



Transmission Orchard Patrol Procedure (TOPP)

Summary

The purpose of this procedure is to describe Vegetation Management (VM) requirements while patrolling commercial orchards traversed by PG&E transmission lines, to ensure the safe and reliable operation of transmission facilities.

This procedure also provides guidance to PG&E employees and contractors for meeting or exceeding the requirements of North American Electric Reliability Corporation (NERC) Standards for Vegetation Management, NERC FAC-003-4 Transmission Vegetation Management.

This procedure excludes non-orchard, routine transmission, and distribution VM work, right-of-way (ROW) reclamation and maintenance, and integrated vegetation management (IVM) work.

Level of Use: Informational Use

Target Audience

Vegetation management (VM) operations personnel

Vegetation management planning personnel

Vegetation management contractors

- Pre-inspection (PI)
 - Tree contractor (TC)
-

Safety

NA

Before You Start

1. Review [TD-7103S, "Transmission Vegetation Management Standard \(TVMS\)."](#)
 2. Review [TD-7103P-05, "Transmission Vegetation Management Imminent Threat Procedure"](#)
 3. Review the Definitions section of this document.
 4. Review the Electrical Vegetation Management Best Management Practices (BMPs) document located on the VM shared drive at:
[VM Environmental BMPs](#)
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Procedure Steps

1 Patrol / Inspection

1.1 Inspection Frequency and Work Plan

1. Orchard PI must:
 - a. INSPECT NERC-lines every calendar year.
 - b. INSPECT non-NERC lines once per cycle, November 15 through November 14.
 - c. **Not** deviate from the normal inspection cycle by more than 2 months without variance documentation, and in no case by more than 18 months.
 - (1) IF the schedule variance is greater than two (2) months,
 THEN DOCUMENT AND RECORD approval from PG&E orchard vegetation program manager (orchard VPM) in ITS).
 - d. NOTIFY orchard VPM prior to making any changes to the NERC inspection schedule.
2. Tree crew must:
 - a. COMPLETE 100% of NERC work in the calendar year.
 - b. SEND any variance from the plan to PG&E orchard VPM for approval.
 - c. WORK with PI to ENSURE that variances are documented in the Issue Tracking System (ITS).



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1.2 Schedule Variance

1. IF inspection deviates from normal cycle by more than 2 months,

OR the NERC Annual Work Plan will **not** be completed in the Calendar year,

THEN transmission PI DOCUMENTS the variance to the Work Plan in ITS, using one of the following sub-types:

- Change in expected growth rate
- Circumstances that are beyond the control of an applicable Transmission or Generator Owner
- Rescheduling work between growing seasons
- Crew or contractor availability / mutual assistance agreements
- Identified unanticipated high priority work
- Weather conditions / accessibility
- Permitting delays
- Re-entry delays due to agricultural spraying
- Land ownership changes / change in land use by the land owner
- Emerging technologies

1.3 Inspection Area

1. Orchard PI must:

- a. INSPECT all orchard vegetation with the potential to grow, sway, or fall into PG&E's electric transmission conductors, AND any orchard vegetation that could fall into any transmission structures, guys, or poles, regardless of ROW or easement width.
- b. TAKE CAUTION while patrolling commercial orchards when any of the following exist:
 - Bees
 - Farm equipment
 - Uneven ground
 - Irrigation
 - Potential for heat illness
 - Low-hanging branches
 - Signs or notification indicating use of herbicide or pesticides



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1.4 Under-Build Sections

1. Orchard PI must:
 - a. CONDUCT transmission line inspections with distribution under-build following the requirements stated in the [TD-7103P-01, "Transmission Non-Orchard Routine Patrol Procedure \(TRPP\)."](#)
 - b. NOTIFY local distribution PI of the under-build location, so that the local distribution PI can generate a tag and issue work to the local distribution TC.
 - c. REPORT any potential hazards using the [TD-7103P-09-F01, "VM T&D Hazard Notification and Imminent Threat Form"](#) as per the [TD-7103P-09, "T&D Vegetation Hazard Notification Procedure."](#)

1.5 Lines Inspected as Corridors

1. Orchard PI must:
 - a. RECORD all line segments included as a corridor in the spans tool in the Project Management Database (PMD), including partial lines that enter and exit the corridor at varying locations.
 - b. LIST all tower (pole) numbers in sequential order.

1.6 Idle Lines and Lines Energized at a Lower Voltage

1. Orchard PI must:
 - a. TREAT all idle, de-energized, and lower voltage lines as energized at the designed transmission voltage.
 - b. INSPECT AND PRUNE idle, de-energized lines, and lines energized at a lower voltage.
 - c. DOCUMENT all exceptions including "no work" by TCs on idle lines.
 - d. FORWARD all documented exceptions for approval to the orchard VPM.
 - e. FILE all documentation on idle, de-energized lines, and lower voltage lines in the circuit folder, AND RECORD information on the patrol map(s) annually.

1.7 Non-PG&E Owned Transmission Lines

1. IF orchard PI or tree crew observes a compliance violation on non-PG&E lines during adjacent routine inspections or other work,

THEN that person must NOTIFY the orchard VPM.



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1.7 (continued)

2. Orchard PI must:

- a. IF compliance violations are observed on these lines during adjacent routine inspections,

THEN NOTIFY the orchard VPM.
- b. DOCUMENT AND FILE the location of non-PG&E owned lines in the circuit folder, and RECORD on the patrol maps.
- c. INSPECT **only** those non-PG&E-owned transmission lines for which VM maintenance agreements exist.

