AERIAL INSPECTION REVIEW+ TEAM

AIR+ TEAM HANDBOOK

Revision	Revision Date	Revision notes
0.0	2/06/2020	• Document created from DIRT handbook. See previous handbook for previous revisions.
1.0	2/21/2020	• Released version
2.0	5/27/2020	• Fixed image numbering bugs • Updated info around grounding of OPGW and shield wire • Added photos and info on bent pins • Updated some photos • Removed unnecessary and confusing info from cotter key section • Moved info regarding automatic splices in guys to the guys section • Added more examples of damaged insulators • Brought priority codes around cracked poles into agreement with updated ETPM • Updated guidance on foundation sealant (mastic) on towers • Added further examples of c-hook wear, including diagrams and on wood poles • Added information on wood poles and stubs • Updated two-three pole structure guide • Added guidance for “USA” and mid-construction poles
3.0	7/31/2020	• Removed guidance for USA poles • Added table to help identify “F” of FDA for each pole type • Added guidance for foundations based on contamination areas • Added additional photos of bent pins • Removed FDA and priority on lightly contaminated insulators • Added example of FDA and priority for missing anti-climbing guard • Clarified and removed priority from hardware corrosion example • Clarified guidance on stub poles regarding priority assignment • Adjusted priorities on examples of missing bolts on hardware • Improved wording throughout • Fixed formatting of some tables to improve readability • Added section on structure tags • Improved wording in many photo captions to clarify descriptions • Updated priority on example images of guys • Updated FDA table with additional guidance, particularly regarding vegetation • Updated hanger plate FDA code to be “Hardware-Tower” • Added guidance on insulators out of plumb (“Replace” is appropriate in some circumstances) • Clarified prioritization around bird nests • Added additional examples of damage to polymer insulators • Changed FDA to -Repair around cotter keys • Added Table 7 from ETPM to handbook • Removed guidance for HV signs under distribution equipment
4.0	9/2/2020	• Updated language regarding sourcing documents • Updated condition codes across the entire handbook • Added updated Table 6 and changed name (Table 4) to reflect new ETPM Rev5 • Added updated information on insulators from Job Aid 07
5.0	02/10/2021	• Updated hanger plate priorities in example photos • Added “Hardware-Tower” to reference FDA guide • Added emergency FDAs to example photos • Added notes on guy wire bonding • Changed FDA around missing climbing steps • Note added on replacing insulators when replacing hanger plates • Note updated on automatic splices on guys • Added note on degree of damage to HV signs requiring work • Replaced guidance on primary/secondary members with info from Job Aid • Added info on open jumpers • Updated Table 4 • Updated FDAs around A tags to reflect “emergency” FDAs • Added switch, idle facility, signage, and vegetation sections, along with photos • Updated Job aid references • Updated FDAs and priorities throughout
5.0	02/10/2021	• Updated table numbers • Fixed table formatting • Removed table lines from around images • Added additional note on hanger plate and cold-end hardware tags • Added note on automatic splice locations • Implemented changes from standards team
6.0	05/07/2021	• Fixed some inconsistencies with respect to condition codes and prioritization • Added several pages of examples of damaged fiber (OPGW & ADSS) • Added example of a working shackle • Added example of TSP with open top • Resolved conflicting guidance on insulator chip size from JA-07 and ETPM. Used ETPM values

		• Changed some FDAs (Foundation buried, working shackle present) • Changed guidance on how to handle tags for worn hanger plates and c-hooks • Added guidance on dampers on armor rod and preforms (shield wire) • Added guidance on unburied tabs on LDSPs • Added additional examples of vegetation • Added note on OPGW with insulators
7.0	01/21/2022	• Fixed table numbering issue • Added further examples of wood pole types (concrete, laminated, hybrid and EDEP) • Added example of HV sign above lowest point on conductor • Added example of missing danger sign on tower • Added example of fallen HV/danger sign on structure • Added example of congested framing and missing fiberglass rod • Added example of guy insulator installed mid-span on a guy • Added example of turnbuckles out of threads • Added example of crossarm staining on insulators • Added notes on primary vs secondary members and a note on bent vs “kinked” members • Added updated guidance on pole steps (2 adjacent steps must be missing for tag) • Included updated table from JA07 in insulator section • Added notes on covering crossarm openings on steel structures • Included installing raptor guard on 500kV structures when insulators contaminated • Added guidance on installing animal guards when missing • Further clarified what to do in the case of flashing for each insulator type • Added example of flashed post insulator • Added example of loose cotter key for straight type keys • Included further examples of contamination • Added examples of dead-end automatic shoes (to be replaced) • Added further examples of corona damage to porcelain bells • Added example of damaged to polymer insulator • Added examples of bent horizontal polymer post insulators • Added examples of corona damaged polymer insulator • Added example of tight J hooks • Added example of incorrect armor rod placement on ADSS • Updated link to JA12 in mastic section • Updated worn mastic photo • Added updated photos of vegetation around structures • Updated photo of switch blade out of position and associated FDA • Added examples of proper and improper platform grounding, and veg around platforms • Added example of unlocked switch cabinet • Added new section with some examples of component dimensions to be used for estimating distances • Added example of missing washers on king-pin pole top plate • Added examples of connectors being used in place of shoes on dead-ends • Added example of split bolt not bonded • Added example of non-standard fiberglass guy insulator • Added example of splice too close to suspension hardware
8.0	01/20/2023	• Added example of Lattice Steel Pole • Updated table 4 to reflect TD-8123P-103 • Updated SME to IRS • Remove 'B' priority in all locations and corrected each to follow new standards • Updated Condition codes to follow new standards • Corrected all FDAs and priorities corresponding to example photos • Added example images for: high voltage signs, danger signs, structure numbers, visibility strips, unauthorized attachments, guy bonding, slack/loose guys, guy marker damage, not sectionalized guy, bent anchor, cattle guard, guy out of thimble, pole tracking, unauthorized climbing, pole top rot, bonding issues, mud sills, wood stub, debris foundations, soil erosion, mastic on LDSPs, rotten crossarms, twisting crossarms, raptor guard, worn paint, bent members, bent ladder, animal guards, missing dampers on 500kv, cross-ties, loose tie-wires, contaminated insulators, active arcing, chipped insulators, out of plumb insulators, tracking insulators, rusted caps, rusted pins, damaged grout, broken glass insulator, damaged polymer insulator, damaged corona rings, spill gaps, loose hardware, corroded hardware, cracked hardware, unseated hardware, missing hardware, out of standard hardware, OPGW, shield wire damaged, shield wire deadend tails, underbuilt OPGW, debris on conductor, damaged conductor, damaged/out of standard ampacts, conductor out of lay, bent/out of standard dampers, weights, spacers, splices, foundation damage, switch components, number of switches • Split bolt distance to bonded hardware clarification • Slotted hardware washers’ requirement updated
8.1	01/30/2023	• Figure 235 – right image change to condition 1, no notification required • Figure 46 – right example FDA corrected • Figure 23 – left image example corrected priority per JA13 pg16
8.2	02/13/2023	• Realign table of contents

		• Updated: EDEP FDA usage, switch number tags, aerial markers, Figure 34 priority, Figure 180 FDA, Figure 224 FDA, Foundation FDA's, Switch 'out of adjustment' guidance, buried secondary members, cold end hardware FDA, climbing racks, steel guy markers, guy bob requirements, Figure 53 priority

Table of Contents

Process

Look at *every image* for indications of damage. **Zoom in** and scan the structure and all components for any damage or non-conformances with the ETPM. Using Sherlock, fill out the inspection form and generate notifications if required. Communicate frequently with your IRS (Inspection Review Specialist).

Source documents

When reviewing the inspection images, refer to the guidelines given in the ETPM (Electric Transmission Preventive Maintenance Manual) and example images provided in the AIR+ Team handbook. For quick reference, "Guide for Assigning Priority Codes" table, from the ETPM is provided in this handbook.

This handbook is meant as a quick reference guide, and to provide example images. It is not a substitute for reading and understanding the official PG&E standards and job aids. If a discrepancy is found between official PG&E job aids or standards and this handbook, please defer to the official PG&E job aids and/or standards, and bring the discrepancy to the attention of team leadership for correction and improvement of the handbook.

Condition Codes

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

When assigning condition codes, assign condition codes based on a "weakest-link"/"worst case" scenario: If one insulator earns a condition code of 5, and the other two receive a condition code of 1, the general insulator score for the structure should be a 5 – the worst score.

Use your expertise and best judgement when assigning condition codes and selecting a worst case scenario

- 5 = Heavy Damage with Safety Concerns (generally A priority only)
- 4 = Heavy Damage (generally E+ priority only)
- 3 = Moderate Damage (generally E priority only)
- 2 = Light Damage (generally F notification)
- 1 = No Visible Damage (generally no notification)

Definitions

Span	The horizontal distance between two electrical support structures.
Parent SAP	For a 2 or 3 pole structure the parent SAP number is the main number for all poles in the structure.
Child(ren) SAP	For a 2 or 3 pole structure the child(ren) SAP number(s) is given to individual poles that are not the parent SAP.
Connected	A multi-pole structure physically connected to another (via crossarm or guy). Should be a parent/child
Unconnected	A multi-pole structure not physically connected to another (via crossarm or guy). Typically an A/B/C style structure which is flown together. Each structure is independent.

References

The primary source for PG&E standards is the TIL: https://ecmappwlsp01c2.comp.pge.com/TILVIEWER. The following standards and job aids are available to you. This is not an exhaustive list and does not include all job standards or job aids available. Please reference the TIL for any and all up to date PG&E standards and technical documents.

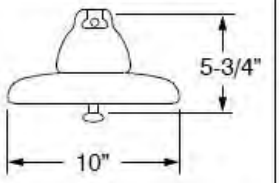
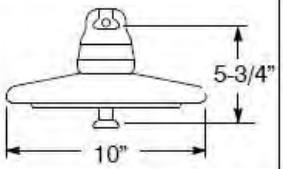
Anchors for Pole Line Guys 022221	TIL LINK
ARMOR RODS AND TIES FOR ALUMINUM CONDUCTORS 028853	TIL LINK
BONDING DETAILS FOR POLE LINES 06667	TIL LINK
Buckarm Dead End Construction 015201	TIL LINK
Clearance Tables CPUC 022158	TIL LINK
CONNECTORS FOR TRANSMISSION CONDUCTORS 028854	TIL LINK
Contruction Requirements for Pole Line Guys 022178	TIL LINK
CORROSION AREA – OVERHEAD LINES 032911	TIL LINK
Double Circuit Post Type Construction 043621	TIL LINK
Exhibit 8 - Wood, Fiberglass/Composite Poles 60kV, 70kV, 115kV Fiberglass Guys Strain Insulator	TIL LINK
Exhibit 9 - Transmission Wood Pole Repair vs Replace Decision Tree	TIL LINK
G.O. 95	LINK
Guy Grips Clamps and Splices 06537	TIL LINK
HVA 500kV Tower Guying Details 333262	TIL LINK
High Voltage Signs 015070	TIL LINK
Insulation Districts for Overhead Line and Stations 026300 Rev1 (4.30.01)	TIL LINK
Marking Numbering and Identification 022168	TIL LINK
METHOD OF BRIDGING TO PREVENT POLE FIRES 056845	TIL LINK
METHODS FOR REPAIRING DAMAGED OVERHEAD LINES 028855	TIL LINK
Pole Top Mounting Bracket for Three Post Insulators Wood Pole Lines 036509	TIL LINK
Splices - Number in Transmission Lines TD-022487B-005	TIL LINK
Suspension Type Insulators 015014 (Rev 10 8-15-17)	TIL LINK
TD-1006P-02 Switch maintenance and Inspection Program	TIL LINK
TD-1006S Switch Attachment photos	TIL LINK
TD-1009S Marking Guarding and Stepping T&D Towers and Lattice Poles	TIL LINK
TD-06537B-001 Automatic Guy Strand Dead Ends and Splices Supporting Transmission	TIL LINK
TD-9213S Terms and Abbreviations	TIL LINK
Three Pole Construction 115kV Wood Pole Lines 048875	TIL LINK
Triangular and Flat Dead-End Construction 015082	TIL LINK
Triangular Construction 115kV Wood Pole Lines 048873	TIL LINK
Triangular Pin Type Construction 44-70kV Pole Lines 8 Ft Crossarm 015080	TIL LINK
Triangular Post and Dead End Construction 056724	TIL LINK
Triangular Post and Suspension Construction 053804	TIL LINK
Triangular Post Type Construction 44-70kV Pole Lines 043620	TIL LINK
Vertical and Delta Post Type Construction 045707	TIL LINK
Vertical Angle Construction 44-115kV Pole Lines 015084	TIL LINK
Vibration Damper Requirements 015073	TIL LINK

Job Aids

TD-1001M-JA04	Identifying Levels of Deterioration and Corrosion on Transmission Line Steel Structures and Supports
TD-1001M-JA06	Identifying Levels of Damage and Condition of Wood Poles and Non-Steel Framing on Transmission Line Structures and Supports
TD-1001M-JA07	Identifying Levels of Corrosion and Condition of Hardware and Insulators on Transmission Line Structures and Supports
TD-1001M-JA08	Identifying Levels of Damage and Condition of Animal Guards on Transmission Line Structures and Supports
TD-1001M-JA09	Identifying Maintenance Work on Bird Nests on Transmission Line Structures and Supports
TD-1001M-JA10	Identifying Conductor Conditions
TD-1001M-JA11	Evaluating Conditions of OPGW in Transmission Line
TD-1001M-JA12	Identifying Foundation Condition on Transmission Line Structures and Supports
TD-1001M-JA13	Identifying Levels of Damage and Condition of Guys and Anchors on Transmission Line Structures and Supports
TD-1001M-JA14	Identifying Levels of Damage and Condition of Splices on Transmission Line Structures and Supports
TD-1001M-JA15	Identifying Levels of Deterioration and Corrosion on Transmission Line Switches
TD-1001M-JA20	Evaluating Conditions for Vegetation Nonconformance in Transmission Line
TD-1001M-JA21	Evaluating Conditions of ADSS in Transmission Line
TD-1001M-JA22	Evaluating Conditions of Non-ADSS Lashed Fiber Cable in Transmission Line

Approximate component sizes

Table 2 Data and Codes for Corrosion Resistant Ball-Type Socket Insulators

Application, Class, and Loads	Description See Code Column for Shell Color	Code	Manufacturer	Catalog Number [1]
Line: General Use Through 115 kV Suspension and Dead-End Through 115 kV Suspension Only Through 230 kV and 500 kV Station: General Use Through 115 kV Suspension and Single Conductor Dead-Ends Through 230 kV Class: 52-3 M and E Rating: 20,000 lbs. Proof Test: 10,000 lbs. Minimum		314057 (light gray) 314036 (brown)	Locke (NGK) Lapp	20S195 8200Z-70K[2] 8200Z-70D[3] 8200ZK[2] 8200ZD[3]
		314090 (glass)	Sediver	N100/146DC

1 See Note 2 on Page 1.
2 K - Manufactured in China NGK Plant
3 D - Manufactured in Dalian

Component Materials

COMPONENT	MATERIAL	FINISH
Clamp Body and Keeper	Aluminum Alloy	Cast and finished
Clamp Bolt	Aluminum Alloy	Anodized bolt head and lubricated threads
Messenger Cable	Steel	Galvanized
Damper Weights	Cast Iron	Hot-Dip Galvanized

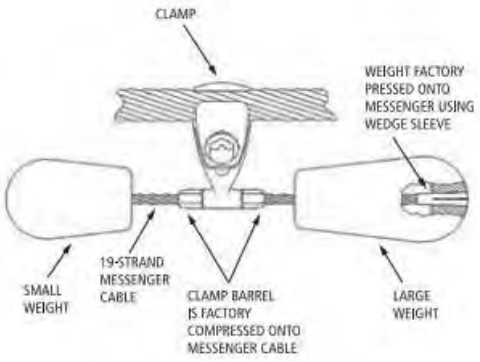


Figure 2—1700AA Series Construction

Damper Specifications by Size

WEIGHT CONFIGURATION	APPLICABLE DIAMETER RANGE (IN.)	APPROXIMATE WEIGHT OF ASSEMBLY (LBS)*	APPROXIMATE LENGTH OF ASSEMBLY (IN.)*
1706AA	0.971 - 1.210	9.3	15
1707AA	1.211 - 1.382	10.1	16
1708AA	1.383 - 1.825	17.6	19

* Weight and length may vary slightly according to clamp size used.

OH: Transmission

Post-Type Insulators, 60-115 kV Transmission Lines

Salvable Substitute – Ceramic Insulators (continued)

Table 7 Ceramic Insulators (continued)

kV	Insulation Districts [1]	No. of Sheds	S (square inches)	SI / SP Max.	Dimensions (inches) L	P	TL [2]	Manufacturer	Catalog Number	Code
60	AAA, A, and B	15	1,290	0.86	64-1/4	23-1/4	30	NGK	DA-85508A	311088 (lt. gray)
		16	1,680	0.95	66	24-1/4	31-1/2	Lapp	985447-0	
		15	1,290	0.86	64-1/4	23-1/4	30	NGK-Locke	PX-0105	311089 (brown)
70	B and C	–	–	–	–	–	–	–	–	
60	C and D	11	740	0.78	45	16-11/16	21-3/4	NGK	DA-85710A	311090 (lt. gray)
		13	874	0.84	47	17	22-3/4	Lapp	98566-70	
		11	770	0.78	45	16-1/2	21-3/4	NGK-Locke	PX-0104	311091 (brown)
70	D	–	–	–	–	–	–	–	–	
115	AAA and A	26	3,080	0.83	132	43-3/8	51	NGK	DA-85509A	311092 (lt. gray)
		34	2,828	1.00	129-1/4	49-1/4	61	Lapp	98581PA70	
		26	3,020	0.80	132	43-1/8	51	NGK-Locke	PX-0103	311093 (brown)
		–	–	–	–	–	–	–	–	
70	AAA and A	24	1,960	1.41	100	39-13/16	46-5/8	NGK	DA-85203R	311094 (lt. gray)
		26	2,190	0.90	100	36-3/4	48-3/8	Lapp	98580PA70	
		23	2,260	0.94	100	38-3/4	46-5/8	NGK-Locke	PX-0107	311095 (brown)
115	B, C, and D	–	–	–	–	–	–	–	–	

[1] Local conditions and experience with severe contamination may dictate the upgrading of an area within a district to the next higher district.

[2] Tolerance = 3% of dimension TL.

S = Total Surface Area

$\frac{SI}{SP}$ = Ratio of $\frac{\text{Shed Interval}}{\text{Shed Projection}}$ (must be less than 1.5)

Ratio of $\frac{L}{P}$ = must be less than 3.17

L = Leakage Distance

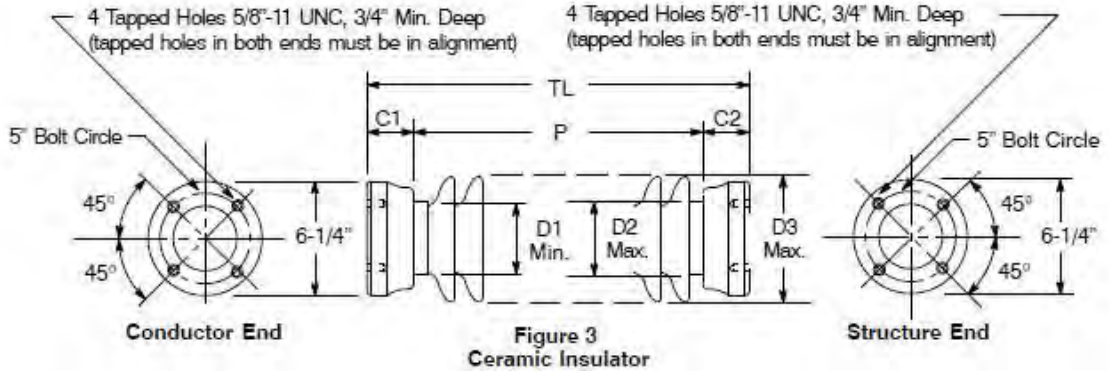


Figure 3
Ceramic Insulator

Figure 1 **Diagrams indicating various dimensions of typical components. The above dimensions can be used to approximate distances in photos when no other options are available.**

FDA Codes

FDAs for E+ through F notifications

Table 1 **Common issues and corresponding FDA codes for each structure type. Only to be used for tags with priority E+ through F. For A priority tags, use emergency FDAs, as described in the next section. For issues not listed, please refer to the ETPM, body of handbook or ask your IRS**

Common scenario	Structure	Facility	Damage	Action
Anchor - pullout, damage	Steel	Anchor-Steel	No Good/Out of Stdrd	Repair/replace*
	Tower	Anchor-Steel	No Good/Out of Stdrd	Repair/replace*
	Wood	Anchor-Wood	No Good/Out of Stdrd	Repair/replace*
Anchor - buried	Steel	Anchor-Steel	No Good/Out of Stdrd	Repair/replace*
	Tower	Anchor-Steel	No Good/Out of Stdrd	Repair/replace*
	Wood	Anchor-Wood	No Good/Out of Stdrd	Repair/replace*
Armor rod – damaged or missing	Steel	Conductor-Steel	No Good/Out of Stdrd	Repair
	Tower	Conductor-Steel	No Good/Out of Stdrd	Repair
	Wood	Conductor-Wood	No Good/Out of Stdrd	Repair
Bird nest	Steel	Structure-Steel	Debris/Nest/etc.	Remove
	Tower	Structure-Steel	Debris/Nest/etc.	Remove
	Wood	Structure-Wood	Debris/Nest/etc.	Remove
Bolt in tower - loose	Tower	Hardware-Tower	No Good/Out of Stdrd	Replace
Bolt in tower - missing	Tower	Hardware-Tower	Missing	Install
Bond wire – missing or broken	Wood	Hardware-Wood	Missing OR No Good	Replace OR Install
Cold-end insulator hardware, including C-hooks, shackles, etc.	Steel	Insulator-Steel	No Good/Out of Stdrd	Repair/replace*
	Tower	Insulator-Steel	No Good/Out of Stdrd	Repair/replace*
	Wood	Insulator-Wood	No Good/Out of Stdrd	Repair/replace*
Conductor - Damaged, corrosion, uneven sag, kinked at shoe	Steel	Conductor-Steel	No Good/Out of Stdrd	Repair
	Tower	Conductor-Steel	No Good/Out of Stdrd	Repair
	Wood	Conductor-Wood	No Good/Out of Stdrd	Repair
Crossarm damage	Wood	Crossarm-Wood	No Good/Out of Stdrd	Repair/replace*
	Tower	Structure-Tower	No Good/Out of Stdrd	Repair/replace*
Dampers - corrosion, missing, out of position	Steel	Damper-Steel	No Good/Out of Stdrd	Replace
	Tower	Damper-Steel	No Good/Out of Stdrd	Replace
	Wood	Damper-Wood	No Good/Out of Stdrd	Replace
Danger/HV sign/Pole tag missing or damaged	Steel	Marker-Steel	No Good/Out of Stdrd	Install
	Tower	Marker-Steel	No Good/Out of Stdrd	Install
	Wood	Marker-Wood	No Good/Out of Stdrd	Install
Foundation / structure base - damaged, cracked, mastic, erosion	Steel	Structure-Steel	No Good/Out of Stdrd	Repair
	Tower	Foundation/ Concrete-Tower	No Good/Out of Stdrd	Repair
	Wood	Structure-Wood	No Good/Out of Stdrd	Repair

Guys - loose, over-tensioned, insufficient insulation, corrosion, damaged	Steel	Guy Wire-Steel	No Good/Out of Stdrd	Repair/replace*
	Tower	Guy Wire-Steel	No Good/Out of Stdrd	Repair/replace*
	Wood	Guy Wire-Wood	No Good/Out of Stdrd	Repair/replace*
Guy not bonded (missing wire)	Wood	Guy Wire-Wood	No Good/Out of Stdrd	Repair
Guy with automatic splice displaying damage	Steel	Auto Guy Wire Splice-Steel	No Good/Out of Stdrd	Repair/replace*
	Tower	Auto Guy Wire Splice-Steel	No Good/Out of Stdrd	Repair/replace*
	Wood	Auto Guy Wire Splice-Wood	No Good/Out of Stdrd	Repair/replace*
Hardware – structure: (climbing steps, anti-split bolts, etc.)	Steel	Hardware-Steel	Missing OR No Good	Replace OR Install
	Tower	Hardware-Tower	Missing OR No Good	Replace OR Install
	Wood	Hardware-Wood	Missing OR No Good	Replace OR Install
Hanger plates**	Tower	Hardware-Tower	No Good/Out of Stdrd	Replace
Hot-end insulator hardware: cotter keys, shoes, etc.	Steel	Insulator-Steel	No Good/Out of Stdrd	Repair/replace*
	Tower	Insulator-Steel	No Good/Out of Stdrd	Repair/replace*
	Wood	Insulator-Wood	No Good/Out of Stdrd	Repair/replace*
Insulators - contamination	Any	Insulator	Contaminated	Ground Wash/ Helicopter Wash†
Insulators and insulator hardware	Steel	Insulator-Steel	No Good/Out of Stdrd	Repair/replace*
	Tower	Insulator-Steel	No Good/Out of Stdrd	Repair/replace*
	Wood	Insulator-Wood	No Good/Out of Stdrd	Repair/replace*
Jumpers - Damaged, broken strands, kinked at shoe	Steel	Jumper-Steel	No Good/Out of Stdrd	Repair
	Tower	Jumper-Steel	No Good/Out of Stdrd	Repair
	Wood	Jumper-Wood	No Good/Out of Stdrd	Repair
OPGW - Damaged, corrosion, uneven sag, kinked at shoe	Steel	Shield Wire / OPGW-Steel	No Good/Out of Stdrd	Repair
	Tower	Shield Wire / OPGW-Steel	No Good/Out of Stdrd	Repair
	Wood	Shield Wire / OPGW-Wood	No Good/Out of Stdrd	Repair
Right of way - trash, structures, etc.	Any	Right of Way	Encroachment	Remove
Rotten pole or pole top	Wood	Structure-Wood	Rotten	Replace
Splices - Automatics	Steel	Splice-Steel	No Good/Out of Stdrd	Replace
	Tower	Splice-Steel	No Good/Out of Stdrd	Replace
	Wood	Splice-Wood	No Good/Out of Stdrd	Replace
Splices - within 10' of structure	Steel	Splice-Steel	No Good/Out of Stdrd	Repair
	Tower	Splice-Steel	No Good/Out of Stdrd	Repair
	Wood	Splice-Wood	No Good/Out of Stdrd	Repair
Structure requires paint	Steel	Structure-Steel	Paint/Coating	Other
	Tower	Structure-Steel	Paint/Coating	Other
Structure out of plumb	Steel	Structure-Steel	No Good/Out of Stdrd	Repair
	Tower	Structure-Tower	No Good/Out of Stdrd	Repair
	Wood	Structure-Wood	No Good/Out of Stdrd	Repair

Tower members - buckled/bent/missing	Tower	Structure-Tower	No Good/Out of Stdrd	Repair
Turnbuckle out of threads	Tower	Guy Wire-Steel	No Good/Out of Stdrd	Repair
Vegetation encroaching upon structure (light, easy to remove) ††	Steel	Structure-Steel	Debris/Nest/etc.	Remove
	Tower	Structure-Steel	Debris/Nest/etc.	Remove
	Wood	Structure-Wood	Debris/Nest/etc.	Remove
Heavy vegetation (requiring saw to remove, or overgrown poison ivy/oak)	Any	Vegetation	Overgrown	Remove
Veg. overgrown in right of way***	Any	Vegetation	Overgrown	Remove
Woodpecker holes	Wood	Structure-Wood	No Good/Out of Stdrd	Repair/Replace*

*Select depending on degree of damage

**For worn hanger plate and C-hook, create two notifications – one for hanger plate and one for cold-end hardware.

***Only use in cases of extreme overgrowth and/or possible conductor contact mid-span.

†The difference between ground/helicopter wash should be based around truck accessibility. If a truck can reach the structure in question, use ground wash. Otherwise use helicopter.

†† Never use Structure FDA for vegetation issues, per JA20 use Vegetation FDA for qualifying issues regarding vegetation.

FDAs for A priority notifications

For instances where an A-priority notification is required, there are special FDAs that should be used in place of the normal FDAs. The best way to resolve this is to first figure out the most appropriate FDA for the equivalent B-tag, then "convert" it using the table below. For questions, please ask your SME for further guidance.

F	D	A	Notes
Emergency	Fire	Replace	Fire capital items
Emergency	Storm Related	Repair	Expense items (any cause)
Emergency	Storm Related	Replace	Replace entire structure (non-fire)
Emergency-Steel	Other	Replace	Individual capital components: steel (non-fire)
Emergency-Wood	Other	Replace	Individual capital components: wood (non-fire)

Table 2: Emergency FDA guidance

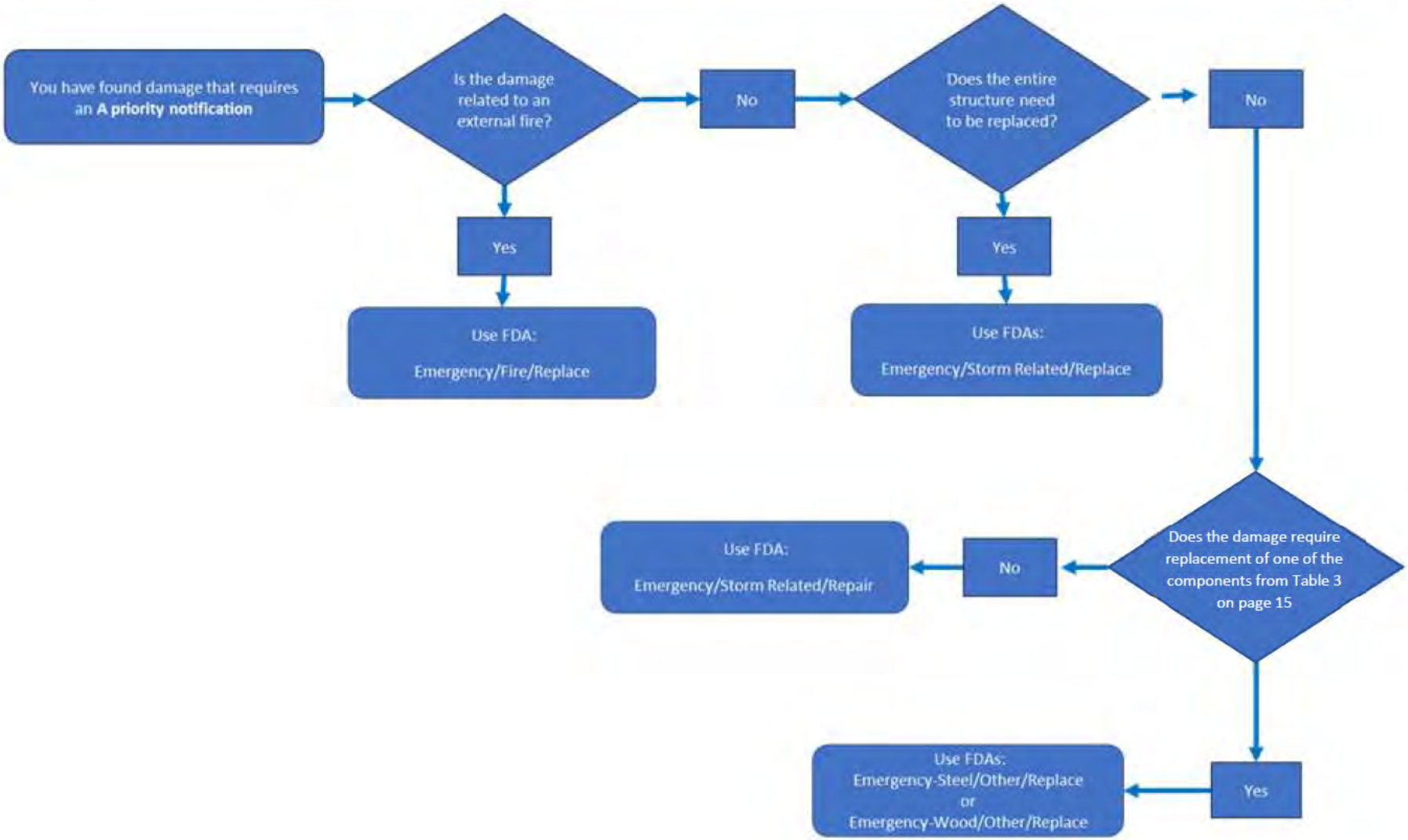
FDAs should be chosen by following a general hierarchy, roughly in order listed above. If the situation is not appropriate for a given FDA, then go to the next FDA until an appropriate FDA is found.

1. Expense items are generally "small" items. It is easier to list the capital items than the expense items – please see the list of capital FDAs in Table 3 below. For expense items, regardless of damage cause, use Emergency | Storm Related | Repair.
2. Issues caused by a wildfire, capital items (see Table 3 below). Use Emergency | Fire | Replace. Do not use for pole fires, only for external fires.
3. Non-fire pole or tower replacements: use Emergency | Storm Related | Replace.
4. Capital items are generally "big". Replacing any component in Table 3 below should use Emergency-Wood | Other | Replace or Emergency-Steel | Other | Replace based on the structure type.

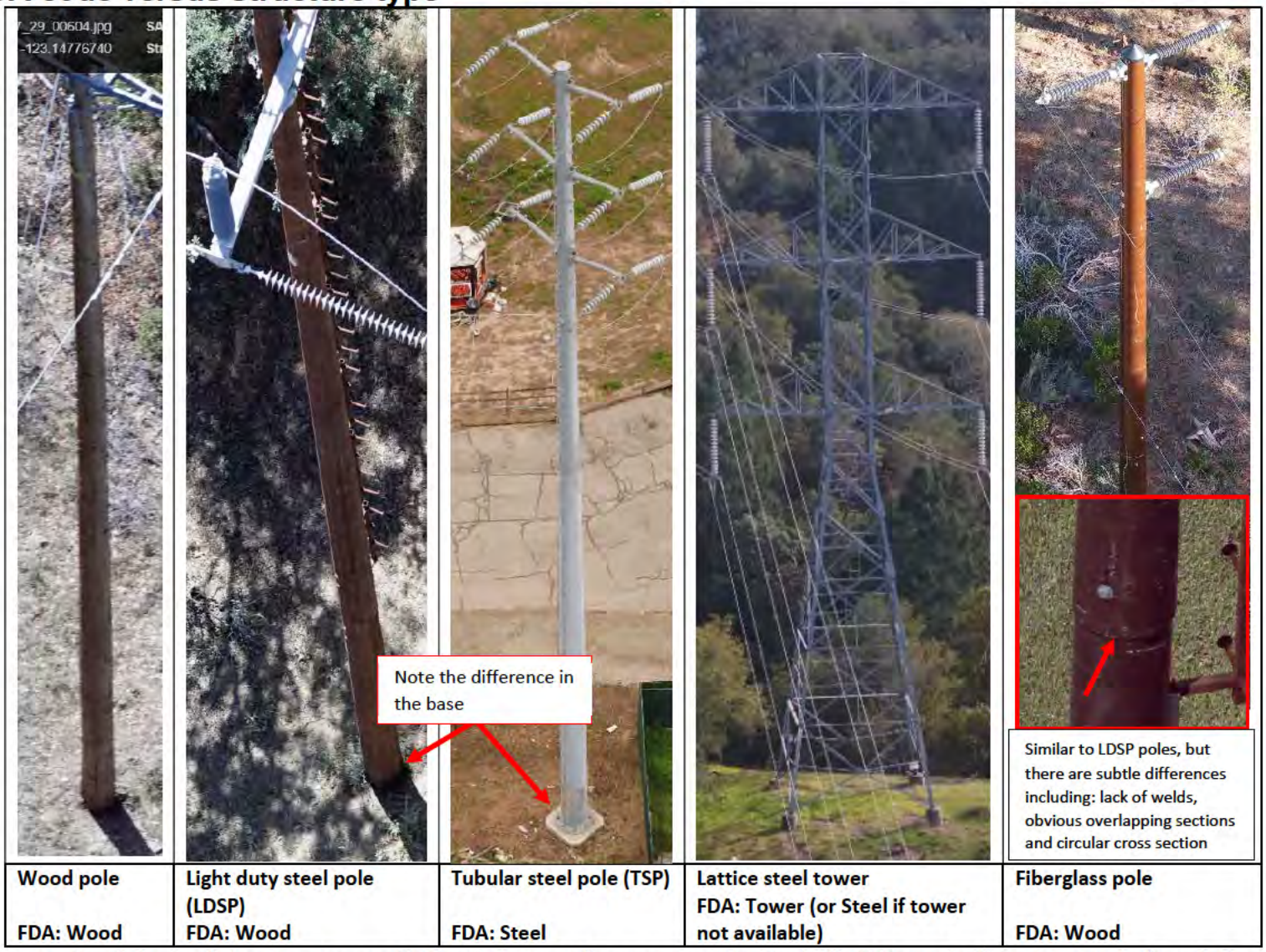
Replacement of the following items are capital:

Anchors	Foundations
Boardwalks/Fences/Roads	Guy poles
Conductor (150'+ on all three phases)	Insulators
Crossarms	Switches
FAA lighting/marker balls	Structures

Table 3: Capital items (only when replaced)


You have found damage that requires an A priority notification
Is the damage related to an external fire?
No
Does the entire structure need to be replaced?
No
Yes
Use FDA:
Emergency/Fire/Replace
Yes
Use FDAs:
Emergency/Storm Related/Replace
Does the damage require replacement of one of the components from Table 3 on page 15
No
Use FDA:
Emergency/Storm Related/Repair
Yes
Use FDAs:
Emergency-Steel/Other/Replace
or
Emergency-Wood/Other/Replace

FDA code versus structure type



Wood pole FDA: Wood	Light duty steel pole (LDSP) FDA: Wood	Tubular steel pole (TSP) FDA: Steel	Lattice steel tower FDA: Tower (or Steel if tower not available)	Fiberglass pole FDA: Wood

Figure 2 **Breakdown of structure type vs FDA code to use when appropriate. Typically TSPs are built on a concrete foundation.**

				
Hybrid pole **FDA: Wood**	**Concrete pole** **FDA: Wood**	**Laminated wood pole** **FDA: Wood**	**Engineered direct embedded pole (EDEP)** **FDA: Steel**	**Lattice steel pole (LSP)** **FDA: Tower (or Steel if tower not available)**

Figure 3 **Continued table of structure types and FDAs.**

ETPM Table 4. Guide for Assigning Priority Codes

Copied from TD-1001M Electric Transmission Preventive Maintenance Manual for convenience. Please monitor the official document. If any differences are found between this table and the one in the official document linked here, please defer to the official TD-1001M in the TIL and alert team leadership.

Component[1]	Priority Code				
	A (Level 1 - Immediate)	E+ (Level 2- 3 Months)	E (Level 2 – 6/12/36 Months)		F (Level 3 - 60 months)
Anchor-Steel (ANCS) **Anchor-Wood (ANCW)** NOTE: Anchor head buried (per Dwg. 025998, e.g., incomplete inspection)	>50% material loss		25-50% material loss Soil Movement/slide. Guy anchor being pulled out. Twisted/bent anchor rod. Anchor rod concrete has significant cracking, needs repair and resealing		15-25% Material Loss Anchor rod concrete has minor cracking, needs resealing Anchor rod in concrete not sealed in corrosive environments. Re-seal deteriorated mastic.
Guy Wire-Steel (GYWS) **Guy Wire-Wood (GYWW)** **Guy Splices**	>50% material loss Broken or missing load bearing guy	Slack or overtension load bearing guys	Broken or missing storm guy where required 25-50% material loss Guy insulator in poor condition Preform grips not in thimbles Preform cross ties not properly installed Where automatic guy strand dead ends and splices exist, follow guidance in Job Aid 13	Clearance from energized conductors Framing configurations where a bird can land and reach energized parts **AND** guy bonded and not sectionalized (e.g., does provide a path to ground)	Fiberglass rod not installed or installed in wrong position (guidance in 022178) 15-25% material loss Turnbuckles out of threads

[1] For Action Code abbreviations use INST (install), REPA (Repair), REPL (Replace)

Component[1]	Priority Code				
	A (Level 1 - Immediate)	E+ (Level 2- 3 Months)	E (Level 2 – 6/12/36 Months)		F (Level 3 - 60 months)
Conductor-Steel (CONS) **Conductor-Wood (CNDW)** **Shield Wire/OPGW, ADDS, non-ADSS lashed[2] (SHLS) (SHLW)** **Jumpers (JUMS) (JUMW)** **Tie Wire (TIES, TIED)** **Ground Wire (GRWS, GRWT, GRWW)**	>50% material loss Broken strands and out-of-lay strands (e.g., gunshot) >40%, Dwg 028855 Active arcing Broken or loose tie wire (conductor not well seated in the saddle with vertical load or not fully captured with tie wire)	Evidence of arcing Twisted bundled conductor	10-50% material loss Broken strands and out-of-lay strands (e.g., gunshot) 5-40%,Dwg 028855 Conductor kinked/pinched at clamp Broken ground wire Loose connector or weight	Broken or loose tie wire (conductor well seated in the saddle with vertical load or partially captured with tie wire) Vibrating (send to engineering for evaluation) Ground wire in poor condition (corrosion, flashed, missing)	Broken strands and out-of-lay strands (e.g., gunshot); Dwg 028855 Uneven sag (send to engineering for evaluation)
Damper-Steel (DAMS) **Damper-Wood (DAMW)** **Spacers (SPAS, SPAW)**			Bent >45 degrees damper Missing spacer (where required) Broken spacer	Broken/missing/ out of position damper	**No 24-month tags**

[2] For OPGW, ADSS and non-ADSS lashed fiber cable, refer to associated Job Aids referenced in Section 2.4.8 for specific conditions and priorities

Component[1]	Priority Code				
	A (Level 1 - Immediate)	E+ (Level 2- 3 Months)	E (Level 2 – 6/12/36 Months)		F (Level 3 - 60 months)
Splices (SPLS) (SPLW)	>50% material loss Very hot (>100-degree differential)	Hot (<100-degree differential)	Any visible damage to splice Automatic Splice	Any splice < 10' to clamp	
Electrical clearances: GO95 Clear Infract-Tower (GO9S) GO95 Clear Infract-Wood (GO9W) **Right of Way (ROW1)** **Vegetation (VEGN)** **Vegetation-Tower (VEGT)**	Tree contacting line or showing signs of contact (burnt leaves or limbs) Encroachments		Circuit-to-circuit Trees Clearance < G.O. 95 or PG&E required Significant vegetation around base of structure; may be impacting climbing or ability to inspect base of structure.	Grade change (Ground Clearance < G.O. 95) or PG&E required Jumper clearance less than requirement; Doc 068177 Burnt Ground Clearance <G.O. 95 or PG&E required	Encroachments to be resolved via Land Management.
Foundation/ Concrete-Tower (FOND)[3] **Note:** Earth covered/buried foundation (covering steel member) (incomplete inspection) **Direct buried grillage** **Note:** Uncover 6" to determine conditions. If no issue, rebury, no tag needed. Based on condition seen, if additional excavation needed, expose stub <18"	Significant soil erosion or movement causing lack of support around the foundation. Damage to, or separation of, main structural support members or stub angle tower leg that compromises structural integrity Direct buried grillage rust, corrosion >50% material loss	Cracked (cracks >1/2")	Buckled rebar, concrete spalling Rebar exposed with >50% material loss Slide 10 - 15 inches Exposed wood pile Erosion (vertical) > 3' Stub in concrete, has significant cracking, needs repair and resealing	30 - 50% material loss of foundation or stub Direct buried grillage rust, 30% - 50% material loss Rotated Soil movement (e.g., movement causing bowing of tower members)	Cracked (cracks 1/16"-1/2") Stub in concrete needs resealing Erosion 1'-3' Stub in concrete, has minor cracking, needs resealing

[3] For structural integrity or other significant concerns request an engineering assessment by directly contacting civil engineering or through the local supervisor.

Component[1]	Priority Code				
	A (Level 1 - Immediate)	E+ (Level 2- 3 Months)	E (Level 2 – 6/12/36 Months)		F (Level 3 - 60 months)
Insulator (INSU) **Insulator-Steel (INSS)** **Insulator-Wood (INSW)** (Insulators with these conditions, see TD-1001M-JA07, Flashed Cracked, Broken, Gunshot, Chipped >1½ inches)	>50% material loss Contaminated (arcing)	Contaminated (heavy)	30–50% material loss Tracking (heavy) Corona rings damaged, missing (where required) or improperly installed (500 kV only)	Out-of-plumb post or suspension insulator exhibiting signs of impacting conductor Chalking/cracking on polymer Missing/loose cotter key in retainer pin[4]	Tracking (medium) Contaminated (medium) Out-of-plumb post insulator > 6"
Hardware **(HRDS)** **(HRDT)** **(HRDD)** **Bolts, J-Bolts, U-Bolts, links, clamps, hot-end or cold-end hardware, shoe assembly, shackles, cotter key/pin, turnbuckle** **Hanger Plates**	>50% material loss Cracked >50% Contaminated (arcing) Cotter key missing AND retainer pin not fully seated < ¼" material remaining on plate[5]	Cracked 5-50% 30 - 50% material loss ¼" – ½" material remaining on plate[5]	Missing hardware (if necessary, send to engineering for evaluation) Missing or loose cotter key in retainer pin[4]		Loose

[4] Other missing or loose cotter key configurations will be prioritized based on site-specific conditions.
[5] Thickness of material (i.e., plate thickness) can determine if Priority A or Priority E. A relatively thin plate (e.g., less material) is a Priority A.

