

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

SUMMARY

This utility procedure provides instructions for intrusively inspecting, testing, restoring, reinforcing, treating, and reusing wood poles. This includes, but is not limited to, wood poles, laminated wood poles, through-bore wood poles, wood stubs, intumescent-wrapped wood poles, idle wood poles, wood guys, wood guy poles, and wood poles inside substations/switching stations/transmission transition stations. It applies to wood poles owned and maintained by PG&E. It may also apply to new or used wood poles owned by third parties if there is an existing maintenance agreement in place. It applies to both routine and off-cycle Pole Test and Treat (PT&T) inspections.

Level of Use: Informational Use

TARGET AUDIENCE

This procedure is intended for personnel who maintain or intrusively inspect wood distribution and/or transmission poles.

SAFETY

Personal injury may result from improperly performing actions described in this procedure. When testing wood poles, all work must be performed as described in [Utility Procedure TD-2325P-02, "Testing Wood Poles Before Climbing."](#)

Potential hazards associated with intrusive pole inspections and treatment include, but are not limited to, the following conditions and situations:

- Underground/overhead utilities
- Overhead obstructions
- Noise
- Insects (bees, wasps, spiders)
- Snakes
- Vegetation, including poison oak
- Heat illness
- Vehicular and pedestrian traffic
- Tripping hazards, uneven ground, or hidden objects
- Chemicals
- Operating aerial lifts
- Hostile customers

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BEFORE YOU START

1. WEAR the following personal protective equipment (PPE) when performing tasks described in this procedure:
 - Gloves
 - Hard hat
 - Safety glasses
 - Hearing protection
 - Traffic or high-visibility vest
 - Appropriate work footwear
 - Appropriate apparel, including flame-resistant (FR) clothing when required
2. USE only PG&E-approved tools and equipment to perform work described in this procedure. Required tools and equipment include, but are not limited to:
 - a. For intrusively inspecting and testing:
 - Framing hammer
 - Tools to excavate around poles
 - Tools to scrape poles
 - Power drill
 - Ship auger bits
 - Pole thickness gauge
 - Boron rods
 - Plastic plugs
 - Non-conductive tape measure
 - IML PowerDrill tool and accessories (as needed/specified)
 - b. For stubbing:
 - Steel trusses and bands

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BEFORE YOU START (continued)

- Tools to drive trusses
- Step plates (REFER to [Numbered Document 022616, "Stepping of Poles"](#)) and visibility strips
- Dielectric overshoes
- Dielectric mats
- Dielectric blankets
- c. For remedial treatment:
 - Preservatives
 - Tools to apply preservatives
- d. For marking and tagging:
 - Pole reject tags
 - Barcodes (for use on distribution-only poles and transmission with distribution underbuild poles)
- e. For recording data:
 - (1) PG&E personnel USE [Form TD-2325P-01-F01, "Pole Inspection/Test Report,"](#) OR mobile electronic data recording equipment as required by PT&T personnel to record data.
 - (2) PT&T contractors USE mobile electronic data recording equipment as required by PT&T personnel.
- 3. The preservatives used in pole remedial treatments are classified as hazardous materials. COMPLY with the following requirements:
 - a. Only contractors possessing valid California agricultural pest control business licenses may APPLY preservatives.
 - b. APPLY approved fumigants at rates described in the manufacturer's Environmental Protection Agency (EPA)-issued label.
 - c. OBTAIN AND MAINTAIN Material Safety Data Sheets (MSDS) for all preservatives used.
 - d. Properly LABEL vehicles AND chemicals.

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BEFORE YOU START (continued)

- e. HANDLE AND DISPOSE OF preservatives and preservative containers as described in applicable regulations.

NOTE

Intrusive inspection cycle:

PG&E PERFORMS an intrusive inspection for each wood pole per [California Public Utilities Commission \(CPUC\) General Order \(G.O.\) 165, "Inspection Requirements for Electric Distribution and Transmission Facilities,"](#) and [Utility Standard TD-2325S, "Inspecting, Testing, and Maintaining Wood Poles."](#) PG&E Asset Strategy may CHOOSE to inspect on a more frequent basis, based on risk and/or strategy, such as on a 10-year cycle.

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PROCEDURE STEPS

1 General Information

1.1 This procedure contains eight sections. PERFORM the procedure in the order shown below.

1. [General Information](#)
2. [Intrusively Inspecting and Testing Wood Poles](#)
3. [Special Procedures for Previously Stubbed Poles](#)
4. [Evaluating Poles for Reinforcement](#)
5. [Reinforcing Poles with Steel Trusses \(Stubbing\)](#)
6. [Pole Reinforcement and Replacement Prioritization and Duration](#)
7. [Marking and Tagging Poles](#)
8. [Reusing Wood Poles](#)

1.2 RECORD AND STORE all data obtained while intrusively inspecting and testing poles for future use and retrieval.

1. PG&E personnel and PT&T contractors must either:
 - a. RECORD data on [Form TD-2325P-01-F01, "Pole Inspection/Test Report,"](#) AND STORE the completed form with any associated maintenance notifications,
 - OR
 - b. RECORD AND STORE data electronically using a PG&E-approved device and/or electronic application.

1.3 MAINTAIN records for intrusive inspection activities for the life of the pole.

1.4 SEE [Appendix A, "Pole Test and Evaluation Flow Chart,"](#) starting on Page 54 for information on testing and evaluating procedures.

1. REVIEW the flow charts carefully AND NOTE the following information:
 - a. **Exceptions** for the following poles:
 - (1) Center-bored streetlight poles
 - (2) Poles set in concrete, asphalt, or brick

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1.4 (continued)

(3) Gas-treated poles with one of the following original treatments:

- B (butane)
- G (Cellon gas)
- MP (methane propane)
- PB (pentachlorophenol ["penta"] in liquid petroleum gas)
- PD (penta in chlorinated hydrocarbon solvent)

b. Differences between distribution and transmission poles

c. Decision points

2. APPLY procedures in this document to all wood distribution and transmission poles unless noted by exceptions, differences, or decision points.

2 Intrusively Inspecting and Testing Wood Poles



CAUTION

The intrusive inspection and testing procedures in this [Section 2](#) do not replace the requirements specified in the following documents:

[Code of Safe Practices \(CSP\):](#)

- Section 4, Rule 414, "Working in Elevated Positions," starting on Page 4-9
- Section 4, Rule 417, "Inspecting and Testing Wood Poles and Stubs," starting on Page 4-11

[Utility Procedure TD-2325P-02, "Testing Wood Poles Before Climbing"](#)

Before climbing, TEST poles as described in [TD-2325P-02](#).

NOTE

Cedar poles require a larger circumference than Douglas fir poles to meet the same strength requirements.

NOTE

For laminated wood poles, covered wood (fiber-wrapped poles), poles with steel or concrete casings (including modular [mod] poles), SEE [Appendix G, "Special Procedures for Laminated Wood Poles, Covered Wood \(Fiber-Wrapped\) Poles, and Poles with Steel or Concrete Casings \(including Mod Poles\),"](#) starting on Page 66.

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

2.1 General Information

1. USE the intrusive inspection and testing procedures in this section to determine the serviceability and structural integrity of wood poles.
2. DETERMINE whether a pole is covered by this procedure using [Table 1](#) below.

Table 1. Pole Types Covered and Not Covered by this Procedure

Covered	Not Covered
Materials	
<ul style="list-style-type: none"> • Wood • Laminated wood 	<ul style="list-style-type: none"> • Steel • Light-duty steel • Aluminum • Fiberglass/composite • Hybrid • Concrete
Structure/Type	
<ul style="list-style-type: none"> • Wood guy • Wood guy pole • Wood stub • Through-bore • Center-bore • Push brace • Intumescent-wrapped 	<ul style="list-style-type: none"> • Tower • Electrolier • Tree
Pole Use/Ownership	
<ul style="list-style-type: none"> • PG&E distribution • PG&E transmission • PG&E streetlight (distribution only) • PG&E communication (distribution only) • Wood poles owned by customer/third party but maintained by PG&E 	<ul style="list-style-type: none"> • Wood poles owned and maintained by customer/third party
Pole Service Status	
<ul style="list-style-type: none"> • In-service • Idle 	<ul style="list-style-type: none"> • Removed • Not in field
Pole Locations	
<ul style="list-style-type: none"> • Wood poles in PG&E territory, including inside substations, switching stations, transmission transition stations, and PG&E powerhouses 	

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2.1 (continued)

3. PERFORM the following procedures in the order shown below to determine the serviceability and structural integrity of wood poles:
 - a. Visual inspection
 - b. Sound inspection (hammer test)
 - c. Below-ground external inspection (excavation)
 - d. Intrusive inspection (bore and probe tests)
 - e. Effective circumference evaluation
 - f. Alternative pole evaluation

2.2 Visual Inspection

1. Visually INSPECT all poles from pole top to groundline before testing or treating.
2. DOCUMENT all pertinent pole information, including:
 - a. Address/physical location
 - b. Brand information (SEE [Figure 1, "Manufacturer Pole Brand,"](#) on Page 9)
 - Manufacturer
 - Year manufactured
 - Pole class
 - Pole height
 - Wood species
 - Original treatment type
 - Year installed (from date nail)
 - Pole number (SAP Equipment ID, Structure Number, and/or barcode)
 - Surface conditions
 - Circumference at groundline
 - Existing reinforcement (wood stubs or steel trusses)
 - Distance from ground level to manufacturer pole brand

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2.2 (continued)



Figure 1. Manufacturer Pole Brand

3. IDENTIFY AND DOCUMENT damage reasonably detected with the naked eye from groundline to pole top, as described below:
- Vehicular, mechanical, or fire damage
 - Bird (avian) or insect damage
 - Breaks or checks (cracks)
 - Compression wood (SEE [Figure 2](#) below)



Figure 2. Poles with Compression Wood

- Above-groundline shell rot

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2.2 (continued)

- Severe erosion (i.e., signs of erosion adjacent to the pole, such as slope changes, sinking soil, ruts, water channels) (SEE [Figure 3](#) below)



Figure 3. Signs of Severe Erosion

- Other conditions that could render the structure non-serviceable
4. IF any damage requires **immediate** attention (SEE [Appendix H, “Examples of Visual Inspections Requiring Escalation,”](#) on Page 72),
THEN TAKE the following actions:
 - a. Immediately CONTACT the PG&E PT&T field construction manager (CM). The construction manager ESCALATES to the PG&E PT&T field supervisor.
 - b. CALL AND REPORT the concern to **1-800-PGE-5000 (1-800-743-5000)** per [Utility Procedure TD-2204P-01, “Restoration Dispatch 911 Call.”](#)
 5. RECORD the presence of the following tags or markers:
 - a. Yellow reject tags (“S” or “N”)

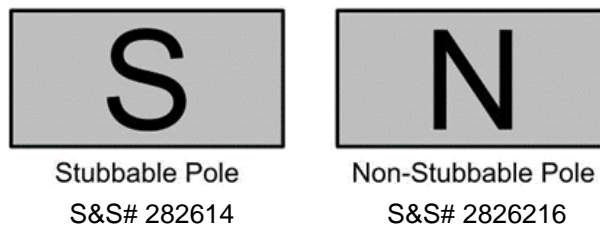


Figure 4. Pole Reject Tags

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2.2 (continued)

- b. Yellow deteriorated pole tags (legacy tags – not currently used)

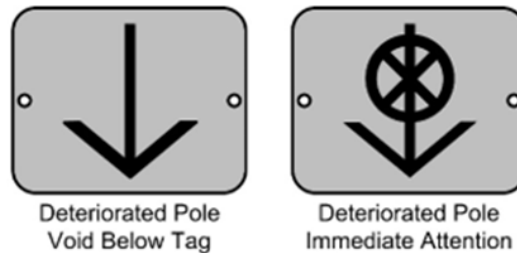


Figure 5. Deteriorated Pole Legacy Tags – Not Currently Used

6. CAPTURE the following photos of the pole. ENSURE that the photos are clear and in-focus:
 - Photo of the pole number (SAP Equipment ID Number, Structure Number, and/or barcode, as applicable).
 - Photo(s) of **both** the newly installed inspection tag and the previous inspection tag (if present).
 - (1) Both inspection tags may be captured in **one** photo. A separate photo is not required for each tag.
 - Photo(s) of the pole brand and date nail.
 - Photo(s) of the entire pole.
 - Photo(s) of the bottom third of the pole, including the surface conditions at the base of the pole.
 - Photo(s) of the existing reinforcement (if pole is reinforced).
 - Photo(s) of the area exposed by a removed obstruction (if an obstruction was removed).
 - Photo(s) of the below-ground health of the pole, including a non-conductive tape measure depicting the excavation depth, once excavated, if applicable.
7. IF the pole is non-serviceable for safety reasons due to severe fire, avian, or insect damage, or other serious mechanical damage or defect,

THEN EVALUATE the pole for reinforcement (SEE [Section 4, "Evaluating Poles for Reinforcement,"](#) starting on Page 34).
8. RECORD the data, as appropriate.

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2.3 Sound Inspection (Hammer Test)

1. PERFORM a sound inspection (hammer test) for all poles.
2. STRIKE the pole on all sides (all four quadrants) with a metal framing hammer (20-ounce minimum).
 - a. START at the groundline AND CONTINUE to a height of 7 feet or as high as the inspector can reach, whichever is greater.
3. ENSURE that the marks from the crosshatched face on the strike plate of the hammer are visible on the pole.
4. LISTEN for the sound produced when the hammer strikes the pole to identify the location of possible internal voids or hollows.
5. IF the pole produces a hollow sound or other sounds that indicate pole defects, such as internal ruptures, cross breaks, or ring separation at one or more locations,

THEN INVESTIGATE these locations by performing below-ground excavation, bore testing, AND probing.
 - a. SEE [Subsection 2.5](#) starting below and [Subsection 2.6, "Intrusive Inspection – Boring Inspection Holes,"](#) starting on Page 16.

2.4 Poles Less than 10 Years Old

1. IF the pole manufacture date is less than 10 years ago AND the pole passes both the visual and sound inspections,

THEN ACCEPT the pole as serviceable (further evaluation is not required).

2.5 Below-Ground External Inspection (Excavation)

1. **Exception:** IF a pole is set in asphalt, concrete, or brick,

THEN DO NOT REMOVE the asphalt, concrete, or brick, unless necessary.
 - a. **Recommended:** PERFORM an intrusive inspection of poles set in asphalt, concrete, or brick using an IML PowerDrill, as described in [Utility Procedure TD-2325P-08, "Intrusively Inspecting Wood Poles Using IML PowerDrill Inspection Tool,"](#) if they meet specified criteria. The IML PowerDrill can identify subsurface decay without excavation.
2. Assess Obstruction Removal
 - a. Wherever safe and feasible, REMOVE any above-ground obstruction to ensure a complete assessment and excavation.

