

Vegetation Management Guidelines

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ABOUT THIS INFORMATION

The following information is intended as a guide for use when performing vegetation management services. Vegetation management includes the services of distribution and transmission line clearance, overhead safety inspection program and landscape maintenance. Regardless of the service performed, every work site has its own safety and work requirements.

Note: This information addresses procedures for Holy Cross Energy operating employees and is not intended for use as personal safety guidelines. Contractors are responsible for developing and following their own safety procedures.

Contractors who are performing vegetation management services are required to have a copy of this information with them in the field. Those performing line clearance activity are also required to have the book "[*Best Management Practices- Utility Pruning of Trees*](#)" by the International Society of Arboriculture on each truck or work location at all times. Contractors are required to supply their own copy of this publication.

****This information supersedes all previous manuals and guidelines for line clearance and vegetation management work for Holy Cross Energy.**

1. SAFETY

All personnel performing vegetation management work on or near Holy Cross Energy facilities or rights of way shall follow approved safety guidelines and procedures. All contractors performing work for Holy Cross Energy shall comply with all applicable governmental safety and health regulations, and the safety and health provisions of their

contracts.

There are two important standards for tree worker safety in the United States, OSHA 1910.269 and ANSI Z133.1. Contract line clearance tree workers must meet the requirements of these standards as well as any other applicable federal, state or local laws, codes, or regulations.

1.1 OSHA REQUIREMENTS (1910.269)

[OSHA 1910.269](#) is the Occupational Safety and Health Administration's vertical standard pertaining to the generation, transmission and distribution of electricity. A specific section of OSHA 1910.269 requires that everyone performing tree work in proximity to electric hazards must be qualified and their training has to be documented.

1.2 ANSI REQUIREMENTS (Z-133.1)

[ANSI Z-133](#) is the American National Standard for Arboricultural Operations Pruning, Repairing, Maintaining, and Removing Trees, and Cutting Brush -Safety Requirements. It has the force of law because it is the document an OSHA compliance officer would reference when identifying safety violations of employees engaged in tree work. Therefore, it is considered the definitive safety standard for arboricultural operations.

In short, ANSI Z-133 defines an electric hazard to exist anytime a tree worker, tool, tree or any other conductive object is closer than 10 feet from an energized conductor with a voltage of 50,000 volts or less. From this 10 foot baseline, 0.4 inches of required clearance is added for every 1,000 volts above the 50,000-volt baseline. ANSI Z-133 provides tables that outline minimum approach distances for both qualified and non-qualified tree workers based on voltage and elevation.

Contractor managers are required to provide ANSI Z-133 minimum approach distance tables to their employees.

1.3 STATE REQUIREMENTS

Colorado: [Colorado Revised Statutes Title 9 Safety -Industrial and Commercial, Article 2.5-High Voltage Power lines -Safety Requirements](#). Only qualified employees of an electric utility can perform any activity that may bring an individual or equipment within 10 feet of high voltage (lines in excess of 600 volts) overhead lines. Employees and contractors working directly for the utility are considered qualified. Non-qualified employees or individuals must contact the appropriate utility to make arrangements for safe activity.

All employees and contractors must be aware of the nature and characteristics of the electric facilities before work begins. Contractors need to understand that the electric facilities must remain energized during the performance of work unless special arrangements are made with an authorized Holy Cross Energy representative.

The following procedures pertain to contractors performing vegetation management work for Holy Cross Energy:

- The contractor shall obtain full information as to the voltage of its circuits and

minimum approach distances before starting the work.

The contractor shall at all times conduct work in a manner to safeguard the public from injury and property from damage.