Component[1]	Priority Code				
	A (Level 1 - Immediate)	E+ (Level 2- 3 Months)	E (Level 2 – 6/12/36 Months)		F (Level 3 - 60 months)
Switch (SWTC) **Switch-Steel (SWIS)** **Switch-Wood (SWIW)** (Switch insulators with these conditions, see TD-1001M-JA07, Flashed, Cracked, Broken, Gunshot, Chipped >1½ inches) **SCADA-Steel (SCDS)** **SCADA-Wood (SCDW)**	>50% material loss Cracked >50% Arcing or evidence of arcing Switch operating mechanism unlocked Inoperable Out of adjustment (blades and load break devices not fully seated) Missing/damaged switch attachment Inform GCC that SCADA is not operational (no tag required unless instructed)		30 - 50% material loss Tracking (heavy) Contaminated (heavy) Heating Bent/Bowed control rod or platform	Switch handle not bonded to platform Cracked 5-50% Loose/broken/missing parts or hardware	Contaminated (medium) Tracking (medium)
Structure-Steel (STRS)[6] **Structure-Tower (STRT)[12]** **Shield Wire Plates** **Crossarms (CRSL, CRST)**	Critical/Main member: • >50% material loss • Cracked >50% • Broken/missing Severe damage to main structural support members compromising structural integrity (stub, leg, cross arm) Internal corrosion of tubular members	Moderate damage to main structural support members compromising structural integrity (stub, leg, cross arm)	Pack-rust at joints, crevices, or overlaps Buckled/bent secondary member 30 - 50% material loss Missing bolts on single bolt connection on critical member Broken/missing secondary member	Twisted Out of plumb (send to engineering for evaluation) Cracked 10-50% H-frame cross brace broken	Paint /Galvanizing finish deteriorating and little rust or metal loss Climbing steps in poor condition Vibrating members Loose bolts Single bolt missing of multi-bolt connection

[6] For hanger plates, refer to Hardware section of this table.
[12] For structural integrity or other significant concerns, request an engineering assessment by directly contacting civil engineering or through the local supervisor.

Component[1]	Priority Code				
	A (Level 1 - Immediate)	E+ (Level 2- 3 Months)	E (Level 2 – 6/12/36 Months)		F (Level 3 - 60 months)
Markers (i.e. signs)Steel (MRKS) **Markers (i.e. signs)-Wood (MRKW)** **Guy Markers (GMKS, GMKW)** **FAA Lighting and Batteries**	Facilities or structures which have a recent history of trespass or third-party unauthorized access		FAA battery no good, FAA Lighting missing or no good Marker balls damaged	Marker balls in poor condition and wearing on conductor	Cracked, Broken, Loose, Missing Anti-climbing guards missing where required per TD-1009S-F01 Anti-climbing guards broken, cracked, damaged
Road (ROAD)	Posing threat to facilities due to wash-out or land motion		No E tags		Access road repair or replacement

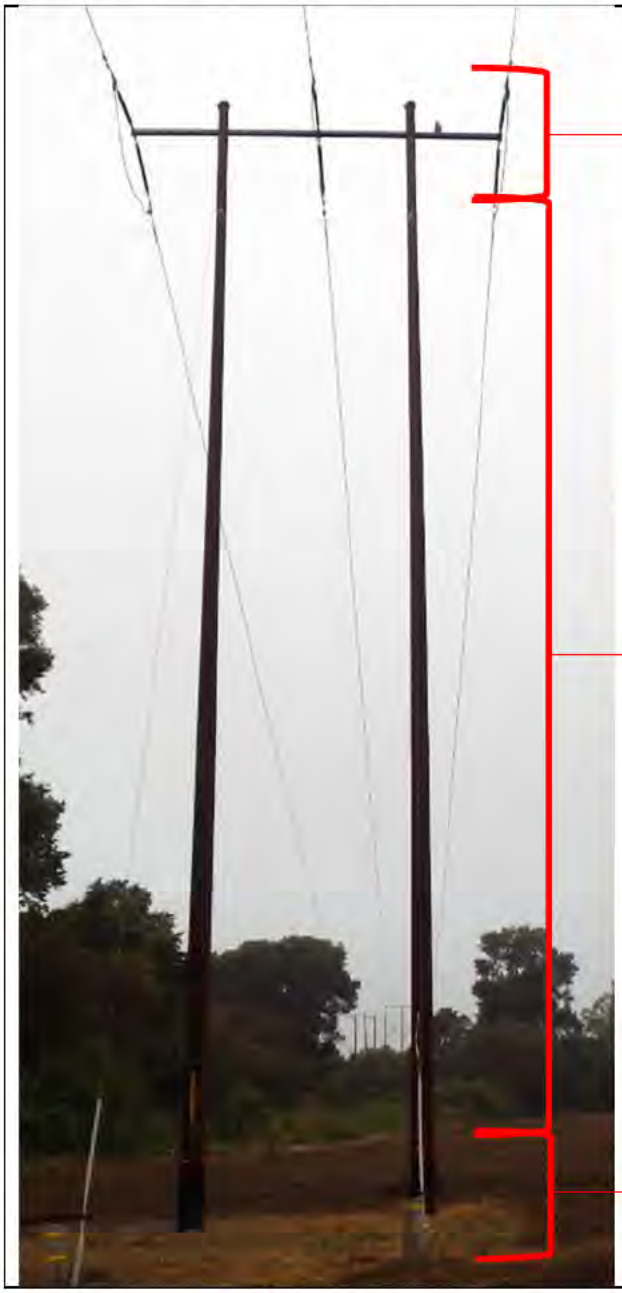
Component[1]	Priority Code				
	A (Level 1 - Immediate)	E+ (Level 2- 3 Months)	E (Level 2 – 6/12/36 Months)		F (Level 3 - 60 months)
Structure-Wood (STRW) (see note below) Includes pole, crossarms (CRSW, CRSL), bonding, bearing plates **Guy Stub (STUS, STUW)** (Also referred to as Guy Pole) **Note:** Includes pole, crossarms (CRSW, CRSL), bonding, bearing plates.	Burnt/Rotten >50% material loss Crossarm bracing missing or broken, compromising insulator and conductor Bond wire broken < ¼" gap Severe pole top damage or split top, compromising hardware, or crossarm integrity Cracked (not checks) Broken	H-frame cross brace broken or missing Out of plumb > 3 feet (causing insulators and conductor compromised) Pole top damage or split top compromising hardware or crossarm integrity	Burnt/Rotten 20-50% material loss Slide >5 feet Twisted Soil Movement (Erosion >3 feet in the ground) Bond wire broken > ¼" gap Worn/woodpecker/insect damage (severe and/or near hardware)	Crossarm bracing loose/ missing Ground molding in poor condition or missing Standing water (not including seasonal conditions)	Climbing steps in poor condition Worn/woodpecker/ insect damage (medium or minor damage near hardware) Slide 1 - 5 feet Soil movement (erosion 1-3 feet in the ground)

Component[1]	Priority Code				
	A (Level 1 - Immediate)	E+ (Level 2- 3 Months)	E (Level 2 – 6/12/36 Months)		F (Level 3 - 60 months)
Structure (Fiberglass, Composite, or Concrete)	Crossarm bracing/missing causing insulator and conductor to be compromised Buckled (deformation)	Out of plumb >3 feet (causing insulators and conductor compromised) H-frame cross brace broken/missing	Crossarm bracing loose/missing Slide > 5' Cracked concrete into rebar	Soil Movement (Erosion >3 feet in the ground) Cracked fiberglass	Cracked concrete (cracks > ½") not into rebar Slide 1-5' Pole access device/ Climbing steps in poor condition Soil movement (Erosion 1-3' in the ground)
Idle Facilities (any facility type) (De-energized) See TD-1003P-01: Management of idle electric transmission line facilities	Removal of idle facilities posing an immediate threat to life, property, or reliability.		No E tags	-	Removal of non-emergency idle facilities.

NOTE: If, on performing the required visual inspection and hammer test, the field inspector believes the pole to be suspect, the pole must be tested further in accordance with Utility Standard TD-2325S, "Wood Pole Inspection, Testing, and Maintenance," and Work ProcedureTD-2325P-01, "Wood Poles - Testing, Reinforcing and Reusing." This standard establishes the requirements for inspecting and testing the structural integrity of wood poles, the requirements for reinforcing and reusing, and requirements for testing wood poles prior to climbing. After completing the pole inspection, the field inspector must complete the TD-2325P-01-F01, "Attachment 1 - Pole Inspection/Test Report," and forward it to the supervisor. The supervisor will forward it to the estimating group for further evaluation and appropriate corrective action identification.

Multi-pole inspections

Sherlock will now serve you "connected" (parent/child structures) structures as one, and unconnected ("A/B/C") structures one after another. Please inspect each one consecutively. When encountering an issue as described below, please try to adhere to the guidance as strictly as possible. Changes may arise in Sherlock which render these instructions difficult to follow. In those instances, request help from your IRS.



Damage at the conductor level that could be considered for the entire structure (e.g. conductor damage, or damage to crossarm) should be assigned to the left pole.

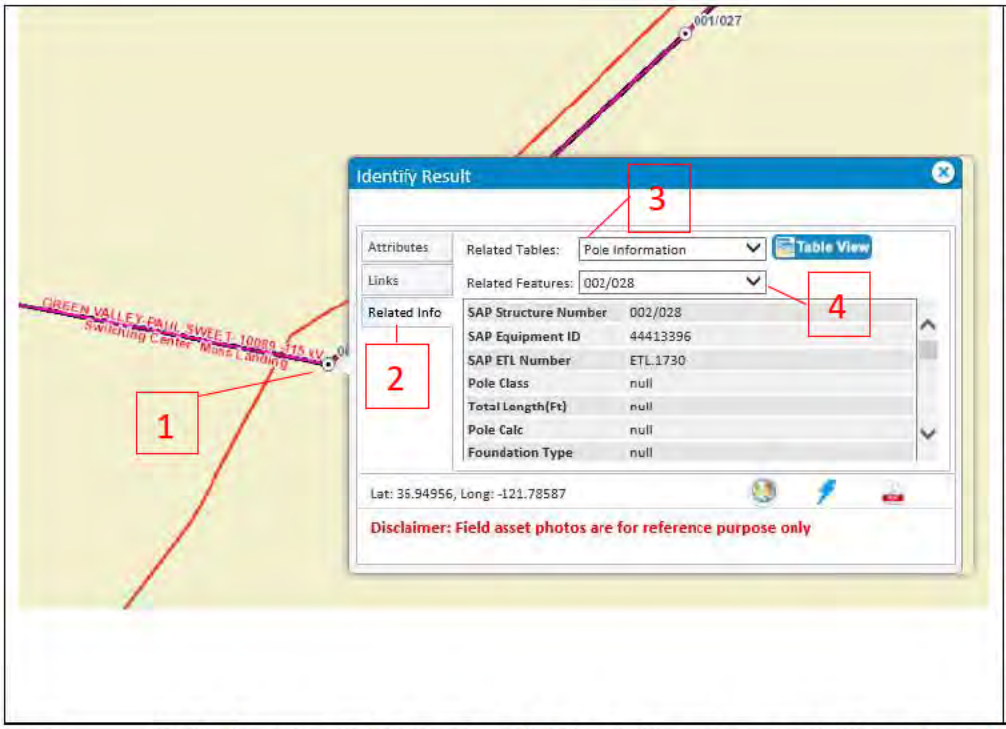
Damage to insulators should be assigned to the insulator SAP, but your IRS may do that for you.

NOTE: if one insulator in an A/B/C structure requires replacement, create additional notifications for the other two poles referencing the original.

Damage at the pole level should ALWAYS be assigned to the damaged pole in question.

NOTE: if one pole in a multi-pole structure is damaged and requires replacement, create additional notification(s) for the other poles referencing the original.

Damage at ground level that could be considered for the entire structure (e.g. vegetation or stubs) should be assigned to the left pole. Foundation issues should still be assigned to whichever pole is affected.



Steps for viewing left/right/center pole information:

1. Find structure in ETGIS and click location
2. Click "Related Info" tab
3. Select "Pole Information" in top dropdown menu
4. Select pole in question

SAP number, structure number, and left/right/center status are viewable in the lower information pane

Figure 4 **Guide for using ETGIS to identify left, right, and center SAP numbers for parent/child multi-pole structures.**

Signage and markings

High voltage sign guide

Wood or tubular steel poles:

At least **ONE** of the following **MUST** be true:

1. **Structure has HV sign on both sides of pole itself, within 40" of lowest conductor >750 V**

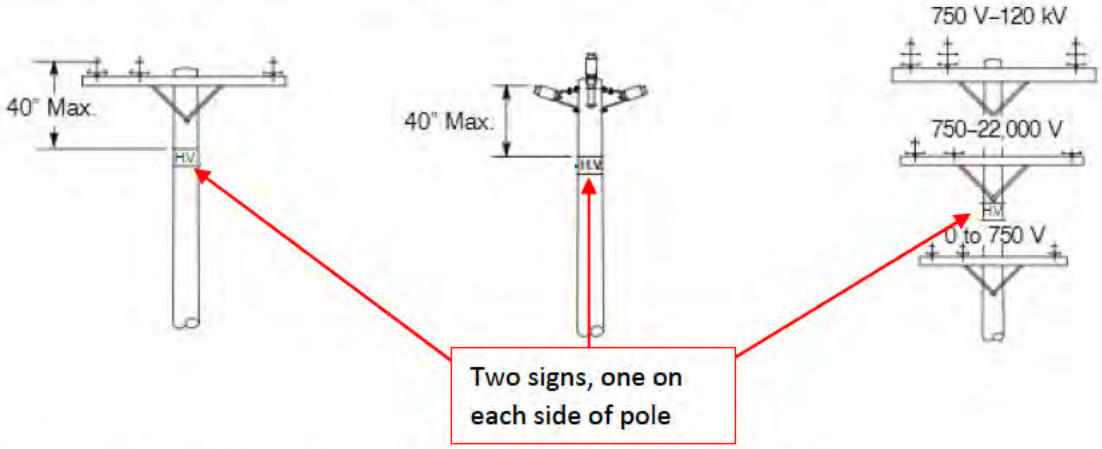


Figure 5 Examples of sign placement for wood or tubular steel poles

OR

2. **Each crossarm supporting line conductors energized above 750 V must have signs on BOTH the front and the back of the crossarm. If no crossarm is present, method one (1) above MUST be used.**

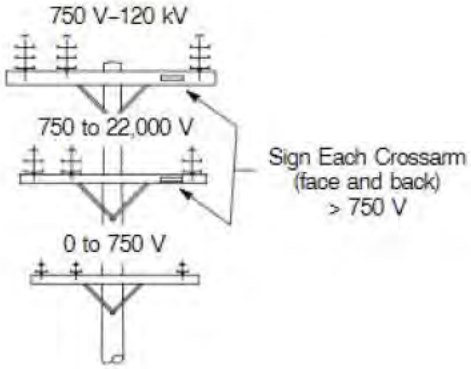


Figure 6 Example of sign placement on crossarms

Lattice steel poles:

1. **IF NO GUARDS PRESENT**, sign should be in climbing space, both sides of pole, at most 40" below lowest conductor of 750 V or more

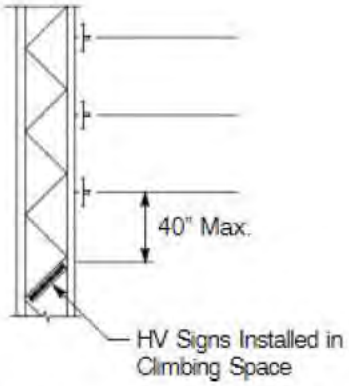


Figure 7 Example of sign placement on lattice steel poles without climbing guards

2. **IF GUARDS PRESENT**, high voltage signs should be ABOVE GUARD, in climbing space on both sides of pole, at most 40" below lowest conductor of 750 V or more **OR** on both sides of crossarms containing conductors above 750V

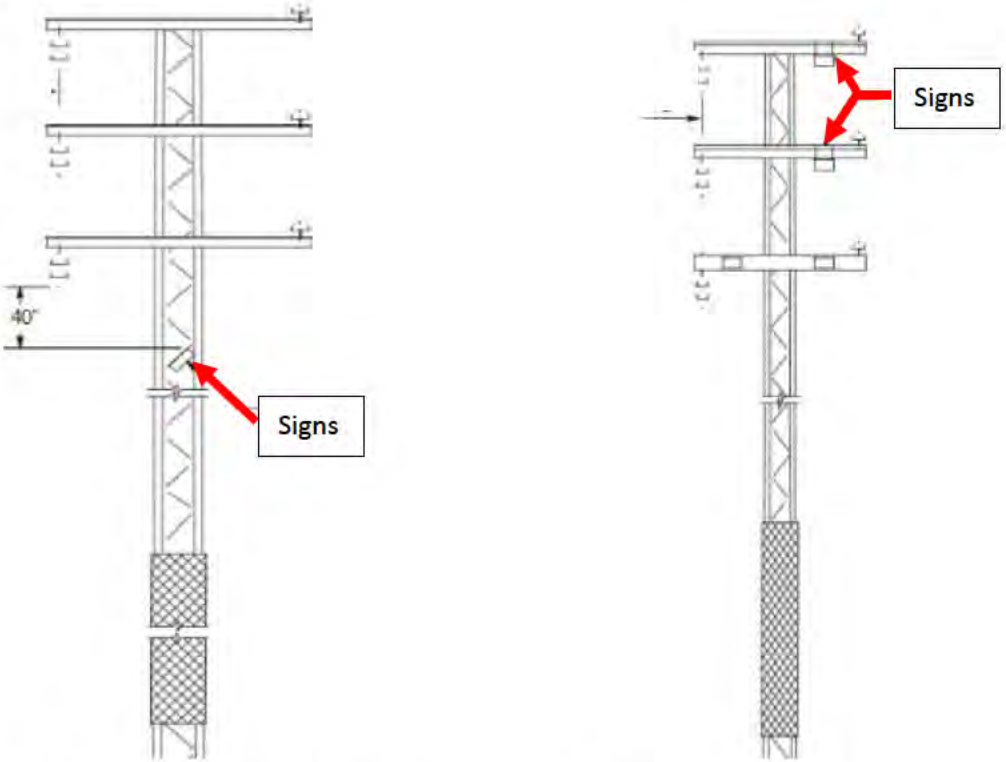


Figure 8 Example of sign placement on lattice poles with climbing guards.

Lattice steel towers:

Install two danger signs on opposite corners of the tower, on the sides of the tower that are at right angles to the line, not less than 10 feet nor more than 20 feet above the ground. Signs may be mounted on a horizontal member, or on a diagonal member if a horizontal member is not available. If no suitable member is available in the limits specified, the mounting height may be increased but shall not exceed 30 feet.

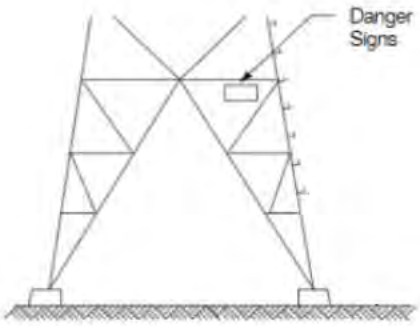


Figure 9 Example of sign placement on lattice steel towers.

High voltage signs that are legible (i.e. all letters clearly visible) do not require replacement

If a structure has distribution attached, high voltage signs need only be inspected at the transmission level (for AIR+ purposes)

Structure tags

At least ONE of the following MUST be true:

- Single poles and towers of any material must have a structure ID
- At least one pole in a two-pole structure must have a structure ID
- At least one pole in a three-pole structure with a parent ID (i.e. those with left/right/center poles) must have a structure ID
- All three poles in a three-pole structure without a parent ID (i.e. those with A/B/C poles) must have a structure ID

NOTES:

Poles should have a yellow and black structure tag.

Welded, painted, or hand-written numbering are ***not*** currently acceptable numbering methods.

Old aluminum numbers nailed on wood poles are acceptable as long as they are legible.

Punctuation (e.g., : ; - ?) is not required on the pole.

Letters required (e.g. 003-102A, Z025-005, etc.)

Other Markers

Switch number tags must be present when a transmission switch is attached to the structure. If missing, use FDA: Marker (i.e. signs)-(wd/stl)|No Good/Out of Stdrd|Install, F-Priority.

Aerial Mile Markers, where present, need to be legible. If illegible or damaged, use FDA: Marker (i.e. signs)-(wd/stl)|No Good/Out of Stdrd|Install, F-Priority.

Examples

Condition: 1
Priority: No Notification Required
FDA: N/A

Condition: 2
Priority: F
FDA: Marker (i.e. sign)-Wood|No good/Out of Stdrd|Install

Figure 10 **Cracked high voltage sign (left). Damaged sign, no longer legible (right).**

Condition: 2
Priority: F
FDA: Marker (i.e. sign)-Wood|No good/Out of Stdrd|Install

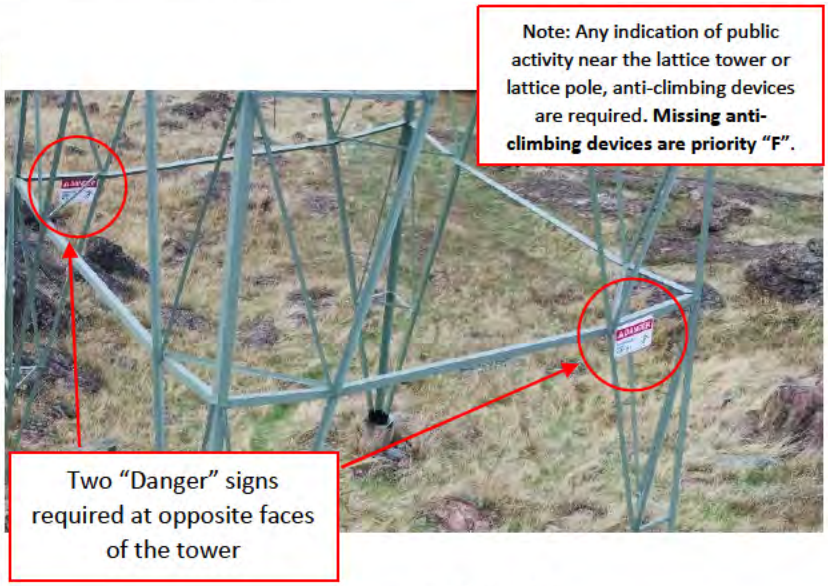
Condition: 2
Priority: F
FDA: Marker (i.e. sign)-Wood|No good/Out of Stdrd|Install

Figure 11 **High voltage sign is *above* the lowest point of the jumper (left). Loose high voltage sign (right).**

Condition: 2
Priority: F
FDA (1): Marker (i.e. sign)-Steel|No good/Out of Stdrd|Install
FDA (2): Structure-Wood/Steel|Debris/Nest/etc|Remove

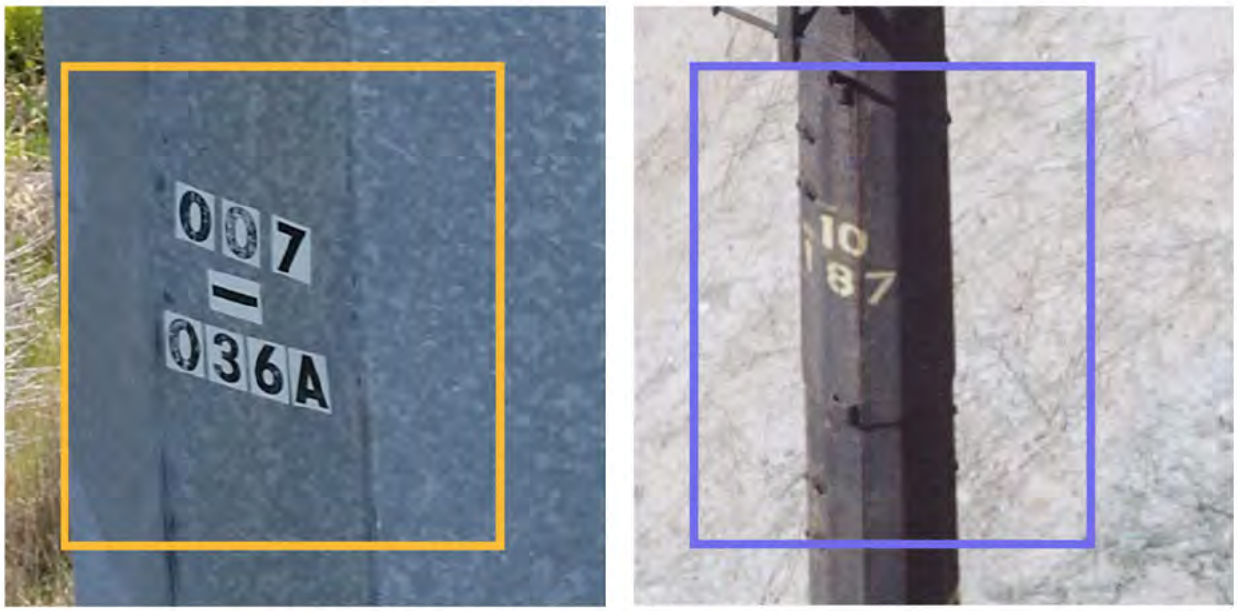
Figure 12 **Danger (or HV sign) fallen off of the structure and sitting at bottom. Two tags are necessary – one for the fallen sign and another to replace the missing one.**

Condition: 2
Priority: F
FDA: Marker (i.e. sign)-Steel|No good/
Out of Stdrd|Install



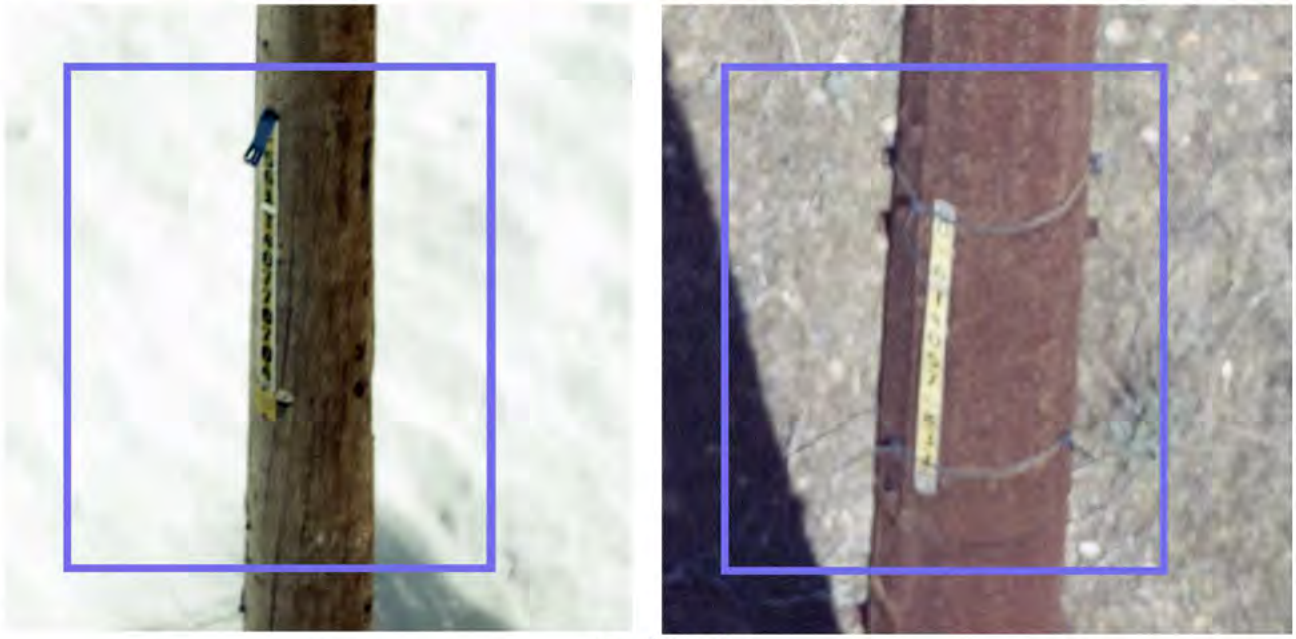
Condition: 1
Priority: No notification required

Figure 13 **Damaged sign (left). Damage signs can be bullet holes, covered by paint or faded letters. Example of proper high voltage signage for lattice towers (right).**



Condition: 2
Priority: F
FDA: Marker (i.e. sign)-Wood/Steel|No good/Out of Stdrd|Install

Figure 14 **Structure ID is not to standard, should be yellow and black (left). ID is painted on the structure (right).**



Condition: 2
Priority: F
FDA: Marker (i.e. sign)-Wood/Steel|No good/Out of Stdrd|Install

Figure 15 **Damaged structure ID (left). Structure ID is secured to the structure with no signs of mastic (right). Steel banding is an approved of way to affix structure number to pole.**

Note: Providing that the Structure ID numbers are not blocked and there are signs that mastic was used to install tag, no notification is required.

Condition: 2
Priority: F
FDA: Marker (i.e. sign)-Wood/Steel|No good/Out of Stdrd|Install

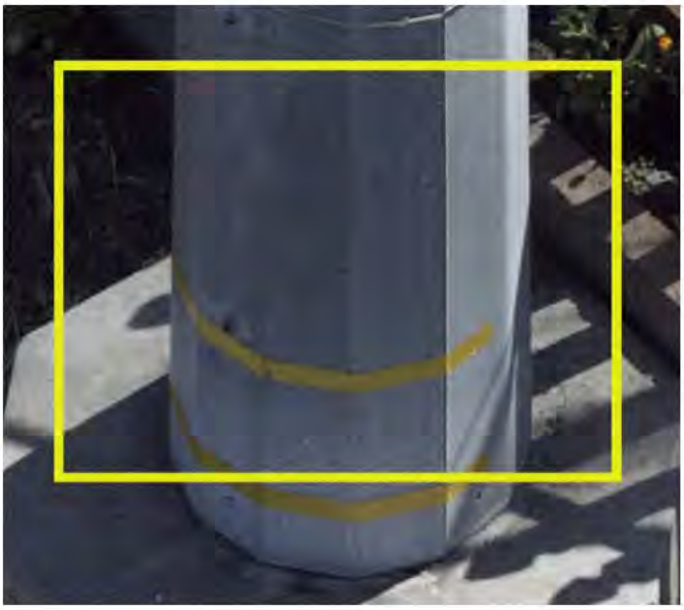
Figure 16 **Faded ID (left). Damaged high voltage sign (right).**

Condition: 2
Priority: F
FDA: Marker (i.e. sign)-Wood/Steel|No good/
Out of Stdrd|Install

Condition: 2
Priority: F
FDA: Marker (i.e. sign)-Steel|No good/
Out of Stdrd|Install

Figure 17 **High visibility strips required inside substations (left). High visibility strips need to be installed on structures located in area with heavy tire tracks (right).**

Condition: 1
Priority: No notification required



Condition: 2
Priority: F
FDA: Marker (i.e. sign)-Wood/Steel|No good/Out of Stdrd|Install

Figure 18 **High visibility strips required on both street side and agricultural side of pole (left). Visibility strips required 15ft from paved roadways and 6ft from well-travelled trails, driveways, parking lot, etc. that isn't protected by a curb. (per standards in 022168)**

OH: Marking

Marking, Numbering, and Identification of Line Structures

Visibility Strips on Poles and Guy Markers

1. Emphasizing the presence of poles is a primary consideration in determining the need to mark poles and guy markers. Reflective visibility strips shall be installed on wood, fiberglass, steel power poles, or guy poles, and guy markers as follows:
   - A. On poles and guy markers installed on state highways, in accordance with the marking section of the *Caltrans Traffic Manual*.
   - B. On poles and guy markers located within 15 feet from the paved surface or 15 feet from the edge of the traveled, unpaved portion of city or county roads (streets) where not protected by curbs.
   - C. On poles and guy markers within 6 feet of an adjacent driveway, private roadway (street intersection), turnaround, parking lot, or thoroughfare in rural district, capable of being traversed by vehicles where not protected by curbs.
   - D. For the purpose of meeting these requirements, a curb must meet the following minimum specifications:
     1. Material shall be concrete or similar composition.
     2. The face of the curb shall be approximately 90° to the surface of the roadway (or ground).
     3. The curb shall be greater than 5-1/2" high by 5-1/2" wide and shall be securely anchored to the ground.
2. Visibility strips should not be installed where there is no reasonable expectation of traffic. For example: Cross country poles, poles through waterways level of the or wetlands, rear easement poles, poles behind guardrails, or poles on embankments that are well above or below the road.

Figure 19 **Direction from page 31 of 41 in document 022168 "Marking, Numbering, and Identification of Line Structures" which applies to towers as well.**

Condition: 2
Priority: F
FDA: Structure-Wood|Debris/Nest/etc|Remove

Condition: 2
Priority: F
FDA: Structure-Wood|Debris/Nest/etc|Remove

Figure 20 **Unauthorized non-utility attachments present.**

Guys and guy anchors

Please refer to TD-1001M-JA13 Identifying Levels of Damage and Condition of Guys and Anchors on Transmission Line Structures and Supports, for more information.

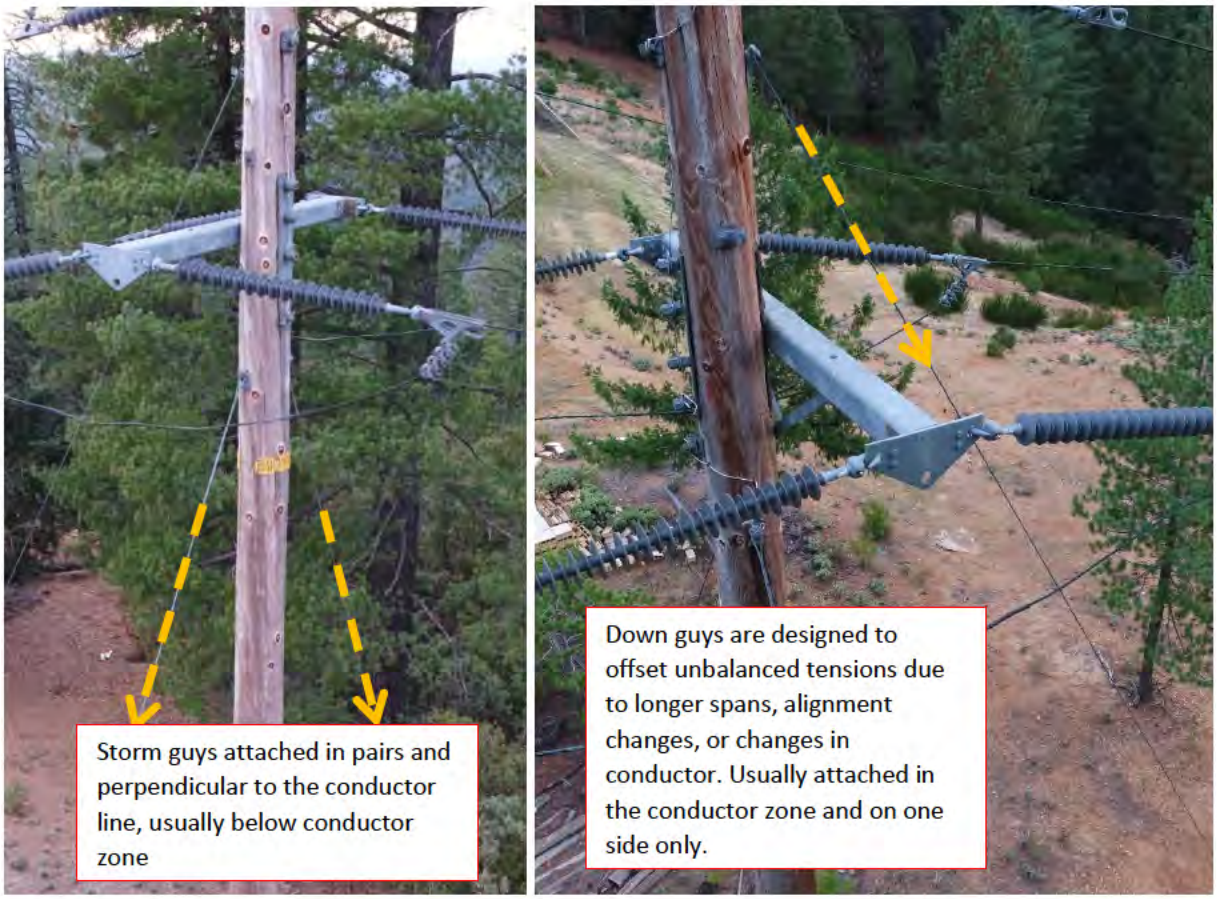


Figure 21 Example of storm guys (left) and down guys (right).

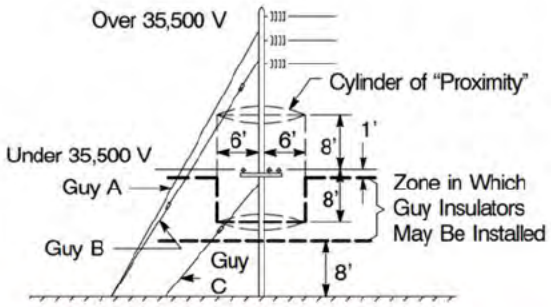
Storm guys are typically installed in pairs, are lower on the pole, and come in perpendicular to the conductor line. Down guys are designed to offset tension imbalances in the line, so are usually attached solo. They can attach at any angle to the conductor.

If there is damage to both storm and down guys, create one notification (if possible), but use the highest applicable priority.

If there is an automatic splice on a guy wire *and it is damaged,* it should be priority "E". An automatic splice on the guy without damage requires no notification.

Condition: 3
Priority: E
FDA: Guy Wire-(Wood/Steel)|No Good/Out of Stdrd|Repair

Figure 22 **Example of internal span guys (left) loose internal span guys, (right) good internal span guy.**

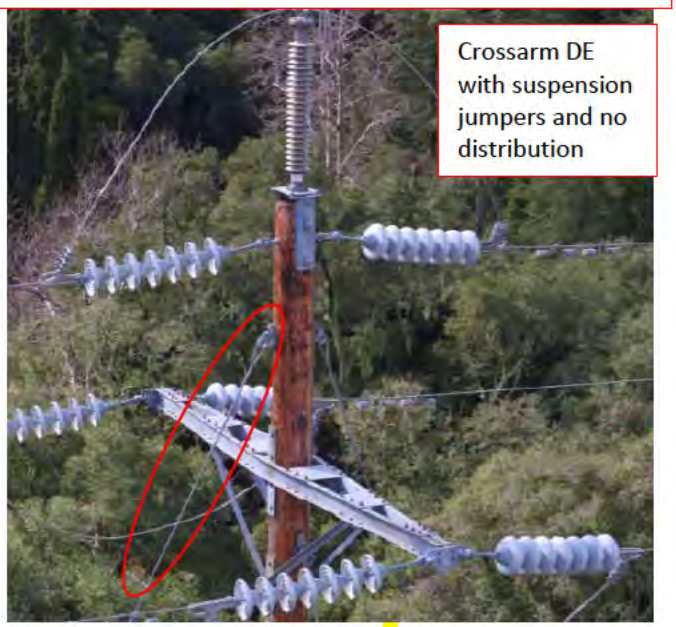


Guy bobs are not required UNLESS the guy passes through the Cylinder of Proximity. Reference Doc#022178.

See *Transmission Job Aid Fiberglass Guy Strain Insulator*, available in *03-Onboarding/Helpful Standards* for detailed walkthrough of priority assignments for insulators on guys

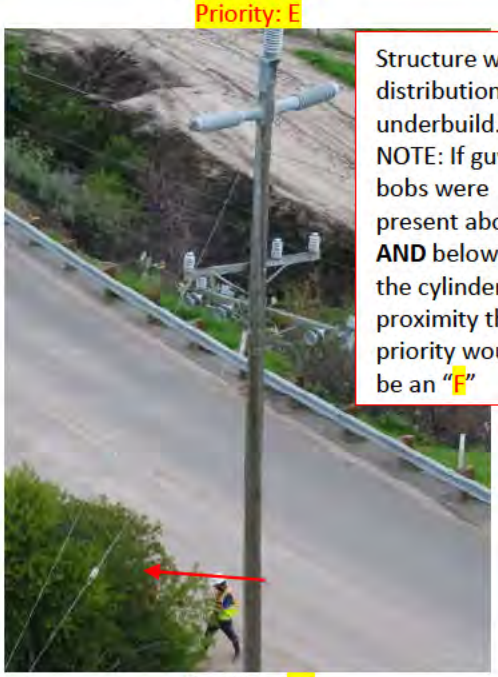
Tri Pin X Arm with no distribution (This is considered congested framing.)

Condition: 3
Priority: E



Crossarm DE with suspension jumpers and no distribution

Condition: 2
Priority: F



Structure with distribution underbuild. NOTE: If guy bobs were present above **AND** below the cylinder of proximity the priority would be an "F"

Condition: 2
Priority: F

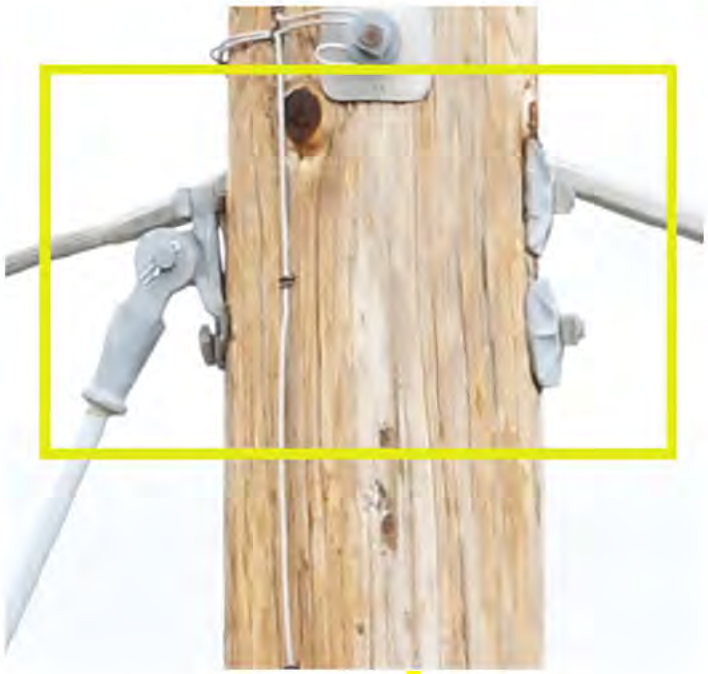
Vertical DE structure with no distribution

Condition: 2
Priority: F

Figure 23 **Examples of guyed structures with missing fiberglass rod. If congestion exists at Transmission-level, assign E-priority.**

FDA: Guy Wire-Wood|No Good/Out of Stdrd|Repair

Condition: 1
Priority: No notification required



Condition: 2
Priority: F
FDA: Guy Wire-Wood|No Good/Out of Stdrd|Repair

Figure 24 **Guy wires on steel poles (left). Fiberglass rods without bonding and loose hardware (right).**

Condition: 1
Priority: None

Condition: 3
Priority: E
FDA: Guy Wire-Wood|No Good/Out of Stdrd|Repair

Figure 25 **Structure with all insulators attached to a continuous bracket. This structure does not need bonding, *unless* there is a guy in proximity to the hardware (left). Missing fiberglass insulator on guy and a congested configuration (right).**

If a guy is attached 10 feet or more below a hardware attachment, no bonding is necessary, even if a strain insulator is present.