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2.5 (continued)

- b. REMOVE obstructions in a 2-foot distance from the circumference of the pole, if possible.
- c. REMOVE only removable obstructions. Typically, vegetation is removable.
 - (1) IF the vegetation is part of a manicured garden,
THEN REQUEST permission from property owner(s) to remove the vegetation.
 - i. IF permission is granted,
THEN REMOVE as much vegetation as required to ensure complete access.
 - ii. IF permission is unknown or not granted,
THEN USE boards or other means to push vegetation out of the way to enable excavation AND FOLLOW guidance in [Subsection 2.6, "Intrusive Inspection – Boring Inspection Holes,"](#) starting on Page 16 to inspect around the obstruction.
 - (2) IF the vegetation is wild,
THEN REMOVE as much vegetation as required to ensure complete access.
- d. CAPTURE phot(s) of the area exposed by the removed obstruction.
- e. DO NOT REMOVE non-removable obstructions. FOLLOW the guidance in [Subsection 2.6](#) to inspect around the obstruction. The following obstructions are non-removable:
 - Fences
 - Risers
 - Pole key and foam
 - Mud seal
 - Ground molding
 - Buddy pole butt

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2.5 (continued)

3. Partial Excavation (minimum 90° or one quadrant)

a. IF the pole manufacture date is 10 years ago or older,

THEN TAKE the following actions:

- (1) LOCATE the largest seasoning check near the groundline area.
- (2) EXCAVATE soil adjacent to the check to a minimum depth of 20 inches.
- (3) ENSURE that the excavation is a minimum of 90°, or one quadrant of the pole, at the groundline AND is a minimum of 6 inches wide at the bottom.
- (4) IF evident that 7/8-inch plastic plugs were used in a past inspection,

THEN initially EXCAVATE on the side of the pole necessary to expose the existing below-ground plug.
- (5) REMOVE any previously installed backing paper completely.
- (6) CAPTURE photo(s) of the below-ground health of the pole.

4. Full Excavation

a. IF any of the following conditions apply:

- The pole is a gas pole (SEE [Definitions](#) starting on Page 46).
- The partial excavation inspection reveals external decay and/or damage at/or below 66 inches.
- The bore and probe test reveals internal decay.

THEN TAKE the following actions:

- (1) Completely EXCAVATE soil around the pole (full 360° or as much as possible) to a minimum depth of 20 inches.
- (2) IF a full 360° excavation is not possible,

THEN TAKE the following actions:

- i. EXCAVATE around the pole as much as possible.

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2.5 (continued)

- ii. NOTE the degree of excavation completed either on [Form TD-2325P-01-F01, "Pole Inspection/Test Report,"](#) OR in the mobile electronic data recording equipment as required by PT&T personnel.

NOTE

The degree of excavation is cumulative and does not have to be continuous.

- (3) ENSURE that the excavation is a minimum of 6 inches wide at the bottom to allow sufficient room to drill inspection holes below the groundline.
 - (4) REMOVE any previously installed backing paper completely.
 - (5) CAPTURE photo(s) of the below-ground health of the pole.
5. DETERMINE the soundness of the wood below the groundline by brushing and scraping the excavated pole.
- a. DO NOT REMOVE good or visually sound wood from the pole.
 - b. REMOVE all below-ground exterior decayed wood, surface rot, and/or damage from the pole.
 - (1) REMOVE below-ground external decay and/or damage to a point 8 inches above the groundline.
 - (2) CLEAN OUT external decay pockets.
 - c. PERFORM a sound inspection (hammer test) below ground.

NOTE

A gas pole is particularly susceptible to soft-rot shell deterioration of the outer surface.

- d. CAPTURE photos, in different locations, including a non-conductive tape measure depicting the excavation depth, of the below-ground health of the pole.

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2.6 Intrusive Inspection – Boring Inspection Holes

1. IF either of the following conditions are true:

- The pole's manufacture date 10 is years ago or older.

OR

- The pole fails either a visual or sound inspection.

THEN CONDUCT an intrusive inspection using the following boring inspection holes AND probing inspection holes procedures.

2. **Exception:** IF the pole is a through-bore pole,

THEN SEE [Subsection 2.9, "Exception: Through-Bored Douglas Fir Pole,"](#) starting on Page 23 for inspection instructions.

3. **Exception:** IF the pole is an intumescent-wrapped wood pole (pole brand installed on the exterior of the fiberglass wrap),

THEN TAKE the following steps:

- a. It is acceptable to drill through the intumescent wrap; however, this can lead to accelerated dulling of the auger. The following steps may be used as an alternative to drilling through the intumescent wrap:
- (1) CUT an opening to expose the wood using a knife or tin snips. The length of the cut is dependent on the desired exposure of bare wood.
 - (2) FOLD BACK (DO NOT REMOVE) the intumescent wrap on "L," "U," and "X" cuts. (SEE [Figure 6](#) below and [Figure 7, "X' Cut Reference for Intumescent-Wrapped Poles,"](#) on Page 17.)

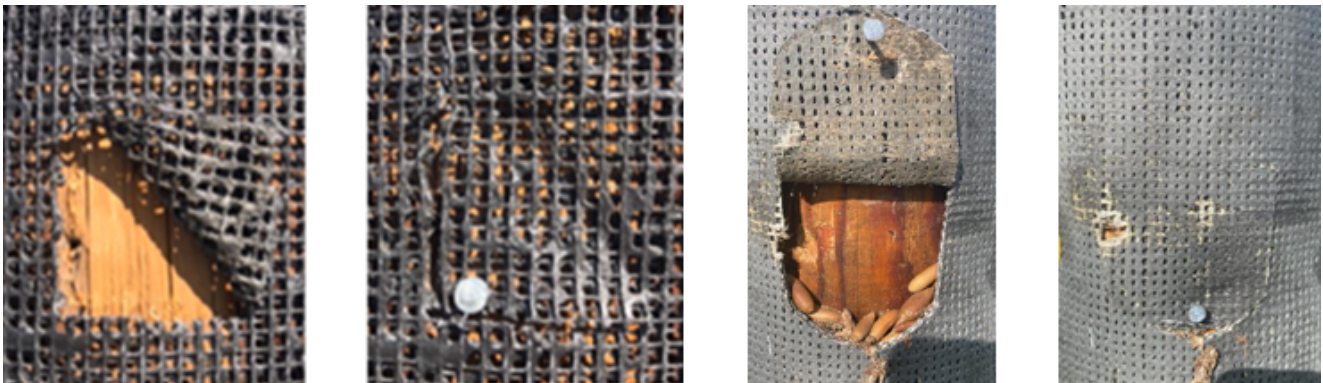


Figure 6. "L" Cut and "U" Cut Reference for Intumescent-Wrapped Poles

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2.6 (continued)

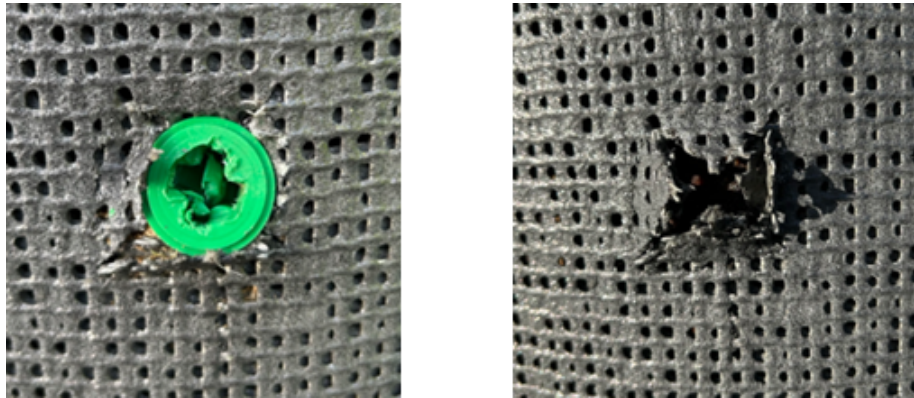


Figure 7. “X” Cut Reference for Intumescent-Wrapped Poles

- (3) PERFORM a bore test by following Subsections [2.6.5](#)–[2.12.4](#) on Pages 17–26.
- (4) UNFOLD the intumescent wrap back to its original position on “L,” “U,” and “X” cuts.
- (5) SECURE the intumescent wrap.
 - i. For “L” and “U” cuts, NAIL the intumescent wrap back to pole.
 - ii. For “X” cuts, USE a plug to hold down the intumescent wrap.



WARNING

USE caution when drilling into a center-bored wood streetlight pole as the drill bit could nick an electric wire inside the pole.

4. **Exception:** IF the pole is a center-bored wood streetlight pole,

THEN DO NOT PERFORM an intrusive inspection using boring inspection holes and probing inspection holes procedures.
 - a. REJECT the pole as non-serviceable.
 - b. SCHEDULE the pole for replacement.
5. Boring Inspection Holes
 - a. BORE $\frac{7}{8}$ -inch or $\frac{9}{16}$ -inch holes at an angle of 45° – 60° to the vertical axis of the pole.

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2.6 (continued)

- b. EXTEND each bore beyond the center of the pole.
- c. BORE with a long-shank ship auger to allow observation of wood shavings exiting the bore.
 - (1) PG&E personnel USE a ship auger with a 9/16-inch bit (Code 200958).
 - (2) PT&T contractors typically USE ship augers with a 7/8-inch bit.
- d. BORE to a slant depth of at least 9 inches for poles with a groundline circumference less than 32 inches.
- e. BORE to a slant depth of at least 15 inches for poles with a groundline circumference greater than 32 inches.
- f. DO NOT BREAK THROUGH the other side of the pole.
- g. DO NOT BORE into seasoning checks.
- h. EXAMINE the wood shavings for decay.

6. Locating Inspection Holes

NOTE

SEE [Subsection 2.9, "Exception: Through-Bored Douglas Fir Pole."](#) starting on Page 23, for instructions to inspect through-bored Douglas fir poles.

- a. BORE OR INSPECT a minimum of three holes.
- b. IF the pole has been tested previously and plugged AND the previous bores are in the proper locations,

THEN TAKE the following actions:
 - (1) For wooden plugs, BORE a new hole, approximately 2 inches below and to the left or right of existing wooden plugs.
 - (2) For plastic plugs, RE-INSPECT the previous bore holes by removing the plastic plug(s) to facilitate the probe test.
- c. IF the pole either has not been bore-tested previously OR IF removable plastic plugs were not used during a previous inspection,

THEN TAKE the following actions:

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2.6 (continued)

- (1) START the first bore adjacent to the largest seasoning check, 12 inches below the groundline.
- (2) START the second bore 120° to the right of the first bore at the groundline.
- (3) START the third bore 120° to the right of the second bore at no less than 12 inches above the groundline.

7. **Exception:** IF the pole is set in asphalt, concrete, or brick, OR if the pole otherwise cannot be excavated,

THEN PERFORM an intrusive inspection using one of the following options to obtain the remaining strength (RS) and shell thickness of the pole:

- a. **Option 1:** PERFORM an IML PowerDrill inspection. (REFER to [Utility Procedure TD-2325P-08, "Intrusively Inspecting Wood Poles Using IML PowerDrill Inspection Tool,"](#) for operating instructions.)

OR

- b. **Option 2:** PERFORM a sound and bore inspection.

- (1) START the first bore adjacent to the largest seasoning check at the groundline.
- (2) BORE the inspection holes deeply and across as much of the pole cross-section as possible.
- (3) LOOK carefully for any signs of decay, enclosed pockets, or voids.

- i. IF any decay, enclosed pockets, OR voids are found,

THEN REJECT the pole AND EVALUATE the pole for reinforcement (SEE [Section 4, "Evaluating Poles for Reinforcement,"](#) starting on Page 34.)

2.7 Intrusive Inspection – Boring Required New Inspection Hole(s)

1. DETERMINE the location for a new 9/16-inch inspection hole.

- a. IF the pole has **no** obstructions,

THEN BORE a 9/16-inch inspection hole 12 inches below the groundline, approximately 3 inches to the left or right of the previous inspection hole.

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2.7 (continued)

- b. IF the pole has removable obstructions,

THEN BORE a 9/16-inch inspection hole 12 inches below the groundline, at the approximate middle of the previously obstructed area.
 - c. IF the pole has non-removable obstructions,

THEN BORE 9/16-inch inspection holes at the groundline AND 12 inches below the groundline so the hole forms a secant with the obstructed surface and crosses the pole a minimum of 2 inches inward (to ensure that it is bored into untreated wood).
 - d. IF the pole is set in asphalt, concrete, or brick, OR if the pole otherwise cannot be excavated,

THEN PERFORM an intrusive inspection using one of the following options to obtain the RS and shell thickness of the pole:
 - (1) **Option 1:** PERFORM an IML PowerDrill inspection. (REFER to [Utility Procedure TD-2325P-08, "Intrusively Inspecting Wood Poles Using IML PowerDrill Inspection Tool,"](#) for operating instructions.)
 - (2) **Option 2:** PERFORM a sound and bore inspection.
 - i. BORE a 9/16-inch inspection hole at the groundline, approximately 3 inches to the left or right of the previous inspection hole.
2. BORE a new 9/16-inch inspection hole.
- a. BORE a hole at an angle of 45°–60° to the vertical axis of the pole.
 - b. EXTEND each bore beyond the center of the pole.
 - c. BORE with a long-shank ship auger to allow observation of wood shavings exiting the bore.
 - (1) USE a ship auger with a 9/16-inch bit (Code 200958).
 - d. BORE to a slant depth of at least 9 inches for poles with a groundline circumference less than 32 inches.
 - e. BORE to a slant depth of at least 15 inches for poles with a groundline circumference greater than 32 inches.
 - f. DO NOT BREAK THROUGH the other side of the pole.

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2.7 (continued)

- g. DO NOT BORE into seasoning checks.
- h. EXAMINE wood shavings for decay.

2.8 Intrusive Inspection – Probing Inspection Holes

1. PROBE each bored hole to inspect for internal voids or pockets.
 - a. PROBE **all** previously bored holes AND new inspection holes.
2. USE an approved shell thickness gauge with a calibrated scale that converts the measurement taken at an angle (usually 45°) to the actual thickness measurement perpendicular to the pole axis.
3. MEASURE the thickness of the exterior pole casing (i.e., the outside of the pole, the shell).
4. MEASURE the depths of any enclosed pockets.
5. INSERT the shell thickness gauge into a hole made by boring. (SEE [Figure 8](#) below and [Figure 9, "Using a Shell Thickness Gauge,"](#) on Page 22.)

