

AEP Forestry

Goals, Procedures & Guidelines for Distribution and Transmission Line Clearance Operations

May 14, 2009

Goals, Procedures & Guidelines for Distribution and Transmission Line Clearance

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AEP System Forestry Guidelines

Foreword

A. Introduction

The purpose of these AEP Forestry Guidelines is to document and inform AEP employees and its contractors of important criteria, practices and procedures pertaining to initial vegetation clearing for construction projects and the maintenance of rights of way. AEP incorporates these guidelines into each tree service contract; a copy shall be kept in all vegetation management contractor's vehicles. These guidelines are for the sole and exclusive use of the contractor and are to be read consistently with other contract documents by and between AEP and the Contractor.

B. Definitions

Brush: Woody stem vegetation less than four (4) inches DBH.

Clearing: The physical cutting and/or removal of woody stem vegetation within the right of way.

DBH: (Diameter at Breast Height). The diameter of a tree measured at the height of 4-1/2 feet above the ground on the uphill side.

Danger Tree: A tree considered a potential hazard to AEP's facilities positioned outside of the normally cleared right-of-way.

Debris: Non-vegetative material such as pop bottles, cans, wire, paper and old tires.

Directional Pruning: The reduction of a tree's crown in a manner that provides increased conductor clearance by pruning to direct growth of the upper crown away from the conductors.

Fallen Tree: A tree lying on the ground not cut by the Contractor.

Hanger: A limb cut from a parent stem or bole of a tree as part of the line clearance pruning procedure left aloft caught and held by the other branches of the tree.

Hazard Tree: A tree considered a potential threat to the safety and reliability of AEP's facilities growing within the normally maintained right-of-way.

Log: The merchantable portion of a tree as designated by AEP.

Lopping: The cutting of limbs and slash so that they lie in contact with the ground or as otherwise designated by AEP.

Mowing: The mechanical cutting of woody stem vegetation within the right-of-way.

Prescription: The plan prepared for each circuit or unit of work. It designates the vegetation to be maintained, the method(s) of maintenance, and who will perform the work.

Removal: The complete cutting down of trees at or near the ground line. AEP shall specify the disposal method.

Slash: The un-merchantable portion of a tree as designated by AEP.

Tree: Woody stem vegetation greater than four (4) inches DBH.

I. Contractor Guidelines

A. Safety

1. Protecting the safety of the public is of utmost importance to AEP. Contractors shall regard safety as their first priority. Contractors and their employees will recognize and follow all laws, rules and regulations regarding public and worker safety. Any safety related incidents (e.g., personal injury, vehicle accident, outages, flashes, near miss, customer issues, etc.) that occur on the job must be reported to the appropriate AEP personnel as soon as possible.
2. All contact incidents outages or operations caused by contract crews shall be reported to the appropriate AEP Dispatch center and Forestry immediately.

B. Personnel

1. If required by state or local laws and regulations the contractor shall have an ISA Certified Arborist available.
2. No private work may be solicited or worked by Contractor employees while on AEP time. Contractors shall not receive compensation from anyone except AEP for tree work that is a part of AEP's Forestry program. The consequences will be crew and/or contractor disciplinary action.

C. Equipment

1. Contractors shall provide sufficient equipment in working order to operate their business.
2. The minimum number of chain saws on the job shall equal the number of personnel on the crew, or as per contract agreement. Chainsaws shall not be billed separately unless approved by AEP Forestry personnel.
3. Each climber shall be provided with a complete set of equipment including: rope, saddle, chainsaw, pruner and handsaw. Each tree crew shall be properly equipped so that, if necessary, a tree rescue can be performed.

The use of spurs/climbers/hooks should be avoided. Where their use is necessary (as in the removal of some trees or in climbing trees, which do not provide a notch in which to tie in) only qualified persons shall be permitted to use them.

D. Overtime

Overtime is billable for work performed outside the scope of the normal work schedule.

