


Liberty CalPeco	Legal, Regulatory, and Compliance	Transmission & Distribution Vegetation Management Program	Methodology	Doc. No.	VM-04	
				Version	1.0	
Effective Date		05/21/2021				
Supersedes		N/A				
Post Work Verification Procedure						

Post Work Verification Procedure VM-04



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1 Purpose

The purpose of this procedure is to define the Vegetation Management (VM) program oversight requirements used to provide reasonable assurance Liberty Utilities (Liberty) is meeting the applicable requirements pertaining to VM.

Liberty VM maintains and implements a robust scheduling process in order to meet mandated compliance inspection requirements, as applicable. Maintenance work (pre-inspection, pruning and removal) is performed by non-Liberty resources (contractors). The oversight recommended in this procedure is intended to provide several levels of defense-in-depth strategy in order to provide reasonable assurance that inspection and maintenance work is being effectively performed.


2 Applicability

- Transmission (60kV-120kV)
- Distribution
- Vegetation Management Program

3 Definitions

Refer to Liberty the VM Glossary of Terms for other capitalized terms used in this document.

- **Acceptable Quality Level (AQL)** – Is the maximum number of nonconforming products considered acceptable in a particular sample size based on business, financial and safety levels
- **Confidence Level (CL)** – The confidence level is the amount of uncertainty you can tolerate. The higher the CL, the more certain you are of the results. With a CL of 95%, you would expect an error one in 20 times. With a CL of 99%, you would expect an error one in 100 times.
- **Judgmental Sampling** – is a type of nonrandom sample that is selected based on the opinion of an expert. Results obtained from a judgment sample are subject to some degree of bias, due to the frame and population not being identical.
- **Margin of Error (MoE)** – The margin of error is the amount of error that you can tolerate.
- **Population Size** – The total number of items (equipment/assets/people) from which to choose a sample.
- **Quality Control (QC)** – Typically verifies a product by testing a sample of the product against a specification, standards, or other criteria. Quality control measures are aimed at checking, measuring, or inspecting a sample of one or more product characteristics and evaluating the results against requirements to confirm compliance.

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- **Quality Assurance (QA)** – Typically assesses a process through analysis of objective evidence that supports the program or process for adherence and/or compliance with specific requirements.
- **Reasonable Assurance** – A high, but not absolute, level of assurance.
- **Sample Size** – This is the minimum recommended size for sampling.

4 Detail

4.1 Personnel Qualifications

Associates degree or higher in urban forestry, forestry, botany, ecology, biology, conservation, environmental science, horticulture or comparable area. ISA Certified Arborist with a minimum of three years of experience in Utility Arboriculture. Additional credentials such as ISA Certified Utility Specialist and Tree Risk Assessment Qualification are preferred. Work experience in exchange for education may fulfill the minimum qualifications for this position at the discretion of the Liberty Manager of Vegetation Management.

4.2 Sampling Methodology

QC inspections for VM are based on judgmental sampling and not 100% inspection. Judgment is used to prioritize QC resource allocation based on risk. The intent of QC inspections is to provide reasonable assurance that high quality work is being performed and meeting program requirements.

The sampling performed for Liberty’s VM program will identify nonconforming conditions for those items subject to QC inspection.

4.3 Sample Size for Inspection Priority

Table 1 below apply CL and MoE to Inspection Priority and provides recommended sampling mileage. Liberty will use a sample size of approximately 31.4% of completed tree work on all lines. Liberty will also use a sample size of approximately 31.4% of completed detailed pre-inspections on all lines. For Hazard Tree mitigation, 21% inspection is performed of completed work. For Pole Brushing, 12% inspection is performed of completed work.

The QC sampling mileage in Table 1 may be adjusted yearly (higher or lower) to address program improvements/concerns. Changes in the sampling mileage will be identified in the annual Quality Control Inspection Plan (Section 4.8) and may also result in revisions to this document.


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Table 1: Sample Size (percentage) and Units

Work Type	Category	Annual Circuit Miles	Annual Hazard Trees ¹	Annual Poles	Statistical Sampling ²		
					CL/MoE	%	Units
Completed Tree Work ^{3 4}	T and D	742	-	-	99/7	31.4	233 Miles
Detailed Pre-Inspection ⁵	T and D	247	-	-	N/A	31.4	78 Miles
Hazard Tree Work ⁶	T and D	-	2,500	-	99/5	21	524 Trees
Pole Brushing ⁷	T and D	-	-	4,859	99/5	12	584 Poles

Note: Circuit mileage sampled should take into consideration density of vegetation.

4.4 Acceptable Quality Level and Conformance Rate

To provide measurement of performance and facilitate trending, the results of post work verifications and quality control inspections are communicated using an Acceptable Quality Level (AQL) and Conformance Rate (CR).