NOTE

While pushing a tight-fitting shell thickness indicator into a pole, the inspector can feel the tip of the hook pass from one growth ring to another in solid wood, but not in decayed wood.

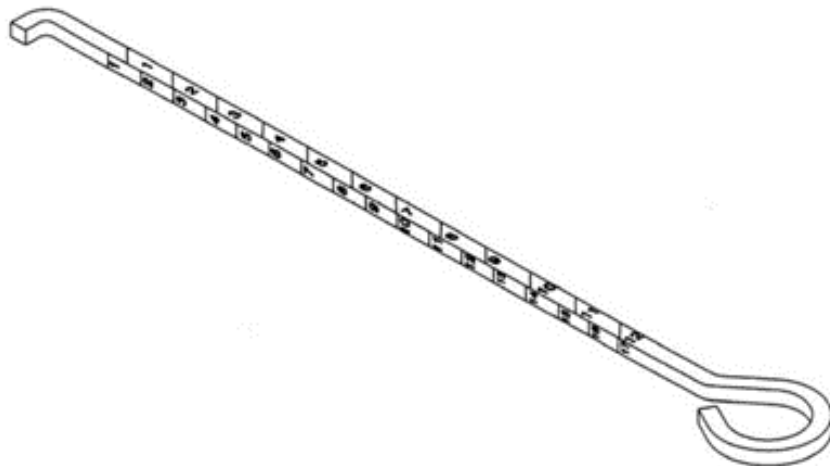


Figure 8. Shell Thickness Gauge (Code 204908)

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

2.8 (continued)

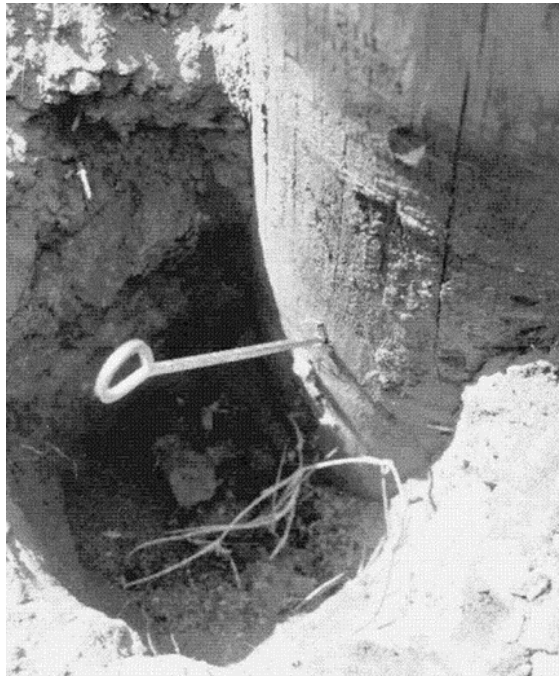


Figure 9. Using a Shell Thickness Gauge

6. PULL the shell thickness gauge back while turning it and pressing it against the side of the hole until the side wall is identified.

NOTE

The hook on the end of the shell thickness gauge should catch on the edge of sound wood inside the decay pocket as it is pulled back.

7. For a western red cedar or pine pole:
 - a. There is a well-defined transition from sound to decayed wood.
 - b. USE the shell-thickness gauge reading without compensation.
8. For a Douglas fir pole:
 - a. There is no well-defined demarcation between advanced decay and sound wood.
 - b. MEASURE only sound wood.
 - c. DEDUCT ½ inch from the shell thickness gauge reading to allow for the lack of a well-defined transition and the effects of incipient decay.

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2.8 (continued)

9. IF decayed wood OR a void is found while probing inspection holes,
THEN TAKE the following actions:
 - a. PERFORM a full excavation of the pole down to 20 inches below the groundline.
 - b. BORE additional inspection holes as described in [Subsection 2.10, "Intrusive Inspection – Boring Additional Inspection Holes,"](#) starting on Page 24.
 - c. PROBE the inspection holes as described in [Subsection 2.8, "Intrusive Inspection – Probing Inspection Holes,"](#) starting on Page 21.
10. IF no decayed wood or voids are found,
THEN PROCEED without boring any additional inspection holes.
11. PERFORM an effective circumference evaluation as described in [Subsection 2.18, "Effective Circumference Evaluation,"](#) starting on Page 28.

2.9 **Exception:** Through-Bored Douglas Fir Pole

1. IF the pole is a through-bored Douglas fir pole,
THEN TAKE the following actions:
 - a. BORE a single inspection hole.
 - b. START the hole 18 inches above the top row of through-bore holes.
 - c. DO NOT BORE into the through-bored zone.
2. IF the probe test reveals an internal void above the through-bored zone,
THEN TAKE the following actions:
 - a. PERFORM an additional sound inspection (hammer test).
 - b. BORE a single inspection hole at any suspect location.
 - c. RECORD shell thickness data from inspection holes for use in evaluating the pole later.
3. IF the probe test reveals no internal void above the through-bored zone,
THEN TAKE the following actions:

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

2.9 (continued)

- a. PROCEED without boring any additional inspection holes.
 - b. RECORD shell thickness data from inspection holes for use in evaluating the pole later.
4. IF the pole is a gas-treated, through-bored Douglas fir pole,
- THEN PERFORM a full excavation as described in Subsections [2.5.4, "Full Excavation,"](#) through [2.5.5](#) on Pages 14–15.

2.10 Intrusive Inspection – Boring Additional Inspection Holes

1. Procedure for Boring Inspection Holes
 - a. For areas at or below the groundline, BORE 9/16-inch holes at an angle of 45°–60° to the vertical axis of the pole.
 - b. For areas above the groundline, BORE 9/16-inch holes at an angle of 90° to the vertical axis of the pole.
 - c. EXTEND each bore beyond the center of the pole.
 - d. BORE with a long-shank ship auger to allow observation of wood shavings exiting the bore.
 - (1) USE a ship auger with a 9/16-inch bit (Code 200958).
 - e. For inspection holes at or below the groundline, BORE to a slant depth of at least 9 inches for poles with less than 32 inches of groundline circumference.
 - f. For inspection holes at or below the groundline, BORE to a slant depth of at least 15 inches for poles with greater than 32 inches of groundline circumference.
 - g. DO NOT BREAK THROUGH the other side of the pole.
 - h. DO NOT BORE into seasoning checks.
 - i. IF boring inspection holes at the same level as a previous inspection,

THEN REMOVE OR DRILL THROUGH the existing test plugs at that level to fully identify and locate the presence of voids. REMOVE drilled-through test plugs AND REPLACE them with new plugs.

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

2.10 (continued)

2. Location of Intrusive Inspection Holes

NOTE

BORE necessary holes required by the software to properly evaluate the extent of decay. BORE holes at the appropriate levels for inspection.

- a. BORE a minimum of two holes at each level required for inspection.
 - b. SPACE the holes evenly around the circumference of a pole.
 - c. BORE three holes at other levels, as needed, to evaluate the pole for feasibility of reinforcement (SEE [Section 4, "Evaluating Poles for Reinforcement,"](#) starting on Page 34).
 - d. BORE additional holes, as needed, to determine the extent of decay.
3. PROBE inspection holes as described in [Subsection 2.8, "Intrusive Inspection – Probing Inspection Holes,"](#) starting on Page 21.
 4. RECORD shell thickness data from inspection holes for use in evaluating the pole later.

2.11 Application of Internal Preservatives (Fumigant Treatment)

1. Personnel who inspect poles using the bore and probe test TREAT poles with internal fumigants as follows:
 - a. POUR fumigant through the 7/8-inch holes bored for the inspection.
 - b. POUR fumigant only into sound wood above and/or below internal voids (if present).
 - c. DO NOT PLACE fumigant into voids and/or checks.
 - d. APPLY approved fumigants at rates described on the manufacturer's EPA-issued label.
 - e. POUR fumigant treatment into the inspection hole bored in a through-bored Douglas fir pole.
 - f. INSERT a boron rod (Code 140037) into the 9/16-inch inspection hole.

2.12 Plug Inspection Holes

1. PLUG all 7/8-inch or 9/16-inch inspection holes with removable plastic plugs.

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

2.12 (continued)

2. REUSE existing plastic plugs, where possible.
3. PLUG 9/16-inch inspection holes with 9/16-inch removable plastic plugs equivalent to Code 140038.
4. PLUG 7/8-inch inspection holes with 7/8-inch removable plastic plugs.

2.13 Application of External Preservatives

NOTE

PT&T contractors normally APPLY external preservatives.

1. A contractor possessing a valid California agricultural pest control business license must properly TREAT the following poles with approved preservatives:
 - Poles that remain in service
 - Poles that are candidates for reinforcement
 - Poles scheduled for replacement

2.14 External Treatment

1. IF the pole is a gas pole OR if the pole is excavated fully and found to be serviceable, THEN TAKE the following actions:
 - a. APPLY an approved preservative paste from the bottom of the excavation to 3 inches above the groundline.
 - b. BRUSH the paste liberally into checks and exposed pockets.
 - c. APPLY the preservative paste to meet the minimum coating thickness recommended on the manufacturer's EPA-issued label.
 - d. COVER the treated area with a 16-pound, polyethylene-backed kraft paper.
 - e. WRAP the pole for 24 inches (from 20 inches below the groundline to 4 inches above the groundline).
 - f. APPLY any previously removed paper to the outside of the new paper.
 - g. STAPLE OR NAIL the wrapping in place.

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

2.15 Worksite Cleanup

1. REPLACE the soil previously excavated around the pole.
2. ENSURE all foreign materials (i.e., gloves) are removed from the worksite.

2.16 Calculate Average Shell Thickness

1. To calculate average shell thickness at a specific level on the pole, PERFORM the following calculations:
 - a. TOTAL the shell thickness measurements taken at that level.
 - b. DIVIDE the shell thickness total by the number of measurements taken.
2. CALCULATE AND RECORD the average shell thickness at 12 inches below the groundline.
3. CALCULATE AND RECORD the average shell thickness at the groundline.
4. DETERMINE the minimum average shell thickness as the lesser of the average shell thickness at 12 inches below the groundline and the average shell thickness at the groundline.
5. IF all the following conditions are true:
 - Pole is not set in concrete, asphalt, or brick
 - Probing inspection locates internal voids
 - Minimum average shell thickness is 2 inches or less (3 inches or less for poles 70 feet and longer)

THEN TAKE the following actions:

- a. REJECT the pole as non-serviceable.
- b. EVALUATE the pole for reinforcement.

2.17 Exceptions

1. IF a pole is set in concrete, asphalt, or brick AND the probing inspection locates internal voids,

THEN TAKE the following actions:

 - a. REJECT the pole as non-serviceable.
 - b. EVALUATE the pole for reinforcement.

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

2.17 (continued)

2. IF a pole has a measured average minimum shell thickness of 1 inch or less at any level on the pole AND any reading used to derive the average is 0.5 inches or less,

THEN TAKE the following actions:

- a. REJECT the pole as non-serviceable.
- b. SCHEDULE the pole for replacement AND PRIORITIZE it per [Subsection 6.3](#) on Page 42.

2.18 Effective Circumference Evaluation

1. The PT&T inspector (whether PG&E personnel or a PT&T contractor) PERFORMS the effective circumference evaluation.
2. MEASURE the circumference of the pole at the groundline.
3. IF the pole has mechanical, shell, or fire damage,

THEN TAKE the following actions:

- a. REMOVE as much damaged wood at or near the groundline as feasible.
 - b. MEASURE the resulting effective groundline circumference.
 - c. MEASURE the original circumference at a point below the damage that best approximates the original undamaged circumference of the pole.
4. USE measurements from inspection holes to calculate reductions.
 5. IF any of the following defects are found from 12 inches below the groundline to 66 inches above the groundline:
 - Hollow hearts (SEE [Appendix C, "Poles with Hollow Hearts,"](#) starting on Page 60)
 - Enclosed pockets (SEE [Appendix D, "Poles with Enclosed Pockets,"](#) on Page 62)
 - Exposed pockets (SEE [Appendix E, "Poles with Exposed Pockets,"](#) on Page 63)

THEN CALCULATE the resultant effective groundline circumference by reducing the circumference measurement per the relevant appendix.

- a. PERFORM the calculation by hand OR electronically using a PG&E-approved device and/or electronic application.

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

2.18 (continued)

6. IF any combination of defects is found on the pole,

THEN MAKE separate reductions to the effective circumference for each defect.
7. COMPARE the result of subtracting the reductions from the measured effective groundline circumference with the minimum effective groundline circumference in [Appendix B, "Required Groundline Circumference,"](#) on Page 59.
8. IF the resultant effective groundline circumference is equal to or less than the minimum effective groundline circumference required by [Appendix B](#),

THEN TAKE the following actions:
 - a. REJECT the pole as non-serviceable.
 - b. EVALUATE the pole for reinforcement.
9. IF the resultant effective groundline circumference is greater than the minimum effective groundline circumference required by [Appendix B](#),

THEN ACCEPT the pole as serviceable (further evaluation is not required).
10. RECORD the resultant effective groundline circumference, as appropriate.

2.19 Alternative Pole Evaluation Method

1. The PT&T inspector (whether PG&E personnel or a PT&T contractor) PERFORMS the alternative pole evaluation.
2. The alternative pole evaluation method is an optional alternative to [Subsection 2.18, "Effective Circumference Evaluation,"](#) starting on Page 28.
3. IF voids are found OR the pole is rejected as non-serviceable,

THEN CALCULATE the pole strength (percent remaining strength [% RS]) using approved software.
4. IF the % RS is:
 - Greater than 75% for distribution
 - Greater than 80% for transmission
THEN ACCEPT the pole as serviceable (further evaluation is not required).

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

2.19 (continued)

5. IF the % RS is:

- Less than or equal to 75% for distribution
- Less than or equal to 80% for transmission

THEN TAKE the following actions:

- a. REJECT the pole as non-serviceable.
- b. EVALUATE the pole for reinforcement.