E.. Work Procedures

1. Contractor practices shall be compliance with applicable industry standards (e.g., ANSI, OSHA, NESC) whenever practical unless the use of such standards increases the risk of injury or property damage.
2. Changes in the workweek due to inclement weather, equipment breakdowns or other circumstances must have prior approval by AEP Forestry personnel.
3. The contractor will be responsible for the development of a plan to complete the assigned tasks. The assigned tasks must be performed in a systematic way that follows this plan. Some examples are: beginning work at substations, working between protection devices, or other methods to prevent inefficiency and/or skipped work. The plan must meet AEP approval before work begins.
4. It is the Contractor's responsibility to ensure that the plan is followed, including time estimates to complete the assigned tasks.
5. Contractor shall provide daily work locations to AEP, including changes to these locations throughout the workday.
6. Each crew shall have a planned worksheet at all times, except in the case of emergency work.
7. The Contractor's daily association with their crews and customers will allow planned outages and refusals to be worked on a progressive basis. A written list of such areas that have not been worked, including reasons, shall be supplied to AEP Forestry personnel. Undocumented skips may be worked at the Contractor's expense.
8. Contractor's work shall be inspected on an ongoing basis. When an assigned task is complete, the Contractor must notify AEP Forestry for final inspection.
9. The Contractor will notify AEP of any hazardous conditions found during the performance of work under this contract. This is to include danger trees, soil erosion, and any attachment to AEP's facilities,

deteriorated, damaged or broken facilities and any other abnormal conditions.

F. Public Relations

Public relations are important to AEP. Proper notification can eliminate most property owner issues before they arise. Advanced notification provides the property owner/resident with an opportunity to voice concerns.

1. Where required, an attempt will be made to contact property owners through personal notification, door hangers, news releases, letters, etc. AEP will attempt to contact an absentee landowner only if the landowner provides AEP with a method to contact the landowner.
2. During emergency work, Contractor will attempt to notify the property owner/resident of the crew's arrival. Discretion should be used during late night or early morning work. If no personal contact is made, a door card may be left to explain the emergency work performed.
3. Contractor will document all locations where door cards were left, including address and date. A monitored local or toll-free telephone number to reach the contractor should be on each card.

G. Refusals

1. A "refusal" is considered any property owner/resident refusing to allow or permit the contractor to manage vegetation as specified within the scope of, and according to, these guidelines and all applicable specifications, permits and easements.
2. The contractor shall fill out a refusal/complaint form with all pertinent information for all refusals.
3. If the contractor is unable to resolve the refusal within one week, the refusal shall be turned over to the appropriate AEP Forester.
4. Undocumented refusals or those left unaddressed for more than one week by the contractor may be worked at the Contractor's expense.

H. Damage Claims and Complaints

1. The contractor shall be responsible for all damage claims and complaints due to its negligence. AEP shall be notified immediately of all claims and complaints.
2. An on-site investigation with the resident/ property owner shall be made as soon as possible. This meeting, or telephone arrangements for the investigation, shall be made within twenty-four (24) hours of receipt of the complaint. AEP's representative may accompany the Contractor during this initial investigation.
3. All valid claims resulting from the Contractor's negligence shall be settled within thirty (30) days by the Contractor, or the Contractor shall provide evidence he is trying to reach a reasonable settlement.
4. The Contractor shall keep AEP informed of the status of all complaints. When a settlement is reached, a written release for both AEP and the Contractor shall be obtained from the property owner/resident.
5. If a settlement cannot be reached, the Contractor shall confirm in writing to AEP the final settlement offer and briefly summarize events pertaining to the offer.
6. After thirty (30) days, if a Contractor fails to resolve a claim, does not continue attempts to resolve the claim or keep AEP fully informed, AEP may settle the claim and bill the Contractor.
7. Costs to restore outages or repair the Owner's facilities due to negligence may be billed to Contractor as determined by AEP Forestry.

II. Performance Guidelines

A. Removals

1. Stumps shall be flush cut (three (3) inch maximum height) and treated with an approved herbicide, unless designated otherwise by AEP Forestry.
2. Tree removal shall be completed in one operation. If this is not practical, hazardous conditions shall not be left while the work is not actively in progress. Trees shall be removed in a manner to protect yards, fences, houses, electric lines and other facilities.