- The contractor must use all necessary protection for its employees and the public, and guard against interference with normal operation of the circuits. If, in the judgment of the contractor's general foreman/supervisor, it is too hazardous to prune or remove trees with the circuits energized, the contractor must contact an authorized Holy Cross Energy representative(s). If appropriate, Holy Cross Energy will de-energize circuits to ensure the safe pruning or removal of the tree(s). Should the contractor knock down or come into contact with Holy Cross Energy conductors (power lines), the contractor must notify Holy Cross Energy immediately and take the necessary protective measures. All contractor-caused electric service interruptions are subject to repair at the contractor's expense.
- In the event a contractor becomes aware of any dangerous, broken, loose or faulty Holy Cross Energy line facilities in the normal course of its line clearance performance, the contractor shall promptly advise Holy Cross Energy as to the exact equipment location(s) and nature of the condition found in accordance with the Overhead Safety Inspection Program. (See section 4, OHSI program).
- Any contractor personnel entering substation equipment yards must be qualified employees (OSHA 1910.269). Contractor personnel must notify dispatch prior to entering any substation, must lock the gate behind them while in the substation, notify dispatch when leaving the substation, and must close and lock the gate behind them.

Holy Cross Dispatch (970) 947-5400

2. GENERAL LINE CLEARANCE

2.1 WHY ELECTRIC UTILITIES ARE REQUIRED TO PERFORM THE WORK

State regulatory entities such as the Public Utility Commissions (PUC) and Public Service Commission's (PSC) require electric utilities to maintain its facilities in accordance with the National Electric Safety Code (NESC). The NESC generally requires the trimming or removal of interfering trees.

Federal agencies such as the North American Electric Reliability Council (NERC) require electric utilities to maintain its transmission system in accordance with the mandatory vegetation management and maintenance standard set forth in the [Energy Policy Act of 2005 \(FAC-003-1\) section 1211](#). These industry standards are designed to ensure safe and reliable operation of a transmission line system.

Trees are a major contributor of electric service interruptions nationwide. Trees cause outages in two ways, mechanical and electrical. Mechanical damage refers to entire trees or portions of trees falling and physically damaging facilities (knocking down wires, poles, etc.). Because trees can be conductive, electrical outages can also occur. These interruptions are caused when a portion of a tree becomes a short circuit path for electricity to flow causing a protective device to operate and stop the flow of electricity. Therefore, trees must be maintained an adequate distance from the conductors in an attempt to prevent interruptions of electric service.

2.1.1 National Electric Safety Code (NESC) Requirements

The National Electric Safety Code, Vegetation Management Section 2IS.A.I states:
Vegetation that may damage ungrounded supply conductors should be pruned or removed. Vegetation management should be performed as experience has shown to be necessary.

Note: Factors to consider in determining the extent of vegetation management required include, but are not limited to: line voltage class, species' growth rates and failure characteristics, right-of-way limitations, the vegetation's location in relation to the conductors, the potential combined movement of vegetation and conductors during routine winds, and sagging of conductors due to elevated temperatures or icing

2.1.2 Public Utilities Commission (PUC)/Public Service Commission (PSC) Tariffs

Tariffs and agreements with various state regulatory entities give utility companies and their contractors the ability to enter private property for maintenance purposes regardless of the existence of an easement or prescriptive rights.

3. VEGETATION MANAGEMENT (VM)

3.1 GENERAL PHILOSOPHY

Vegetation management is a data-driven, progressive system of information gathering utilized to best plan and complete work. It involves the use of various types of vegetation management treatments including removing, pruning and mowing of vegetation. The overall goal of a utility VM program is to develop site-specific, environmentally sensitive, cost effective and socially responsible solutions to vegetation control near an electric facility.

3.2 TREE OF INTEREST MITIGATION

Any tree on or off the right-of-way with the potential to contact an electric supply line is considered a tree of interest. A tree of interest has an unacceptable risk of failing before the next maintenance cycle. Trees of interest should be topped or trimmed below line height or removed.

Conditions that might indicate the presence of a tree of interest could include but are not limited to the following:

Biological Factors

- Decay/deadwood/dead trees
- Cracks
- Weak branch unions
- Cankers/fungal bodies

Environmental Factors

- Root damage, restrictions
- Changes in exposure
- Poor architecture (leaning, structural overloading, imbalance due to wounding, etc.)