6. **Exception:** IF the pole is a gas pole,

THEN TAKE the following actions:

a. IF the excavation performed is 180° or greater AND the wood pole RS is:

- Greater than 75% for distribution
- Greater than 80% for transmission

THEN ACCEPT the pole as serviceable (further evaluation is not required).

b. IF the excavation performed is 180° or greater AND the wood pole RS is:

- Greater than 35% but less than or equal to 75% for distribution
- Greater than 35% but less than or equal to 80% for transmission

THEN TAKE the following actions:

- (1) REJECT the pole as non-serviceable.
- (2) EVALUATE the pole for reinforcement.

c. IF the wood pole RS is less than or equal to 35%,

THEN TAKE the following actions:

- (1) REJECT the pole as non-serviceable.
- (2) SCHEDULE the pole for replacement AND PRIORITIZE it per [Subsection 6.3](#) on Page 42.

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

2.19 (continued)

- d. IF the excavation performed is less than 180° (includes poles set in a solid surface such as asphalt, concrete, or brick) AND the wood pole RS is:

- Greater than 35% but less than or equal to 100% for distribution
- Greater than 35% but less than or equal to 100% for transmission

THEN TAKE the following actions:

- (1) REJECT the pole as non-serviceable.
- (2) EVALUATE the pole for reinforcement.

- i. IF the pole is not a candidate for reinforcement with a steel truss,

THEN SCHEDULE the pole for replacement.

NOTE

The IML PowerDrill tool is an approved, supplemental intrusive inspection method that can be used for all poles, especially gas-treated wood poles where 180° excavation is not possible, including poles set in solid surfaces or inside substations. REFER to [Utility Procedure TD-2325P-08, "Intrusively Inspecting Wood Poles Using IML PowerDrill Inspection Tool,"](#) for operating instructions.

3 Special Procedures for Previously Stubbed Poles

- 3.1 This section applies to poles previously stubbed using either a wood stub or a steel structural support (steel truss) and steel bands, regardless of the age or original treatment of the stubbed pole.

3.2 Wood Stub

1. IF the pole was previously stubbed using a wood stub,

THEN TAKE the following actions:

- a. For distribution:

- (1) SCHEDULE the pole for replacement.

- b. For transmission:

- (1) PERFORM visual and sound inspections of both the pole AND wood stub.

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3.2 (continued)

- (2) BORE AND PROBE inspection holes at the banding levels on both the pole AND wood stub to confirm the following shell thickness requirements for reinforcement (SEE [Section 4, "Evaluating Poles for Reinforcement,"](#) starting on Page 34):
 - i. Average shell thickness at 66 inches above the groundline on the pole is 4 inches or greater (5 inches or greater for poles 70 feet and longer).
 - ii. Average shell thickness at upper banding levels on the pole AND on the wood stub is 4 inches or greater (5 inches or greater for poles 70 feet and longer).
 - iii. Average shell thickness at lower banding levels on the pole AND on the wood stub is 2 inches or greater (3 inches or greater for poles 70 feet and longer).
- c. IF the pole and wood stub both meet shell thicknesses requirements for reinforcement,

THEN TAKE the following actions:
 - (1) PERFORM a partial excavation of the wood stub.
 - (2) BORE 9/16-inch or 7/8-inch fume holes on the wood stub at the following levels:
 - 12 inches below the groundline
 - At the groundline
 - 2 inches above the lower set of bands
 - (3) ENSURE that the wood stub meets the minimum average shell AND effective circumference requirements.
- d. IF either the pole OR wood stub do not meet shell thicknesses requirements for reinforcement,

OR IF the wood stub does not meet minimum average shell AND effective circumference requirements,

THEN SCHEDULE the pole for replacement.
- e. IF both the pole and wood stub pass all inspections,

THEN ACCEPT the pole as serviceable (further evaluation is not required).

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

3.3 Steel Truss

1. IF the pole was previously reinforced using steel structural supports and steel bands (steel truss),

THEN TAKE the following actions:

- a. PERFORM visual and sound inspections of the wood in the banding areas.
- b. CAPTURE photo(s) of the existing reinforcement.
- c. PROBE inspection holes at the banding levels on the pole to confirm the following shell thickness requirements for reinforcement (SEE [Section 4, "Evaluating Poles for Reinforcement,"](#) starting on Page 34).
 - (1) Average shell thickness at 66 inches above the groundline on the pole is 4 inches or greater (5 inches or greater for poles 70 feet and longer).
 - (2) Average shell thickness at the upper banding level on the pole is 4 inches or greater (5 inches or greater for poles 70 feet and longer).
 - (3) Average shell thickness at the lower banding level on the pole is 2 inches or greater (3 inches or greater for poles 70 feet and longer).
- d. IF the pole does not meet shell thicknesses requirements for reinforcement,
THEN SCHEDULE the pole for replacement.
- e. ENSURE that reinforcement bands meet the following conditions:
 - (1) The bands are installed properly at the correct heights.
 - (2) The bands are tight enough that they cannot be moved by hand.
 - i. IF the bands are not installed properly or tight enough,
THEN SCHEDULE the pole for rebanding.
- f. Visually INSPECT steel stubs/trusses for rust.
 - (1) IF rust is evident on the steel stub,
THEN INSPECT the stub 12 inches below the groundline for corrosion.
 - (2) IF corrosion has not penetrated more than one third of the stub's perimeter across its width,
THEN TAP it with a hammer.

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3.3 (continued)

- (3) IF the steel stub is solid,
THEN the steel stub is strong enough to support the pole.
- g. IF it appears that corrosion has deteriorated the stub's strength,
THEN SCHEDULE the pole for replacement.
- h. IF the stubbed pole passes all inspections,
THEN ACCEPT the pole as serviceable (further evaluation is not required).

4 Evaluating Poles for Reinforcement

NOTE

IF an average shell thickness of 1 inch or less is observed at any level on the pole
AND any reading used to derive the average is 0.5 inches or less,
THEN SCHEDULE the pole for replacement AND PRIORITIZE it per [Subsection 6.3](#)
on Page 42.

- 4.1 IF a pole is rejected as non-serviceable,
THEN EVALUTE the pole to determine whether it meets structural requirements necessary to
obtain suitable strength from an ancillary structural member, such as a steel truss.
- 4.2 DO NOT USE steel trusses to alleviate an overload condition not caused by groundline
deterioration.
- 4.3 Crossings
 - 1. DO NOT USE steel trusses in any of the following circumstances:
 - Crossings over major railroads.
 - Crossings over communication lines not attached to the same pole(s).
 - Conflicting lines where Grade "A" construction is required.
 - (1) REFER to [CPUC G.O. 95, "Rules for Overhead Electric Line Construction,"](#) Rule 22.1.A, "Conflicting Lines," on Page II-13 for the definition of conflicting lines.
 - Crossings over a major freeway, expressway, or controlled-access highway.
 - (1) REFER to the California Department of Transportation (Caltrans) [Highway Design Manual](#) for the definitions of freeway, expressway, and controlled-access highway.

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- 4.4 BORE AND PROBE inspection holes at 66 inches above the groundline AND at banding levels shown in [Subsection 4.6](#) starting below to determine the average shell thickness at each level.
- 4.5 Check at 66 Inches
1. BORE AND PROBE inspection holes at 66 inches above the groundline.
 2. DETERMINE the average shell thickness at 66 inches above the groundline.
 3. IF the average shell thickness at 66 inches above the groundline is less than 4 inches (5 inches for poles 70 feet and longer),

THEN the pole is not a candidate for reinforcement with a steel truss.
 - a. SCHEDULE the pole for replacement.
 4. IF the average shell thickness at 66 inches above the groundline is 4 inches or greater (5 inches or greater for poles 70 feet and longer),

THEN EVALUATE the shell thickness at banding levels.
- 4.6 Check at Banding Levels
1. EVALUATE shell thickness at banding levels using the following criteria:
 - a. IF the thickness at banding levels meets either [Criteria 1](#) below (preferred) OR [Criteria 2](#) on Page 36,

THEN the pole is a candidate for reinforcement with a steel truss.
 - b. IF the thickness at banding levels fails both [Criteria 1](#) AND [Criteria 2](#),

THEN the pole is not a candidate for reinforcement with a steel truss.
 - (1) SCHEDULE the pole for replacement.
 2. Criteria 1
 - a. BORE AND PROBE inspection holes at 42 inches AND 15 inches above the groundline.
 - b. DETERMINE the average shell thickness at 42 inches above the groundline.
 - c. DETERMINE the average shell thickness at 15 inches above the groundline.
 - d. IF the average shell thickness at 42 inches is 4 inches or greater (5 inches or greater for poles 70 feet and longer) AND the average shell thickness at 15 inches is 2 inches or greater (3 inches or greater for poles 70 feet and longer),

THEN the pole meets [Criteria 1](#) requirements.

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4.6 (continued)

3. Criteria 2

- a. BORE AND PROBE inspection holes at 54 inches AND 26 inches above the groundline.
- b. DETERMINE the average shell thickness at 54 inches above the groundline.
- c. DETERMINE the average shell thickness at 26 inches above the groundline.
- d. IF the average shell thickness at 54 inches is 4 inches or greater (5 inches or greater for poles 70 feet and longer) AND the average shell thickness at 26 inches is 2 inches or greater (3 inches or greater for poles 70 feet and longer),

THEN the pole meets [Criteria 2](#) requirements above.

4.7 Exposed Pockets

1. IF the pole has an exposed pocket between the bottom of the lowest band and 66 inches above the groundline AND the pocket is greater than 4 inches wide and 4 inches deep,

THEN the pole is not a candidate for reinforcement with a steel truss.

- a. SCHEDULE the pole for replacement.

4.8 Enclosed Pockets

1. IF the pole has an enclosed pocket that meets **all** the following criteria:

- The pocket is located between band locations.
- The pocket is more than 6 inches wide and 2 inches high.
- The minimum shell thickness closest to the pocket is less than 1 inch.

THEN the pole is not a candidate for reinforcement with a steel truss.

- a. SCHEDULE the pole for replacement.

4.9 Obstructions to Placing Trusses

1. IF either of the following conditions prevent locating the steel truss within 9 inches of the preferred position (its strong x-axis parallel to the pole line):

- Presence of below-ground (or buried) facilities
- Facilities attached to the surface of the pole (ground wires, risers, power or communication equipment, water or gas pipes, fences, etc.)

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4.9 (continued)

THEN the pole is not a candidate for reinforcement with a steel truss.

- a. SCHEDULE the pole for replacement.

5 Reinforcing Poles with Steel Trusses (Stubbing)

NOTE

Pole reinforcement (stubbing) contractors, not PG&E personnel, usually REINFORCE poles with steel trusses.

5.1 Design Criteria

1. ENSURE that after the steel truss is installed, the pole's strength meets or exceeds the original strength of the pole.
2. SIZE AND PLACE the trusses as described in [Numbered Document 063418, "Inspection of Wood Poles for Pole Stub Installation."](#)
3. USE additional steel sizes not listed in [063418](#) if they meet strength requirements AND are previously approved.
4. SIZE AND ORIENT trusses to provide required groundline strength against wind loading and to support the bending loads on the pole.
5. ENSURE that the expected life of the steel truss is at least 25 years.

5.2 RECORD the presence of previous remedial treatment tags.

1. IF the pole qualifies for reinforcement with a steel truss AND the pole has not been remedially treated with internal preservatives within 2 years of the date on the tag,

THEN remedially TREAT the pole as described in [Subsection 2.11, "Application of Internal Preservatives \(Fumigant Treatment\),"](#) on Page 25.
2. IF the pole does not qualify for reinforcement with a steel truss,

THEN DO NOT TREAT the pole.

5.3 Installing Trusses

1. NOTIFY Underground Service Alert (USA) (also known as [AKA] 811) of all poles to be reinforced.
 - a. VISIT USA's website at <https://usanorth811.org/> OR CALL **1-800-227-2600**.
2. USA personnel MARK areas where poles will be reinforced before driving trusses.

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5.3 (continued)

3. PG&E personnel OBTAIN any other required permits before installation (e.g., street opening permits).
4. Personnel performing work USE proper safety devices, including dielectric overshoes, dielectric mats, and dielectric blankets.
5. Personnel working with or around compressed air safely SECURE all attachment points with a whipcheck. ENSURE that the whipcheck is also connected to the air hammer and shank.
6. DO NOT REMOVE pole attachments, such as risers or ground wires, when installing a truss.
7. IF the pole is a riser pole greater than 600 volts (primary),
THEN a qualified electrical worker (QEW) must PERFORM the following tasks:
 - a. VERIFY that the riser is safe to work around before installing the steel truss.
 - b. BE PRESENT AND OBSERVE the steel truss installation process.
8. DO NOT DISCONNECT ground wires.
9. IF relocating a ground is necessary to avoid interference when installing the truss,
THEN ARRANGE for the ground wire's relocation before installation.
10. IF ground molding is found to be broken OR is damaged during truss installation,
THEN REPLACE the first 8 feet from the groundline.
11. DRIVE trusses with a power hammer (either pneumatic [air] or hydraulic) with sufficient power to ensure the truss is buried to its specified depth within a reasonable time.
(REFER to [Numbered Document 063418, "Inspection of Wood Poles for Pole Stub Installation."](#))
12. USE a 500-pound drop weight system, if necessary, to complete installation in difficult soils or rock.
13. INSTALL step plates (REFER to [Numbered Document 022616, "Stepping of Poles"](#)) on all stubbed poles.
14. INSTALL visibility strips as required by [Numbered Document 022168, "Marking, Numbering, and Identification of Line Structures,"](#) on stubbed poles.
15. IF old step plates OR pole steps are removed,
THEN PLUG the holes with appropriately sized plugs.