3. Targets for removal are:

- All trees with the potential of growing into the conductors.
- Trees where adequate clearance cannot be obtained using proper pruning practices.
- Trees that will take less than three times the amount of time to remove as they would take to prune.
- Trees within five (5) feet of poles.
- Mature trees where more than 50% of the crown must be removed to obtain clearance.
- Young vigorously growing trees where more than 66% of the crown must be removed to obtain clearance.
- Palm species.

4. Trees that may be less suitable candidates for removal are:

- Those that would take more than three times longer to remove than to prune for proper clearance and at least 50% of the crown would be left intact.
- Species that will not reach a height that would affect the conductors.
- Slow-growing tree species.

5. Deciduous stumps shall be flush cut (three (3) in. maximum height) and shall be treated with an appropriate herbicide to prevent re-growth unless the situation prevents application according to label instructions, there is a documented customer refusal or an AEP forester directs otherwise.

6. At the request of the property owner/resident diseased, dying, or dead trees which could threaten AEP facilities will be "made safe", allowing for removal by the customer or private arborist. Generally, all brush and wood generated by this activity should be left on site, unless otherwise directed by AEP Forestry.

B. Pruning

1. Contractor practices should be compliance with all applicable industry standards (i.e., ANSI, OSHA, NESC) whenever practical unless the use of such standards increases the risk of injury or property damage.
2. Pruning shall be done in a manner that protects current tree health and with regard for future growth and development.
3. Pruning shall provide at least the minimum specified clearance from electrical conductors as set forth in Tables I and II.

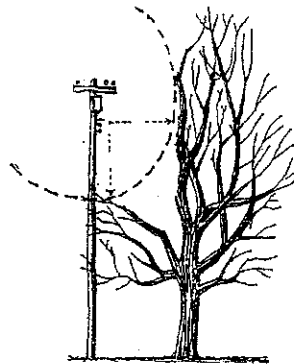
4. Reasonable care should be exercised to prevent the spreading of insects or diseases from one tree to another.
5. Portions of wild cherry, black walnut and other vegetation toxic to livestock (i.e., wilted leaf material) that has been pruned, cut or damaged by the contractor's activities, should be removed from active pasture areas accessible to livestock, unless agreed to by the property owner.

C. Clearances - Distribution

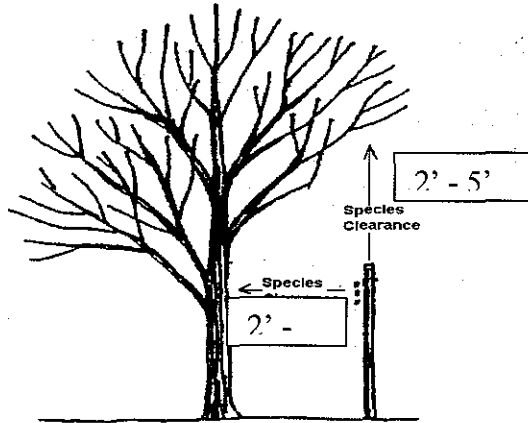
Variances to this recommendation may be necessary and applied due to specific operating company guidelines or specific restrictions in permits and/ or easements.

Minimum clearance for distribution system lines is that distance that will prevent re-growth into any AEP conductors for a minimum of three (3) years (see Table I in the appendix). The species, site, limb and conductor sag and sway during windy conditions and the effect of electrical load should all be considered when determining the clearance requirement.

1. Primary Conductors- Limbs should be pruned for a minimum of three (3) years clearance. Overhanging limbs should be removed. Top of tree should be directionally pruned unless prior arrangements have been made with the appropriate AEP Forestry representative.



2. Open Wire Secondary Conductors- Limbs should be pruned for two (2) to five (5) feet of clearance without removing overhanging branches unless otherwise specified by an AEP Forestry representative.



3. Twisted, Cabled Secondary, Service Drops or Street Light Conductors -

Trees near twisted or cabled secondary service drops and street light wires will not be pruned unless limbs are applying pressure to the line. Do not prune for street light illumination except under the specific direction of the appropriate AEP Forestry representative.