3.3 -WORK GUIDELINES

3.3.1 ANSI A-300

[The American National Standard Institute's A-300](#) standard presents performance standards for the care and maintenance of trees, shrubs, and other woody plants. The standard is intended as a guide for federal, state, municipal, and private authorities including property owners, property managers, and utilities.

Whenever possible and practical, contractor tree workers are expected to adhere to this standard when pruning trees near electric facilities.

The International Society of Arboriculture booklet titled "Best Management Practices for Utility Pruning of Trees" provides a good working summary of the principals included in ANSIA-300. Contract tree workers are expected to have a copy of this booklet in the field for reference purposes.

3.3.2 Pruning

Tree pruning is the selective removal of branches that are not an adequate distance from the primary line, or that will grow too close to the power line before the next maintenance cycle. Secondary, street light and service wires are not routinely trimmed for clearance unless overbuilt primary exists. In addition, secondary or streetlight wires may be trimmed if major interference, such as a broken limb, exists.

Tree pruning is done to provide adequate clearance from our primary electric facilities. If practical, trimming methods will be based on procedures and examples set forth by ANSI A-300. As a general rule, trees should be pruned to improve or re-establish the clearance provided from previously performed right of way maintenance.

Pruning should be done to remove or shorten dangerous limbs, such as those overhanging wires that have a high potential for breaking or bending into Holy Cross Energy conductors due to ice, snow or wind loading. Be aware of the possibility of included bark at the branch bark ridge.

Some factors to consider when pruning include:

- Tree species
- Growth rates (how fast the branches grow back)
- Wood strength (the chance of the branch breaking under the load of strong wind, snow or ice) -Conductivity (how well the wood can conduct electricity)
- Branch size (Larger-diameter branches coming in contact with conductors by failure or deflection create the greatest risk for tree-related interruptions)
- Voltage conducted by the line and the line's construction (the higher the voltage, the greater the clearance required)
- Framing and spacing between phases of multi-phase lines (compact design and multi-phase lines pose higher risk to tree-related interruptions)
- Location of a tree in relationship to protective devices and critical customers on the circuit (hospitals, etc)

- Location of a tree in regards to general public safety (existence of tree houses, public places, climb ability of tree etc)
- Risk of wildfire ignition

Vegetation Screens

Where required by federal, state and/or local laws or regulations, screens of trees may be left on the right-of-way so the natural tree line is not interrupted.

3.3.3 Removal

Tree removal is the selective clearing of entire trees and brush at ground level. Contractors will consult their Holy Cross Energy Vegetation Management representative for specific removal criteria for the area in which they are working.

Generally:

- Remove tall-growing trees that fit the removal criteria for that geographic area.
- Remove tall-growing brush that has the potential to grow into the conductor.
- Apply the "wire zone/border zone" concept to transmission and distribution electric facilities.
- All trees and brush should be cut as close to the ground as practical. Remove all second growth from stumps cut on previous pruning cycles.
- Mitigate all trees that present an unacceptable risk to Holy Cross Energy facilities (See Hazard Tree Mitigation Section 3.2.)
- Keep all poles, guy wires and switch grates clear of vegetation.

Trees are not removed from the vicinity of secondary, streetlight and service wires.

4 TRANSMISSION AND DISTRIBUTION (T & D) LINE CLEARANCE

4.1 –GENERAL T & D LINE CLEARANCE GUIDELINES

Holy Cross Energy's clearance guidelines are based on local tree growth rates, specific to individual trees on specific circuits. Specific clearances are determined based on species growth rates, as well as line voltage, construction of facilities, electric reliability performance and other factors listed below.

The primary objective of the T&D line clearance program is to keep the facilities clear of all tall-growing trees, brush and other vegetation that could grow too close to conductor. This is accomplished by routine maintenance on each circuit including tree removal, pruning and mowing. Each right-of-way (ROW) has an established maintenance cycle depending on work required.