- An AQL is recommended by VM management and agreed upon by the assessed contractor's management
- The CR is used to assess whether performance is meeting or is below the established AQL
- The CR is determined by the number of nonconforming assets (trees) identified within the circuit mile population compared to the number of assets inspected. An example of how the CR is determined is provided below:
 - If 100 assets are inspected in one month and 19 assets are found nonconforming, the CR is 81%. If the AQL for acceptable performance is

¹ This is an approximate number that could vary significantly from year to year

² See Appendix A for underlying calculations


³ Completed tree work resulting from annual LiDAR inspections and 3-year cycle Detailed Pre-Inspections

⁴ See Paragraph 4.7.1

⁵ See Paragraph 4.7.2

⁶ See Paragraph 4.7.3

⁷ See Paragraph 4.7.4

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determined to be 95% CR, then a CR of 81% falls short of the performance expectation by 14%.

Note: Sufficient time is required to establish program maturity that meets VM program expectations. Therefore, establishment of the AQL, scoring criteria and performance trending will occur after sufficient time has passed to allow the program to mature. Typically, maturity should be achieved approximately 12 months after implementation.

4.5 Defense In Depth Oversight Strategy

VM work primarily consists of: (1) Pre-inspection; (2) Line clearing (pruning and removal); (3) Hazard Tree Mitigation; and (4) Pole Brushing. To provide reasonable assurance the Liberty VM program is functioning at a high level of compliance, Liberty is implementing a two tiered oversight strategy intended to ensure a robust program built on defense-in-depth oversight. The two levels of oversight are as follows:

- Post Work Verification
- Quality Control Inspections

Post Work Verifications are performed by Liberty System Arborists and are the initial reviews performed to validate documentation and field work accuracy. Volume of documentation review and field work is recommended in Section 4.6.


Quality Control Inspections are performed by appropriately trained and qualified internal or external entities whose function, and organizational reporting is independent to the VM organization. Quality Control Inspections are performed using judgmental sampling with emphasis on an assigned inspection priority level, and are intended to provide reasonable assurance of compliance. Details are provided in Section 4.7.

4.6 Post Work Verifications – Performed by Liberty

4.6.1 Post Work Documentation Review – Desktop Review

Post Work Documentation Review is performed as follows:

- 100% of submitted work is reviewed for accuracy
- After satisfactory review, the work process is approved in Liberty’s work management system
 - Errors identified through the review process, are communicated to the responsible work crew foreman, as applicable
 - Documentation errors are corrected

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4.6.2 Post Work Validation – Field Review

Post Work Field Validation is performed as follows:

- As part of their day to day duties, Liberty System Arborists review field work for adherence to work specifications. Any work that is determined to be unsatisfactory is reported to the contractor to be corrected.
- Review criteria includes but is not limited to the following:
 - Ensure Maintenance Clearance Distance (MCD) was achieved or work was completed as otherwise described in prescription
 - Slash and debris removal was satisfactory as required by Liberty’s specification and applicable regulations
 - Complete and accurate inventory (e.g., species, location, other attributes as needed)
 - Pruning was completed per ANSI standard
- After satisfactory review, the work process is approved in the Liberty’s work management system
 - Errors identified through the field validation/review process, are communicated to the responsible work crew foreman, as applicable
 - Inadequate MCD is remediated and objective evidence to support remediation is provided to the System Arborist, or the System Arborist must field validate compliance

If training provided to the pre-inspection contractors and/or feedback provided after a System Arborist review fails to yield satisfactory performance, additional controls will be added to the process to correct performance deficiencies.


4.6.3 Post QC Work Validation – Field Review

A Post QC Field Validation is performed on an as needed basis to confirm contractor QC inspections are being performed as described in Paragraph 4.7.

4.7 Quality Control Inspections – Performed by QC Inspection Contractor

4.7.1 Tree Pruning and Removal

- All transmission and distribution circuits shall be inspected as follows:
 - 31.4% of actual circuit length (see Table 1)
 - If significant inspection criteria violations are identified, the QC inspector (or their representative) must provide timely notification to the applicable Liberty System Arborist and VM Coordinator for potential scope expansion, feedback to contractor, or other action deemed appropriate

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- Next annual inspection should not encompass the same circuit mileage sample
- QC inspection criteria includes but is not limited to the following:
 - Ensure MCD was achieved or work was completed as otherwise described in the work prescription
 - Slash and debris removal was satisfactory as required by Liberty’s specification and applicable regulations
 - Complete and accurate inventory (e.g., species, location, all other attributes as required)
 - Pruning was completed per ANSI standard
- Inadequate MCD shall require rework by the contractor