4. Span Guy Wires – Trees near span guys should only be pruned of heavy limbs applying pressure on the wires.

5. Poles and down guys - All poles and down guys will be cleared of all volunteer trees, brush, and slash to obtain a minimum of a five (5) foot radius of clearance around the pole or guy.

6. Vines - Should be cut, but not removed from AEP or other facilities, and treated with an herbicide to prevent re-growth. Pulling / removing vines may damage equipment and endanger the employee.

D. Clearances - Transmission

The ultimate goal of vegetation maintenance is to provide for the safe, reliable operation of the AEP transmission system. When performing maintenance, the objective for locations on spans with less than 100' vertical clearance at maximum sag from conductor to ground is removal of all woody-stemmed vegetation to the appropriate width, leaving the cleared area of the right of way populated with grasses and herbaceous growth. Under certain circumstances (unique topographic and/or environmentally sensitive conditions), AEP may allow compatible, low-growing species to remain in the right of way. In maintained areas (mowed yards, lawns and public areas), trees deemed compatible with safe operation of the line may remain, although AEP strongly discourages this practice. Compatible species will be limited to those that grow no

more than 15' tall or actively maintained trees that could be considered a crop such as in nurseries or orchards.

Clearance Table Guidelines

Right of Way No Restrictions	Right of Way with Restrictions
< 100' Vertical Clearance between Conductors at Maximum Sag and Ground	< 100' Vertical Clearance between Conductors at Maximum Sag and Ground
1) Remove All Woody Stemmed Vegetation *	1) Trim or Remove Vegetation to Meet Column C *
2) Do Not Allow Vegetation Closer than Column E	2) Do Not Allow Vegetation Closer than Column E
3) Trigger Distance to Schedule Maintenance per Column D	3) Trigger Distance to Schedule Maintenance per Column D
> 100' Vertical Clearance between Conductors at Maximum Sag and Ground	> 100' Vertical Clearance between Conductors at Maximum Sag and Ground
1) Trim or Remove Vegetation to meet Column B *	1) Trim or Remove Vegetation to Meet Column C *
2) Do Not Allow Vegetation Closer than Column E	2) Do Not Allow Vegetation Closer than Column E
3) Trigger Distance to Schedule Maintenance per Column D	3) Trigger Distance to Schedule Maintenance per Column D

* Upon Completion

1. Restrictions - When removal of all woody-stemmed vegetation is not achievable (i.e. there are restrictions), AEP will endeavor to cut or trim so that upon completion of the work no vegetation will be closer to conductors at maximum sag than the distances outlined in -Columns A and C. Distances are based on completed work meeting or exceeding the minimum approach distances to energized conductors for persons *other than qualified* line-clearance arborists and qualified line-clearance arborist trainees (Columns A and C).

2. Minimum Approach - Additional maintenance should be scheduled when vegetation will encroach within the minimum approach distances from energized conductors for *qualified* line-clearance arborists and qualified line-clearance arborist trainees (Columns A and D). In areas where easement or other legal agreements, or regulations restrict vegetation management practices, the maximum allowable amount of vegetation will be removed or otherwise controlled. AEP will annually monitor locations where these clearances cannot be achieved. The monitoring will determine whether maintenance that is more frequent may be required in order to assure the safe, reliable operation of the circuit.

E. Hangers and Clean Up

1. All hangers should be removed from the pruned tree before leaving the job site.

2. Work sites shall be left in a neat and orderly condition.
3. A minimum amount of clean up work should be performed, especially when a property owner requests a tree be removed. Unless otherwise designated by AEP Forestry, wood shall not be cut up or hauled away. Where designated by AEP Forestry, chipping the brush, cutting wood into lengths that can be handled and raking the site is the maximum clean up that should be performed.
4. All streams and/or drainage ditches shall be kept free of any limbs or woody debris cut by the contractor. Any cut debris that inadvertently falls into such an area, or any debris left in an area that may be prone to regular flooding, shall be moved/removed in an appropriate manner (chipped, stacked on top of ditch bank, etc.)