Maintenance objectives include:

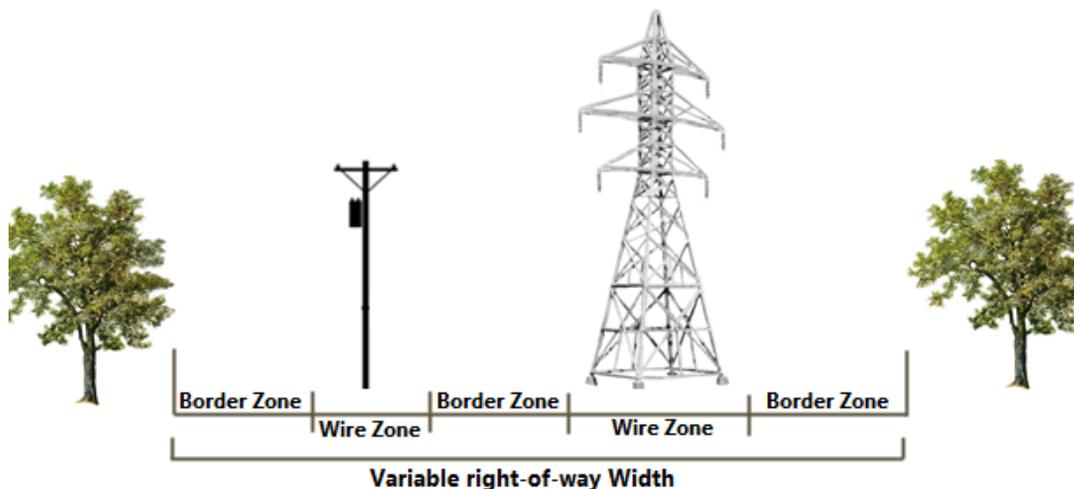
- Public and worker safety
- Compliance with regulatory and legal requirements
- Reliable electric service that allows for operational flexibility
- Environmental stewardship and habitat enhancement

4.2 –WIRE ZONE/BORDER ZONE

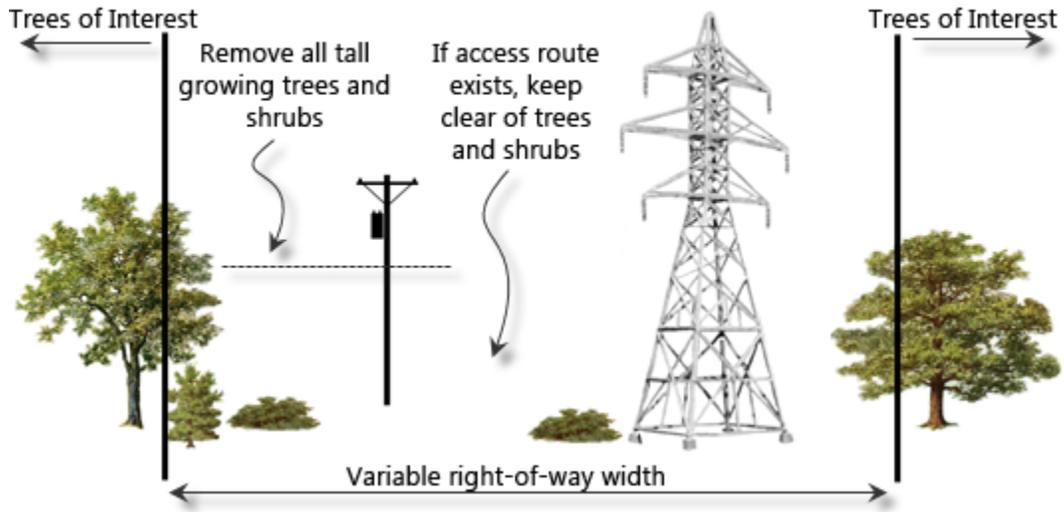
Wherever feasible, the wire zone/border zone concept (Bramble and Byrnes, 2000) shall be integrated into the vegetation management program to allow for different types and heights of vegetation in the ROW. This concept differentiates between the wire zone directly under the conductors and the remaining border zone.

Generally; this concept allows for different, yet compatible, vegetation types in these separate zones.

