

Fire Rebuild Design Guidance for System Hardening

SUMMARY

This document describes the standard Overhead design requirements for all **new construction and reconstruction work in Tier 2 and Tier 3 Fire Areas, and Zone 1 (tree mortality) areas**. In many cases, the requirements listed are current standard requirements or special application requirements used in new construction.

The requirements outlined in this bulletin are not intended or required for maintenance and emergency work (unless the emergency is in follow-up to a fire event, requiring system rebuild).

The information in this bulletin is available for use immediately but will be **effective on 1/15/20**. Take reasonable steps to implement requirements as soon as practical. These requirements do not apply retroactively to rebuild work completed to date. In addition, some requirements may change in the future as we gather more information and receive feedback.

This bulletin supersedes bulletin TD-9001B-009 Rev 1.

Level of Use: Informational Use

AFFECTED DOCUMENT

See Reference Documents in Overhead and Underground tables below.

TARGET AUDIENCE

The target audience is Service Planning, Estimating, Capacity & Reliability Planning Engineering, and Electric M&C personnel and contractors associated with the fire rebuild areas.

WHAT YOU NEED TO KNOW

- Overhead Design and Construction Requirements:

Requirement	Reference Document(s)	Intent
1.1. The following are the PG&E standard conductor sizes allowed in Tier 2 and Tier 3 areas: <ul style="list-style-type: none"> 1/0 ACSR Tree wire¹ 397 All Al Tree wire¹ 	059690 059626	Current standard for new construction, reduces risk of wires down due to mechanical

¹ Refer to bulletins TD-059626B-005 for information on this conductor, including material code, ampacity, sag curve, and construction requirements

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Requirement	Reference Document(s)	Intent
<ul style="list-style-type: none"> 715 All Al Tree wire¹ <p>For corrosion/coastal areas use:</p> <ul style="list-style-type: none"> #2 CU Tree wire 397 All Al Tree wire 715 All Al Tree wire 	<p>076251</p> <p>TD-059626B-005</p>	<p>failure/deterioration of wire which reduces risk of wildfire ignition caused by wires down faults</p>
<p>1.2. The required setting depth shall be adjusted using the table listing set depths by pole length provided in Attachment 2.</p>	<p>015203</p>	<p>The “Rule of Thumb” for High Fire Threat Design (HFTD) T2-T3 Setting Depth is:</p> <ul style="list-style-type: none"> 10%+3 ft for all poles up to and including 65 feet 10%+2.5 ft for all poles = 70 feet 10%+2 ft for all poles longer than 70 feet
<p>1.3. A pole loading calculation (PLC) must be performed using either PLS CADD or O-Calc Pro® software tools on each pole prior to construction. This applies to all PLCs, including those submitted by third parties.</p> <p>New direction regarding safety factors will be released with an update to O-Calc.</p>		

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Requirement	Reference Document(s)	Intent
<p>1.7. Build to standard Triangular Crossarm construction (Using PG&E approved bonded Composite Crossarm).</p> <p>Pole-top extensions are not allowed if it requires the current framing to be changed from triangular to flat.</p>	066196	Raptor construction is not necessary with tree wire.
<p>1.8. All insulators, including post and pin types, that support span wires and slack spans (excluding jumper supports) must have angle washers installed at the top and bottom of the composite arm.</p> <p>This construction applies to tangent, angle and slack span construction for wind loading reinforcement purposes.</p>	068180 will be revised to reflect this requirement.	Field personnel must ensure changes are executed in the field.
<p>1.9. Trees are not to be used as a means of attaching primary, secondary, or services. Trees are also not an approved means for anchoring or guying of any poles.</p>	TD-2999B-044	
<p>1.10. In heavily wooded areas, never use trees for guy support. Consider the increased vegetation clearance planned in HFTD Tiers 2 & 3 and determine if the newly available lead length is enough to support the pole.</p>		

