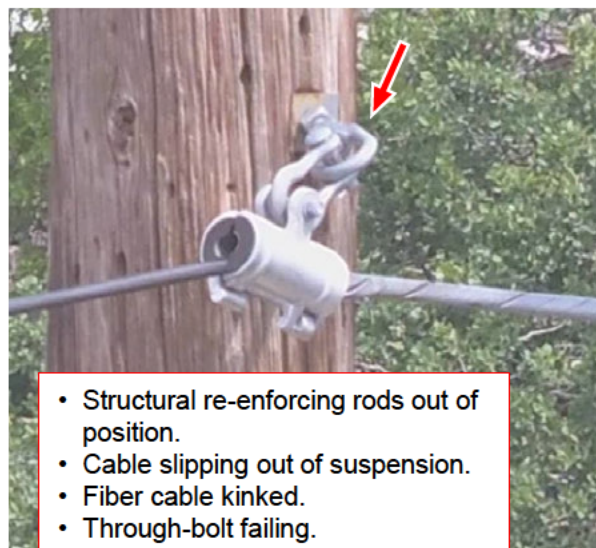
## ADSS Condition Levels and Impact (continued)

Condition 4

**Sharp angle/kink of ADSS cable and failing hardware.**

**Action:**

1. Initiate SAP Notification, Priority Code E (3 months).
2. Take close-up photos of the condition found.



## ADSS Condition Levels and Impact

### Condition 4

#### No Signs of E-Field Damage

**Non-Standard Installation** of suspension/tangent support on structure with line voltage of 69 kV and above.

#### Action:

1. Initiate SAP Notification, Priority Code E (12 months).
2. Take close-up photos of the condition found.

#### NOTE

- Installation of the dielectric support and aluminum suspension without rods is not allowed on structures with a voltage greater than 60 kV.
- See Pages 6, 7, and 8 for reference and exception.





## ADSS Condition Levels and Impact (continued)

Condition 4

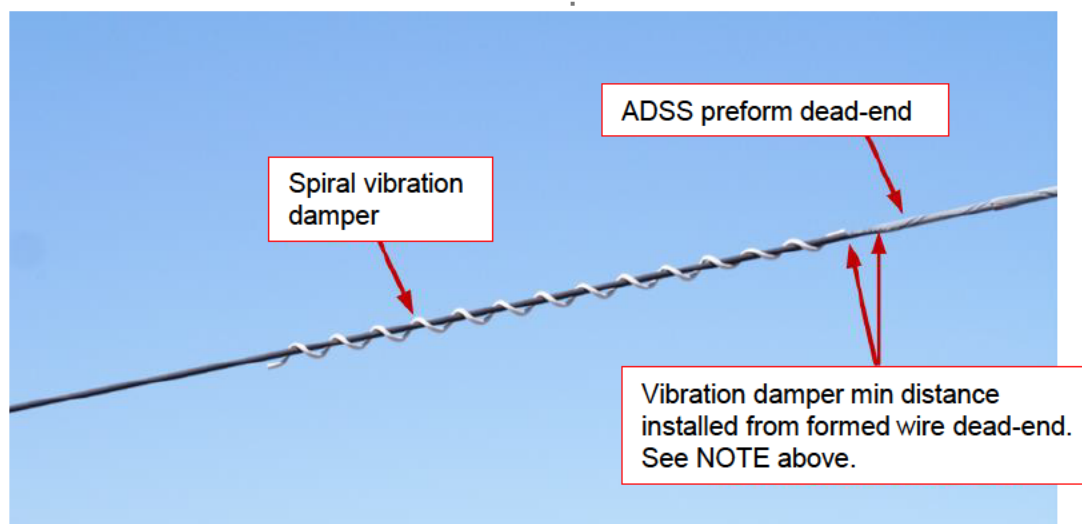
### Spiral Vibration damper installed incorrectly

#### Action:

1. Initiate SAP Notification, Priority Code E (3 months).
2. Take close-up photos of the condition found.

#### NOTE

- For all transmission voltage levels, ensure that the damper is not touching the armor rods or any part of the dead-end/ suspension hardware.
- For 69 kV and above, install the damper a minimum of 4 feet away from all hardware components.
- For 60 kV, there is no minimum distance requirement. The damper just cannot be touching any part of the hardware assembly.
- Check for signs of tracking between the damper and armor rods, as well as on the ends of the damper closest to the armor rods.



## ADSS Condition Levels and Impact (continued)

Condition 4

## Corona coil installed incorrectly

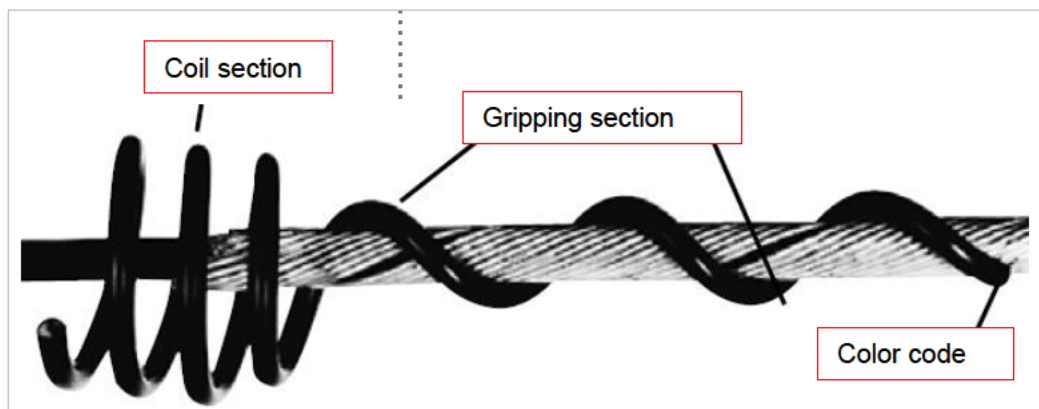
## Action:

1. Initiate SAP Notification, Priority Code E (3 months).
2. Take close-up photos of the condition found.
3. The purpose of the corona coil is to eliminate the effects of corona discharge.
  - If the corona coil is not installed correctly, check for signs of corona discharge on the cable.