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

6 Pole Reinforcement and Replacement Prioritization and Duration

6.1 Distribution

1. **Distribution** wood poles recommended for **replacement**: PRIORITIZE based on calculated wood pole strength, treatment, AND the tables below:

- [Table 2](#)
- [Table 3](#)
- [Table 4](#)

Table 2. Distribution Pole Replacement Prioritization for Non-Gas Poles and for Gas Poles with 180° or Greater Excavation

G.O. 95, Rule 18 Level	L2				
Tag Priority	X	B	E		
Time for Remediation	7 Days	6 Months	1 Year	2 Years	3 Years
Non-High Fire Threat District (HFTD)	≤ 35%	36–40%	41–50%	51–60%	61–75%
HFTD Tier 2	≤ 35%	36–40%	41–75%	NA	
HFTD Tier 3	≤ 35%	36–75%	NA		

Table 3. Distribution Pole Replacement Prioritization for Gas Poles with Less than 180° of Excavation – Includes Poles Set in a Solid Surface Such as Asphalt, Concrete, or Brick

G.O. 95, Rule 18 Level	L2				
Tag Priority	X	B	E		
Time for Remediation	7 Days	6 Months	1 Year	2 Years	3 Years
HFTD	≤ 35%	36–40%	41–50%	51–60%	61–100%
HFTD Tier 2	≤ 35%	36–40%	41–100%	NA	
HFTD Tier 3	≤ 35%	36–100%	NA		

Table 4. Distribution Pole Replacement Prioritization for Non-Gas and Gas Poles with No Calculated Wood Pole Strength

HFTD Tier	Tag Priority	Due Date
HFTD	E	3 Years
HFTD Tier 2	E	1 Year
HFTD Tier 3	B	6 Months

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6.1 (continued)

2. **Distribution** wood poles recommended for **reinforcement (including rebanding)**: PRIORITIZE based on calculated wood pole strength, treatment, AND the tables below:

- [Table 5](#)
- [Table 6](#)
- [Table 7](#)

Table 5. Distribution Pole Reinforcement Prioritization for Non-Gas Poles and for Gas Poles with 180° or Greater Excavation

G.O. 95, Rule 18 Level	L2			
Tag Priority	B	E		
Time for Remediation	6 Months	1 Year	2 Years	3 Years
Non-HFTD	36–40%	41–50%	51–60%	61–75%
HFTD Tier 2	36–40%	41–75%	NA	
HFTD Tier 3	36–75%	NA		

Table 6. Distribution Pole Reinforcement Prioritization for Gas Poles with Less than 180° of Excavation – Includes Poles Set in a Solid Surface Such as Asphalt, Concrete, or Brick

G.O. 95, Rule 18 Level	L2			
Tag Priority	B	E		
Time for Remediation	6 Months	1 Year	2 Years	3 Years
Non-HFTD	36–40%	41–50%	51–60%	61–100%
HFTD Tier 2	36–40%	41–100%	NA	
HFTD Tier 3	36–100%	NA		

Table 7. Distribution Pole Reinforcement Prioritization for Non-Gas and Gas Poles with No Calculated Wood Pole Strength

HFTD Tier	Tag Priority	Due Date
HFTD	E	3 Years
HFTD Tier 2	E	1 Year
HFTD Tier 3	B	6 Months

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

6.2 Transmission

1. **Transmission** wood poles recommended for **replacement or reinforcement (including rebanding)**: PRIORITIZE based on calculated wood pole strength, treatment, AND the tables below:

- [Table 8](#)
- [Table 9](#)
- [Table 10](#)

Table 8. Transmission Pole Replacement Prioritization for Non-Gas Poles and for Gas Poles with 180° or Greater Excavation

G.O. 95, Rule 18 Level	L1	L2		
Tag Priority	A	E		
Time for Remediation	Immediate	6 Months	1 Year	3 Years
Non-HFTD	≤ 35%	36–40%	41–60%	61–80%
HFTD Tier 2	≤ 35%	36–40%	41–80%	NA
HFTD Tier 3	≤ 35%	36–80%	NA	

Table 9. Transmission Pole Replacement or Reinforcement Prioritization for Gas Poles with Less than 180° of Excavation – Includes Poles Set in a Solid Surface Such as Asphalt, Concrete, or Brick

G.O. 95, Rule 18 Level	L1	L2		
Tag Priority	A	E		
Time for Remediation	Immediate	6 Months	1 Year	3 Years
Non-HFTD	≤ 35%	36–40%	41–60%	61–100%
HFTD Tier 2	≤ 35%	36–40%	41–100%	NA
HFTD Tier 3	≤ 35%	36–100%	NA	

Table 10. Transmission Pole Replacement or Reinforcement Prioritization for Non-Gas and Gas Poles with No Calculated Wood Pole Strength

G.O. 95, Rule 18 Level	L2			L3
Tag Priority	E			F
Criteria	Ignition Risk	Worker Safety	Other	All
HFTD Tier 3	6 Months	1 Year	3 Years	5 Years
HFTD Tier 2 (HFRA/Z1)	1 Year	1 Year	3 Years	5 Years
Non-Tiered	NA	1 Year	3 Years	5 Years

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

6.3 IF the % RS is less than or equal to 35%,

OR IF an average minimum shell thickness of 1 inch or less is observed at any level on the pole AND any reading used to derive the average is 0.5 inches or less,

1. THEN TAKE the following actions:

a. For distribution:

- (1) TAKE immediate action.
- (2) REJECT the pole as non-serviceable.
- (3) SCHEDULE the pole for replacement.
 - i. SPECIFY the replacement as Priority X.

b. For transmission:

- (1) TAKE immediate action.
- (2) REJECT the pole as non-serviceable.
- (3) As an interim measure, REINFORCE the pole, if possible.
 - i. SPECIFY the reinforcement as Level 1 Emergency.
 - ii. HAND-OFF to Emergency Program personnel.
- (4) SCHEDULE the pole for replacement.
 - i. IF the pole was not reinforced,
THEN TAKE the following steps:
 - SPECIFY the replacement as Level 1 Emergency.
 - HAND-OFF to Emergency Program personnel.
 - ii. OTHERWISE, IF the pole was reinforced,
THEN TAKE the following steps:
 - SPECIFY the replacement as Level 2.
 - DETERMINE the priority and duration in accordance with [Utility Procedure TD-8123P-103, "Electric Transmission Line Guidance for Setting Priority Codes."](#)

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

7 Marking and Tagging Poles

NOTE

Usually, pole reinforcement and PT&T contractors MARK AND TAG poles.

- 7.1 TAG all poles that have either been inspected, tested, and treated, OR are unsuitable for treatment.
- 7.2 PLACE tag(s) approximately 6 feet above the groundline and above the pole brand.
- 7.3 TAG all poles treated by a contractor with aluminum tags that show the following information:
- Contractor's name
 - Year of inspection
 - Types of tests performed
 - Types of treatments applied
- 7.4 PLACE treatment tags adjacent to, and not over, any tags applied by previous pole contractors.
- 7.5 TAG non-serviceable poles using a yellow tag (7/8-inch x 9/16-inch with black lettering).
1. ENSURE that the tag shows the following information (SEE [Figure 4, "Pole Reject Tags,"](#) on Page 10).
 - "S" means the pole **is** a candidate for reinforcement (stubbable).
 - "N" means the pole **is not** a candidate for reinforcement (non-stubbable).
 2. PLACE the tag on the road-facing side of the pole, approximately 7 feet above the groundline.
- 7.6 IF a pole cannot be reinforced,
THEN REMOVE the yellow "S" (stubbable) tag AND REPLACE it with a yellow "N" (non-stubbable) tag.
- 7.7 IF a pole is successfully reinforced,
THEN REMOVE the yellow "S" (stubbable) tag.
- 7.8 CAPTURE photo(s) of inspection tags (previous and newly installed).

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

8 Reusing Wood Poles

NOTE

Cedar poles require a larger circumference than Douglas fir poles to meet the same strength requirements.

- 8.1 DETERMINE the pole's age from either the brand or the date nail.
- 8.2 DETERMINE the species AND treatment from the brand.
- 8.3 IF any of the following conditions are true,
THEN DO NOT REUSE the pole:
 - The pole is a ponderosa pine.
 - The pole is gas-treated.
 - The pole is older than 20 years.
- 8.4 SALVAGE AND REUSE poles that are 10 years old or less, if possible.
- 8.5 CONSIDER reusing poles as old as 20 years if they were tested and proved to be sound as described in this procedure.
- 8.6 CONSULT the wood pole product engineer with questions about inspecting wood poles that are being considered for reuse.
- 8.7 REFER to [Numbered Document 025055, "Requirements for Customer-Owned Poles,"](#) located in [Utility Manual TD-7001M, Electric & Gas Service Requirements \(Greenbook\)](#).
- 8.8 PERFORM the following tasks in the following order as described in this procedure:
 1. Visual inspection
 2. Sound inspection (hammer test)
 3. Intrusive inspection (bore and probe test)
- 8.9 ASSESS the pole.
 1. IF the average shell thickness is less than 4 inches at 6 feet from the butt,
THEN DO NOT REUSE OR ACCEPT the pole.

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

- 8.10 SCRAPE AND REMOVE any external decay or damage AND MEASURE the resulting circumference 6 feet from the butt AND at the pole top to determine the class of pole.
1. SEE [Appendix F, "ANSI Pole Dimension Criteria,"](#) starting on Page 64 for the American National Standards Institute (ANSI) criteria for pole dimensions.
- 8.11 IF checks in the climbing area of the pole (groundline to within 5 feet from the top) meet either of the following criteria:
- Exceed $\frac{3}{4}$ inch in width.
 - Exceed 3 feet in length when measured downward from the point where the check is at its maximum (i.e., the point where it exceeds $\frac{3}{4}$ inch).
- THEN DO NOT REUSE the pole.
- 8.12 IF knots on the pole meet any of the following criteria:
- Exceed $2\frac{1}{2}$ inches in diameter for poles less than or equal to 45 feet.
 - Exceed 3 inches in diameter for poles greater than 50 feet.
 - The sum of knot diameters in any knot cluster exceeds 9 inches in any 1-foot vertical section of the pole.
- THEN DO NOT REUSE the pole.
- 8.13 IF the poles have significant avian, fire, or other damage,
- THEN DO NOT REUSE the pole.
- 8.14 IF the pole has a split top down to the intended crossarm level,
- THEN DO NOT REUSE the pole.
- 8.15 PLUG all inspection holes with boron rods (Code 140037) and removable plastic plugs equivalent to Code 140038.
- 8.16 PLACE a new date nail adjacent to the existing date nail, if any, to denote that the pole is used.
- 8.17 TREAT all "cut" surfaces (i.e., poles topped, gains, drilled holes) with copper naphthenate (Code 490718) OR a PG&E-approved wood preservative before reusing the wood pole.

END of Instructions

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

DEFINITIONS

Average shell thickness: The sum of one or more shell thickness measurements taken at evenly spaced intervals around the circumference of a pole at a common elevation, divided by the number of measurements taken. Whenever possible, take three measurements spaced 120° apart at each elevation.

Bore: The process of using a manual or power drill to breach the exterior of a pole, primarily to provide access for internal examination of the pole and secondarily to create a reservoir for remedial chemical application.

Check (seasoning check): The natural, lengthwise separation of wood fibers which usually extends across the rings of annual growth. This separation is normally caused by changes in wood moisture content.

Compression wood: Compression wood typically develops on the underside (compression side) of leaning or malformed stems, branches, and beneath branch insertion. This causes an eccentric pith situated to the side of oval-shaped poles. Eccentric growth rings containing an abnormally high proportion of late wood are indicative of its presence. It is also characterized by a more gradual transition between early wood and late wood than in normal wood.

Damage: Externally or internally caused weakness to a utility pole that could compromise the pole's overall strength.

Decayed wood: Wood that has lost its strength due to insect infestation or decomposition caused by fungi. Decayed wood shavings are discolored, crumble easily, and do not maintain wood structure and fiber strength.

Distribution pole: A distribution pole is a distribution asset, as defined by the Electric Distribution Geographic Information System (EDGIS).

Effective circumference: The resultant effective circumference of sound wood of the pole at or near the groundline. It may be less than the original circumference due to surface decay (shell rot), fire, mechanical, or insect damage, or reductions taken because of internal decay. Estimators use the effective circumference to reassess/evaluate pole loading or to reclassify poles.

Enclosed pocket: An enclosed area of deterioration within the heartwood of a pole.

Excavation: The removal of soil to expose a pole from the groundline to an area of 20–30 inches below-ground, thereby providing access for visual inspection, application of external preservative treatment, and below-ground boring. The excavation may be completely around the circumference of the pole or partially exposing the pole, depending on the condition of the pole and its original treatment type.

Exposed pockets: The absence of wood on the outside surface of a pole, typically caused by decay fungi or other wood-deteriorating processes.

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

DEFINITIONS (continued)

Exterior pole casing: The outside of a pole.

External preservative treatment: The application of an approved wood preservative to the exterior surface of a pole from 2–3 inches above the groundline to the bottom of a groundline excavation, intended to serve as a barrier to decay in the groundline area of the pole.

Feasibility of reinforcement: Determination of whether a pole meets structural requirements necessary to obtain suitable strength from an ancillary structural member.

Internal fumigation: The application of an approved volatilizing chemical formulated to kill decay-causing organisms or fungi spores within the wood.

Intrusive inspection (bore and probe test): The act of drilling a hole and using an approved shell thickness gauge to determine the internal condition of a pole.

Minimum average shell thickness: The lesser of the average shell thicknesses at 12 inches below the groundline and at the groundline.

Minimum safety factor: [G.O. 95](#) requires that poles be replaced before safety factors have been reduced (due to deterioration) to less than 67% of the safety factors required for the grade of construction.

Non-serviceable pole: A pole that was tested and, based on the measurements, may meet test criteria to be acceptable to remain in service; however, in the judgement of the contractor inspector/foreman, the presence of defect(s) may require the pole to be reinforced or replaced. All poles should be completely and thoroughly inspected, and the data collected should reflect actual conditions in the field.

Original circumference: The circumference of a pole measured at the groundline or directly below any mechanical damage. Use the original circumference to determine the pole's original class and original strength.

Original pole treatment types: Grouped as follows:

- **Gas poles:** B (butane), G (Cellon gas), MP (methane propane), PB (penta in liquid petroleum gas), PD (penta in chlorinated hydrocarbon solvent)
- **Penta poles:** A (penta in creosote), P (penta), PA (penta in petroleum)
- **Creosote poles:** C (creosote), N (copper naphthenate)
- **Salt poles:** SB (salts boliden), SK (chromated copper arsenate), SZ (ammoniacal copper zinc arsenate), ZMA (zinc metal arsenate)
- **DCOI:** DA (dichlorooctylisothiazolinone)



Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

DEFINITIONS (continued)

Probe: A process in which a shell thickness gauge is inserted into a pole that has been bored to determine the condition of the wood inside the pole.

Qualified electrical worker (QEW): By regulatory definition, a qualified person who has a minimum of 2 years training and experience with high-voltage circuits and equipment and has demonstrated by performance familiarity with work to be performed and hazards involved.

Rebanding: The adjustment and/or tightening of steel bands on poles with existing steel truss reinforcements.

Reinforcement: Mechanical technique(s) to restore the strength of a pole decayed at or near the groundline to serviceable condition.

Safety factor: The pole strength divided by the pole load. Both the bending moment at the groundline and the vertical load are considered.

Serviceable pole: A pole with sufficient mechanical strength or a pole that can be reinforced to sufficient mechanical strength to remain in service.

Shell: The measurement of solid wood from the outer surface of a wood pole to the outer edge of an internal void, if one exists.

Shell thickness gauge: A tool used to detect internal decay pockets in poles by “feeling” growth rings in sound, but not decayed, wood when inserted through or removed from snug-fitting holes bored in the pole.