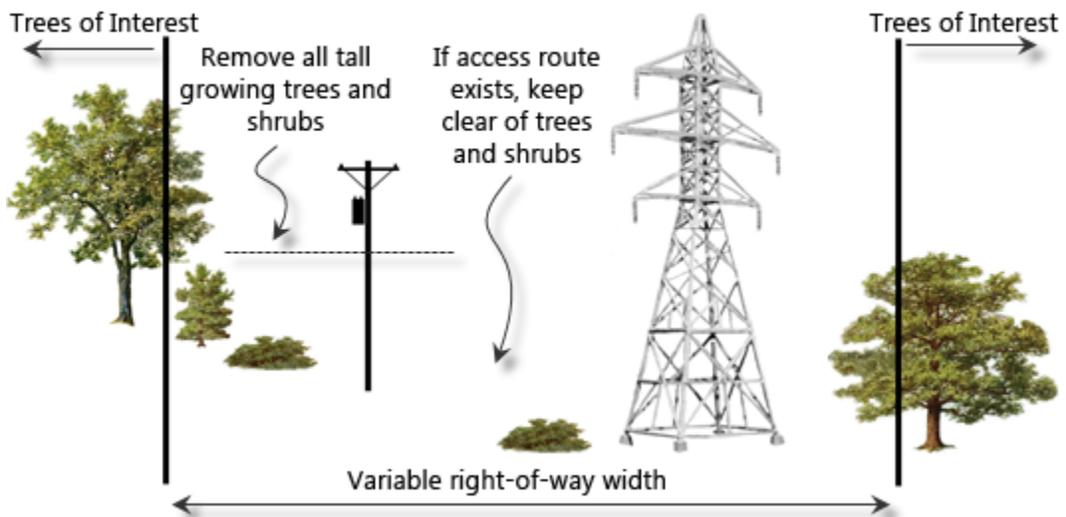
- Wire Zone: Area directly underneath the conductor(s). Vegetation in the wire zone consists of low-growing forbs and grasses.
- Border Zone: Area that begins at the outside edge of the wire zone and extends to the edge of the easement. The border zone may contain additional low-growing woody plants and trees.
- The wire zone/border zone concept, as applied by Holy Cross Energy, does not require removal of tall-growing trees if, at maximum mature height, the tree would not come within 15 feet of vertical clearance nor have the potential to fall into or overhang a conductor horizontally.
- Areas outside the border zone must be patrolled for trees of interest (see Tree of Interest Mitigation Section 3.2).



Cross-Section of Typical Transmission and Distribution Right of Way



Special Considerations for Clearing Trees of Interest on Slopes of Right of Way



4.3 MINIMUM CLEARANCE GUIDELINES

If, for any reason, the wire Zone/Border Zone concept cannot be achieved, the following minimum clearance guidelines are to be maintained at all times.

Maintained Clearances for Trees

In order to maintain these minimum clearances at all times, crews performing tree work must consider the tree species, growing environment, re-growth rate, maintenance cycle length (Holy Cross Electric adheres to a 5 year cycle), etc. in order to determine the amount of clearance required at the time of pruning. The following tables are provided as a guideline only. Each tree requires the evaluation of these factors in order to determine specific re-growth rates.

Table 1	Average re-growth after trimming (ft)
Common Tree Species	5 Year Cycle
American Elm	24
Ash	15
Aspen	5
Black Locust	32
Blue Spruce	5
Box-Elder	29
Cottonwood	20
Douglas Fir	5
Engelmann Spruce	5
Linden	12
Lodge pole Pine	5
Ponderosa Pine	5
Poplar	20
Red Oak	12
Siberian Elm	20
Silver Maple	26
Sugar Maple	17
Weeping Willow	31
Willow	20

Table A - HORIZONTAL CLEARANCE @ LOWEST SAG POINT			
Voltage (kV)	Up to 400 FT Span	Up to 800 FT Span	Up to 1200 FT Span
25	10	15	N/A
115	12	20	32

Table B - HORIZONTAL CLEARANCE @ STRUCTURE			
Voltage (kV)	Up to 400 FT Span	Up to 800 FT Span	Up to 1200 FT Span
25	10	10	10
115	12	12	12