Steel poles with guys that do not enter the distribution's cylinder of proximity **don't** require fiberglass rods. If the guys do enter the cylinder of proximity, follow the same process

Condition: 2
Priority: F
FDA: Guy Wire-Wood|No Good/Out of Stdrd|Repair

Condition: 2
Priority: F
FDA: Guy Wire-Wood|No Good/Out of Stdrd|Repair

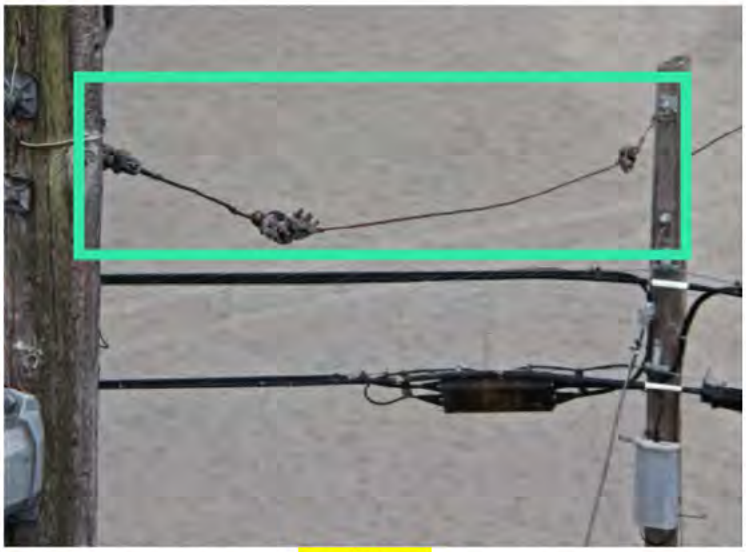
Figure 26 **Fiberglass guy insulators installed mid-span on guy wire (left). These should be repaired on an F tag. The standard is to have them installed up against the pole hardware. Short fiberglass guy insulator used on transmission (right). These types of insulators are not acceptable and should be replaced with the longer standard insulators.**

Condition: 5
Priority: A
FDA: Emergency | Storm Related | Repair

Condition: 3
Priority: E
FDA: Anchor-Wood/Steel|No Good/Out of Stdrd|Replace

Figure 27 **Broken load bearing guys (left). Corroded anchor rod (right).**

Condition: 3
Priority: E
FDA: Guy Wire-Wood/Steel|No Good/Out of Stdrd|Repair



Condition: 3
Priority: E
FDA: Guy Wire-Wood/Steel|No Good/Out of Stdrd|Repair

Figure 28 **Loose guy (left). Loose span guy (right).**

Condition: 3
Priority: E
FDA: Guy Wire- Wood/Steel |No Good/Out of Stdrd|Repair

Condition: 3
Priority: E
FDA: Guy Wire- Wood/Steel |No Good/Out of Stdrd|Repair

Figure 29 **Loose guy (left and right).**

Condition: 3
Priority: E
FDA: Guy Wire-Wood|No Good/Out of Stdrd|Repair

Condition: 3
Priority: E
FDA: Guy Wire-Wood|No Good/Out of Stdrd|Repair

Figure 30 **Damage on the fiberglass insulators with signs of tracking (left). Damaged fiberglass insulator to the core due to flash or tracking (right).**

Steel guy markers are acceptable on guys. Reference Doc#06542. Follow any visibility strip conformances in 'Marking Numbering and Identification 022168'.

Condition: 2
Priority: F
FDA (1): Guy Wire Mark/Indic- Wood/Steel |No Good/Out of Stdrd|Install
FDA (2): Structure-Wood/Steel|Debris/Nest/etc|Remove

Figure 31 **Guy marker has fallen off of the guy wire. Two tags are necessary – one for the fallen marker and another to replace it. (Only one of the guy wires require a marker in this scenario.)**

Condition: 3
Priority: E
FDA: Guy Wire-Wood/Steel|No Good/Out of Stdrd|Repair

Condition: 2
Priority: F
FDA: Guy Wire Mark/Indic-Wood/Steel| No Good/Out of Stdrd|Install

Figure 32 **Guy not sectionalized. When evaluating the guy decision tree, this should be treated as '*no 506 bob installed*' (left). Missing guy marker (right).**

Condition: 3
Priority: E
FDA: Anchor-Wood/Steel|No Good/Out of Stdrd|Replace

Condition: 1
Priority: No notification required

Figure 33 **Bent anchor rod (left). Metal guy marker – acceptable (right).**

Guy Strand Cattle Guard Installation

Notes

1. A cattle guard must fit freely on the guy wire.
2. The cattle guard clamp base prevents cattle guards from unwrapping guy grips and allows the guard to rotate freely.
3. Cattle guards should be installed only on down guys that are exposed to livestock.
4. A guy marker shall be installed above the cattle guard to ensure that there is a minimum of 8 feet of total marker on the guy. To allow the cattle guard to move freely, install an additional marker as follows. Using the plastic guy guards listed in Document 06542, cut the guard just above the flanged portion (approximately 2 feet). Take the remaining round section and install it upside down just above the cattle guard. The section can be cut to adjust for the sectionalizing insulator as long as the total length (including the cattle guard) is at least 8 feet.

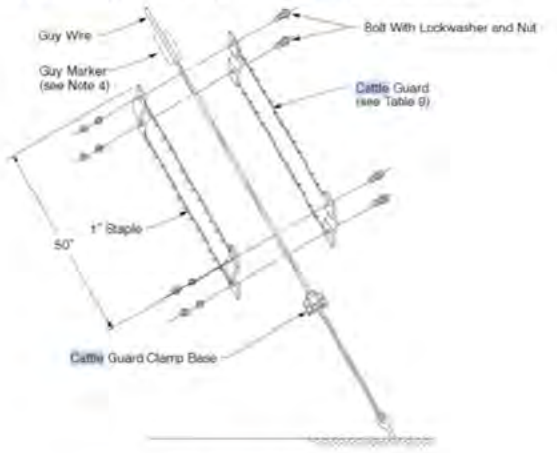


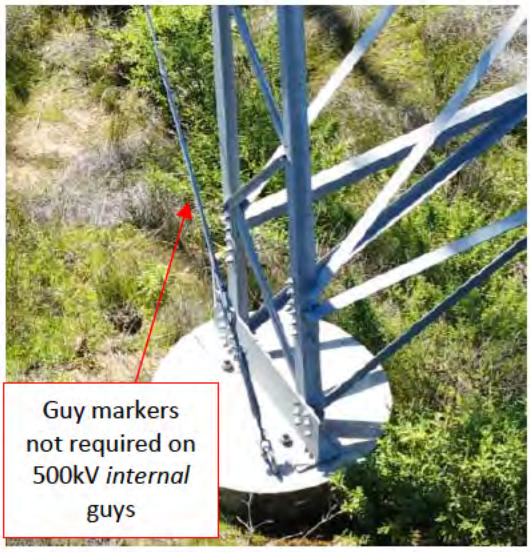
Figure 45
Guy Strand Cattle Guard Installation

Figure 34 **Guy strand cattle guards require a yellow guy marker installed as the above figure shows. The FDA to be used if this style cattle guard is damaged is Guy Wire-(Wood/Steel)|No Good/Out of Stdrd|Repair. Priority: E**

Condition: 1
Priority: No notification required

Condition: 1
Priority: No notification required

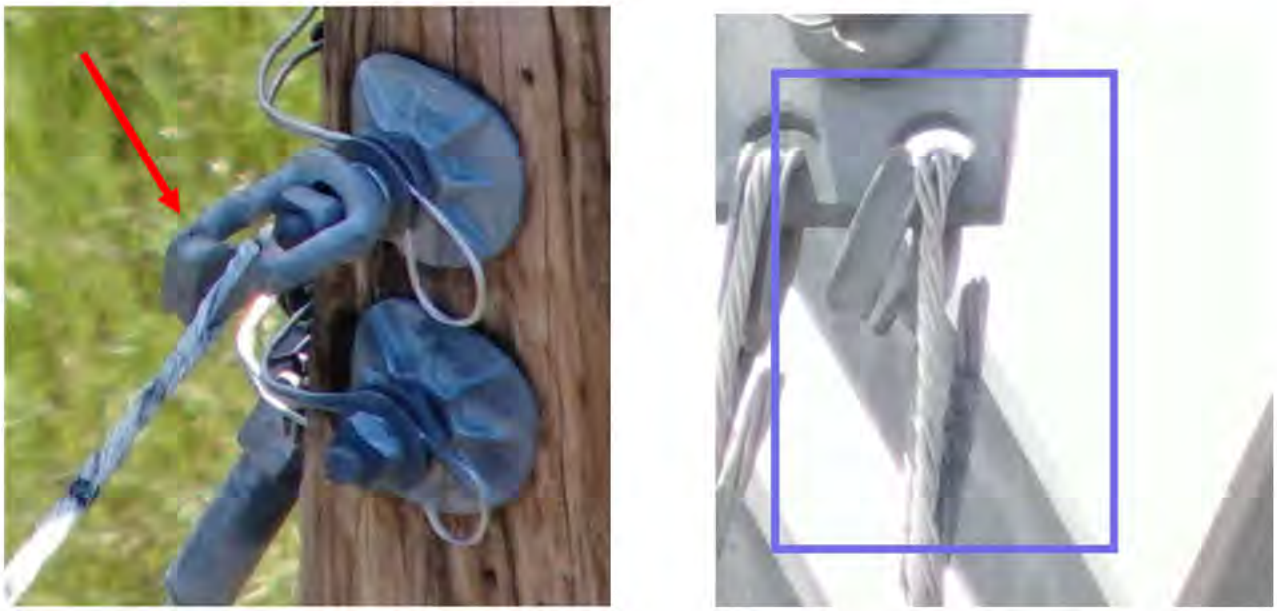
Figure 35 **Example of anchors consisting of "rods" (left), and "loops" (right).**



Condition: 1
Priority: No notification required

Condition: 4
Priority: E+
FDA: Guy Wire- Wood/Steel | No good/Out of Stdrd | Repair

Figure 36 **Guy wires on 500kV structures (left). Cotter key not fully seated on guy hardware (right).**



Condition: 3
Priority: E
FDA: Guy Wire-Wood/Steel|No Good/Out of Stdrd|Repair

Figure 37 **Examples of guy preform not in thimble. If there is damage (broken strands) to the preform, assign E+ priority.**

Condition: 2
Priority: F
FDA: Guy Wire-Wood/Steel|No Good/Out of Stdrd|Repair

Figure 38 **Turnbuckle out of threads (left) and tightened down to the point of touching (right).**

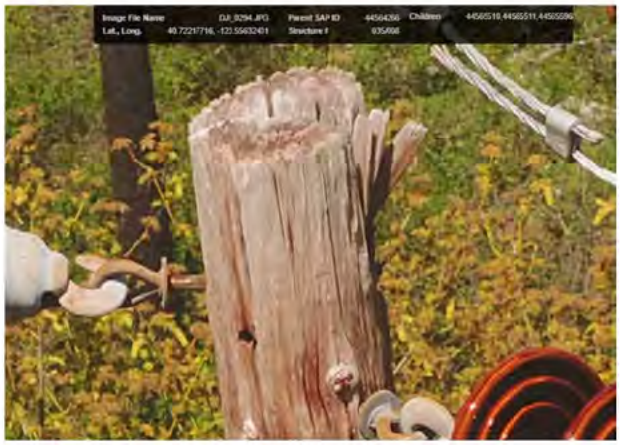
Pole structures & bonding

See TD-1001M-JA06 **Identifying Levels of Damage and Condition of Wood Poles and Non-Steel Framing** for detailed walkthrough of priority assignments for all types of damage in wood structures.

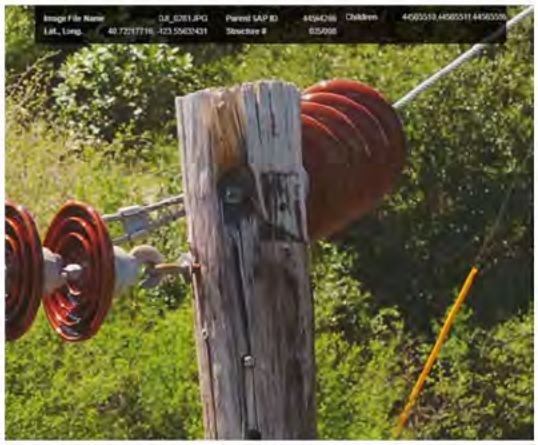
Condition: 4
Priority: E+
FDA: Structure-Wood|No Good/Out of Stdrd| Replace

Condition: 4
Priority: E+
FDA: Structure-Wood|No Good/Out of Stdrd| Replace

Figure 39 **Excessive pole deflection (left), erosion/soil movement Issues (right).**

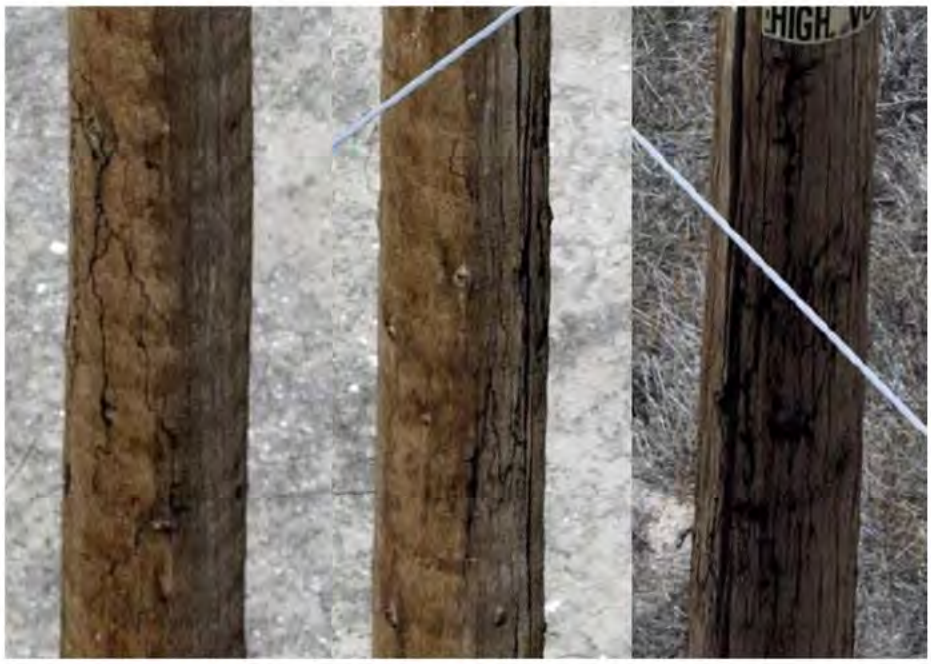


Condition: 5
Priority: A
FDA: Emergency|Storm Related|Replace



Condition: 5
Priority: A
FDA: Emergency|Storm Related|Replace

Figure 40 **Severe pole top decay, compromising hardware on same structure.** ***Note pullout in left image***



Condition: 5
Priority: A
FDA: Emergency-Wood|Other|Replace

Figure 41 **Example of tracking that extends to the ground level, assign emergency tag due to public safety. Find the source of failed insulation/bonding.**

Condition: 5
Priority: A
FDA: Emergency|Storm Related|Repair

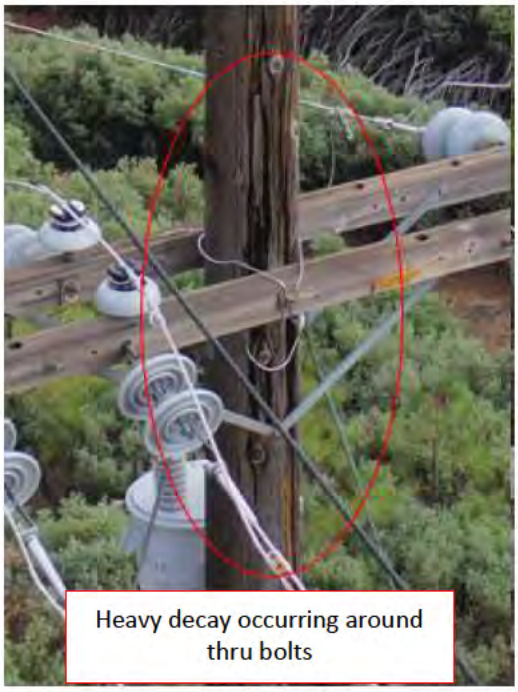
Figure 42 **Example of unauthorized climbing. Evidence of public activity.**

Condition: 4
Priority: E+
FDA: Structure-Wood|No Good/Out of Stdrd| Replace

Condition: 4
Priority: E+
FDA: Structure-Wood|No Good/Out of Stdrd| Replace

Condition: 2
Priority: No notification required

Figure 43 **Pole decay/ shell and core rot (left). Burnt pole with significant material loss (center). Burnt pole with minimal material loss (right).**



Condition: 4
Priority: E+
FDA: Structure-Wood|No Good/Out of Stdrd| Replace

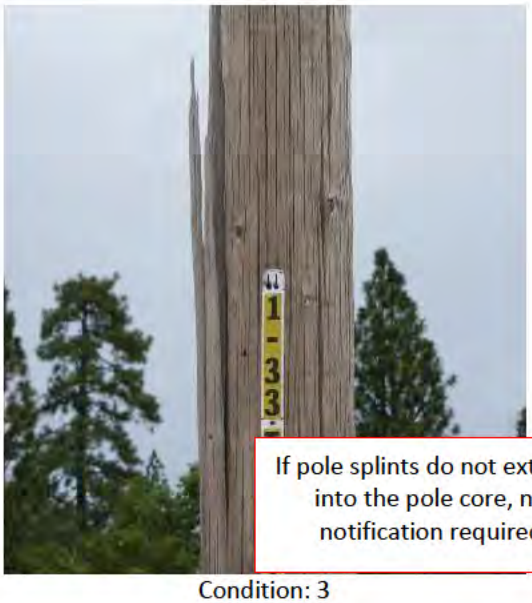
Condition: 3
Priority: E
FDA: Structure-Wood|No Good/Out of Stdrd| Replace

Figure 44 **Pole cracks/rot with material loss (left). Single pole deflection on H-frame (right).**

Condition: 4
Priority: E+
FDA: Structure-wood|No Good/Out of Stdrd| Replace

Condition: 2
Priority: F
FDA: Structure-Wood|No Good/Out of Stdrd| Repair

Figure 45 **Large woodpecker holes in proximity to hardware (left). Multiple medium woodpecker holes in close proximity to one another.**



Condition: 3
Priority: E
FDA: Structure-Wood|No Good/Out of Stdrd| Replace

Condition: 5
Priority: A
FDA: Emergency|Storm Related|Replace

Figure 46 **Splitting pole (left). Pole top rot compromising insulator hardware (right).**

Condition: 2
Priority: F
FDA: Structure-Wood|No Good/Out of Stdrd| Repair

Condition: 3
Priority: E
FDA: Structure-Wood|No Good/Out of Stdrd| Replace

Figure 47 **Single medium size woodpecker hole (left), pole top rot (right).**

Per **TD-1001M-JA06 Identifying Levels of Damage and Condition of Wood Poles and Non-Steel Framing**:

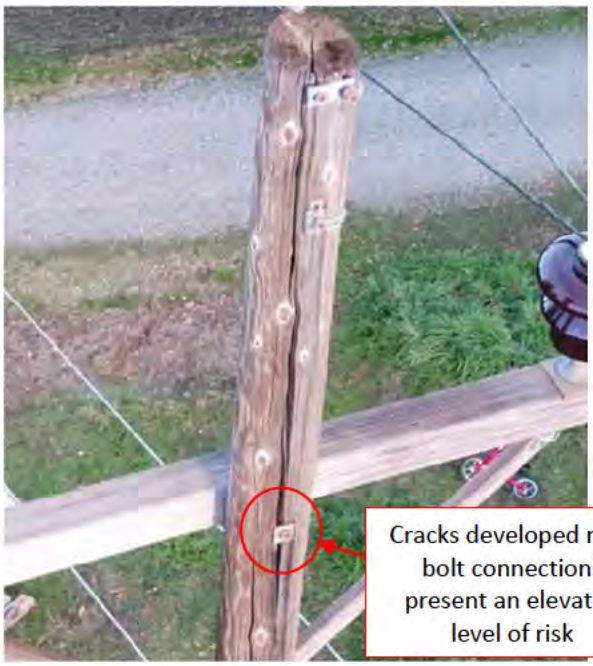
Crack depth	Priority notification
< 4 inches	No notification required
< 50% depth	E Priority
> 50 % depth	E+ Priority

Condition: 4
Priority: E+
FDA: Structure-Wood|No Good/Out of Stdrd|Replace

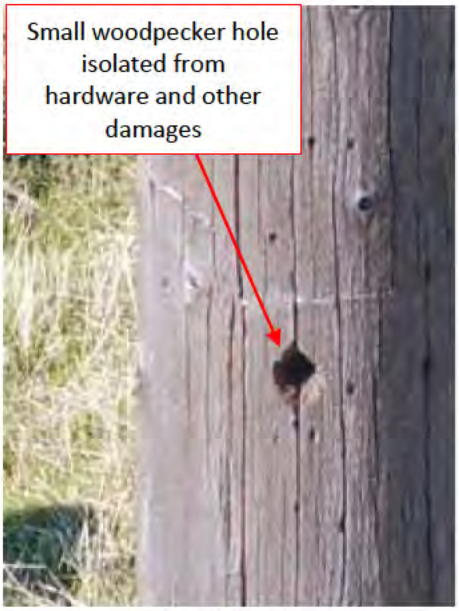
Condition: 3
Priority: E
FDA: Structure-Wood|No Good/Out of Stdrd|Replace

Condition: 4
Priority: E+
FDA: Structure-Wood|No Good/Out of Stdrd|Replace

Figure 48 **Wide pole crack with likelihood of penetrating greater than 50% of the pole cross section (left). Shell rot and pole cracks (center). Woodpecker holes in center of pole (right).**



Condition: 3
Priority: E
FDA: Structure-Wood|No Good/Out of Stdrd|Replace



Condition: 2
Priority: No notification required

Figure 49 **Wide pole crack penetrating roughly 50% of the pole (left). Single small woodpecker hole (right).**

Condition: 2
Priority: No Notification Required

STRUCTURES MID-CONSTRUCTION

If a structure is in the process of being constructed in the photos, please do the inspection and complete the checklist to the best of your ability. *Do not simply mark it as CNI.*

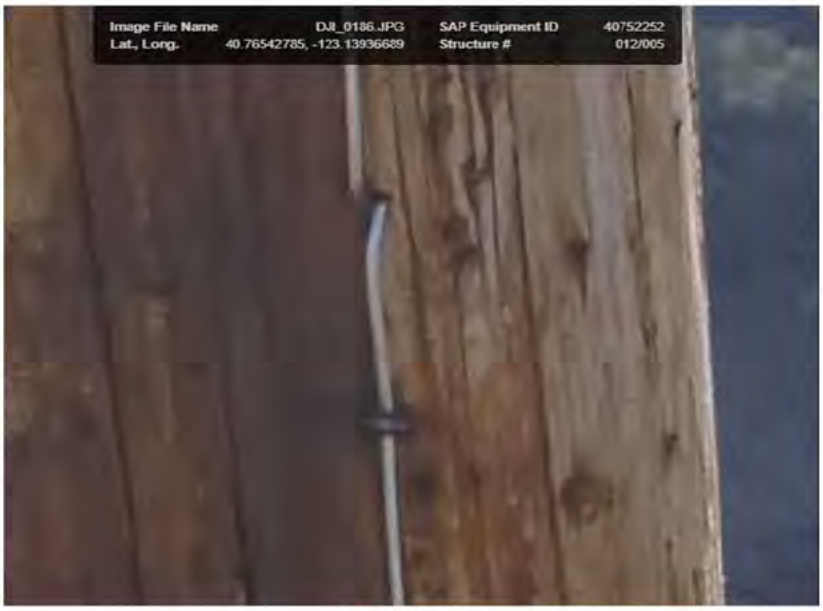
Figure 50 **Pole top crack. Hardware that is perpendicular to a crack can serve as anti-split device.**

Condition: 2
Priority: No Notification Required

Condition: 2
Priority: No Notification Required

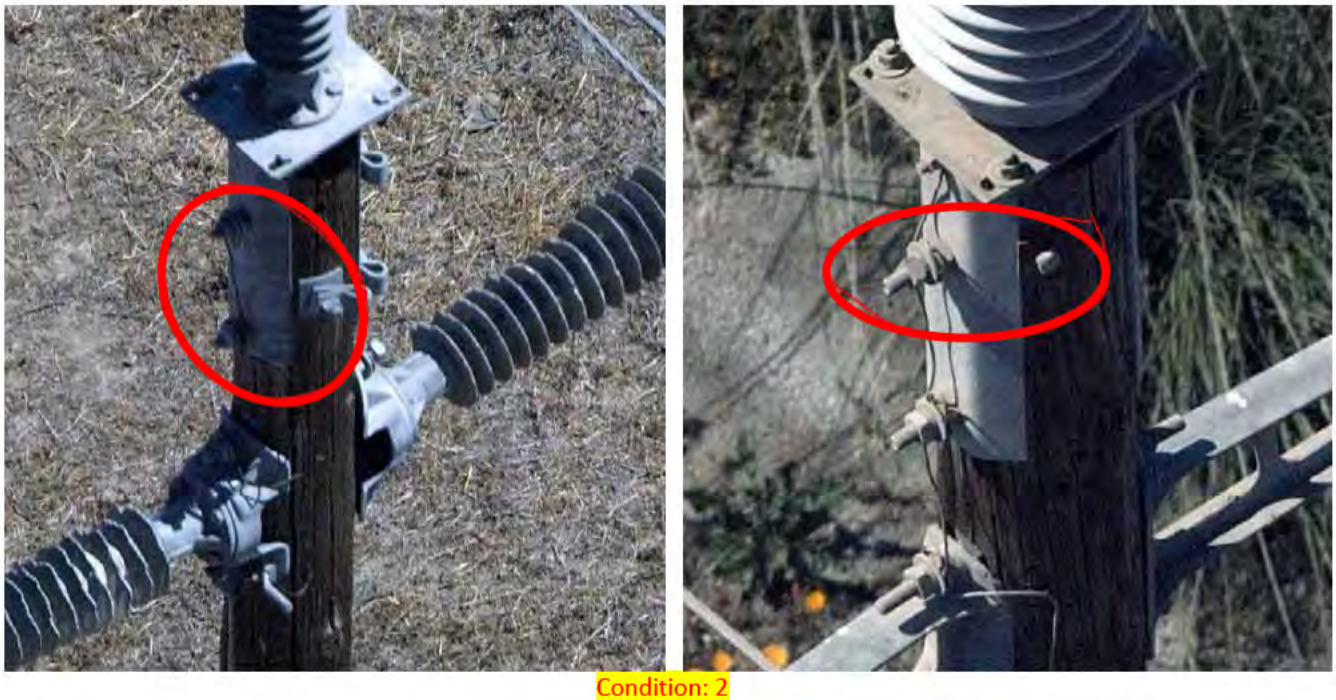
Figure 51 **Surface mold (left). Typical pole cracking and shrinking as a result of aging (right).**

Condition: 2
Priority: F
FDA: Hardware-Wood| No Good/Out of Stdrd | Replace



Condition: 5
Priority: A
FDA: Emergency | Storm Related | Repair

Figure 52 **Missing bond wire (left). Broken bond wire with gap <0.25" (right). Risk of spark requires A priority tag per Table 4.**



Condition: 2
Priority: F
FDA: Hardware-Wood| No Good/Out of Stdrd | Replace

Figure 53 **Split bolt installed within 1-1/2" of bonded hardware and missing a bonding wire itself. This requires installation of a bonding wire with an F priority.**

Condition: 3
Priority: E
FDA: Hardware-Wood|No Good/Out of Stdrd|Replace

Figure 54 **When transmission framing consisting of multiple X-arms (left), there needs to be a common bond between them. All associated hardware and any hardware within 1-1/2 inches of bonded hardware, needs to be incorporated into the bonding scheme. Staples are not approved to join two sections of bond wire (right). If there is a gap less than <0.25" between them, *this should be sent as a possible emergency tag.***

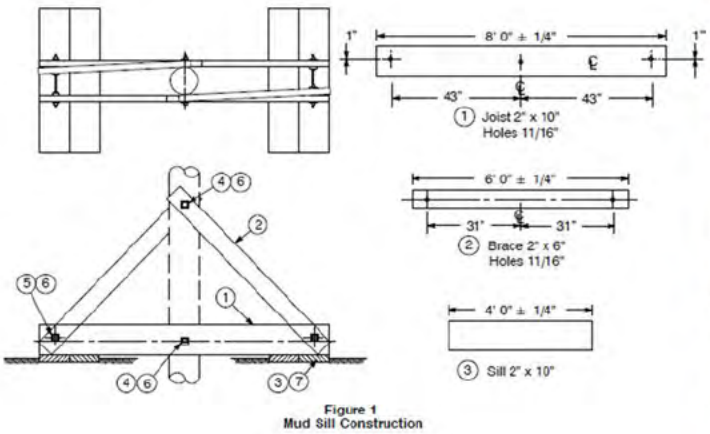


Figure 1
Mud Sill Construction

Condition: 3
Priority: E
FDA: Structure-Wood|No Good/Out of Stdrd|Repair

Figure 55 **"Mud Sills for Wood Pole Lines" from Document 030109 (left). Damaged mud sill (right). This is also known as a 'bog shoe' or 'swamp brace'.**

Condition: 3
Priority: E
FDA: Structure-Wood|No Good/Out of Stdrd|Replace

Condition: 2
Priority: F
FDA: Structure-Wood/Steel|Debris/Nest/etc|Remove

Figure 56 **A pole which has been braced by a wood stub (left). Old structure foundation needs to be removed (right).**

Condition: 2
Priority: F
FDA: Structure-Wood|Debris/Nest/etc|Remove

Condition: 2
Priority: F
FDA: Structure-Wood|Debris/Nest/etc|Remove

Figure 57 **Soil erosion/medium hole near base of structure (left). If the stub is cut off at ground level and has rotted or started to rot and to form a hole, or if it has the potential to be a tripping hazard, it should be given an F priority, due to risk to humans, as well as livestock and other animals (right).**

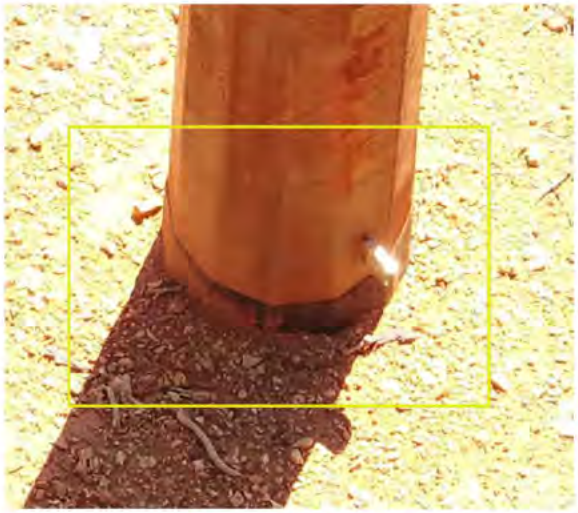
Condition: 3
Priority: E/F
FDA: Structure-Steel|No Good/Out of Stdrd|Repair

Figure 58 **The above TSP has the top open to the elements. This can cause a buildup of moisture in the interior of the pole. This should be given an F tag. However, if there are signs of rust or corrosion damage at the base of the pole, it can be upgraded to an E.**

Condition: 3
Priority: E
FDA: Structure-Wood|No Good/
Out of Stdrd|Repair

Condition: 3
Priority: E
FDA: Structure-Wood|No Good/
Out of Stdrd|Repair

Figure 59 **These structures should have at least one tab buried (left). Direct buried foundation with soil erosion more than 3 feet (right).**



Condition: 3
Priority: E
FDA: Structure-Wood|No Good/Out of Stdrd|Repair

Condition: 1
Priority: No Notification Required
FDA: N/A

Figure 60 **Worn mastic with signs of rust (left). Not all mastic is black, and lighter shades don't necessarily mean there's wear present (right).**

Pacific Gas and Electric Company

Utility Bulletin: TD-051742B-001
Publication Date: 01/24/2018 Rev: 0

Ladder Requirements for Tubular Steel Poles and Light Duty Steel Poles

SUMMARY

This bulletin will state the ladder requirements for TSP's (Tubular Steel Poles w/Foundation) & LDSP's (Light Duty Steel Poles) under 90' tall in areas that are accessible to bucket trucks 365 days a year. Bucket trucks that have 90' reach are assumed to be readily attainable.

Level of Use: Informational Use

AFFECTED DOCUMENT

This bulletin affects Tubular Steel Poles standard 051742 general note 6.

TARGET AUDIENCE

Transmission line Project Managers, Transmission Line Responsible Engineers, Transmission line Maintenance and Construction

WHAT YOU NEED TO KNOW

- TSP's & LDSP's (Light Duty Steel Poles) under 90' tall in locations that have bucket truck access 365 days a year will not be required to have ladders installed the length of the pole.

DOCUMENT APPROVER

[redacted] Manager, Transmission Line and Substation Standards

DOCUMENT CONTACT

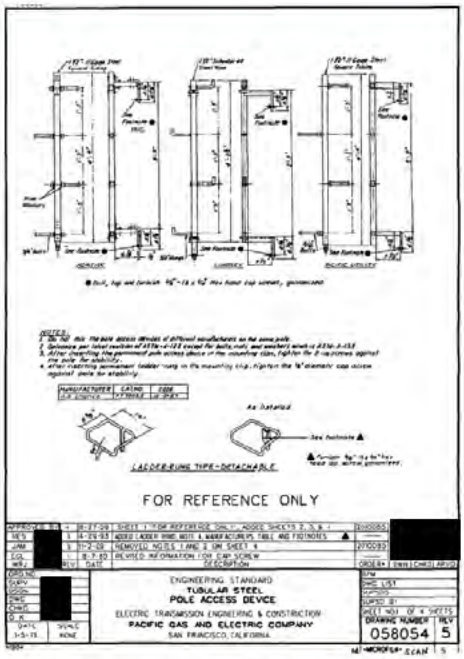
[redacted] Sr. Standards Engineer

[redacted] Sr. Standards Engineer

[redacted] Expert Reliability Specialist

INCLUSION PLAN

This bulletin will be absorbed in the next revision of Document 051742 Tubular Steel Poles standard.



Document TD-051742B-001 outlines the need to install climbing racks (Dwg 05854) to LDSP and TSP poles that are not accessible. If the pole is missing the climbing racks, use priority E and FDA Hardware-(Wd/Stl)|No Good/Out of Stdrd|Replace.

Crossarms and Bracing

Condition: 5
Priority: A
FDA: Emergency|Other|Replace

Condition: 5
Priority: A
FDA: Emergency|Other|Replace

Figure 61 **Failed H-frame crossarm (left). Failed crossarm bracing (right).**

Condition: 4
Priority: E+
FDA: Crossarm-Wood|No Good/Out of Stdrd|Replace

Figure 62 **Detached H-frame bracing.**

Condition: 3
Priority: E
FDA: Crossarm-Wood|No Good/Out of Stdrd|Repair

Condition: 3
Priority: E
FDA: Crossarm-Wood|No Good/Out of Stdrd|Repair

Figure 63 Damage to crossarm brace.

Condition: 4
Priority: E+
FDA: Crossarm-Wood|No Good/Out of Stdrd|Repair

Condition: 4
Priority: E+
FDA: Crossarm-Wood|No Good/Out of Stdrd|Replace

Figure 64 Damage to crossarm brace at hardware, missing bracing (left). Cracked crossarm at hardware (right).

Crossarm decay/rot resulting in 20-50% of cross-sectional material loss

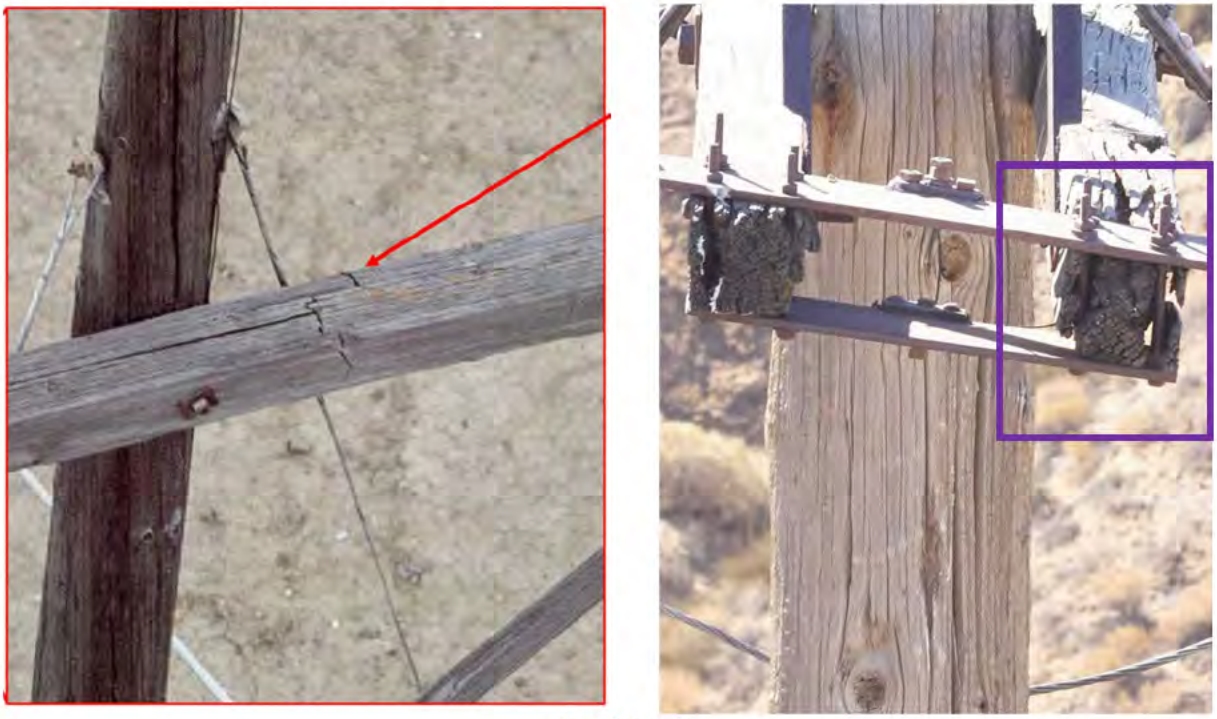
Condition: 4
Priority: E+
FDA: Crossarm-Wood|No Good/Out of Stdrd|Replace

Condition: 3
Priority: E
FDA: Crossarm-Wood|No Good/Out of Stdrd|Replace

Figure 65 **Heavy damage/crossarm rot compromising hardware (left) and moderate damage/crossarm rot (right).**

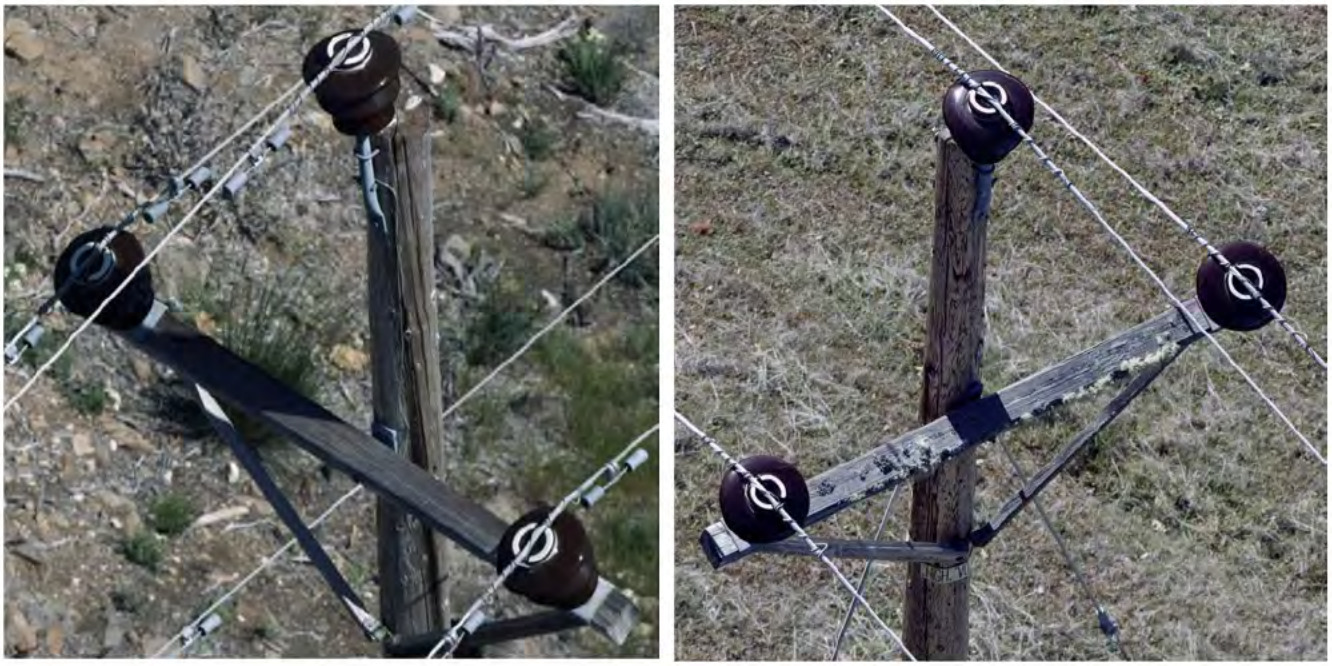
Condition: 3
Priority: E
FDA: Crossarm-Wood|No Good/Out of Stdrd|Replace

Figure 66 **Cracked crossarm (left and right). Note: Field will not repair tri-pin framing, so a "replace" FDA is preferred in this case.**



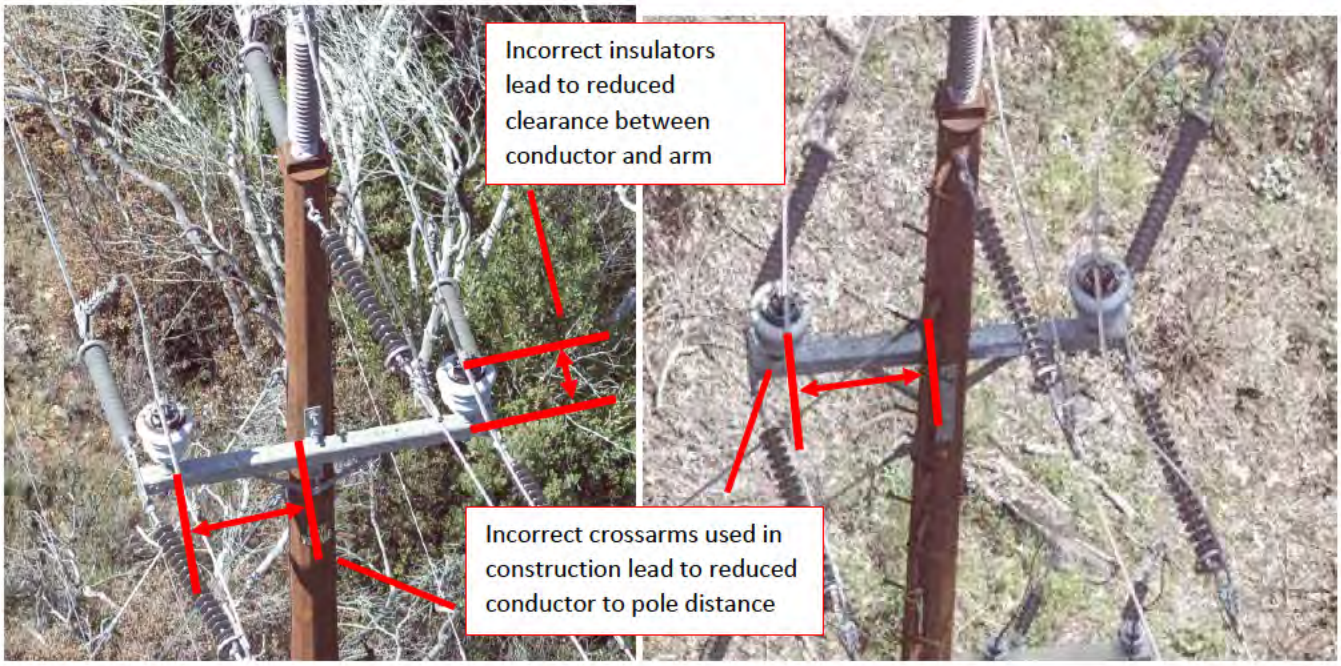
Condition: 5
Priority: A
FDA: Emergency-Wood|Other|Replace

Figure 67 **Crossarm cracked >50% (left). Crossarm cracked/rotten with signs of hardware slippage (right).**



Condition: 3
Priority: E
FDA: Crossarm-Wood|No Good/Out of Stdrd|Replace

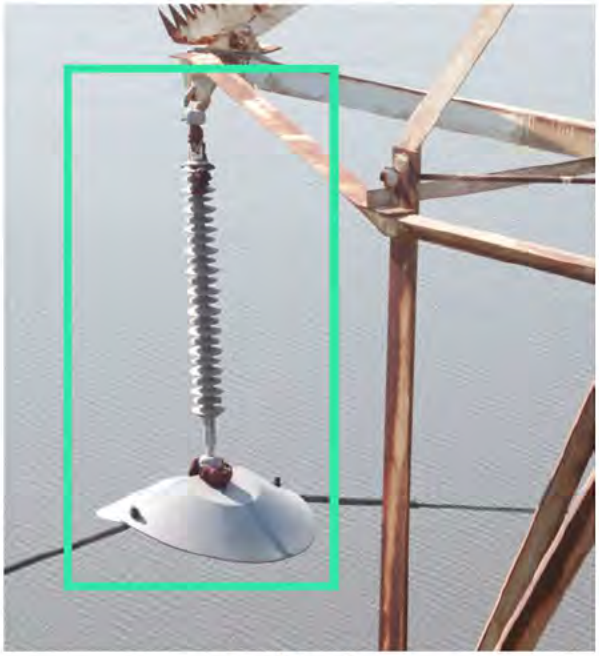
Figure 68 **Examples of crossarm twisting/rolling.**



Condition: 4
Priority: E+
FDA: Crossarm-Wood|No Good/Out of Stdrd|Replace

Figure 69 **Insufficient crossarm length and insulator sizes can reduce the clearances between conductor and pole or conductor and crossarm to potentially dangerous distances.**

Figure 70 **Structure with correct clearances between pole, crossarm, and conductor.**



Condition: 3
Priority: E
FDA: Raptor Guard-Wood/Steel|No Good/Out of Stdrd|Install

Condition: 1
Priority: None

Figure 71 **Damaged raptor guard (left). Poles with open-ended crossarms with evidence of bird activity should be covered as in the photo (right). If not, they should be written up with an F priority tag.**

Condition: 2
Priority: F
FDA: Raptor Guard-Wood/Steel|No Good/Out of Stdrd|Install

Condition: 2
Priority: F
FDA: Raptor Guard-Wood/Steel|No Good/Out of Stdrd|Install

Figure 72 **Examples of bird activity in the open ended crossarm. Bird droppings (left) and a nest within the crossarm (right). Contamination of the insulators should be determined by direction of JA07.**

Towers

Please reference TD-1001M-JA04 Identifying Levels of Deterioration and Corrosion on Transmission Line Steel Structures and Supports, for more information.