Backwards installation of  
corona coil



## Correct Installation of Corona Coil



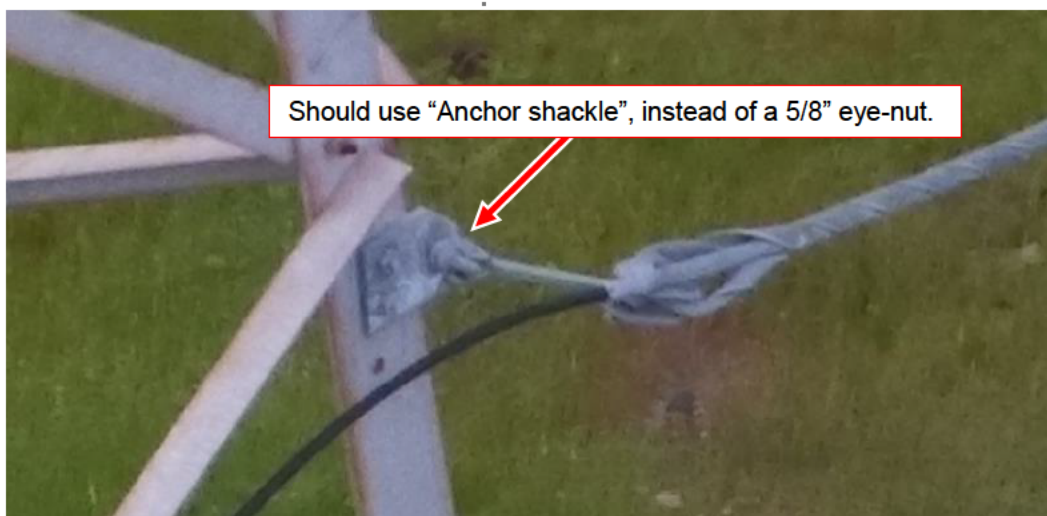
## ADSS Condition Levels and Impact (continued)

Condition 3

### Non-standard installation of ADSS.

#### Action:

1. Initiate SAP Notification, Priority Code E (12 months).
2. Take close-up photos of the condition found.





## ADSS Condition Levels and Impact (continued)

**Condition 4**

### Non-standard installation of ADSS.

#### Action:

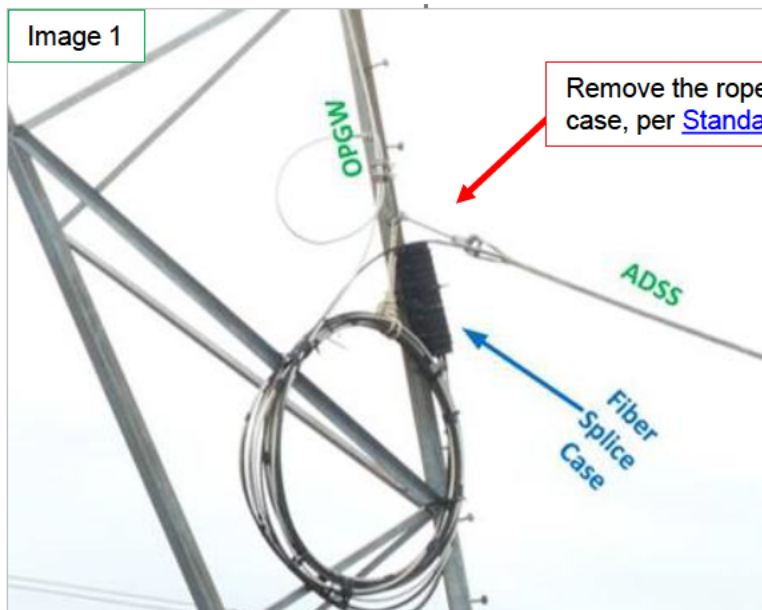
1. Initiate SAP Notification, Priority Code E (12 months).
2. Take close-up photos of the condition found.

#### NOTE

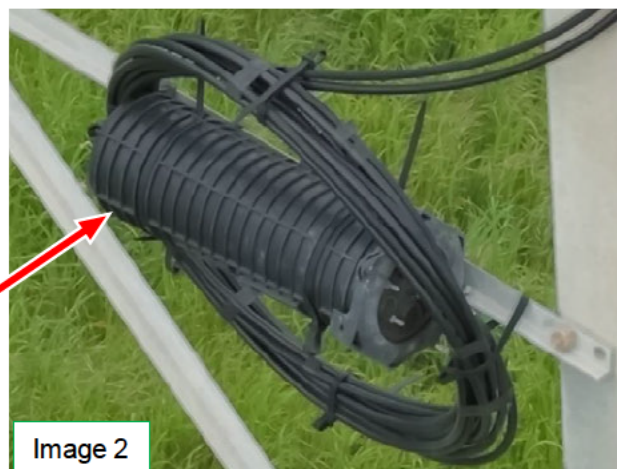
In Image 1 below, this was a temporary install, as a result of an emergency restoration, till the permanent installation could be engineered.