3. Orchard VPM must:

- a. INVESTIGATE transmission lines indicated as non-PG&E on GIS (or provided via the [TD-7102P-14, "Project Management Database \(PMD\) Circuit and Line Verification Procedure"](#)) during the annual planning period.
- b. CONTACT the Land Department to determine whether 3rd-party maintenance agreements exist for the non-PG&E owned transmission lines.
 - (1) IF a 3rd-party maintenance agreement exists for the non-PG&E owned transmission lines,

THEN INSTRUCT the PI to patrol the lines in accordance with this procedure AND the requirements of the 3rd-party maintenance agreement.
 - (2) IF a 3rd-Party Maintenance Agreement does **not** exist for the indicated non-PG&E transmission lines, AND compliance violations are observed on these lines during adjacent routine inspections, THEN
 - a) MAKE reasonable attempts to NOTIFY the property owner AND PG&E stakeholders of compliance status.
 - b) NOTIFY the appropriate regulatory agency, as deemed necessary by the orchard VPM.



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1.8 Prescriptions for NERC and Non-NERC Transmission Lines on Towers Only

1. Orchard PI must:

- a. REPORT any potential hazards or imminent threats using the [TD-7103P-09-F01, "VM T&D Hazard Notification and Imminent Threat Form"](#) as per the [TD-7103P-09, "T&D Vegetation Hazard Notification Procedure."](#)
- b. USE modeled Minimum Ground to Conductor Clearance (MGCC) when LiDAR data is available.
- c. IF LiDAR data is **not** available, THEN
 - (1) USE Maximum Tree Height Table to determine work prescription (see Table 5 in Appendix A, Clearance Prescription Tables) AND DOCUMENT in the VM database (VMD) Record Comment section that LiDAR data was not used.
 - (2) EXERCISE professional judgment.
 - (3) IF the trees will exceed the maximum tree height or violate the Minimum Vegetation Clearance Distance (MVCD) in the annual cycle of any zone,

THEN PRESCRIBE removal OR a final tree height, based on the potential line-sag (Table 5 in Appendix A, Clearance Prescription Tables), plus PG&E minimum clearance requirement (see Table 1 in Appendix A, Clearance Prescription Tables), accounting for a minimum of one (1) year anticipated growth.
- d. IF removal is prescribed, THEN
 - (1) USE Trim Code Height Final Height (HFH) = 1 foot.
 - (2) RECOMMEND the Orchard Removal Program to growers, when applicable.
 - (3) Before removing trees from an existing orchard, CONTACT the orchard program manager for approval, as the removal of trees from existing orchards could involve the Orchard Removal Program.
- e. IF pruning is prescribed prior to the incompatible trees being removed, THEN
 - (1) PRESCRIBE sufficient work to obtain a minimum of 1 year clearance distance below the maximum tree heights.
 - (2) USE trim code HFH when entering pruning data.
- f. PRESCRIBE the height of the tree after work is complete in the Clearance field.



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1.8 (continued)

2. Orchard PI must **CONSIDER AND USE** the following options for spans when patrolling orchards, as applicable:

a. **WHEN** a transmission line is observed to be sagging below Rule 37 minimum ground-to-conductor distances (see Table 4 in Appendix A, Clearance Prescription Tables),

THEN INCLUDE the additional sag below the as-designed Minimum Ground to Conductor Clearance (MGCC) distances for work prescribed in the span.

NOTE

For all transmission lines with span lengths of 600 ft. or less, sag and blow-out are expected to be negligible.

b. **USE** Appendix B, Engineering Charts for Blow-Out as a guideline when prescribing side trimming.

(1) **EXERCISE** professional judgment, including consideration for site conditions, location of the tree in relation to the conductor's vertical plane, and known wind directions, which can reduce or increase the blow-out distances.

2 Prescriptions for Tower and Pole Clearing

2.1 IF the required vegetation work is for non-orchard tree species,

THEN the orchard PI must **NOTIFY** the non-orchard PI **AND RECEIVE** confirmation that this communication has been received.

NOTE

APPLIES to wood poles or metal structures 60kV or greater, including transmission structures with underbuild construction.

2.2 IF woody vegetation is in contact with the structure or pole, **OR** significantly interferes with the visual inspection of the tower or pole base or footings,

THEN vegetation work is required as described below, **AND** orchard PI must:

1. **PRESCRIBE** removal of vines and woody vegetation with a DBH less than 24" (preferred).

a. Professional judgment may be exercised to prune or not work trees less than 24" DBH, depending on field conditions.

b. Pruning must achieve a minimum of 10 ft. of clearance from any part of the structure.



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2.2 (continued)

2. PRESCRIBE pruning of DBH greater than or equal to 24" (preferred).
 - a. Professional judgment may be exercised to remove or not work trees greater than 24" DBH, depending on field conditions.
 - b. Pruning must achieve a minimum of 10 ft. of clearance from any part of the structure.
3. PRESCRIBE stump treatment when removing re-sprouting species.
4. CREATE a separate location record for tower clearing work.
5. INPUT "CC1A" into the SSD # field of the location record when prescribing tower or pole clear work.
6. INPUT the tower or pole # in the location comments field.

3 Prescriptions for Down Guy Clearing

3.1 IF the required vegetation work is for non-orchard tree species,

THEN the orchard PI must NOTIFY the non-orchard PI AND RECEIVE confirmation that this communication has been received.

NOTE

APPLIES to wood poles or metal structures 60kV or greater, including transmission structures with underbuild construction.