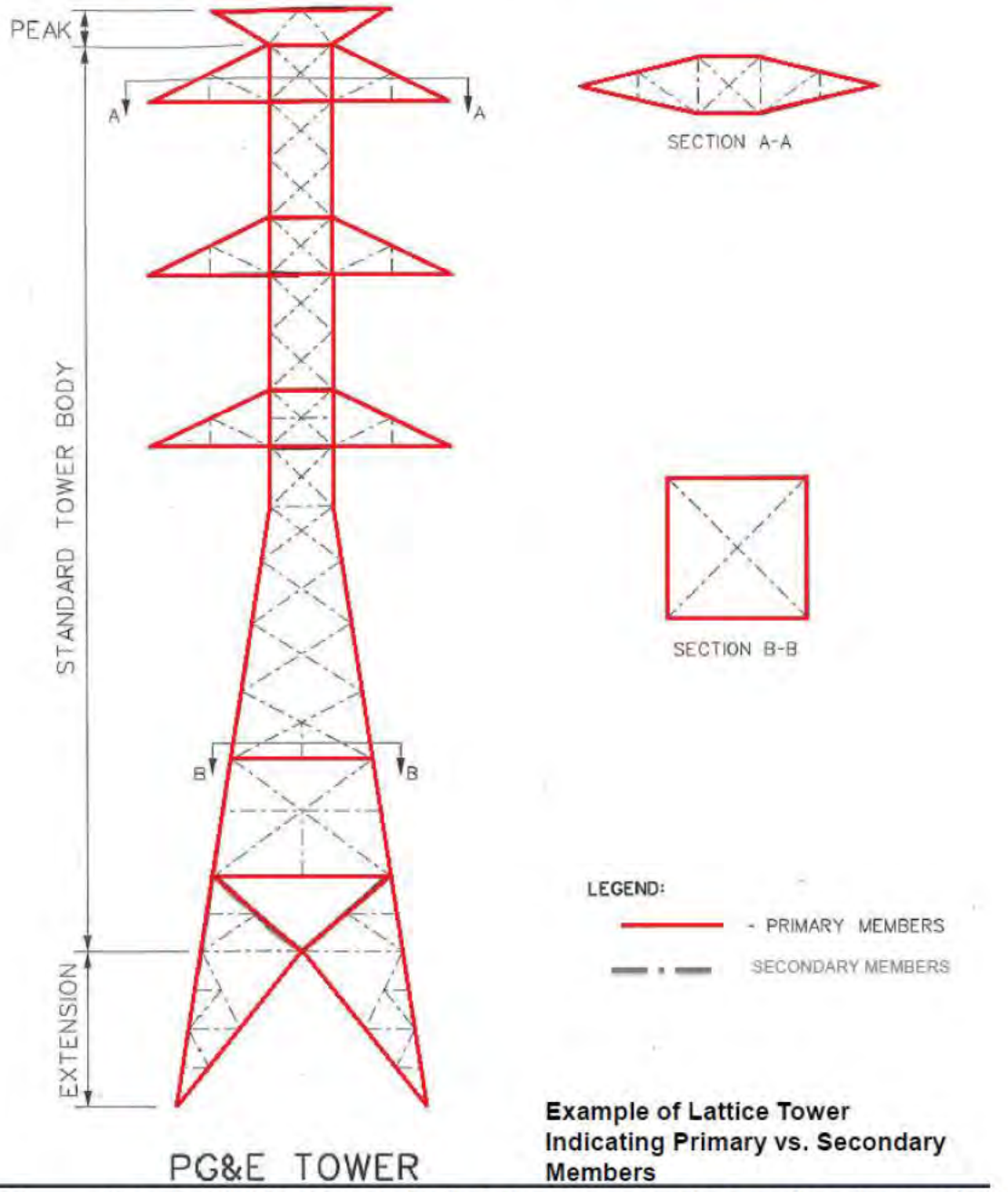
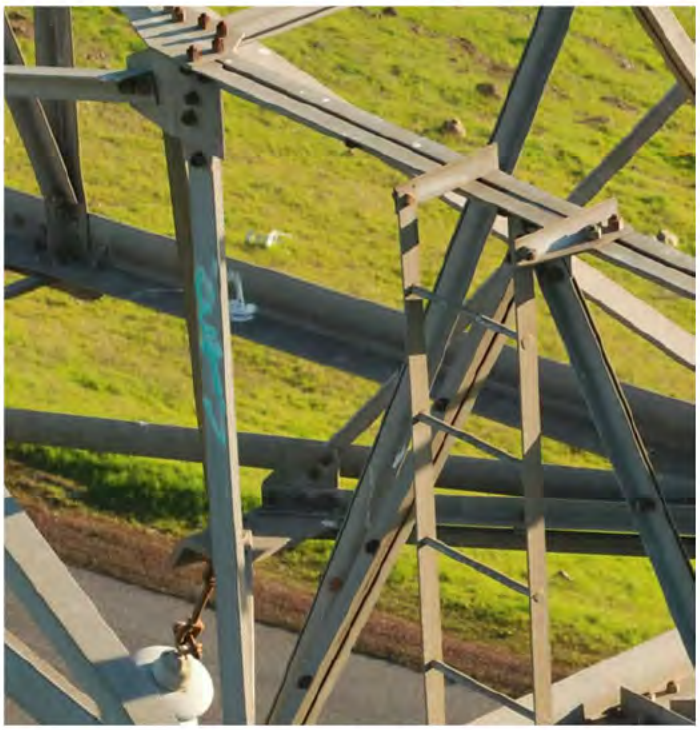


Figure 73 **Example of lattice tower indicating primary vs. secondary members. In general, damages to the primary members will be evaluated with a higher priority than secondary members.** ***If damage to a member compromises structural integrity of the tower, it should be given a E+ tag, otherwise use an E priority.***



Condition: 5
Priority: A
FDA: Emergency|Storm Related|Repair

Figure 74 **Examples of unauthorized climbing. Evidence of public activity.**

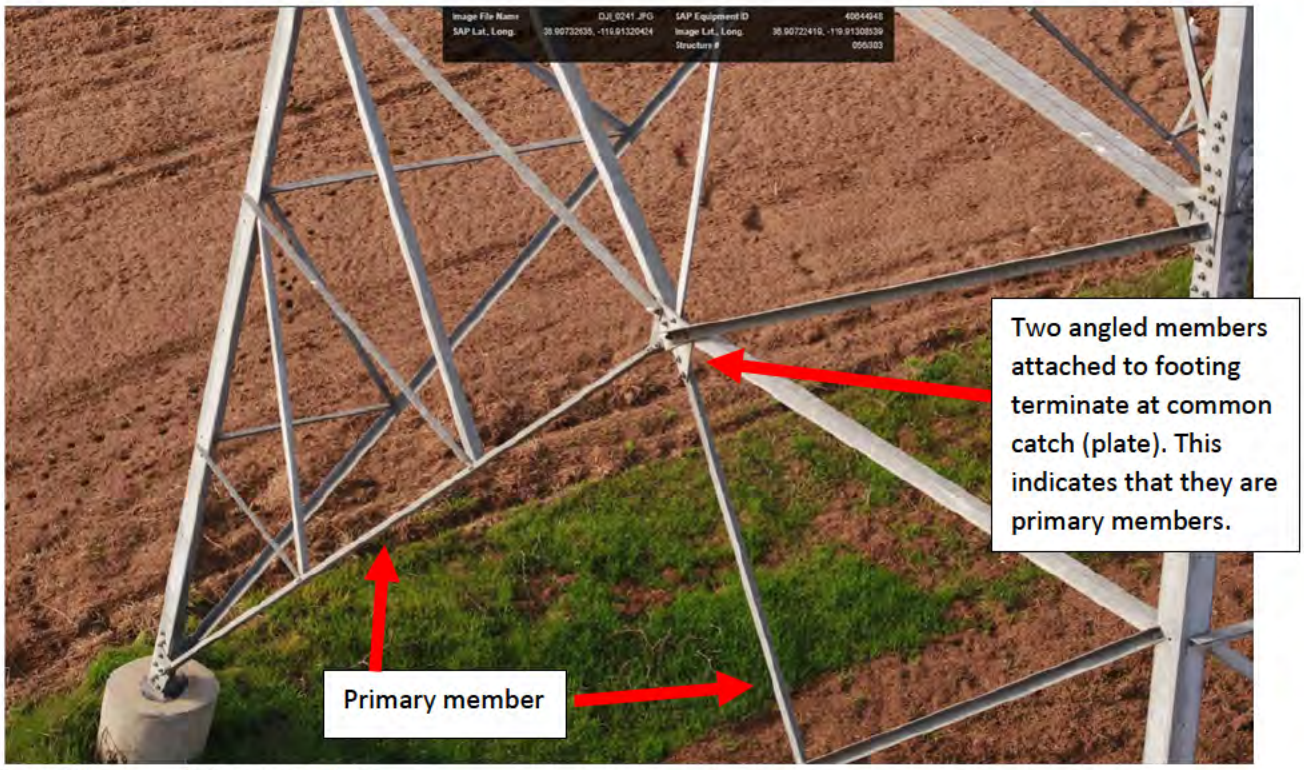
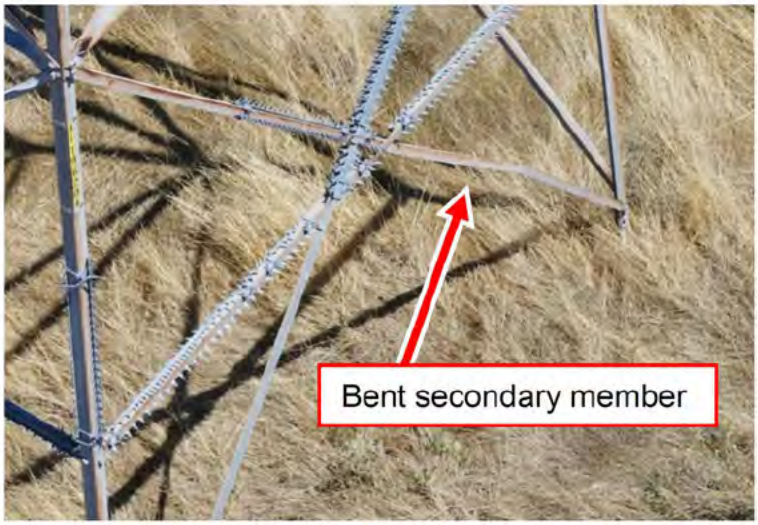


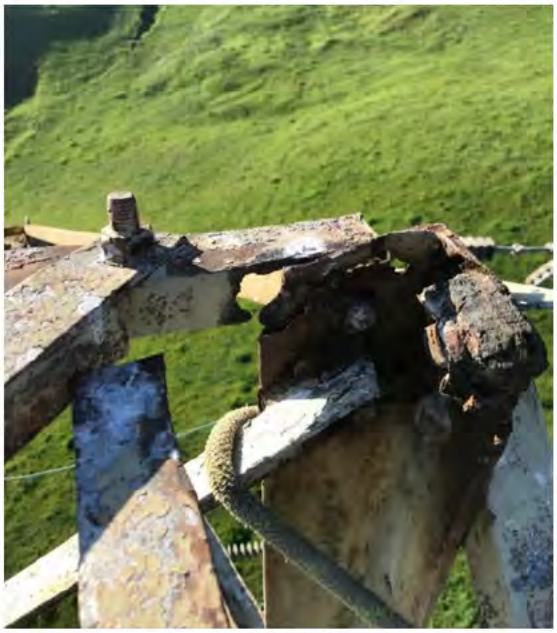
Figure 75 **Primary members**



Condition: 3
Priority: E
FDA: Structure-Tower|No Good/Out of Stdrd|Repair

Figure 76 **Secondary member. The two angled members are *not* attached to a plate, but instead continue straight through to the legs. This indicates they are secondary.**

NOTE: Deformed members should be written up *regardless* of the type of deformation ("bent", "kinked", etc). Trying to draw a distinction between different deformation types has led to confusion. Please write up any deformed/bent members with the appropriate priority. Only damage should be written up. Intentional kinks for construction should of course be ignored.



Condition: 5
Priority: A
FDA: Emergency|Storm Related|Repair

Condition: 5
Priority: A
FDA: Emergency|Storm Related|Repair

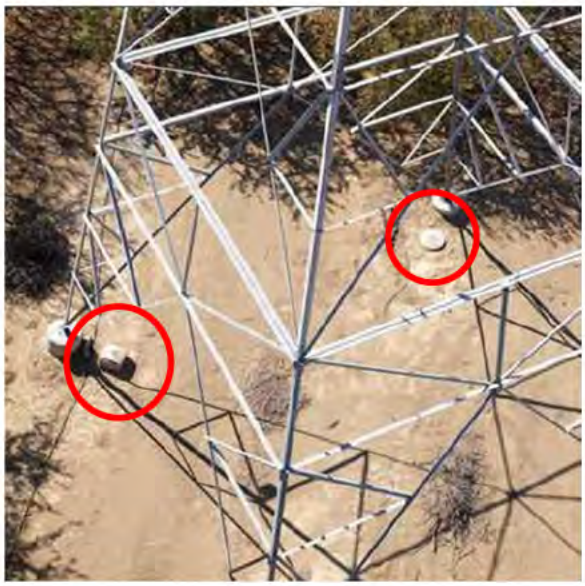
Figure 77 Severe member rust (left). Cracked crossarm member (right).

Condition: 4
Priority: E+
FDA: Structure-Tower|No Good/Out of Stdrd|Repair

Condition: 4
Priority: E+
FDA: Structure-Tower|No Good/Out of Stdrd|Repair

Figure 78 Cracked bolt hole in crossarm (left). Corroded connection plate(right).

Condition 4
Priority E+
FDA: Structure-Tower|No Good/Out of Stdrd|Repair



Condition: 2
Priority: F
FDA: Structure-Steel|Debris/Nest/etc.|Remove

Figure 79 **Critical/main member corrosion with 30-50% material loss (left). Old tower foundation (CIRT to contact civil engineering for action) (right).**

Condition: 2
Priority: F
FDA: Structure-Steel|Paint/Coating|Other

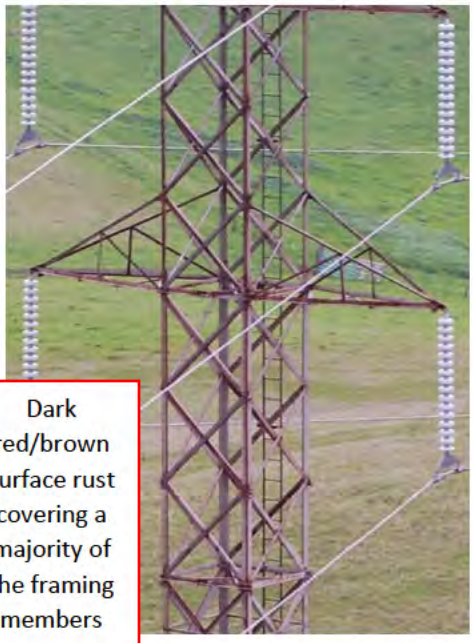
Figure 80 **Worn paint/galvanizing finish with material loss starting to develop (left). Worn paint (right).**

Condition: 2
Priority: F
FDA: Structure-Steel|Paint/Coating|Other

Figure 81 Examples of spotted dark red rust with some material loss (left). Dark red rust (right).

Condition: 1
Priority: No notification required

Figure 82 Examples of minor surface rust with no material loss.

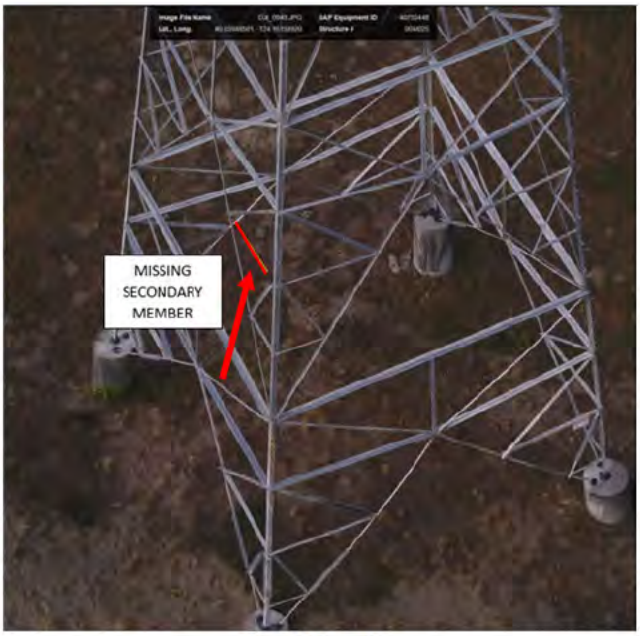


Condition: 2
Priority: F
FDA: Structure-Steel|Paint/Coating|Other

Condition: 4
Priority: E+
FDA: Structure-Tower|No Good/Out of Stdrd|Repair

Figure 83 **Lattice tower surface rust (left). Bent primary member on crossarm (right). *Any additional bent members on the same crossarm should be considered a possible A priority.***

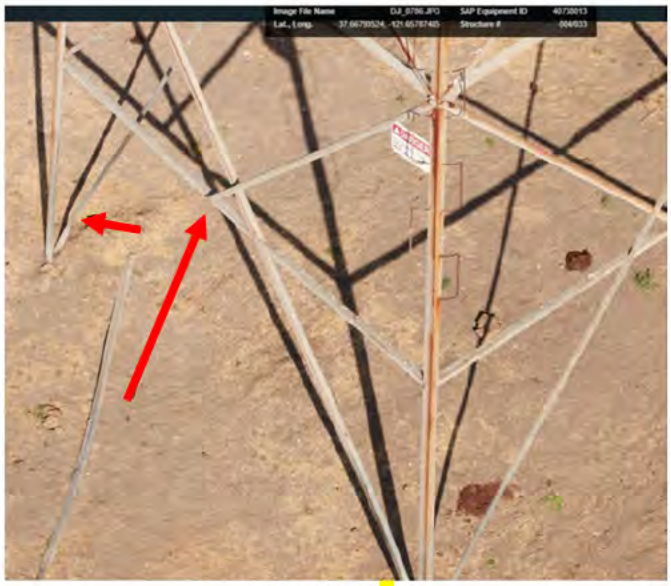
Condition: 4
Priority: E+
FDA: Structure-Tower|No Good/Out of Stdrd|Repair



Condition: 4
Priority: E+
FDA: Structure-Tower|No Good/Out of Stdrd|Repair

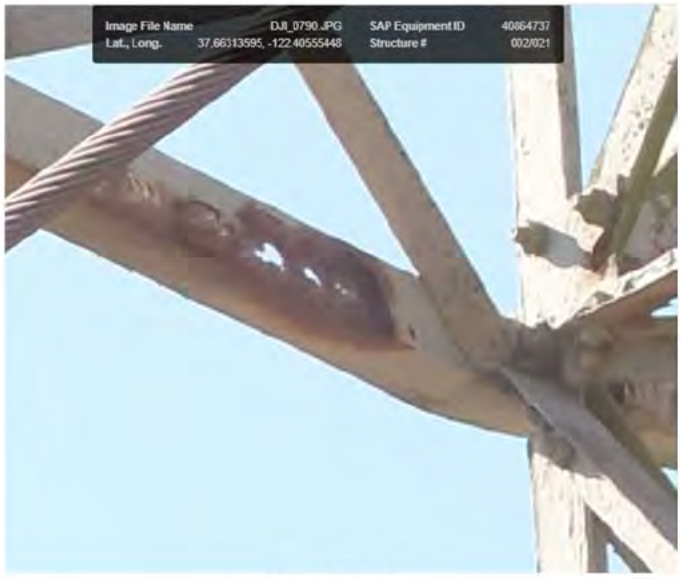
Figure 84 **Bent secondary members (multiple) compromising structural integrity (left). Missing secondary member (right). Only noticeable when compared to other locations on the tower.**

Condition: 4
Priority: E+
FDA: Structure-Tower|No Good/Out of Stdrd|Repair



Condition: 4
Priority: E+
FDA(1): Structure-Tower|No Good/Out of Stdrd|Repair
FDA(2): Structure-Steel | Debris, Nest, etc. | Remove

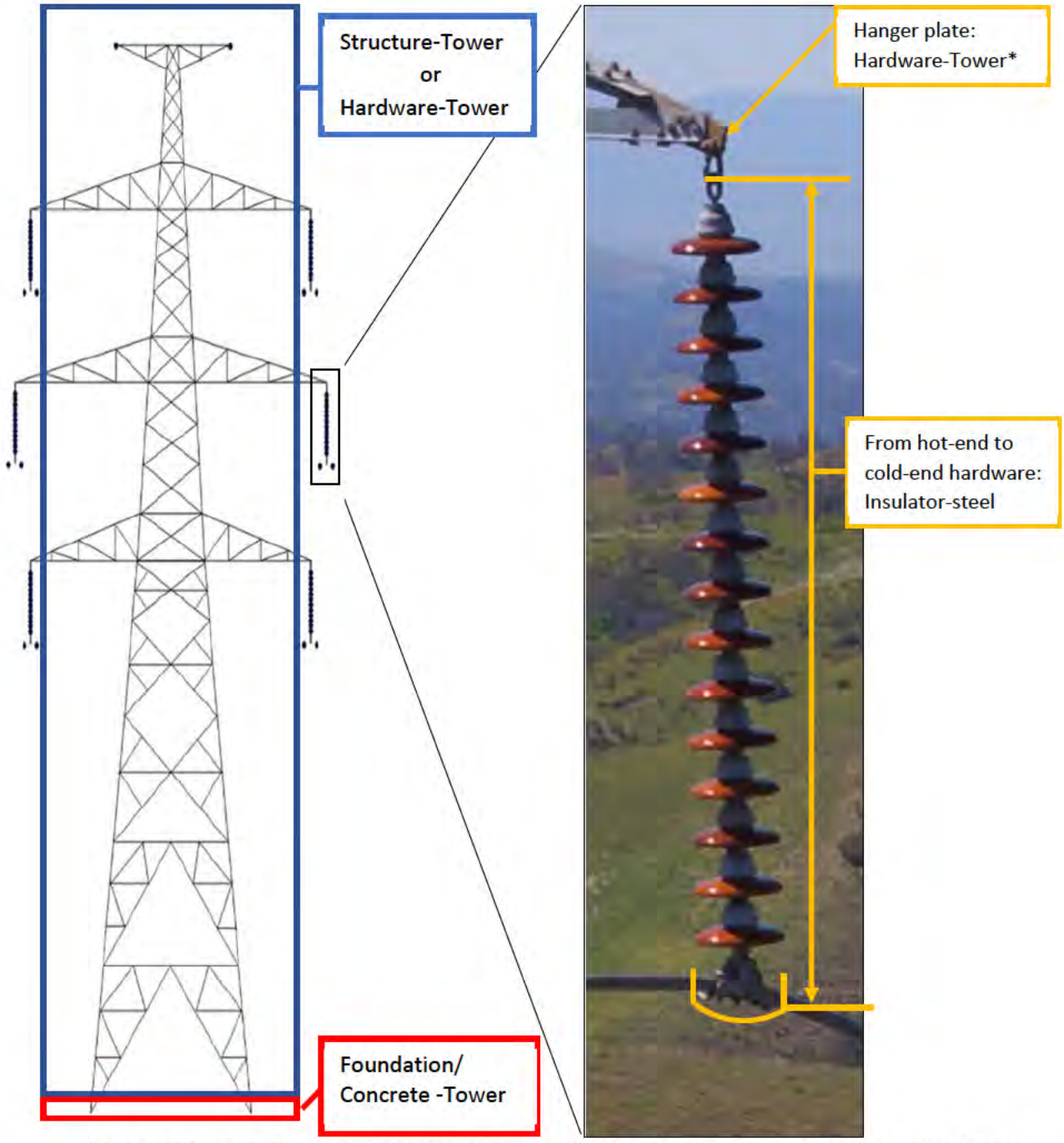
Figure 85 **Moderate damage to primary member (left). Completely missing secondary member, with buckling members in other locations E+; Debris F-priority (right).**



Condition:5
Priority: A
FDA: Emergency-Steel|Other|Replace

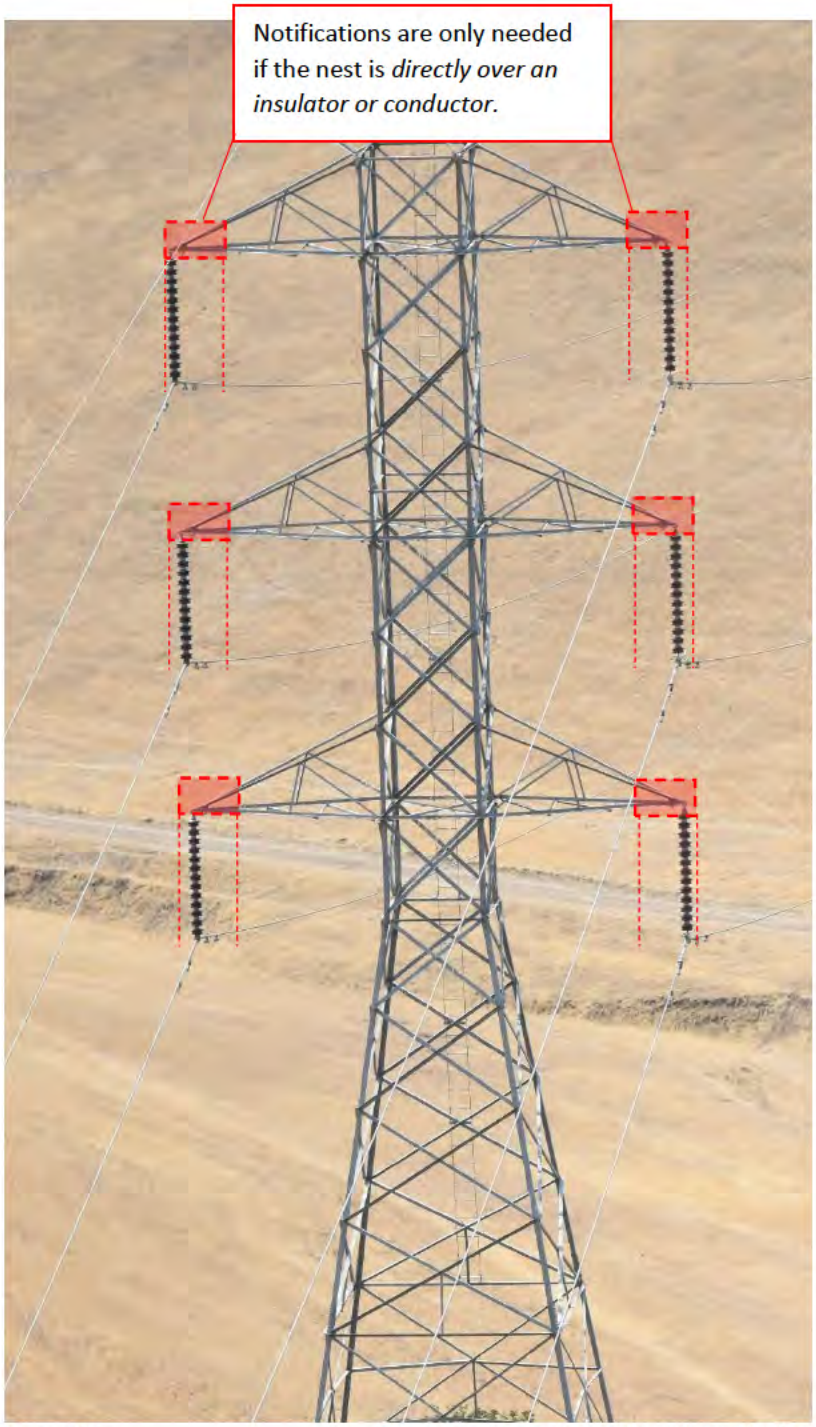
Condition:5
Priority: A
FDA: Emergency-Steel|Other|Replace

Figure 86 **Two types of A priority damage on crossarms. One is rusted through with material loss>50%. The other has had a mechanical failure of the crossarm.**



**** For worn hanger plate and C-hook, create two notifications (two rows in word doc) – one for hanger plate and one for cold-end hardware. If insulators look more than 3 years old (e.g., brown porcelain), call to replace the insulators instead of just replacing insulator hardware.***

Figure 87 **Diagram of Facility codes to be used in creating notifications for towers.**



Note:

Notifications are only required for large raptor nests above the conductor. Use an "E" priority tag.

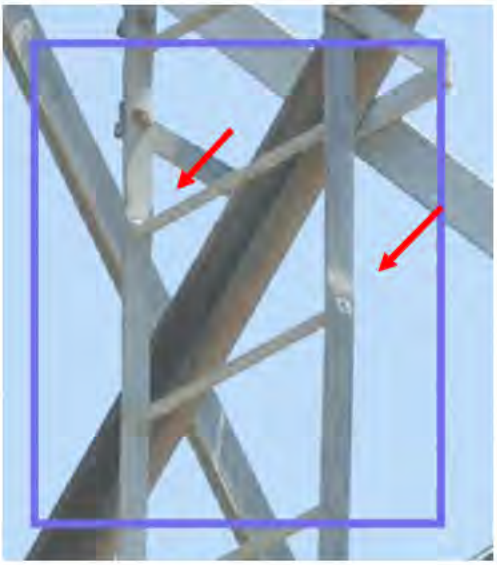
Separate from being over the conductor, if there is evidence of corrosion on the members due to the nest it would warrant an E notification. Check for nest decay as a potential indicator of moisture.

Condition: 3
Priority: E
FDA: Structure-Steel|Debris/Nest/etc|Remove

Figure 88 **Large raptor nest and regions that require a nest notification**

See: TD-1001M-JA09 **Identifying Maintenance Work on Bird Nests on Transmission Line Structures and Supports** for more info on bird nests

Note: It is standard practice to only install a complete set of climbing steps on one leg of a 500kV tower.



Condition: 2
Priority: F
FDA: Hardware-Tower|No Good/Out of Stdrd|Replace

Figure 89 Climbing steps in poor condition (left). Bent ladder (right).

Pacific Gas and Electric Company

Utility Standard: TD-1009S
Publication Date: 01/29/2021 Rev: 2

Requirements for Marking, Guarding, and Stepping T&D Towers and Lattice Steel Poles

4 Stepping

4.1 Tower steps and ladders must not be less than 7 ft, 6 inches (in.) from the ground line or from any easily climbed foreign structure within 6 ft of the tower from which one could step, including tower footings. See Figure 3 and the Definitions section below for an illustration and definition of towers that are easily climbed and towers that are not easily climbed.

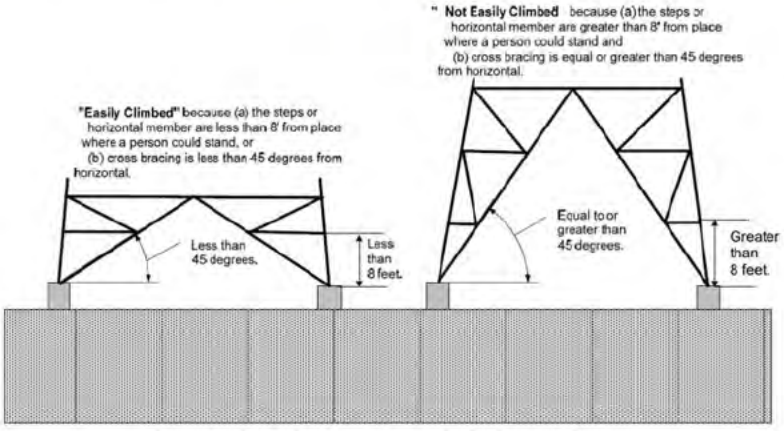
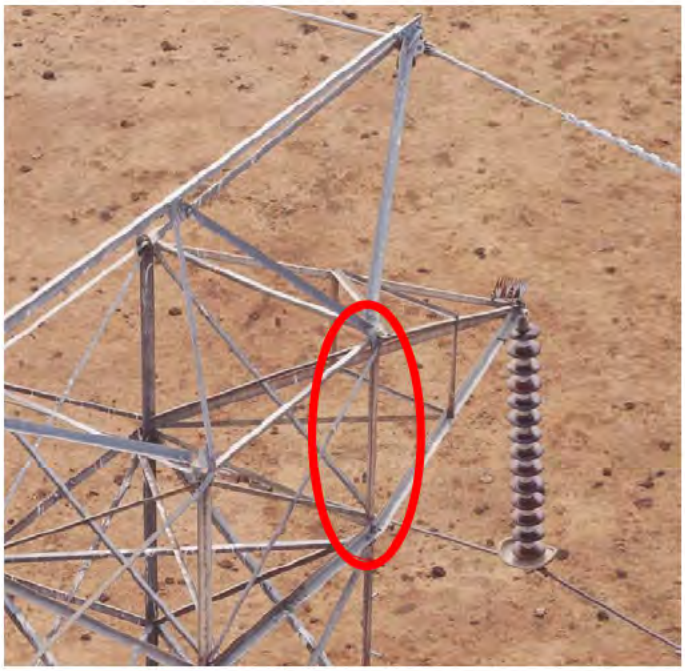


Figure 3. "Easily Climbed" and "Not Easily Climbed" Towers

4.2 Because footing caps can often be more than 6 in. above the ground line, all measurements for the installation of the first step must be from the top of the footing cap, fence, wall, or ground level which would provide access to the tower step.

4.3 Temporary steps must not be left unattended on any tower at any time.



Condition: 2
Priority: F
FDA: Hardware-Tower|No Good/Out of Stdrd|Replace

Figure 90 **Climbing steps missing. Steps must be up to level of fiber cable if installed on structure (left). Three or more adjacent (consecutive) steps must be missing to warrant a tag (right).**

Condition: 1
Priority: No notification required

Condition: 1
Priority: No notification required

Figure 91 **Damaged raptor guard (left), missing bolts that do not require a notification.**

For a complete breakdown of where climbing guards are required, please see ***TD-1009S-F01 Evaluation of Transmission and Distribution Towers or Lattice Steel Poles for Prevention of Unauthorized Climbing.***

Condition: 2
Priority: F
FDA: Structure-Tower|Anti-Climbing Guard|Install

Figure 92 **Structure in obviously populated area that should be equipped with an anti-climbing guard. Use FDA: Structure-Tower|Anti-Climbing Guard|Repair with priority F if guard is present but damaged.**

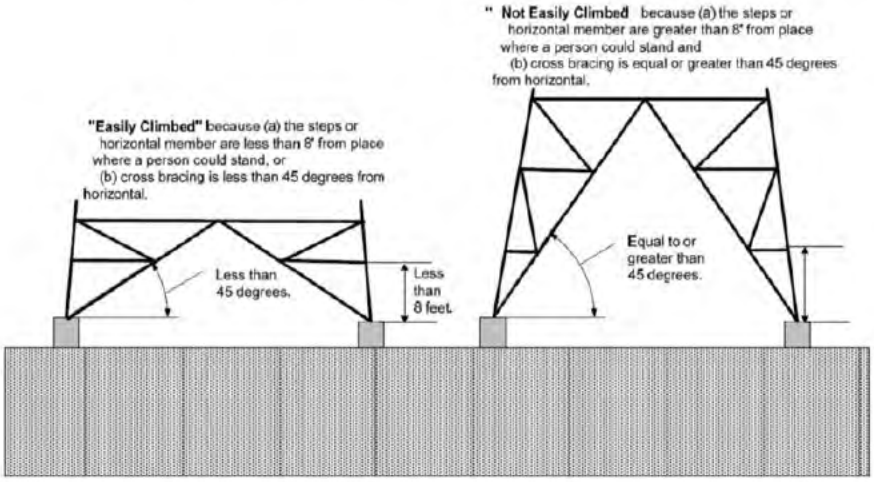


Figure 93 **Definition of "easily climbed" structures.**

Condition: 3
Priority: E
FDA: Animal Guard-Steel No Good/Out of Stdrd|Repair

Figure 94 **If an animal guard is present on the structure or guy turnbuckles but is missing/damaged on one or more of the legs or turnbuckles, write a notification to install animal guard.**

500kV Towers

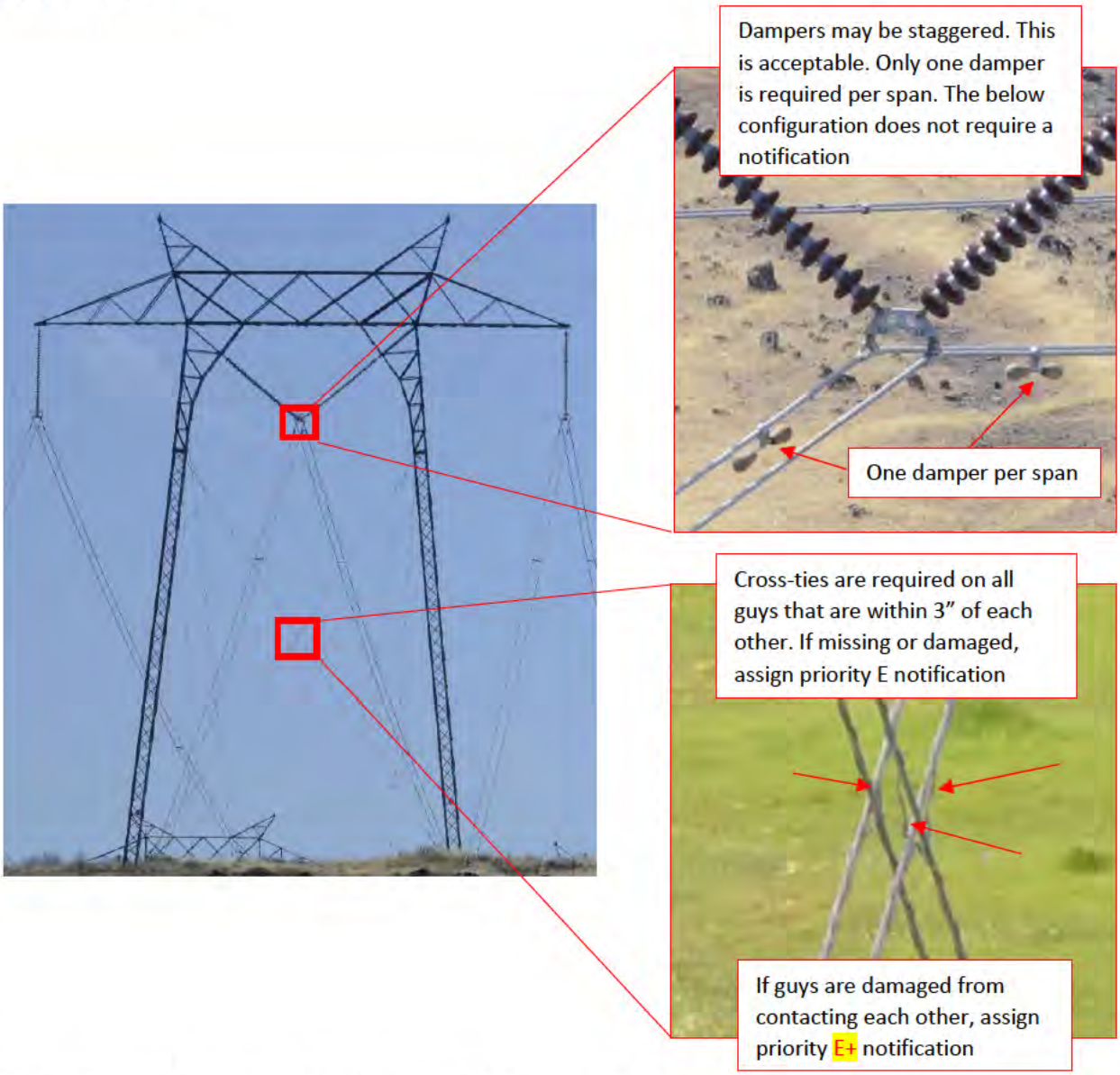
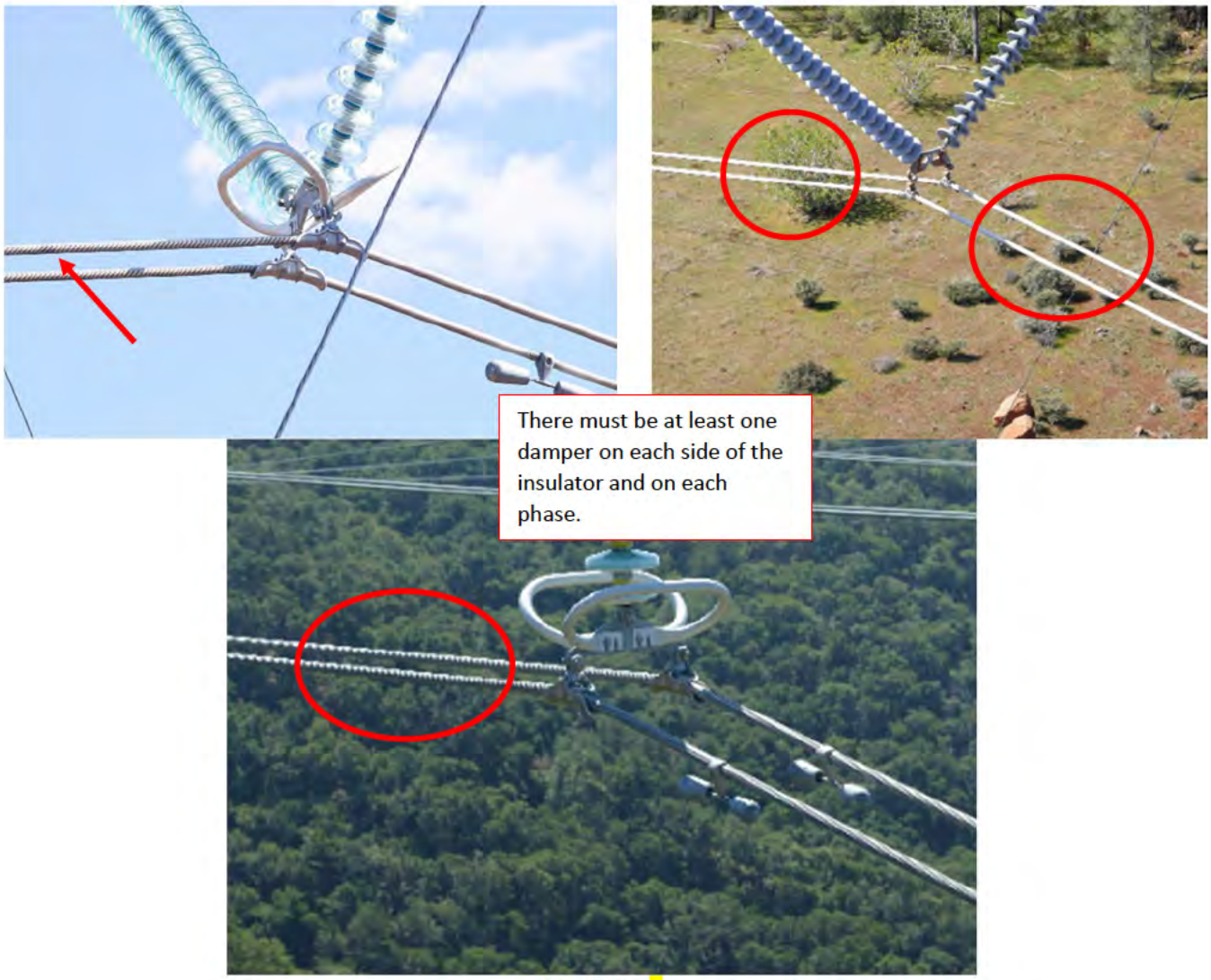


Figure 95 **Illustration of 500kV tower with acceptable damper and internal guy crosstie configurations. Only make a notification for a cross tie if it is 100% clear that a cross tie is needed or broken. Please include *multiple images* from *different angles* in your notification to make it clear.**