- If this type of condition is found, CIRT confirms with IT if the condition is a temporary installation and if there is a project in the works to remediate the situation to a standard installation.
- If there is a project in the works, the splice case and slack coil can be left in this configuration. Ensure that the rope is in good working order.

Image 1



Splice case should not be tie-wrapped to the tower leg. Tie-wraps appear to be the standard UV-rated type. Non-UV-rated would fail quickly in the sun.



## ADSS Condition Levels and Impact (continued)

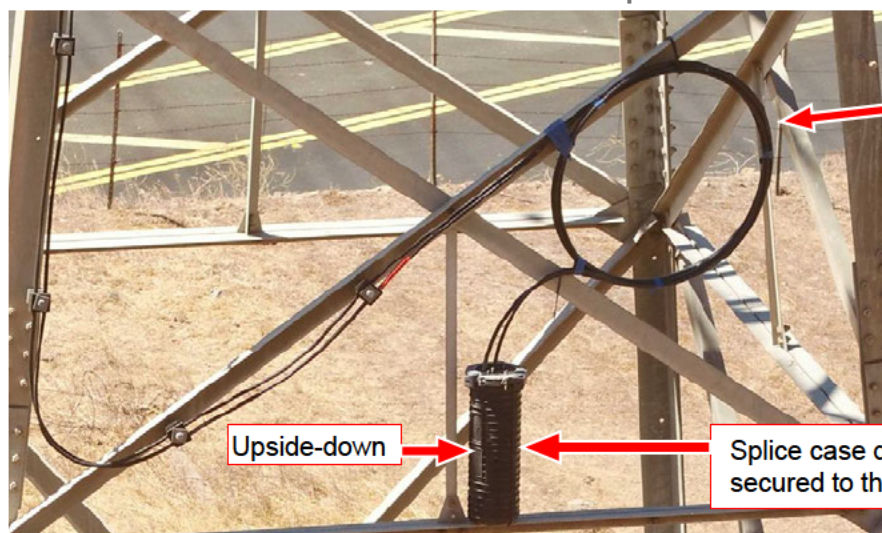
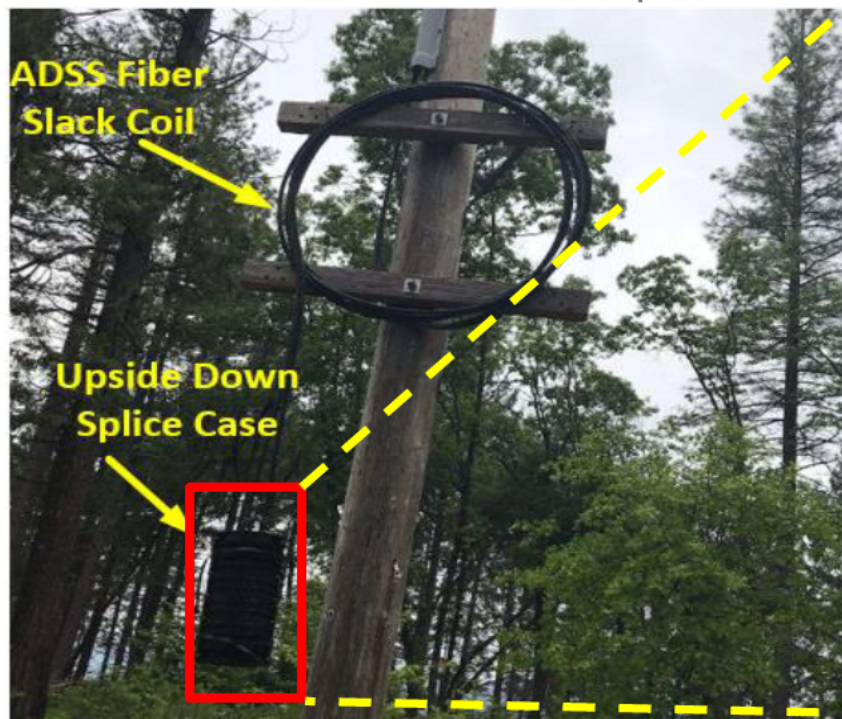
### Condition 4

#### Non-standard installation of ADSS.

An upside-down splice case might fill up with water, which will damage the bare fiber strands. The bottom side of the splice case is the side where the fiber cables enter.

#### Action:

1. Initiate SAP Notification, Priority Code E (12 months).
2. Take close-up photos of the condition found.





## ADSS Condition Levels and Impact (continued)

Condition 4

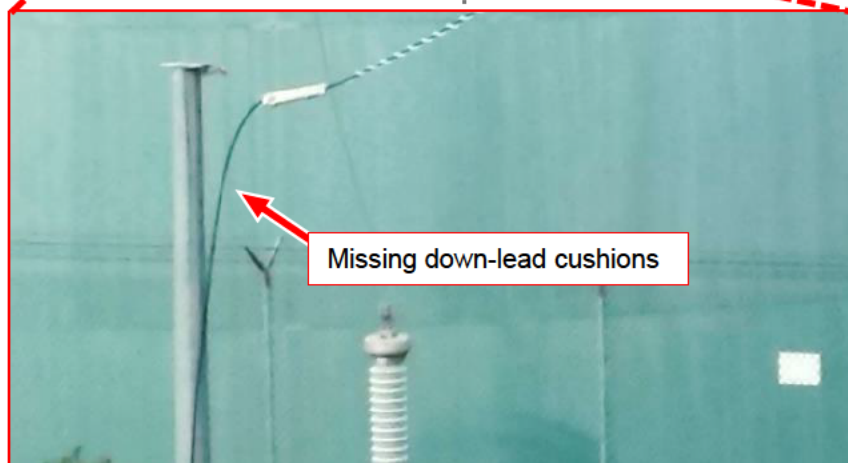
### Non-standard installation of ADSS.