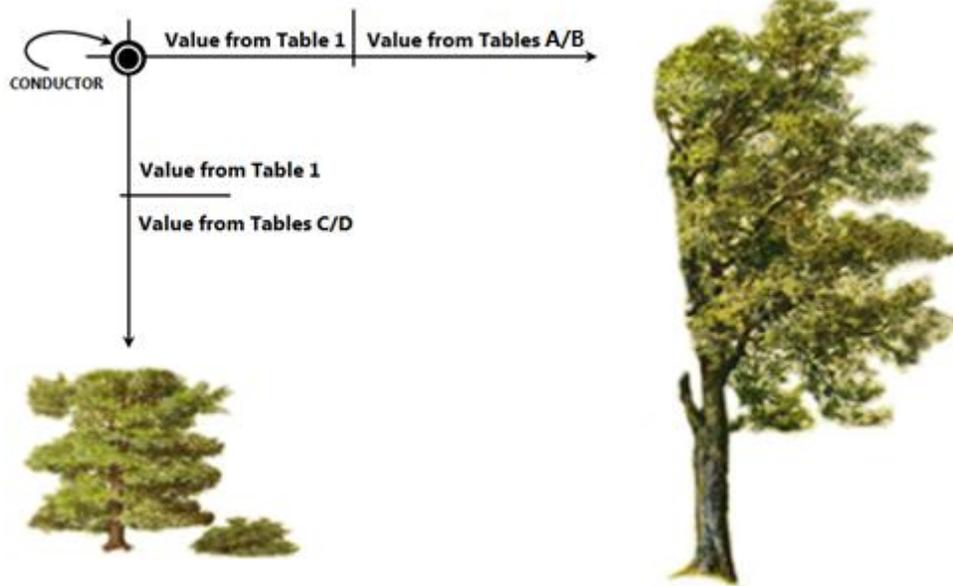
Table C - VERTICAL CLEARANCE @ LOWEST SAG POINT

Voltage (kV)	Up to 400 FT Span	Up to 800 FT Span	Up to 1200 FT Span
25	14	18	N/A
115	16	22	26

Table D - VERTICAL CLEARANCE @ STRUCTURE

Voltage (kV)	Up to 400 FT Span	Up to 800 FT Span	Up to 1200 FT Span
25	10	10	N/A
115	12	12	12

Calculating Horizontal and Vertical Minimum Clearances



The following calculations must be performed to determine clearances necessary at time of pruning:

Horizontal Clearance at time of pruning = (Value from Tables 1) + (Value from Tables A/B)

Vertical Clearance at time of pruning = (Value from Tables 1) + (Value from Tables C/D)

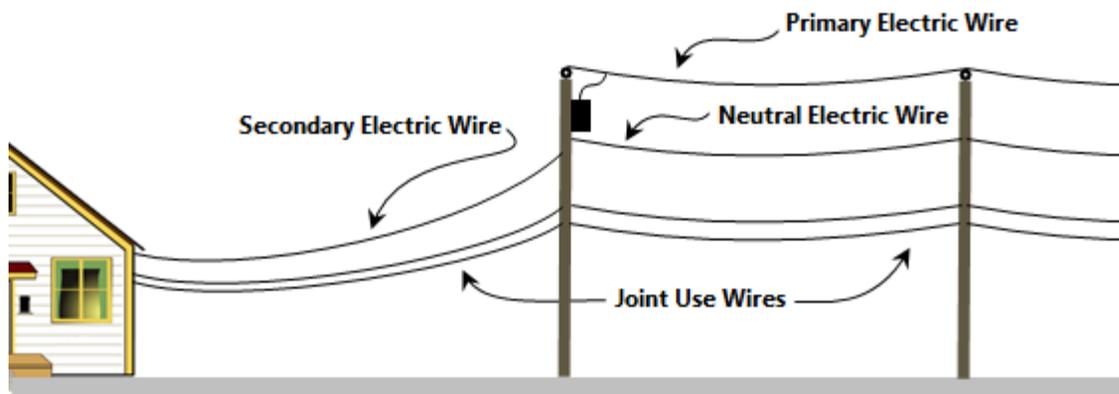
Rights of Way/Easements

Contractors need to be aware that transmission and distribution lines may be constructed where legal easements exist. Special conditions may apply regarding vegetation management activities. If questions arise, contact the appropriate Holy Cross Energy Vegetation Management representative.