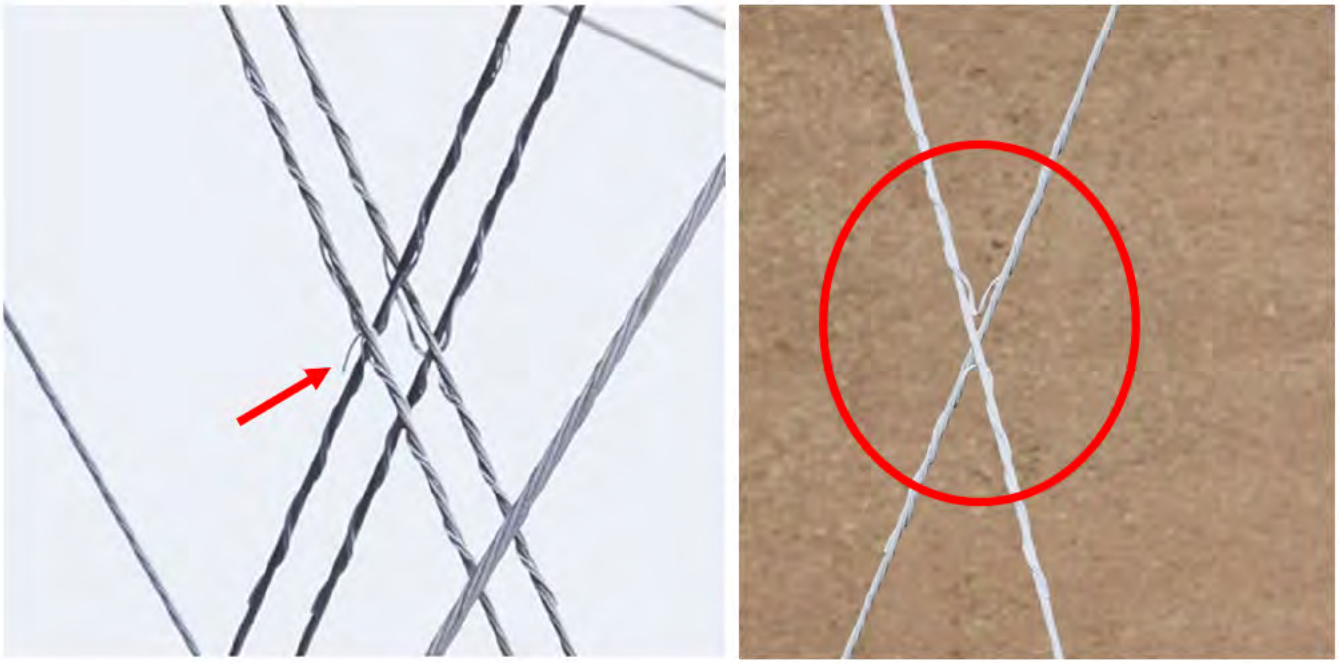


Condition: 3
Priority: E
FDA: Dampers-Steel|No Good/Out of Stdrd|Replace

Figure 96 **Examples of one missing damper (top left). Missing a damper for each span (top right). Missing a damper on one span (bottom).**

Condition: 1
Priority: No notification required

Figure 97 **Correctly installed cross tie.**



Condition: 3
Priority: E
FDA: Guy Wire-Steel|No Good/Out of Stdrd|Repair

Figure 98 **Example of damaged/loose cross tie (left). Non-standard cross tie (right).**

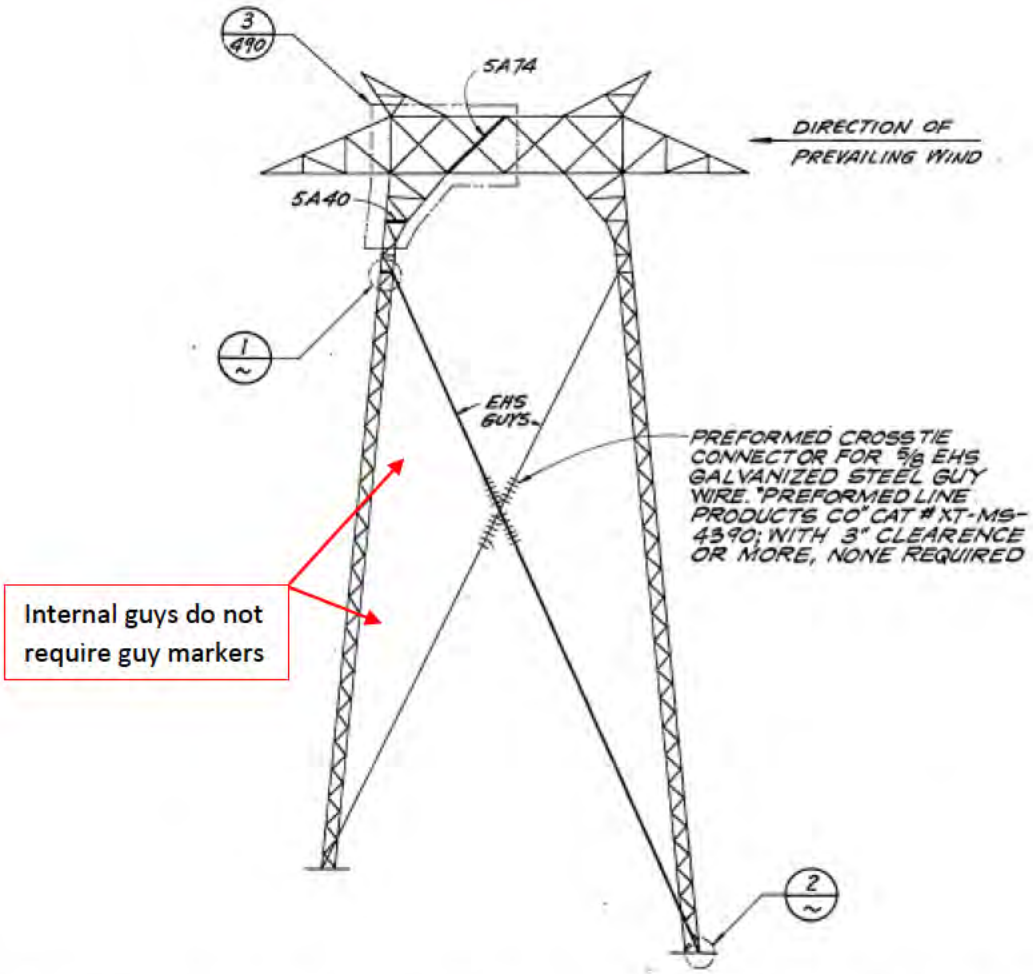
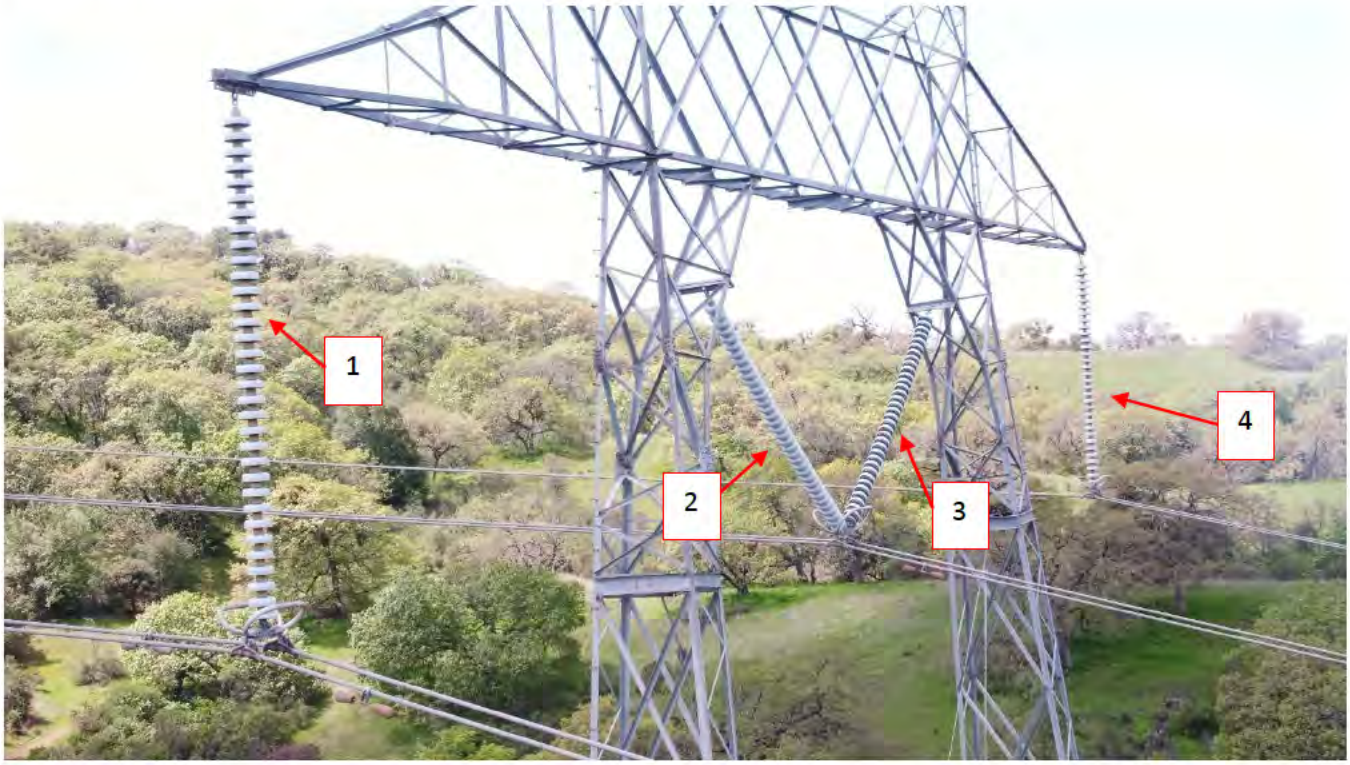


Figure 99 **Illustration of internal guys, and situation in which crosstie connectors are required for 500kV towers. TD-349487.**

Notification	Priority
Corona ring missing (required only on dead-ends or where previously installed)	E
Loose internal guys	E+
Missing, damaged, or loose cross-tie on internal guys (within 3" of each other)	E
- with damage to guys	E+
Missing guy markers (external guys only)*	F

Counting insulators (I- and V-strings)

For the purposes of the 500kV Pronto form, the answer to "How many strings?" and "Number of insulator strings" should be as follows: Each individual string counts as one. Therefore, an I-string counts as one, and a V-string counts as 2. The number and types of strings (e.g. "one V-string and two I-strings") should be included in the "Comments" field as shown below.



Hardware & Insulators	
How many strings?	4
Number of insulator strings (for records purposes) i.e. #I strings, #V strings	4
Comments	1 V-string, 2 I-string

Figure 100 **Counting strings for the 500kV Pronto form questions above. Each individual string of bells counts as one.**

500kV OPGW/Shield wire configurations

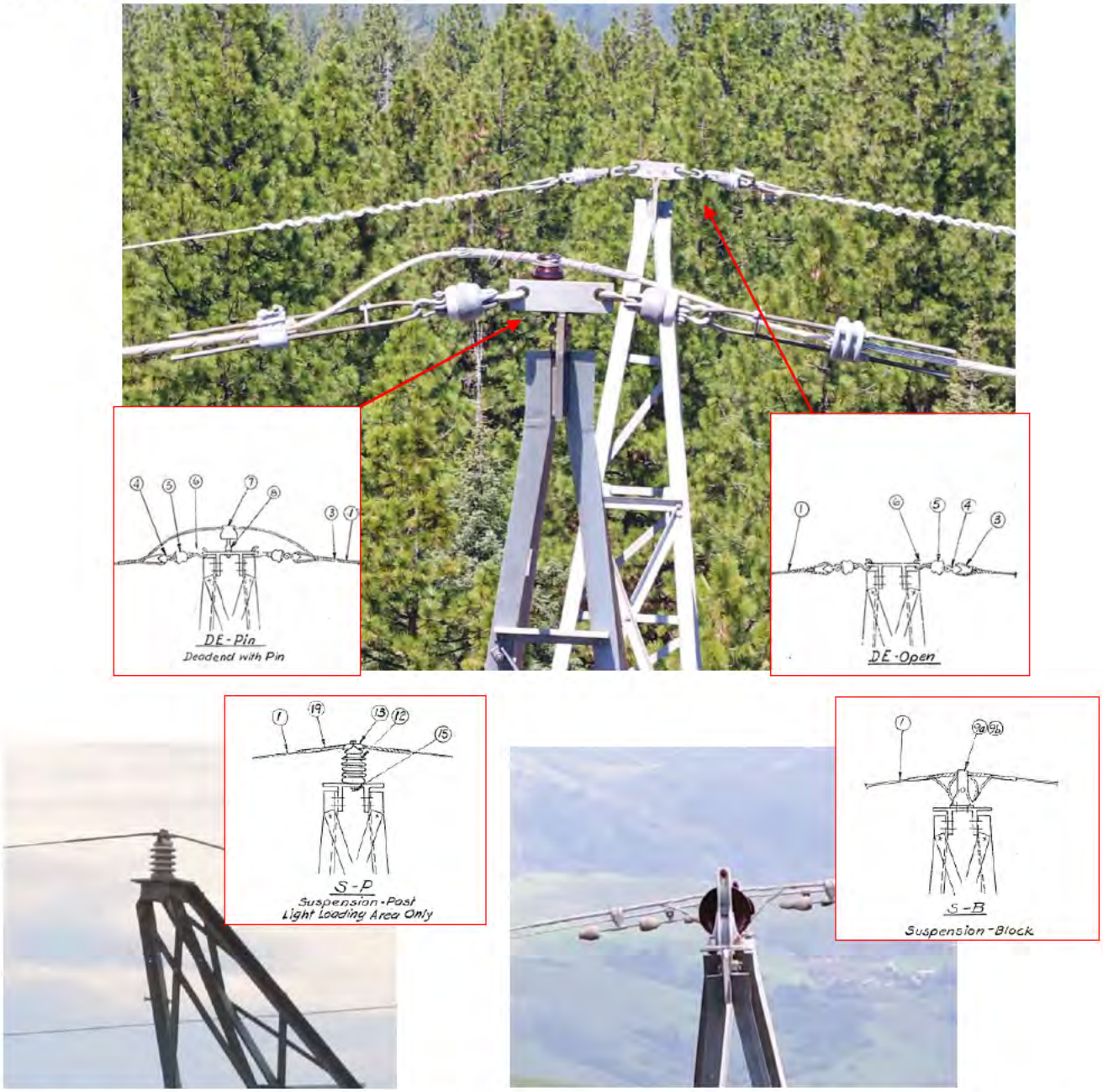


Figure 101 **Types of hardware present on 500kV OPGW/shield wire. Top photo: OPGW on near peak and shield wire on far peak. Dead-end pin (on fiber optic), dead-end open, suspension post, and suspension block.**

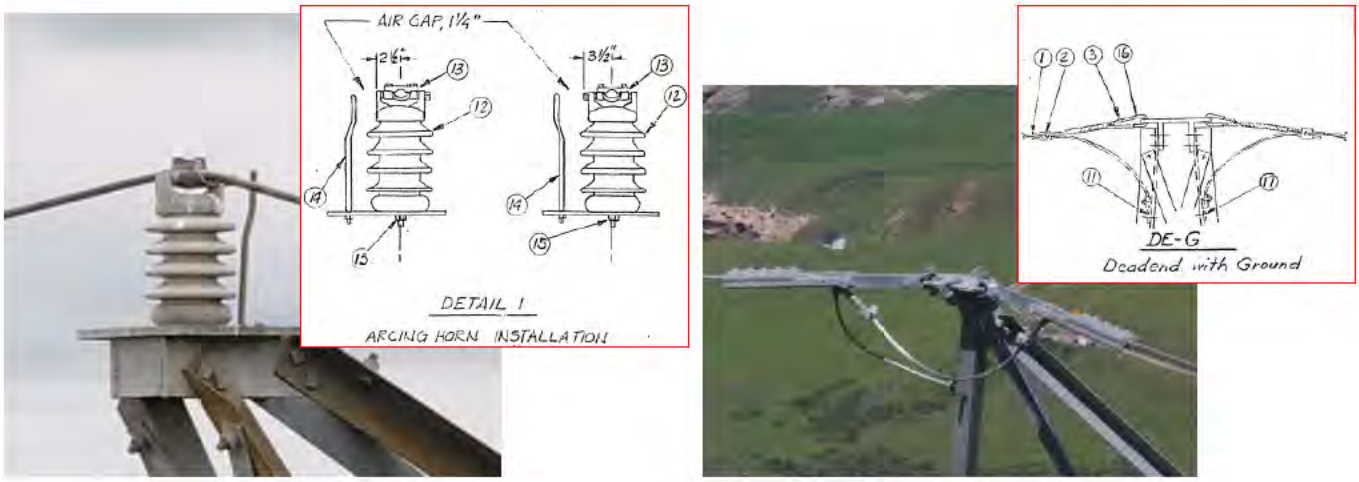


Figure 102 **Types of hardware present on 500kV OPGW/shield wire. Shield wire (left), OPGW (right). Arcing horn, and dead-end with ground (with jumper, grounded on one side).**

Insulators

Guide for Replacing Damaged Insulators

- The table below is based on ANSI C29.1 dry flashover insulator characteristics. If possible, replace insulators before the onset of wet weather.
- Adjust the Priority Code based on the various conditions that may exist, including
  - Priority Code A (fix immediately) for 2 or more insulators fewer than the G.O. 95 requirement
  - Priority Code E+ (fix within 3 months) for 1 insulator or fewer than the G.O. 95 requirement
  - Priority Code E (fix within 1 year) if less than design, but more than or equal to the G.O. 95 requirement
    - Number of insulators fewer than G.O. 95 requirement may be due to damaged insulators or previous designs.

If an insulator string has broken insulators and the remaining number of good insulators in the string exceeds the design number of units, assign Priority Code E

(Table 2 in JA-07)

Voltage	Configuration	Contamination District	G.O.95 Minimum Requirements		Design # of Units	Minimum # of Units
			Dry Flashover	# of Units		
500 kV	Dead-end	AAA	1,190 kV	23	34	32
	Dead-end	B, C, D			34	32
	Vee String	AAA			36	34
	Vee String	B, C, D			34	32
	Suspension	AAA			32	30
	Suspension	B, C, D			32	30
230 kV	Dead-end	AAA	582 kV	12	24	20
	Dead-end	A			24	20
	Dead-end	B, C, D			15	13
	Suspension	AAA			15	13
	Suspension	A, B, C, D			15	13
115 kV	Dead-end	AAA	333 kV	6	12	10
	Dead-end	A			11	9
	Dead-end	B			10	8
	Dead-end	C, D			9	8
	Suspension	AAA			10	6
	Suspension	A, B			8, 9	6
	Suspension	C, D			8	6
60/70 kV	Dead-end	AAA	180 kV	3	7	5
	Dead-end	A, B			6	5
	Dead-end	C, D			5	5
	Suspension	AAA, A, B			5	3
	Suspension	C, D			4	3

Insulator Conditions:

- Broken insulators have one or more of the following conditions:
  - Glass or porcelain is broken and only the hub is remaining.
  - One or more skirts are broken, and a piece is missing.
  - The insulator is cracked.
  - Glass insulators retain 80% of the M&E rating. Thus, if a glass insulator is broken, use Table 4 in ETPM Manual, to assign priority code to replace the broken insulator(s).
- Chipped insulators generally have little effect on the reliability of the insulator and do not need to be addressed, unless one or more of the conditions listed below are present.
  - A crack extends from the chip.
  - The chip is larger than 1-1/2 inches in diameter.
  - The chip is located next to a grouted fitting where it could trap water and freeze.
- The priority for a flashed insulator depends on the type of insulator. The following information provides some direction for assigning priorities to the various types of insulators:
  - Porcelain: Replace the entire insulator string or post insulator. Depending on the weather conditions, contamination present on the insulator, and the contamination area, assign Priority Code A, E+, or E. If assigning a Priority Code E+ or E, wash or clean the insulator as soon as practical. if contaminated. This is to prevent it from flashing over again before it is replaced.
  - Glass: Glass insulators do not always need to be replaced when flashed. If the glass is intact, cleaning the insulator usually restores its electrical strength. However, if the glass is broken, replace the insulator(s) and assign the Priority Code using the criteria for broken insulators.
  - Non-Ceramic: If the flashover damaged the insulator core/sheath or end fittings, assign Priority Code A and replace the insulator. If there is no visible damage to the insulator or end fittings, the insulator does not need to be replaced and does not need a Priority Code.

.

The above information is copied from TD-1001M-JA07 **Identifying Levels of Corrosion and Condition of Hardware and Insulators on Transmission Line Structures and Supports.** Additional information and guidance can be found in this document.

Note on flashed insulators:

- Porcelain: If flashed, create one tag to replace, and one to wash the remaining insulators
- Glass: If flashed (and no other damage), create tag to wash insulators
- Polymer: If flashed, replace insulators

Examples

The below examples are broken up by insulator type. This is for convenience only. In any case where the type of damage pictured can occur in other insulator types, it should be assumed that the damage shown, and the priority and FDA listed should be applied to other insulator types as well (for example, out of plumb or contaminated insulators).

Ceramic/Porcelain

Condition: 3
Priority: E
FDA: Tie Wire-Wood|No Good/Out of Stdrd|Replace

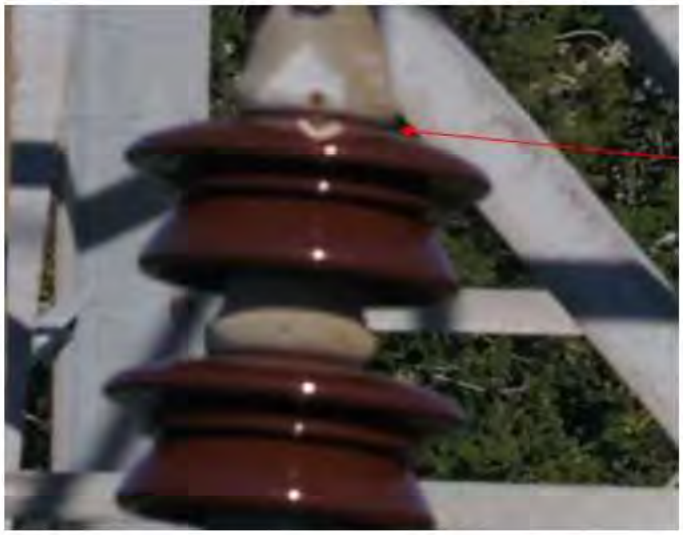
Condition: 5
Priority: A
FDA: Emergency|Storm Related|Repair

Figure 103 **Loose tie wire with uplift, conductor still over the biscuit (left). Loose tie wire with uplift and insulator starting to turn (right).**

Condition: 3
Priority: E
FDA: Tie Wire-Wood|No Good/Out of Stdrd|Replace

Condition: 1
Priority: N/A
FDA: N/A

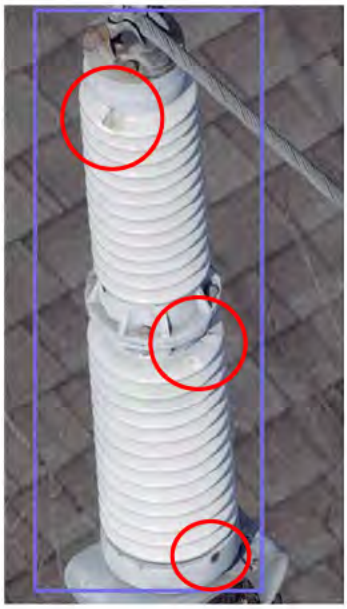
Figure 104 **Loose tie wire, conductor seated in the biscuit (left). Fully seated conductor with no issues (right).**



Condition: 4
Priority: E+
FDA (1): Insulator-Steel|No Good/Out of Stdrd|Replace
FDA (2): Insulator|Contaminated|Ground /Helicopter Wash

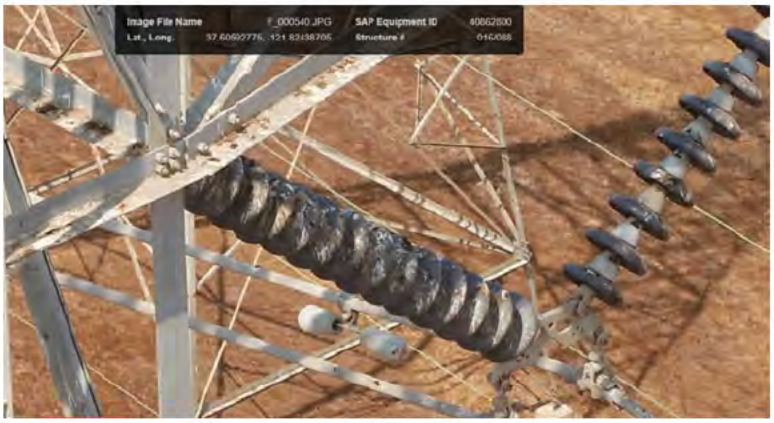
Figure 105 Flashed insulator (left). Multiple flashes on insulator string (right).

Condition: 4
Priority: E+
FDA (1): Insulator-Wood|No Good/Out of Stdrd|Replace
FDA (2): Insulator|Contaminated|Ground Wash



Condition: 4
Priority: E+
FDA (1): Insulator-Steel|No Good/Out of Stdrd|Replace
FDA (2): Insulator|Contaminated|Ground Wash

Figure 106 Flashed pin insulator (left). Flashed ceramic post insulator (right), if such an insulator is flashed on one end or on one shed: E tag. If flashed on two sheds or more, or both ends: E+ tag.



Condition: 2
Priority: F
FDA: Insulator |Contaminated|Ground /Helicopter Wash

Condition: 2
Priority: F
FDA: Insulator |Contaminated|Ground /Helicopter Wash

Condition: 4
Priority: E+
FDA: Insulator |Contaminated|Ground /Helicopter Wash

Condition: 4
Priority: E+
FDA: Insulator |Contaminated|Ground /Helicopter Wash

Figure 107 **Examples of a variety of insulator contamination. Ground wash applies to most wood poles or shorter structures that are accessible by truck. Helicopter wash applies to towers and not easily accessed structures.**

Note: *On 500kV only:* If a tag is created for contamination of insulators, and no bird guards are present, create a tag for their installation (FDA: Raptor Guard-Steel|Missing|Install) – E priority.

Condition: 3
Priority: E
FDA: Insulator-Steel(or Wood)|No Good/Out of Stdrd|Replace

Figure 108 **Insulators with staining from corrosion of crossarm. These should be called out for insulator replacement on an E tag. Repair action to be determined by CIRT.**

Condition: 3
Priority: E
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Replace

Condition: 3
Priority: E
FDA: Insulator-Steel|No Good/Out of Stdrd|Replace

Figure 109 **Corona damage (left). Corona damage on bells (right). Create an E tag if three or more bells are damaged, but if there is considerable damage or material loss, a tag could be created on an insulator with less than three damaged bells.**

Priority: 3
Priority: E
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Replace

Priority: 3
Priority: E
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Replace

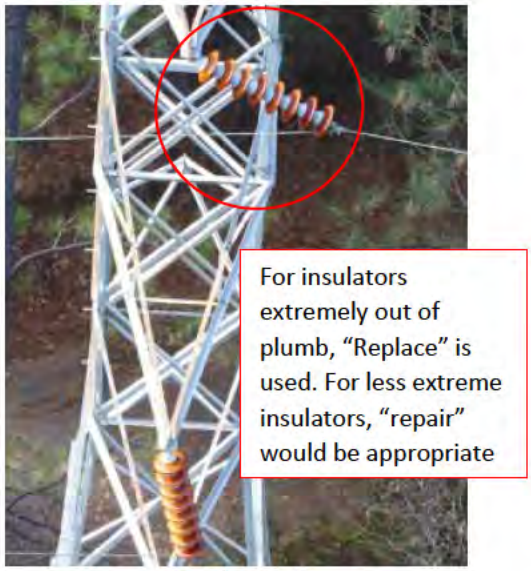
Figure 110 **Insulators with chipped bells larger the 1-1/2 inches in diameter.**

Condition: 5
Priority: A
FDA: Emergency-Wood/Steel|Other|Replace

Condition: 1
Priority: No notification required

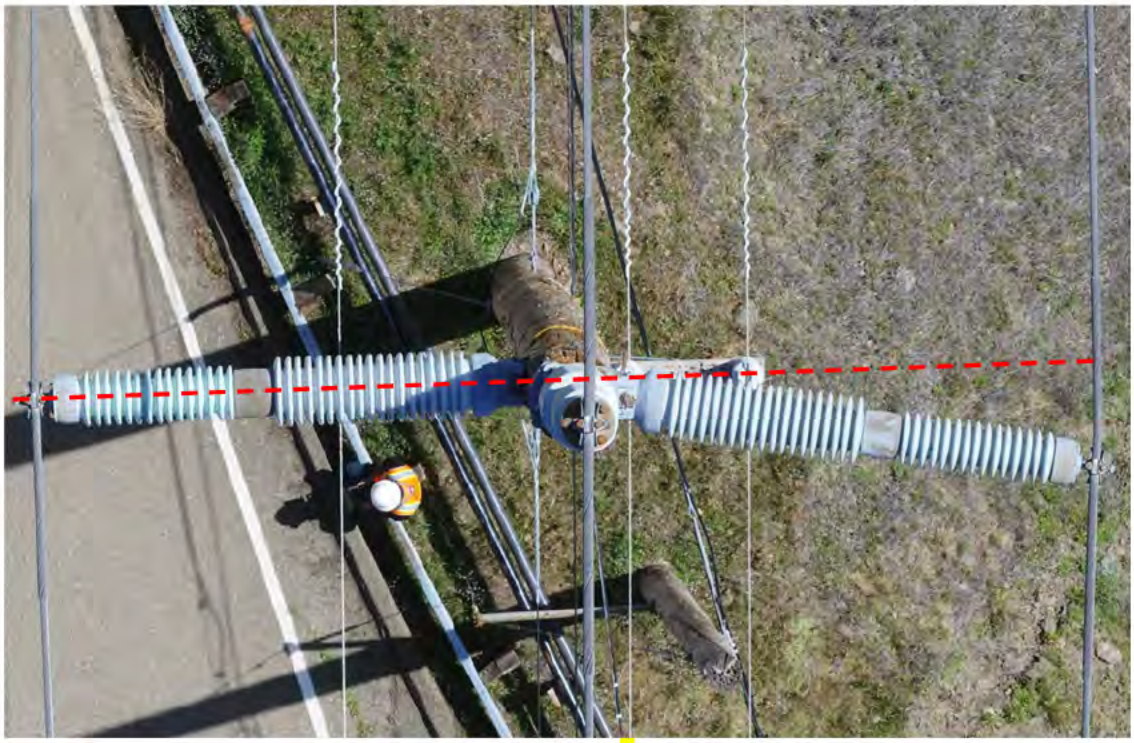
Figure 111 **Separated cap with arcing (left). Insulator with chip less than 1-1/2 inches in diameter (right).**

Condition: 4
Priority: E+
FDA: Insulator-Steel|No Good/Out of Stdrd|Replace



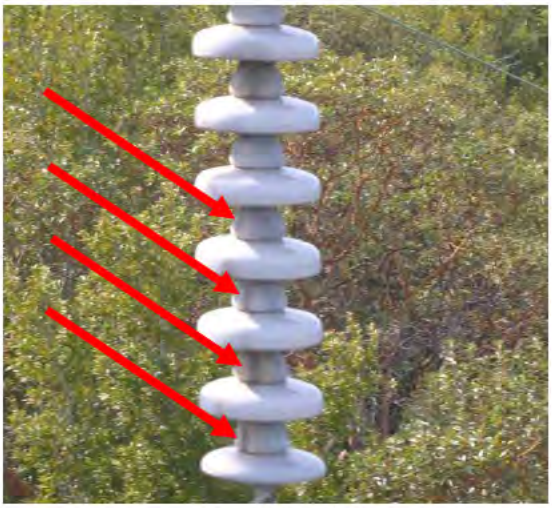
Condition: 4
Priority: E+
FDA: Insulator-Steel|No Good/Out of Stdrd|Replace

Figure 112 **Out of plumb insulators.** ***Insulators extremely out of plumb require replacement, rather than repair.***

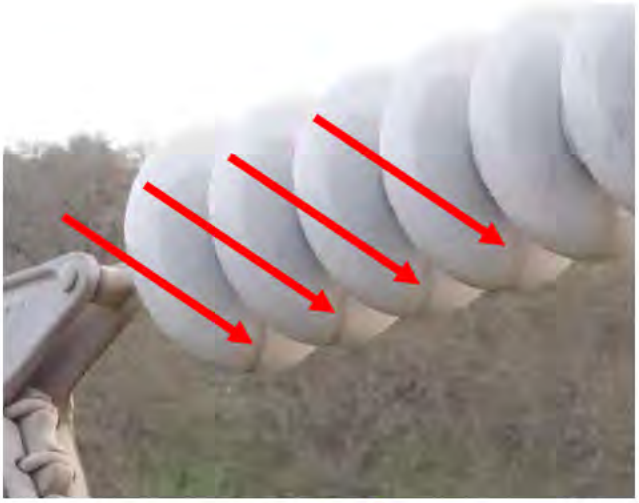


Condition: 2
Priority: F
FDA: Insulator-Steel|No Good/Out of Stdrd|Repair

Figure 113 **Out of plumb post insulator >6" not impacting conductor. If the conductor is being impacted, assign E priority.**

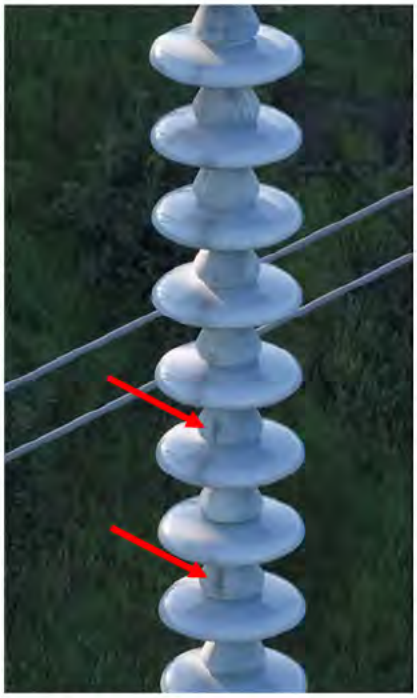


Condition: 3
Priority: E
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Replace



Condition: 1
Priority: No notification required

Figure 114 **Example of tracking visible on insulator caps (left). Right image shows minor contamination, which due to the orientation of the string and the flow of water, resembles tracking. Because this is contamination and *not* damage, no tag is necessary. Tracking is generally wider and doesn't occur in such a straight and uniform line.**



Condition: 3
Priority: E
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Replace

Figure 115 **When tracking is found, use Table 4 in determining the priority of replacing the insulators based on G.O.95. If tracking extends from the cap to the porcelain bell a wash would be need and priority based on G.O.95. If tracking is only on the cap, no wash is required.**

Condition: 3
Priority: E
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Replace

Condition: 3
Priority: E
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Replace

Figure 116 30% rust on caps and insulators are over 50 years old per ETGIS installed date (left). Additional damage could warrant higher priority. Light rust developing with some caps showing signs of dark rust close to 30% of cap (right).

Condition: 1
Priority: No notification required

Condition: 3
Priority: E
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Replace

Figure 117 Mild surface rust on insulator caps (left). Dark rust on multiple bells (right).

Condition: 4
Priority: E+
FDA (1): Insulator-Wood/Steel|No Good/Out of Stdrd|Repair
FDA (2): Insulator-Wood/Steel|No Good/Out of Stdrd|Replace

Condition: 5
Priority: A
FDA: Emergency-Wood/Steel|Other|Replace

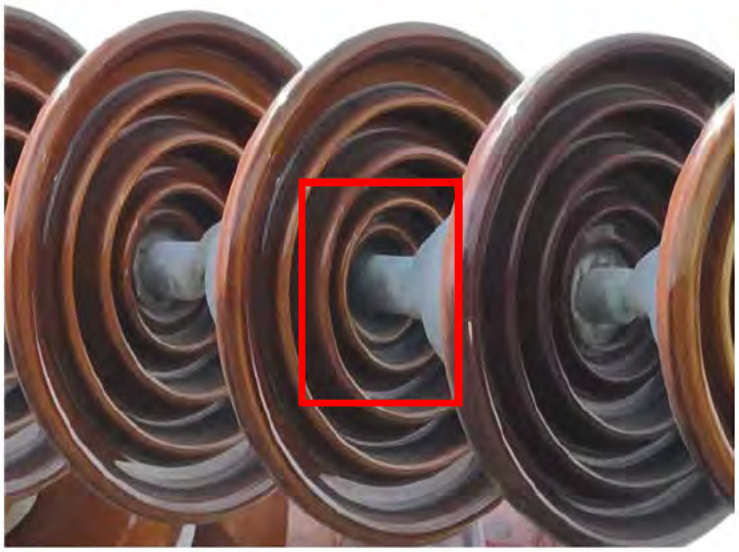
Figure 118 Example of rusted insulator pins (left) that also has a loose cotter key. Example of emergency level rusted insulator pins (right).

Condition: 4
Priority: E+
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Replace

Condition: 3
Priority: E
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Replace

Figure 119 Examples of rusted insulator pins.

Condition: 3
Priority: E
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Replace



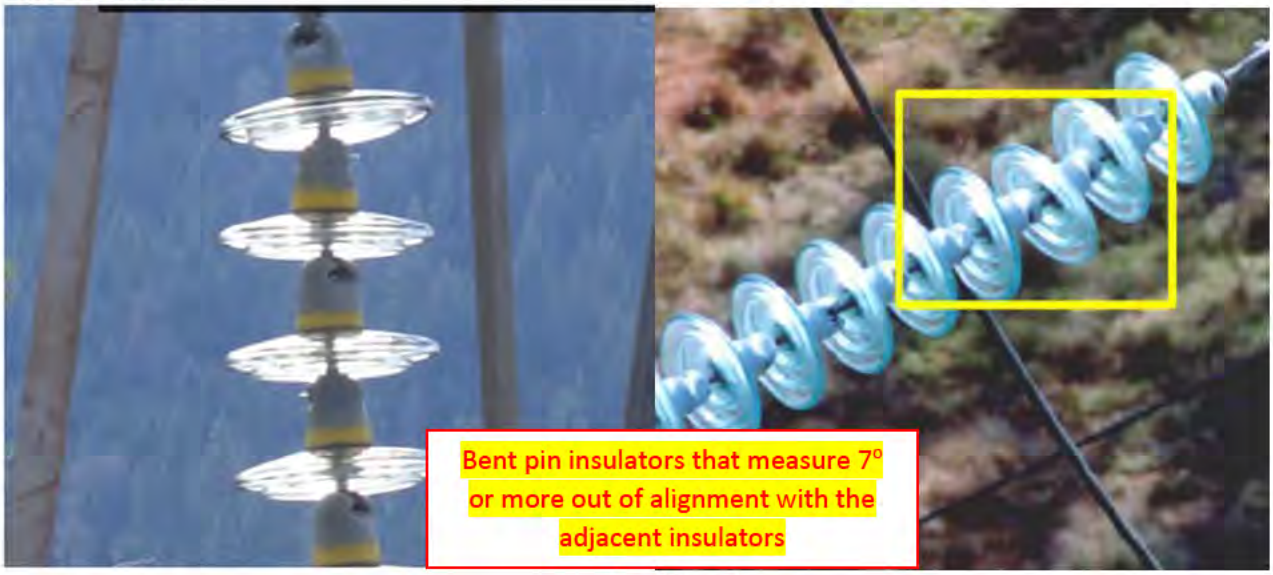
Condition: 3
Priority: E
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Replace

Figure 120 Insulator grout missing (top) and broken (bottom).

Condition: 3
Priority: E
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Replace

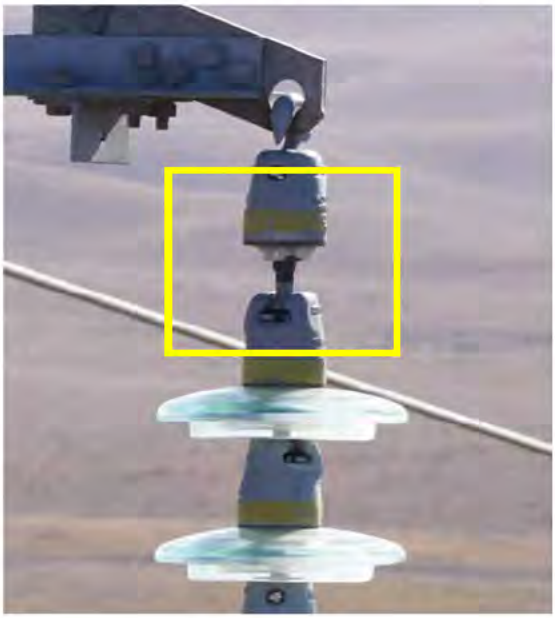
Condition: 3
Priority: E
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Replace

Glass insulators



Condition: 3
Priority: E
FDA: Insulator-Steel|No Good/Out of Stdrd|Replace

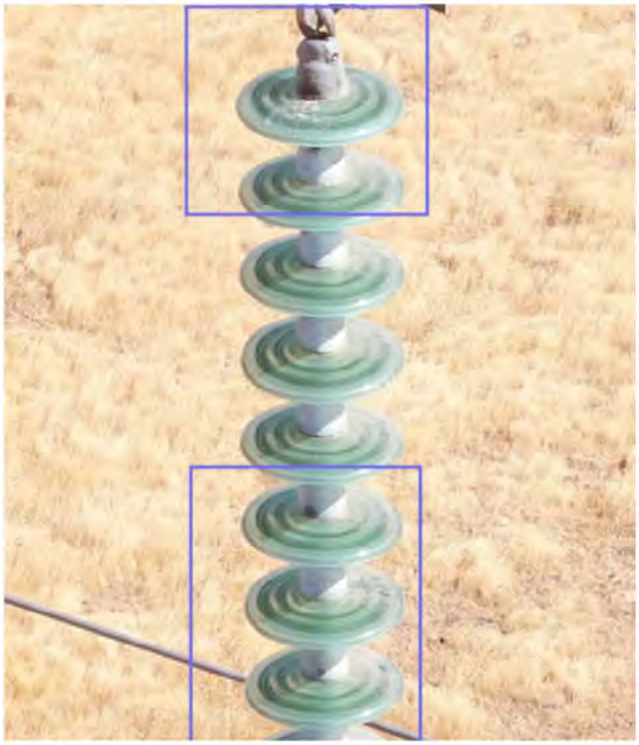
Figure 121 **Example of strings which have suffered pin bending.**



Condition: 3
Priority: E
FDA: Insulator-Steel|No Good/Out of Stdrd|Replace

Figure 122 **Example of broken insulator.**

Note on glass insulators: Glass bells are *designed* to completely shatter upon failure, and maintain structural stability and electrical resistance, even when the bell is completely missing. Therefore, a glass insulator broken to the cap only requires an E notification, unless the string is under-insulated (by bell count) for that string.



Condition: 3-5
Priority: E-A
FDA: Insulator-Steel|No Good/Out of Stdrd|Replace

Figure 123 **Examples of glass insulators that have experienced damage to the glass (in the form of bubbling) and/or major damage to the caps. These insulators should be replaced on a priority based on the number of damaged bells.**

Note on glass insulators: If calling for a wash on glass insulators, base priority and condition on the number of bells flashed/remaining.

Polymer insulators

Condition: 4
Priority: E+
FDA: Insulator-Wood|No Good/Out of Stdrd|Replace

Condition: 4
Priority: E+
FDA: Insulator-Wood|No Good/Out of Stdrd|Replace

Figure 124 Insulator chalking (left), corona damage to insulator (right).

Condition: 3
Priority: E
FDA: Insulator-Steel|No Good/Out of Stdrd|Replace

Condition: 3
Priority: E
FDA: Insulator-Wood|No Good/Out of Stdrd|Replace

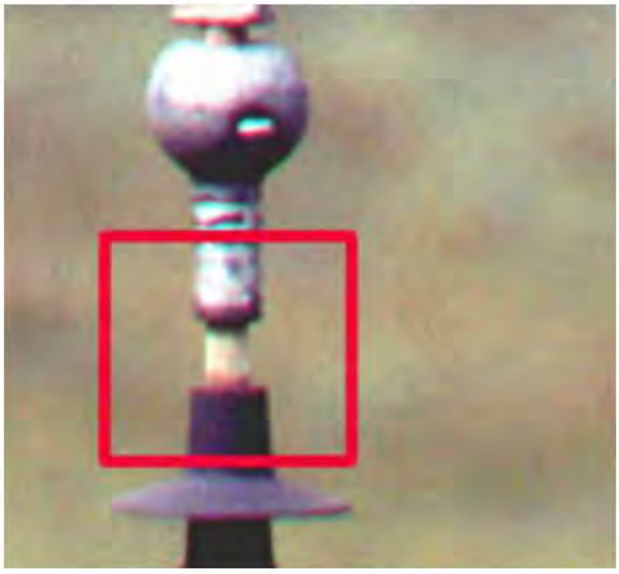
Figure 125 Examples of damage to polymer insulators. Chalking/flashing (left), and flashing (right).