#### NOTE

Maximum spacing is 5 feet between down-lead cushions.

#### Action:

1. Initiate SAP Notification, Priority Code E (12 months).
2. Take close-up photos of the condition found.





## ADSS Condition Levels and Impact (continued)

Condition 4

### Non-standard installation of ADSS.

#### Action:

1. Initiate SAP Notification, Priority Code E (12 months).
2. Take close-up photos of the condition found.



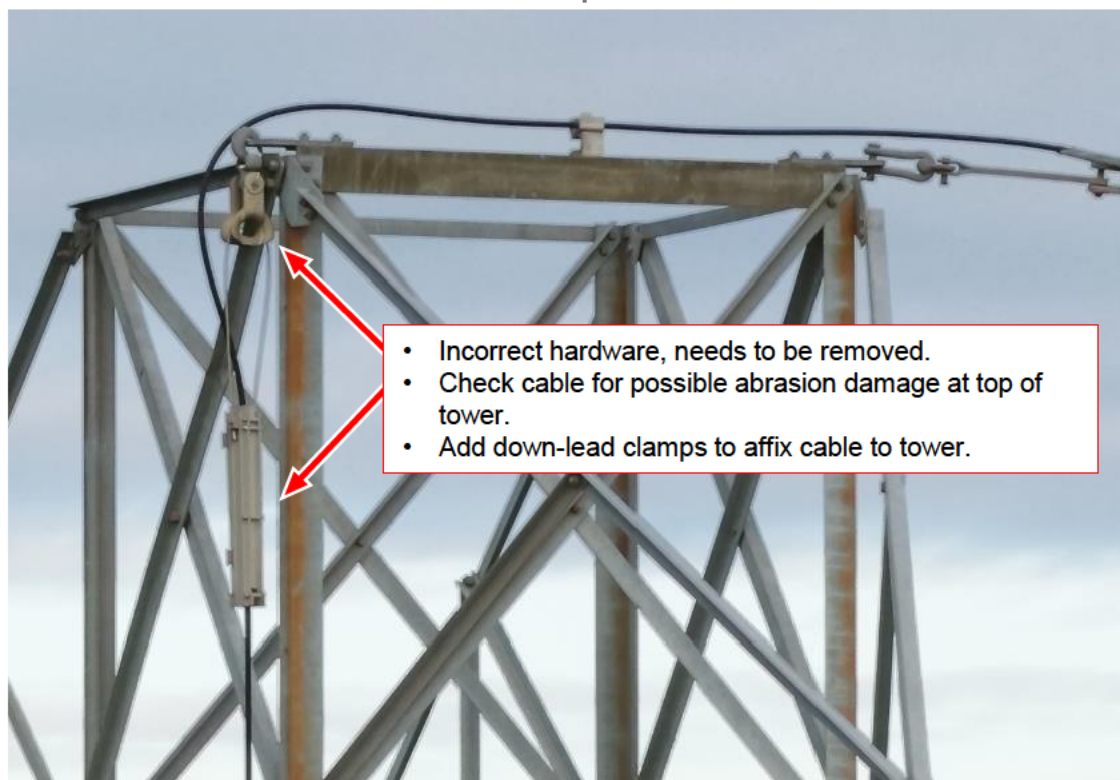
## ADSS Condition Levels and Impact (continued)

Condition 4

### Non-standard installation of ADSS.

#### Action:

1. Initiate SAP Notification, Priority Code E (12 months).
2. Take close-up photos of the condition found.



## ADSS Condition Levels and Impact (continued)

Condition 4

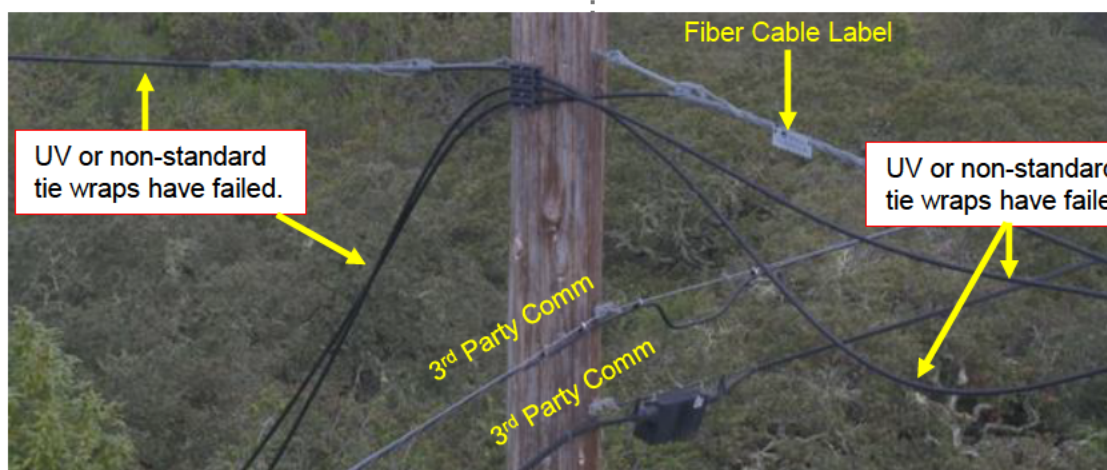
### Failed Tie-Wraps ADSS.