3.2 IF woody vegetation is in contact with the guy wire, at or above the insulator bob,

THEN vegetation work is required as described below, AND orchard PI must:

1. PRESCRIBE removal of vines and woody vegetation with a DBH less than 24" (preferred).
 - a. Professional judgment may be exercised to prune or not work trees less than 24" DBH, depending on field conditions.
 - b. Pruning must achieve a minimum of 10ft of clearance from any part of the structure.
2. PRESCRIBE pruning of DBH greater than or equal to 24" (preferred).
 - a. Professional judgment may be exercised to remove or not work trees greater than 24" DBH, depending on field conditions.
 - b. Pruning must achieve a minimum of 10 ft. of clearance from any part of the wire.



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3.2 (continued)

3. PRESCRIBE stump treatment when removing re-sprouting species.
4. CREATE a separate location record for down guy clearing work.
5. INPUT "CC1B" into the **SSD #** field of the location record when prescribing down guy wire work.
6. INPUT the tower or pole # in the location **Comments** field.

4 Prescriptions for Existing Orchard Types

4.1 Walnut Trees

1. Orchard PI must:
 - a. USE 10 ft. of re-growth for annual growth rate.
 - b. PERFORM off-cycle assessment patrols during July and August.
 - (1) IF pre-inspection determines the walnut trees will **not** hold compliance until October 1st,

THEN PRESCRIBE mid-cycle trimming with HFH = 10 ft.
2. IF mid-cycle trimming is required on a specific orchard,

THEN the tree crew must PERFORM tree work for that orchard no later than 10 business days following pre-inspection.

4.2 Almonds, Pistachios, and Other Mechanically-Harvested Nut Trees (Not Walnuts)

1. Orchard PI must USE 8 ft. of re-growth for annual growth rate.

4.3 Manually-Harvested Fruit Trees

1. Orchard PI must:
 - a. QUARANTINE manually-harvested fruit trees.
 - b. MONITOR manually-harvested fruit orchards to ensure trees do not encroach upon PG&E Clearance Requirements (see Table 1 in Appendix A, Clearance Prescription Tables).



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4.3 1. (continued)

NOTE

Manually-harvested fruit trees are typically production pruned by growers to keep them below 15 ft. to comply with COSHA regulations. Production pruning keeps fruit trees to heights that are short enough to meet PG&E's clearance requirements.

- c. LIST all locations, transmission line name(s), assessor's parcel number (APN), type of fruit tree, and follow-up dates for re-inspection to ensure trees are production pruned.
 - (1) IF tree re-growth used for work prescription purposes is increased or decreased based on site conditions and/or prior re-growth patterns,

THEN DISCUSS changes to prescribed work with the orchard contract program manager or orchard VPM prior to conducting work.

4.4 Raised Tower Locations

NOTE

Transmission towers are raised for various reasons, which can affect MGCC distances.

- 1. IF modeled LiDAR is unavailable for the raised towers,

THEN PI PRESCRIBES work as follows:
 - a. WHEN both towers of a span are raised, THEN
 - (1) For tower and quarter zones only, USE Table 5 in Appendix A, Clearance Prescription Tables AND the new (raised) conductor heights at each tower when prescribing work in the tower and quarter zones.
 - (2) For belly zone, PRESCRIBE work using the new MGCC AND CONSULT with the orchard contract forester and / or orchard program manager.



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4.4 1. (continued)

- b. WHEN only one tower of a span is raised (quarter and tower zones are elongated from mid-span to the raised tower, and shortened from mid-span to the lower tower) THEN
 - (1) LOCATE the offset mid-span of the span by finding the lowest point in the span.
 - (2) DETERMINE the new zone locations (distances within the span) of each tower, quarter, and belly zone.
 - (3) AFFIX zone cards to the new zone locations.
 - (4) For the lower tower, USE Table 5. Rule 37 "As-Designed" Maximum Tree Height Chart for Commercial Orchards Only in Appendix A, Clearance Prescription Tables for each quarter and tower zone, using the conductor height of the lower tower.
 - (5) For the raised tower, USE Table 5, using the conductor height for each quarter and tower zone at the raised tower.
 - (6) For the belly zone, USE Table 5 AND consult with the contract orchard forester and / or the orchard program manager.
- c. INDICATE raised tower location(s) on the circuit map AND in the Comments section of the tree record.

- 2. IF modeled MGCC is available to determine the modeled maximum tree heights for each zone,

THEN PI must USE the consequent maximum tree heights for each zone.

4.5 Pre-Patrol Letters and Grower Lists

- 1. Orchard PI must:

- a. SEND pre-patrol letters to growers prior to the start of each quarter's patrol.
 - (1) REVIEW the grower lists to ensure accuracy; make corrections to the information as necessary.
 - (2) INCLUDE the Assessor Parcel Number (APN) and county in the pre-patrol letter, AND a statement that alerts growers to contact the local PI supervisor if herbicide or pesticide spraying will be present during the time of the patrol.

- b. IF challenges arise with a grower during patrol or during tree work,
THEN RED-LINE the grower entry in the grower list for future reference.



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4.6 Forecasting

1. Prior to closing out a project, orchard PI must DOCUMENT the next year's forecast in the pre-inspection circuit folder located in the local office.