Solid-surface pole: A pole set in and fully surrounded by a solid surface such as pavement, concrete, brick, or solid rock.

Sound inspection (hammer test): The act of striking a framing hammer on the surface of a pole from the groundline to as high as can be reached to identify possible internal voids or hollows in the pole. A framing hammer has a crosshatched face on the strike plate, which leaves marks on the wood.

Sound wood: Wood that has no decay. Sound wood shavings are light in color and maintain wood structure and fiber strength.

Stub: A short length (9–16 feet) of wood pole or steel channel set/driven into the ground adjacent to an existing pole and banded to the pole to restore the pole’s original strength.

Suitable for reinforcement: A pole with damage or decay at or near the groundline that can be reinforced to extend the pole life.

Transmission pole: A transmission pole is a transmission asset, as defined by the Electric Transmission Geographic Information System (ETGIS). This also includes transmission poles with distribution underbuild, as well as guy poles supporting a transmission pole (regardless of the voltage class supported).

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

DEFINITIONS (continued)

Through-bored pole: Douglas fir wood poles which have a series of $\frac{3}{8}$ -inch or $\frac{1}{2}$ -inch holes bored completely through the intended groundline area of the pole to ensure complete penetration of the original preservative treatment.

Void: An internal defect or pocket in a utility pole. Voids are measured in depth, width, and height.

Whipcheck: A device attached to an air compressor line connection between mechanical connectors. This secures the air compression line and prevents the hose from whipping back and forth in the case of a hose clamp coming loose, preventing potential injury.

IMPLEMENTATION RESPONSIBILITIES

Area electric superintendents communicate this procedure to electric supervisors in their areas.

Electric supervisors ensure all personnel are adequately trained on this procedure.

Area electric superintendents communicate this procedure to electric compliance supervisors in their areas.

Compliance supervisors ensure all compliance inspectors are adequately trained on this procedure.

Service Planning and Estimating supervisors communicate this procedure to Service Planning and Estimating personnel.

PT&T supervisors communicate this procedure to PT&T personnel and contractors.

PT&T quality control (QC) supervisors communicate this procedure to PT&T personnel and contractors.

GOVERNING DOCUMENT

[Utility Standard TD-2325S, "Inspecting, Testing, and Maintaining Wood Poles"](#)

COMPLIANCE REQUIREMENT / REGULATORY COMMITMENT

CPUC G.O.s:

- [95, "Rules for Overhead Electric Line Construction"](#)
- [165, "Inspection Requirements for Electric Distribution and Transmission Facilities"](#)

[North American Electric Reliability Corporation \(NERC\) Standard FAC-501-WECC-2, "Transmission Maintenance"](#)

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

COMPLIANCE REQUIREMENT / REGULATORY COMMITMENT (continued)

Information and Records Management:

PG&E Data, Information, and Records are company assets that must be traceable, verifiable, accurate, and complete and can be retrieved upon request. Functional Areas are responsible for complying with the Information & Records Governance Policy, Standards, and the Information and Records Retention Schedule. Refer to [GOV-7101S, "Enterprise Records and Information Management Standard,"](#) for further guidance or contact Information & Records Governance at Information&RecordsGovernance@pge.com.

REFERENCE DOCUMENTS

Developmental References:

Utility Procedures:

- [TD-2325P-02, "Testing Wood Poles Before Climbing"](#)
- [TD-2509P-01, "Electric Transmission and Distribution Arc-Flash Hazard Control Procedure"](#)
- [TD-3320P-31, "Arc-Flash Hazards and Controls for Substation Facilities"](#)

Supplemental References:

[ANSI 05.2-2020, "Structural Glued Laminated Timber Poles"](#)

[Caltrans Highway Design Manual](#)

[Code of Safe Practices \(CSP\)](#)

Numbered Documents:

- [015203, "Construction Requirements for Wood Distribution Poles"](#)
- [022168, "Marking, Numbering, and Identification of Line Structures"](#)
- [022616, "Stepping of Poles"](#)
- [025055, "Requirements for Customer-Owned Poles"](#)
- [063418, "Inspection of Wood Poles for Pole Stub Installation"](#)

[Utility Manual TD-7001M, *Electric & Gas Service Requirements \(Greenbook\)*](#)

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

REFERENCE DOCUMENTS (continued)

Utility Procedures:

- [TD-2204P-01, "Restoration Dispatch 911 Call"](#)
- [TD-2325P-08, "Intrusively Inspecting Wood Poles Using IML PowerDrill Inspection Tool"](#)
- [TD-8123P-103, "Electric Transmission Line Guidance for Setting Priority Codes"](#)

[Utility Standard SAFE-1001S, "PG&E Injury & Illness Prevention Plan \(IIPP\)"](#)

APPENDICES

[Appendix A, "Pole Test and Evaluation Flow Chart"](#)

[Appendix B, "Required Groundline Circumference"](#)

[Appendix C, "Poles with Hollow Hearts"](#)

[Appendix D, "Poles with Enclosed Pockets"](#)

[Appendix E, "Poles with Exposed Pockets"](#)

[Appendix F, "ANSI Pole Dimension Criteria"](#)

[Appendix G, "Special Procedures for Laminated Wood Poles, Covered Wood \(Fiber-Wrapped\) Poles, and Poles with Steel or Concrete Casings \(Including Mod Poles\)"](#)

[Appendix H, "Examples of Visual Inspections Requiring Escalation"](#)

ATTACHMENTS

[Form TD-2325P-01-F01, "Pole Inspection/Test Report"](#)

DOCUMENT REVISION

This utility procedure supersedes Utility Procedure TD-2325P-01, "Intrusively Inspecting, Reinforcing, and Reusing Wood Poles," Rev. 4, dated 08/01/2024.

DOCUMENT APPROVER

██████████ Senior Director, Asset Strategy

██████████ Senior Director, Transmission, Substation, and Storage Strategy

██████████, Director, PT&T

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

DOCUMENT OWNER

[REDACTED], Senior Manager, Electric Distribution

DOCUMENT CONTACT

[REDACTED], Senior Electric Distribution Engineer

[REDACTED], Senior Advising Transmission Electric Standards and Strategy Engineer

[REDACTED], Senior Manager, Contract Execution

[REDACTED], Senior Manager, Electric Compliance

REVISION NOTES

Where?	What Changed?
Entire document	Revised procedure to incorporate safety review edits.
Subsection 2.5	Added depth of 66 inches to Step 2.5.4, "Full Excavation." Added requirement to also check for damage when checking for external decay.
Subsection 2.19	Removed % RS formulae. Modified transmission RS requirement in Step 2.19.6.b. Modified distribution and transmission RS requirements in Step 2.19.6.d.
Subsection 3.3	Reordered requirements to check for shell thickness before checking reinforcement bands.
Subsections 6.1 and 6.2	Added "treatment" as a prioritization criterion. Renamed Table 2 and added new Tables 3 and 4. Added that reinforcement includes rebanding. Renamed and re-numbered former Table 3 (now Table 5) and added new Tables 6 and 7. Renamed and re-numbered former Table 4 (now Table 8) and added new Tables 9 and 10.
Subsection 6.3	Removed requirement to hand off Priority X replacements to Emergency Program personnel in Step 6.3.1.a.(3).
Definitions	Added the following definitions: <ul style="list-style-type: none">• Damage• Rebanding• Void• DCOI (added to "Original pole treatment types" definition)

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

REVISION NOTES (continued)

Where?	What Changed?
Document Contact	Updated document contact information.
Appendix A	Updated flow chart in Figure 12.
Appendix B	Re-numbered former Table 5 to Table 11.
Appendix C	Re-numbered former Table 6 to Table 12.
Appendix D	Re-numbered former Table 7 to Table 13.
Appendix E	Re-numbered former Table 8 to Table 14.
Appendix F	Re-numbered former Table 9 to Table 15. Re-numbered former Table 10 to Table 16.
Appendix G	Removed “Transmission Only” from Section 3 title. Added new Subsection 3.4 for distribution only. Added new Subsection 3.5 for transmission only.

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

Appendix A, Pole Test and Evaluation Flow Chart

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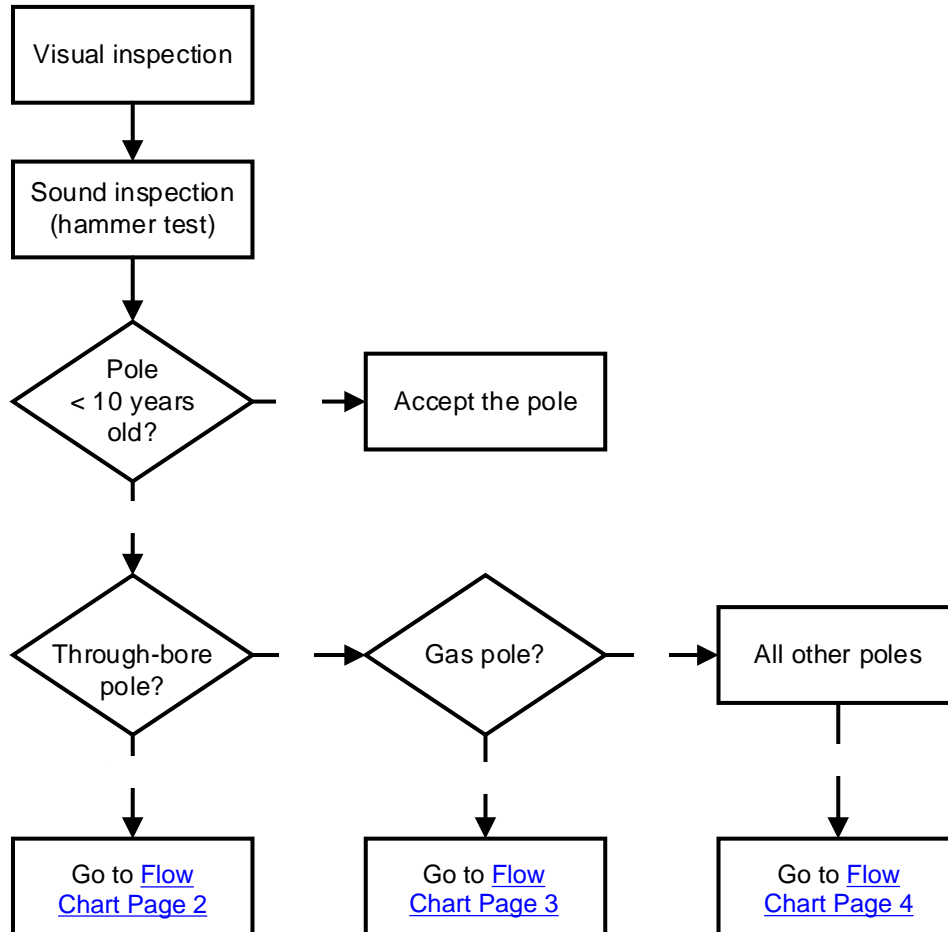


Figure 10. Pole Test and Evaluation Flow Chart – Page 1



Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

Appendix A, Pole Test and Evaluation Flow Chart

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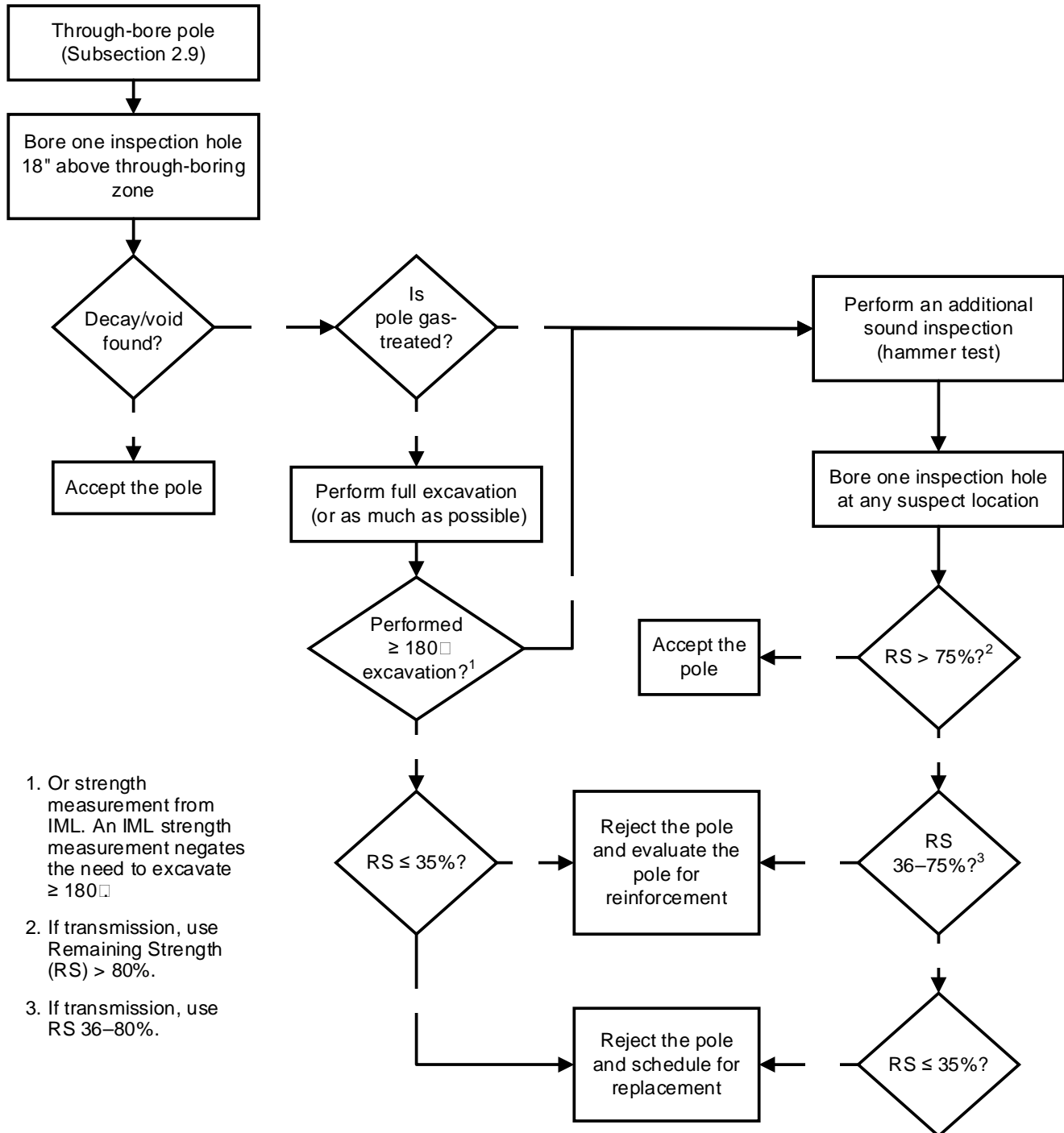