#### NOTE

If a low hanging fiber cable presents a safety risk to the general public, discuss with the supervisor if this should be classified as a Priority Code A.

#### Action:

1. Initiate SAP Notification, Priority Code E (12 months).
2. Take close-up photos of the condition found.





## ADSS Condition Levels and Impact (continued)

Condition 4

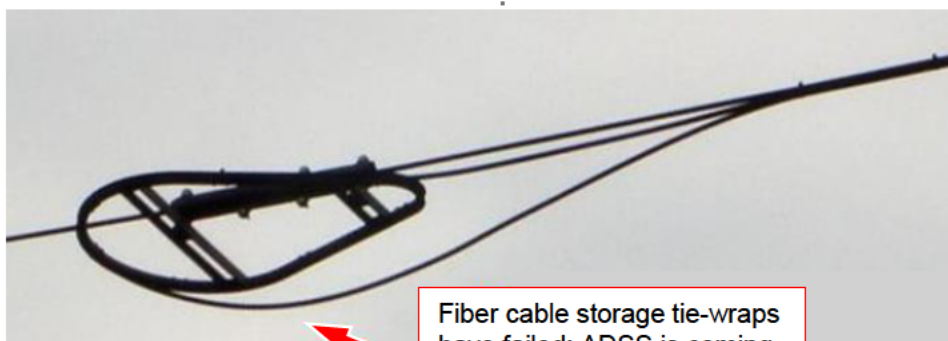
### Non-standard installation of ADSS Slack Loop or Splice Case

#### NOTE

If a low hanging fiber cable presents a safety risk to the general public or if the fiber splice case is at risk of falling to the ground, discuss with the supervisor if this should be classified as a Priority Code A.

#### Action:

1. Initiate SAP Notification, Priority Code E (12 months).
2. Take close-up photos of the condition found.



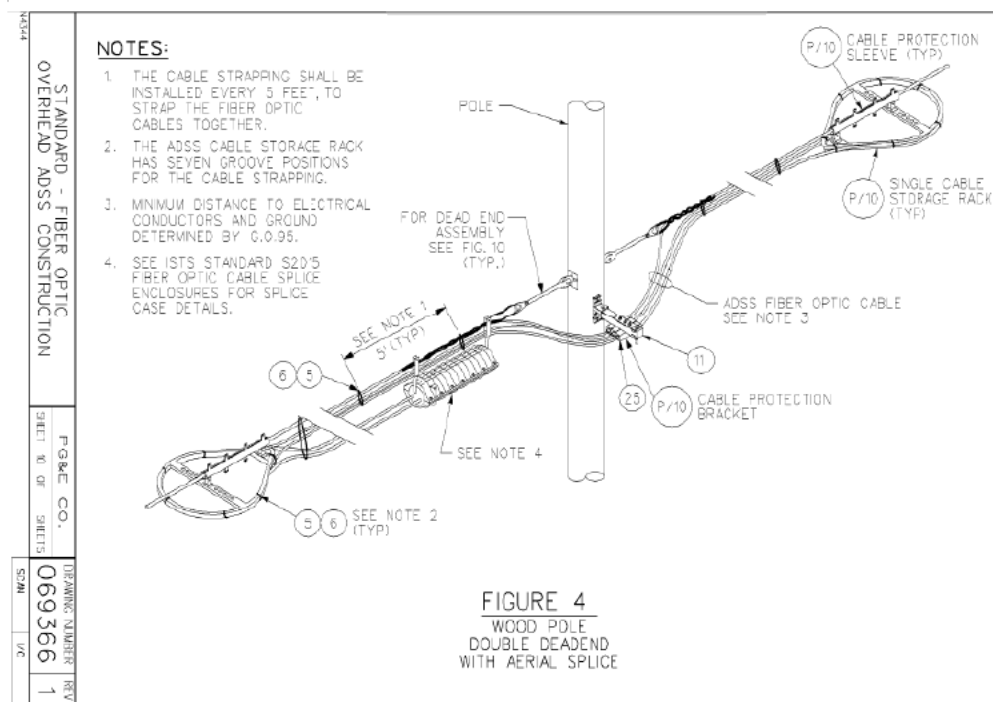
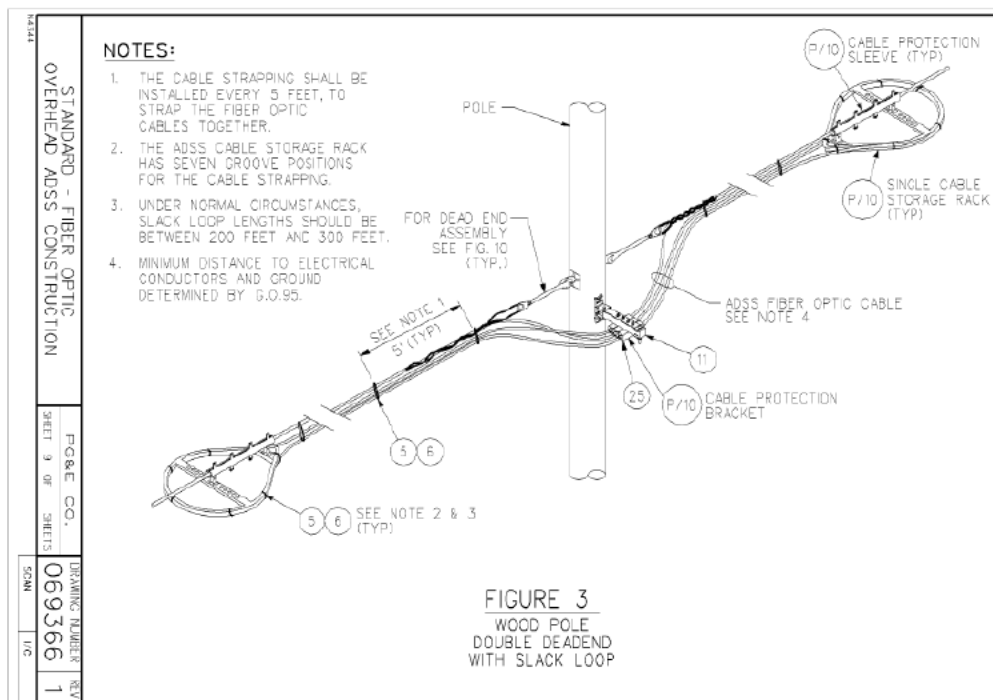
Fiber cable storage tie-wraps have failed; ADSS is coming loose from storage system.