5 New Orchards

5.1 Orchard PI must:

1. WHEN a new orchard is identified, including ground preparation, THEN
 - a. ENTER information into the handheld device with an alert code.
 - b. NOTIFY the orchard VPM and orchard database manager.
 - (1) FILE all documentation regarding non-PG&E owned lines in the circuit folder, and RECORD on the patrol maps.
 - (2) FORWARD maintenance agreements to transmission operations manager.
 - c. ENTER data to VMD.
2. AFTER the data is entered AND the VMD populates ITS as a New Planting record(s), THEN the orchard contract VPM, supervising PI, and / or database manager does the following:
 - a. UPDATES the ITS record(s), including:
 - APN
 - Tree spacing
 - Number of incompatible trees
 - Tallest tree height
 - Approximate "after harvest" year when the trees will grow tall enough to require routine pruning.
 - Species
 - Land Rights
 - Real Quest information
 - b. EMAILS RealQuest data and land documents to the orchard VPM.



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5.1 (continued)

3. Upon notification, the VPM NOTIFIES the grower, in writing, of the following:
 - a. IF not yet planted, THEN
 - (1) INSTRUCTS the grower **not** to plant the orchard trees within the PG&E easement and/or beneath the electric transmission lines.
 - (2) OFFERS to identify the easement boundaries.
 - b. IF planted (e.g., the grower has planted trees within the easement and/or beneath the electric lines),

THEN INSTRUCTS the grower to remove trees by a specific date AND OFFERS to identify the easement trees.
 - c. IF the trees are **not** removed,

THEN notify the grower in writing that PG&E will remove the trees on a certain date.
 - d. IF the grower obstructs this work,

THEN initiate the [TD-7103P-07, "Transmission Vegetation Refusal Procedure."](#)

END of Instructions



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Definitions

Aerial Patrol – Use of a helicopter or other aircraft, with or without LiDAR capacity, during the visual inspection of vegetation.

Belly – The lowest point in the span.

Blow-out – The maximum distance the conductors will move off-center in less than fresh gale conditions (39 mph wind speeds).

Commercial Orchard – An orchard where production is on a large or industrial scale.

Corridor – The presence of one or more transmission lines located within easements or contiguous easements, or within close proximity of each other.

Distribution Under-Build – The presence of electric distribution lines located directly under and parallel with the transmission lines above, and attached to the same pole or structure.

Down Guy (guy wire) - Wire running from the attachment near the top of the pole to rod and anchor installed in the ground.

Easement (or Right of Way) – The as-built condition of a geographically described strip of land under a transmission line(s) upon which PG&E's electric transmission facilities are constructed, operated, and maintained. "Easement" refers specifically to the legal description of that corridor.

Even Ground – Where the elevation difference between two adjacent towers is less than 20 ft.

Hazard Trees

- **All lines:** Trees that are dead or show signs of disease, decay or ground or root disturbance, which could fall into or otherwise impact conductors, towers, or guy wires before the next inspection cycle.
- **NERC lines only:** In addition, trees within the easement with a likely potential to fail within the next two years (as assessed by the pre-inspector), which would pass within PG&E's Minimum Clearance Requirements.

Imminent Threat – A vegetation condition affecting NERC transmission lines where it has been identified and confirmed by PG&E personnel and/or contractors that the vegetation condition is likely to cause a fault at any moment. This condition could arise from within or outside the electric transmission right of way (ROW), and might be the result of tree growth, potential tree or limb failure, or line movement due to sag or sway.



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Light Detection and Ranging (LiDAR) – Technology used to determine vegetation conditions, particularly distances and clearances, in relation to the electric conductors and easement boundaries.

- **“As-Flown” LiDAR Data** – A snap shot of data that provides vegetation conditions, facility locations, span lengths, and conductor heights at the time of the LiDAR visual flight.

Low Lines – Transmission lines that are observed to be sagging below the Rule 37 MGCC distances.

Maximum Tree Height Allowed – MGCC minus the PG&E Minimum Clearance Requirement.

Minimum Vegetation Clearance Distance (MVCD): Minimum vegetation clearance distance required to prevent flash-over. However, prudent vegetation maintenance practices dictate that substantially greater distances will be achieved at time of vegetation maintenance.

Minimum Ground to Conductor Clearance (Rule 37 MGCC) – The closest the lines can get to the ground. MGCC can be determined by performing a ground-based engineering analysis, by using LiDAR data or based on clearances listed in General Order 95, Rule 37.

NERC-Regulated Transmission Lines (NERC lines) – Transmission lines operated at 200kV or higher and certain sub-200kV lines that are elements of a Major Western Electric Coordinating Council (WECC) Transfer Path.

Non-PG&E Owned Transmission Lines – Transmission lines connected to PG&E facilities.

Orchard – Any commercially-producing orchard; includes only trees that are part of the production crop.

Orchard Tree – Any commercial-producing fruit or nut tree that is part of the production crop.

Overhang – A tree and/or limb breaking the vertical plane of the outside conductor.

Professional Judgment – A process used to reach a well-reasoned conclusion that is based on the relevant facts and circumstances available at the time of the conclusion. A fundamental part of the process is the involvement of individuals with sufficient knowledge and experience. Professional judgment involves the identification, without bias, of reasonable alternatives; therefore, careful and objective consideration of information that might seem contradictory to a conclusion is key to its application.

Right-of-Way – See Easement.

Under-Build - The presence of distribution construction directly under and parallel with transmission construction.



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Wire Zone - For 60/70kV, the section of the corridor located between the outside conductors plus 10 ft. on each side. For 115kV and 230kV, the section of the corridor located between the outside conductors plus 15 ft. on each side. For 500kV, the section of the corridor located between the outside conductors plus 20 ft. on each side.

Zones – The geographic divisions within line spans: tower, quarter, and belly zones.

Implementation Responsibilities

The vegetation management team is responsible for the implementation, communication, and maintenance of this procedure and associated standard.