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<p>1.11. Due to the wind speed, new un-guyed (e.g. tangent) poles may require larger class sizes than historically designed.</p> <p>Storm guys may be used as an option to offset the need for a larger pole class. Consider changing the route, using shorter span lengths, or increase the pole class and set depth as needed until the pole loading model shows a passing safety factor. The use of storm guys will require consultation with the Land Department to determine and/or obtain land rights (easements).</p>		
<p>1.12. Ensure clearances are met with the greater sags of tree wire. Sags for tree wire can be much greater than bare wire and set depths are deeper leaving less room for clearances.</p>		<p>Example: Bare 2 ACSR in heavy loading has a 10' sag on a 400' span. 1/0 ACSR TW has a 15' sag for the same span. For a 45' pole set 7.5' deep the clearance for the 1/0 ACSR TW is only 22.5'</p>
<p>1.13. The prior 200-foot span requirement is now a recommendation.</p>		<p>Try to limit span lengths to 200' or less when possible due to increased sags.</p>
<p>1.14. No new in-line splices to be installed. (This requirement does not apply to repairs as part of repair, restoration and emergency activities. However, all splices must be covered.)</p>	<p>TD-022487B-003</p>	<p>Current standard for new construction, reduces risk of wires down due to splice failure which reduces risk of wildfire ignition caused by wires down faults</p>
<p>1.15. Replace all open-wire secondary with ACSR aerial cable or AWAC aerial cable.</p>	<p>059690</p>	<p>Current standard for new construction improves reliability and reduces risk of wires down due to tree contact. This reduces risk of wildfire ignition caused by wires down faults.</p>
<p>1.16. Only transformers with FR3 insulating fluid are allowed in Tier 2 and Tier 3 fire areas</p>		<p>FR3 fluid standards were implemented in 2014 and latest DOE high efficiency standards were implemented in 2016.</p>

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Requirement	Reference Document(s)	Intent
1.17. Ensure that all transformer locations are fully bird/animal guarded and include insulated jumpers	061149	Reduces risk of wildfire ignition caused by bird/animal contact with equipment
1.18. Ensure that all risers and equipment locations are fully bird/animal guarded and include insulated jumpers	061149	Reduces risk of wildfire ignition caused by bird/animal contact with equipment
1.19. Ensure that any Regulator installations are Closed-Delta with SCADA.	TD-015239B-003	Current standard for new construction, improves reliability by reducing restoration time
1.20. Install Cal Fire Exempt surge arrestors per 031822 (Check with Planning Engineer).	031822	Current standard for high fire areas, reduces risk of wildfire ignition caused by equipment operation
1.21. Install Cal Fire Exempt equipment only – no new, non-exempt equipment shall be installed; install ELF or Fault Tamer fuses for transformer protection and E-power fuses for lateral and riser protection (see Fuse decision tree). Install E fuses when fusing is required in fire areas. If coordination is not possible, installing an ELF fuse ² at the discretion of the responsible distribution engineer is acceptable.	015225	Current standard for high fire areas, reduces risk of wildfire ignition caused by equipment operation

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Requirement	Reference Document(s)	Intent
1.22. Use PG&E approved Composite Tie Wires or Covered Tie Material Code 290299, use pressed connectors or Fired Wedge connectors. All skinned conductors (e.g. Dead ends, T Connections) must be covered with approved raptor covers or taped up (medium voltage fusion tape material code M390190).	015195 021349 028853	
Do not make connections under conductor covers.		
Piercing hot line connectors are not allowed to be used.		
Three-phase switching devices as required by the local planning engineer:		
1.23. Use automated line equipment (i.e. switches, regulators, etc.).		
1.24. Add SCADA to the existing switching device or install new SCADA MSO switch for isolating from one tier to another (i.e. Tier 1 from Tier 2, Tier 2 from Tier 3, Tier 1 from Tier 3). If required for system protection, use a line recloser.		
1.25. Phase Balancing: stagger transformer and single-phase lateral tap line connections to balance phase loading. On 3-phase line sections DO NOT reconnect transformers solely to the two outside phases.		