Rope is never an approved method for securing aerial fiber splice cases

## Drawing 69366, "Hardware for Overhead ADSS Construction (Distribution)"

The drawing below shows the two scenarios where a slack loop is installed with and without a splice case.



## ADSS Condition Levels and Impact (continued)

Condition 4

### Pre-Existing Rope Safety Snubs

#### NOTE 1

Safety snubs are typically installed out past a damaged area on the ADSS cable, to provide a safety dead-end grip, in case the cable were to fail. The safety snub should be a preform snub and not rope.

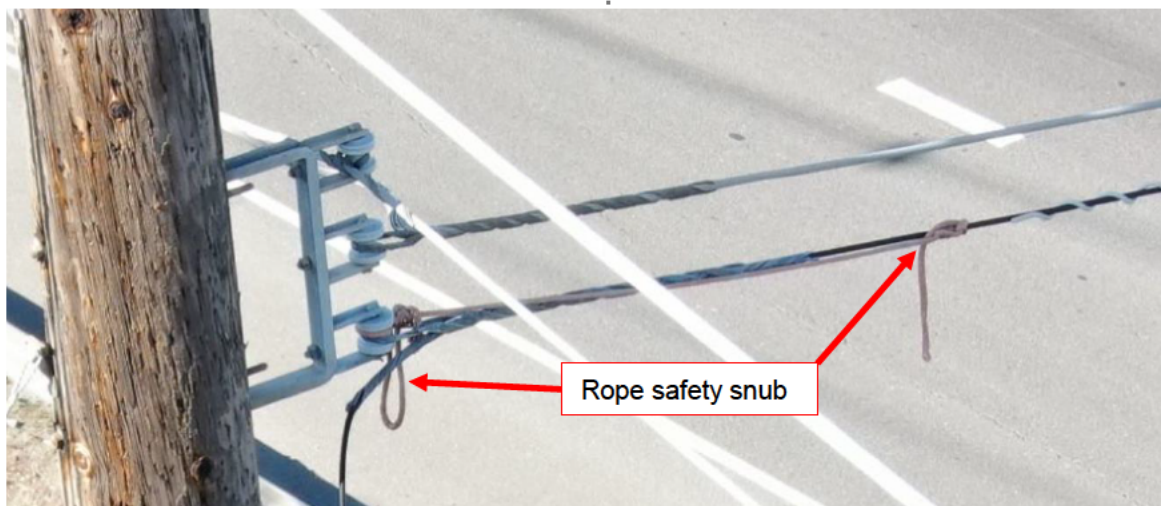
IF rope is found in this scenario,  
THEN replace the rope with a fiber preform dead-end, with a corona coil installed on the end.

#### NOTE 2

In parallel with the LC-Tag, IT and ET work together on a project to remove the damaged cable section and replace it with a new cable. This task is, most likely, a multi-year effort.

### Action:

1. Initiate SAP Notification, Priority Code E (12 months).
2. Replace rope with a fiber dead-end assembly (dead-end, isolator, and corona coil).  
  
IF fiber dead-ends are not available,  
  
THEN contact IT for further direction.
4. Take close-up photos of the condition found.