Condition: 4
Priority: E+
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Replace

Condition: 4
Priority: E+
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Replace

Figure 126 **Example of polymer insulator heavily contaminated (left). Heavy contamination (right). Polymer insulators do not get washed, only replaced.**

Condition: 2
Priority: F
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Replace



Condition: 4
Priority: E+
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Replace

Figure 127 **Moss (medium) contamination (left). Sheds sliding off and revealing core on polymer insulator (right).**

Condition: 4
Priority: E+
FDA: Insulator-Steel|No Good/Out of Stdrd|Replace

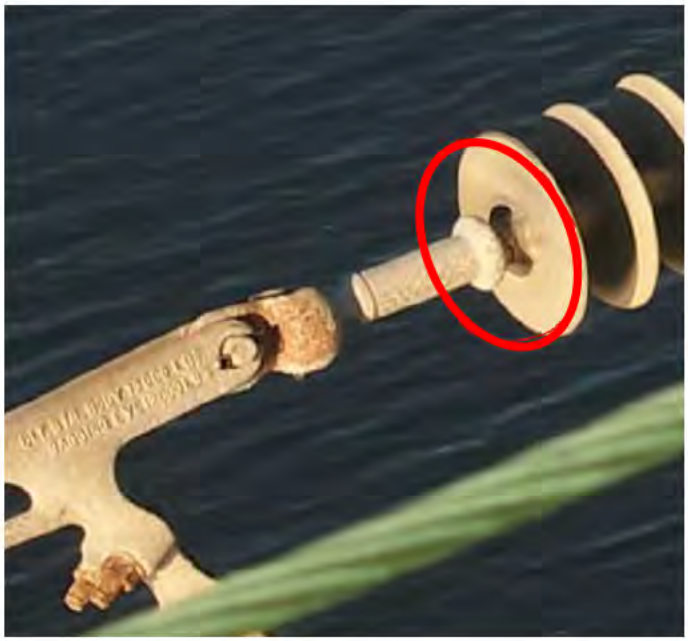
Damage to polymer sheds is acceptable, if it is limited to the sheds and does not extend to the sheath

Condition: 1
Priority: No notification required

Figure 128 **Flashed polymer insulator (left). Minor damage to polymer sheds (right).**

Condition: 3
Priority: E
FDA: Insulator-Steel/Wood|No Good/Out of Stdrd|Replace

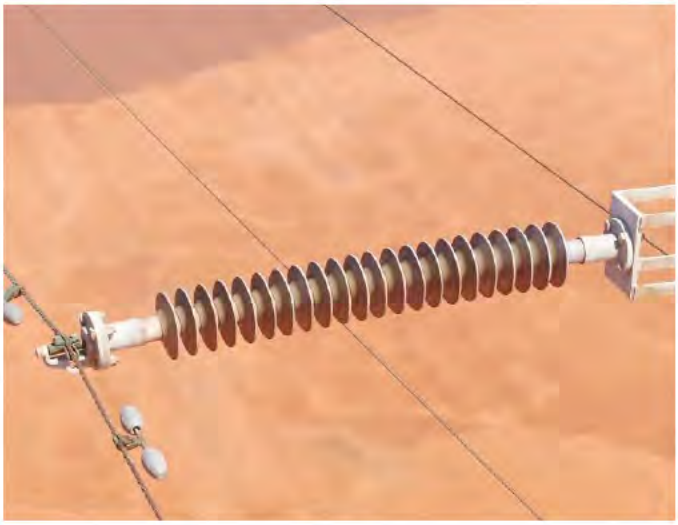
Figure 129 **Severe shed damage on polymer insulators. Under normal circumstances, damage to the sheds of a polymer insulator without damage to the sheath would not require a notification. However, the damage at the far right end is extensive and very close to the sheath. This is a borderline case but an E priority notification would be warranted.**



Condition: 5
Priority: A
FDA: Emergency-Steel/Wood|Other|Replace

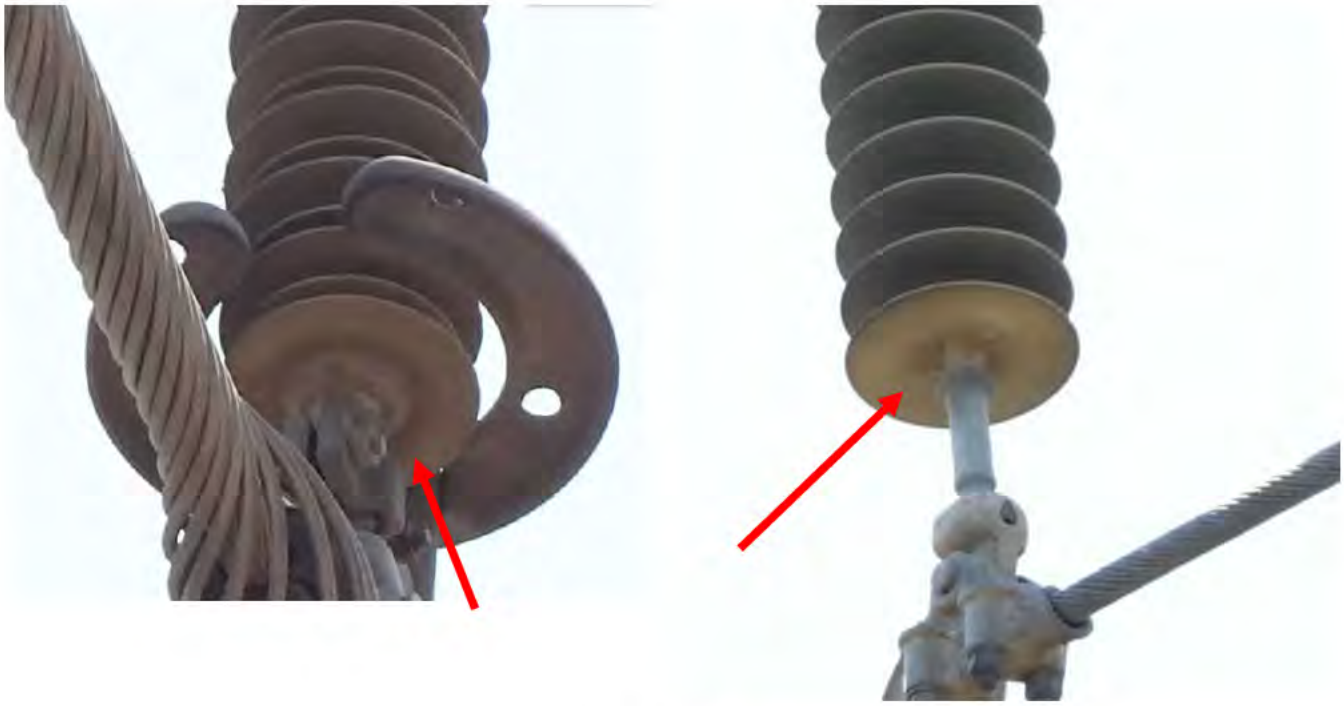
Condition: 4
Priority: E+
FDA: Insulator-Steel/Wood|No Good/Out of Stdrd|Replace

Figure 130 **Insulator damage that could result in an A tag (left). The protective sheath has been broken, which would lead to degradation of the core. Damage to insulator sheath, not to the core (right).**



Condition: 3
Priority: E
FDA: Insulator-Steel/Wood|No Good/Out of Stdrd|Replace

Figure 131 **Bowing polymer post insulators. These should be replaced.**



Condition: 3
Priority: E
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Replace

Figure 132 **Examples of corona damage on polymer insulators. The pictured insulators should be replaced with an E tag. All suspension type polymer insulators from 115kv to 230kv require grading rings.**

Condition: 3
Priority: E
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Replace

Condition: 3
Priority: E
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Replace

Figure 133 **Examples of corona damage to polymer insulators.**

Condition: 3
Priority: E
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Replace

Figure 134 **Damaged corona ring (left). Snowshoe style corona ring with a polymer insulator (right) needs a notification to install the correct style grading ring.**

Condition: 3/2
Priority: E/F
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Repair

Figure 135 **A notification is required when the corona ring breaks the top horizontal plane of the conductor or is in contact with the conductor (left). If damage is present, E priority, if no damage present assign F priority.**

Condition: 3
Priority: E
FDA: Ground wire-Wood/Steel|No Good/Out of Stdrd|Repair

Condition: 1
Priority: None

Figure 136 **Spill gaps should be installed underneath horizontal insulators to prevent bird contact. IF there is damage to the spill gap, create a notification to repair it (FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Repair, Priority: E). IF ground wire is not installed or within standards on wood or composite poles, a notification is needed (left). Spill gaps with no grounding issues or damage (right).**

SPILL GAPS

Notes

1. Spill gaps are used for insulation coordination to protect electrical equipment from electrical surges.
2. Proper installation orientation of spill gaps must be followed in order to prevent raptor momentary outages and bird kills.
3. On horizontal post-type insulators spill gaps must be oriented on the underside of the insulator as shown in Figure 2.
4. When required to add spill gaps on obsolete insulators, replace entire insulator with insulators approved for purchase.

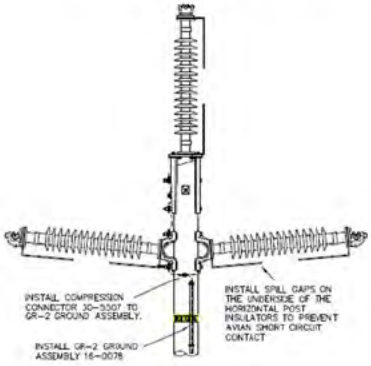


Figure 2
Spill Gap Orientation on Horizontal Insulators

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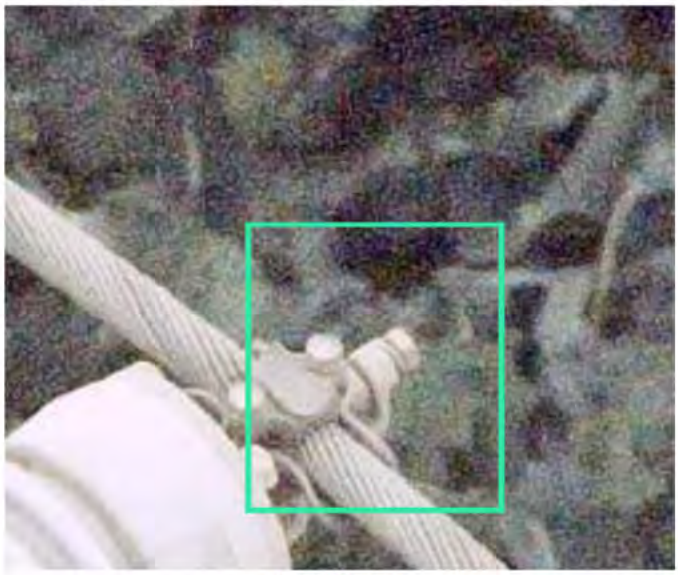
Condition: 5
Priority: A
FDA: Emergency|Storm Related|Repair

Condition: 4
Priority: E+
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Repair

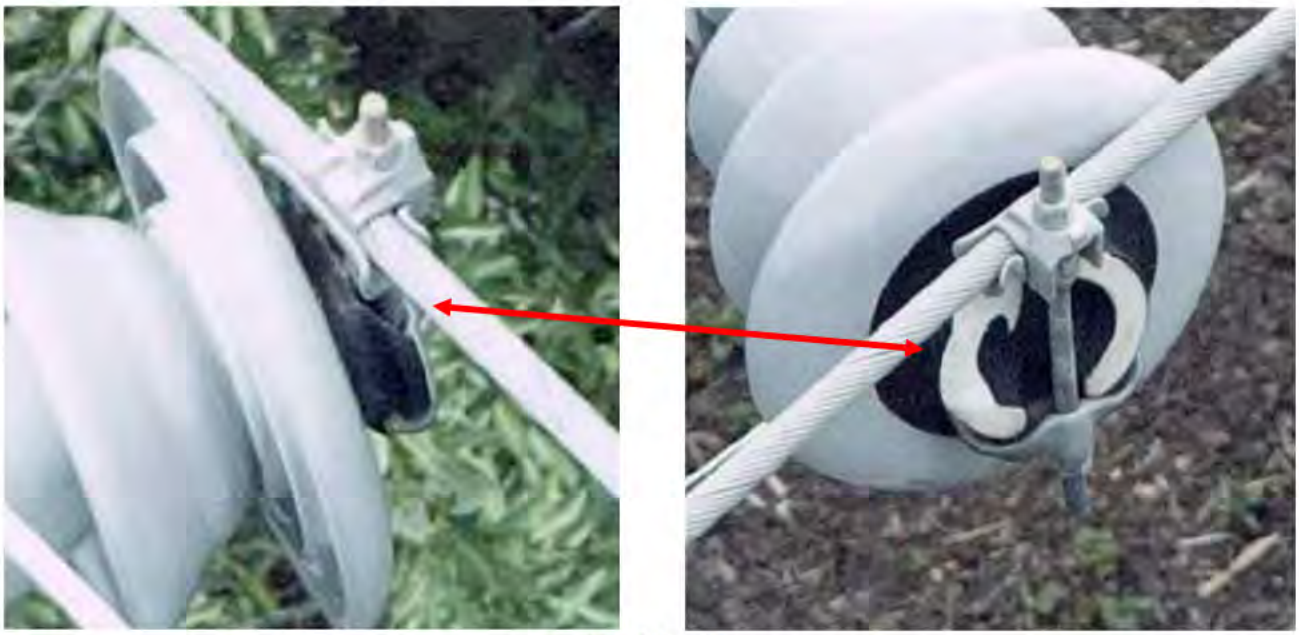
Figure 137 **Missing clamp (left). Incorrectly installed trunnion clamp, *if elevation has uplift at the location of the clamp consider a possible A priority*** **(right).**

Condition: 2
Priority: F
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Repair



Condition: 2
Priority: F
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Repair

Figure 138 **Examples of loose retainer bolt on trunnion clamp.**



Condition: 5
Priority: A
FDA: Emergency|Storm Related|Repair

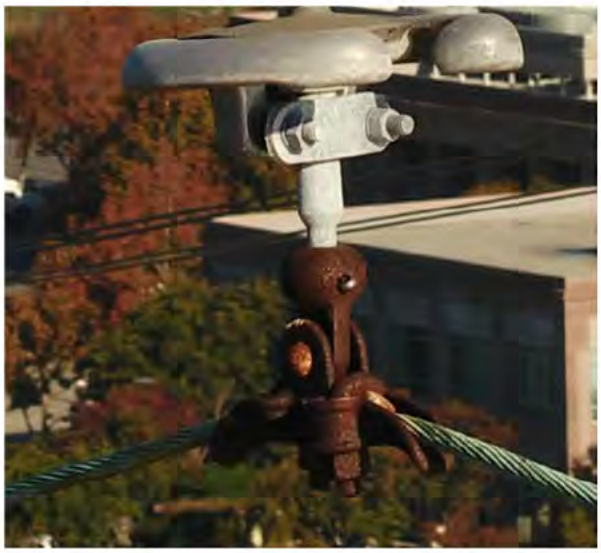
Figure 139 **Broken pin insulator biscuit at connection hardware.**

Condition: 3
Priority: E
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Repair

Condition: 3
Priority: E
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Repair

Figure 140 **Missing bolts on suspension shoe (left). Missing bolt on suspension shoe (right).**

Note for hardware:	Deadend framing type with similar damage to bolts/nuts is treated with more caution due to the threat of conductor slipping in the hot-end hardware, which could affect conductor clearance. Suspension framing type doesn't have the same failure modes in this case. Please refer to other examples for deadend framing type damage.



Condition: 1
Priority: No notification required

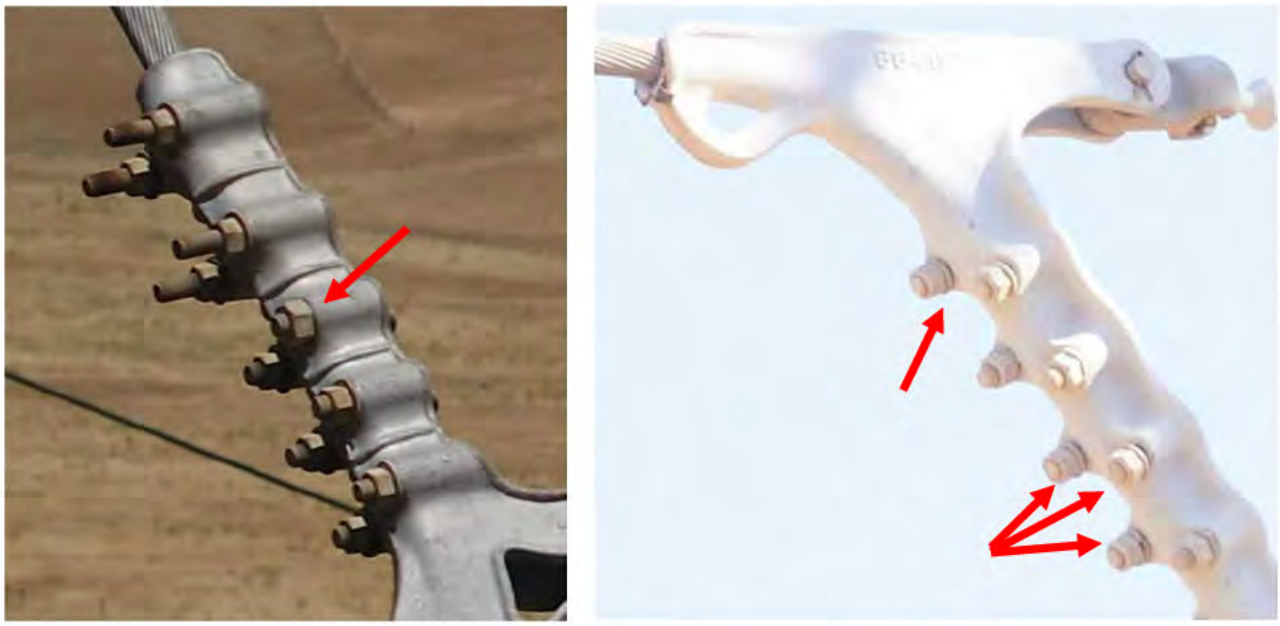
Condition: 3
Priority: E
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Repair

Figure 141 **Hardware surface rust (left): material loss is not significant enough to warrant an E priority notification. Corroded nuts on suspension shoe (right).**

Condition: 3
Priority: E
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Repair

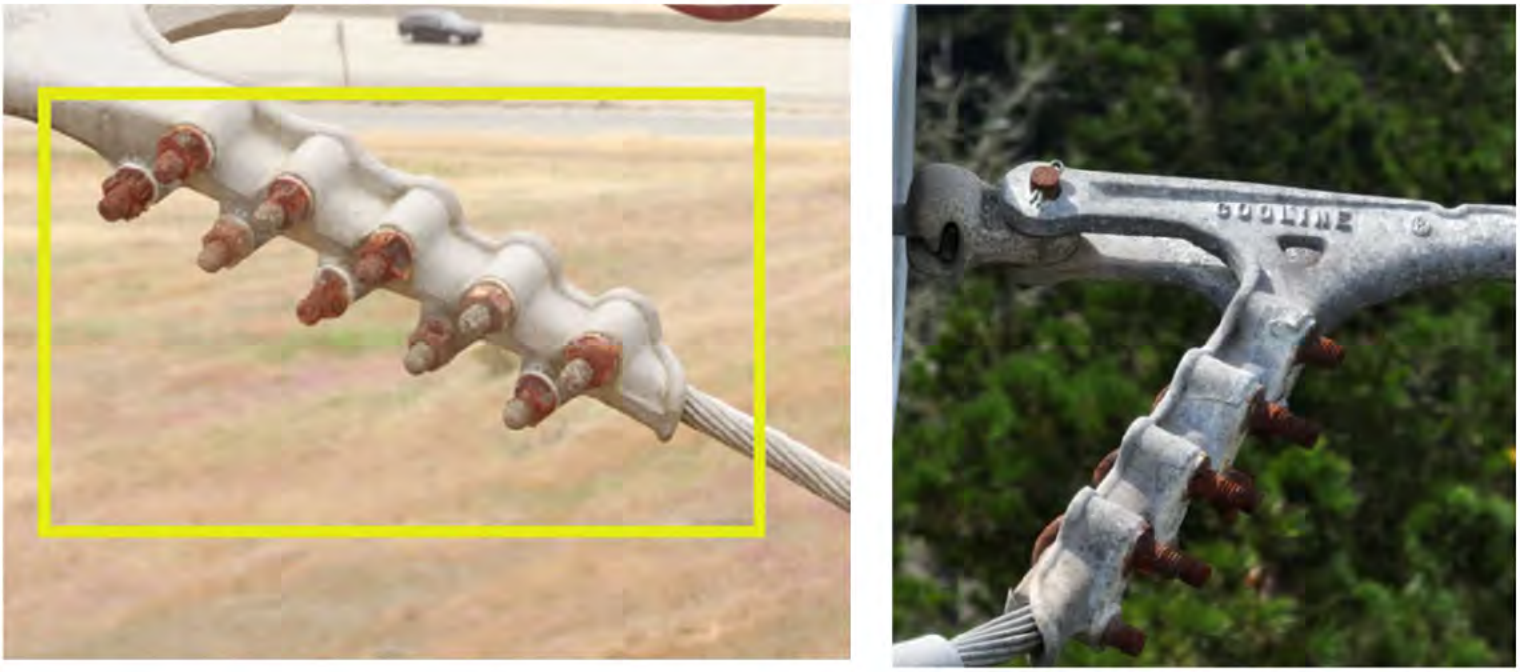
Condition: 3
Priority: E
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Repair

Figure 142 **Corroded shoe hardware**



Condition: 3/2
Priority: E/F
FDA: Insulator- Wood/Steel|No Good/Out of Stdrd|Repair

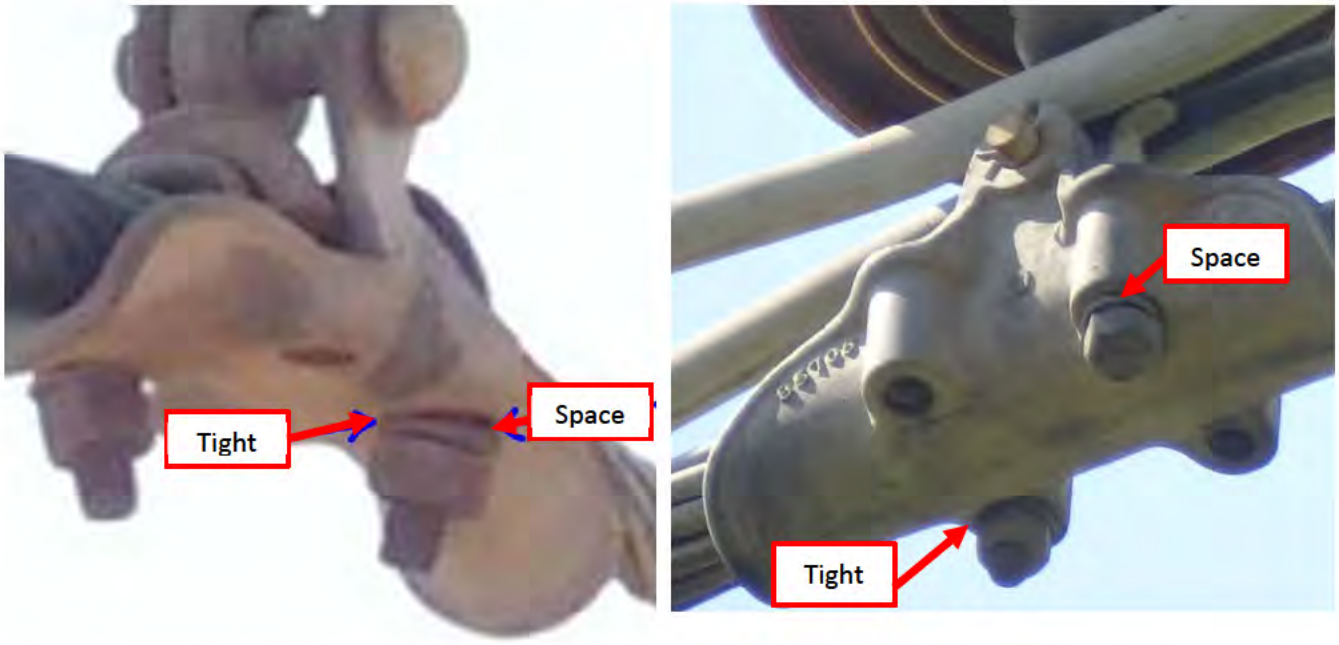
Figure 143 **Missing a washer on shoe E tag (left). Loose hardware F tag (right).**



Condition: 4
Priority: E+
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Repair

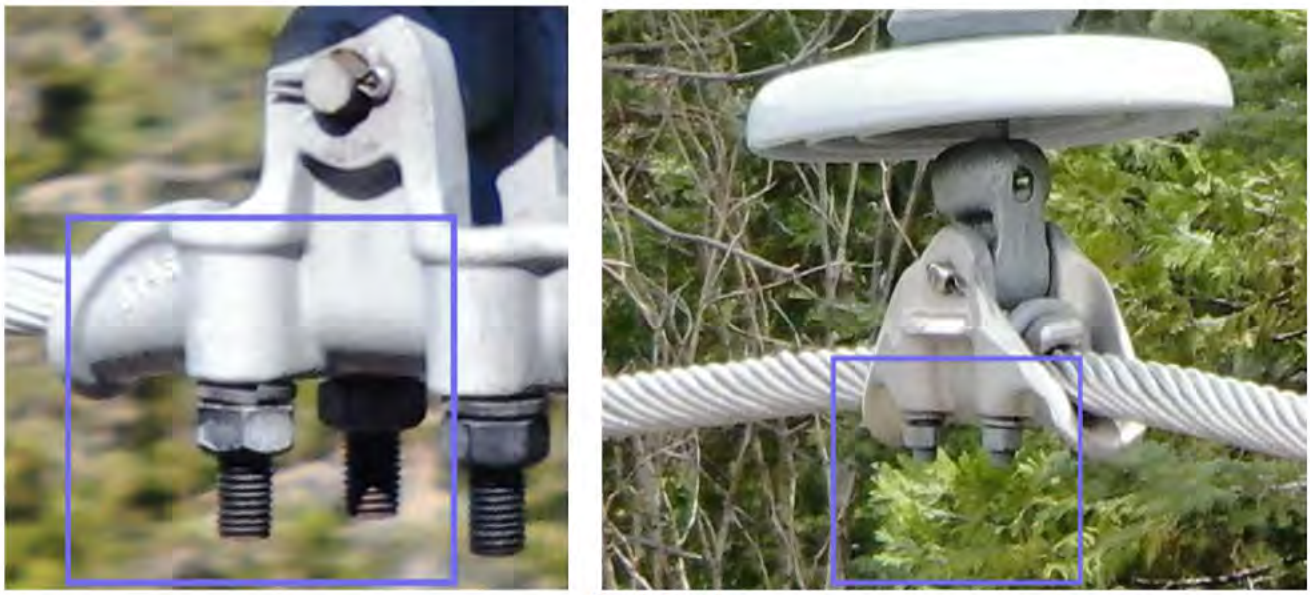
Condition: 5
Priority: A
FDA: Emergency|Storm Related|Repair

Figure 144 **Damaged nuts 30-50% (left). Damaged nuts more than 50% (right).**



Condition: 1
Priority: No notification required

Figure 145 **J-bolts may appear on the outside of the washer/nut, but tight on the inside, closest to the conductor (see above). These nuts cannot be tightened any further and should be considered tight. No tags required, even if the lock washer isn't completely compressed because of this space.**



Condition: 2
Priority: F
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Repair

Figure 146 **Examples of suspension shoes with U-Bolts and lock washers are not fully compressed.**

Condition: 2
Priority: F
FDA: Insulator- Wood/Steel|No Good/Out of Stdrd|Repair

Condition: 1
Priority: None

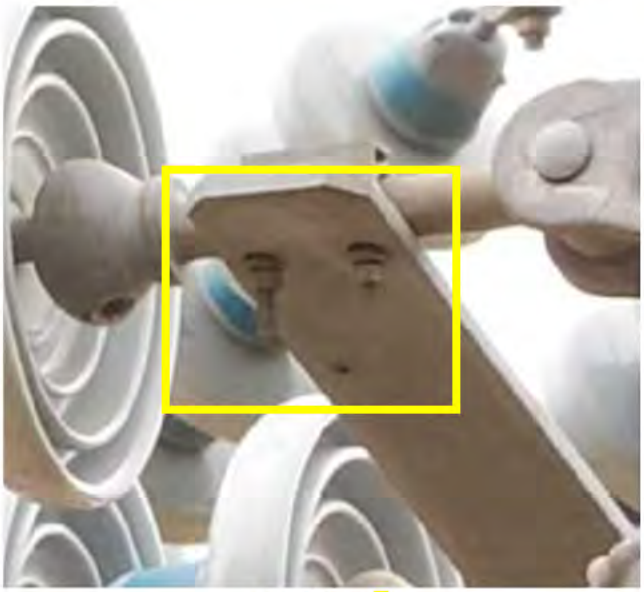
Figure 147 **Loose hardware on shoe (left). Same style hardware secure (right).**

Condition: 2
Priority: F
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Repair

Condition: 2
Priority: F
FDA: Hardware-Wood/Steel|No Good/Out of Stdrd|Replace

Figure 148 **Loose lock washers on suspension shoe (left). Loose cold end hardware on insulator (right). Notice cold end hardware uses hardware FDA, and hot end hardware uses insulator FDA. Hot end hardware being loose requires a line clearance to perform maintenance, and cold end hardware does not.**

Condition: 2
Priority: F
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Repair



Condition: 2
Priority: F
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Repair

Figure 149 **Loose J-bolts on spacer bar.**

Condition: 4
Priority: E+
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Repair

Figure 150 **A straight type cotter key with no bump and legs not split (left). Non-standard cotter key (right).**

Condition: 4
Priority: E+
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Repair

Condition: 5
Priority: A
FDA: Emergency|Storm Related|Repair

Figure 151 **Missing cotter key (left). Cracked shoe (right).**

Condition: 5
Priority: A
FDA: Emergency|Storm Related|Repair

Condition: 4
Priority: E+
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Repair

Figure 152 **Example of unseated retainer key and insulator not seated in the socket (left). Unseated retainer key (right).**

Condition: 4
Priority: E+
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Repair

Condition: 4
Priority: E+
FDA: Insulator-Wood/Steel|No Good/Out of Stdrd|Repair

Figure 153 **Examples of unseated retainer keys (left) missing cotter key, retainer pin backing out yet still seated through hardware (right).**

Condition: 3
Priority: E
FDA: Insulator-Steel|No Good/Out of Stdrd|Repair

Condition: 3
Priority: E
FDA (1): Insulator-Steel|No Good/Out of Stdrd|Repair
FDA (2): Hardware-Tower|No Good/Out of Stdrd|Replace

Figure 154 **Missing cold-end hardware such as c-hook, clevis, shackle, etc (left), and incorrect installation of right insulator string (right). The c-hook installed in the incorrect eye of the hanger plate has created a twist in the hardware/crossarm warranting hardware replace issue.**

Condition: 4
Priority: E+
FDA: Insulator-Steel/Wood| No Good/Out of Stdrd|Repair

Figure 155 **Automatic dead-end shoes which should be removed when found.**

Condition: 2
Priority: F
FDA: Insulator-Steel/Wood| No Good/Out of Stdrd|Repair

Figure 156 **Turnbuckle out of threads (left). Polymer installed upside down and able to collect water (right).**

Hardware

See TD-1001M-JA07 Identifying Levels of Corrosion and Condition of Hardware and Insulators on Transmission Line Structures and Supports for more information.

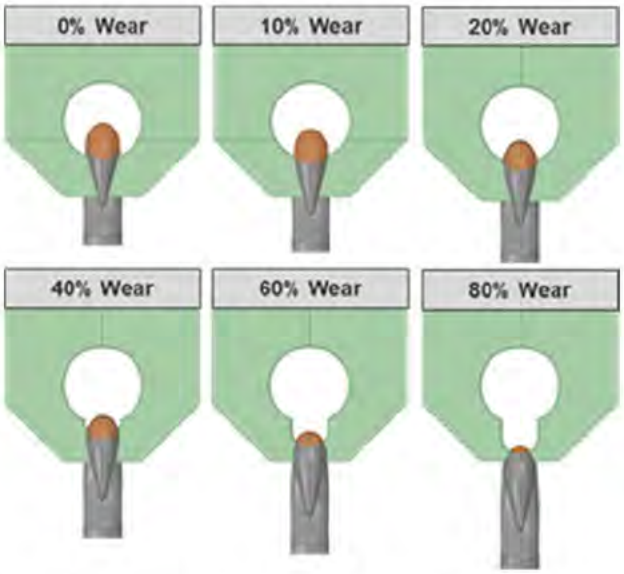


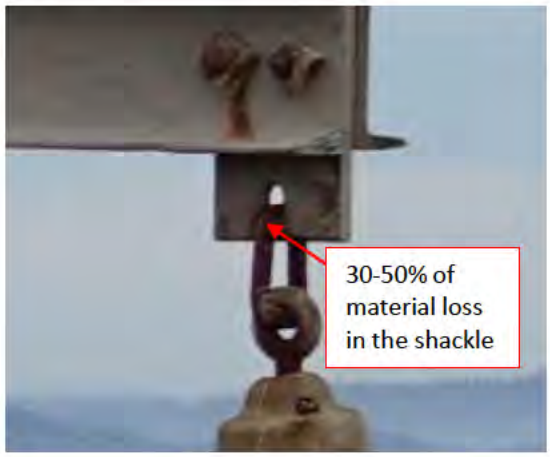
Figure 157 **Diagrams of potential wear-patterns in C-hooks and hanger plates. This diagram only depicts equal wear on both hook and plate. If one was worn more than another, they might appear differently than above. (Not to scale. See 3D models).**

Condition: 5
Priority: A
FDA: Emergency|Storm Related|Repair

Condition: 5
Priority: A
FDA (1): Emergency|Storm Related|Repair (Hanger plate)
FDA (2): Emergency Wood/Steel|Other|Replace (Insulator)

Figure 158 **Sheared connection on the suspension shoe on OPGW/Shield wire (left), worn hanger plate/y-clevis connection (right). Two notifications are made for the right image. One for the hanger plate and one for the insulator hardware. Insulators will almost always be replaced when hanger plates and hardware are replaced.**

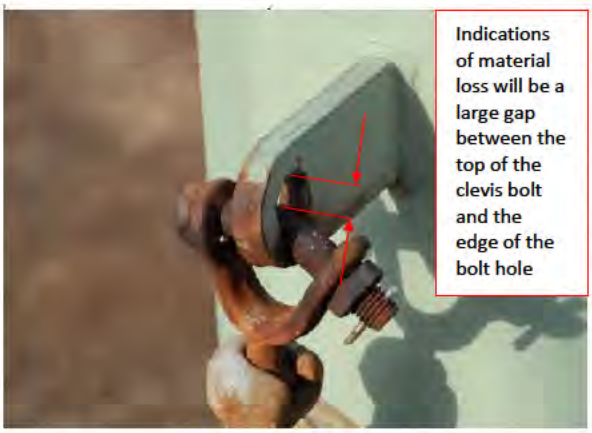
Condition: 5
Priority: A
FDA: Emergency|Storm Related|Repair



Condition: 4
Priority: E+
FDA (1): Hardware-Tower|No Good/Out of Stdrd|Replace
FDA (2): Insulator-Steel|No Good/Out of Stdrd|Repair/Replace

Figure 159 **Rusted suspension shoe with bolt hole deformation on OPGW/Shield wire (left), worn shackle/ hanger plate connection (right). Insulators will almost always be replaced when hanger plates and hardware are replaced.**

Condition: 4
Priority: E+
FDA: Insulator-Steel|No Good/Out of Stdrd|Repair



Condition: 4
Priority: E+
FDA (1): Hardware-Tower|No Good/Out of Stdrd|Replace
FDA (2): Insulator-Steel|No Good/Out of Stdrd|Replace

Figure 160 **Missing cotter key (left). Rusted y-clevis (right).**

Wear on hanger plates and cold-end hardware

- Hanger plates should be written up **based on how much material is left, in inches**, per the ETPM. Please see Table "Guide for Assigning Priority Codes" for specific values.
- Cold-end hardware should be given a tag **based on percentage wear and not an absolute measurement.**
- **Each type of damage can and should be written up independently.** If a hanger plate deserves one priority of tag, and the insulator hardware deserves a different priority, each should be written. If hanger plates are worn, a second tag is always needed to replace the insulators. However, if just the cold-end hardware is worn, only the tag to replace the insulators is necessary.

Condition: 1
Priority: No notification required

Condition: 1
Priority: No notification required

Figure 161 Minor surface rust (left). Hardware surface rust (right): material loss is not significant enough to warrant an E priority notification.

Condition: 1
Priority: No notification required

Condition: 1
Priority: No notification required

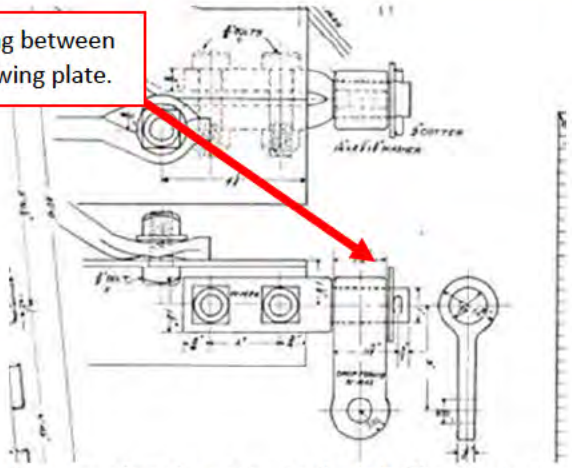
Figure 162 Broken working eye (left). Minor surface rust (right).

Condition: 3
Priority: E
FDA: Insulator–Wood/Steel|No Good/Out of Stdrd|Replace

Figure 163 **Working shackle used on structure. Working shackles have pins which screw in, as shown on the right.**

Condition: 5
Priority: A
FDA (1): Emergency|Storm Related|Repair (Hanger plate)
FDA (2): Emergency Wood/Steel|Other|Replace (Insulator)

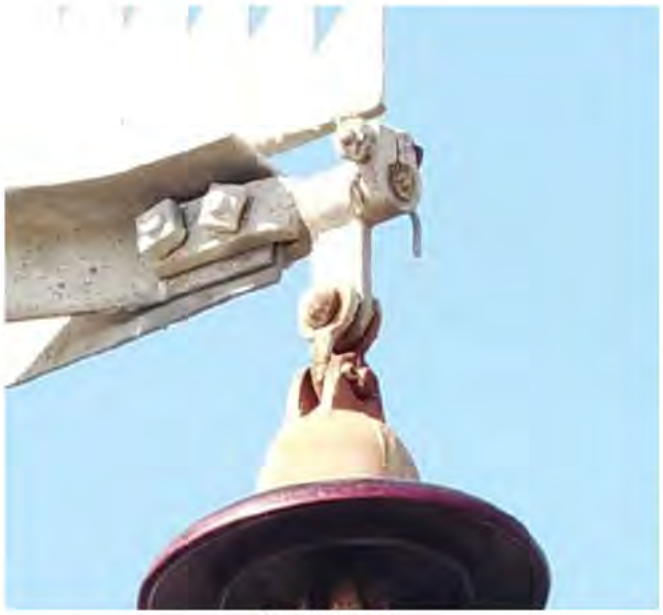
Figure 164 **Wear can occur in any configuration, even on wood poles. Always be aware of this when examining cold-end hardware. Replace FDA(2) is appropriate due to insulator age.**



Condition: 4
Priority: E+
FDA: Hardware-Steel|No Good/Out of Stdrd|Replace

Diagram of configuration to the left. The missing washer is visible.