- The VM manager communicates this procedure to the VM stakeholders.
- The orchard VPM communicates this procedure to the operational work teams.

Governing Document

[TD-7103S, "Transmission Vegetation Management Standard \(TVMS\)"](#)

Compliance Requirement/ Regulatory Commitment

California Public Resource Code 4292

California Public Resource Code 4293

CAOSHA Requirements

[CPUC General Order \(G.O.\) 95 Rule 35](#)

North American Electric Reliability Corporation (NERC) Standards for Vegetation Management, [NERC FAC-003-4 Transmission Vegetation Management](#)

Reference Documents

[TD-7102P-14, "Project Management Database \(PMD\) Circuit and Line Verification Procedure"](#)

[TD-7103P-01, "Transmission Non-Orchard Routine Patrol Procedure \(TRPP\)"](#)

[TD-7103P-05, "Transmission Vegetation Management Imminent Threat Procedure"](#)

[TD-7103P-07, "Transmission Vegetation Refusal Procedure"](#)



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[TD-7103P-09, "T&D Vegetation Hazard Notification Procedure"](#)

[TD-7103P-09-F01, "VM T&D Hazard Notification and Imminent Threat Form"](#)

Appendices Appendix A, Clearance Prescription Tables
Appendix B, Engineering Charts for Blow-Out

Attachments NA

Document Rescission Transmission Routine Patrol Standard, Version 7, May 2011

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Revision Notes

Where?	What Changed?
Entire document	Edited; updated to meet Checklist requirements.
Summary section	Added reference to: North American Electric Reliability Corporation (NERC) Standards for Vegetation Management, NERC FAC-003-4 Transmission Vegetation Management.
Note under Table 1 in Appendix A.	Reference to FAC-003-3 updated to FAC-003-4 to match current version of Compliance Requirements document.
Definitions section	Added definition for MVCD.



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Where?	What Changed?
Compliance Requirements/Regulatory Commitment section	Updated link to the FAC-003-4 version: North American Electric Reliability Corporation (NERC) Standards for Vegetation Management, NERC FAC-003-4 Transmission Vegetation Management
Appendix A	Updated Table 2. NERC Minimum Vegetation Clearance Distance (MVCD) in Feet



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APPENDIX A, CLEARANCE PRESCRIPTION TABLES

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Table 1. PG&E Clearance Requirements

Voltage	60/70 kV	115 kV	230 kV	500 kV
PG&E Minimum Clearance Requirement ⁽¹⁾	4 ft	10 ft	10 ft	15 ft

Note: PG&E defined minimum clearance is designed to meet or exceed all applicable regulatory requirements at all times, including FAC-003-4.

Table 2. NERC Minimum Vegetation Clearance Distance (MVCD) in Feet

NERC Minimum Vegetation Clearance Distance (MVCD) in Feet				
Elevation (feet)	60/70 kV	115 kV	230 kV	500 kV
0 - 500	1.1	1.9	4	7
501 - 1000	1.1	1.9	4.1	7.1
1001 - 2000	1.1	1.9	4.2	7.2
2001 - 3000	1.2	2	4.3	7.4
3001 - 4000	1.2	2	4.3	7.5
4001 - 5000	1.2	2.1	4.4	7.6
5001 - 6000	1.2	2.1	4.5	7.8
6001 - 7000	1.3	2.2	4.6	7.9
7001 - 8000	1.3	2.2	4.7	8.1
8001 - 9000	1.3	2.3	4.8	8.2
9001 - 10000	1.4	2.3	4.9	8.3
10001 - 11000	1.4	2.4	5	8.5
11001 - 12000	1.4	2.5	5.1	8.6
12001 - 13000	1.5	2.5	5.2	8.8
13001 - 14000	1.6	2.6	5.3	8.9
14001 - 15000	1.6	2.7	5.4	9.1

Note: The maximum tree heights described in this procedure must always meet (or exceed) the NERC MVCD requirements described in this table.



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Table 3. PG&E Orchard Clearance Prescription Guidelines

<p>PG&E Clearance Prescription for Orchard Trees where topping is required AND LiDAR is Available</p>	<p>If modeled LiDAR data is available, use modeled data to determine the Minimum Ground to Conductor Clearance (MGCC) at each orchard zone along the span. The inspector must prescribe a final tree height (HFH =) based on the MGCC for each zone, and apply the PG&E minimum clearance requirement (Table 1) in Appendix A, Clearance Prescription Tables and an expected annual growth rate.</p>
<p>PG&E Clearance Prescription for Orchard Trees where topping is required AND LiDAR is not Available</p>	<p>The Maximum Tree Height Table (Table 5 in Appendix A, Clearance Prescription Tables) for Orchards must be used. This Table shows maximum tree heights for each orchard zone, and factors in PG&E's Minimum Clearance Requirements and the MGCC (Rule 37 for each transmission voltage type. The inspector must prescribe a final tree height (HFH =) based on the MGCC for each zone, and apply the PG&E minimum clearance requirement (Table 1) and an expected annual growth rate.</p> <p>For Non-NERC wood pole spans, or where difference between bells on towers, or base of towers is greater than 20 ft.), or for trees impacted by topographical exclusions, or for spans less than 600 ft. in length, prescribe tree work that starts with the current conductor location height and accounts for sag (and blow-out if applicable), plus PG&E minimum clearance requirement (see Table 1). The inspector must prescribe a final tree height (HFH =) including the expected annual growth rate.</p>
<p>PG&E Clearance Prescription for Orchard Trees where side/slope pruning is proper</p>	<p>For trees located outside of the vertical plane of the conductors, where topping is unnecessary, the inspector must use the blow-out guideline charts to determine tree work that requires slope/side pruning (see Appendix B, Engineering Charts for Blow-Out). Professional judgment must be used to determine side clearances required to obtain a minimum of 1 year's growth of clearance, plus the minimum PG&E clearance requirement. Table 1 in Appendix A, Clearance Prescription Tables must be used as a guideline.</p>