F. Clearing and Re-clearing

1. AEP Forestry will provide the width of the right-of-way.
2. All woody plants that have the potential to grow into the lines should be controlled, either by removal, herbicide treatment or a combination of both. On distribution lines and areas approved by Transmission Forestry on transmission lines those woody plants within the right-of-way that at mature size normally would not threaten lines or interfere with access to AEP's facilities, should be left undisturbed in the right-of-way whenever possible. Variances to this recommendation may be applied due to specific operating company guidelines.
3. During scheduled maintenance operations, prune or remove any vegetation within the rights-of-way of station entrances or exits that may affect the safe operation of AEP facilities, including station fences and equipment.
4. During scheduled maintenance operations, any vegetation adjacent to station facilities that may affect the safe operation of those facilities should be brought to the attention of the appropriate AEP personnel.
5. Trees, brush, and existing stumps within the right-of-way shall be cut as close to the ground as practicable, but not to exceed three (3) inches in height above the ground line. Where possible, the cut shall be parallel to the slope and promptly treated with an approved herbicide, unless otherwise directed by AEP Forestry.
6. Trees shall be felled to avoid damage to crops, fences and other facilities. Any trees felled into crops, ditches, streams, roads or

across fences shall be promptly removed. No trees shall be felled in such a manner as to endanger AEP's facilities or the property of third parties, or hinder access along the right-of-way.

7. Tree, brush and slash shall be lopped as designated by AEP Forestry.
8. Danger trees are identified and addressed / worked at the discretion of the individual operating companies or regions. Consideration for danger tree removal shall be made for those trees that are an imminent hazard or threat to AEP facilities. Danger trees may include, but are not limited to, trees that have severe lean or sweep, are dead, or have visible defect or damage. When cut, danger trees shall be cut as low as possible.
8. Stumps of trees growing in fences may be cut at fence post height, as approved by AEP Forestry.
9. Logs may be left in tree lengths or as designated by AEP Forestry. If so designated, the merchantable value of logs shall be preserved as much as practical.
10. In remote areas, brush and logs may be piled at the edge of the right-of-way for wildlife habitat.
11. Brush should not be left in managed agricultural areas or other maintained areas unless designated by AEP Forestry.

G. Herbicide Applications

1. All woody plants that have the potential of growing into the lines, should be controlled. Those woody plants within the right-of-way that at mature size normally would not threaten lines or interfere with access to AEP's facilities should be left untreated in the right-of-way whenever practical.
2. Contractors are required to maintain accurate and up to date records of all herbicide applications made and are required to abide by all Federal, State, and local laws concerning licensing, record keeping, and product handling.
3. Contractors shall attain 100% coverage and 95% control of treated vegetation.
4. AEP Forestry will make vegetation management prescriptions in consultation with contractors.

5. Where required, landowners should be notified before any herbicide treatments occur. There are several acceptable methods of notification such as personal contact, letter, or door hanger.
6. Managers of public rights-of-way involved in the treatment area shall be notified, where appropriate.
7. Contractor shall be responsible for training of herbicide applicators.
8. Unless specifically prohibited by property owners or AEP Forestry, stumps should be treated with an appropriate herbicide treatment.

H. Tree Growth Regulator Application

1. Trees designated for tree growth regulation shall be treated with an approved tree growth regulator (TGR) in accordance with label instructions.
2. All trees shall be inspected by the Contractor for health and vigor prior to treatment. Trees found in an excessive state of decline shall not be treated unless directed by AEP Forestry.
3. As designated by AEP Forestry, landowners should be notified before any TGR treatments occur. There are several acceptable methods of notification such as personal contact, letter, or door hanger.

Goals, Procedures & Guidelines for Distribution and Transmission Line Clearance

APPENDIX I

Distribution Line Clearance Guidelines

These growth rates and clearance distances are guidelines for the minimum clearances required. These distances are not static and should serve as **minimum clearance** requirements unless designated otherwise by AEP Forestry. Good soils and high moisture may cause many species to grow faster. These clearance guidelines are not meant as a requirement for all trees on AEP's rights-of-way. It is understood that during maintenance intervals, trees may encroach into these minimum clearance zones. The guidelines are meant to be used as a guide for trimming those trees currently being maintained.