Holy Cross Energy does not purposely clear non company conductors including cable and phone wires.

4.4. DEFINITION OF DISTRIBUTION CONDUCTOR TYPES

An understanding of the basic distribution system is necessary to determine clearances.



Notification

Holy Cross Energy expects that a reasonable attempt be made by Holy Cross and contractor personnel to notify property owners regarding work to be done.

It is recommended that contractors obtain written acknowledgement from the landowner for all tree and brush removal.

Refusal

If clearing is necessary and the landowner refuses either access or to allow appropriate trimming and or removal, the crew will notify their supervisor. If necessary, the supervisor will notify the appropriate Holy Cross Energy Vegetation Management representative for resolution.

4.4.1 Rights of Way/Easements

Contractors need to be aware that transmission and distribution lines may be constructed where legal easements exist. Special conditions may apply regarding vegetation management activities. If questions arise, contact the appropriate Holy Cross Energy Vegetation Management representative at (970) 947-5422.

4.5 WORK DESCRIPTIONS

4.5.1 Routine Maintenance /Scheduled Work

Routine Maintenance is proactive, scheduled work performed on a circuit/maintenance map basis. In general, all debris is removed, while logs are cut into manageable-sized pieces and left on the property for the customer.

4.5.2 External and Safety Zone Requests

Only qualified tree workers can work on trees that have grown closer than non-qualified tree worker minimum approach distances (see Safety section on page 2). Therefore, Holy Cross Energy provides adequate clearance so that work by non-qualified workers can be performed safely. These clearance requests are known as "safety zone" requests.

It is important that Holy Cross crews and contractor personnel respond to these requests in a timely manner and in accordance with any laws and regulations. Work personnel must

also determine the most cost effective course of action to provide adequate clearance.

Examples include:

- Pruning the portion of the tree back an adequate distance
- Dropping the tree on the ground
- Requesting that the conductor be de-energized
- If the request pertains to a service line, street light wire or other secondary line, advise the requesting party to call Holy Cross Energy Vegetation Management personnel at (970) 947-5422 and request a "line drop" to temporarily remove the wire from the work zone.

Holy Cross Energy does not currently charge a fee for the trimming or dropping of trees related to safety zone requests, but it is important that Holy Cross and contractor personnel clearly communicate to the requesting party that all debris will be left on site.

A service fee may apply to the de-energizing of conductors and for line drops. The requesting party should consult Holy Cross Energy Vegetation Management Representative for more information by calling (970) 947-5422.

If inspection by contractor personnel determines that the tree in question has adequate clearance, the requesting party has the option to have any necessary work performed on their own or if applicable, wait until routine maintenance is performed.

4.5.3 Internal Requests

Various entities within Holy Cross Energy may request assistance from tree crews to mitigate tree issues. The majority of these requests are due to service reliability problems or to clear trees for the installation of new facilities and the upgrade of existing facilities.

Service Reliability Related Requests

It is important that tree personnel respond to these requests in a timely manner and in accordance with any instructions provided with the request. In many cases we expect the tree personnel to make a judgment call as to the necessity of pruning. Holy Cross and contractor personnel need to consider all factors including when the tree is due for routine maintenance when making this decision.

4.5.4 Emergency/Storm Response

Holy Cross and contractor personnel are required to respond to storm situations. Only work necessary for the restoration of power will be performed. A reasonable attempt should be made to notify customers. No debris disposal will be attempted for any tree work performed.

5 OVERHEAD INSPECTION PROGRAM

Holy Cross Energy and its contractors shall report hazards found as part of the overhead inspection program, which is performed in concert with transmission and distribution line clearance operations.