Figure 11. Pole Test and Evaluation Flow Chart – Page 2



Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

Appendix A, Pole Test and Evaluation Flow Chart

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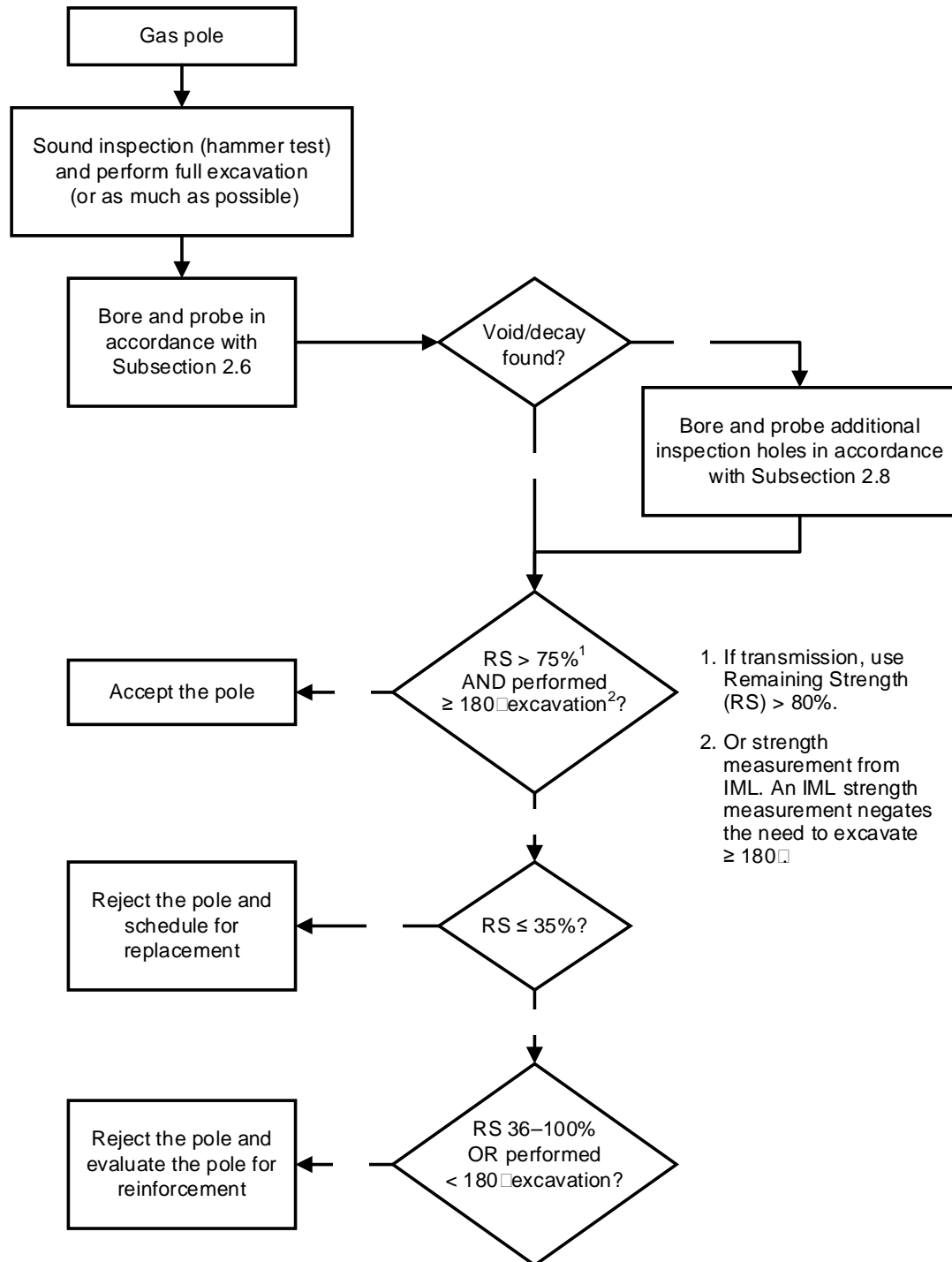


Figure 12. Pole Test and Evaluation Flow Chart – Page 3



Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

Appendix A, Pole Test and Evaluation Flow Chart

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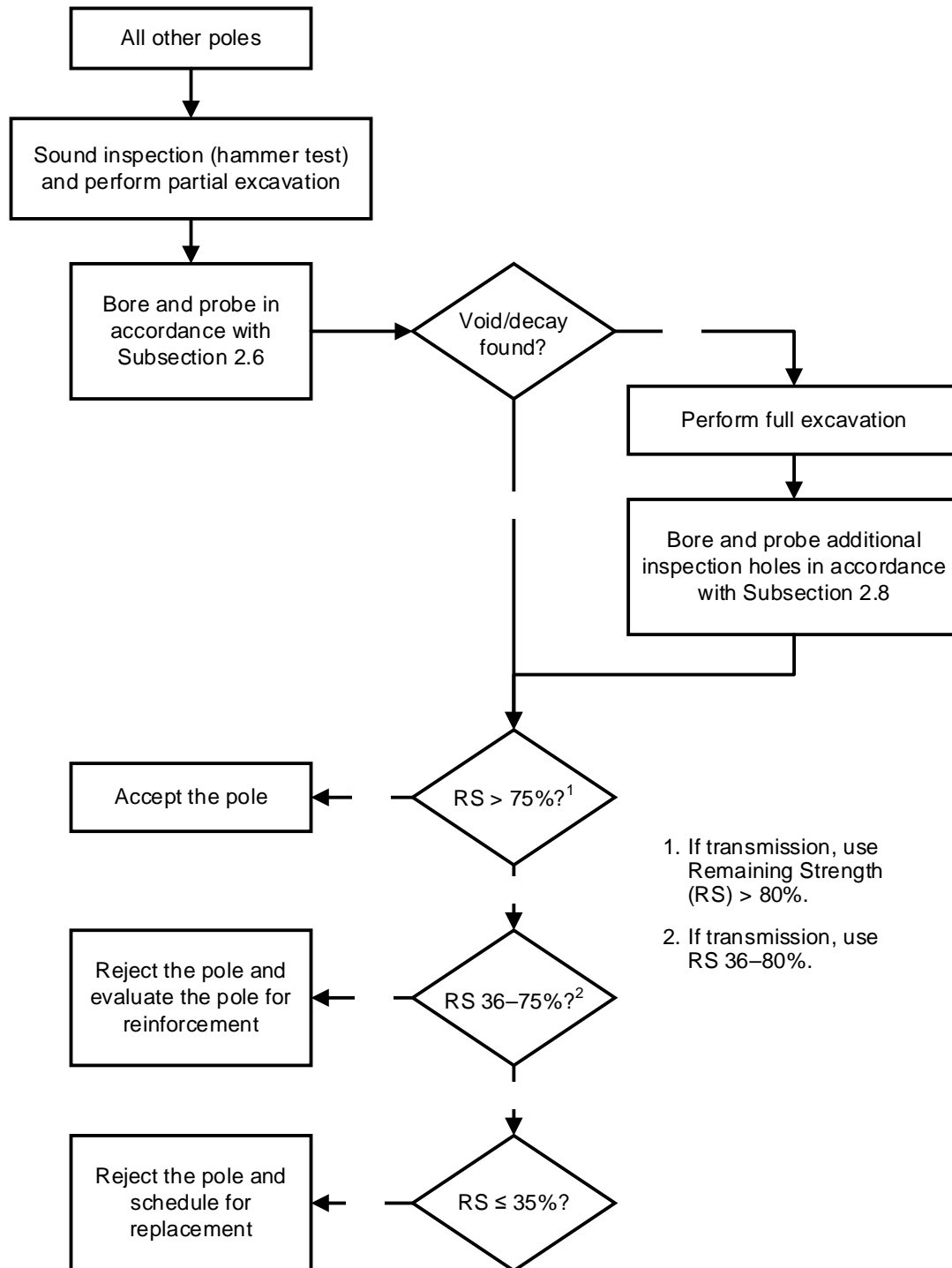


Figure 13. Pole Test and Evaluation Flow Chart – Page 4

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

Appendix A, Pole Test and Evaluation Flow Chart

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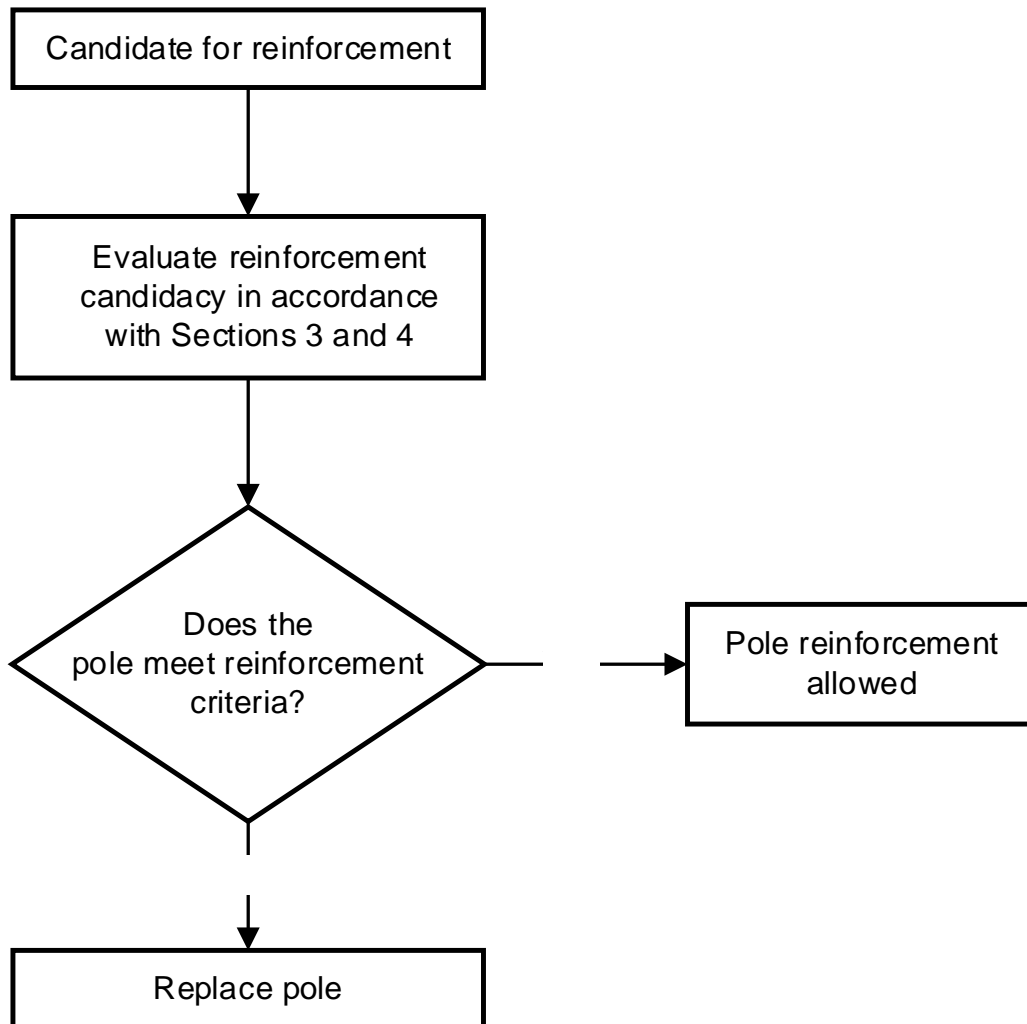


Figure 14. Pole Test and Evaluation Flow Chart – Page 5

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

Appendix B, Required Groundline Circumference

Page 1 of 1

1. MEASURE the minimum effective circumference (in inches) at the groundline at the point of maximum decay.
2. For pole circumferences greater than 60 inches, MULTIPLY the original circumference by 0.87 to obtain the resulting minimum effective circumference.

Table 11. Required Groundline Circumference

Original Circumference of Pole (Inches)	Minimum Effective Circumference Allowed (Inches)	Original Circumference of Pole (Inches)	Minimum Effective Circumference Allowed (Inches)
24	21	43	37½
25	21¾	44	38½
26	22¾	45	39¼
27	23½	46	40
28	24½	47	41
29	25¼	48	41¾
30	26¼	49	42¾
31	27	50	43½
32	28	51	44½
33	28¾	52	45¼
34	29¾	53	46¼
35	30½	54	47
36	31½	55	48
37	32¼	56	49¾
38	33¼	57	49¾
39	34	58	50½
40	35	59	51½
41	35¾	60	52¼
42	36¾		

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

Appendix C, Poles with Hollow Hearts

Page 1 of 2

1. MEASURE the effective circumference (in inches) of sound wood at the groundline.
2. MEASURE the shell thickness (in inches) at the groundline inspection holes AND USE the smallest thickness found.
3. LOCATE the entry in [Table 12](#) starting below, which corresponds to the measurements from Steps [1](#) and [2](#) above.
4. SUBTRACT the [Table 12](#) entry from the measured circumference to obtain the circumference of an equivalent solid pole.

Table 12. Hollow Heart Measured Circumference Deduction

Measured Circumference of Sound Wood (Inches)	Minimum Thickness of Shell (Inches)						
	2.0	2.5	3.0	3.5	4.0	4.5	5.0
22	1	1					
23	1	1					
24	1	1					
25	1	1					
26	1	1					
27	1	1	1				
28	1	1	1				
29	1	1	1				
30	2	1	1	1			
31	2	1	1	1			
32	2	1	1	1			
33	2	1	1	1	1		
34	2	1	1	1	1		
35	3	2	1	1	1		
36	3	2	1	1	1		
37	3	2	1	1	1		
38	3	2	1	1	1	1	
39	3	2	1	1	1	1	



Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

Appendix C, Poles with Hollow Hearts

Page 2 of 2

Table 12. Hollow Heart Measured Circumference Deduction (continued)

Measured Circumference of Sound Wood (Inches)	Minimum Thickness of Shell (Inches)						
	2.0	2.5	3.0	3.5	4.0	4.5	5.0
40	4	2	2	1	1	1	
41	4	3	2	1	1	1	
42	4	3	2	1	1	1	
43	4	3	2	1	1	1	
44	5	3	2	1	1	1	
45	5	3	2	2	1	1	1
46	5	4	3	2	1	1	1
47	6	4	3	2	1	1	1
48	6	4	3	2	1	1	1
49	6	4	3	2	1	1	1
50	6	4	3	2	1	1	1

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

Appendix D, Poles with Enclosed Pockets

Page 1 of 1

1. MEASURE the effective circumference (in inches) of sound wood at the groundline.
2. MEASURE the shell thickness (in inches) at the groundline inspection holes AND USE the smallest thickness found.
3. MEASURE the depth (in inches) of any enclosed pocket.
4. LOCATE the table entry in [Table 13](#) below which corresponds to the measurements from Steps [1–3](#) above.
5. SUBTRACT the [Table 13](#) entry from the measured circumference to obtain the circumference of an equivalent solid pole.