MINIMUM CLEARANCE FROM CONDUCTORS

- **Species with Fast Re-growth Rates:** Prune for a *minimum* clearance of 20 feet from conductors

Cottonwood	Willow
Poplar species	Ailanthus
Silver maple	Box Elder
Sycamore	

- **Species with Medium Re-growth Rates:** Prune for a *minimum* clearance of 15 feet from conductors

Locust	Hackberry
Red maple species	Hickory
Ornamental pear species	Crabapple
Fruit trees (apple, pear, etc.)	Red oak
Elm species	Ash species
Pine, Spruce & Hemlock species	Mulberry
Sweet gum	Bois d'arc (Osage orange, hedge tree)
Catalpa	

- **Species with Slow Re-growth Rates:** Prune for a *minimum* clearance of 10 feet from conductors

Cedar	Persimmon
Chinaberry	White oak (round lobes)
Magnolia	(Redbud, dogwood, etc.)
Any small variety species	

- **Possible Exceptions:**

- When the entire trunk of a tree falls within the minimum clearance specifications.
- When due to the branching structure of the tree less trimming would lend itself to an overall healthier tree, yet with acceptable clearance.
- Isolated instances approved by AEP Forestry representative.

Goals, Procedures & Guidelines for Distribution and Transmission Line Clearance

APPENDIX II

Transmission Line Clearance Guidelines⁽⁷⁾

Column A Nominal Voltage (kV phase to phase)	Column B ⁽⁵⁾ NERC Clearance 1 (no restrictions) Desired Clearance between Conductor ⁽¹⁾⁽²⁾ and Vegetation	Column C ⁽³⁾⁽⁵⁾ NERC Clearance 1 (with restrictions) Desired Clearance between Conductor ⁽¹⁾ and Vegetation	Column D ⁽³⁾ ANSI Clearance between Conductor ⁽¹⁾ and Vegetation	Column E ⁽⁴⁾ NERC Clearance 2 between Conductor ⁽¹⁾ and Vegetation
765 kV	45'	35' 00"	27' 04"	14' 0"
500 kV	45'	26' 08"	19' 00"	10' 0"
345 kV	30'	20' 05"	13' 02"	7' 6"
230 kV	30'	16' 05"	7' 11"	5' 2"
161 kV	25'	14' 00"	6' 00"	3' 5"
138 kV	25'	13' 02"	5' 02"	2' 11"
88 kV & 115kV	25'	12' 04"	4' 06"	2' 6"
69 kV	25'	10' 09"	3' 09"	2' 6"
46kV, 40kV, 34.5 kV & 23 kV	20'	10' 00"	2' 09"	2' 6"

⁽¹⁾ Conductor at maximum sag condition⁽⁶⁾

⁽²⁾ Desired clearance to maintain reasonable clearing cycles

⁽³⁾ ANSI Z133.1 rev. 10/2000

⁽⁴⁾ IEEE Standard 516-2003, Section 4.2.2.3, Tables 5 and 7, calculated clearances (Clearance 2)

⁽⁵⁾ Application of herbicides will be considered as meeting these guidelines, as long as all treated vegetation meets or exceeds the desired clearance from maximum sag (Table AEP1.2, Columns A and C).

⁽⁶⁾ AEP Guideline for Determining Maximum Conductor Sag and Blowout for Vegetation Management is to be used to adjust the conductor's found field condition to the maximum sag condition taking into account the conductor size, span length, elevation, and current temperature.

⁽⁷⁾ (Columns A, B, C, and D) distances exceed clearances for NERC operationally significant circuits noted in NERC Standard FAC-003-1, which gives clearances (Columns A and E) to be maintained between vegetation and conductors under all rated electrical operating conditions, per IEEE Standard 516-2003 (Guide for Maintenance Methods on Energized Power Lines) and as specified in its Section 4.2.2.3, Minimum Air Insulation Distances without Tools in the Air Gap.