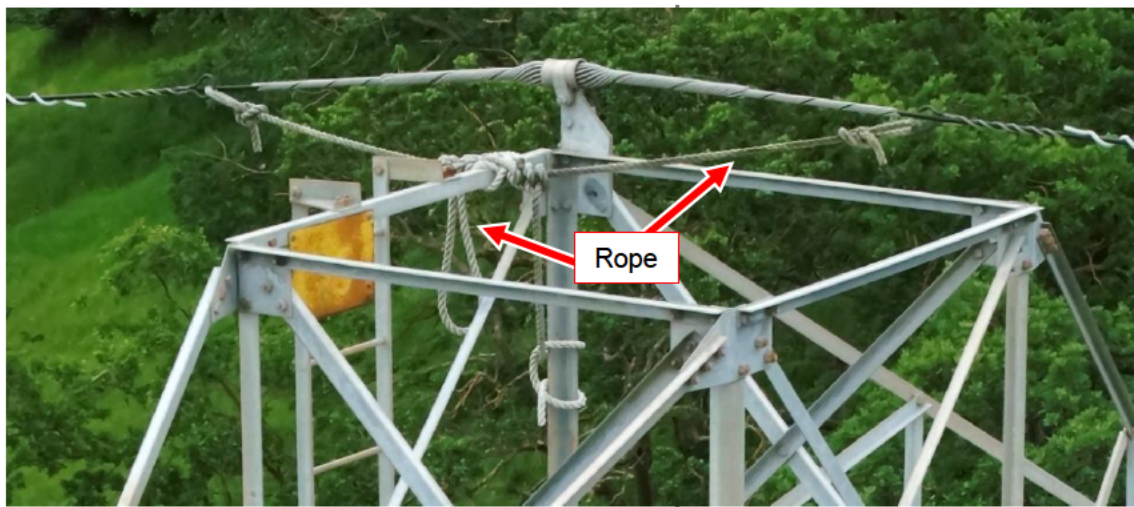




## ADSS Condition Levels and Impact (continued)

Condition 4

### Pre-Existing Rope Safety Snubs (Continued)



## ADSS Condition Levels and Impact (continued)

Condition 2

### Whitish Film Present (Corona Discharge or Pollution?)

#### NOTE 1

Sometimes, a whitish film is found on the cable jacket, which could be either Corona Discharge or sediment build up (pollution). This film can make it difficult to determine if there are any signs of E-Field damage. The whitish film can be removed by wiping the cable jacket down with a cloth. This provides better clarity as to whether E-Field damage is present. It is difficult to perform this action for Above Conductor installations and some Below Conductor installations. See Page 16 for reference.

#### NOTE 2

E-Field calculations can provide guidance if Corona Discharge is expected to be present or not. If the calculations show that Corona Discharge is not expected to be present, then most likely the whitish film build up is pollution. The IT Inspection team can review these calculations and help provide guidance on whether the cable jacket should be wiped down or not.

### Action:

- Inspector creates S5 SAP Notification F.
- CIRT reviews and confirms, and saves S5 with unique description (e.g., HOLD FILM ).
- CIRT emails IT Inspection team for review.
- IT Inspection team reports back to CIRT if an LC should be created or if the S5 notification is to be canceled.
  - The IT Inspection Team provides a priority recommendation, when responding to CIRT, for the fiber cable at the identified location.

Pollution or corona discharge?



Pollution or Corona Discharge?



## ADSS Condition Levels and Impact (continued)

### Condition 2

Cell/antenna cabling installed within less than 10 inches of ADSS cable and cell antenna vertical clearance to ADSS is less than 24 inches.

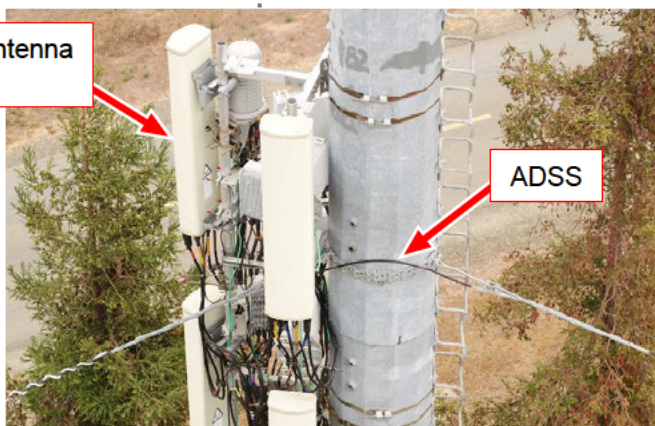
#### NOTE

- 24-inch requirement is specified in G.O. 95, Rule 94.4C, which references Rule 38, Table 2, Case 21.
- 10-inch requirement is specified in G.O. 95, Table 2, Case 2, Column C note (ww).

#### Action:

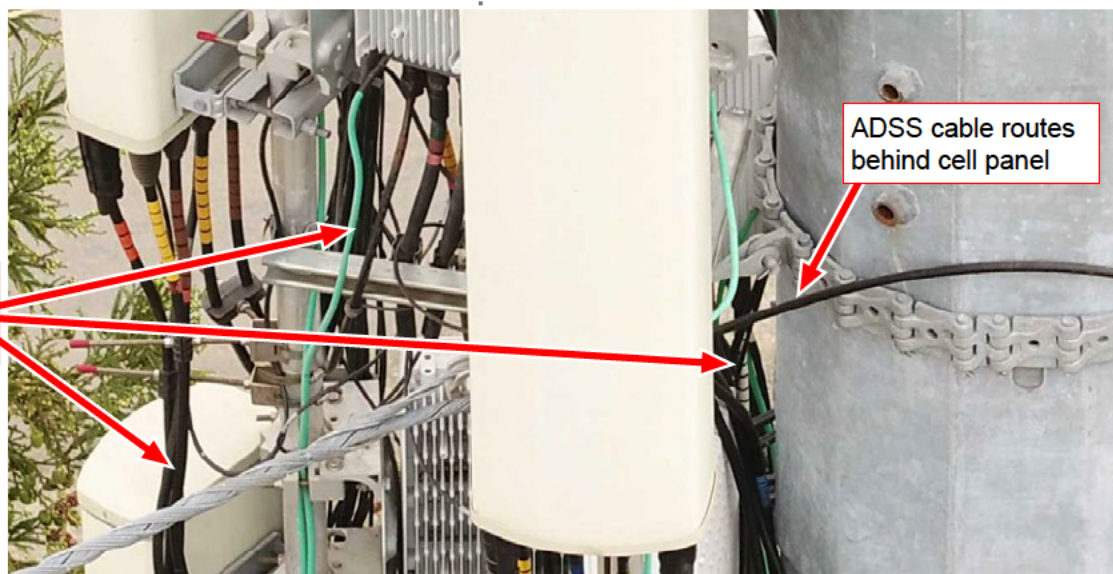
1. Follow [Utility Procedure TD-2014, "Notification of Conditions to Third-Party Utility,"](#) to notify the 3<sup>rd</sup> party of the Level 3 condition: [ThirdPartyNotice@pge.com](mailto:ThirdPartyNotice@pge.com).
2. Finding to be transferred to the New Revenue Development (NRD) group at [NRDLineProjects@pge.com](mailto:NRDLineProjects@pge.com).
3. Take close-up photos of the condition found.