Table 13. Enclosed Pocket Measured Circumference Deduction

Measured Circumference of Sound Wood (Inches)	Thickness of Shell on Thin Side (Inches)	Maximum Pocket Depth (Inches)		
		3.0	4.0	5.0
22–30	1.0	2	2	3
22–30	2.0	–	1	1
22–30	3.0	–	–	–
31–38	1.0	2	2	3
31–38	2.0	1	1	2
31–38	3.0	1	1	1
9–50	1.0	2	3	4
39–50	2.0	1	2	2
39–50	3.0	1	1	1

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

Appendix E, Poles with Exposed Pockets

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1. MEASURE the effective circumference (in inches) of sound wood at the groundline.
2. MEASURE the depth (in inches) of the exposed pocket at the groundline.
3. MEASURE the width (in inches) of the exposed pocket.
4. LOCATE the entry in [Table 14](#) below which corresponds to the measurements from Steps [1–3](#) above.
5. SUBTRACT the [Table 14](#) entry from the measured circumference to obtain the circumference of an equivalent solid pole.
6. REDUCE these deductions by 50% for pockets in line-of-lead (face or back-of-pole).

Table 14. Exposed Pocket Measured Circumference Deduction

Measured Circumference of Sound Wood (Inches)	Depth of Pocket (Inches)	Width of Pocket (Inches)											
		1	2	3	4	5	6	7	8	9	10	11	12
22–30	1	1	2	3	4	5	7	8	9				
22–30	2	2	3	4	5	7	9						
22–30	3	2	3	4	6	8							
22–30	4	2	3	4	6	9							
22–30	5	2	3	4	6	9							
31–40	1	1	1	2	2	3	4	5	6	7	8		
31–40	2	1	2	3	4	5	6	8	10	11	12		
31–40	3	1	2	4	5	6	8	10	12	13	14		
31–40	4	2	3	4	5	7	9	11	13	14	15		
31–40	5	2	3	4	6	8	10	12	14	15	16		
Over 40	1	1	1	1	2	2	2	3	3	4	5	6	7
Over 40	2	1	2	2	3	4	4	5	6	7	8	10	12
Over 40	3	1	2	3	4	5	6	7	8	9	11	13	15
Over 40	4	2	2	4	5	6	7	8	10	11	13	15	17
Over 40	5 or Deeper	2	3	4	5	7	8	10	12	14	16	18	20

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Appendix F, ANSI Pole Dimension Criteria

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Table 15. ANSI Minimum Circumference 6 Feet from the Butt, Douglas Fir

Douglas Fir (DF) Poles								
Pole Class	6	5	4	3	2	1	H1	H2
Minimum Pole-Top Circumference (Inches)	17 (19)	19	21	23	25	27	29	31
Pole Length (Feet)	Minimum Circumference 6 Feet from the Butt (Inches)							
20	21.0	23.0	25.0	27.0	29.0	31.0		
25	23.0	25.5	27.5	29.5	31.5	33.5		
30	25.0	27.5	29.5	32.0	34.0	36.5		
35	27.0	29.0	31.5	34.0	36.5	39.0		
40	28.5	31.0	33.5	36.0	38.5	41.0		
45	30.0	32.5	35.0	37.5	40.5	43.0		
50		34.0	36.5	39.0	42.0	45.0	47.5	50.5
55			38.0	40.5	43.5	46.5	49.5	52.0
60			39.0	42.0	45.0	48.0	51.0	54.0
65			40.5	43.5	46.5	49.5	52.5	55.5
70			41.5	45.0	48.0	51.0	54.0	57.0
75				46.0	49.0	52.5	55.5	59.0
80				47.0	50.5	54.0	57.0	60.0
85				48.0	51.5	55.0	58.5	61.5
90				49.0	53.0	56.0	59.5	63.0
95					54.0	57.0	61.0	64.5
100					55.0	58.5	62.0	65.5
105					56.0	59.5	63.0	67.0

NOTE: PURCHASE Class 6 poles in lengths of 35, 40, and 45 feet with Class 5 (19-inch minimum) tops.

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Appendix F, ANSI Pole Dimension Criteria

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Table 16. ANSI Minimum Circumference 6 Feet from the Butt, Western Red Cedar

Western Red Cedar (WC) Poles								
Pole Class	6	5	4	3	2	1	H1	H2
Minimum Pole-Top Circumference (Inches)	17 (19)	19	21	23	25	27	29	31
Pole Length (Feet)	Minimum Circumference 6 Feet from the Butt (Inches)							
20	23.0	25.9	27.0	29.5	31.5	33.5		
25	25.5	28.0	30.0	32.5	34.5	37.0		
30	28.0	30.0	32.5	35.0	37.5	40.0		
35	30.0	32.0	34.5	37.5	40.0	42.5		
40	31.5	34.0	36.5	39.5	42.5	45.0		
45	33.0	36.0	38.5	41.5	44.5	47.5		
50		37.5	40.0	43.5	46.5	49.5	52.5	55.5
55			42.0	45.0	48.5	51.5	54.5	57.5
60			42.5	46.5	50.0	53.5	56.5	59.5
65			45.0	48.0	51.5	55.0	58.5	61.5
70			46.0	49.5	53.0	56.5	60.0	63.5
75				51.0	54.5	58.0	61.5	65.0
80				52.0	56.0	59.5	63.0	67.0
85				53.5	57.0	61.0	64.5	68.5
90				54.5	58.5	62.5	66.0	70.0
95					59.5	63.5	67.5	71.5
100					61.0	65.0	69.0	72.5
105					62.0	66.0	70.0	74.0

NOTE: PURCHASE Class 6 poles in lengths of 35, 40, and 45 feet with Class 5 (19-inch minimum) tops.

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

Appendix G, Special Procedures for Laminated Wood Poles, Covered Wood (Fiber-Wrapped) Poles, and Poles with Steel or Concrete Casings (Including Mod Poles)

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1 Laminated Wood Poles

- 1.1 This section is for detecting defects affecting the serviceability of engineered, laminated wood poles manufactured per American National Standards Institute (ANSI) standard [ANSI 05.2-2020, "Structural Glued Laminated Timber Poles,"](#) and treated for soil contact per the American Wood Protection Association (AWPA) standards C28 or U1-10, "Commodity Specification D: Poles."
- 1.2 Laminated wood poles are engineered wood with layers of dimensional lumber bonded together with durable and moisture-resistant adhesives (SEE [Figure 15](#) below).
- 1.3 Laminated wood poles are resistant to decay because of their construction (complete penetration of preservatives). They are typically made from renewable sources.



Figure 15. Laminated Wood Pole

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Appendix G, Special Procedures for Laminated Wood Poles, Covered Wood (Fiber-Wrapped) Poles, and Poles with Steel or Concrete Casings (Including Mod Poles)

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- 1.4 FOLLOW the steps in [Section 2, “Intrusively Inspecting and Testing Wood Poles.”](#) starting on Page 6, except MODIFY [Subsection 2.11](#) on Page 25 as described below.

Modification to Subsection 2.11 for Laminated Wood Poles

2.11 Application of Internal Preservatives (Fumigant Treatment)

1. Personnel who inspect poles using the bore and probe test TREAT poles with internal fumigants as follows:
 - a. POUR fumigant into **all** holes and voids (if present).
 - b. APPLY approved fumigants at rates described on the manufacturer’s EPA-issued label.
 - c. INSERT a boron rod (Code 140037) into the 9/16-inch inspection hole.
2. REPLACE any pole found to be non-serviceable.
3. DO NOT REINFORCE laminated wood poles.

2 Covered Wood Poles (i.e., Fiber-Wrapped)

- 2.1 Wood poles may be covered above the groundline for, generally, one of two reasons: (1) as animal climbing prevention, or (2) to contain a preservative or paste applied to a wood pole.



Figure 16. Fiber-Wrapped Wood Pole

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

Appendix G, Special Procedures for Laminated Wood Poles, Covered Wood (Fiber-Wrapped) Poles, and Poles with Steel or Concrete Casings (Including Mod Poles)

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- 2.2 The covering can be a material such as fiber, paper, or plastic.
- 2.3 It is acceptable to bore through the covering when intrusively inspecting the wood pole.
- 2.4 When intrusively inspecting a covered wood pole, FOLLOW the steps in [Section 2, “Intrusively Inspecting and Testing Wood Poles,”](#) through [Section 7, “Marking and Tagging Poles,”](#) on Pages 6–43, except MODIFY [Subsection 4.4](#) on Page 35 as described below.

Modification to Subsection 4.4 for Covered (Fiber-Wrapped) Wood Poles

- 4.4 (a) REMOVE the covering AND visually INSPECT the portion of the pole that was covered, per [Subsection 2.2.3](#) starting on Page 9.
- 4.4 (b) BORE AND PROBE inspection holes at 66 inches above the groundline AND at banding levels shown in [Subsection 4.6](#) starting on Page 35 to determine the average shell thickness at each level.

3 Poles with Steel and Concrete Casings (Modular Pole Butts)

- 3.1 Wood poles may be encased with steel and concrete. SEE [Figure 17](#) below.



Figure 17. Wood Pole with Steel and Concrete Casing

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

Appendix G, Special Procedures for Laminated Wood Poles, Covered Wood (Fiber-Wrapped) Poles, and Poles with Steel or Concrete Casings (Including Mod Poles)

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- 3.2 Steel and concrete casings (mod pole butts) have been used historically as a fix for damaged poles (typically, car poles), to increase pole height or to facilitate a road widening project.
1. The mod/pole modules are tapered, pre-stressed concrete replacement pole butts and are available in 9-foot, 14-foot, and 18-foot lengths.
 2. To secure the existing wood pole top to the module, a steel connecting sleeve and high-strength, fast-setting grout is provided.
 3. The 18- and 14-foot modules are designed to repair poles damaged by car-pole accidents and to increase pole or equipment elevations. The 9-foot module is designed for use in cases of ground decay or pole top relocation.
- 3.3 Concrete casings are also used in special circumstances to extend pole heights or in situations where a wood or steel pole is not preferred (e.g., locations with a high-water table). In such cases, a concrete column is set and the wood pole set in the concrete.
- 3.4 For distribution only, TAKE the following steps:
1. REJECT the pole as non-serviceable.
 2. SCHEDULE the pole for replacement AND PRIORITIZE it per [Subsection 6.1](#) starting on Page 39.
- 3.5 For transmission, FOLLOW the remaining steps for mod poles.
- 3.6 For poles with steel and concrete casings, including modular pole butts, **for transmission**, PG&E Maintenance and Construction (M&C) personnel ASSIST with performing the intrusive test. Transmission M&C PERFORMS the intrusive test and remaining strength (RS) calculation.
1. If desired, PT&T personnel may PERFORM the intrusive inspection AND/OR INPUT the results while PG&E M&C personnel SUPPORT AND/OR STAND BY.
- 3.7 For poles set in concrete piles, pillars, or columns, OR for poles with steel and concrete casings (including modular pole butts), INSPECT the pole per this procedure as if it were set in concrete or a sidewalk, AND MODIFY the steps referring to the groundline as steps referring to the concrete-to-wood transition.
- 3.8 DO NOT REINFORCE wood poles with steel and concrete casings.
- 3.9 Before proceeding with an inspection, PT&T personnel CONTACT the PG&E PT&T supervisor. The PG&E PT&T supervisor CONTACTS PG&E M&C personnel to coordinate the intrusive inspection.

Intrusively Inspecting, Reinforcing, and Reusing Wood Poles

Appendix G, Special Procedures for Laminated Wood Poles, Covered Wood (Fiber-Wrapped) Poles, and Poles with Steel or Concrete Casings (Including Mod Poles)

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- 3.10 PG&E M&C personnel PROCEED to [Subsection 3.11](#) below. PT&T personnel NOTE in the inspection comments that the pole is a wood pole with a steel and concrete casing or is set in a concrete pile/pillar/column.
- 3.11 FOLLOW the steps in [Subsection 2.2, "Visual Inspection,"](#) starting on Page 8 AND INCLUDE the additional step described below.

Addition to Subsection 2.2 for Poles with Steel and Concrete Casings

2.2 Visual Inspection

8. PG&E M&C personnel EXAMINE the grout at the transition from steel and concrete to wood.
 - a. IF the grout is fully intact,

THEN PROCEED to [Subsection 3.12](#) below.
 - b. IF the grout is damaged,

THEN PG&G M&C personnel REMOVE the grout. DO NOT REMOVE OR CLEAN built-up creosote (such as on the Tesla-Stockton-Cogen junction transmission line).
 - c. PG&E M&C personnel RE-GROUT to prevent future water intrusion.

- 3.12 FOLLOW the steps in [Subsection 2.3, "Sound Inspection \(Hammer Test\),"](#) on Page 12 AND MODIFY the steps as described below.

Modification to Subsection 2.3 for Poles with Steel and Concrete Casings

2.3 Sound Inspection (Hammer Test)

1. PERFORM a sound inspection (hammer test) for all poles at the transition from steel and concrete to wood.
2. STRIKE the pole on all sides (all four quadrants) with a metal framing hammer (20-ounce minimum).
 - a. START at the transition from steel and concrete to wood AND CONTINUE to at least 2 feet higher, or as high as the inspector can reach, whichever is greater.



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3.13 FOLLOW the steps in Subsections [2.4, "Poles Less than 10 Years Old,"](#) through [2.19, "Alternative Pole Evaluation Method,"](#) on Pages 12–31. INSPECT the pole per this procedure as if it were set in concrete or a sidewalk AND MODIFY the steps referring to the groundline as steps referring to the steel-and-concrete-to-wood transition.

1. IF decay or an internal void is found,

THEN TAKE the following actions:
 - a. REJECT the pole as non-serviceable.
 - b. SCHEDULE the pole for replacement.

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Appendix H, Examples of Visual Inspections Requiring Escalation

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Figure 18. Examples of Visual Inspections Requiring Escalation