Table 4. Rule 37 "As Designed" Minimum Ground to Conductor Clearance

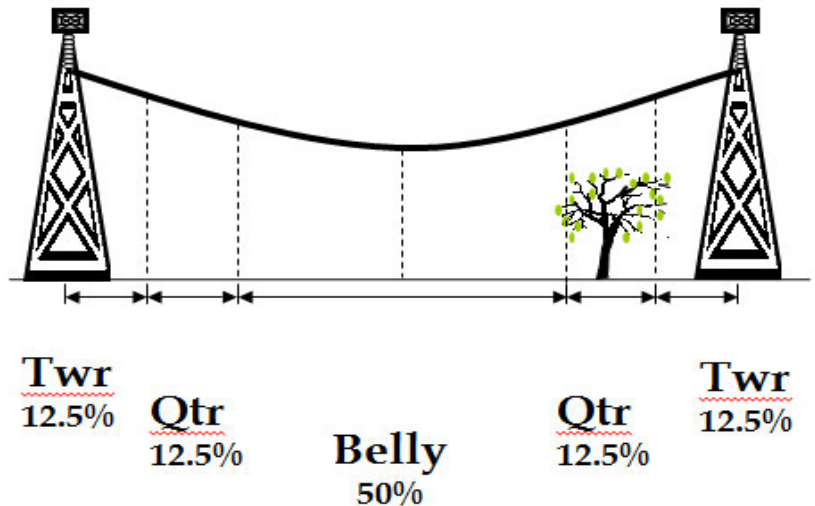
Voltage	60/70	115	230	500
Minimum Ground to Conductor Clearance	27 ft	27 ft	27 ft.	31.5 ft



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Table 5. Rule 37 “As-Designed” Maximum Tree Height Chart for Commercial Orchards Only

60/70 kV			
Wire height at tower	Belly	Qtr	Twr
30	23	24	25
40	23	26	30
50	23	29	36
60	23	31	41
70	23	33	47
80	23	36	52
90	23	38	58
100	23	41	63
115/230 kV			
Wire height at tower			
30	17	18	19
40	17	20	24
50	17	23	30
60	17	25	35
70	17	27	41
80	17	30	46
90	17	32	52
100	17	35	57
110	17	37	63
120	17	39	68
500 kV			
Wire height at tower			
40	16	18	21
50	16	21	26
60	16	23	32
70	16	25	37
80	16	28	43
90	16	30	47
100	16	32	54
110	16	35	59
120	16	37	65



Note:

When modeled LiDAR data or other engineering calculations are available to determine the MGCC of the line, apply those measurements to the maximum tree heights in the chart above by adding or subtracting the modeled MGCC from the Rule 37 MGCC and applying the difference to the maximum tree height. For example, Rule 37 MGCC for a 230kV is 27 ft. If modeled LiDAR data confirms that the actual MGCC of a span is 30 ft., then the difference is a positive 3 ft. (30-27=3). So for the quarter zone trees of a 230kV with an 80 ft. tower/wire connection, the new maximum tree height is 30'+3'=33'.



Transmission Orchard Patrol Procedure (TOPP)

Table 6. Estimating Sag⁽¹⁾⁽²⁾ and Blow-out

Span Length (feet)	600 ft	800 ft	1000 ft	1500 ft	2000 ft
Sag					
Quarter Span (feet)	0	9	11	12	13
Mid span (feet)	0	12	14	16	17
Blow-out					
Quarter Span (feet)	0	5	9	20	36
Mid span (feet)	0	7	12	27	48

Notes

- (1) Estimated sag distances assume ACSS conductors @ 109 °F air temperature and full loading. Under normal operating conditions, the wire is not expected to sag below the minimum ground-to-conductor clearance.
- (2) Estimated sag is 0 ft. for a tree directly located under the wire where it attaches to the tower.

Table 7. GO 95, Rule 35 Compliance Clearance Distance Chart

60/70 kV	115 kV	230 kV	500 kV
18"	2.58 ft	4.54 ft	12.91 ft



Transmission Orchard Patrol Procedure (TOPP)