Cell antenna panel



ADSS

Cell/  
antenna  
cabling



ADSS cable routes  
behind cell panel



## ADSS Condition Levels and Impact (continued)

Condition 2

### Pre-Existing Fiber Dead-End Safety Snub

#### NOTE 1

Safety snubs are typically installed out past a damaged area on the ADSS cable to provide a safety dead-end grip, in case the cable were to fail. The safety snub should be a preform dead-end – **not** rope.

#### NOTE 2

IT must confirm if a project has been created to remedy the issue.

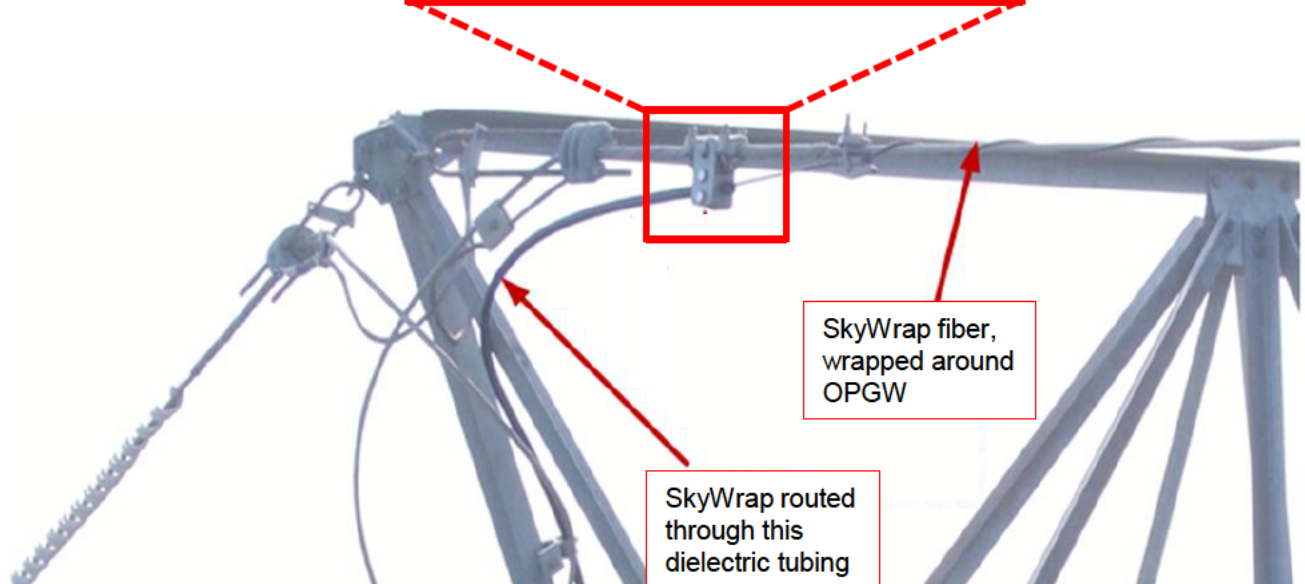
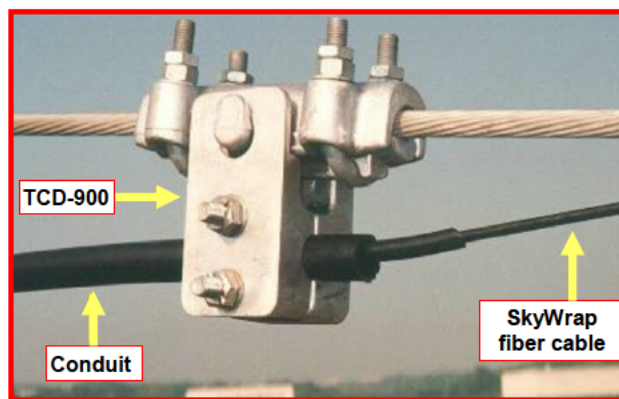
### Action:

1. Inspector creates S5 SAP Notification F.
2. CIRT reviews and confirms, and saves S5 with unique description (e.g., HOLD SNUB).
3. CIRT emails IT Inspection team for review.
4. IT Inspection team reports back to CIRT if an LC should be created or if the S5 notification is to be canceled.
  - The IT Inspection Team provides a priority recommendation when responding to CIRT, for the fiber cable at the identified location.



## Sky Wrap Fiber

- There is only one section of SkyWrap fiber that is installed in the entire PG&E system and that is from Moraga Sub Tower 0/1 to Tower 0/4 (see ETGIS map on next page).
- This SkyWrap fiber is installed, wrapped around the OPGW. Known problem with this technology is that birds land on the OPGW cable and peck/damage the SkyWrap fiber.
  - IF the SkyWrap is starting to come loose from the OPGW, THEN notify IT, E-Tag (12 months).
  - IF the TCD-900 assembly is showing signs of wear or failure, then notify IT, E-Tag (12 months), unless there is severe corrosion/material loss, per the ETPM standards).
  - IF the bolts in that assembly are coming loose, T-Line can tighten those back up.





## Sky Wrap Fiber (Continued)