4.7.2 Detailed Pre-inspection

- All pre-inspected work shall be reviewed as follows:
 - 31.4% of actual circuit length (see Table 1)
 - Next annual inspection should not encompass the same circuit mileage sample
- QC inspection criteria includes but is not limited to the following:
 - Site location and access information are documented and accurate
 - Complete and accurate inventory (e.g., species, all other attributes as required)
 - Appropriate Work Categories are assigned for Pruning, Removal, and Facility Protect (see Paragraph ‘a’ below)
 - Permission is secured, as required
 - Ensure Maintenance Clearance Distance (MCD) was prescribed
 - If unable to secure MCD prescription, a description of why (e.g., tree structure, past pruning practices, property owner request, etc.) is provided along with a description of what clearances are to be obtained
 - Description of slash and debris handling was provided

4.7.3 Hazard Trees

- For the purpose of selecting a sample, the population of Hazard Trees is comprised of trees that have been removed with a “High” or “Imminent” Probability of failure rating in the tree inspection record.
- All hazard tree work shall be inspected as follows:
 - 21% of completed work (see Table 1)
- Hazard Trees will be inspected for the following criteria:

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- Prescription was completed (i.e., monitor, facility protect, remove)
- Slash and debris removal was satisfactory as required by Liberty’s specification and applicable regulations
- Mitigation did not adversely impact other trees (e.g., adjacent trees exposed to windthrow, etc.)
- Site conditions are stable after the completion of work

4.7.4 Pole Brushing

- All pole brushing work shall be inspected as follows:
 - 12% of poles with non-exempt equipment (see Table 1)
 - If significant inspection criteria violations are identified, the QC inspector (or their representative) must provide timely notification to the applicable Liberty System Arborist and VM Coordinator for potential scope expansion, feedback to contractor, or other action deemed appropriate
- Next annual inspection should not encompass the same pole sample
- Poles that require brushing (Subject Poles) will be inspected for the following criteria:
 - Work was completed as required by Public Resource Code (PRC) 4292
 - Slash and debris removal was satisfactory as required by Liberty’s specification and applicable regulations
 - ANSI standard was met if pruning was required

4.7.5 QC Planning, Inspection and Reporting

- The VM Manager is responsible for selecting the circuit mileage to be inspected
- QC inspection packages are provided to the QC inspection contractor by the System Arborist the month prior to the planned QC inspection
- QC inspections shall be performed within 60 days of work completion
- QC inspection reports shall be provided to the VM Manager and responsible System Arborist for review in a timely manner and not to exceed 30 days after the QC work was assigned
 - If significant conditions are identified that require immediate attention, the QC contractor shall notify the applicable System Arborist of such conditions prior to issuing the subsequent report
 - Noted deficiencies are remediated
 - Performance feedback is provided to the appropriate contractor
 - Reworked conditions are verified for completion

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- QC inspection reports are filed in the West General X:Vegetation Management Folder

4.7.6 Inventory Reconciliation

If issues are identified with inventory, the issues shall be reconciled and appropriate records updated in the inventory system of records.

4.8 Annual Quality Control Inspection Plan


An annual QC inspection plan is required to identify the planned QC inspections that will be performed during the calendar year.

Scope identified in the QC plan may be adjusted to account for any unforeseen schedule issues as long as the minimum sampling volume is maintained.

The plan should be developed in the 4th quarter of the year preceding the inspection year.

The plan shall be approved by the VM Manager.

5 Approvals


Program Manager	Signature	Date
Peter Stoltman		05/21/2021


6 Revision History

Version No.	Revision Date	Revised By	Description of Revisions
1.0	05/21/2021	Peter Stoltman	Initial release for VM Program

7 Distribution and Data Retention


The official version of the document shall be stored in the Vegetation Management Program Document Library in the West General (X:) Vegetation Management Folder while in effect and retained for at least seven (7) years thereafter.

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Distribution:

- Wildfire Sr. Manager
- VM Manager
- VM Coordinator
- System Arborist

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Appendix A

Sample Size Calculation Example

Common Confidence Levels:

CL	Z-Score
99%	2.576
95%	1.96
90%	1.645

Standard Deviation (Std Dev): *Remains Constant*

Margin of Error (MoE): *Can Vary 1-10%*

Population Size:

Sample - Underlying Calculations:

$$\text{Sample Size} = \frac{[Z\text{-Score}^2 \times \text{Standard Deviation} \times (1 - \text{Standard Deviation}) / \text{Margin of Error}^2]}{[(Z\text{-Score}^2 \times \text{Standard Deviation} \times (1 - \text{Standard Deviation}) / \text{Margin of Error}^2 \times \text{Population Size}) + 1]}$$

$$\text{Sample Size} = [2.576^2 \times 0.5 \times (1 - 0.5) / 0.05^2] / [(2.576^2 \times 0.5 \times (1 - 0.5) / 0.05^2 \times 2500) + 1]$$

$$\text{Sample Size} = 663.578 / 1.2654$$

Sample Size =