Figure 165 **Washer is missing between the swing plate and the cotter key. If the cotter key is damaged or worn, the hardware and conductor can fall. The "Steel" FDA should be used if this takes place on a tower or on a steel pole**



Condition: 4
Priority: E+
FDA: Hardware-Steel|No Good/Out of Stdrd|Replace

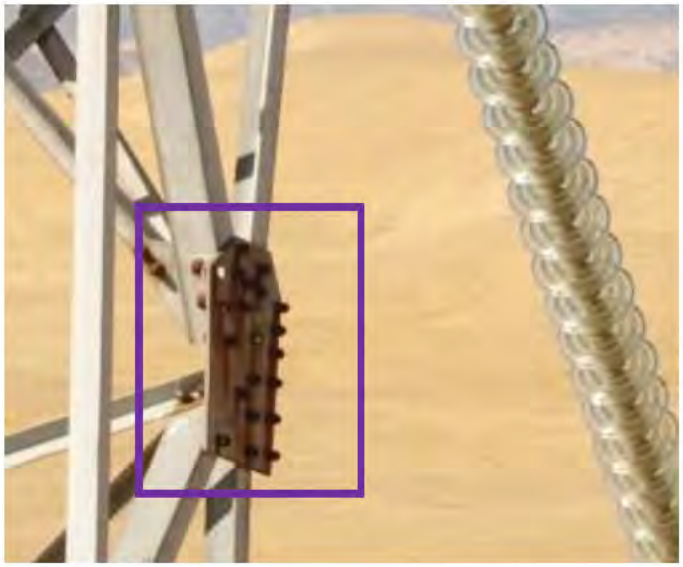
Condition: 3
Priority: E
FDA: Hardware-Steel|No Good/Out of Stdrd|Replace

Figure 166 **Used wire instead of cotter key (left). Cotter key missing, but nut is present and secure (right).**

Condition: 2
Priority: F
FDA: Hardware-Tower|No Good/Out of Stdrd|Replace

Condition: 1
Priority: No notification required

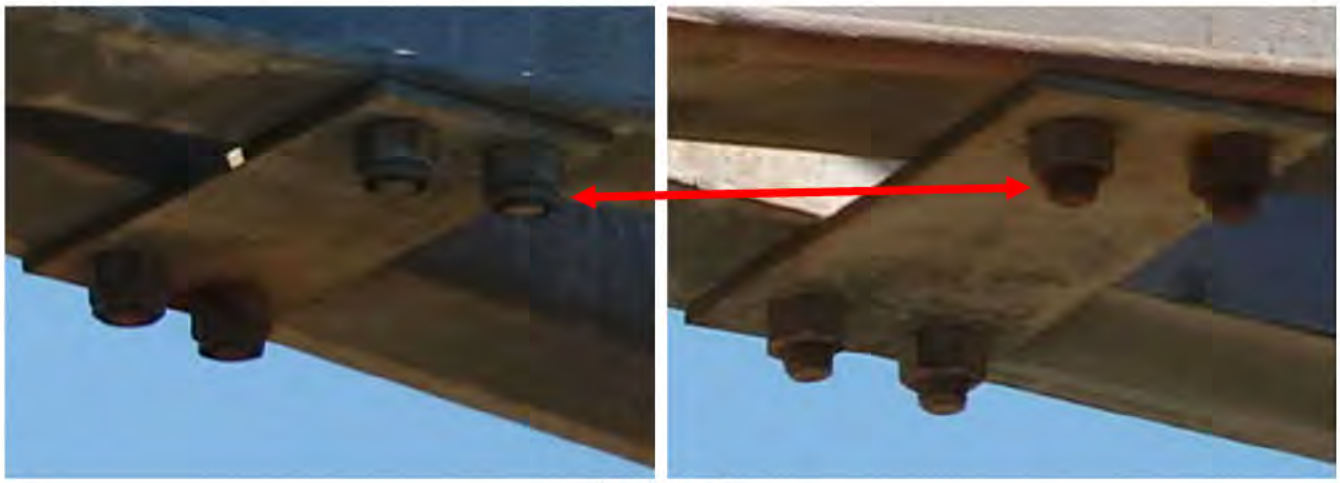
Figure 167 **Loose bolt/nut on tower (left). Example of "punched" bolts (right).**



Condition: 3
Priority: E
FDA: Hardware-Tower|No Good/Out of Stdrd|Replace

Condition: 3
Priority: E
FDA: Hardware-Tower|No Good/Out of Stdrd|Replace

Figure 168 **Corroded nuts/bolts (left). Consider repainting the tower. Missing bolt in a multi bolt connection Per JA-07 (right) is an E priority due to it being a Primary member connection.**



Condition: 3
Priority: E
FDA: Hardware-Tower|No Good/Out of Stdrd|Replace

Figure 169 **Pal nuts should be installed on similar hardware, located in similar/matching sections. Example above shows a similar/matching section, *same crossarm, opposite ends*, (left) has pal nuts and (right) is missing pal nuts. If lock washers/punch marks exist, treat as 'No notification required.'**

Condition: 3
Priority: E

Condition: 1
Priority: No notification required

FDA: Hardware-Tower|No Good/Out of Stdrd|Replace

Figure 170 **Missing pal nut (left). Some structure will use different hardware at splice/connection plates, *pal nuts and lock washers* (right). Each structure can have its own hardware similarities and should be evaluated by comparing adjacent legs or similar/matching sections on the structure.**

Condition: 3
Priority: E
FDA: Hardware-Wood/Steel|No Good/Out of Stdrd|Replace

Figure 171 **Missing pal nuts on crossarm. Structure has pal nuts on both crossarms (left) and on the opposite side missing on one crossarm (right).**

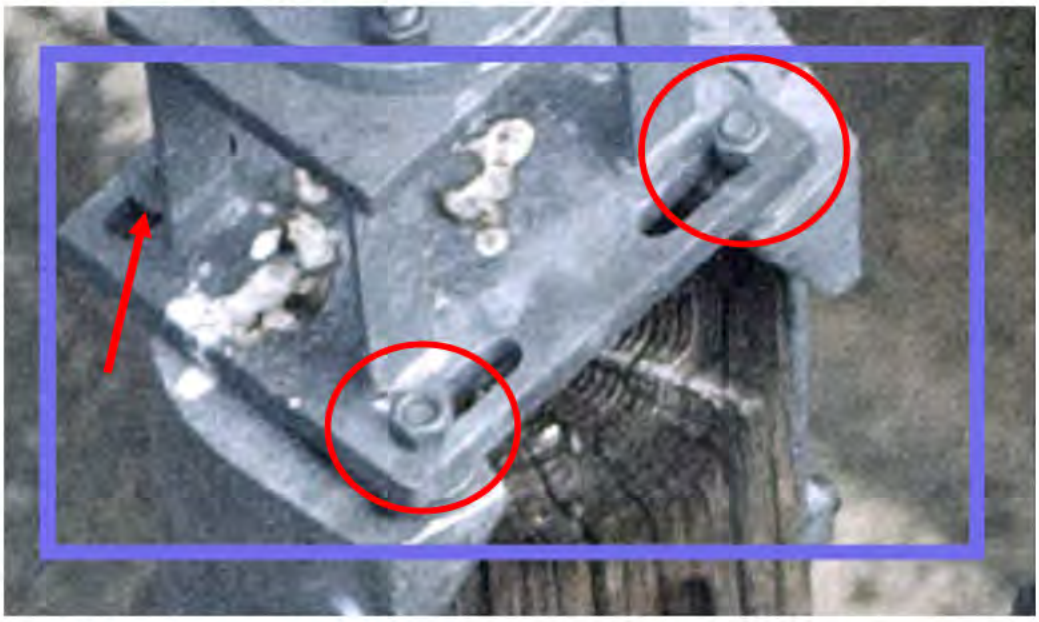
Condition: 2
Priority: F
FDA: Hardware-Wood/Steel|No Good/Out of Stdrd|Replace

Figure 172 **Example of ladder set bolts. The set bolt (left) has not been tightened enough to push the ladder against the welded tab on the structure. Correctly installed set bolt (right).**

Condition: 3
Priority: E
FDA: Hardware-Wood/Steel|No Good/Out of Stdrd|Replace

Condition: 1
Priority: No notification required

Figure 173 **Example of incorrectly installed structural locknut (left). For these nuts to lock, the threads need to protrude past the end of the nut so the rachet can engage the threads. Correctly installed locknut (right).**



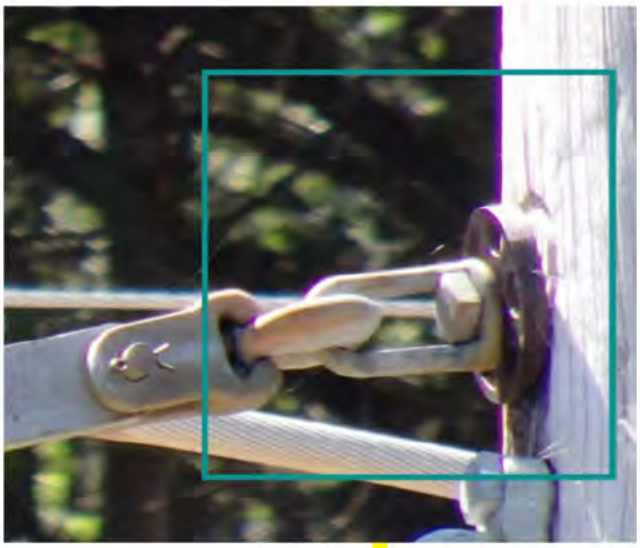
Condition: 3
Priority: E
FDA: Hardware-Wood|No Good/Out of Stdrd|Replace

Figure 174 **This requires a notification when washers are present on hardware and missing on similar hardware. If washers are missing from all similar hardware, assume that it is per design.**

Condition: 2
Priority: F
FDA: Hardware-Wood|No Good/Out of Stdrd|Replace

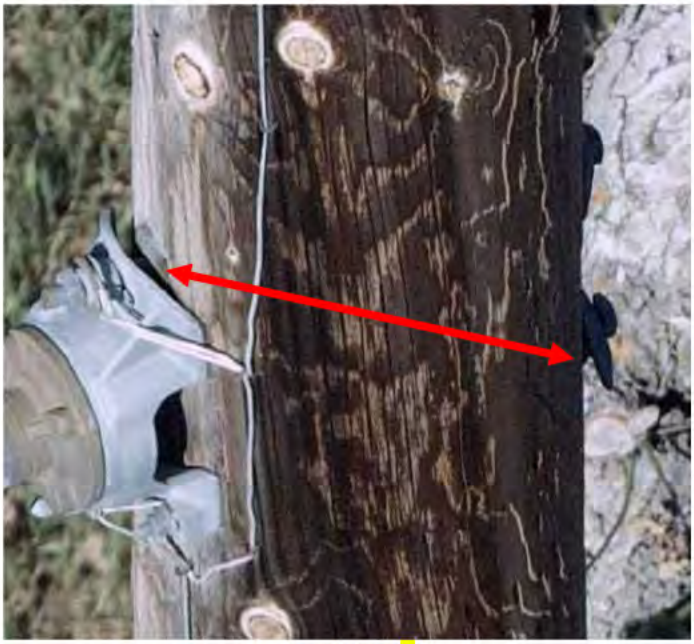
Figure 175 **Spring clips are considered loose if the ends are fully separated and not touching at the bend (left). Loose washer, indications on the pole of the washer's original location (right).**

Condition: 2
Priority: F
FDA: Hardware-Wood|No Good/Out of Stdrd|Replace

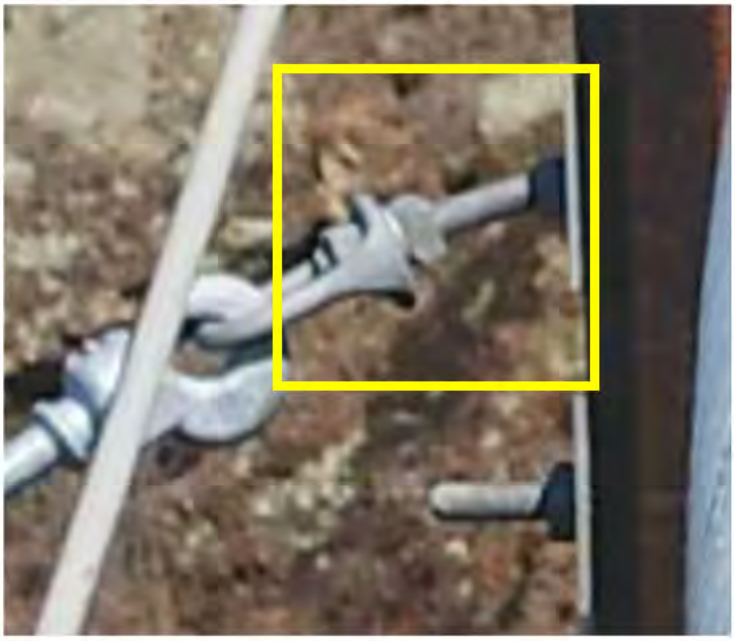


Condition: 2
Priority: F
FDA: Hardware-Wood|No Good/Out of Stdrd|Replace

Figure 176 **Loose U-bolt holding the insulator to the pole (left). Loose sister eye (right).**



Condition: 2
Priority: F
FDA: Hardware-Wood|No Good/Out of Stdrd|Replace



Condition: 3
Priority: E
FDA: Hardware-Wood|No Good/Out of Stdrd|Replace

Figure 177 **Loose hardware securing the insulator bracket to the pole (left). Bent bolt supporting sister eye (right).**

Overhead ground wire, OPGW, and ADSS

If you encounter structures with fiber, OPGW, or other telecom line, please review:

TD-1001M-JA11: Evaluating Conditions of OPGW in Transmission Line
TD-1001M-JA21: Evaluating Conditions of ADSS in Transmission Line
TD-1001M-JA22: Evaluating Conditions of Non-ADSS Lashed Fiber Cable in Transmission Line

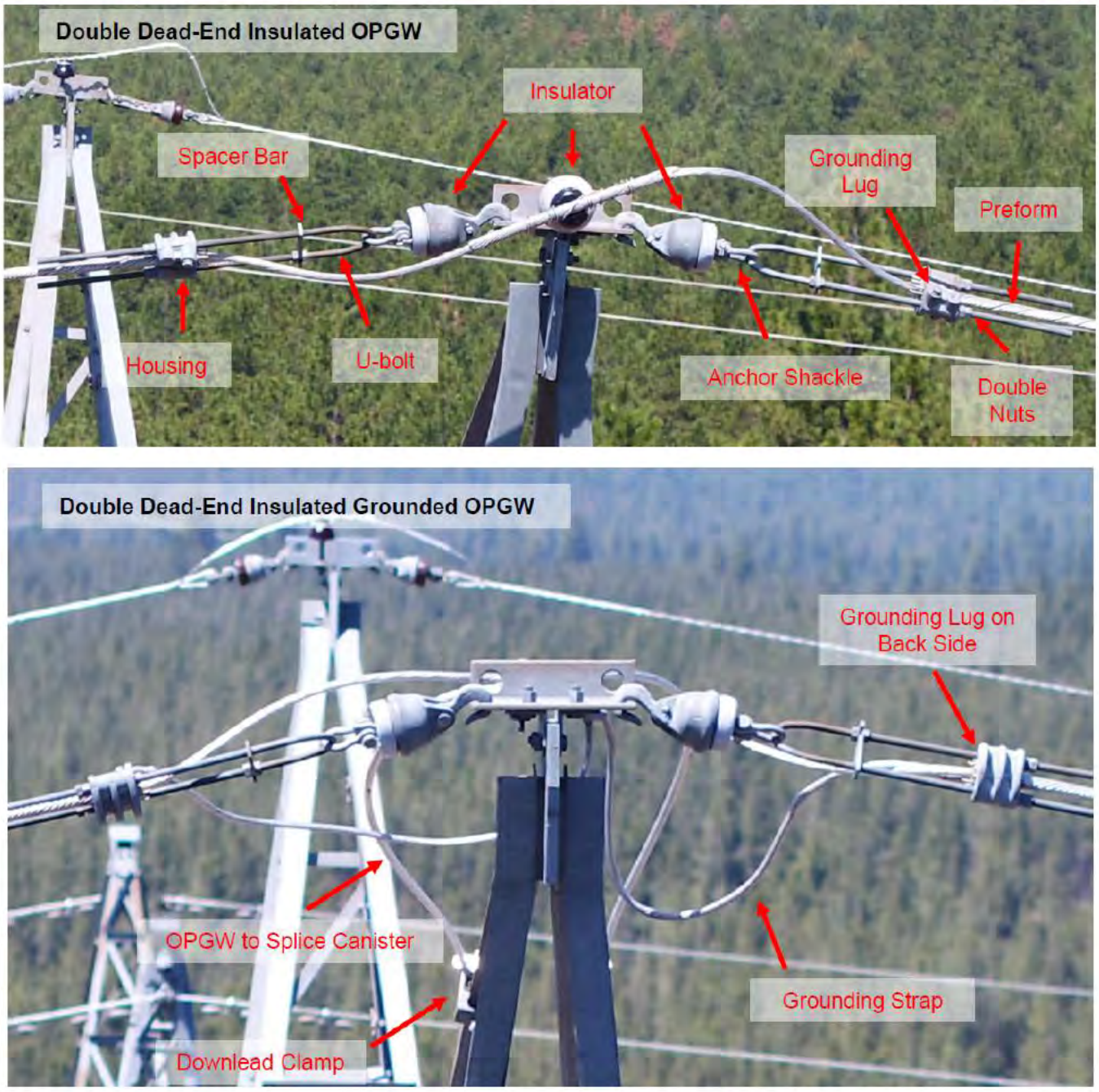
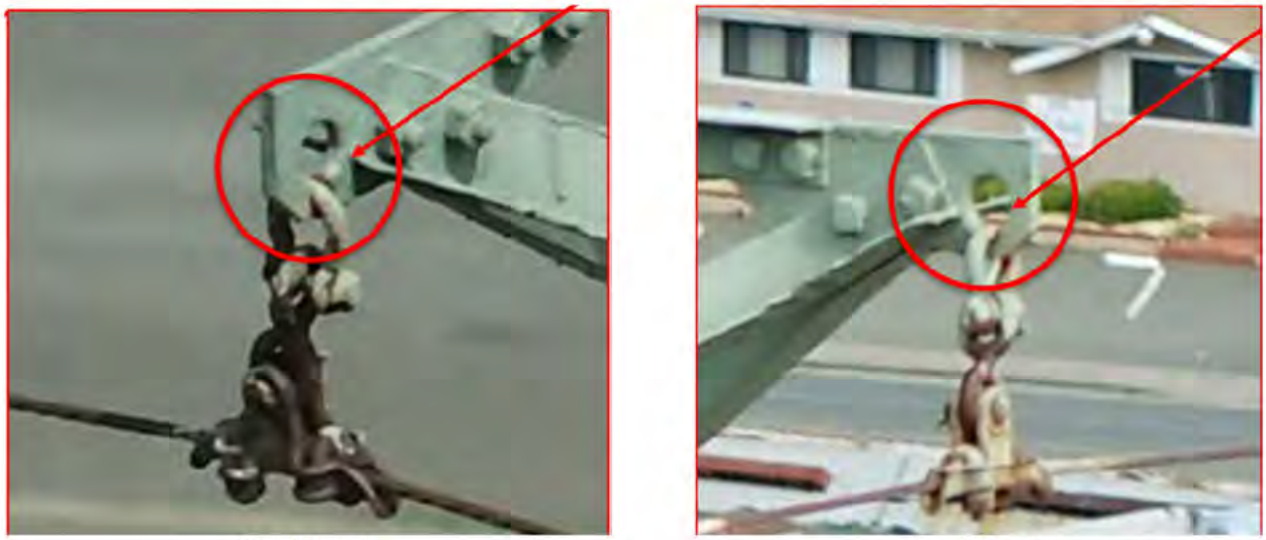


Figure 178 Examples of correct OPGW Installations (found in Job Aid 11).

Condition: 5
Priority: A
FDA: Emergency | Storm Related | Repair

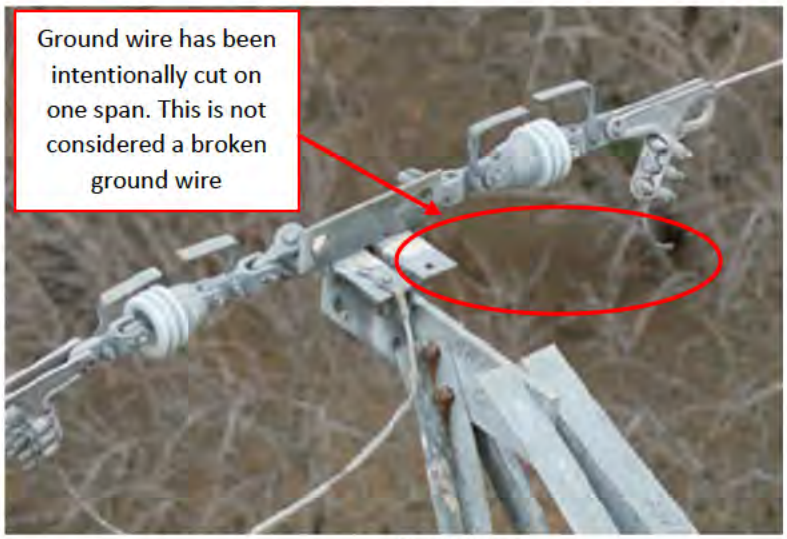
Figure 179 **OPGW under anti-climbing guard level, and insulated from structure, public safety risk that requires immediate action. Image on right not grounded at the top of structure.**



Condition: 5
Priority: A
FDA(1): Emergency|Storm-related|Repair (Hanger Plate)
FDA(2): Emergency Wood/Steel|Other|Replace (Shackle)

Condition: 4
Priority: E+
FDA(1): Shield Wire/OPGW-Steel|No Good/Out of Stdrd|Repair
FDA(2): Hardware-Tower| No Good/Out of Stdrd|Replace

Figure 180 **Severe wear (< ¼ inch remaining) in hanger plate (left). Moderate wear (between ½ and ¼ of an inch, right).**



Reminders:

Some types of damage, particularly on fiber, can be small and difficult to see. Always zoom in during your inspection, especially on these areas.

Some structures that appear new may have old hardware or components, especially in the case of fiber. Always do a thorough inspection, even if the structure appears new.

Condition: 1
Priority: No notification required

Figure 181 **Overhead ground/shield wire**

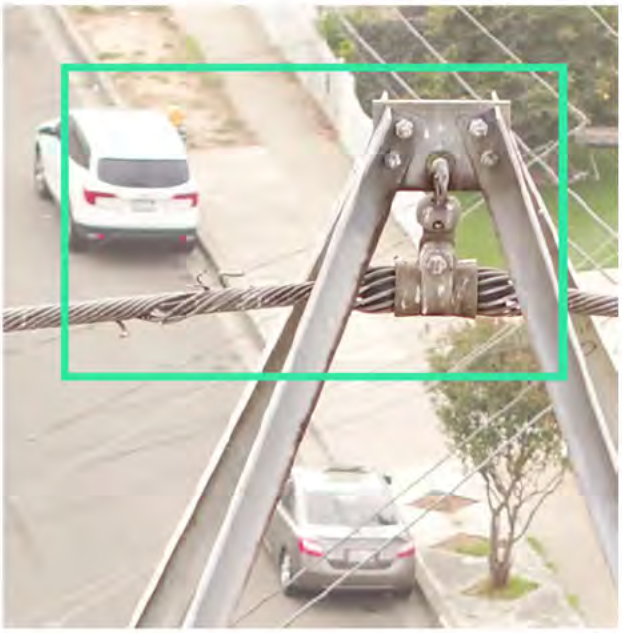
Note: **Grounding OPGW on all structures 230kV and below is required. Both dead-ends should be grounded**

Grounding not required on shield wire

OPGW on 230kv and below with insulators that are not grounded should be written up to allow further investigation

Condition: 3/4
Priority: E/ E+
FDA: Shield Wire/OPGW-Steel|No Good/Out of Stdrd|Repair

Figure 182 **Missing OPGW components. If there is any contact between the wire and the structure, the tag should be upgraded to a E+ and notes made to reflect this. Both dead ends must be grounded (left). External contact of OPGW to itself in the downlead to the coil (left).**



Condition: 4
Priority: E+
FDA: Shield Wire/OPGW-Steel|No Good/Out of Stdrd|Repair

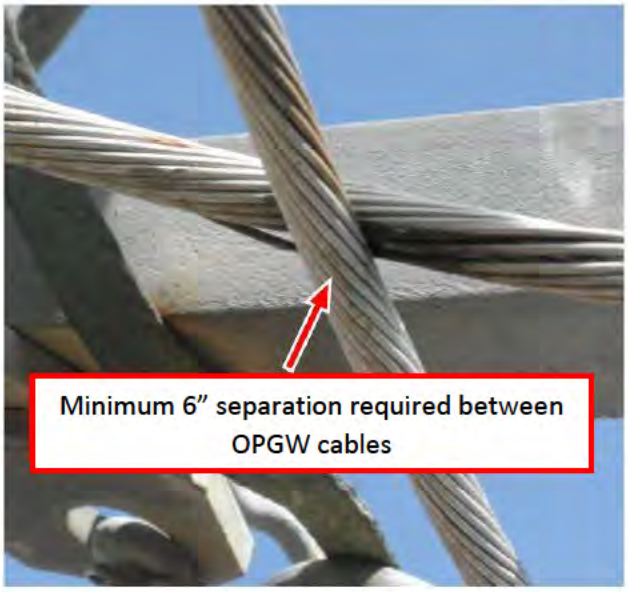
Figure 183 **Broken strands (15% to 40%), with the removed cable shown to the right, after repair.**

Condition: 4
Priority: E+
FDA: Shield Wire/OPGW-Steel|No Good/Out of Stdrd|Repair

Condition: 3
Priority: E
FDA: Shield Wire/OPGW-Steel|No Good/Out of Stdrd|Repair

Figure 184 **Broken strands on OPGW (left). While the damage was minor and may require an E priority, this was elevated to E+ priority based on its location between the dead ends. Loose hardware on OPGW spacer (right).**

Condition: 4
Priority: E+
FDA: Shield Wire/OPGW-Wood/Steel|No Good/Out of Stdrd|Repair

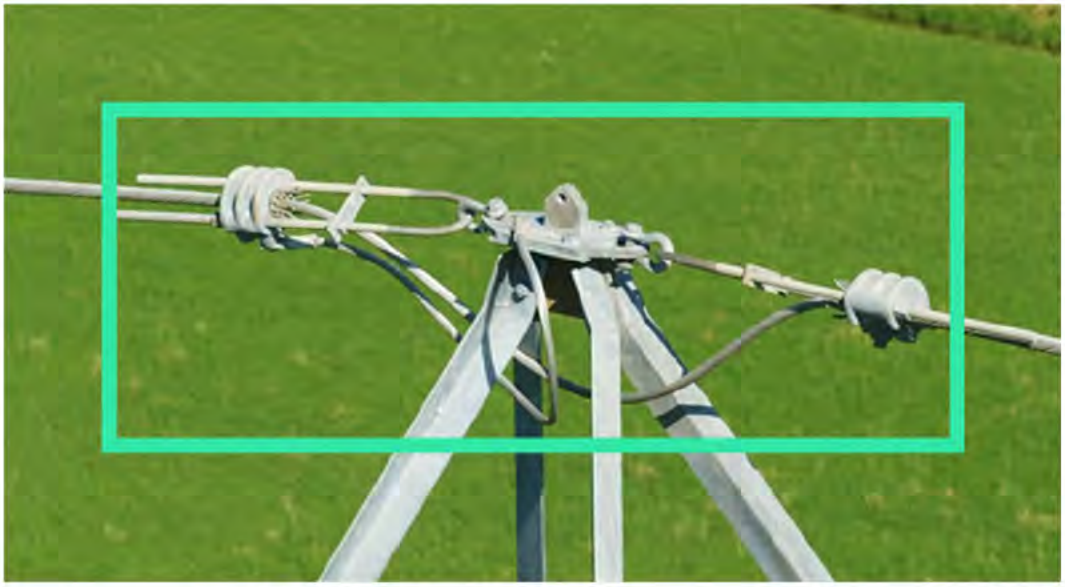


Condition: 4
Priority: E+
FDA: Shield Wire/OPGW-Steel|No Good/Out of Stdrd|Repair

Figure 185 **Broken/damaged strands possibly due to corrosion (left). Less than 6" of clearance between OPGW cables (right).**

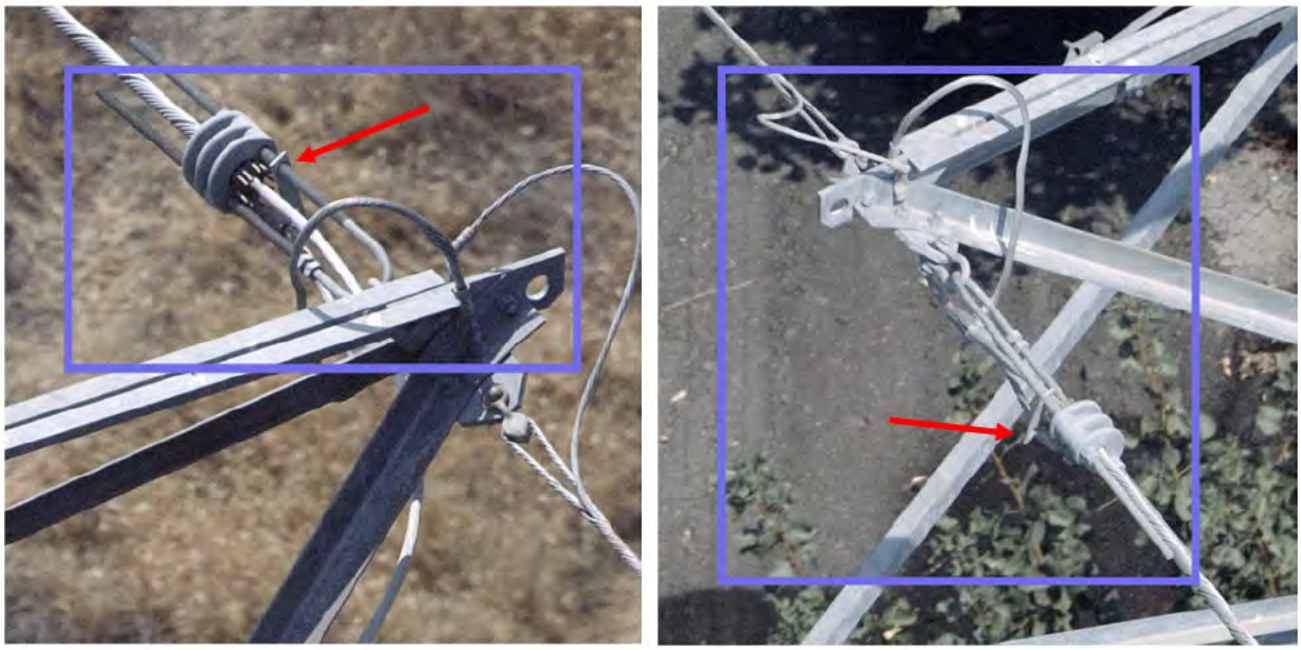
Condition: 5
Priority: A
FDA: Emergency|Storm-related|Repair

Figure 186 **Wear on OPGW hardware in the field (left) and after removal (right).**



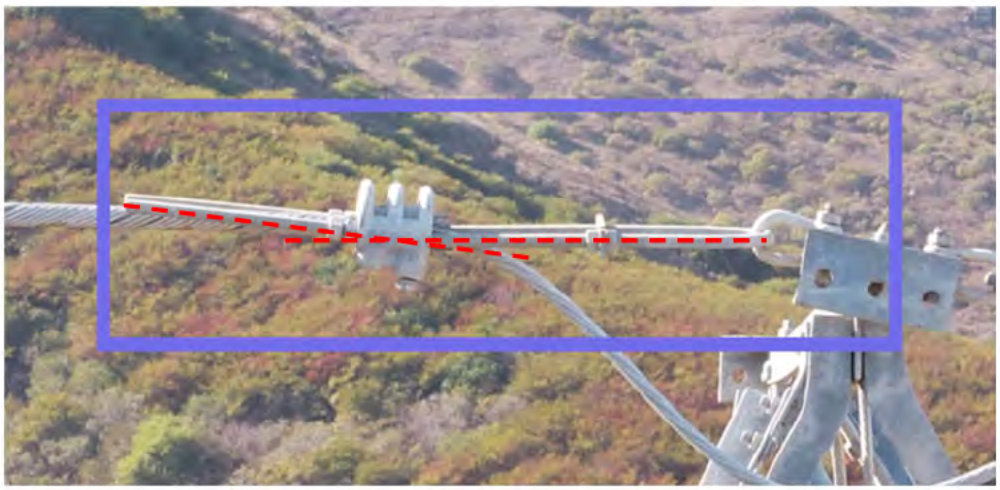
Condition: 3
Priority: E
FDA: Shield Wire/OPGW-Steel|No Good/Out of Stdrd|Repair

Figure 187 **Improper clearance on OPGW, also improper grounding. Each dead end should be grounded. Also, clearance between the cable and the spacer bar should be evaluated. Improper clearance is an E, while contact is a E+ priority.**



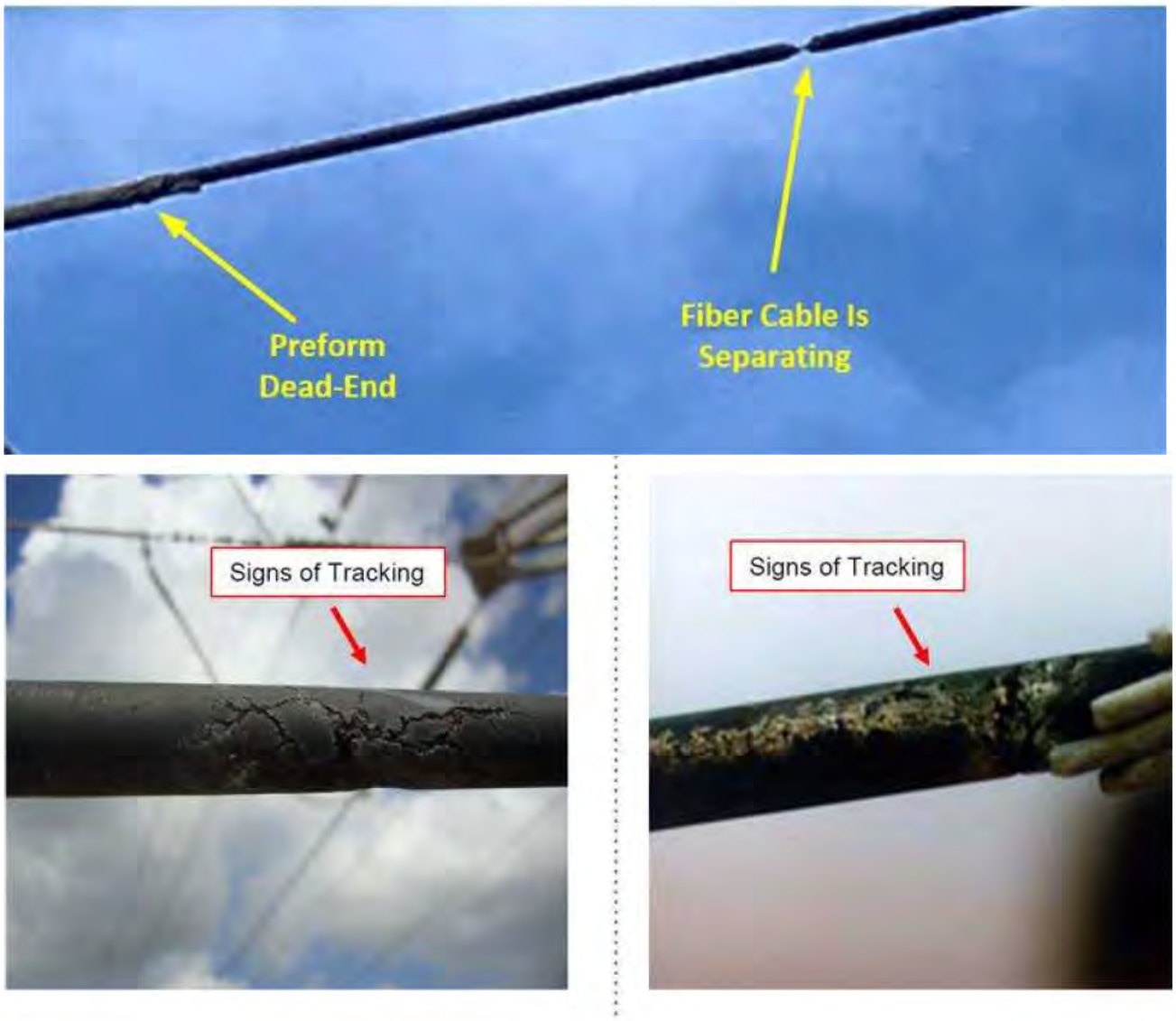
Condition: 3
Priority: E
FDA: Shield Wire/OPGW-Steel|No Good/Out of Stdrd|Repair

Figure 188 **Loose spacer on OPGW**



Condition: 3
Priority: E
FDA: Shield Wire/OPGW-Steel|No Good/Out of Stdrd|Repair

Figure 189 **Bent U-bolt on OPGW.**



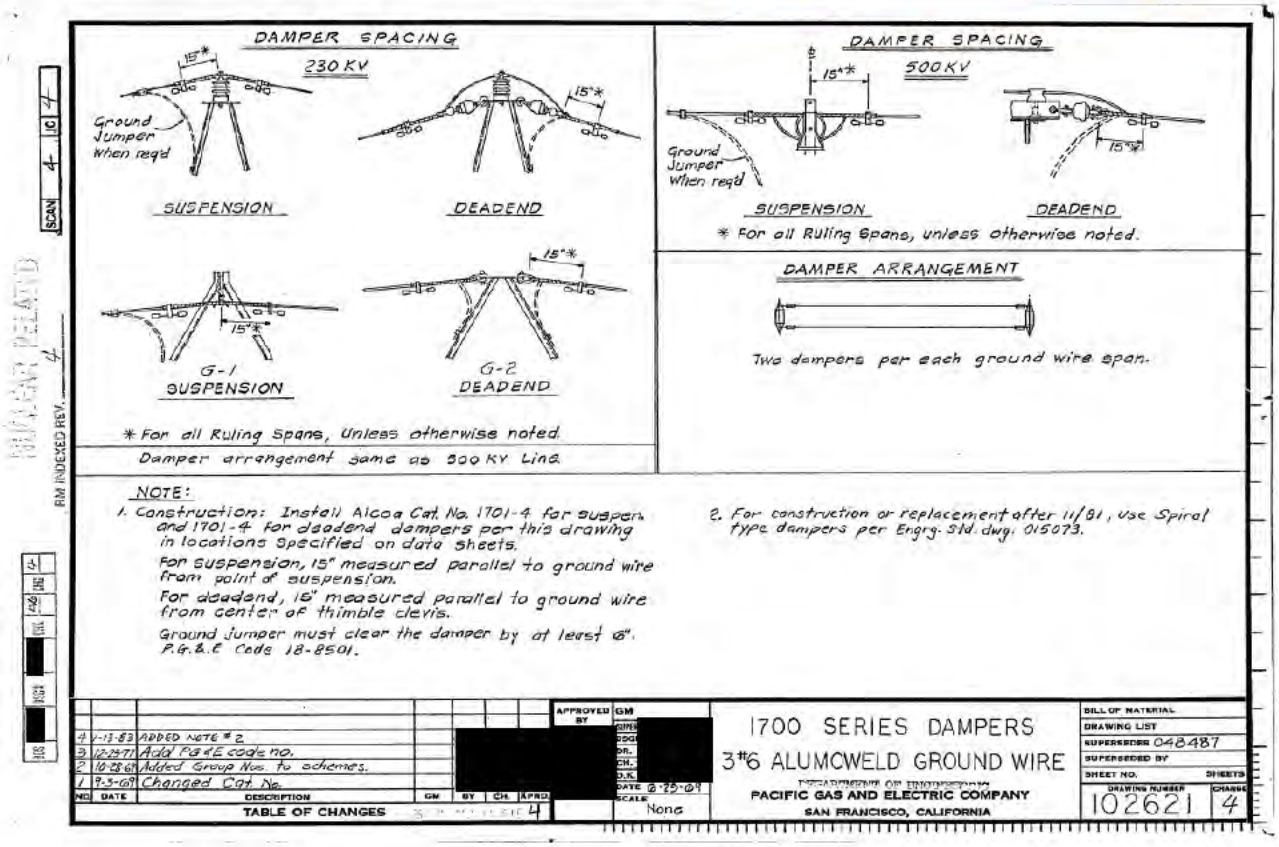
Condition: 4/5
Priority: E+/A
FDA: Shield Wire/OPGW-Wood/Steel|No Good/Out of Stdrd|Repair

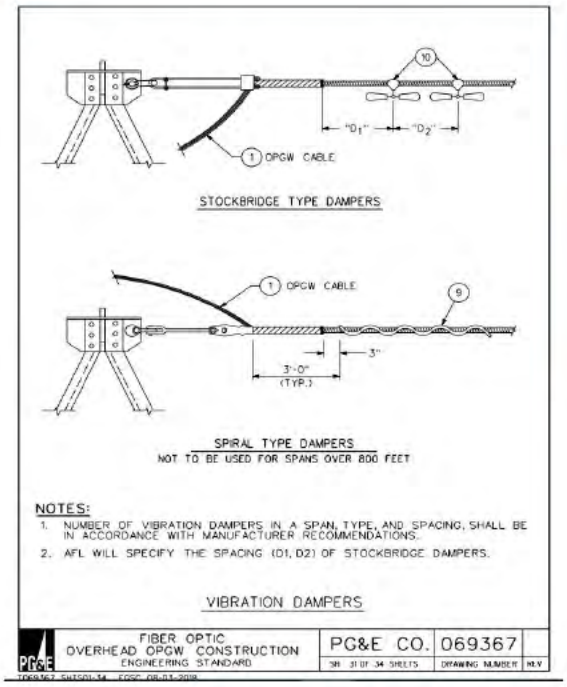
Figure 190 **Signs of tracking and dry-band arcing on ADSS. Based on the ETPM and on the degree of damage, this can be assigned a priority between E+ and A. The damage in the top photo would require an A tag, while the lower photos could be given E+ priority.**

Condition: 1

Priority: No notification required

Figure 191 **Dampers on shield wire preform are acceptable.** **Drawing number 102621 for reference.**





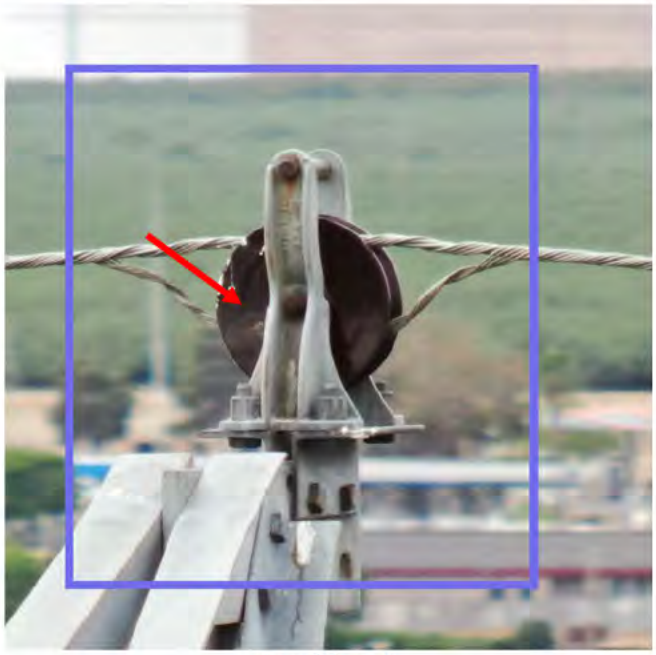
Condition: 3
Priority: E
FDA: Shield Wire/OPGW-Wood/Steel|No Good/Out of Stdrd|Repair

Figure 192 **Drawing of acceptable damper placement on OPGW (left). Example of spiral dampers in contact with OPGW internal armor rod (right).**

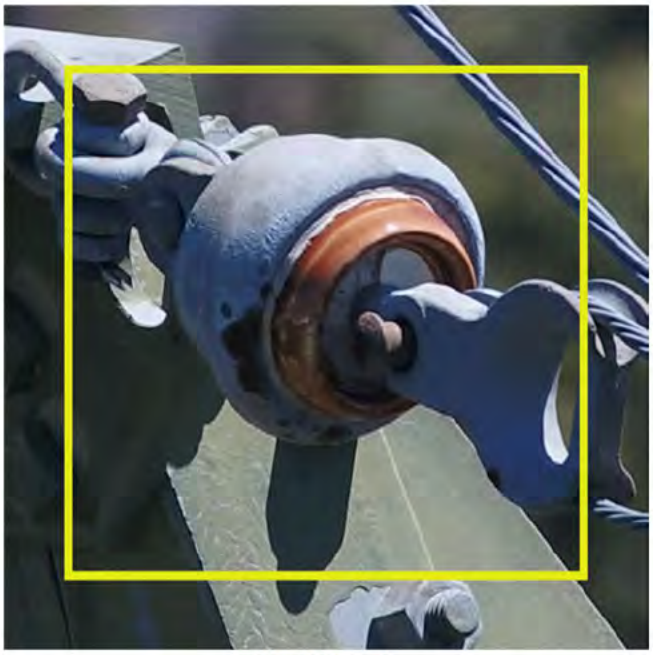
Condition: 3
Priority: E
FDA: Shield Wire/OPGW-Steel|No Good/Out of Stdrd|Repair

Condition: 4
Priority: E+
FDA: Shield Wire/OPGW-Steel|No Good/Out of Stdrd|Repair

Figure 193 **If OPGW ground strap is fraying (left), assign an E tag. If strap is touching the OPGW (right), create a E+ tag. If a strap is touching the tower, but shows no sign of damage, no tag is necessary.**

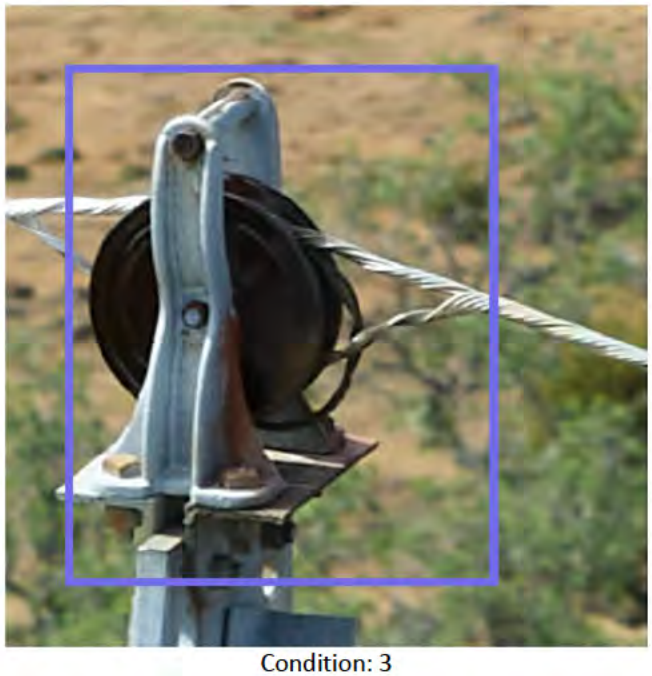


Condition: 3
Priority: E
FDA: Shield Wire/ OPGW-Steel | No Good/Out of Stdrd|Repair



Condition: 3
Priority: E
FDA: Shield Wire/ OPGW-Steel| No Good/Out of Stdrd|Repair

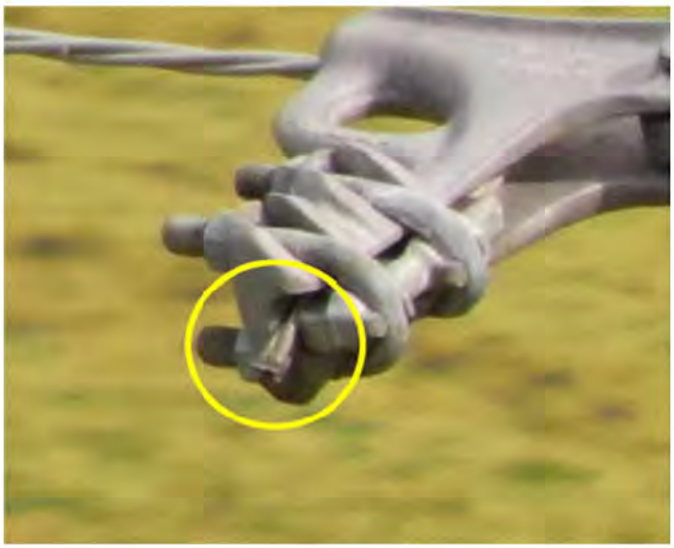
Figure 194 **Shield wire block flashed (left) shield insulator flashed (right).**



Condition: 3
Priority: E
FDA: Shield Wire/ OPGW-Steel | No Good/Out of Stdrd|Repair

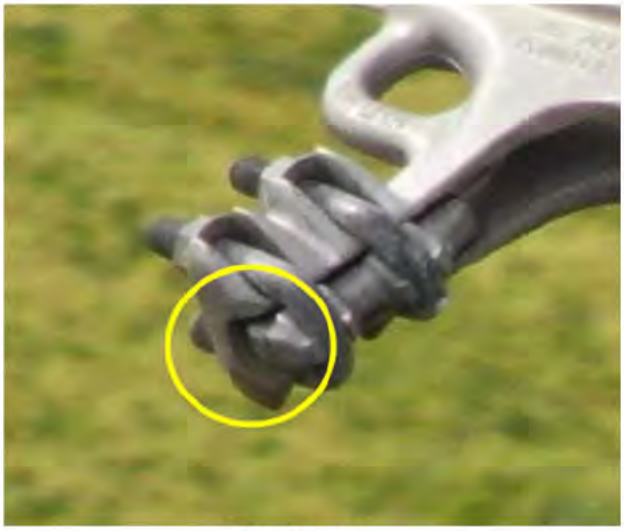
Condition: 4
Priority: E+
FDA: Shield Wire/ OPGW-Steel | No Good/Out of Stdrd|Repair

Figure 195 **Example of loose shield wire preform (left). Shield wire block cracked (right).**

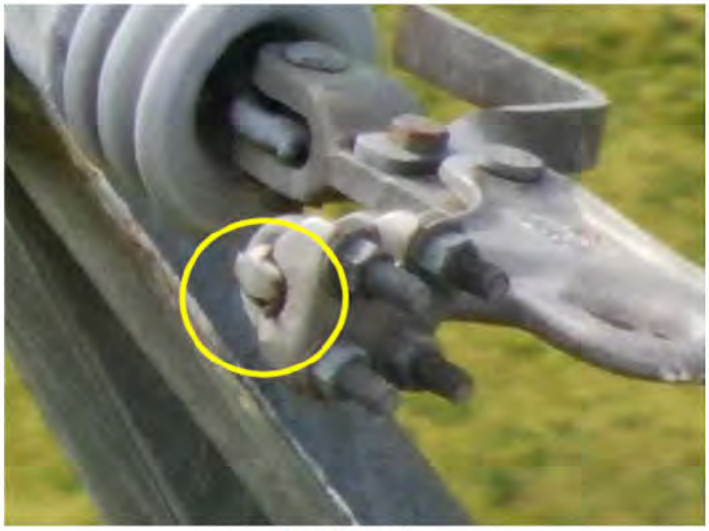


Condition: 1
Priority: No notification required

Figure 196 **Tail is outside dead-end clamp.**



Condition: 5
Priority: A
FDA: Emergency|Storm-related|Repair



Condition: 4
Priority: E+
FDA: Shield Wire/ OPGW-Steel | No Good/Out of Stdrd|Repair

Figure 197 **Tail is inside dead-end clamp AND shows evidence of shield wire further receding/slipping (left). Tail is flush with dead-end clamp (right).**

Condition: 4
Priority: E+
FDA: Shield Wire/OPGW-Wood/Steel|No Good/Out of Stdrd|Repair

Figure 198 **ADSS twisted at hardware attachment, and armor/reinforcement rod out of position (left). Missing reinforcement rod on ADSS, which requires repair (right).**

Condition: 1
Priority: No notification required

Figure 199 **Underbuilt OPGW with sign placed underneath fiber (left). FDS box style housing units do not require a reinforcement rod (right).**

Conductor & Splices

Please see TD-1001M-JA10 Identifying Conductor Conditions for more information on conductors and See TD-1001M-JA14 IdentifyingLevels of Damage and Condition of Splices on Transmission Line Structures and Supports

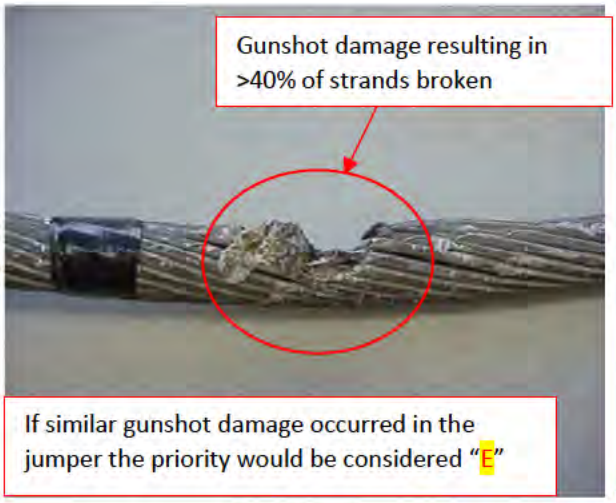
Table 4 Minimum Conductor-to-Ground Clearance Calculations

Voltage	60, 70, 115 kV	60, 70, 115 kV (over railroad)	230 kV	230 kV (over railroad)	500 kV	500 kV (over railroad)
Minimum Clearance Requirement	30 feet [1]	34 feet [1]	30 feet [1]	34 feet [1]	35 feet [1]	39 feet [1]

Note: (1) If the measured conductor to ground clearance is less than shown on this table, consult transmission line engineering to determine the optimal conductor-to-ground clearance for the location in question and whether remediation is required.