APPENDIX B, ENGINEERING CHARTS FOR BLOW-OUT

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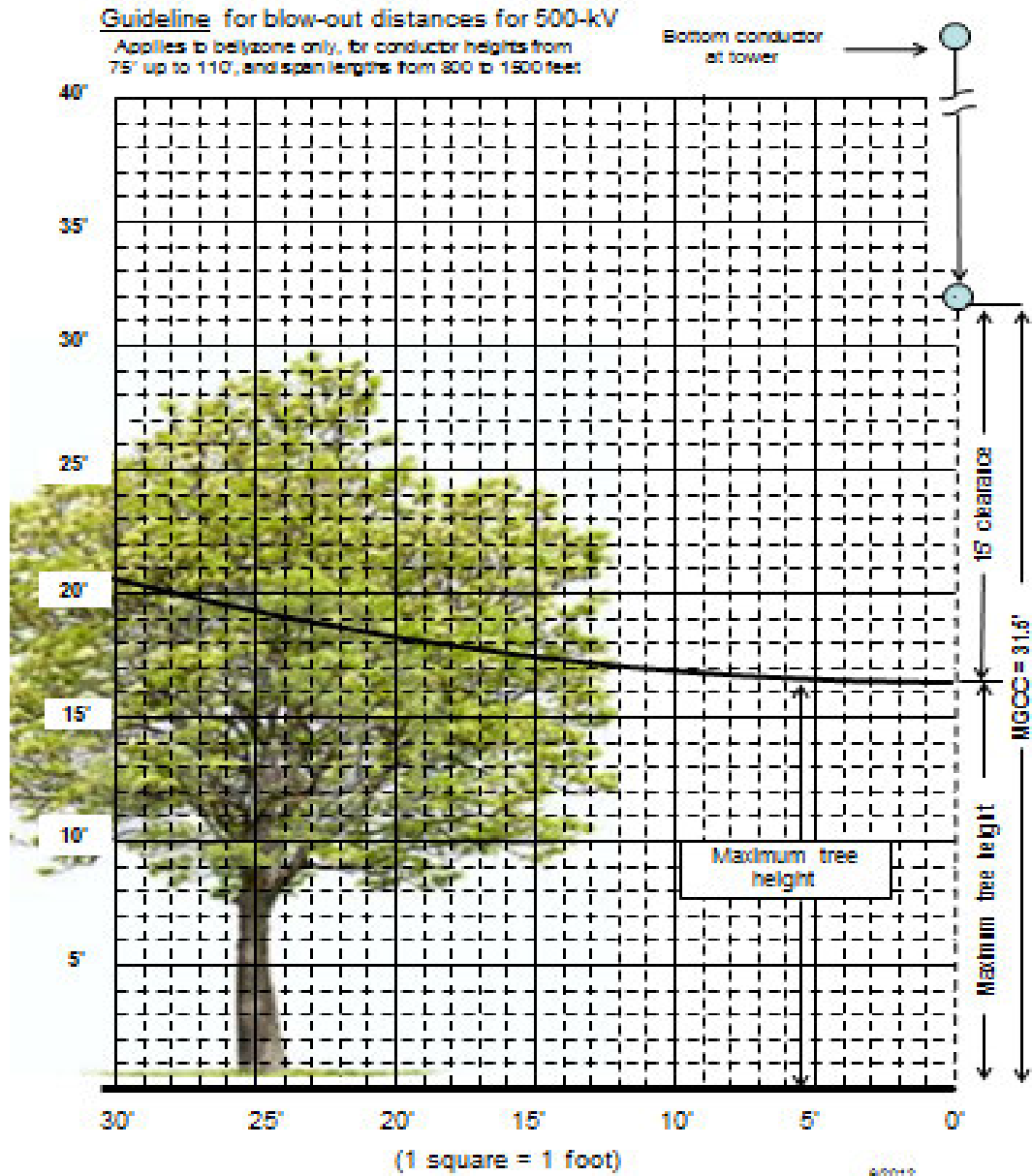


Figure 1. Engineering Chart: For Blow-Out Distances 500 kV



Transmission Orchard Patrol Procedure (TOPP)