¹ Refer to bulletin TD-059626B-005 for information on this conductor, including material code, ampacity, sag curve, and construction requirements

²A current limiting fuse may not coordinate with downstream protective devices.

2. How and When to Apply the New Requirements for Reconstruction:

2.1. All designs and estimates not started prior to 9/1/19 must comply with these requirements. This will include jobs which may require revisions taking place after the 9/1/19 date.

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- 2.2. For reconstruction jobs involving 4 spans or more, all assets must be constructed to comply with the requirements in this bulletin.
- 2.3. When replacing a pole to the new standard where there is an existing transformer on the pole, also replace the transformer to the new standard. (Per note 1.16, only use transformers with FR3 insulating fluid.)
- 2.4. All services must be insulated, and service poles must be sized according to GO95 standards. (Per note 1.14, replace all open wire secondary when adjacent to a transformer.)
- 2.5. The requirements outlined in this bulletin are not intended or required for maintenance and emergency work. For emergency work, work within company policies to restore service safely, quickly.
- 2.6. The requirements outlined in this bulletin are not intended or required for Temporary construction, including interim construction work in Tier 2 and Tier 3 areas to support clean up and reconstruction of the fire affected areas where ultimately the permanent system will be rebuilt as underground system within the next 24 months.
- 2.7. If an existing slack span is being reconducted to the new covered tree wire, refer to TD-059626B-005 Table 8 for the maximum span length and stringing sag limits. When an existing span exceeds Table 8 and there is no room to guy for full tension or add poles to meet the Table 8 span length requirements, longer span lengths are permitted under reduced tension. If there are no clearance issues (i.e. tree, secondary and communication), a slightly larger sag may be permitted.
- 2.8. Reduced tension should only be called for when all other options have been exhausted. Reduced tension will require changing the required sag using the “sag to tension” feature in O-Calc. to calculate pole loading without guying. Basically, acting as a self-supported pole. For reduced tension the following is required: Frame with dead-ends instead of slack span preforms, specify the required reduced tension stringing sag derived from O-Calc on the construction drawing and document O-Calc as to why reduced tension is being used. If there are no clearance issues (i.e. tree, secondary and communication), a slightly larger sag may be permitted.
- 2.9. For calculating minimum requirements for customer cost, these are the new construction standards in the applicable areas and should be treated similar to any other application of our construction standards.
- 2.10. Coordinate with Joint Utilities team as needed.