Table 5 Minimum Conductor-to-Conductor (Circuit-to-Circuit) Clearances

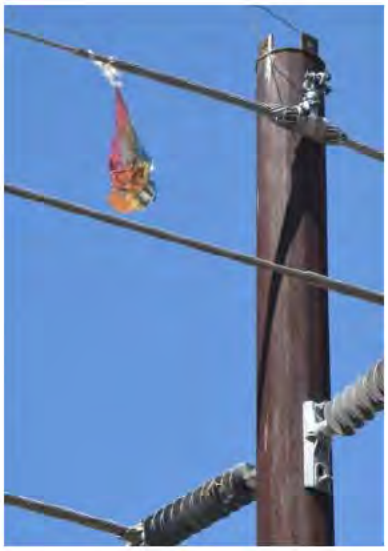
Voltage	60/70 kV	115 kV (Wood)	115 kV (Non-Wood)
Minimum Separation for Circuits Supported on Same Structure	48 inches	84 inches	120 inches
Minimum Separation to Distribution on an Interset Pole	96 inches	120 inches	120 inches



Condition: 5
Priority: A
FDA: Emergency|Storm Related|Repair

Condition: 5
Priority: A
FDA: Emergency|Storm Related|Repair

Figure 200 Gunshot damage (left). Broken conductor, >40% broken strands (right).

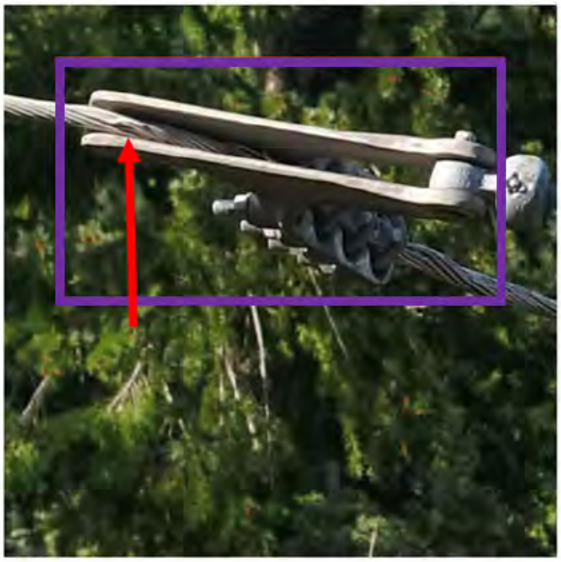


Condition: 5
Priority: A
FDA: Emergency|Storm Related|Repair

Figure 201 **Example of conductor debris touching energized conductor and bonded hardware. *This is an example of T-line operating at distribution voltage, where we inspect per usual besides undersized insulators*. (left). Mylar balloon on conductor/overhead fiber (right).**

Condition: 3
Priority: E
FDA: Conductor or Jumper-Wood/Steel|No Good/Out of Stdrd|Repair

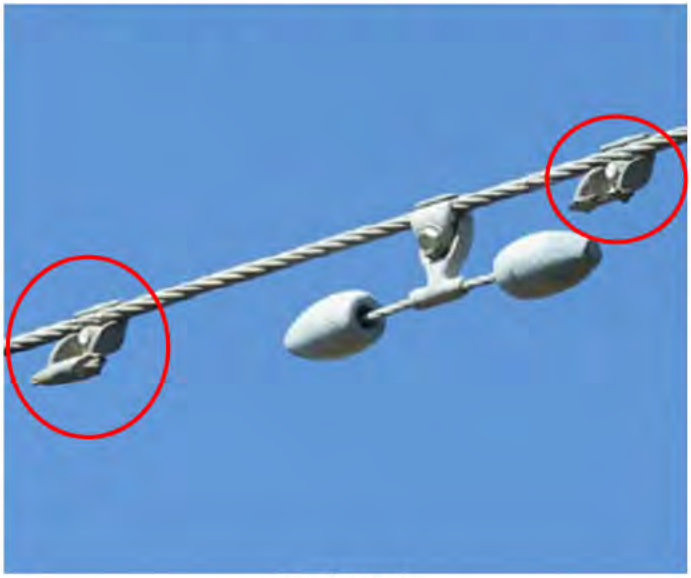
Figure 202 **Examples of conductor damage 5-40%.**



Condition: 3
Priority: E
FDA: Conductor-Wood/Steel|No Good/Out of Stdrd|Repair

Condition: 2
Priority: F
FDA: Conductor or Jumper-Wood/Steel|No Good/Out of Stdrd|Repair

Figure 203 Examples of damaged conductor, 1 strand to 5%. Broken strands up to 5% is an F priority.



Condition: 2
Priority: F
FDA: Conductor-Wood/Steel|Debris/Nest/etc.|Remove

Condition: 2
Priority: F
FDA: Conductor-Wood/Steel|Debris/Nest/etc.|Remove

Figure 204 Examples of conductor debris. Unused hardware.

Condition: 5
Priority: A
FDA: Emergency|Storm Related|Repair

Condition: 5
Priority: A
FDA: Emergency|Storm Related|Repair

Figure 205 **Connector failure/ hot spot, possibly due to overloading (left). Backed off >50% (right).**

Condition: 4
Priority: E+
FDA: Connector-Wood/Steel| No Good/Out of Stdrd|Repair

Condition: 4
Priority: E+
FDA: Connector-Wood/Steel| No Good/Out of Stdrd|Repair

Figure 206 **Backed off 30-50% or Conductor/Ampact damage(left). Conductor only partially in grasp of the clamp (right). *If the connector is on a jumper, use jumper FDA.***

Condition:4
Priority: E+
FDA: Conductor or Jumper-Wood/Steel| No Good/Out of Stdrd|Repair

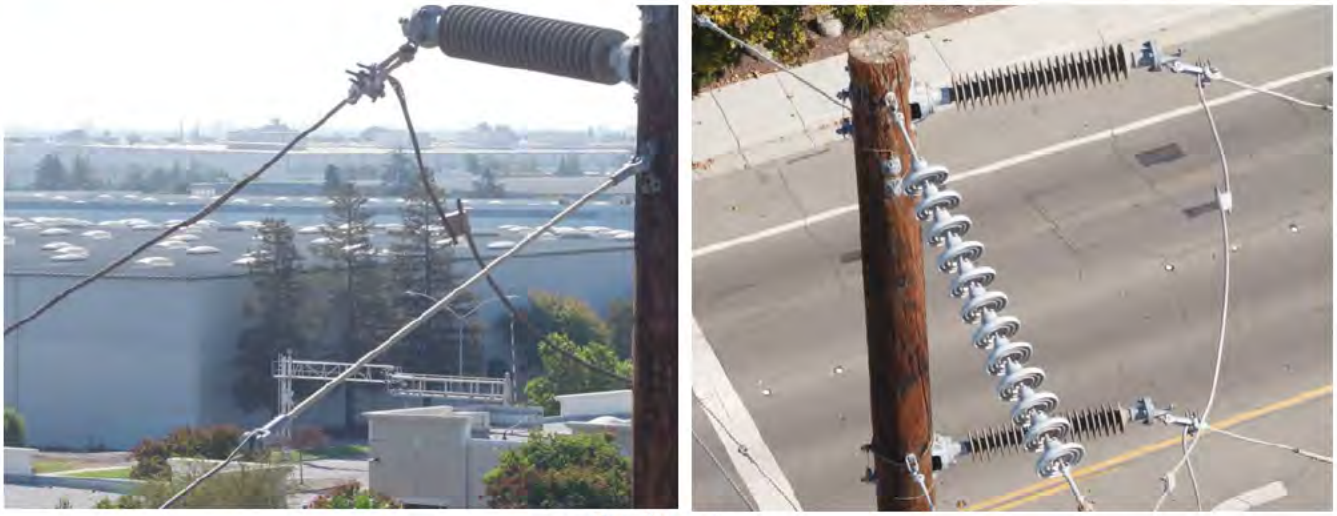
Condition:4
Priority: E+
FDA: Conductor or Jumper-Wood/Steel| No Good/Out of Stdrd|Repair

Figure 207 Examples of conductor strands out-of-lay 5-40%.

Condition:3
Priority: E
FDA: Conductor or Jumper-Wood/Steel| No Good/Out of Stdrd|Repair

Condition:1
Priority: No notification required

Figure 208 Conductor strands out-of-lay 5-40%. Stands are separated enough to see through to the background (left). Conductor NOT out-of-lay (right).



Condition: 1
Priority: No notification required

Figure 209 **Example of acceptable splices on non-tension spans. These are acceptable because (1) they are not under tension, (2) they are on short spans (jumpers), and (3) they don't have down-guys backing the load.**

Condition: 3
Priority: E
FDA: Jumper-Wood/Steel|No Good/Out of Stdrd|Repair

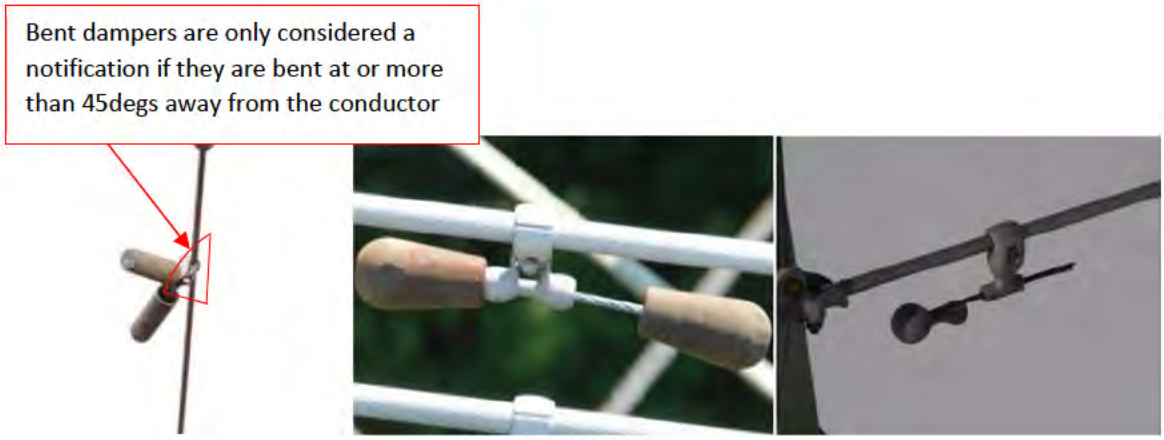
Figure 210 **Jumper connections should be connected to the non-tension side of the shoe. Configuration should be repaired with an E priority notification.**

Condition: 2
Priority: F
FDA: Jumper-Wood| No Good/Out of Stdrd |Repair

Condition: 2
Priority: F
FDA: Jumper-Wood| No Good/Out of Stdrd |Repair

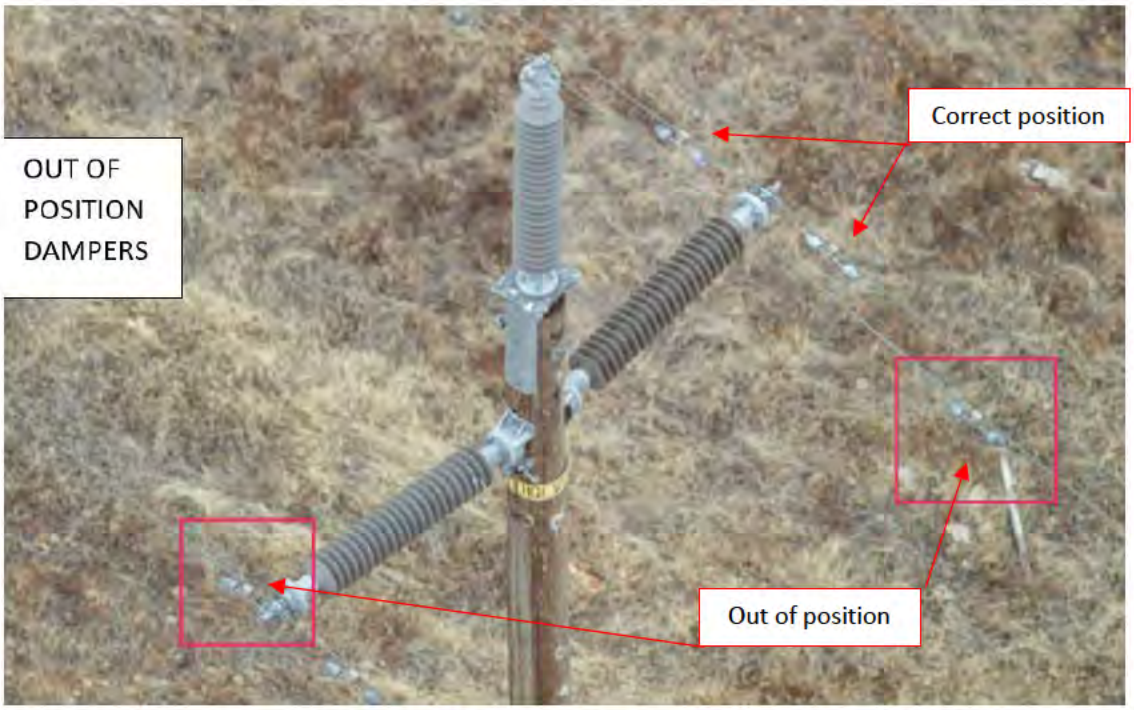
Figure 211 **Examples of incorrectly removed jumpers, also referred to as "open jumpers". See page 05 of TD-1001M-JA23. See section on idle facilities for more info.**

Dampers



Condition: 3
Priority: E
FDA: Damper-Wood/Steel|No Good/Out of Stdrd|Replace

Figure 212 Damaged dampers (left, center, right).



Condition: 3
Priority: E
FDA: Damper-Wood/Steel|No Good/Out of Stdrd|Replace

Figure 213 Dampers out of position

Damper configuration	Resolution
One damper present, and out of position	E priority
Multiple dampers present, outboard (furthest from structure) damper out of position	E priority
Multiple dampers present, inboard (closest to structure) damper out of position	E priority

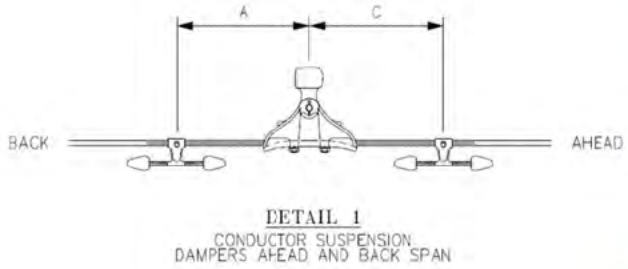
Condition: 3
Priority: E
FDA: Damper-Wood/Steel|No Good/Out of Stdrd|Replace

Condition: 1
Priority: No notification required

Figure 214 **Damper weight in contact with armor rod clamps require a E priority notification (left). If no contact, no tag is necessary (right).**

Condition: 3
Priority: E
FDA: FDA: Damper-Wood/Steel|No Good/Out of Stdrd|Replace

Figure 215 **Bent damper more than 45° (left). Damaged dampers (right).**



DETAIL 1
CONDUCTOR SUSPENSION
DAMPERS AHEAD AND BACK SPAN

Condition: 1
Priority: No notification required

Figure 216 **Dampers on suspension armor rod are acceptable**

Weights

Condition: 3
Priority: E

Condition: 1
Priority: No notification required

FDA: Damper-Wood/Steel|No Good/Out of Stdrd|Replace

Figure 217 **Separation between weight (left). Weight is tight, no tag is necessary (right).**

Condition: 3
Priority: E

Condition: 1
Priority: No notification required

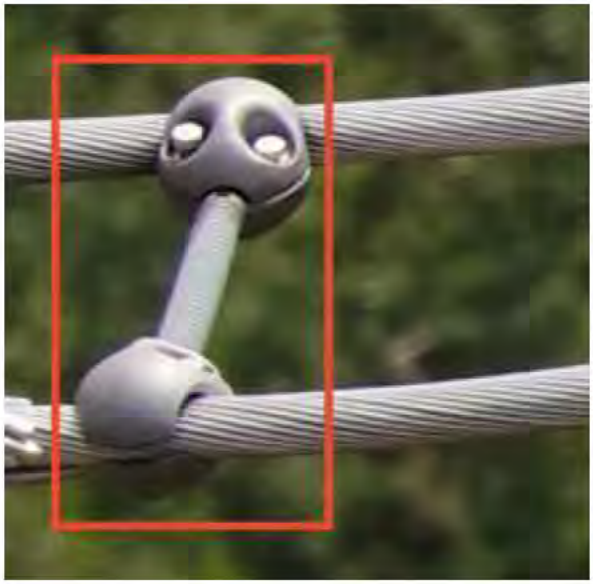
FDA: Damper-Wood/Steel|No Good/Out of Stdrd|Replace

Figure 218 **Weight has loose hardware and separation from the armor rod (left). Weight is tight to the armor rod, no tag is necessary (right).**

Spacers

Condition: 1
Priority: No notification required

Figure 219 Spacer is tight on the conductor (left). Pre-form style spacers are acceptable as long as they aren't damage or broken (right).



Condition: 3
Priority: E
FDA: Spacer- Wood/Steel|No Good/Out of Stdrd|Replace

Condition: 3
Priority: E
FDA: Spacer- Wood/Steel|No Good/Out of Stdrd|Replace

Figure 220 Example of damaged spacers. Loose spacer (left) and broken spacer (right).

Splices

Condition: 5
Priority: A
FDA: Emergency|Storm Related|Repair

Condition: 5
Priority: A
FDA: Emergency|Storm Related|Repair

Figure 221 **Failed splice (left). Splice is not compressed on one side (right).**

Condition: 1
Priority: No notification required
FDA: N/A

Condition: 3
Priority: E
FDA: Splice-Steel/Wood|No Good/Out of Stdrd|Replace

Figure 222 **Implosion splice which is showing signs of interior corrosion with steel plug. No notification unless you notice crack in the housing or further issues (left). Splice within two feet of attachment (right).**

Condition: 3
Priority: E
FDA: Splice-Wood/Steel|No Good/Out of Stdrd|Repair

Condition: 3
Priority: E
FDA: Splice-Wood/Steel|No Good/Out of Stdrd|Repair

Figure 223 Compression splice with only compression marks on the ends (left). Bent compression splice "Banana", splice is bent above the top of the conductor line (right).

The use of automatic splices at any location on the conductor requires a notification. Automatic splices within 10' of the conductor clamp is considered a "E" notification. If the splice is 10' or more from the clamp it should be priority "E". See the guy wire section for automatic splices on guy wires.

Condition: 3
Priority: E
FDA (1): Splice-Wood/Steel|No Good/Out of Stdrd|Repair
FDA (2): Splice-Wood/Steel|No Good/Out of Stdrd|Replace

Condition: 3
Priority: E
FDA: Splice-Wood/Steel|No Good/Out of Stdrd|Replace

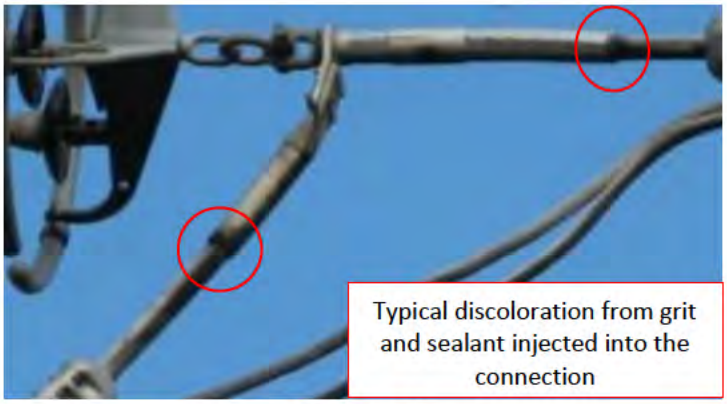
Figure 224 For this structure two notification are needed. One to repair the splice >2'-<10' and one to replace the splice <2' (left). Automatic splice outside of 10 feet (right). ***Splice issues are not affected by the existence of dampers, please refer to damper section when inspecting for the damage of which.***

Condition: 1
Priority: No notification required

Condition: 1
Priority: No notification required

Figure 225 **Examples of shunted splices. Splices that have been shunted, automatic or otherwise, are not a problem, unless there is damage to the splice itself.**

Condition: 3
Priority: E
FDA: Splice-Wood/Steel|No Good/Out of Stdrd|Repair



Condition: 1
Priority: No notification required

Figure 226 **Conductor splice within 10' of conductor attachment point (left), example of compression dead end clamp (right).**

Table 6 Acceptable splice types for different conductor materials. If the splice/material combination is not marked here, it should be assigned a priority of "E" regardless of location with respect to the clamp/shoe. Automatic splices outside of 10ft with no damage can be prioritized as E.

		Type of Conductor		
		Copper	Aluminum	ACSR
Type of Splice	Threaded	×		
	Bolted	×		
	Compression	×	×	×
	Moused	×	×	×
	Twisted	×	×	×

Bolted splice

Western Union Splice

Twisted Splices

Compression Splices

Moused Splices

Threaded Splices

Condition: 3
Priority: E
FDA: Splice-Wood| No Good/Out of Stdrd |Replace

Figure 227 **Examples of non-tension splices. A non-tension splice in a full tension application should be assigned a E priority notification.**

Foundations

Please see TD-1001M-JA12 Identifying Foundation Condition on Transmission Line Structures and Supports for more info

Condition: 3
Priority: E
FDA: Foundation/Concrete-Tower | No Good/Out of Stdrd |Repair

Condition: 4
Priority: E+
FDA: Foundation/Concrete-Tower | No Good/Out of Stdrd |Repair

Figure 228 **Rebar exposed with > 50% material loss (left). Foundation crack exceeding 1/2" in width AND extended to the stub (right).**

Condition: 3
Priority: E
FDA: Foundation/Concrete-Tower | No Good/Out of Stdrd |Repair

Condition: 2
Priority: F
FDA: Foundation/Concrete-Tower | No Good/Out of Stdrd |Repair

Figure 229 **Moderate foundational damage (left). Foundation crack between 1/16" and 1/2" in width (right).**

Condition: 1/2
Priority: None (outside of cont. dist)/F (in cont. dist.)
FDA: Foundation/Concrete-Tower | No Good/Out of Stdrd |Repair

A notification for buried foundation is only required when the bolts on the stub plate of a direct buried tower are covered by the earth

Condition: 2
Priority: F
FDA(1): Foundation/Concrete-Tower | No Good/Out of Stdrd |Repair
FDA(2): Structure-Tower |No Good/Out of Stdrd |Repair

Figure 230 **Stub in concrete not sealed (left), buried steel stubs and buried secondary members (right). If a structure has previously had mastic which has worn away, it should be given an F. However, the structure to the left has not, so its priority is based on if it is in a contamination district or not (see below).**

		Cracks less than 1/16"	Cracks between 1/16" and 1/2"
Not in corrosion district	Mastic never applied	No notification required	F
	Mastic was present, now worn	No notification required	F
In corrosion district	Mastic never applied	F	F
	Mastic was present, now worn	F	F

Table 7: **Breakdown of priorities for mastic based on corrosion district, previously applied mastic, and the presence of cracks. This table is only intended as guidance for mastic issues. For a more detailed breakdown of damage to foundations, see TD-1001M-JA12 .**

Vegetation

In general, vegetation tags should be created in accordance with "Guide for Assigning Priority Codes" table, and should use a "Vegetation" type FDA code. Please see TD-1001M-JA20 **Evaluating Conditions for Vegetation Nonconformance in Transmission Line** for more info.

Condition: 3
Priority: E
FDA: Vegetation|Overgrown|Remove

Condition: 3
Priority: E
FDA: Vegetation|Overgrown|Remove

Figure 231 **Vegetation around base of pole, warranting removal.**

Condition: 3
Priority: E
FDA: Vegetation|Overgrown|Remove

Condition: 3
Priority: E
FDA: Vegetation|Overgrown|Remove

Figure 232 **In general, only "woody" vegetation warrants a notification. "Woody" vegetation is vegetation that cannot be removed with a weed-eater or lawn mower. The vegetation on the left would be considered "woody" while the vegetation on the right would not. Vegetation on the right obstructs the visibility of the foundation.**

Switches

Refer to TD-1001M-JA15 Identifying Levels of Deterioration and Corrosion on Transmission Line Switches for more information on these issues. If you encounter a structure with a switch, please refer to the job aid above.

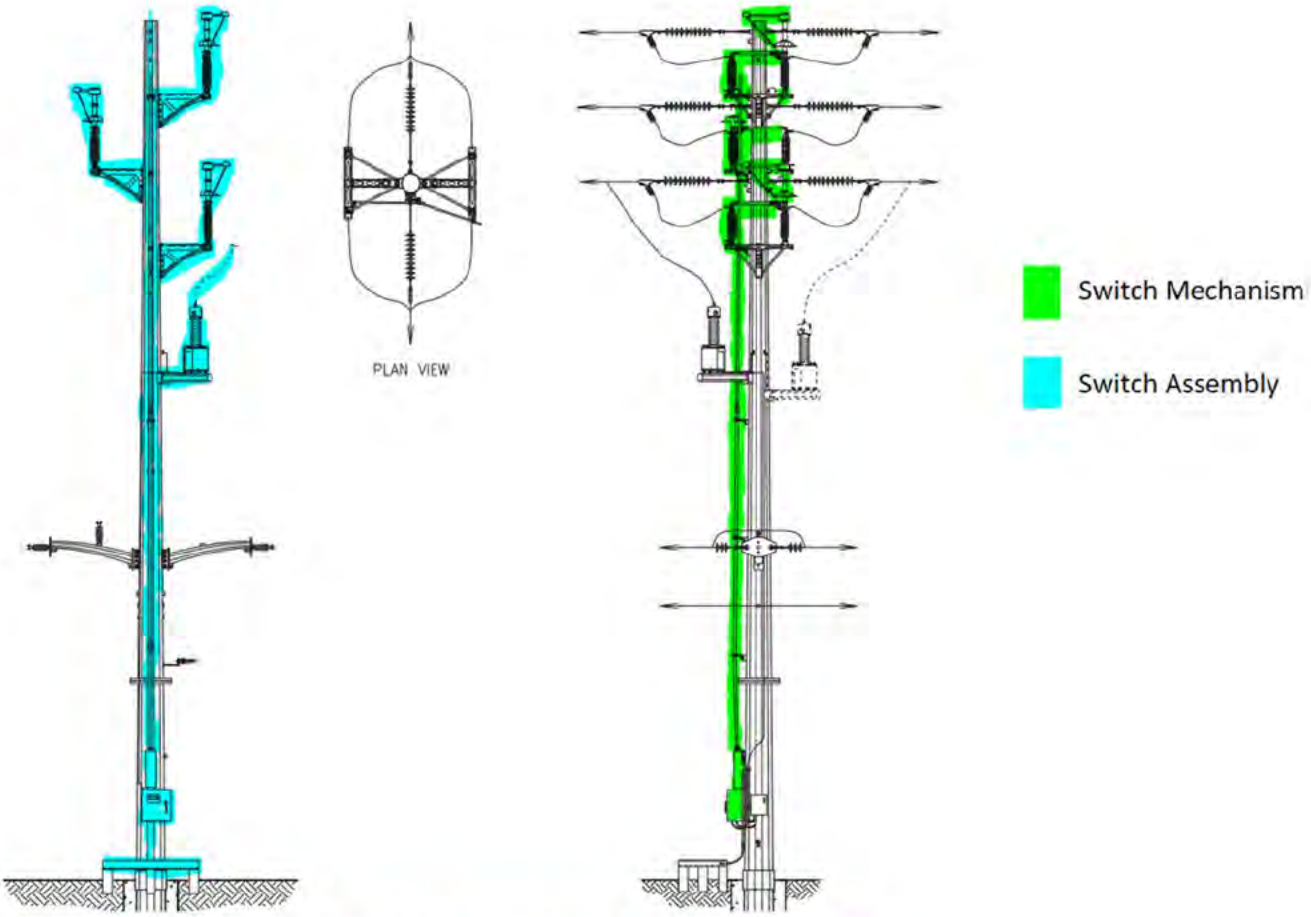


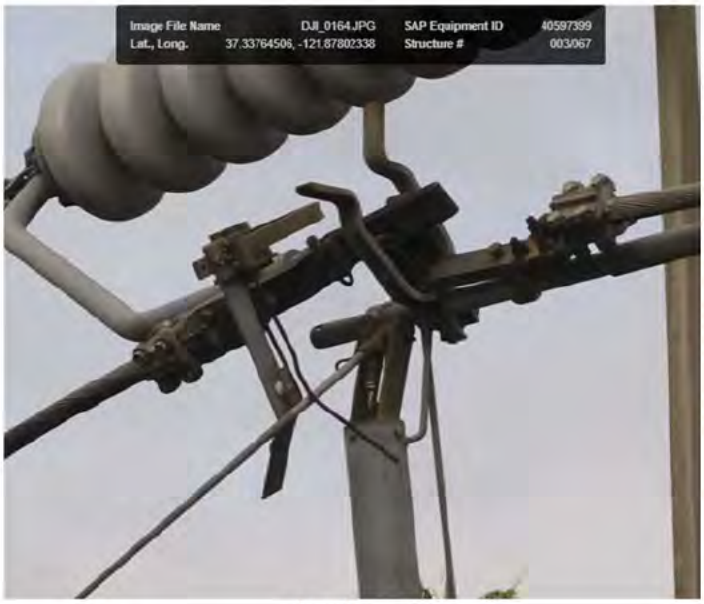
Figure 233 Representation of switch mechanism vs. switch assembly.

Switch Mechanism: The moving part of any switch that either connects or disconnects a line of conductor. This has also been called an 'Operating Mechanism' and generally includes a swing handle, vertical operating pipe, outboard bearings, interphase pipe, position indicators, and all connecting fittings.

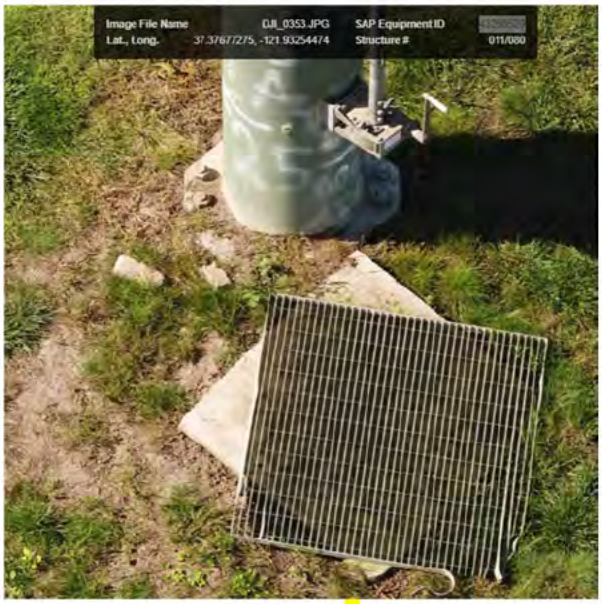
Switch Assembly: Every piece of hardware associated with the switch. The 'assembly' refers to the switch in its entirety.

Out of Adjustment: When a switch is not FULLY seated with contacts, use E+ priority. When a switch is not operable, (switch not fully seated and load break mechanism not seated/captured), use A priority.

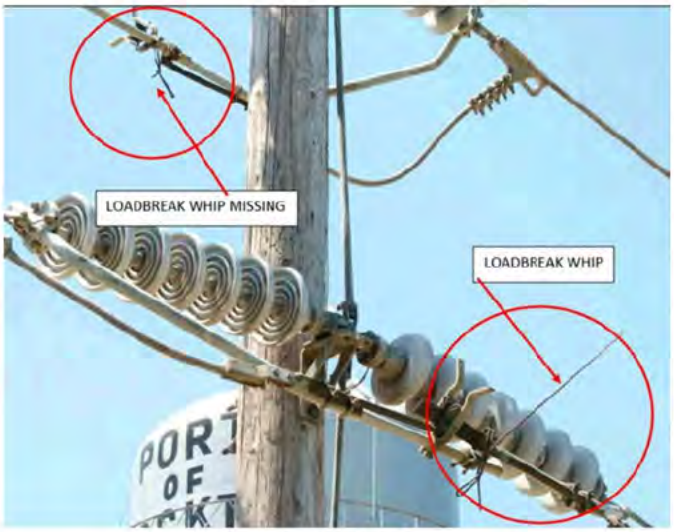
*Switch number tags must be present at each structure that has a switch present. If there is no switch number tag, please use F priority and FDA: Marker (i.e. Signs)-Wd/stl|No Good/Out of Stdrd|Install.



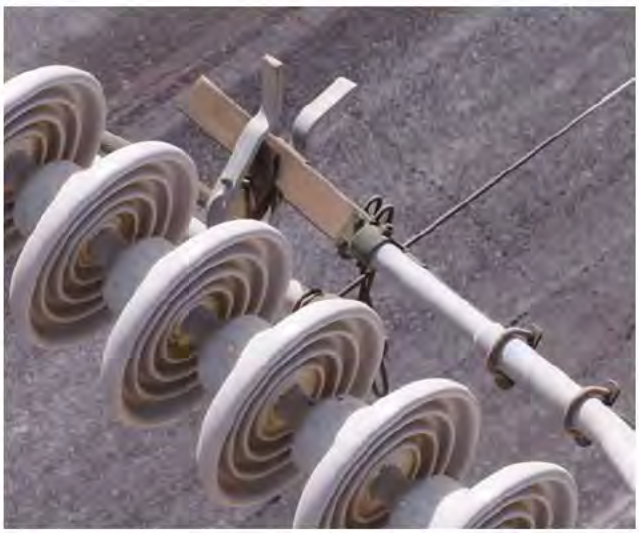
Condition: 5
Priority: A
FDA: Emergency-Steel(wood)|Other|Replace



Condition: 3
Priority: E
FDA: Switch-Steel|Out of Adjustment|Repair (Steel option)
FDA: Switch-Wood|No Good/Out of Stdrd|Repair (Wood option)



Condition: 4
Priority: E+
FDA: Switch-wood| No Good/Out of Stdrd |Repair



Condition: 4
Priority: E+
FDA: Switch|Out of adjustment|Repair

Figure 234 **Switch out of adjustment and load break device not fully seated (upper left). Switch handle not bonded to platform (upper right). Missing and broken whip on fully seated switch (bottom left). Switch blade not seated (bottom right).**

Condition: 1
Priority: No notification required

Condition: 1
Priority: No notification required

Condition: 3
Priority: E
FDA: Switch-Steel|Out of Adjustment|Repair

Condition: 1
Priority: No notification required

Figure 235 **Switches properly grounded (upper left and upper right). Platform improperly grounded, no direct connection between handle and platform (bottom left). Unlocked shroud doesn't qualify as a non-conformance (bottom right).**

Condition: 5
Priority: A
FDA: Emergency|Storm Related|Repair

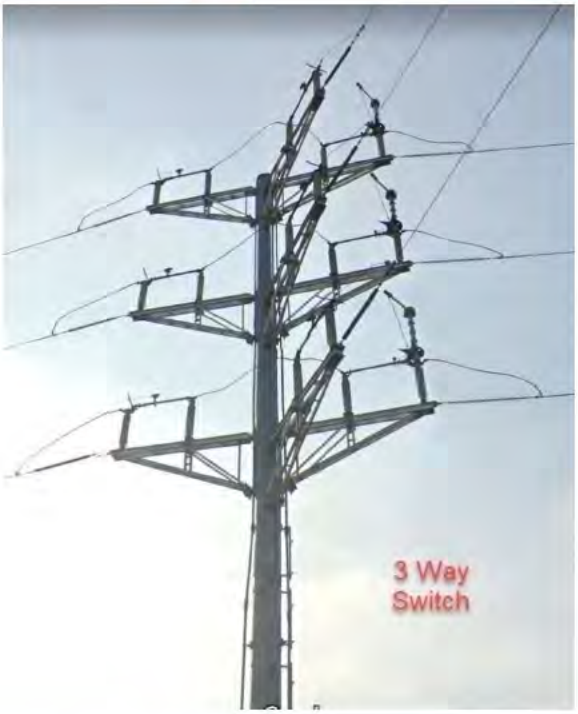
Condition: 5
Priority: A
FDA: Emergency|Storm Related|Repair

Figure 236 Examples of exposed switch control wiring at ground level.

Condition: 3
Priority: E
FDA: Vegetation|Overgrown|Remove

Condition: 3
Priority: E
FDA: Vegetation|Overgrown|Remove

Figure 237 **Generally, any vegetation encroaching on a switch platform warrants an E tag, regardless of the thickness. Grass or weeds should still call for an E tag.**



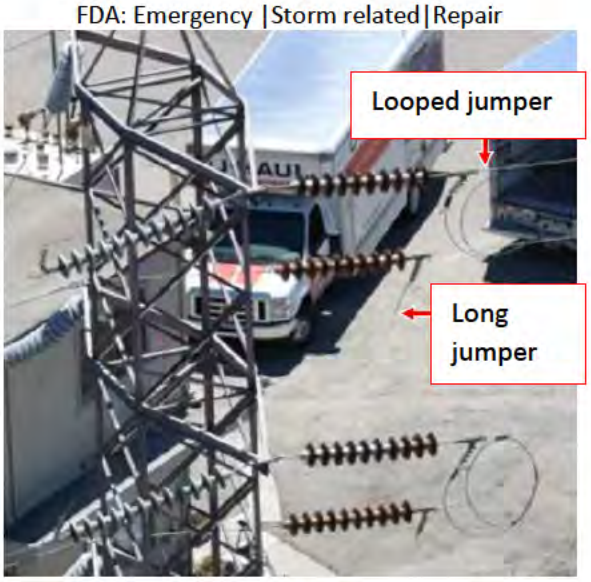
For the purposes of the inspection form, the answer to "**How many switches are present?**" and "**Number of switches**" should be as follows: Each individual set of switches counts as one. Therefore, a 1-Way switch counts as 1, a 2-Way switch counts as 2 and a 3-Way switch counts as 3.

Idle facilities

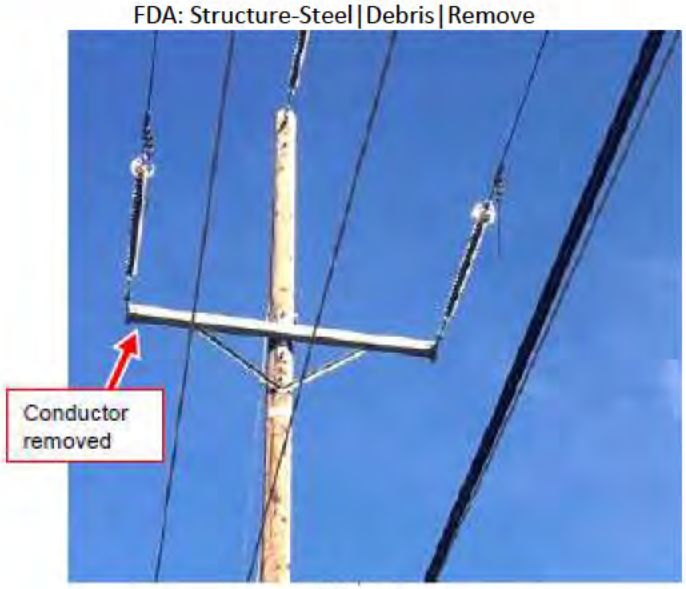
Refer to TD-1001M-JA23 Idle Line Investigation for more information on these types of issues. If you have encountered a structure which you think is idle, please refer to the job aid for more info.

Condition: 5
Priority: A
FDA: Emergency |Storm related|Repair

Condition: 3
Priority: E
FDA: Structure-Steel|Debris|Remove



Condition: 2
Priority: F
FDA: Structure-Steel|Debris|Remove



Condition: 2
Priority: F
FDA: Structure-Wood|Debris|Remove

Figure 238 **Instances of idle facilities for which tags must be created. Always be aware of configurations which may indicate the structure is actually idle.**

Indicators of an Idle Facility

- Jumpers have been cut on all phases.
- Open jumpers are to be cut as short as practical for the field condition and conductor size, allowing enough jumper tail remaining to permit connection with a suitable connector per numbered document 028854, "Connectors for Transmission Conductors." It is not permitted to have jumper tail long enough to impair electrical clearance or allow strand fatigue.

Open Jumper

Table 1

Conductor Size	Approximate Recommended Length
Less than 4/0	2'
4/0 – 2300 kcmil	3'

  - Maintain all electrical clearances when constructing open jumpers.
  - Dead-end jumpers are to be cut as short as practical for reconnecting on both sides of the dead-end.
  - Looping of jumpers and clamping on the main line is not allowed.
  - Open dead-end jumpers on bundled conductor are not to be tied together.
  - Actual lengths can be influenced by field conditions (e.g., framing configuration, conductor type) causing jumper tail lengths to be shorter or longer than listed in **JA-23 Table 1.**
- Conductors have been removed.
- Insulators are undersized.
- Pole tops have been removed.
- First line supervisor knowledge.

Documentation that an idle line is energized at distribution voltages.

Grounded idle facilities

Condition: 1
Priority: No notification required

Figure 239 **Examples of grounded idle lines. This structure has been grounded to prevent the buildup of induced voltage. In this case, no tag is necessary for an idle facility. However, the structure should still be inspected as normal. Refer to JA23 for more information on idle facilities.**