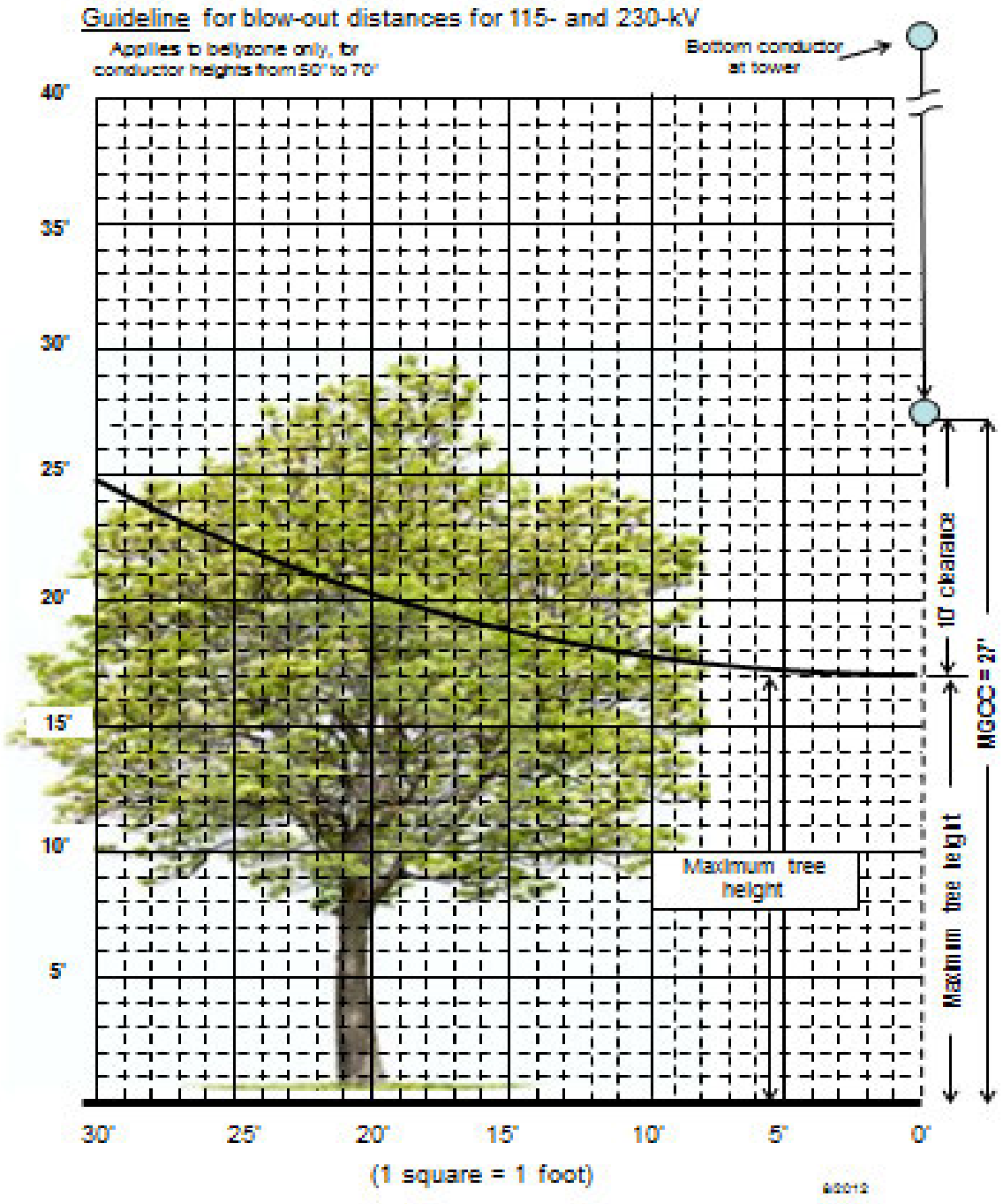


Figure 2. Engineering Chart: For Blow-Out Distances 115-230 kV (Conductor Height 50'-75')



Transmission Orchard Patrol Procedure (TOPP)

Guideline for blow-out distances for 115- and 230-kV

Applies to beltzone only, for conductor heights from 75' to 95'

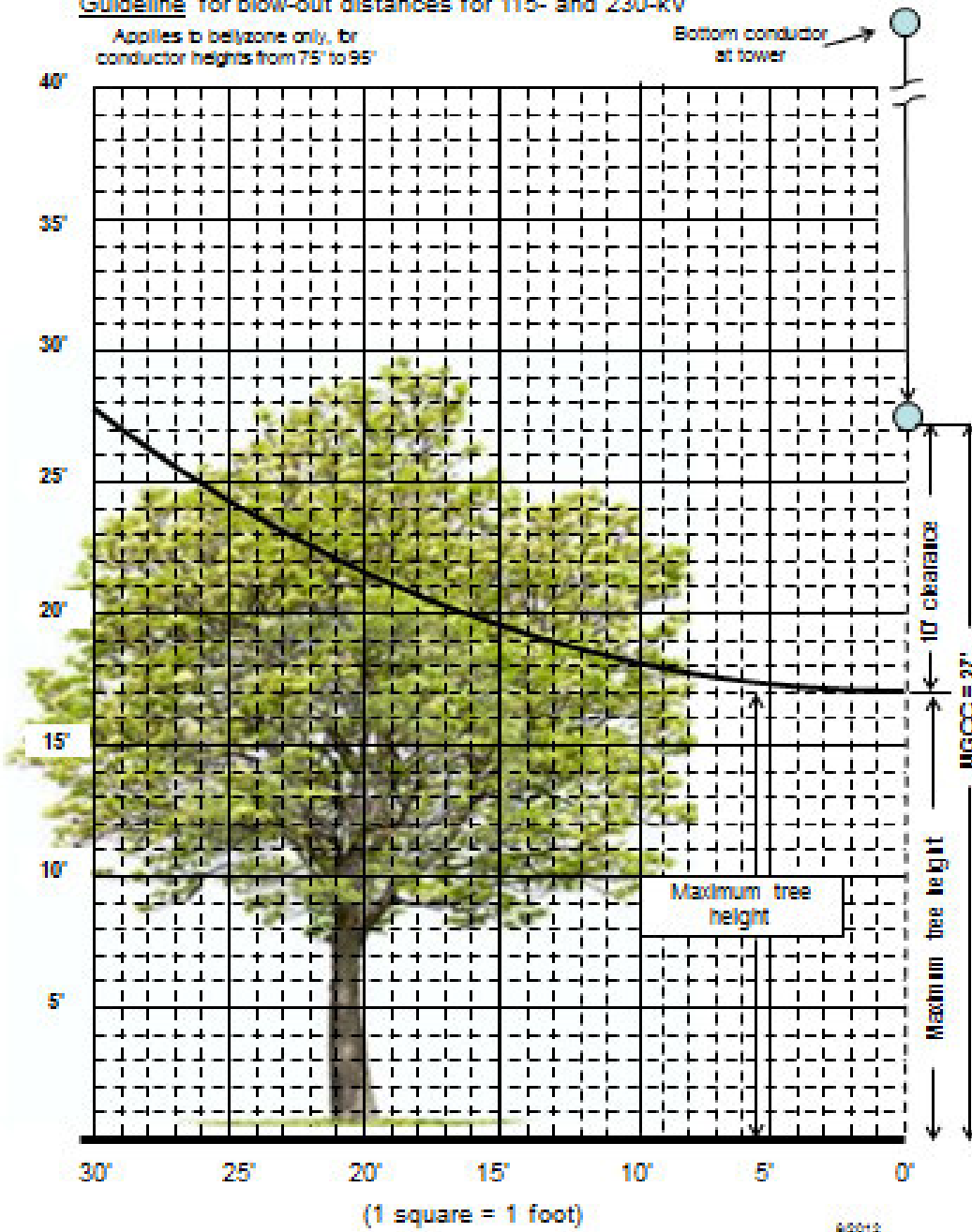


Figure 3. Engineering Chart: For Blow-Out Distances 115-230 kV (Conductor Height 75'-90')