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INCLUSION PLAN

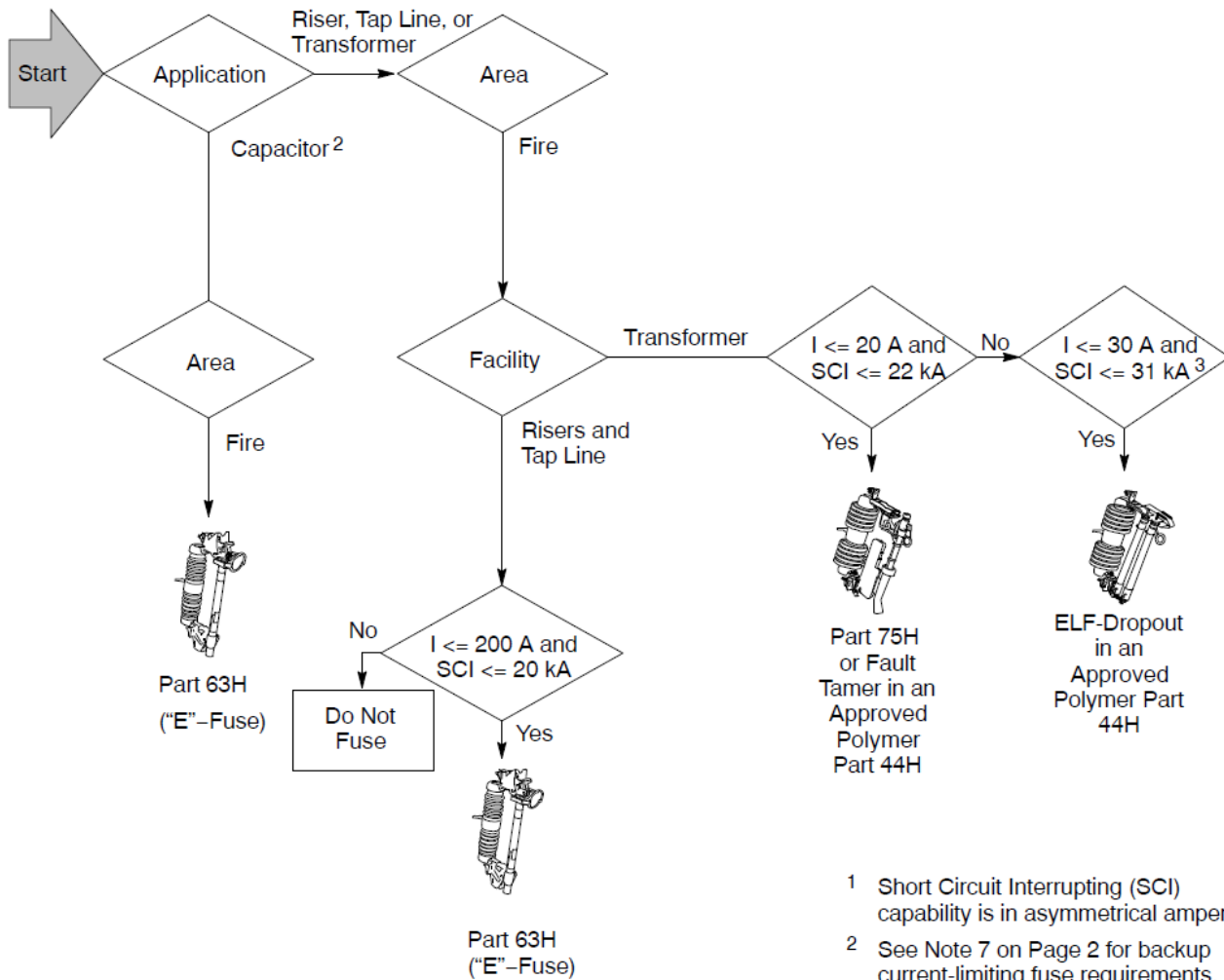
Affected documents will be updated to include the design criteria in this bulletin.

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ATTACHMENT 1: Fuse Application Decision Tree

The following should be used in determining the appropriate fuse to be used in a Fire Area:

Fuse Application Decision Tree



Note: Install Polymer Part 44H with ELF dropout door in the event coordinating with the appropriate E fuse is not possible

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ATTACHMENT 2: Setting Depths

Note: For poles set in rock use GO 95 minimum set depths. For poles set in rock, use GO 95 values as a minimum since the overturn strength of the soil (rock) will be sufficient. (See below Table 6 – GO 95, Rule 49.1)

Pole Setting Depths - Pole Strength vs. Overturn		
Length	Rule of Thumb	
	10% + 2	10% + 3
25		5.5
30		6
35		6.5
40		7
45		7.5
50		8
55		8.5
60		9
65		9.5
70	9.5*	
75	9.5	
80	10	
85	10.5	
90	11	
95	11.5	
100	12	
105	12.5	
110	13	
115	13.5	
120	14	
125	14.5	

Table 6 – GO 95, Rule 49.1 Minimum Pole Setting Depths	
Total length of pole (feet)	Depth in Rock (feet)
20	3
25	3
30	3
35	3 ½
40	3 ½
45	4
50	4
55	4 ½
60	4 ½
65	5
70	5
75	5 ½
80	6

*Note: 70-foot pole “Rule of Thumb” value is 10%+2.5 to maintain consistency of the overall table