5.1-SCOPE

Holy Cross and contractors perform this inspection as part of their normal duties. During the course of routine line clearance operations, all spans of overhead primary conductor will be inspected, regardless of the presence of vegetation. While on each job site, contractors should also inspect secondary and service conductors.

Tree personnel are to identify obvious safety hazards on Holy Cross Energy's distribution and transmission overhead facilities that could pose a threat to the general public as well as our employees and contracted workers. Hazards that present an imminent threat to personal or public safety must be resolved immediately. Depending upon the urgency of the situation, it may be necessary for the inspector to stay on site until a utility representative arrives at the scene.

When a hazard is found, identify the appropriate structure on a corresponding map with a brief description of the problem. The completed map shall be given to a Holy Cross Energy Vegetation Management representative for documentation and repairs.

Sample list of Hazards

The following is a sample list of safety hazards that tree personnel should be able to recognize. Please note that all situations cannot be listed and good judgment must be used when inspecting.

Overhead Facilities

- Cracked or broken cross arms
- Missing cross arm braces
- Guy wires-missing, loose or damaged
- Oil-filled equipment leaks or equipment that might fall down
- Insufficient clearances of conductors -from buildings, tree houses, ladders, transmission, etc.
- Transmission and distribution right-of-way encroachment
- Leaning pole, tower or footing
- Rotted or eroding pole, tower or footing
- Bird nest on a structure
- Significant woodpecker damage to a pole or tower
- Wires down, broken or severely frayed
- Wire off of insulator or pin
- Minimum ground clearances issues
- Damage to insulator
- Damage to pole top pin
- Accessible objects hanging from lines
- Joint use violations
- Meter housing, mast or riser loose or pulling from structure
- Exposed wires
- Doors to underground equipment and vaults unlocked or open

6 MISCELLANEOUS VEGETATION MANAGEMENT

6.1 AVIAN PROTECTION

Holy Cross Energy's long-term Avian Protection Plan details the company's efforts to improve its primarily distribution lines, and to reduce risks to birds from interactions with company facilities. The following are items listed in the Avian Protection Plan as it relates to tree trimming:

- An inactive bird nest is defined as not having eggs or young. If birds are building nests that don't have eggs or young, it is inactive. If tree crews encounter an inactive nest, in part of a tree we need to trim, they can remove the nest. The only exception is an eagle nest. An inactive eagle nest **cannot** be removed.
- If tree crews encounter an active nest (eggs or young present), in part of a tree we need to trim, the nest cannot be removed until it becomes inactive. We can still trim the tree to clear the wire as long as the nest and birds are not disturbed. We may need to return after the nest becomes inactive to finish pruning the tree. These situations must be reported to the Holy Cross Energy Vegetation Management representative who will contact the appropriate government agency representative.
- If tree crews find a dead or injured bird that had come into contact with a line, they must contact the Holy Cross Dispatch Center at (970) 947-5400. Dispatch will then contact the appropriate government agency representative.

6.2 METER CLEARANCE

Outdoor meters or multiple meters shall be located so that a clear line of sight is established and maintained from an accessible location for meter reading. All trees and foliage shall be kept clear to allow access for a safe work zone around the meter cabinet and disconnect.

6.3 PAD MOUNTED TRANSFORMER CLEARANCE (Illustrated Notes):

- A. Top pad of pre-cast concrete transformer vault. Not all pads are the same dimensions.
- B. Transformers. Not all transformers are the same dimensions.
- C. Transformer door. Transformer doors hinge at various positions on the transformers.
- D. Clear areas are required around pad mounted transformers to allow the following:
 1. Access to the primary and secondary compartments of the transformer.
 2. Hot stick operation of the elbows, switch and bay-o-net fuse associated with the primary compartment of the transformer.
 3. Air circulation for cooling the transformer during peak load conditions.
 4. Boom truck access for replacing the transformer.
 5. Routine inspection and maintenance.
- E. Grade shall be level in the clear area.
- F. The clear area shall have no obstructions that would impede Holy Cross Energy personnel in the operation, maintenance, installation, removal, or repair of the transformer or any other Holy Cross Energy facilities at this location.

